

ABORIGINAL CULTURAL HERITAGE REPORT

Abel Upgrade Modification
Environmental Assessment

APPENDIX F

**ABEL UNDERGROUND MINE:
SUPPLEMENTARY ABORIGINAL
CULTURAL HERITAGE ASSESSMENT FOR
ABEL UPGRADE MODIFICATION**

A report to

Donaldson Coal Pty Limited

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EXECUTIVE SUMMARY

Donaldson Coal owns and operates the Abel Underground Mine, located approximately 23 kilometres north-west of the Port of Newcastle, New South Wales. Donaldson Coal is a wholly owned subsidiary of Yancoal Australia Limited.

Project Approval (05_0136) for the Abel Underground Mine was granted on 7 June 2007 by the then NSW Minister for Planning, pursuant to Section 79J of the *Environmental Planning and Assessment Act 1979*. An Environmental Assessment was undertaken for the Project, including an Aboriginal cultural heritage assessment by South East Archaeology.

As a condition of the Project Approval, an Aboriginal Heritage Management Plan (AHMP) was prepared (*Abel Underground Mine: Aboriginal Heritage Management Plan*). The AHMP was subsequently approved by the Department of Planning in February 2008 and is currently implemented to manage all interactions between the Approved Project and Aboriginal heritage.

Donaldson Coal is seeking approval under Section 75W of the *Environmental Planning and Assessment Act 1979* for a Modification to Project Approval 05_0136 to enable upgrades to underground mining operations at the Abel Underground Mine. Herein this is referred to as the 'Abel Upgrade Modification' or 'the Modification'.

This report addresses the impacts of the proposed Modification on Aboriginal heritage, consistent with the Director-General's requirements, Part 3A Project Approval and the approved Aboriginal Heritage Management Plan.

The investigation area comprises the areas within the Abel Underground Mine where the subsidence impacts may change, as a result of the proposed change from bord and pillar to shortwall and longwall mining. These areas, including the potential zone of subsidence influence associated with the changed mining method, comprise:

- "Area A" - approximately 145.6 hectares associated with a proposed change to shortwall mining of the Upper Donaldson Seam for panels UDSW1 - UDSW7;
- "Area B" - approximately 120.4 hectares associated with a proposed change to shortwall mining of the Lower Donaldson Seam for panels LDSW1 - LDSW4; and
- "Area C" - approximately 375.8 hectares associated with a proposed change to longwall mining of the Lower Donaldson Seam for panels LDLW1 - LDLW5.

The original Aboriginal cultural heritage assessment for the Abel Underground Mine involved implementation of the *Interim Community Consultation Requirements for Applicants* policy and the approved AHMP specifies procedures for Aboriginal community involvement. Thirteen Aboriginal organisations had registered an interest in the original assessment. Consistent with Section 4.2 of the AHMP, the Local Aboriginal Land Councils were consulted about the proposed Modification. In addition, the eleven other registered stakeholders involved in the original Aboriginal cultural heritage assessment were also consulted.

An archaeological field survey was undertaken with representatives of the registered Aboriginal stakeholders in April 2012. It involved a targeted sample of the highest risk formations (such as clifflines and major drainages) in the Modification investigation area, to identify and assess the key potential changes that may arise from the proposed change to the mining method in these areas (ie. from bord and pillar, to shortwall and longwall). For the overall Modification investigation area of 641.8 hectares, an area of 155.5 hectares (24%) was subject to archaeological sampling.

As the survey sampled the areas of highest heritage potential, the level and nature of effective survey coverage is considered satisfactory enough to present an effective assessment of the Aboriginal heritage resources identified and potentially present within the Modification investigation area.

Within the Modification investigation area, 15 Aboriginal sites and one rock shelter with Potential Archaeological Deposit (PAD) have been identified, comprising:

- ❑ Seven open grinding groove sites;
- ❑ Six open artefact sites (including isolated finds);
- ❑ Two scarred trees; and
- ❑ One rock shelter with PAD.

Four of these sites had previously been recorded and 11 sites and one rock shelter with PAD were recorded during the present survey. In addition, there are several documented cultural values/places associated with the investigation area:

- ❑ The Black Hill locality (including the Modification investigation area) is a cultural landscape of traditional, historical and contemporary cultural significance to the Aboriginal community;
- ❑ The Black Hill Spur was a pathway used by Aboriginal people, which probably extended from Hexham Swamp to Mount Sugarloaf; and
- ❑ The initiation/ceremonial site known as 'the Doghole' is located in the vicinity of Stockrington and Long Gully.

The results of the investigation are consistent with previous archaeological results from directly within the investigation area and elsewhere in the locality. The open artefact sites and open grinding groove sites identified during the present survey lie comfortably within the nature and range of expected evidence and are similar to other sites previously reported directly within the investigation area and nearby. No specific aspects of this evidence are rare or unique within a regional context. The cultural places (pathway and ceremonial area) had previously been reported and complement other knowledge from the region.

The significance of the Aboriginal heritage evidence was assessed against the criteria used in the original assessment for the Abel Underground Mine. It is noted that all Aboriginal heritage is of interest and contemporary value to the Aboriginal community. Aboriginal heritage evidence represents a tangible link with the traditional past and with the lifestyle and values of community ancestors. The six open artefact sites, rock shelter with PAD, possible scarred trees and three of the open grinding groove sites are assessed as being of low significance within a local context. Four of the open grinding groove sites are assessed as being of low to moderate significance within a local context.

The impacts of the proposed Modification on Aboriginal heritage have been assessed. The primary potential impact relates to changes to the predicted level of underground mining induced subsidence. Maximum predicted values for conventional subsidence and tilts associated with the Modification would be higher than those predicted for bord and pillar mining. However, only two known grinding groove sites of low to moderate significance will be subject to impacts (Abel 2 and AMC2/A), along with two sites of low significance (AMB1/A and AMC16/A). Other grinding groove sites or site types are unlikely to be affected.

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

Consistent with the Part 3A Project Approval, Statement of Commitments, *Abel Underground Mine: Aboriginal Heritage Management Plan* and Part 3A Project assessment, and with consideration of legal requirements under the NSW *National Parks and Wildlife Act 1974* and *Environmental Planning and Assessment Act 1979*, the results of the investigation of the Modification and consultation with the local Aboriginal community, the following management measures are proposed:

- ❑ Provisions relating to Aboriginal heritage in the approved AHMP for the Project that are relevant to the Modification will continue to be implemented. In particular, these include but are not limited to:
 - Aboriginal community involvement, as outlined in Section 4.2 of the AHMP;
 - Management of the Aboriginal Site Database, as outlined in Section 4.3 of the AHMP;
 - Staged systematic archaeological survey of all areas proposed to be undermined, with the Aboriginal stakeholders, as outlined in Section 4.6 of the AHMP;
 - Management of any previously unrecorded Aboriginal heritage evidence, if identified during the course of operations or further investigations, as outlined in Section 4.7 of the AHMP;
 - Management of any skeletal remains, if identified during the course of operations or further investigations, as outlined in Section 4.8 of the AHMP;
 - Monitoring of Aboriginal sites as outlined in Section 4.9 of the AHMP;
 - Periodic review of the AHMP, as outlined in Section 4.10 of the AHMP;
- ❑ The AHMP will be revised to include new provisions relevant to the Modification and revision of several existing relevant provisions:
 - Section 4.5 will be revised to specify that the existing provisions are relevant to the bord and pillar mining area only (exclusive of the longwall and shortwall mining areas);
 - Section 4.5 will be revised to include new provisions relating only to the longwall and shortwall mining areas;
 - Section 4.5 will be revised to include detailed analysis of a sample of individual grinding grooves at each site within the longwall and shortwall mining areas that has a more than unlikely potential for subsidence impacts, using residue and use-wear techniques and experimental data;

- Sections 4.5 and 4.6 will be revised to clarify that any direct surface impacts proposed in the Underground Mine Area south of John Renshaw Drive will be assessed and any identified Aboriginal heritage evidence managed in accordance with the procedures set out in Sections 4.4 and 4.5;
- Section 4.6 will be revised to add procedures to address any potential future alterations that may be proposed to the underground mine plan;
- The AHMP will be revised to address minor changes such as:
 - Replacement of previous references to DECCW with the OEH, and Department of Planning with the DP&I, along with other similar minor amendments;
 - Replacement of Table 1 and Figure 1 with updated versions; and
 - Addition of the DP&I to the procedures in Section 4.8 relating to skeletal remains, Section 4.10 in relation to review of the plan and elsewhere in relation to the provision of reports; and
- Copies of this report should be forwarded to each registered Aboriginal stakeholder and the Department of Planning and Infrastructure and the Office of Environment and Heritage within 25 working days of completion. Any revisions to the AHMP should not be implemented until approved by the Department of Planning and Infrastructure.

TABLE OF CONTENTS

	Page
1. Introduction	1
1.1 Description of the Modification	2
1.2 Objectives and Purpose of this Report	3
1.3 Authorship	5
2. Existing Environment	10
2.1 Natural Context	10
2.2 Cultural Context	11
2.2.1 Heritage Registers	11
2.2.2 Previous Archaeological Research	17
2.2.3 Local Aboriginal Culture	26
2.2.4 Predictive Model of Site Location	27
2.3 Statutory Context	31
3. Methodology	34
3.1 Investigation and Survey Methodology	34
3.2 Aboriginal Consultation	36
4. Results and Discussion	40
4.1 Survey Coverage	40
4.2 Aboriginal Heritage Evidence	45
4.3 Discussion	45
5. Significance Assessment	50
5.1 Criteria	50
5.2 Significance of Heritage Evidence Within the Modification Investigation Area	53
6. Impact Assessment	55
7. Potential Mitigation and Management Strategies	59
8. Recommendations	65
References	68
Acknowledgements	73
Disclaimer	73
Appendix 1: Director-General's Requirements	74
Appendix 2: Aboriginal Heritage Site Descriptions - Previously Recorded Sites	83
Appendix 3: Archaeological Survey Coverage Database - Current Survey	96

	Page
Appendix 4: Aboriginal Heritage Site Descriptions - Sites Recorded During Current Survey	99
Appendix 5: Plates	129
Appendix 6: Aboriginal Community Consultation	139
Appendix 7: Subsidence Impact Assessment	157
Appendix 8: Proposed Amendments to Approved <i>Abel Underground Mine: Aboriginal Heritage Management Plan</i>	164

FIGURES

	Page
Figure 1: Location of Abel Underground Mine	6
Figure 2: Proposed Abel Upgrade Modification mine layout	7
Figure 3: Abel Upgrade Modification Aboriginal heritage investigation areas	8
Figure 4: Abel Upgrade Modification Aboriginal heritage investigation areas showing Local Aboriginal Land Council boundaries and previously recorded Aboriginal sites	9
Figure 5: Approximate location of Aboriginal sites recorded within the Abel Project area (replacement version of Figure 1 of the AHMP)	16
Figure 6: Location of archaeological survey areas and Aboriginal heritage sites within Modification investigation Area A	42
Figure 7: Location of archaeological survey areas and Aboriginal heritage sites within Modification investigation Area B	43
Figure 8: Location of archaeological survey areas and Aboriginal heritage sites within Modification investigation Area C	44

TABLES

	Page
Table 1: Aboriginal sites recorded within the Abel Underground Mine area (replacement version of Table 1 of the AHMP)	13
Table 2: Summary of registered Aboriginal stakeholders involvement	37
Table 3: Summary of key Aboriginal community comments and how they have been addressed by the Project	38
Table 4: Environmental contexts, class of slope and landform elements - summary of survey coverage and artefact density for Modification investigation area	41
Table 5: Summary of the significance of each Aboriginal site within the Abel Upgrade Modification area, the potential impacts of the Modification and appropriate management strategies	67

PLATES (APPENDIX 5)

	Page
Plate 1: Modification Area A, view south of southern portion of survey area AMA4 (gentle drainage depression)	130
Plate 2: Modification Area A, view of dense regrowth vegetation in survey area AMA5 (moderate simple slope near Black Hill Quarry)	130
Plate 3: Modification Area A, Aboriginal stakeholders inspecting southern portion of survey area AMA7 (gentle drainage depression) south of Black Hill Road	131
Plate 4: View south over southern portion of Modification Area A and 'Yellowcliffs' property to Black Hill Quarry and Black Hill (northern portion of Area B)	131
Plate 5: Modification Area B, straight-walled sandstone formation in survey area AMB4, adjacent to Black Hill spur and Black Hill Quarry, with inaccessible cave	132
Plate 6: Area B, Aboriginal stakeholders inspected straight-walled sandstone formation in survey area AMB4, adjacent to Black Hill spur and Black Hill Quarry	132
Plate 7: Modification Area B, view north from Black Hill Quarry (survey area AMB3) to Donaldson Mine	133
Plate 8: View west across Pambalong Nature Reserve to Modification Area B and Black Hill	133
Plate 9: View north from Dog Hole Road along power easement bisecting eastern portion of Modification Area B, between Black Hill and Black Hill Spur	134
Plate 10: View from Black Hill Quarry in Modification Area B south-west across Long Gully to rock formations in Area C, with Mount Sugarloaf, five kilometres south-west of the investigation area, in the rear	134
Plate 11: Modification Area C, straight-walled rock formation in survey area AMC2 (moderate drainage depression)	135
Plate 12: Modification Area C, straight-walled rock formation in survey area AMC5	135
Plate 13: Modification Area C, Aboriginal stakeholders inspecting straight-walled rock formation in survey area AMC5	136
Plate 14: Modification Area C, Aboriginal stakeholder inspecting survey area AMC9 (moderate drainage depression)	136
Plate 15: Modification Area C, Aboriginal stakeholder inspecting survey area AMC16 (moderate drainage depression)	137

	Page
Plate 16: View west from Dog Hole Road to eastern portion of Modification Area C (forested slopes and crests)	137
Plate 17: View south-west (above) and west (below) from Cedar Hill Drive across Pambalong Nature Reserve to Modification Area C (top left, with Mount Sugarloaf in rear, a further 5 kilometres south-west of the investigation area) and Area B (right, with Black Hill in centre-rear), the general location of the Doghole ceremonial area	138

1. INTRODUCTION

This Aboriginal cultural heritage assessment has been prepared by South East Archaeology Pty Ltd for Donaldson Coal Pty Ltd (Donaldson Coal).

Donaldson Coal owns and operates the Abel Underground Mine, located approximately 23 kilometres north-west of the Port of Newcastle, New South Wales, in the Newcastle Coalfield (refer to Figure 1). Donaldson Coal is a wholly owned subsidiary of Yancoal Australia Limited.

Project Approval (05_0136) for the Abel Underground Mine was granted on 7 June 2007 by the then NSW Minister for Planning, pursuant to Section 79J of the *Environmental Planning and Assessment Act 1979* (EP&A Act). An Environmental Assessment (EA) was undertaken for the Project, including an Aboriginal cultural heritage assessment by South East Archaeology (Kuskie 2006).

As a condition of the Project Approval, an Aboriginal Heritage Management Plan (AHMP) was prepared (*Abel Underground Mine: Aboriginal Heritage Management Plan*, Donaldson Coal 2007). The AHMP was subsequently approved by the Department of Planning in February 2008 and is currently implemented to manage all interactions between the Approved Project and Aboriginal heritage.

Donaldson Coal is seeking approval under Section 75W of the EP&A Act for a Modification to Project Approval 05_0136 to enable upgrades to underground mining operations at the Abel Underground Mine. Herein this is referred to as the 'Abel Upgrade Modification' or 'the Modification'.

A Preliminary Environmental Assessment has been prepared (Donaldson Coal 2011) to assist the NSW Department of Planning and Infrastructure (DP&I) to determine their requirements for the Modification. The Director-General's requirements have been issued (refer to Appendix 1).

This report addresses the impacts of the proposed Modification on Aboriginal heritage, consistent with the Director-General's requirements, Part 3A Project Approval and the approved Aboriginal Heritage Management Plan.

The location of the investigation area is marked on Figures 1 - 4 and comprises the areas within the Abel Underground Mine where the subsidence impacts may change, as a result of the proposed change from bord and pillar to shortwall and longwall mining. These areas, including the potential zone of subsidence influence associated with the changed mining method, are marked on Figures 2 and 3 and comprise:

- "Area A" - approximately 145.6 hectares associated with a proposed change to shortwall mining of the Upper Donaldson Seam for panels UDSW1 - UDSW7;
- "Area B" - approximately 120.4 hectares associated with a proposed change to shortwall mining of the Lower Donaldson Seam for panels LDSW1 - LDSW4; and
- "Area C" - approximately 375.8 hectares associated with a proposed change to longwall mining of the Lower Donaldson Seam for panels LDLW1 - LDLW5.

This report is a supplementary report to the Aboriginal heritage assessment report for the Approved Project (Kuskie 2006), and does not seek to repeat the information contained within the primary report.

1.1 Description of the Modification

The proposed Modification would involve the continuation of underground mining within the approved area (ie. Mining Lease {ML} 1618) and the approved seams (Upper Donaldson and Lower Donaldson seams), using a combination of longwall, shortwall and bord and pillar mining. In addition, the Modification would involve the receipt of run-of-mine (ROM) coal associated with the Tasman Extension Project (subject to approval of the Tasman Extension Project).

The key components of the proposed Modification are summarised below:

- ❑ The introduction of longwall mining in a section of the Lower Donaldson Seam (refer to Figure 2);
- ❑ The introduction of shortwall mining in a section of the Upper Donaldson Seam, and a section of the Lower Donaldson Seam (refer to Figure 2);
- ❑ The extension of mining, using bord and pillar extraction, in a southern section of the Upper Donaldson Seam that overlies the Lower Donaldson Seam within ML 1618;
- ❑ Development of the modified mine layout to meet the existing approved subsidence management commitments;
- ❑ An extension of the mine life of approximately one year (ie. until 31 December 2029);
- ❑ Increased annual ROM coal production of up to 6.1 million tonnes per annum (Mtpa);
- ❑ An increase in the amount of ROM coal received from the Tasman Underground Mine (per annum and in total);
- ❑ Increased internal haulage of the ROM coal from the Abel Underground Mine and the Tasman Extension Project to the Bloomfield Coal Handling and Preparation Plant (CHPP);
- ❑ Increased throughput of coal at the Bloomfield CHPP and rail loadout facility;
- ❑ Modifications and upgrades to the CHPP;
- ❑ Increased annual and total quantity of fine and coarse rejects from the Bloomfield CHPP disposed at the Bloomfield Colliery;
- ❑ Potential upgrades to the integrated water management system of the Abel Underground Mine, Donaldson Open Cut and Bloomfield Colliery;
- ❑ Construction and use of additional ventilation shafts;
- ❑ Development and use of in seam gas drainage infrastructure; and
- ❑ Other associated minor infrastructure, plant, equipment and activities.

1.2 Objectives and Purpose of this Report

A Section 75W approval is being sought under the EP&A Act for a Modification to Project Approval 05_0136. The Director-General of the DP&I issued the Environmental Assessment Requirements for the Project on 21 February 2012 (refer to Appendix 1). The requirements identify 'heritage' as a key issue for the Environmental Assessment, with the requirements in relation to Aboriginal heritage being to undertake an Aboriginal cultural heritage assessment (including both cultural and archaeological significance) which must:

- ❑ Demonstrate effective consultation with Aboriginal communities in determining and assessing impacts, and developing and selecting mitigation options and measures; and
- ❑ Outline any proposed impact mitigation and management measures (including an evaluation of the effectiveness and reliability of the measures).

The general requirements of the DP&I of primary relevance to the key issue of Aboriginal heritage also include:

- ❑ Consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments;
- ❑ Detailed assessment of the key issues (eg. heritage), including:
 - A description of the existing environment *using sufficient baseline data*¹;
 - An assessment of the potential impacts of all stages of the proposal, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; and
 - A description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the proposal, including proposals for adaptive management and/or contingency plans to manage any significant risk to the environment;
- ❑ Consultation with the Office of Environment and Heritage (OEH) in the Department of Premier and Cabinet² and relevant Aboriginal groups; and
- ❑ An assessment of the key issues taking into account relevant guidelines, policies and plans. In relation to Aboriginal heritage, these are listed as the draft *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (DEC 2005)³ and *The Burra Charter*.

In relation to the key issue of subsidence, the DP&I requirements include:

¹ DP&I emphasis;

² Prior to April 2011 the Office of Environment and Heritage (OEH) in the Department of Premier and Cabinet was known as the Department of Environment, Climate Change and Water (DECCW), and previously as the Department of Environment and Climate Change (DECC) and Department of Environment and Conservation (DEC) and National Parks and Wildlife Service (NPWS).

³ It is noted that the draft *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (DEC 2005) require an assessment in accordance with the *Aboriginal Cultural Heritage Standards and Guidelines Kit* (DEC 1997) and *Interim Community Consultation Requirements for Applicants* policy (DEC 2004), notwithstanding that the latter policies have now effectively been superseded by the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010a) and the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* policy (DECCW 2010b) respectively.

- ❑ A detailed qualitative and quantitative assessment of the potential conventional and non-conventional subsidence impacts, including a detailed assessment of the potential consequences for those features considered to have significant cultural value.

The original Aboriginal cultural heritage assessment for the Abel Underground Mine (Kuskie 2006) was undertaken with reference to the draft *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (DEC 2005) and involved implementation of the *Interim Community Consultation Requirements for Applicants* (DEC 2004) policy. The Project subsequently received Part 3A Approval (05_0136) and as a condition of that approval, an AHMP (Donaldson Coal 2007) was prepared. This AHMP was subsequently approved by the Department of Planning and is currently implemented to manage all interactions between the Approved Project and Aboriginal heritage. Consequently, it is of high relevance to this application for approval of a Modification to the Approved Project.

The AHMP specifies procedures for Aboriginal community involvement (Section 4.2) with the Local Aboriginal Land Councils (LALCs) and other registered Aboriginal stakeholders⁴, and procedures for further archaeological investigations (Section 4.6).

This investigation has therefore sought to address the Director-General's requirements via relevant procedures within the approved AHMP, with reference to the DEC (1997, 2004, 2005) policies and guidelines.

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

- ❑ Undertake updated register searches, additional research building on that completed by South East Archaeology (Kuskie 2006) for the Approved Project, Aboriginal community consultation in accordance with the AHMP (Section 4.2), and a targeted archaeological survey of areas of high potential to identify and record any Aboriginal heritage evidence or areas of potential evidence or cultural values within the Modification investigation area;
- ❑ Assess the potential impacts of the Modification upon any identified or potential Aboriginal heritage evidence or cultural values;
- ❑ Assess the significance of any Aboriginal heritage evidence or cultural values identified;
- ❑ Provide details of any Aboriginal heritage evidence in accordance with the OEH requirements;
- ❑ Consult with the Aboriginal community as per procedures specified in Section 4.2 of the approved AHMP, with reference to the DEC (2004) policy;
- ❑ Present recommendations for the management of any identified Aboriginal heritage evidence and potential heritage resources or cultural values;
- ❑ Prepare a supplementary archaeological report for the Modification to meet the requirements of the AHMP and DP&I (primarily with reference to the 2005 draft *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* and Section 4.6 of the approved AHMP); and
- ❑ Where required, revise the AHMP to address the Project Modification and any other relevant amendments that may be necessary in relation to the broader Project Area.

⁴ Thirteen Aboriginal stakeholders were registered for the original Abel Aboriginal cultural heritage assessment, through implementation of the *Interim Community Consultation Requirements for Applicants* (2004) policy during the EA (Kuskie 2006).

For the purposes of this Aboriginal cultural heritage assessment, the investigation area totals 642 hectares and can be subdivided into Areas 'A', 'B' and 'C' as shown on Figure 3, which includes the approximate extent of proposed modifications to underground workings, including a buffer zone around the workings based on a 26.5 degree angle of draw.

Proposed modifications to surface facilities are located within areas that have been subject to existing impacts and are of negligible heritage potential and/or were investigated previously (Kuskie 2006). Further investigation of these areas was not required.

1.3 Authorship

This assessment has been prepared by Peter Kuskie, an archaeologist with a BA (Honours) degree in Aboriginal archaeology and over 22 years experience in the conduct of Aboriginal cultural heritage assessments throughout Australia.

The field investigation was undertaken by Stephen Free, an indigenous archaeologist with a BA (Honours) degree in Aboriginal archaeology and 18 years experience in the conduct of Aboriginal heritage assessments, along with senior roles within government in cultural heritage management and indigenous policy and liaison positions. The field investigation was assisted by Jason Barr, an archaeologist with a BA (Honours) degree in Aboriginal archaeology and experience over a six year period in the conduct of Aboriginal heritage assessments.

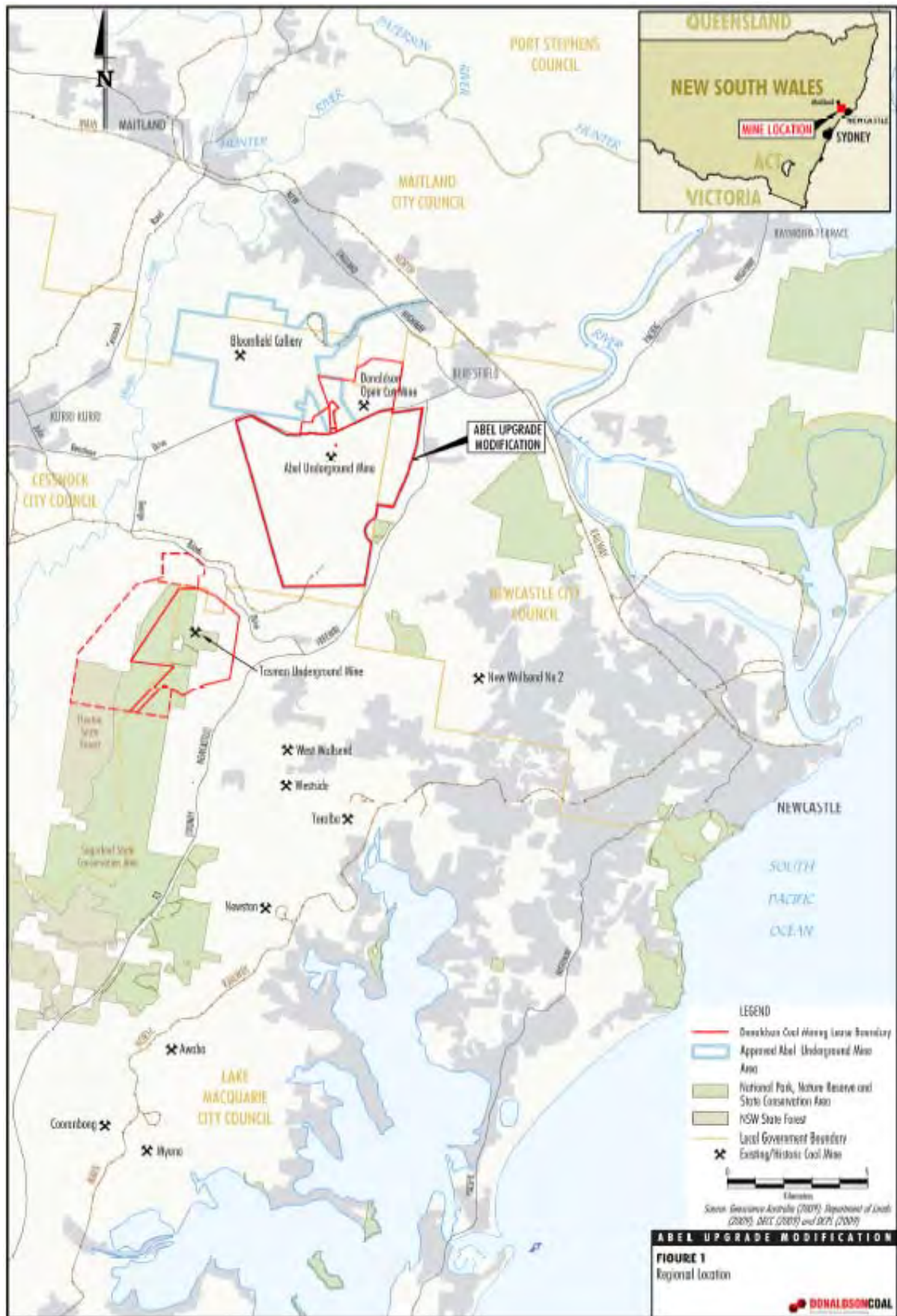


Figure 1: Location of Abel Underground Mine (courtesy Donaldson Coal).

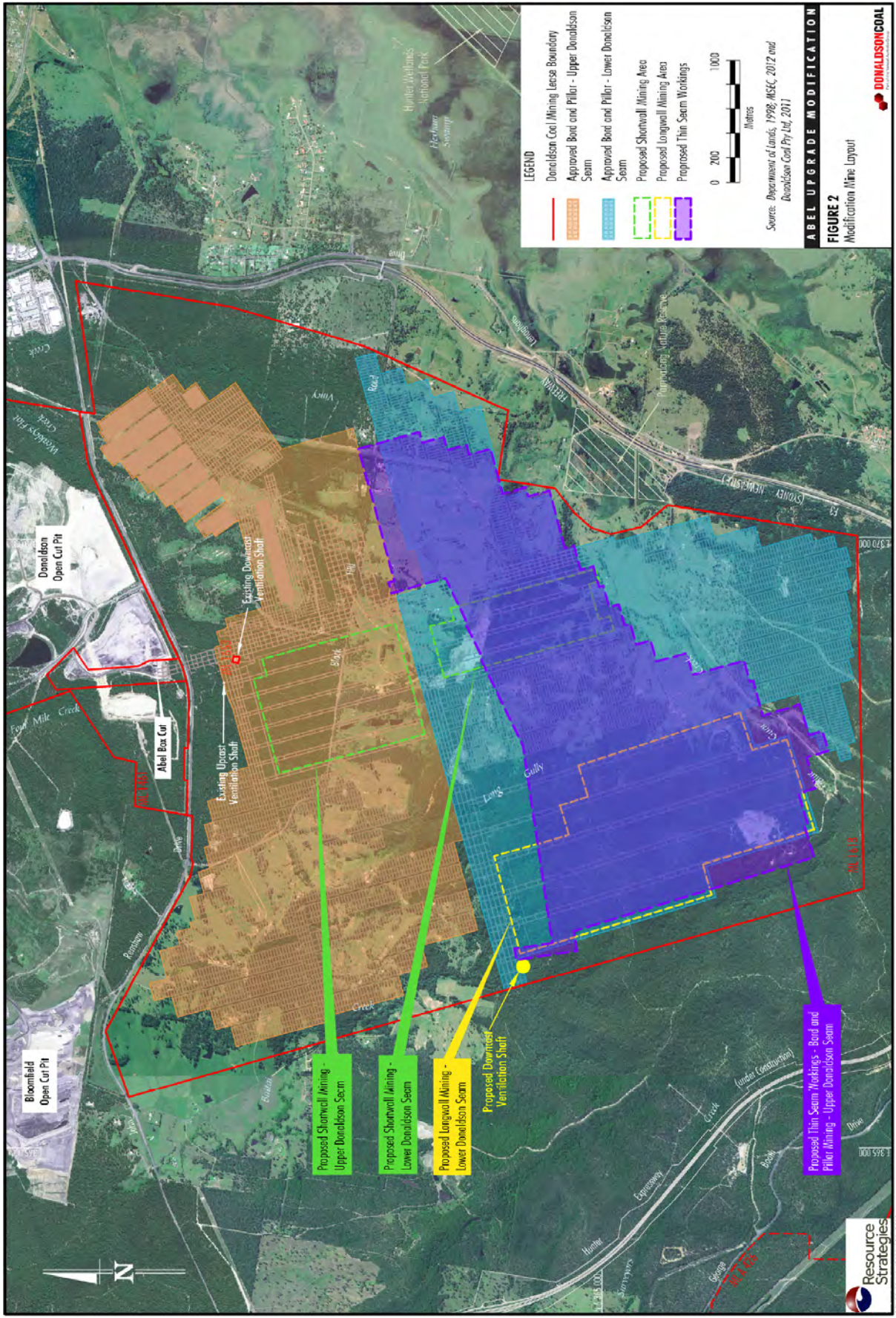


Figure 2: Proposed Abel Upgrade Modification mine layout (courtesy Donaldson Coal).

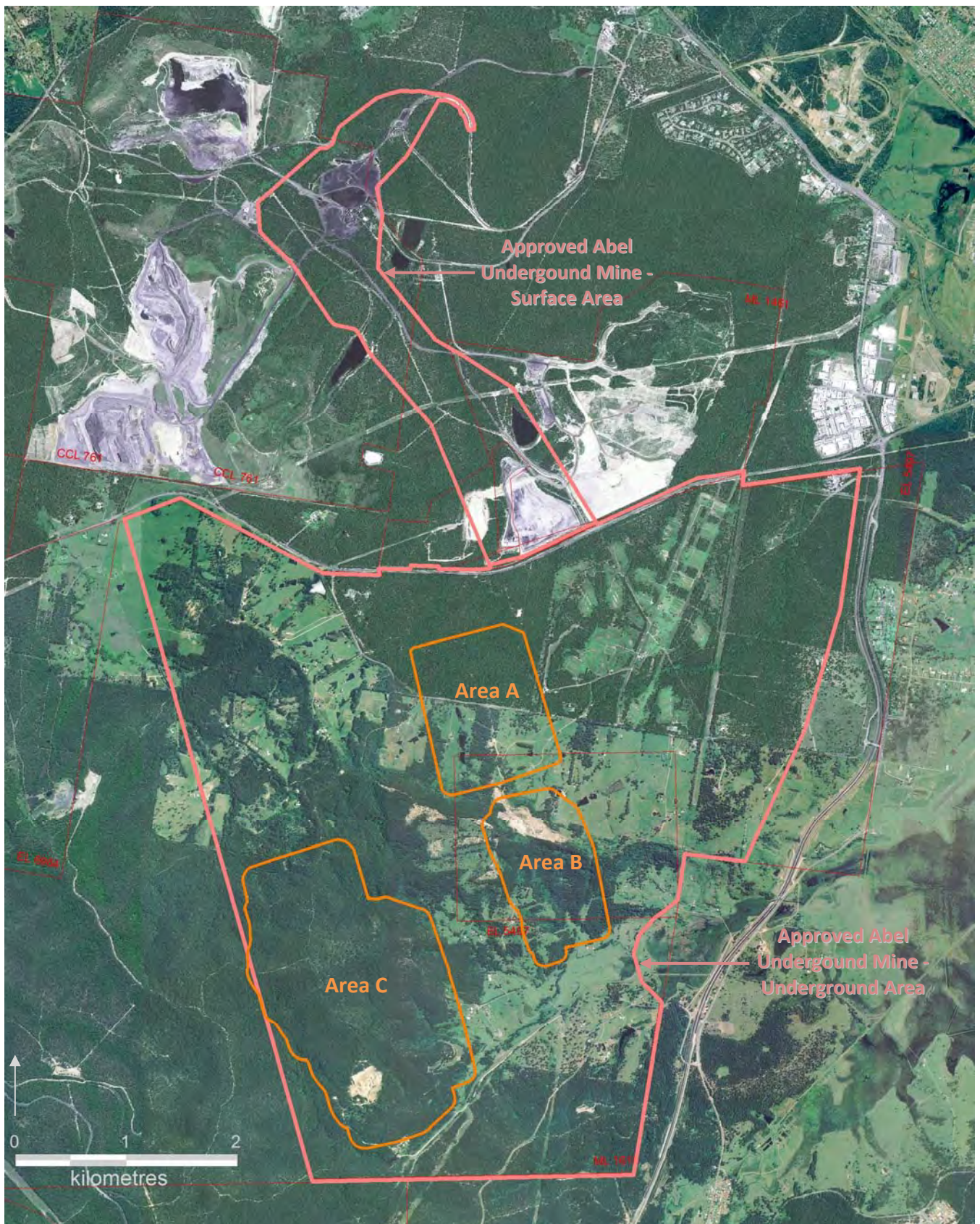


Figure 3: Abel Upgrade Modification Aboriginal heritage investigation areas (Areas A, B and C - orange borders) (courtesy Donaldson Coal; mining lease boundaries - red).

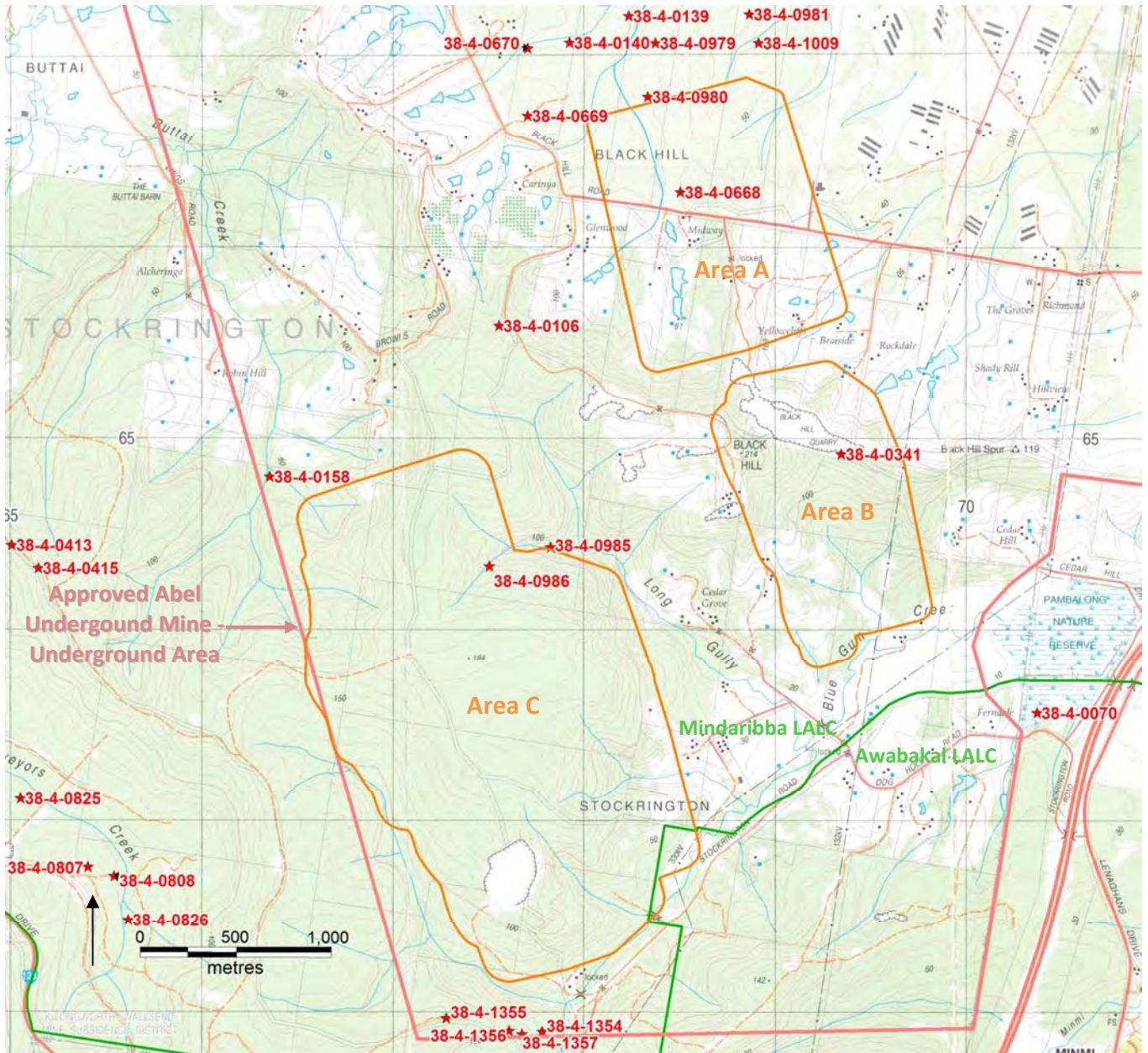


Figure 4: Abel Upgrade Modification Aboriginal heritage investigation areas (orange borders) showing Local Aboriginal Land Council boundaries (green line) and previously recorded Aboriginal sites (red stars) (Beresfield 9232-3N 1:25,000 MGA topographic map; site data courtesy OEH AHIMS but not guaranteed to be free from error or omission - refer to Figure 5 for latest version of Aboriginal site locations incorporating current survey results, corrected grid references for several sites and reported sites that are not listed on the AHIMS register).

2. EXISTING ENVIRONMENT

The 'Underground Area' of the Abel Underground Mine comprises approximately 2,751 hectares south of John Renshaw Drive, in the lower Hunter Valley of NSW.

The investigation area for the Abel Upgrade Modification comprises those areas within the Abel Underground Mine where the subsidence impacts may change, as a result of the proposed change from bord and pillar to shortwall and longwall mining. These areas are marked on Figures 3 and 4 and comprise:

- "Area A" of approximately 145.6 hectares, extending between MGA grid reference eastings 368000 and 369400 and northings 6365350 and 6366900 on the Beresfield 9232-3N 1:25,000 topographic map;
- "Area B" of approximately 120.4 hectares, extending between MGA grid reference eastings 368650 and 369850 and northings 6363800 and 6365400 on the Beresfield 9232-3N 1:25,000 topographic map; and
- "Area C" of approximately 375.8 hectares, extending between MGA grid reference eastings 366500 and 368600 and northings 6362150 and 6364950 on the Beresfield 9232-3N 1:25,000 topographic map.

The Modification investigation area is situated within the Cessnock local government area and comprises land under private ownership (Figure 1).

2.1 Natural Context

Area A is located north of Black Hill and is bisected by Black Hill Road. It largely comprises a low ridge descending north from Black Hill, associated spur crests and side slopes, and lower order headwater tributaries of Four Mile Creek, Weakleys Flat Creek and Viney Creek (Figure 4). Gradients are predominantly gentle. Part of this area has been cleared of native vegetation and is utilised for rural-residential purposes, while the remainder is vegetated by regrowth forest (refer to Plates 1 - 4 in Appendix 5). It is largely underlain by Permian Era shale, mudstone, sandstone, tuff and coal of the Tomago Coal Measures (Newcastle SI56-02 1:250,000 geological map). Major sandstone rock formations are not present.

Area B is located immediately to the south of Area A. It encompasses Black Hill (elevation 214 metres Australian Height Datum {AHD}) and Black Hill Quarry, situated on the ridgeline known as 'Black Hill Spur', and associated moderate to steeply inclined spur crests and side slopes and lower order headwater tributaries of Blue Gum Creek (Figure 4). Part of this area has been cleared of native vegetation and is utilised for rural-residential purposes and open cut mining (the sizeable Black Hill Quarry), but the remainder is vegetated by native forest (refer to Plates 5 - 10 in Appendix 5). It is largely underlain by Permian Era conglomerate, sandstone, tuff, shale and coal of the Newcastle Coal Measures, along with shale, mudstone, sandstone, tuff and coal of the Tomago Coal Measures (Newcastle SI56-02 1:250,000 geological map). Major sandstone rock formations are present, including low escarpments and open surfaces.

Area C is located south-west of Areas A and B. It comprises a relatively low gradient broad ridge and plateau, associated moderate to steeply inclined spur crests and side slopes, and lower order headwater tributaries of Buttai Creek in the north-west, Long Gully in the north-east and Blue Gum Creek in the south-west and south-east (Figure 4). Gradients vary from level to gentle on the plateau, to steep along the dissected margins. This area largely comprises native forest, although extensive timber harvesting has occurred over the past two centuries of non-indigenous occupation (refer to Plates 10 - 17 in Appendix 5). Small portions of this area in the south-east are utilised for rural-residential purposes and in the south-west for open cut mining (Daracon's Stockrington Quarry). It is largely underlain by Permian Era conglomerate, sandstone, tuff, shale and coal of the Newcastle Coal Measures (Newcastle SI56-02 1:250,000 geological map). Major sandstone rock formations are present, including low escarpments, boulders and open surfaces.

Sandstone rock formations can host evidence of Aboriginal occupation, such as deposits of artefacts and other cultural material in rock shelters or overhangs, rock art on surfaces of shelters or overhangs, and grinding grooves on exposed bedrock or isolated cobbles/boulders. These forms of evidence tend to be more susceptible to impacts from underground mining induced subsidence, than other types such as open artefact sites.

The presence of tuff within the underlying geology and quartz within conglomerates indicates that stone materials suitable for manufacturing Aboriginal artefacts may occur in various locations throughout the investigation area. Klauss Diessel and Murray Little (*pers. comm.*, 1996; *cf.* Diessel 1983, Little 1995) have identified such outcrops of tuff in the immediate vicinity of the investigation area on the side-slopes of Black Hill and around Long Gully.

Recent land use impacts to the investigation area have generally been low, but are widespread in relation to several centuries of timber extraction. Low-level impacts are also widespread in the areas cleared and used for rural-residential purposes. Focalised impacts are present in association with numerous roads, farm dams, the sizeable Black Hill Quarry and Stockrington Quarry and other minor infrastructure and works. These impacts are not anticipated to have had a substantial impact on any heritage evidence, other than that the removal of mature trees may have impacted any scarred or carved trees, had they been present, and the focalised impacts may have totally removed or reduced the integrity of any artefact evidence present.

2.2 Cultural Context

2.2.1 Heritage Registers

Previous searches of relevant heritage registers and planning instruments have been updated for this assessment, and to assist with the preparation of a revised AHMP.

Searches were undertaken on 11 March 2012 of the OEH Aboriginal Heritage Information Management System (AHIMS) of an area encompassing the entire Abel Underground Mine (refer to Figure 4). As a result of these searches, and the conduct of surveys for the present assessment (refer to Section 4), the Abel Aboriginal Site Database (refer to Section 4.3 and Table 1 and Figure 1 of the AHMP) and relevant Geographic Information System (GIS) files have been updated.

The updated Table 1 of the AHMP is presented here as Table 1, and the updated Figure 1 of the AHMP is presented here as Figure 5. This table and figure include all known Aboriginal sites directly in or within approximately 50 metres of the Abel Underground Mine⁵.

A total of 61 Aboriginal sites and two Potential Archaeological Deposits (PADs) have been identified in the Abel Underground Mine (Abel Project Area), comprising⁶:

- ❑ 49 open artefact sites (including isolated finds);
- ❑ Eight open grinding groove sites;
- ❑ Three scarred trees;
- ❑ One open grinding groove and artefact site;
- ❑ One rock shelter with PAD; and
- ❑ One PAD.

Within the smaller Modification investigation area, a total of 15 Aboriginal sites and one PAD have been identified⁶, comprising:

- ❑ Seven open grinding groove sites;
- ❑ Six open artefact sites (including isolated finds);
- ❑ Two scarred trees; and
- ❑ One rock shelter with PAD.

Only four Aboriginal sites had previously been recorded directly within the Modification investigation area prior to the conduct of the present survey. These sites comprise OEH #38-4-341 and #38-4-668 (open artefact sites), and #38-4-985 and #38-4-986 (open grinding groove sites recorded by South East Archaeology during a reconnaissance inspection for the original Aboriginal cultural heritage assessment for the Abel Underground Mine). Full descriptions of these sites are presented in Appendix 2.

Site #38-4-980 ('F1/B'; recorded by South East Archaeology during the original assessment) and 'CA6' (recorded by Umwelt 2001a) lie adjacent to Area A of the Modification investigation area in approximately the same location. It is inferred that these recordings may represent the same evidence. The Umwelt (2001a) site is not listed on the OEH AHIMS.

Full descriptions of the 11 Aboriginal sites and one PAD recorded during the current survey are presented in Appendix 4.

No Aboriginal heritage sites are listed on the State Heritage Register, National Heritage List or Commonwealth Heritage List under the *Environment Protection and Biodiversity Conservation Act 1999* or under the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* or on the *Cessnock Local Environmental Plan 2011* or *Hunter Regional Environmental Plan 1989 (Heritage)* within the Modification investigation area.

⁵ Errors or inconsistencies in the OEH AHIMS information, particularly relating to OEH ascribed 'features' and 'site types' and site grid references, have been corrected where possible in Table 1 (and Figure 5). Six reported sites (Umwelt 2001a and Besant 2003) that are not listed on the AHIMS register are also included in this Table and Figure.

⁶ This total includes 11 newly recorded sites, comprising five open grinding groove sites, four open artefact sites and two scarred trees, along with one rock shelter with PAD identified during the present survey (refer to Section 4).

Table 1: Aboriginal sites recorded within the Abel Underground Mine area (replacement version of Table 1 of the AHMP).

OEH Site # ¹	Site Name ²	Site Type / Features ³	MGA Eastings ⁴	MGA Northings ⁴	Locality Within Abel Mine
38-4-0106	Black Hill Open Site	open artefact site	367555	6365589	Underground Area
38-4-0139	Four Mile Creek 1	open artefact site	368235	6367209	Underground Area
38-4-0140	Four Mile Creek 2	open artefact site	367925	6367069	Underground Area
38-4-0158	Reynolds Rock	open grinding groove site	366355	6364799	Underground Area
38-4-0338	Ironbark 1 ⁵	open artefact site	367708	6369879	Surface Area
38-4-0339	Ironbark 2	open artefact site	369295	6368079	Surface Area
38-4-0341	Black Hill Quarry 1	open artefact site	369345	6364919	Underground Area
38-4-0620	Donaldson Monitoring Site 3 (DMS3)	open artefact site	369195	6368151	Surface Area
38-4-0640	Donaldson Monitoring Site 4 (DMS4) ⁶	open artefact site	368768	6368362	Surface Area
38-4-0665	FMC3 Donaldson Mine ⁷	open grinding groove and artefact site	368405	6369089	Surface Area
38-4-0666	FMC4 Donaldson Mine ⁸	open artefact site	368355	6368839	Surface Area
38-4-0667	FMC5 Donaldson Mine	open artefact site	368605	6368889	Surface Area
38-4-0668	FMC6 Donaldson Mine ⁹	open artefact site	368410	6366250	Underground Area
38-4-0669	FMC7 Donaldson Mine	open artefact site	367705	6366689	Underground Area
38-4-0670	FMC8 Donaldson Mine	scarred tree	367705	6367039	Underground Area
38-4-0672	ISF3 Donaldson Mine ¹⁰	open artefact site	368800	6367810	Surface Area
38-4-0684	ERM site 1-3 ¹¹	open artefact site	368465	6367394	Underground Area
38-4-0685	ERM site 5-6 ¹²	open artefact site	369253	6367574	Underground Area
38-4-0686	ERM site 4 ^{13, 14}	open artefact site	369380	6367761	Underground Area
38-4-958	A20/C ¹⁵	open artefact site	368833	6368100	Surface Area
38-4-959	A20/A ¹⁵	open artefact site	368679	6368637	Surface Area
38-4-979	F1/C ¹⁵	open artefact site	368374	6367077	Underground Area
38-4-980	F1/B ¹⁵	open artefact site	368334	6366790	Underground Area
38-4-981	F1/A ¹⁵	open artefact site	368872	6367219	Underground Area
38-4-984	A17/A ¹⁵	open artefact site	368200	6368906	Surface Area
38-4-985	Abel 1 ¹⁵	open grinding groove site	367823	6364430	Underground Area
38-4-986	Abel 2 ¹⁵	open grinding groove site	367510	6364337	Underground Area
38-4-987	A22/A ¹⁵	open artefact site	368838	6367839	Surface Area
38-4-1008	A21/A ¹⁵	open artefact site	368620	6368650	Surface Area
38-4-1009	F2/A ¹⁵	open artefact site	368921	6367076	Underground Area
38-4-1010	A17/C ¹⁵	open artefact site	368034	6369312	Surface Area
38-4-1011	A15/A ¹⁵	open artefact site	367881	6369777	Surface Area
38-4-1012	A7/A ¹⁵	open artefact site	366839	6370687	Surface Area
38-4-1014	A17/B ¹⁵	open artefact site	368070	6369393	Surface Area
-	CA5 ¹⁶	open artefact site	368440	6366990	Underground Area
-	CA6 ¹⁷	open artefact site	368320	6366770	Underground Area

OEH Site # ¹	Site Name ²	Site Type / Features ³	MGA Eastings ⁴	MGA Northings ⁴	Locality Within Abel Mine
-	CA7 ¹⁸	open artefact site	367720	6366640	Underground Area
38-4-1136	HLA Risk Assessment Isolated Find	open artefact site	368668	6369241	Surface Area
38-4-1216	CTGM PAD1	PAD	371039	6368231	Underground Area
38-4-1287	CTGM1 AT1	open artefact site	371995	6368278	Underground Area
38-4-1288	CTGM2 BL	open artefact site	370364	6368087	Underground Area
38-4-1289	CTGM3 AT3	open artefact site	370646	6368123	Underground Area
38-4-1290	CTGM4 MC	open artefact site	370764	6368013	Underground Area
38-4-1336	Black Hill 1	open artefact site	372098	6368010	Underground Area
38-4-1354	Blue Gum Creek RTA 11 IF	open artefact site	367780	6361896	Underground Area
38-4-1355	Blue Gum Creek RTA 12	open artefact site	367278	6361967	Underground Area
38-4-1356	Blue Gum Creek RTA 13 IF	open artefact site	367608	6361900	Underground Area
38-4-1357	Blue Gum Creek RTA 14 IF	open artefact site	367675	6361884	Underground Area
pending	AMA2/A ¹⁹	open artefact site	368590	6366390	Underground Area
pending	AMA2/B ¹⁹	open artefact site	368703	6366603	Underground Area
pending	AMA2/C ¹⁹	open artefact site	368640	6366511	Underground Area
pending	AMB1/A ¹⁹	open grinding groove site	369242	6364779	Underground Area
pending	AMC2/A ¹⁹	open grinding groove site	367343	6364155	Underground Area
pending	AMC2/B ¹⁹	rock shelter with PAD	367340	6364645	Underground Area
pending	AMC2/C ¹⁹	open grinding groove site	367624	6364425	Underground Area
pending	AMC2/D ¹⁹	scarred tree	367346	6364645	Underground Area
pending	AMC5/A ¹⁹	open artefact site	367641	6364252	Underground Area
pending	AMC10/A ¹⁹	open grinding groove site	366935	6363192	Underground Area
pending	AMC12/A ¹⁹	scarred tree	367576	6363045	Underground Area
pending	AMC16/A ¹⁹	open grinding groove site	367903	6363467	Underground Area
-	Diocese 1 ²⁰	open artefact site	370717	6366454	Underground Area
-	Diocese 2 ²⁰	open artefact site	369524	6367536	Underground Area
-	Diocese 3 ²⁰	open artefact site	370200	6366299	Underground Area

1. OEH Site # - site number as listed on the OEH AHIMS;
2. Site name of visible, spatially separate locations of heritage evidence/Aboriginal objects;
3. Standard archaeological site type description. Note - there are numerous errors and inaccuracies in the OEH AHIMS data with respect to site descriptions, these have been corrected where possible. 'Isolated artefacts' often comprise the only visible evidence of a larger artefact scatter, hence all 'isolated artefacts' and 'artefact scatters' are referred to as 'open artefact occurrences';
4. MGA grid reference - The listed grid reference only refers to a single point within a site - often sites extend over broader areas of land. As noted above, there are numerous inaccuracies in the OEH AHIMS data and the accuracy of grid references not recorded by South East Archaeology has not necessarily been verified;
5. Site 'Ironbark 1' (OEH #38-4-338) was presumably relocated by Kuskie (2006) and recorded as A12/A;
6. Site DMS4 (OEH #38-4-640) was presumably relocated by Kuskie (2006) and recorded as A20/B;
7. Description from the OEH #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;

8. Description from the OEH #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;
9. Umwelt (2002a) map this site 3.5 kilometres east of the reported grid references. It is inferred that the OEH AHIMS grid references are incorrect with interchanging of the easting “6” and “8”. New grid references have been created for this site on the basis of previous mapping and reported site descriptions;
10. The OEH site record has incorrect grid references (c. 1 kilometre in error, probably a single digit error). The description from the OEH 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 by Kuskie (2006). New grid references have been created for this site on the basis of previous mapping and reported site descriptions;
11. 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 evidence may have been impacted by improvements to John Renshaw Drive;
12. 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 evidence may have been impacted by improvements to John Renshaw Drive;
13. 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 evidence may have been impacted by improvements to John Renshaw Drive;
14. ERM Site 7 may be located within the John Renshaw Drive road reserve and marginally outside of the underground area and has therefore been excluded from this Table. 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 evidence may have been impacted by improvements to John Renshaw Drive;
15. Site identified and recorded by Kuskie (2006);
16. CA5 was recorded by Umwelt (2001a) but is not registered on the OEH AHIMS. It may correspond with F1/C located by Kuskie (2006). Umwelt (2001a) moved artefacts from sites CA5, CA6 and CA7 0.5 metres off the track on which they were situated. New grid references have been created for this site on the basis of previous mapping and reported site descriptions;
17. CA6 was recorded by Umwelt (2001a) but is not registered on the OEH AHIMS. It may correspond with F1/B located by Kuskie (2006). Umwelt (2001a) moved artefacts from sites CA5, CA6 and CA7 0.5 metres off the track on which they were situated. New grid references have been created for this site on the basis of previous mapping and reported site descriptions;
18. CA7 was recorded by Umwelt (2001a) but is not registered on the OEH AHIMS. It is located close to site #38-4-0669. Umwelt (2001a) moved artefacts from sites CA5, CA6 and CA7 0.5 metres off the track on which they were situated. New grid references have been created for this site on the basis of previous mapping and reported site descriptions;
19. Site identified and recorded by South East Archaeology during April 2012 survey for Abel Modification.
20. 'Diocese 1, 2 and 3' were recorded by Besant (2003) but are not registered on the OEH AHIMS.

Additional Notes: While the OEH grid references place site #38-4-0552 within the underground area, descriptions from the site card place this site on the northern side of John Renshaw Drive outside of the underground area and it has therefore been omitted from this table. There are potentially other errors associated with the OEH AHIMS data for sites not recorded by South East Archaeology. Sites of cultural significance that do not contain Aboriginal objects are not listed within this Table.

2.2.2 Previous Archaeological Research

Numerous heritage investigations have been undertaken on the elevated terrain around Beresfield and Black Hill, which have led to the identification and/or recovery of significant quantities of heritage evidence, predominantly stone artefacts.

F3 Freeway at Black Hill:

The key study for the lower Hunter region is that by Kuskie and Kamminga (2000), who undertook extensive testing and salvage excavations along the F3 Freeway at Black Hill and Woods Gully, adjacent to Hexham Swamp, two kilometres east of the Modification investigation area.

The 14 week excavation program comprised an initial phase of testing, a second phase of broad area excavations and a third phase of mechanical surface scrapes. A total of 612 small test units were excavated in the first phase, for a total area of 38.25 m². These units, measuring 0.25 x 0.25 metres in area, were excavated three metres apart on a rectangular grid across each site. The main objectives of identifying the basic pattern of artefact distribution, characterising the nature and variety of archaeological evidence and selecting locations for broader area excavation were achieved (Kuskie and Kamminga 2000).

In the second phase at each site, larger areas were excavated by shovel and trowel. At site Black Hill 2 (OEH #38-4-376), a 7 m² area and a 56 m² area were excavated on the ridge crest at the end of Black Hill Spur. At Woods Gully (#38-4-410), an 87 m² area was excavated adjacent to the watercourse, including a 39 m² narrow trench extending away from the creek up the hill-slope. Excavation of the broad areas in the second phase permitted almost all of the relevant research questions to be addressed (Kuskie and Kamminga 2000).

Following the controlled excavations, earthmoving machinery was used in the third phase of the salvage program to carefully remove the grass cover and upper centimetres of soil, to identify if other significant features (such as hearths or heat treatment pits) were present. Five surface scrapes were undertaken within the Freeway corridor at site Black Hill 2 and two at Woods Gully. After the surface had been scraped, personnel walked slowly across measured areas to identify and collect any cultural material present. The surface scrapes permitted identification of several diagnostic items and features that were not identified during the earlier phases. Several dense artefact concentrations were found at Black Hill 2 and subsequently salvaged by hand excavations totalling 8 m² in area (Kuskie and Kamminga 2000).

In total, an area of 196.25 m² was carefully excavated by hand. Surface scrapes with a combined area of 34,422 m² were undertaken. The excavations resulted in a total of 72.4 tonnes (64.6 cubic metres) of soil being dug by hand and wet-sieved. Through the hand excavations and surface scrapes, a total of 37,585 lithic items were identified and recorded. This assemblage comprised 22,921 identifiable Aboriginal artefacts and 14,664 items described as 'lithic fragments', which were lithic items that did not have sufficient morphological attributes to positively identify them as artefacts, even though many must be fragmentary debris from stone knapping (Kuskie and Kamminga 2000).

The mean density of artefacts per volume within the hand excavations equated to 546.2 artefacts/m³ at Black Hill 2 and 209.5 artefacts/m³ at Woods Gully. The density of artefacts varied widely within individual excavation unit spits (ranging from nil to 23,555 artefacts/m³) (Kuskie and Kamminga 2000).

A total of 44 categories of stone artefacts were identified in the Black Hill 2 and Woods Gully assemblages. Six basic categories of activities were identified through the artefactual evidence at the sites: non-specific stone flaking, bipolar flaking, microblade production, backing retouch of microblades, loss or intentional discard of microliths and loss or intentional discard of non-microlith tools. However, many of the artefact categories represent debris from stone knapping, with production of microblades being the most common specific activity. Some of the microblades (and probably other flake types) were further knapped to make microliths, particularly bondi points. Artefact assemblages containing microblades and microlith knapping debitage are typical of prehistoric occupation sites in the lower Hunter Valley and south-eastern Australia generally (Kuskie and Kamminga 2000).

Replicative microblade and microlith knapping experiments were performed to determine the quantity of artefacts and debitage produced by such events and to provide baseline data for the interpretation of the Black Hill 2 - Woods Gully evidence. Examination of the ratios of microlith backing flakes produced by experimental manufacturing of tuff and silcrete bondi points indicates that possibly less than 150 bondi points were made on-site at broad area C3/B, and less than half that number at broad area F5/A (Kuskie and Kamminga 2000).

These results highlight the huge quantity of mostly small debitage produced by knapping microblades and microliths. Most of the lithic assemblages at the Black Hill 2 and Woods Gully sites derive from these activities, yet comparatively small numbers of the desired end products are the presumed result of all this evidence of activity. The apparent 'wastefulness' of the microblade and microlith manufacturing activities, or high costs of time and energy expended, is very significant. Kuskie and Kamminga (2000) postulate that considerable time and effort was expended on heat treating silcrete to improve knapping properties and perhaps produce symbolically significant (and aesthetically appealing) colours, knapping microblades and microliths (with minimal, if any, concern for conservation of stone) and arming spears with the end products (primarily bondi points). Alternative options were available to achieve more or less the same products and material outcomes for less expenditure of time and energy. Therefore Kuskie and Kamminga (2000) postulated that these activities occurred because a spear armed with stone barbs was an important component of a man's equipment and may have had considerable social value. In such circumstances, it is feasible that men would have invested time and energy in producing spear barbs, even transforming the colour of stone for reasons other than purely utilitarian ones.

The overall size characteristic of the artefact assemblages is that most items (89%) are small, measuring less than 20 mm in maximum dimension. In fact, the vast majority of artefacts (64.6% of the combined artefact total) measure less than 10 mm in size. This high proportion of very small artefacts is due to the abundance of microblade debitage and the use of 'total sieve retrieval' methodology (Kuskie and Kamminga 2000).

Seven different types of stone materials were identified in the excavated assemblages. However, the assemblages were overwhelmingly dominated by indurated rhyolitic tuff (70.45% of combined artefact assemblages) and to a lesser extent silcrete (20.4%), materials which were favoured for making microblades, microliths, eloueras and worimi cleavers in the Hunter Valley during recent millennia. Minor frequencies of other stone materials were present, such as quartz, chalcedony, chert, dacite and sandstone. Microscopic inspection of specimens, thin-section analysis and x-ray diffraction analysis were critical in identifying stone materials and establishing that the stone type commonly referred to by archaeologists as 'indurated mudstone' is in fact indurated rhyolitic tuff (Kuskie and Kamminga 2000). It was inferred that in the lower Hunter Valley, much or nearly all of the stone used for knapping was probably derived from local sources within a day's foraging range of campsites.

There is considerable evidence to suggest that a proportion of the silcrete items in the lithic assemblage have been heat affected. Deliberate heat treatment was inferred for a large proportion of the silcrete assemblage, and for specific silcrete items. It is probable that heat treatment of silcrete occurred both at the Woods Gully and Black Hill 2 sites and at other localities in the surrounding area. Evidence of two possible heat treatment pits was identified at Black Hill 2. In Aboriginal society, colours had important symbolic meaning and part of the reason for heat treatment may have been to obtain desired colours as well as to improve the flaking properties of the stone. This may have been especially important for armatures of fighting and hunting spears (Kuskie and Kamminga 2000).

An episode of occupation associated with a stone-lined fireplace at Woods Gully was radiocarbon dated to 2,130±70 years Before Present (Beta-119475). The Woods Gully and Black Hill 2 sites are dominated by evidence of microblade and microlith technology, indicating a maximum possible age of about 4,000 years BP (Kuskie and Kamminga 2000).

The potential types of occupation relevant to the Black Hill 2 and Woods Gully sites were discussed. The evidence from these sites was interpreted in relation to the traditional lifestyle of the local Aboriginal people and the hypothesised occupation types.

Abel Underground Mine:

Another key study of relevance to the present Modification is the Environmental Assessment for the Abel Underground Mine. Kuskie (2006) completed an Aboriginal cultural heritage assessment for the Abel Underground Mine Part 3A application with reference to the draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005) as specified in the then Director-General of the Department of Planning's Environmental Assessment Requirements.

The investigation area for the Abel Underground Mine comprised 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 was to be used for surface facilities, primarily within the existing Donaldson open cut mine, but also including a portion of the Bloomfield lease area (the 'northern investigation area'). This area included a broad corridor extending north-west from John Renshaw Drive to adjacent to the Bloomfield workshop area, and northeast to the existing rail loop (refer to Figure 3).

The heritage assessment involved background research, searches of relevant heritage registers, consultation with the Aboriginal community in accordance with the DEC (2004) *Interim Community Consultation Requirements for Applicants* policy, a field survey of areas to be disturbed by surface infrastructure, a reconnaissance inspection of the underground lease area in order to refine a predictive model, and brief reporting of the results (Kuskie 2006).

Kuskie (2006) located two grinding groove sites near Black Hill, south of John Renshaw Drive (Abel 1 and Abel 2), two small artefact scatter site loci (F1/A and F2/A) and two isolated artefact loci (F1/B and F1/C) south of John Renshaw Drive, and ten small artefact scatter/isolated artefact site loci (A7/A, A15/A, A17/A, A17/B, A17/C, A20/A, A20/B, A20/C, A21/A and A22/A) in the Donaldson and Bloomfield lease areas north of John Renshaw Drive (refer to Table 1 and Figure 5).

In total (including previous recordings), approximately 38 Aboriginal heritage sites were known to be 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 comprised 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. At least two places that may be of traditional or historical cultural significance to Aboriginal people, but do not necessarily host physical remains, occur within the southern investigation area. These comprise an Aboriginal pathway along Black Hill Spur that probably extended from Hexham Swamp to Mount Sugarloaf, and a ceremonial site known as 'the Doghole' in the vicinity of Stockrington and Long Gully (Kuskie 2006) (refer to Section 2.2.3).

Although the northern investigation area, which is mainly contained within the active mine leases of Donaldson and Bloomfield mines, was comprehensively sampled by the archaeologists and Aboriginal stakeholders, inspections within the southern investigation area, where underground mining will occur, were 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 was proposed as a staged process in advance of underground mining (Kuskie 2006; refer below and to Section 4.6 of the AHMP).

A predictive model of Aboriginal site location was 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 investigation area. Other types of heritage evidence are known to occur or have some potential to occur within the southern investigation area, particularly ceremonial sites, cultural sites of significance, grinding grooves, lithic quarries, rock shelters, shell middens and scarred trees (Kuskie 2006).

Impacts from underground mining in the area south of John Renshaw Drive are limited to mining induced subsidence which could primarily affect two forms of heritage evidence, rock shelters and grinding groove sites, through cracking and/or rock fall. The potential impact of subsidence on other site types was assessed as generally low.

Proposed management and mitigation measures to minimise the potential impacts of the Abel Underground Mine on Aboriginal heritage were outlined (Kuskie 2006). These have since been incorporated in the AHMP for the Abel Underground Mine (Donaldson Coal 2007), that was approved by the Department of Planning in February 2008. The key measures included:

- An Aboriginal Heritage Management Plan will be implemented 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 includes procedures for ongoing Aboriginal consultation and involvement, maintenance of an Aboriginal site database, management of recorded sites within the investigation area, further archaeological investigation prior to undermining, identification and management of previously unrecorded sites (including skeletal remains) and a programme of monitoring. The plan will be regularly verified to establish that it is functioning as designed (ie. policies adhered to and actions implemented) to the standard required;
- 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 as specified in the AHMP. Donaldson will seek to *minimise* impacts to identified and potential Aboriginal heritage evidence within the northern investigation area and to conserve identified evidence where impacts are not required to occur for operational reasons. Donaldson will seek to *mitigate* impacts to identified and potential Aboriginal heritage evidence within the northern investigation area where impacts must occur for operational reasons;

- ❑ Staged systematic archaeological survey of each section proposed to be undermined in the southern investigation area will occur with the participation of the Aboriginal stakeholders prior to any underground mining in that 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 and mitigation measures implemented as per the AHMP;
- ❑ 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;
- ❑ A regional monitoring network for Aboriginal heritage across the Abel, Tasman, Donaldson and Bloomfield sites will be established, including continuation of the existing programme of monitoring in the Donaldson Bushland Conservation Areas, monitoring before and after undermining for a sample of Aboriginal sites within the southern investigation area for which it is not anticipated that subsidence related impacts will occur, monitoring before and after undermining for all Aboriginal sites for which it is inferred that undermining may result in impacts in order to ensure the adequacy of conservation measures (ie. mining exclusion zones) around those sites, and documentation of the results of all monitoring in an annual report; and
- ❑ Donaldson will continue to consult with and involve the registered Aboriginal stakeholders, particularly the Local Aboriginal Land Councils, in the ongoing management of the heritage resources within the investigation area as per the AHMP.

Donaldson Mine and Bloomfield Mine:

Immediately north of the Modification area and extending to within it, a number of studies have been undertaken into the Donaldson Coal Mine and Bloomfield Mine.

Effenberger (1997) initially investigated the 546 hectare Donaldson Exploration Lease (EL) 5071 with a sample survey and located 11 heritage sites, including FMC6 (OEH #38-4-668) within Area A of the Modification (refer to Appendix 2). With the exception of one large artefact scatter (WF1, over 100 artefacts on a rise adjacent to a floodplain) and a possible scarred tree, the sites comprised small artefact scatters (less than five artefacts) or isolated artefacts.

Umwelt (1998a, 1998b) conducted further investigation of the Donaldson Lease Area to address issues raised by the National Parks and Wildlife Service (NPWS) with the original Effenberger (1997) assessment. Additional predictive modelling and surveying was undertaken, only to result in the location of one further isolated artefact.

Umwelt (2000) then prepared an Aboriginal Sites Management Plan for the Donaldson Mine to cover the first year of mine operations. In response to additional concerns raised by the NPWS, Umwelt (2001b) undertook further survey of the mine area, identifying three more isolated artefacts.

Also in the same year, Umwelt (2001a) surveyed for seven days two major conservation areas located within the surface and underground areas in the Donaldson Lease Area. These areas, known as 'Bushland Area 1' and 'Bushland Area 2' total 956 hectares in size. Bushland Area 1 extends south of John Renshaw Drive to Black Hill Road and encompasses part of the Modification Area A. An additional eight Aboriginal sites (CA1-8) to those previously recorded were identified in the Bushland Conservation Areas. These were almost all isolated artefacts, with the exception of one small artefact scatter. Site CA6 is located immediately north of Area A of the Modification investigation area. Umwelt (2001a) moved artefacts from Sites CA1, CA2, CA3, CA4, CA5, CA6 and CA7 half a metre off the track on which they were situated. At Site CA8 the artefact was moved 55 metres north of its original location.

As part of an ongoing monitoring program at Donaldson Coal, Umwelt (2000, 2002b, 2002c, 2004a, 2005a) monitored heritage site locations in seven areas in 'Bushland Conservation Areas' of which two are located within the surface study area and two within the underground area. Ongoing monitoring revealed several new sites including two within the surface study area of the Abel Underground Mine (OEH #38-4-0620 and 38-4-0640).

Black Hill Quarry:

Greer and Brayshaw (1983) surveyed the location of a proposed gravel quarry on Black Hill. The property lies about one kilometre north-west of the crest of Black Hill (and Modification 'Area B'), within the physiographic region identified by Matthei (1995) as the Sugarloaf Range. An area of '250 metres square' (presumably 250 x 250 metres) was investigated, comprising a ridge crest and knoll adjacent to an existing quarry. A site (OEH #38-4-106) containing seven artefacts was located (refer to Figure 4). The artefacts included flakes, a flaked piece and a blade, of chert, silcrete and fine-grained siliceous materials. Artefacts extended over a 25 x 2 metre area, at a mean density of one artefact per seven square metres.

Ruig (1993) investigated proposed extensions to the Black Hill Quarry. The 5.6 hectare area is located immediately north-east of the Black Hill peak, within the Modification 'Area B' (Figure 4). One isolated artefact (black 'siltstone' flake) was located (OEH #38-4-341). Ruig (1993) suggests the 'combination of steepness, inaccessibility and the unavailability of raw lithic materials indicates that it would be unlikely that Aboriginal people used the area as a place to manufacture stone tools'. Pebbles eroding from conglomerate rock were noted as being too small for use in making artefacts.

Hunter Expressway:

An initial survey of the F3 to Branxton 'Hunter Expressway' alignment was conducted by Brayshaw (1994) and subsequent surveys, test excavations and salvage collections and excavations were undertaken by Brayshaw (2001) and Umwelt (2003, 2004b, 2005b, 2006a, 2006b). Numerous stone artefact sites have been identified, along with grinding grooves and stone arrangements.

Surveys of the F3 to Branxton route alignment were undertaken in December 2003 and February 2004 for 'Section 1', the eastern-most four kilometres of the route near Seahampton, and from January to March 2004 for 'Section 2', which comprises the route west of Seahampton to the Belford Deviation west of Branxton. The sites recorded included 50 artefact scatters, 29 isolated artefacts, eight grinding grooves and three stone arrangements (recorded as a single site complex), along with 22 PADs.

Areas in the vicinity of Sugarloaf Range were surveyed in 2003 and few sites identified. The sites that were recorded in this locality included three stone arrangements, four artefact scatters, an isolated artefact and a grinding groove site. The stone arrangements along Minmi Creek were interpreted by the Awabakal people as being related to male initiation ceremonies. Umwelt (in prep.) concluded that the higher more steeply inclined portions of the Sugarloaf Range were not utilised by large numbers of people or for encampments, but by small groups of people for hunting, gathering, axe grinding and ceremonial purposes (Umwelt 2005b).

Sub-surface investigation of a number of sites and PADs was undertaken by Umwelt (2006a) between July 2004 and October 2005, under Section 87 Permit #2096. This involved at least four sites of potential significance (#37-6-1339, 37-6-1368, 38-4-813 and 38-4-815) and 19 PADs. The test excavations typically comprised four single square metre units excavated on a 10 metre grid at each PAD or site. In addition, nine landform units were tested across nine different creek catchments. This typically involved excavation of square metre units at 50 metre intervals from the creek banks to adjacent crests. Hence, variable numbers of test units were excavated between the different locations. Approximately 1,560 artefacts were recovered from the overall testing program, but detailed results are pending.

Four of the areas subject to testing were located around Surveyors Creek, approximately one kilometre south-west of Modification 'Area C':

- ❑ Surveyors Creek PAD 3 (#38-4-0823): Four test units were excavated on a broad low spur crest 250 metres from the creek and no artefacts were recovered;
- ❑ Surveyors Creek PAD 4 (#38-4-0824): Four test units were excavated on a broad low spur crest 150 metres from the creek and one artefact was recovered;
- ❑ Surveyors Creek PAD 5 (#38-4-0825): Four test units were excavated on a lower slope on the southern side of the creek and 23 artefacts were recovered;
- ❑ Surveyors Creek PAD 6 (#38-4-0826): Four test units were excavated on a lower slope five metres west of a northerly flowing tributary of Surveyors Creek and 70 metres south of the confluence of two tributaries. Twelve artefacts were recovered.

In addition, the 'Surveyors Creek Landform Testing' occurred within PAD 5, with 15 units excavated and 17 artefacts identified. Around Blue Gum Creek, approximately one kilometre south of Modification 'Area C', landform testing also occurred with nine units excavated and no artefacts identified.

Salvage by surface collection and/or excavation was undertaken under Section 90 Consent #1940 for five sites in the Blue Gum Creek catchment in 'Section 1', with nine test units also excavated near that creek. Salvage by surface collection was undertaken under Section 90 Consent #2102 for 68 sites within 'Section 2'. Preliminary results have been presented by Umwelt (2006a), but a detailed report is pending. Salvage of both surface artefacts and sub-surface deposits is yet to occur or is in progress for a number of sites/PADs that may be impacted by the proposal. A final report on the collections and excavations undertaken to date is pending.

Other Nearby Relevant Studies:

Besant (2003) investigated the former Barter Poultry Farm at Black Hill for the Catholic Diocese. The land is located immediately east of the Modification 'Area A', along Black Hill Road. A survey was conducted over two days in 2003 with representatives of the Mindaribba LALC and Lower Hunter Wonnarua Council. Two isolated artefacts ('Diocese 1' and 'Diocese 2') were located, along with one small artefact scatter ('Diocese 3'). The grid references provided by Besant (2003) place these sites in the area of the former poultry farm, east of Modification Area A, north of Black Hill Road and south of John Renshaw Drive. However, none of these sites appears to have been listed on the OEH AHIMS register.

ERM (2008) conducted a brief assessment of Coal and Allied land immediately south-west of the junction of John Renshaw Drive and the F3 Freeway. An isolated artefact and a small artefact scatter were identified during the single day survey.

Synthesis:

Archaeological investigations in the northern foothills of the Sugarloaf Range around Black Hill have resulted in the identification of a number of open artefact scatters and grinding groove sites, with less common sites such as scarred tree, stone arrangement, natural mythological and rock engravings also identified.

Strong traditional, historical and contemporary Aboriginal cultural values have also been identified. The Black Hill Spur was a route or pathway used by Aboriginal people, extending from Hexham Swamp to Mount Sugarloaf, and an initiation and ceremonial site known as 'the Doghole', is also located in this locality (Kuskie and Kamminga 2000). Mount Sugarloaf itself, five kilometres south-west of the Modification area, is documented for its association with male initiation ceremonies and the presence of the supernatural spirit being "Puttikan" and the supreme being "Koe-in", and is inferred to be an important connection between the secular and the sky-world (Threlkeld in Gunson 1974, Kuskie 2012).

Artefact occurrences tend mostly to be identified near water sources, particularly on level or gently inclined landform units and close to higher order streams, wetlands/swamps, lakes and the former Hunter River estuary. Fewer instances are reported of artefacts along ridgelines and further from higher order watercourses. However, the majority of surveys have obtained a disproportionate sample of watercourses in relation to other environmental contexts. Virtually no artefact evidence has been identified along recent alluvial flats (Kuskie and Clarke 2006).

Individual open sites can range in artefact quantity from one to many hundreds or even thousands of artefacts. Typically many exposures of evidence contain fewer than ten artefacts. Artefact density in the surface assemblages varies, but is generally low (less than one artefact per square metre). Where sub-surface testing or salvage excavation has been undertaken, it has often resulted in the location of artefacts within the upper (A horizon or unit) soil. These deposits can include dense concentrations of artefacts, along with other features such as hearths and heat-treatment pits (Kuskie and Clarke 2004, 2006).

Artefact scatters in the region are typically dominated by two stone materials, tuff and silcrete, and it appears that dominance is generally related to the local availability, abundance and quality of these materials. Preferences of stone materials for manufacturing of backed artefacts appears to be equally variable and dependent on availability and quality of materials (Kuskie and Clarke 2006).

Flakes, flake portions, flaked pieces and cores relating to general stone flaking and the production of microblades are items typically found in open artefact scatters. Artefacts that have been retouched or utilised typically comprise less than 5% of overall assemblages. Often bondi points (spear barbs) or other microliths comprise much of the retouched/utilised category. Tools relating to other activities also comprise a very small proportion of most assemblages (Kuskie and Clarke 2006).

Three basic patterns of open artefact site structure have been identified:

- ❑ Low density 'background discard';
- ❑ Isolated knapping floors/artefact concentrations, with minimal other evidence apart from 'background discard'; and
- ❑ Denser concentrations of artefacts extending over large areas, but without distinct knapping floors or clear spatial structure (*cf.* Koettig and Hughes 1985:48).

Aboriginal occupation of the nearby coastal region has been dated to 7,800 years Before Present (BP) at a midden excavated by Dyll at Swansea Heads (Dyll and Bentley 1975) and further north in the Newcastle Bight to around 15,000 years BP by Baker (1994). Occupation of the hinterland ranges has been dated to 11,050±136 BP (SUA-931) at Loggers Shelter in the Mangrove Creek Dam catchment by Attenbrow (1981). However, most archaeological sites in the region have been dated or are assumed to date to the latter part of the Holocene period (<4,000 years BP), after the sea had reached its present level.

A number of key research themes have been addressed during archaeological assessments in the area, including:

- ❑ Models of occupation: - relationship between coastal and inland evidence, use of and proximity of resources, and influence of various site location factors;
- ❑ Chronology of occupation: - evidence for Holocene age occupation;
- ❑ Stone technology: - analysis of knapping behaviour and tool functions through technological attribute analysis, conjoining and discard events, heat treatment, and use-wear and residue analysis;
- ❑ Environmental issues: - relationship of evidence to resources and the changing nature of those resources and the environment over time, and the effects of environmental change on the distribution and visibility of evidence; and
- ❑ Cultural issues: - timing and nature of changes in technology, and the management of stone materials.

For a comprehensive discussion of previous studies within the locality, including detailed occupation models, refer to Kuskie and Kamminga (2000) and Kuskie (2012).

2.2.3 Local Aboriginal Culture

Tindale (1974) compiled an assessment of Aboriginal clan territories in Australia. The Awabakal people are described as occupying land between Wyong and Maitland and Newcastle, west to Kurri Kurri, including the location of the present Modification area. The territory of the Worimi people is described as extending north from Maitland and Newcastle. The Wonnarua occupied an extensive territory from west of Maitland to the Dividing Range (Tindale 1974). The Modification area lies close to the boundary of these groups, although it is noted that such boundaries tended to be fluid (Peterson 1976).

A wide variety of subsistence resources were available to the local Aboriginal population (refer to Kuskie and Kamminga 2000 for a comprehensive discussion). The nearby wetlands of Hexham Swamp and around Blue Gum Creek and elsewhere probably contained diverse and abundant floral species in the late Holocene, of which many would have been exploited. Sedges, grasses and various tubers and roots were possibly available, along with eels and fish. Brayshaw (1986) noted several observations made by early non-indigenous settlers of Aboriginals catching eels and fish in swamps in the district. No references are made of the exploitation of plant resources in the Maitland area, however early accounts often omitted the details of less visible (and predominantly female) plant gathering activities. Faunal species exploited would have included kangaroos, wallabies, echidna, emus, possums, flying fox, birds, wildfowl, goanna, snakes and honey from bees (Resource Planning 1993:15).

The material culture of the local people would have included a variety of items made from bark, other components of plants, stone, shell, bone or other animal components (eg. fur), including shields, clubs, spears, digging sticks, boomerangs, water containers, canoes, rafts, message sticks, clapping sticks, spearthrowers, bark and vine cords, huts, netted and woven dilly bags, bone tools, shell tools, shell pendants, stone tools, fur belts and fur cloaks (cf Brayshaw 1986). Ethnohistorical observations are documented for the use of bark for huts, string, baskets and drinking vessels, and in cord for sewing canoes, fishing lines and nets (Brayshaw 1986).

Wood was used to make clubs, yamsticks, boomerangs, spears, spearthrowers, hatchets and shields (Resource Planning 1993:14). Observations were made of gum or resin from *Acacia* and *Xanthorrhoea* species being used (Resource Planning 1993:14). Shells were used to sharpen or shape wooden implements or as fishhooks. Kangaroo bones were made into awls to sew kangaroo and possum skin cloaks, belts and headbands (Brayshaw 1986).

Following the period of non-indigenous exploration and settlement, the Aboriginal population in the region was rapidly decimated by introduced diseases and disintegration of their traditional social structure. However, a large Aboriginal population remains in the region today, particularly focused on urban areas such as Maitland, and takes an active interest in their cultural heritage.

There are several documented cultural connections with the investigation area, relating to the Black Hill pathway and the 'Doghole' ceremonial area (refer to Figure 5).

Interviews by Kuskie (refer to Kuskie and Kamminga 2000) with long-time Black Hill residents Mrs Beryl Harges and Mrs Judith Crockett identified knowledge that the Black Hill Spur was a route or pathway used by Aboriginal people. It is likely that this pathway extended from Hexham Swamp to Mount Sugarloaf as partially marked (for the Abel Project Area only) on Figure 5. For further discussion of this and other pathways in the Mount Sugarloaf locality refer to Kuskie (2012).

A ceremonial site known as 'the Doghole' is located in the approximate area marked on Figure 5, 'a couple of miles from Minmi at the head of the Big (Hexham) Swamp' (Wallsend & Plattsburg Sun 3/1/1891). It has been 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. The 'Doghole' was 'held in sacred regard' and only initiated men were allowed visit the place (Wallsend & Plattsburg Sun 3/1/1891).

These accounts in the Wallsend and Plattsburg Sun extended back 40 or 50 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 5) 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 shown here in Figure 5.

2.2.4 Predictive Model of Site Location

A predictive model of site location was constructed for the Abel Project (Kuskie 2006) to identify areas of high archaeological sensitivity (ie. locations where there is a high probability of archaeological evidence occurring), so it can be used as a basis for the planning and management of Aboriginal heritage. Predictive modelling involves reviewing existing literature to determine basic patterns of site distribution. These patterns are then modified according to the specific environment of the investigation area to form a predictive model of site location. A sampling strategy is employed to test the predictive model and the results of the survey used to confirm, refute or modify aspects of the model.

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

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

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

Below is a brief description of the site types that may occur within the Modification investigation area, following the Abel predictive model (Kuskie 2006) with refinements on the basis of the extensive survey undertaken for the Tasman Extension Project (Kuskie 2012). For a detailed discussion of the Aboriginal occupation models that underpin the predictive model, refer to Kuskie and Kamminga (2000) and Kuskie (2012).

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

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

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

Artefact scatters may represent the evidence of:

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

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

Within the Modification investigation area there is a potential for stone artefacts to occur in a widespread distribution of variable density across all landform units, apart from in areas subject to a high level of existing impacts (such as the Black Hill and Stockrington quarries). However, much of the artefact evidence potentially present is likely to be currently obscured by vegetation and/or soil.

The artefact evidence is predicted to be generally of a low to very 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; Kuskie and Kamminga 2000), interspersed with 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. In general, the use of the moderate to steeply inclined slopes is anticipated to have been very low, with consequently a very low density of evidence expected. Superimpositioning of evidence along the crests (eg. the Black Hill Aboriginal pathway) from repeated movement may result in relatively higher artefact density in these areas.

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). 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 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 (refer to Figure 5). The potential for additional bora/ceremonial sites to occur within the area is assessed as relatively low, notwithstanding that strong cultural ties have been identified by the Awabakal and Wonnarua people with this landscape and ceremonial sites have been reported elsewhere in the locality (refer to 'Cultural Sites' below and to Kuskie 2012).

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, and given the historical reports of burials in caves around Mount Sugarloaf to the south (Threlkeld in Gunson 1974).

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

Both vegetation removal and the long passage of time since the practice of tree carving was prevalent have rendered this site type 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 Modification area. Some knowledge of cultural sites of traditional and historic significance has already been identified, including 'the Doghole' and the Aboriginal pathway along Black Hill Spur. The potential for additional sites of historical or traditional cultural significance to occur within the area is assessed as relatively low, notwithstanding that strong cultural ties have been identified by the Awabakal and Wonnarua people with this landscape and similar sites have been reported elsewhere in the locality (refer to Kuskie 2012).

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 and grinding of seeds and processing of other plant matter and animal foods.

Grinding grooves are typically located in sedimentary bedrock along watercourses. The investigation area hosts suitable geology and drainage depressions, and a number of grinding groove sites have previously been recorded there (Table 1). 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: A lithic quarry is the location of an exploited stone source (Hiscock and Mitchell 1993:32). Sites will only be located where exposures of a stone type suitable for use in artefact manufacture occurs. Reduction sites, where the early stages of stone artefact manufacture occur, are often associated with quarries.

Within the investigation area and its immediate vicinity, sources of suitable stone materials (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, particularly for tuff (wherever 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 Areas B and C 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, midden deposits and/or rock art. These sites will only occur where suitable geological formations are present.

Within the investigation area (particularly Areas B and C), sandstone rock formations are present in a number of areas, including low cliffs 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 (particularly Area A) 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. Both vegetation removal and the long passage of time since these practices were prevalent have generally rendered this site type rare. However, scarred trees have been recorded in the Project Area and their potential to occur within the Modification area is considered to be moderate to low, given the presence of remnant mature native trees.

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 a low to moderate potential for stone arrangement sites to occur within the investigation area, particularly in association with 'the Doghole' ceremonial site. Similar sites have been recorded several kilometres south of the investigation area.

2.3 Statutory Context

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

The Abel Upgrade Modification represents a proposed Modification to an existing Major Project approved under Part 3A of the EP&A Act. The Abel Underground Mine is currently operating, with Aboriginal heritage managed under an approved Aboriginal Heritage Management Plan (Donaldson Coal 2007).

Although Part 3A of the EP&A Act has been repealed, under Division 4.1 of Part 4, 'State Significant Development' is treated in a similar manner to the former Part 3A. Similar to the previous Part 3A legislation, under Section 89J of Part 4 of the EP&A Act, a Section 90 Aboriginal Heritage Impact Permit (AHIP) to impact Aboriginal objects is not required for an approved State Significant Development or for any investigative or other activities required to be carried out for the purpose of complying with environmental assessment requirements issued in connection with a development application for any such development. *In lieu* of a Section 90 AHIP, Aboriginal heritage needs to be managed post-approval under an Aboriginal Heritage Management Plan subject to the approval of the DP&I. This is the current situation at the Abel Underground Mine.

In relation to the NP&W Act, an 'Aboriginal object' is defined under Section 5(1) as:

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

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

Under s89A of the NP&W Act, a person who is aware of the location of an Aboriginal object that is the property of the Crown or, not being the property of the Crown, is real property, and does not, in the prescribed manner, notify the Director-General thereof within a reasonable time after the person first becomes aware of that location is guilty of an offence against the Act unless the person believes on reasonable grounds that the Director-General is aware of the location of that Aboriginal object. The 'prescribed manner' is currently taken to be written notice in a form approved by the Director-General, being the Aboriginal Site Recording Forms available on the OEH website.

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

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

- 1) A person must not harm or desecrate an object that the person knows is an Aboriginal object.
- 2) A person must not harm an Aboriginal object ('strict liability offence').

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

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

- (e) desecrates the object or place, or
- (f) is trivial or negligible, or
- (g) is excluded from this definition by the regulations.

There are various exemptions and defences to offences under Section 86 of the Act, including where the harm occurs under an AHIP. As noted above, a Section 90 AHIP is not required for an approved Part 3A Project such as the Abel Underground Mine.

Consents regarding impacts to Aboriginal objects or areas with potential for Aboriginal objects are managed through the OEH Aboriginal Heritage Impact Permit system, as outlined in Section 90 of the NP&W Act and clauses 80D and 80E of the Regulations. The issuing of an AHIP is dependent upon adequate archaeological assessment and review (cultural heritage assessment report), together with an appropriate level of Aboriginal community liaison and involvement. Typically, to support an AHIP, an Aboriginal cultural heritage assessment must be undertaken in accordance with the OEH (2011) *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*, which effectively involves an assessment following the DECCW (2010a) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* and Aboriginal community consultation in accordance with the DECCW (2010b) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* policy. For a more comprehensive discussion, refer to Kuskie (2012).

3. METHODOLOGY

3.1 Investigation and Survey Methodology

The salient points relating to the proposed Abel Upgrade Modification are:

- ❑ The Abel Underground Mine is an Approved Project under Part 3A of the EP&A Act;
- ❑ The Abel Underground Mine is currently operating, with Aboriginal heritage managed under an approved Aboriginal Heritage Management Plan (Donaldson Coal 2007); and
- ❑ The proposed Abel Upgrade Modification under Section 75W of the EP&A Act constitutes an action that can be addressed under the existing AHMP with procedures for Aboriginal consultation and archaeological assessment consistent with the Approved Project, assessment to date (Kuskie 2006) and the Director-General's requirements.

The general requirements of the DP&I for Aboriginal heritage include an assessment taking into account relevant guidelines, policies and plans, such as the draft *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (DEC 2005) and *The Burra Charter*.

The original Aboriginal cultural heritage assessment for the Abel Underground Mine (Kuskie 2006) was undertaken with reference to the draft *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (DEC 2005) and involved implementation of the *Interim Community Consultation Requirements for Applicants* (DEC 2004) policy. The AHMP specifies procedures for Aboriginal community involvement (Section 4.2) and procedures for further archaeological investigations (Section 4.6). This investigation has sought to address the Director-General's requirements via relevant procedures within the approved AHMP, with reference to the DEC (1997, 2004 and 2005) policies and guidelines.

Previous searches of relevant heritage registers and planning instruments have been updated for this assessment of the Abel Upgrade Modification, and to assist with the preparation of a revised AHMP. Searches were undertaken on 11 March 2012 of the OEH AHIMS.

As a result of these searches, and the conduct of surveys for the present assessment (refer to Section 4), the Abel Aboriginal Site Database (refer to Section 4.3 and Table 1 and Figure 1 of the AHMP) and relevant GIS files have been updated. The updated Table 1 of the AHMP is presented here as Table 1, and the updated Figure 1 of the AHMP is presented here as Figure 5.

The archaeological field survey involved a targeted sample of the highest risk formations (such as clifflines and major drainages) in the Modification investigation area. This assisted in identifying and assessing the key potential changes that may arise from the proposed change to the mining method in these areas (ie. from bord and pillar, to shortwall and longwall). Procedures remain in the AHMP (Section 4.6) for the comprehensive staged systematic survey of all other areas susceptible to subsidence impacts prior to undermining. Once those future surveys have been completed, the geographic extent of the area susceptible to subsidence impacts (including from bord and pillar, shortwall and longwall mining) will have been subject to systematic heritage survey, consistent with Section 4.6 of the AHMP.

Field inspection of the Modification investigation area was undertaken over seven days between 2 and 13 April 2012, by Stephen Free and Jason Barr of South East Archaeology, assisted by representatives of the registered Aboriginal stakeholders (refer to Section 3.2 and Appendix 6).

The investigation occurred in accordance with the draft methodology dated 29 February 2012 that was provided to the registered Aboriginal stakeholders on 2 March 2012 for comment and finalised without any issues being raised by any of the stakeholders.

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

Where parts of the Modification investigation area were assessed as being highly impacted (ie. A unit soil totally removed) and having negligible potential for any heritage evidence to survive, these areas were classified as *modified* and not subject to survey (for example, the Black Hill Quarry and the Stockrington Quarry).

Detailed recording of the archaeological *survey areas* was made on survey recording forms, including environmental variables and heritage resources identified or potentially present. Each *survey area* was assigned a unique reference code after the Abel Modification initials and the Modification Area (A, B or C) (refer to survey coverage database in Appendix 3). For example, AMA1 refers to survey area #1 in Area A, while AMC3 refers to survey area #3 in Area C).

The survey team was equipped with high resolution 1:4,300 scale mapping of the investigation area, with two metre contours, a 100 metre MGA grid and an aerial photograph underlay. Along with the use of hand-held Global Positioning System (GPS) units (generally accurate to within five metres), these features assisted with defining survey areas and survey units and accurately establishing the location of Aboriginal sites and marking the above onto the detailed base mapping (refer to Figures 6 - 8 and Appendix 4).

Within each survey area:

- Inspection was made widely for the obtrusive site types, particularly those that are susceptible to subsidence impacts, such as rock shelters with deposit and/or art and grinding grooves; and
- Although not the focus of the inspection, as impacts from subsidence will be limited, where identified during the course of this inspection stone artefact and other cultural evidence, such as scarred trees, were also recorded.

Aboriginal heritage site recording forms for each identified site were also completed. Spatially separate locations of heritage evidence were recorded as separate site loci named after "Abel Modification" for the project, followed by the Modification Area (A, B or C) and the survey area number and a sequential letter. For example, the site loci identified within survey area AMA2 in Area A were named "AMA2/A", "AMA2/B" and "AMA2/C" (refer to detailed site descriptions in Appendix 4).

As required under Section 89A of the *National Parks and Wildlife Act 1974*, site records have been completed for all new or updated site recordings conducted during the assessment and lodged with the OEH.

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

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

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

3.2 Aboriginal Consultation

The Modification investigation area lies almost entirely within the boundary of the Mindaribba LALC, although portions of the broader Abel Underground Mine also lie within the boundary of the Awabakal LALC (refer to Figure 4).

The original Aboriginal cultural heritage assessment for the Abel Underground Mine (Kuskie 2006) involved implementation of the *Interim Community Consultation Requirements for Applicants* (DEC 2004) policy and the approved AHMP specifies procedures for Aboriginal community involvement (Section 4.2).

Thirteen Aboriginal organisations had registered an interest in the original assessment (refer to Table 2). Consistent with Section 4.2 of the AHMP, the LALCs and all other registered stakeholders were provided with the proposed methodology for the Modification assessment and allowed a minimum of 15 working days for comment. At the behest of Donaldson Coal, in consideration of an interest expressed in and a contribution provided to an adjacent project (Tasman Extension), Mr Shane Frost of Awabakal Descendants Traditional Owners Aboriginal Corporation (ADTOAC) was also provided the draft methodology and consulted about the Modification and invited to attend the field inspection.

Information about the scope of the Modification and proposed heritage assessment process was presented in this document to all stakeholders on 2 March 2012, along with a request for input into the nature of the proposed methodology, any Aboriginal objects or places of cultural value within the investigation area stakeholders were aware of, any restrictions or protocols Aboriginal stakeholders considered necessary in relation to any information of sensitivity provided, and any other factors Aboriginal stakeholders considered to be relevant to the heritage assessment (refer to Appendix 6).

All comments received were to be documented and taken into account and identified in the final report as to how they were considered in finalising the methodology. No comments were provided by any of the registered stakeholders on the draft methodology.

Table 2: Summary of registered Aboriginal stakeholders involvement.

Registered Stakeholder	Sent Modification Information and Methodology	Participation in Field Survey ⁷
Mindaribba LALC	2/3/12	2-13/4/12
Awabakal LALC	2/3/12	-
Lower Hunter Wonnarua Council	2/3/12	2-13/4/12
Yarrawalk (a division of Tocomwall Pty Ltd)	2/3/12	2-13/4/12
Wonnarua Culture Heritage	2/3/12	-
Barkuma Aboriginal Neighbourhood Centre Inc (now trading as Gidawaa Walang)	2/3/12	-
Aboriginal Native Title Consultants	2/3/12	-
Giwiirr Consultants	2/3/12	-
Hunter Valley Cultural Consultants	2/3/12	-
Mingga Consultants	2/3/12	-
Upper Hunter Heritage Consultants	2/3/12	-
Valley Culture	2/3/12	-
Wattaka Wonnarua Cultural Consultants Service	2/3/12	-

In accordance with Section 4.2 of the AHMP, Donaldson Coal engaged representatives of Mindaribba LALC to participate in the survey. In accordance with Section 4.2 of the AHMP, Donaldson Coal also elected, where it was determined that such consultation may be beneficial to the completion of the assessment, to engage representatives of registered Native Title Claimants and other registered stakeholders with demonstrated skills and experience in the conduct of heritage studies in the local area, and/or specific cultural knowledge of the project area in relation to specific heritage issues.

Field inspection of the Modification investigation area was undertaken over seven days between 2 and 13 April 2012 (refer to Appendix 6), with assistance provided by:

- ❑ Mathew Yates and Adam Johnson - Mindaribba LALC;
- ❑ Lionel McGrady, Luke House, Daniel Scott and Todd Maley - Lower Hunter Wonnarua Council (LHWC);
- ❑ Danny Franks and Steve Verey - Yarrawalk; and
- ❑ Shane Frost - ADTOAC.

In accordance with Section 4.2 of the AHMP, Donaldson Coal provided the LALC with a draft copy of the heritage assessment report and allowed a minimum of 15 working days to provide written comment. No comments were provided by the Mindaribba LALC.

⁷ At the behest of Donaldson Coal, in consideration of an interest expressed in and a contribution provided to an adjacent project (Tasman Extension), Mr Shane Frost of ADTOAC was also invited to attend the field inspection.

In accordance with Section 4.2 of the AHMP, Donaldson Coal also made available to the other registered Aboriginal stakeholders, along with Mr Shane Frost (ADTOAC, not a registered stakeholder), the draft heritage assessment report for comment. The only comments received were from Mr Scott Franks (Yarrawalk) and Mr Shane Frost (ADTOAC) (refer to Appendix 6). Key issues relating to Aboriginal heritage are addressed below in Table 3 (where feasible the issue number is noted on the correspondence provided by the registered party in Appendix 6).

Mr Franks (Yarrawalk) endorsed and commended the quality of the report, and requested further involvement of Traditional Owners in future investigations (such as for the SMP requirements). Donaldson Coal will ensure that relevant Traditional Owners are consulted and involved, in accordance with Section 4.2 of the AHMP.

Mr Shane Frost (ADTOAC) raised a number of issues which are addressed in Table 3 below (notwithstanding that ADTOAC is not a registered Aboriginal stakeholder for the Project).

Donaldson Coal will provide copies of the final report to the LALC and other stakeholders within 25 working days of completion.

Table 3: Summary of key Aboriginal community comments and how they have been addressed by the Project.

Issue #	Issue	Raised by	Project Team Response
1	Satisfaction with report and recommendations, but preference to see greater involvement of Traditional Owners in ongoing consultation and field investigations relating to SMP requirements.	Scott Franks (Yarrawalk)	Donaldson Coal will ensure relevant Traditional Owners continue to be consulted and involved in future studies as outlined in Section 4.2 of the AHMP.
2	Report and AHMP not consistent with current legislative requirements for heritage management and consultation.	Shane Frost (ADTOAC)	Outside of the scope of this Modification. Report and AHMP consistent with all relevant DP&I requirements.
3	Desire for greater inclusion and expression of cultural values within the significance assessment.	Shane Frost (ADTOAC)	Endeavours have been made during the five month consultation process for this Modification to involve the Aboriginal community in the Project, identify cultural values and cultural significance, and seek input into the heritage assessment of the Modification, in accordance with the DP&I requirements and approved AHMP. This has been acknowledged by a number of the registered parties. Consultation and cultural values are documented throughout this report, particularly in Sections 3.2, 4 and 5, and Appendix 6. Notwithstanding, in order to further address this issue, Donaldson Coal has agreed to meet with ADTOAC (not a registered stakeholder for the Project) to discuss further.
4	Wording of AHMP should be revised to include all registered Aboriginal stakeholders, not just the LALC.	Shane Frost (ADTOAC)	Donaldson Coal will ensure relevant Traditional Owners and other registered Aboriginal stakeholders continue to be consulted as outlined in Section 4.2 and elsewhere throughout the AHMP. It is noted that ADTOAC is not a registered stakeholder for the Project.

Issue #	Issue	Raised by	Project Team Response
5	Disagree with assessment of possible scarred trees.	Shane Frost (ADTOAC)	Not accepted (refer to Section 4.3 for discussion of rationale). In any event, subsidence impacts are not predicted to occur to either 'possible scarred tree'. As such, further investigation (eg. by an arboricultural expert) is not proposed.
6	'All our sites are significant to us'.	Shane Frost (ADTOAC)	The importance of all Aboriginal cultural sites to Aboriginal people is acknowledged in this report (eg. refer to Section 5.1 and 5.2).
7	Report does not address issue of intergenerational equity.	Shane Frost (ADTOAC)	The issue of intergenerational equity is addressed in Sections 6 and 7 of this report in relation to the Modification.
8	Aboriginal stakeholders need to be involved in baseline recording and ongoing monitoring of sites that may be affected by the Modification.	Shane Frost (ADTOAC)	Consistent with existing commitments as outlined in Section 4.9 of the approved AHMP and Sections 7 and 8 of this report, monitoring in consultation with Aboriginal stakeholders will continue, with the monitoring program extended to encompass relevant sites in the Modification.
9	No consultation other than opportunity to comment on draft report.	Shane Frost (ADTOAC)	Not accepted. A five month consultation process has been undertaken for this Modification, in accordance with the DP&I requirements and approved AHMP, including provision of the draft methodology for comment, involvement of stakeholders in the field survey and provision of the draft report and AHMP revisions for comment. Consultation is documented throughout this report, particularly in Section 3.2 and Appendix 6. Notwithstanding, in order to further address this issue, Donaldson Coal has agreed to meet with ADTOAC (not a registered stakeholder for the Project) to discuss further.
10	"Offsets" sought to compensate for possible loss of heritage resources.	Shane Frost (ADTOAC)	In consideration of the limited impacts of the Modification and various options for heritage mitigation and management, Donaldson Coal has not identified a need for cultural "offsets". Notwithstanding this, Donaldson Coal has agreed to meet with ADTOAC (not a registered stakeholder for the Project) to discuss this issue further, including the potential for extending into the Abel Modification area the commitment made in relation to the Tasman Extension to fund further research into cultural values.

4. RESULTS AND DISCUSSION

4.1 Survey Coverage

The archaeological survey involved a targeted sample of the highest risk formations (such as clifflines and major drainages) in the Modification investigation area. These areas were sampled within 29 survey areas. The locations of the individual survey areas are marked on Figures 6 - 8 and descriptions are presented in Appendix 3. A summary of the survey coverage is presented in Table 4 for the combined environmental contexts.

For the overall Modification investigation area of 641.8 hectares, an area of 155.5 hectares (24%) was subject to archaeological sampling. Total direct survey coverage (ground physically inspected for heritage evidence) equated to approximately 145,920 m² or 9.4% of the area of 155.5 hectares sampled, or 2.3% of the overall Modification investigation area. The total effective survey coverage (*visible* ground surface physically inspected with potential to host heritage evidence, for example stone artefacts) equated to around 4,469 m² or 0.3% of the area of 155.5 hectares sampled, or 0.07% of the overall Modification investigation area.

As the total survey coverage only refers to an area of several metres width directly inspected by each member of the survey team, the actual coverage for obtrusive site types (for example, rock shelters and grinding grooves) was significantly greater than this.

The effective survey coverage (primarily relevant to the identification of stone artefacts on the surface, not obtrusive site types) was significantly reduced by the dense cover of vegetation and leaf litter, which limited surface visibility. Archaeological visibility, the actual visible ground surface with potential for heritage evidence (accounts for factors such as ground disturbance and sediment deposition), occurred in a similar pattern to surface visibility (mean of just 3% across the total survey sample).

Within the 145.6 hectare 'Area A', 38 hectares or 26% of the total area was subject to sampling. Within this sampled area, total direct survey coverage equated to approximately 50,980 m² or 13.4% of the area of 38 hectares sampled, or 3.5% of the overall Area A.

Within the 120.4 hectare 'Area B', 24 hectares or 20% of the total area was subject to sampling. Within this sampled area, total direct survey coverage equated to approximately 20,560 m² or 8.6% of the area of 24 hectares sampled, or 1.7% of the overall Area B.

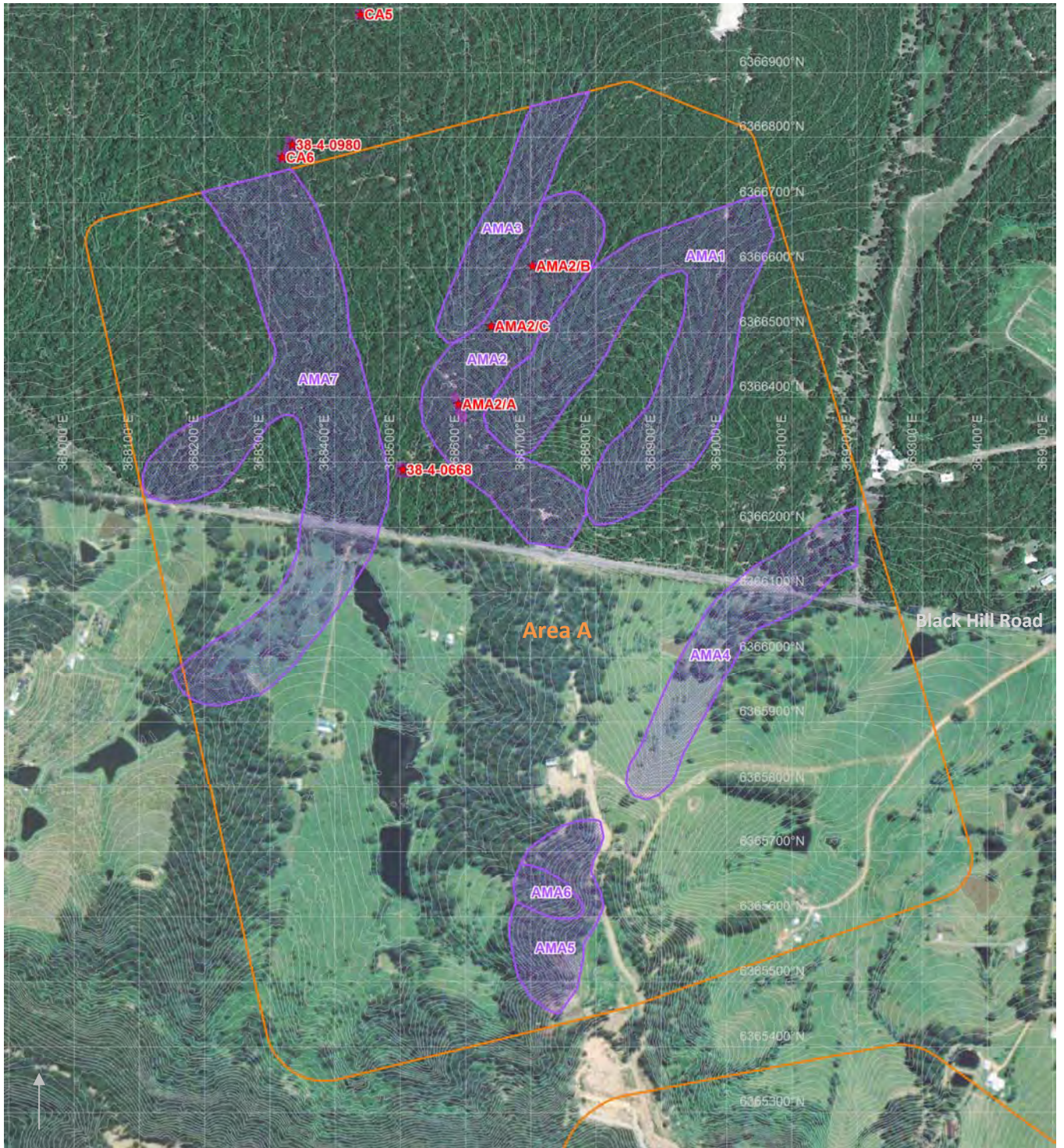
Within the 375.8 hectare 'Area C', 93.5 hectares or 25% of the total area was subject to sampling. Within this sampled area, total direct survey coverage equated to approximately 74,380 m² or 8% of the area of 93.5 hectares sampled, or 2% of the overall Area C.

As a result of previous timber extraction and vegetation clearing, a relatively low frequency of mature native trees exists within the investigation area. Where identified, these were inspected for evidence of Aboriginal scarring. Numerous areas of exposed sandstone open surfaces (bedrock), rock outcrops, rock walls, boulders and scarps were identified, particularly in Areas B and C. These areas were widely inspected for shelter sites and grinding grooves.

As the survey sampled the areas of highest heritage potential, the level and nature of effective survey coverage is considered satisfactory enough to present an effective assessment of the Aboriginal heritage resources identified and potentially present within the Modification investigation area. The coverage within the sample area was comprehensive for obtrusive site types (eg. rock shelters, grinding grooves and scarred trees) but limited to some extent for the less obtrusive stone artefacts by surface visibility constraints. Nevertheless, in view of the predictive modelling and the results obtained from the sample of effective coverage, it is concluded that the survey provides a valid basis for determining the probable impacts of the Modification and formulating recommendations for the management of the identified and potential Aboriginal heritage resources.

Table 4: Environmental contexts, class of slope and landform elements - summary of survey coverage and artefact density for Modification investigation area.

Environmental Context	Total Area of Context (Within Sampled Area) (m ²)	% Context Comprises of Sampled Area	Total Area Surveyed (m ²)	% Surveyed of Context	Effective Survey Coverage Total (m ²)	% Effective Survey Coverage of Context	Total # Artefacts (open sites)	Artefact Density (# artefacts per m ² effective survey coverage)
gentle drainage depression	328,440	21.12%	42,920	13.07%	825	0.25%	0	-
moderate drainage depression	491,544	31.60%	45,400	9.24%	907	0.18%	0	-
steep drainage depression	39,080	2.51%	2,560	6.55%	51	0.13%	0	-
gentle ridge crest	93,810	6.03%	10,800	11.51%	1,800	1.92%	10	0.0056
gentle simple slope	128,100	8.24%	7,000	5.46%	140	0.11%	0	-
moderate simple slope	392,870	25.26%	28,140	7.16%	564	0.14%	1	0.0018
steep simple slope	81,580	5.24%	9,100	11.15%	182	0.22%	0	-
Totals/Means	1,555,424	100.00%	145,920	9.38%	4,469	0.29%	11	0.0025
Class of Slope								
gentle	550,350	35.38%	60,720	11.03%	2,765	0.50%	10	0.0036
moderate	884,414	56.86%	73,540	8.32%	1,471	0.17%	1	0.0007
steep	120,660	7.76%	11,660	9.66%	233	0.19%	0	-
Totals/Means	1,555,424	100.00%	145,920	9.38%	4,469	0.29%	11	0.0025
Landform Element								
drainage depression	859,064	55.23%	90,880	10.58%	1,783	0.21%	0	-
ridge crest	93,810	6.03%	10,800	11.51%	1,800	1.92%	10	0.0056
simple slope	602,550	38.74%	44,240	7.34%	886	0.15%	1	0.0011
Totals/Means	1,555,424	100.00%	145,920	9.38%	4,469	0.29%	11	0.0025



- Key:**
- ★ open artefact site
 - open grinding groove and artefact site
 - open grinding groove site
 - Potential Archaeological Deposit (PAD)
 - ▲ rock shelter with PAD
 - ◆ scarred tree

Figure 6: Location of archaeological survey areas (purple shapes) and Aboriginal heritage sites within Modification investigation Area A (aerial photograph and two metre contours courtesy Resource Strategies; 100 metre MGA grid; Modification investigation area border - orange).

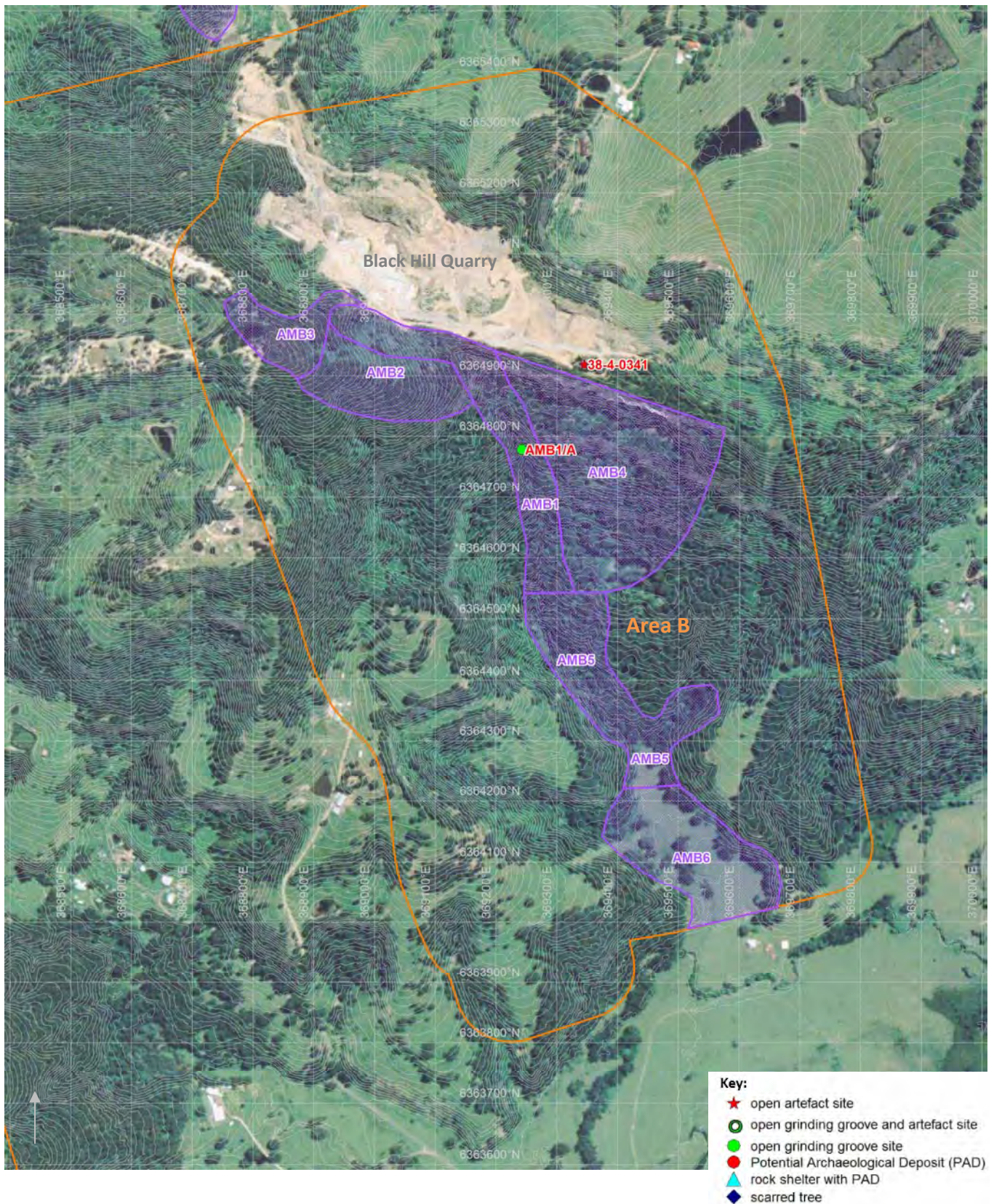


Figure 7: Location of archaeological survey areas (purple shapes) and Aboriginal heritage sites within Modification investigation Area B (aerial photograph and two metre contours courtesy Resource Strategies; 100 metre MGA grid; Modification investigation area border - orange).

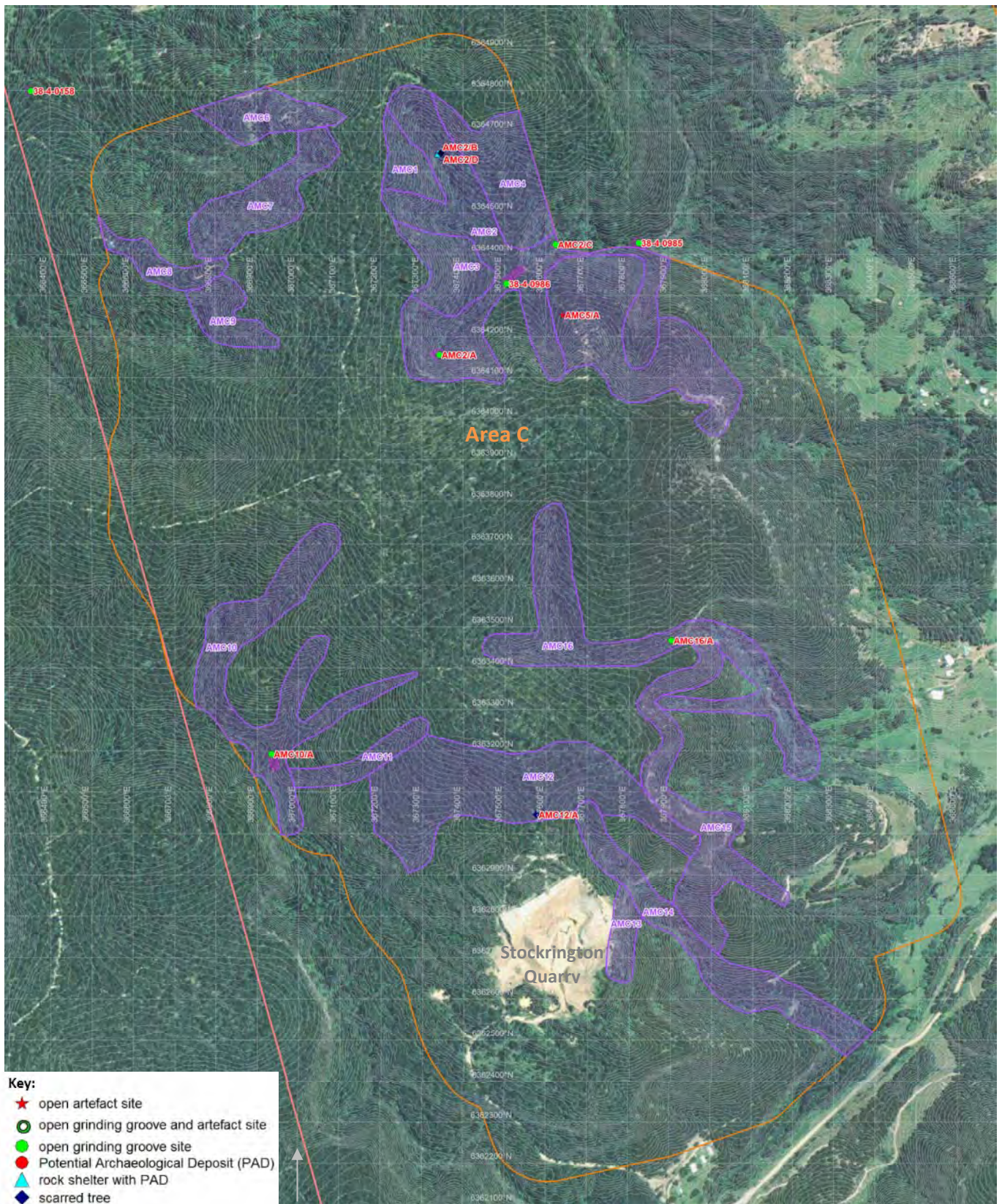


Figure 8: Location of archaeological survey areas (purple shapes) and Aboriginal heritage sites within Modification investigation Area C (aerial photograph and two metre contours courtesy Resource Strategies; 100 metre MGA grid; Modification investigation area border - orange).

4.2 Aboriginal Heritage Evidence

Within the Modification investigation area, a total of 15 Aboriginal sites and one PAD have been identified (refer to Table 5), comprising:

- ❑ Seven open grinding groove sites;
- ❑ Six open artefact sites (including isolated finds);
- ❑ Two scarred trees; and
- ❑ One rock shelter with PAD.

Four of these sites had previously been recorded (refer to Appendix 2 for descriptions) and 11 sites and one rock shelter with PAD were recorded during the present survey (refer to Appendix 4 for descriptions). The locations of these sites are marked on Figures 5 - 8.

In addition, there are several documented cultural values/places associated with the investigation area (refer to Figure 5 and Section 2.2.3) and the Black Hill locality is a cultural landscape of significance to the Aboriginal community:

- ❑ The Black Hill locality (including the Modification investigation area) is a cultural landscape of traditional, historical and contemporary cultural significance to the Aboriginal community;
- ❑ The Black Hill Spur was a pathway used by Aboriginal people (Mrs Beryl Harde and Mrs Judith Crockett pers. comm., 1996; Kuskie and Kamminga 2000). It is likely that this pathway extended from Hexham Swamp to Mount Sugarloaf as partially marked (for the Abel Project Area only) on Figure 5 (refer to Kuskie 2012 in relation to the Mount Sugarloaf locality); and
- ❑ The initiation/ceremonial site known as 'the Doghole' is located in the vicinity of Stockrington and Long Gully (Wallsend & Plattsburg Sun 3/1/1891, also 13/12/1890, 7/1/1891; refer to Kuskie and Kamminga 2000, Hartley 1990, Resource Planning 1992).

The registered Aboriginal stakeholders did not disclose any other specific knowledge of traditional or historical cultural values/places. However, the possibility cannot be excluded that other traditional or historical Aboriginal values or associations may exist that were not divulged to South East Archaeology by the persons consulted.

4.3 Discussion

Open artefact sites:

Six open artefact sites are known to occur within the Modification investigation area.

Sites AMA2/A, AMA2/B and AMA2/C were recorded during the current survey in 'Area A' (refer to Appendix 4 for full descriptions). These are small, low-density open artefact sites (six, three and one artefact respectively) that are located on a vehicle track leading north of Black Hill Road. The sites occur on a broad, gentle ridge crest that descends north from Black Hill to Weakleys Flat Creek and Four Mile Creek. The integrity of the sites is low due to the well-formed nature of the vehicle track.

One previously recorded site (OEH #38-4-668, 'FMC6 Donaldson Mine') also occurs in the immediate vicinity of these sites in Area A, on a vehicle track on the same ridge crest north of Black Hill Road (refer to Appendix 2 for description). This is also a small, low density artefact scatter (four artefacts).

Within Area B of the Modification investigation area, one previously recorded open artefact site (OEH #38-4-341, 'Black Hill Quarry 1') has been recorded (refer to Appendix 2 for description). The site comprises an isolated artefact on an unformed vehicle track on the ridge crest of Black Hill, adjacent to the existing quarry. This ridge has been identified as a pathway that was used by Aboriginal people (Kuskie and Kamminga 2000).

Within Area C of the Modification investigation area, one open artefact site (AMC5/A), was recorded during the current survey (refer to Appendix 4 for full description). The site comprises an isolated artefact located on a vehicle track on a moderate simple slope.

Eleven artefacts were recorded in the four open artefact sites during the present survey. These comprise four proximal flake portions, three flakes, three lithic fragments and one core. These items may represent the fragmented debris of on-site knapping of primary flakes and/or microblades or other on-site fracture, such as accidental breakage, or accidental discard. Five of the artefacts comprise silcrete, three tuff, two chert and one acidic volcanic. As noted in Sections 2.1 and 2.2, local sources of tuff and silcrete are known, and may have been utilised for these materials.

Open grinding groove sites:

Seven open grinding groove sites are known to occur within the Modification investigation area, almost all within 'Area C'.

One open grinding groove site (AMB1/A) was recorded during the current survey in Area B, along with four (AMC2/A, AMC2/C, AMC10/A and AMC16/A) in Area C (refer to Appendix 4 for full descriptions). Two grinding groove sites (#38-4-985, 'Abel 1', and #38-4-986, 'Abel 2') have previously been recorded within Area C during the EA (Kuskie 2006; refer to Appendix 2 for descriptions). All of the sites occur within moderately inclined first or second order headwater tributaries of Blue Gum Creek and Long Gully.

A total of 35 grooves have been recorded at these sites during the current and previous investigations. Sites AMC2/C with ten grooves and AMC2/A with nine grooves are the largest. Sites Abel 1 and 2 have at least five and four grooves respectively. The remaining sites have only two or three grooves each. However, it is highly probable at most of the sites that beneath standing water and moss, additional grooves may be present.

Many of the grooves are elongated and relatively broad, others are elongated and narrow and u-shaped, and some are broader oval or round shapes. Some of the grooves may be the result of shaping and sharpening of ground-edge hatchets and/or axes. Other grooves may have been used for seed-grinding or other purposes, such as the preparation of medicine or processing of animal foods or ochre. Recently developed residue and use-wear analysis techniques (Stephenson 2011) may enable resolution of this issue. Other naturally formed holes occur in the sandstone rock formations and the possible use of these by Aboriginal people cannot be discounted.

Scarred trees:

Two possible scarred trees (AMC2/D and AMC12/A) were identified within Area C during the present survey and recorded at the request of the Aboriginal stakeholders (refer to Appendix 4 for descriptions).

Aboriginal scarred trees exhibit the evidence of Aboriginal utilisation of bark and/or wood for the manufacture of canoes, containers, shelters, shields or boomerangs. Scarred trees may also have been associated with cultural activities and places, such as initiation ceremonies and burials, although these are more often associated with carved trees. Beesley (1989), Bell (1982) and Crew (1990, 1991) outline the criteria for identifying Aboriginal scarred trees:

- ❑ The scar is wholly enclosed;
- ❑ The scar exhibits the removal of bark and/or wood;
- ❑ The scar is regular in shape and usually oval, elongated, rectangular, or curved to fit the shape of the trunk;
- ❑ Multiple scars on one tree may be present;
- ❑ Stone or steel axe marks may be present around the edge of the scar;
- ❑ Multiple, small, regularly spaced scars may be present;
- ❑ The tree is of indigenous species and of mature age;
- ❑ The tree may be associated with particular resource zones such as rivers; and
- ❑ The tree may be associated with other Aboriginal sites.

A number of non-Aboriginal causes for scarred trees exist, including loss of branches, lightning and fire damage, insect damage, growth stress, bird activity and modern (or historical) activity such as survey marks and mechanical damage from machinery and vehicles (Crew 1990, 1991). Natural causes for scarring often result in basal scars and scars irregular or ragged in shape, while scars on immature and exotic trees are not considered to be characteristic of Aboriginal activity and may be the result of either natural or modern causes (Crew 1990, 1991). Scars arising from recent (non-Aboriginal) human activity are generally fully enclosed, but usually exhibit the removal of bark only and are often rectangular, arched or half oval in shape (Crew 1990, 1991). Such scars may also exhibit steel axe marks and occur on exotic species, often associated with sites of non-Aboriginal human activity, such as construction areas, roads or farm buildings (Crew 1990, 1991).

Site AMC2/D is located on a headwater tributary of Long Gully close to the small rock shelter with PAD (AMC2/B). AMC12/A is located on a simple slope near the Stockrington Quarry. Although the scar of AMC2/D is symmetrical, the tree does not appear to be of sufficient age to host a scar of Aboriginal origin, and it is inferred that a natural cause for this scar is probable. Although a larger, relatively old tree, the scar on AMC12/A is asymmetrical and appears more likely to have derived from natural or non-indigenous causes. The tree is located adjacent to the quarry haul road.

Rock shelter with PAD:

One very small rock shelter with PAD (AMC2/B) was identified within Area C during the present survey and recorded at the request of the Aboriginal stakeholders (refer to Appendix 4 for description). The PAD is located in a boulder on a first-order headwater tributary of Long Gully. It has a very low entrance and a very small habitable floor area.

A PAD is not technically an "Aboriginal object" as defined under the NP&W Act, however excavation may reveal stone artefacts and other cultural deposits (eg. charcoal from camp fires). The research potential of PADs can be assessed in relation to various criteria (refer to Kuskie 2012). The AMC2/B PAD is of a very small size, with a very low roof height and limited habitable floor area, as such the potential research value is assessed as very low.

Cultural values:

The approximate locations of two cultural places within the investigation area are marked on Figure 5. Both places have been documented in historical times (Kuskie and Kamminga 2000, Wallsend & Plattsburg Sun 3/1/1891) but relate to traditional Aboriginal use of the area. In addition, the general locality of Black Hill is considered to be a cultural landscape of significance to the Aboriginal community.

The Black Hill Spur was a pathway used by Aboriginal people, that probably extended from Hexham Swamp along Black Hill Spur and over Black Hill (in Area B) and further west and south along ridges to Mount Sugarloaf. This route is only marked on Figure 5 for the Abel Project Area (refer to Kuskie 2012 for mapping to Mount Sugarloaf).

The initiation/ceremonial site known as 'the Doghole' is located in the vicinity of Stockrington and Long Gully (Wallsend & Plattsburg Sun 3/1/1891, also 13/12/1890, 7/1/1891; refer to Kuskie and Kamminga 2000, Hartley 1990, Resource Planning 1992).

Site Interpretation:

The inferences that can be made about the nature of occupation at the identified sites or elsewhere in the Modification investigation area are limited somewhat by the nature of the sample.

The evidence identified at the open artefact sites is consistent with background discard, manuport and artefact material which is insufficient either in number or in association with other material to suggest focused activity in a particular location (Rich 1993, Kuskie and Kamminga 2000). All of the open artefact sites are small, with few artefacts, at low densities. Notwithstanding exposures extending along vehicle tracks, further evidence was not identified. The assemblage comprises items that represent non-specific stone flaking, without distinct activity areas.

The grinding groove sites provide evidence of the production and maintenance of stone hatchets/axes, and potentially other activities such as seed-grinding, or processing of other plant food, animal food or ochre, or preparation of medicine. Residue analysis may enable resolution of the function of these grooves.

The scars on the two trees have probably arisen from non-Aboriginal causes. Any Aboriginal use of the very small rock shelter with PAD is uncertain, and inferred to be unlikely.

Broader models of occupation for the Hunter Valley region have been proposed by Kuskie and Kamminga (2000) for the lower valley and Kuskie and Clarke (2004) for the central to upper valley, based on ethnographic, ethnohistorical, oral historical and archaeological evidence.

Much of the Modification investigation area is distant from *primary resource zones* or *secondary resource zones* under this model, and is likely to have involved occupation of a generally low intensity. This may have involved behaviour such as transitory movement between locations, hunting and gathering activities by small parties of men and/or women and children, and production and maintenance of stone hatchets/axes, and potentially other activities such as seed-grinding, or processing of other plant food, animal food or ochre, or preparation of medicine. This area may generally have been exploited during the course of the normal daily round by inhabitants of encampments located in the primary or secondary resource zones (eg. along the margins of the higher order watercourses and Hexham Swamp) that foraged within an area of up to ten kilometres radius from their campsites.

The southern-most portion of Area B and the south-eastern fringe of Area C include the margins of the former Hunter River estuary and Blue Gum Creek. These areas may constitute primary or secondary resource zones, where more focused occupation (eg. encampments, or events of longer duration or involving larger numbers of people) occurred. Consequently, larger and higher density artefact evidence is anticipated to occur in these zones, particularly on landform units of lower gradient.

As indicated by the historically documented account of 'the Doghole', ceremonial uses are also known within the locality of the Modification area.

Regional Context:

The results of the investigation are consistent with previous archaeological results from directly within the investigation area (Kuskie 2006) and elsewhere in the locality (refer to Section 2.2.2).

The open artefact sites and open grinding groove sites identified during the present survey lie comfortably within the nature and range of expected evidence (Kuskie 2006, Donaldson Coal 2007, refer also to Section 2.2.4) and are similar to other open artefact and grinding groove sites previously reported directly within the investigation area and nearby. No specific aspects of this evidence are rare or unique within a regional context.

The cultural places (pathway and ceremonial area) had previously been reported (Kuskie 2006) and complement other knowledge from the region (refer to Kuskie 2012).

Reassessment of Predictive Model:

In view of the survey results of the targeted sample of areas of higher potential within the Modification investigation area, the predictive model of site location (refer to Section 2.2.4) can be reassessed.

The survey results conform to the site location predictions, and none of the results provide grounds for any modifications to the predictive model.

The predictive model continues to apply as stated in Section 2.2.4 for all areas outside of those that were sampled within the Modification investigation area. Within those areas that were sampled (ie. the survey areas as marked on Figures 6 - 8) the potential for additional obtrusive site types (such as rock shelters, grinding groove sites and scarred trees) is generally lower than stated in the predictive model, as the survey coverage was sufficient that any such visible evidence would likely have been detected. Nevertheless, additional grinding grooves may be present at some of the identified sites (eg. currently obscured by water and moss) and the potential for less obtrusive evidence (such as stone artefacts) remains as generally stated in the predictive model.

5. SIGNIFICANCE ASSESSMENT

5.1 Criteria

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

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

- I. Scientific (Archaeological) value;
- II. Importance to Aboriginal people (Cultural value);
- III. Educational value;
- IV. Historic value; and
- V. Aesthetic value.

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

Scientific (Archaeological) Value:

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

Research Potential:

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

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

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

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

- a) Potential to address locally specific research questions;
- b) Potential to address regional research questions;

- c) Potential to address general methodological or theoretical questions;
- d) Potential deposits; and
- e) Potential to address future research questions.

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

Representativeness:

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

The main criteria used for assessing representativeness include:

- a) The extent to which the evidence occurs elsewhere in the region;
- b) The extent to which this type of evidence is subject to existing or potential future impacts in the region;
- c) The integrity of the evidence compared to that at other localities in the region;
- d) Whether the evidence represents a prime example of its type within the region; and
- e) Whether the evidence has greater potential for educational or demonstrative purposes than at other similar localities in the region.

Nature of Evidence:

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

- a) Presence, range and frequency of stone materials;
- b) Presence, range and frequency of artefact types; and
- c) Presence and types of other features.

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

Integrity:

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

The criteria used in assessing integrity include:

- a) Horizontal and vertical spatial distribution of artefacts;
- b) Preservation of intact features such as midden deposits, hearths or knapping floors;
- c) Preservation of site contents such as charcoal and shell which may enable accurate direct dating or other analysis; and
- d) Preservation of artefacts which may enable use-wear/residue analysis.

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

Aboriginal (Cultural) Significance:

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

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

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

Educational Value:

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

Historic Value:

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

Aesthetic Value:

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

5.2 Significance of Heritage Evidence Within the Modification Investigation Area

The significance of the Aboriginal heritage sites, cultural areas/values and potential deposits within the Modification investigation area has been assessed in relation to the criteria presented in Section 5.1 (refer to Table 5). The significance assessment involves ratings of 'low', 'low-moderate', 'moderate', 'moderate-high' and 'high'. The assessment has been conducted within both local and regional contexts.

It is noted that all Aboriginal heritage is of interest and contemporary value to the Aboriginal community. Aboriginal heritage evidence represents a tangible link with the traditional past and with the lifestyle and values of community ancestors. The Aboriginal community themselves are in the best position to identify the levels of cultural significance and the stakeholders have been invited throughout the course of the Project to provide input into the cultural significance of the sites and areas. The response of many stakeholders is that all identified sites and cultural values, along with the Project area itself, are of high cultural significance.

Open artefact sites AMA2/A, AMA2/B, AMA2/C, AMC5/A, #38-4-668 and #38-4-341:

Open artefact sites AMA2/A, AMA2/B, AMA2/C, AMC5/A, #38-4-668 and #38-4-341 are assessed as being of low scientific significance within a local context and low scientific significance within a regional context on the basis that:

- ❑ The sites are of low representative value within a regional context. Similar evidence exists elsewhere throughout the region and the identified artefacts do not represent rare or unusual types;
- ❑ The sites exhibit a very limited range of artefact and stone material types;
- ❑ The sites have been affected by various post-depositional impacts and are consequently of relatively low integrity; and
- ❑ There is a low potential for sub-surface deposits that may be of high research value.

Grinding groove sites AMB1/A, AMC2/C and AMC16/A:

Grinding groove sites AMB1/A, AMC2/C and AMC16/A are assessed as being of low scientific significance within a local context and low scientific significance within a regional context on the basis that:

- ❑ The sites are of low representative value within a regional context. Similar evidence exists elsewhere and the identified grooves do not represent rare or unusual types;
- ❑ The sites exhibit a very limited number and range of grooves; and
- ❑ The sites are relatively isolated (in the case of AMB1/A and AMC16/A) and of generally low research potential, other than with respect to analysis of groove functions through residue analysis.

Grinding groove sites AMC2/A, AMC10/A, Abel 1 and Abel 2:

Grinding groove sites AMC2/A, AMC10/A, Abel 1 and Abel 2 are assessed as being of low to moderate scientific significance within a local context and low scientific significance within a regional context on the basis that:

- ❑ The sites are of relatively low representative value within a regional context. Similar evidence exists elsewhere, including within State Conservation Areas (eg. Sugarloaf);
- ❑ The sites exhibit a low to moderate number of grooves and some internal variety in groove types and shapes;
- ❑ The sites are of moderate to high integrity; and
- ❑ The sites are of moderate research potential, with respect to analysis of groove functions through residue analysis and reassessment of occupation models.

Aesthetic values also apply to these sites, given the natural forested mountainous landscape with limited recent human impacts. Educational values also apply, with more complex and larger sites such as AMC2/A and AMC10/A having potential for use as an educational resource.

Rock Shelter with PAD AMC2/B:

The rock shelter with PAD AMC2/B is assessed as being of low scientific significance within a local context and low scientific significance within a regional context on the basis that:

- ❑ The PAD is of low representative value within a regional context. Similar evidence exists elsewhere throughout the region and this particularly example is very small and of very low research potential;
- ❑ The PAD exhibits no complexity (ie. no artefacts or other forms of evidence such as rock art or grinding grooves are present); and
- ❑ As a consequence of the very small size of the habitable floor area and PAD, very low internal roof and entrance height, and topographical context of the shelter distant from higher order water sources, there is a very low potential for a sub-surface deposit that may be of research value.

Possible scarred trees AMC2/D and AMC12/A:

The possible scarred trees AMC2/D and AMC12/A are assessed as being of low scientific significance within a local context and low scientific significance within a regional context on the basis that the origin of both scars is inferred to be non-Aboriginal.

Cultural Places/Values

The Black Hill locality (including the Modification investigation area) is a cultural landscape of high traditional, historical and contemporary cultural significance to the Aboriginal community. These values were made known to South East Archaeology in 1996 during work on an adjacent project (F3 Freeway at Black Hill, Kuskie and Kamminga 2000) and have been reaffirmed on numerous occasions since then during the many projects South East Archaeology has undertaken within the lower Hunter Valley.

The historically known Black Hill Spur Aboriginal pathway is considered to be of high cultural value, as is the historically documented initiation/ceremonial site known as 'the Doghole'. Aesthetic values also apply to these places (or portions thereof), where natural forested mountainous landscapes exist and extensive views of the surrounding region are available. Scientific values may also apply to both places, where the cultural values manifest as physical evidence, for example stone artefact sites along the pathway and ceremonial sites within the ceremonial area.

6. IMPACT ASSESSMENT

The Abel Upgrade Modification involves the continuation of underground mining within ML1618, but with a change from bord and pillar to shortwall and longwall mining (and consequent changes to potential subsidence impacts). The areas potentially affected and subject to heritage assessment, including a buffer zone around the workings based on a 26.5 degree angle of draw, comprise (refer to Figures 2 and 3):

- ❑ Area A - approximately 145.6 hectares associated with a proposed change to shortwall mining of the Upper Donaldson Seam for panels UDSW1 - UDSW7;
- ❑ Area B - approximately 120.4 hectares associated with a proposed change to shortwall mining of the Lower Donaldson Seam for panels LDSW1 - LDSW4; and
- ❑ Area C - approximately 375.8 hectares associated with a proposed change to longwall mining of the Lower Donaldson Seam for panels LDLW1 - LDLW5.

The Modification would also involve other changes (refer to Section 1.1), but these are located within areas that have been subject to existing impacts and are of negligible heritage potential and/or were investigated previously (Kuskie 2006), and are not considered further here.

The primary potential impact of the proposed Modification relates to changes to the predicted level of underground mining induced subsidence.

An assessment of subsidence impacts for the Modification area and identified Aboriginal sites has been prepared by MSEC (2012) (refer to Appendix 7 and Table 4).

MSEC (2012) assessed maximum predicted subsidence, tilt and curvatures for a 20 metre radius at each site and compared the predictions with those provided in the initial Part 3A assessment (refer to Tables 6.18 - 6.21 in Appendix 7). It is noted that the sites identified during the present survey had not been assessed as part of the initial EA.

MSEC (2012) conclude that the maximum predicted values for conventional subsidence and tilts associated with the Modification would be higher than those predicted for the EA (based on bord and pillar mining). However, only two grinding groove sites had previously been recorded within the Modification area and were available for comparison (Abel 1 and 2), and for these, the maximum predicted values were actually less than predicted in the EA for a bord and pillar mining layout (refer to Appendix 7).

In relation to the six open artefact sites within the Modification area, MSEC (2012) conclude that it is unlikely that these sites would be affected by surface cracking associated with subsidence, although note that in general, potential remediation works can give rise to impacts. Temporary cracking during the period of active mining can affect the ground surface in the locality of sites situated directly above the mined area. However, previous experience elsewhere indicates that these tension cracks gradually fill in over a period of years (refer to Kuskie 2006). 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.

In relation to the two possible scarred trees, MSEC (2012) conclude from past longwall mining experience that the incidence of impacts on trees is extremely rare, and usually only associated with very shallow depths of cover or very steeply sloping terrain. As these circumstances are not present in relation to the two possible scarred trees, MSEC (2012) conclude that it is unlikely that these trees would be affected by subsidence. In any event, the origin of both scars is inferred to be non-Aboriginal.

In relation to the rock shelter with PAD (AMC2/B) of low significance, MSEC (2012) conclude that the likelihood of significant physical impacts is very low (less than 5%), but note that numerous variables relate to the potential for impacts to occur (such as individual shelter geometry, jointing, inclusions, weaknesses within the rock mass, groundwater pressure and seepage flow behind the rock face) which are difficult to quantify and predict. Maximum conventional subsidence of 0.4 metres and tilt of 8 millimetres/metre (mm/m) is predicted for the vicinity of the shelter. However, given the freestanding nature of the large boulder in which it is located, the potential for impacts is very low.

Grinding groove sites are by their nature located on rock outcrops. Such outcrops tend to be sensitive to subsidence induced surface cracking. Grinding groove sites Abel 1, Abel 2, AMC2/C and AMC10/A are located outside of the proposed longwall panels in Area C (refer to Figure in Appendix 7). MSEC (2012) conclude that as maximum strains are similar to those predicted in the EA, the potential for impacts to these sites is also similar to that assessed in the EA. MSEC (2012) make the following conclusions for these sites:

- ❑ Abel 1 - potential for impacts (cracking) unlikely (5% or less) with uniform tensile strains of <0.3 mm/m;
- ❑ Abel 2 - potential for impacts (cracking) possible (10-50%) with strain of 0.5 mm/m (maximum crack width of 5 mm predicted);
- ❑ AMC2/C - potential for impacts (cracking) unlikely (less than 5%), with maximum strains very small and less than the order of survey tolerance (<0.3 mm/m);
- ❑ AMC10/A - potential for impacts (cracking) unlikely (less than 5%), with maximum strains very small and less than the order of survey tolerance (<0.3 mm/m).

Grinding groove sites AMB1/A, AMC2/A and AMC16/A are located directly above the proposed longwall or shortwall mining. MSEC (2012) conclude that fracturing (cracking) of the bedrock could occur at these sites:

- ❑ AMB1/A - potential for impacts (cracking) possible (10-50%) with conventional tensile strains of 3 mm/m and compressive strains of 0.5 mm/m predicted;
- ❑ AMC2/A - potential for impacts (cracking) possible (10-50%) with conventional tensile strains of 1 mm/m and compressive strains of 2 mm/m predicted;
- ❑ AMC16/A - potential for impacts (cracking) possible (10-50%) with conventional tensile strains of 1.5 mm/m and compressive strains of 4.5 mm/m predicted.

Fracturing of bedrock has been observed where tensile strains are greater than 0.5 mm/m or compressive strains greater than 2 mm/m (MSEC 2012). Fracturing of bedrock may not necessarily directly affect individual grooves, but would affect the context of a site should it occur.

The Black Hill pathway occupies a relatively small proportion of the longwall mining area, mainly in Areas B and C. Similarly, the 'Doghole' ceremonial area occupies a relatively small proportion of the longwall mining area, fringing the eastern margin of 'Area C'. The Black Hill locality (including the Modification investigation area) is a landscape of cultural significance to the Aboriginal community.

In these areas, MSEC (2012) conclude that potential impacts could include surface cracking and deformations and changes in surface water drainage, with the full range of predicted subsidence movements for the Modification area (as discussed by MSEC 2012: Section 4). The conclusions of MSEC (2012) in relation to the overall Modification are that maximum total subsidence resulting from thin seam pillar extraction panels in the Upper Donaldson Seam and proposed longwalls in the Lower Donaldson Seam is 3.1 metres, with up to 1.7 metres in the areas of the proposed shortwalls. Donaldson Coal will continue to maintain existing commitments to avoid subsidence impacts to third order streams, rainforest communities and the Pambalong Swamp and associated alluvium. As such, while some subsidence impacts are expected to occur as documented by MSEC (2012), which may have some adverse effect on the overall level of cultural value of these cultural areas, this decrease in value is inferred to be relatively low.

Although the primary potential impact of the proposed Modification relates to changes to the predicted level of underground mining induced subsidence, small areas may be directly impacted by surface works, for example in association with ventilation shafts. The location of these impact areas is pending detailed design. However, considering some level of flexibility inherent with the design and location of these facilities, avoidance of impacts to obtrusive site types such as grinding grooves, rock shelters and scarred trees should be feasible.

The change to longwall and shortwall mining is likely to result in an increase in impacts to Aboriginal heritage than would occur with bord and pillar mining, notably to open grinding groove sites. Notwithstanding that the impacts to sites Abel 1 and Abel 2 are actually predicted to be lower with longwall and shortwall mining than bord and pillar mining, previous commitments were made to avoid subsidence impacts through bord and pillar mining to open grinding groove and rock shelter sites (refer to Section 4.5 of the AHMP; Donaldson Coal 2007).

The nature of the longwall and shortwall mining method greatly reduces the flexibility to avoid or minimise impacts to known Aboriginal sites within the panels or sites that may be identified in the future during further detailed surveys that will occur prior to undermining (refer to Section 4.6 of the AHMP). Unless significant and potentially economically unfeasible changes are made to the design of the longwall and shortwall panels, four currently identified open grinding groove sites may be subject to impacts (Abel 2 of low to moderate local significance, and AMB1/A, AMC2/A and AMC16/A of low local significance).

Approximately 76% of the longwall and shortwall Modification area has not been subject to systematic archaeological survey, and as stated in the predictive model, there is potential for further evidence to be present that may be subject to subsidence impacts⁸. However, as the areas of highest potential have been sampled during the present investigation, the quantity, extent and distribution of evidence is not expected to exceed that identified during the present survey or involve significant differences to that currently known⁹. Nevertheless, additional grinding groove sites have a high probability of existing within the Modification area and could be identified during future surveys, and these may also be subject to impacts.

The overall impacts of the proposed Modification on Aboriginal heritage will be relatively low within a local context and very low within a regional context. Only two known grinding groove sites of low to moderate significance will be subject to impacts (Abel 2 and AMC2/A) with two sites of low significance potentially subject to impacts (AMB1/A and AMC16/A). Impacts are unlikely to occur to two other open grinding groove sites of low to moderate significance (Abel 1 and AMC10/A) and one site of low significance (AMC2/C) (refer to Table 5).

The proposed Modification is not inconsistent with the principle of intergenerational equity and will not cause, within a regional context, a loss of heritage resources that could be viewed as being very rare or unique or unlikely to exist elsewhere.

Following from the conclusion that the impacts of the Modification will be very low within a regional context, it logically follows that the cumulative impact of the Modification within a regional context (in combination with other mining projects in the region such as the Tasman Mine) will be very low.

⁸ Notwithstanding that the 24% of the Modification area that was subject to systematic sampling during the present survey represents the clifflines and other major rock formations and drainages of highest heritage potential.

⁹ For example, while a low number of additional grinding groove sites may occur, large sites such as those in the Tasman Extension Grinding Groove Area (Kuskie 2012) or high numbers of sites, are not expected, as it is inferred that such types/patterns would have been identified within the 24% of the area (of highest potential) already subject to survey. Similarly, large significant rock shelters are not expected, as the major rock formations have now been surveyed and these were typically straight-walled, with only one very small shelter with PAD identified.

7. POTENTIAL MITIGATION AND MANAGEMENT STRATEGIES

General strategies that are typically available for the management of identified and potential Aboriginal heritage resources include further investigation (for example, sub-surface test excavation), unmitigated impact, mitigated impact, conservation and/or monitoring. A key consideration in selecting suitable strategies is the recognition that Aboriginal heritage is of primary importance to the Aboriginal community, and that decisions about the management of sites should be made in consultation with the relevant Aboriginal stakeholders. Specific options for the proposed Modification are discussed below and the recommended strategies are presented in Section 8 and summarised in Table 5.

The potential impacts of the proposed Modification primarily relate to mining induced subsidence (not direct surface impacts), and to open grinding groove sites, and will be relatively low within a local context. Three key strategies can be implemented to mitigate the effects of subsidence, comprising avoidance of impacts, further investigation/salvage, and monitoring.

Only two known grinding groove sites of low to moderate significance will be subject to impacts (Abel 2 and AMC2/A), along with two sites of low significance (AMB1/A and AMC16/A; refer to Table 5). Considering the salient factors listed below, it is concluded that specific conservation or mitigation measures (such as redesign of the longwall panels to avoid impacts, salvage/removal of the grooves, or slotting of bedrock around the sites to minimise the risk of cracking) are not warranted:

- ❑ Relatively low significance of these sites;
- ❑ Relatively low numbers of open grinding groove sites potentially subject to impacts;
- ❑ Potential that impacts may not occur, or that only minor cracking of the rock surface, not necessarily directly along the grooves, may occur;
- ❑ Limited potential for impacts to occur to two other open grinding groove sites of low to moderate significance (Abel 1 and AMC10/A) and one site of low significance (AMC2/C);
- ❑ Location of the sites within the longwall panels; and
- ❑ Engineering and economic constraints associated with modifications to the panel design.

Nevertheless, to assist in offsetting any potential impacts to the open grinding groove sites, and to assist in addressing relevant questions relating to the use of the grooves and the occupation model for the Project area, detailed analysis of a sample of individual grinding grooves at each site potentially subject to impacts, using residue and use-wear techniques and experimental data, is warranted. This would be appropriate for the sites with a more than unlikely potential for subsidence impacts (ie. of the currently identified sites, Abel 2, AMB1/A, AMC2/A and AMC16/A).

Consistent with an existing Project commitment, as outlined in Section 4.6 of the approved AHMP, staged systematic archaeological survey by suitably qualified and experienced archaeologists and the Aboriginal stakeholders of all areas proposed to be undermined, remains warranted for those areas that have not been subject to systematic survey to current standards. Additional archaeological survey of the areas subject to sampling within the Modification area during the current assessment (refer to Figures 6 - 8) is not required.

Any sites identified during future surveys can be managed in accordance with procedures specified in the AHMP (refer to Sections 4.5 and 4.7). However, the existing procedures only relate to bord and pillar mining, and include a commitment to avoid impacts to all known grinding groove and rock shelter sites and any future grinding groove or rock shelter sites that may be identified. Such a commitment is inconsistent with the conclusions of this assessment for the proposed Modification and unfeasible in the context of the proposed change of mining method. Consequently, Section 4.5 of the AHMP requires revision to specify that existing commitments will be maintained in relation to bord and pillar mining areas, and outline new procedures for longwall and shortwall mining areas. The new procedures for longwall and shortwall mining areas would appropriately comprise (refer to Appendix 8 for a revised version of the AHMP highlighting all proposed changes):

In relation to open grinding groove sites:

- For open grinding groove sites assessed as being of low significance, following detailed recording of the evidence, impacts will be permitted to occur without further action;
- For open grinding groove sites assessed as being of low to moderate or higher significance, following detailed recording of the evidence, a qualified subsidence expert will provide an assessment of potential subsidence impacts:
 - Where the potential for subsidence impacts is assessed as unlikely or very unlikely, impacts will be permitted to occur without further action;
 - Where the potential for subsidence impacts is assessed as anything more than unlikely, impacts will be permitted to occur with detailed analysis of a sample of individual grinding grooves at each site using residue and use-wear techniques and experimental data, along with monitoring.
- For open grinding groove sites assessed as being of high significance and where the potential for subsidence impacts is assessed as anything more than unlikely, in addition to the above, mitigation options such as slotting of the bedrock around the site to isolate it from ground curvatures and strains will be investigated by a qualified subsidence expert and implemented where feasible (ie. the potential benefit of mitigating impacts outweighs the potential risk that the mitigation procedure will itself cause impacts to the site).

In relation to rock shelter sites:

- For rock shelter sites/PADs assessed as being of low significance, following detailed recording of the evidence, impacts will be permitted to occur without further action;
- For rock shelter sites/PADs assessed as being of low to moderate, moderate or high significance, following detailed recording of the evidence, a qualified subsidence expert will provide an assessment of potential subsidence impacts:
 - Where the potential for subsidence impacts is assessed as unlikely or very unlikely, impacts will be permitted to occur without further action;
 - Where the potential for subsidence impacts is assessed as anything more than unlikely, and the significance is assessed as low to moderate, or moderate, impacts will be permitted to occur with monitoring;
 - Where the potential for subsidence impacts is assessed as anything more than unlikely, and the significance is assessed as moderate to high, or high, the site will be subject to test excavation and consideration of further mitigation (salvage excavation). Subsequently, impacts will be permitted to occur with monitoring;

- Where the potential for subsidence impacts is assessed as anything more than unlikely, and grinding grooves are present within the shelter on portable rock formations, these will be removed prior to undermining for temporary storage at the Donaldson Coal office, then replaced at or as close to their original positions after undermining has occurred;
- Where the potential for subsidence impacts is assessed as anything more than unlikely, and grinding grooves are present within the shelter on the main body of the rock mass, impacts will be permitted to occur with detailed analysis of the grooves using residue and use-wear techniques and experimental data, along with monitoring.

In relation to rock shelter sites, procedures for the assessment of significance and the conduct of any test or salvage excavations would be required, such as:

- ❑ The significance assessment and any excavation would be undertaken by appropriately qualified and experienced archaeologists, in consultation with the registered Aboriginal stakeholders (refer to Section 4.2 of the AHMP);
- ❑ The significance assessment and any excavation would be undertaken prior to any subsidence impacts occurring to any of those specific areas or sites;
- ❑ An initial small test excavation would occur, with the aim to identify the nature of deposits, site integrity and research potential, and enable a reassessment of significance;
- ❑ A baseline would be established in the shelter and an accurate plan prepared;
- ❑ A 2 metre x 0.5 metre trench would be pegged out in the central portion of the main habitable floor area of the shelter, extending from near or at the rear of the shelter towards or across the dripline;
- ❑ The excavation would be dug by trowel in 0.5 x 0.5 metre units to the depth of the visible or predicted cultural deposits or to bedrock. Each unit would be labelled using an alphanumeric grid. Major rock would be excavated around and not removed;
- ❑ Excavation units would be dug in successive levels ('spits') of five centimetres depth, within individual soil units. Where pits or lenses are identified, these may also be excavated and sieved separately as a sub-unit. Where stratigraphy/soil profile changes occur, a new spit may be commenced;
- ❑ Vertical control (depth below surface) would be established using levels off a datum point;
- ❑ Data would be recorded for each excavation unit on an 'Excavation Unit Recording Form', including the position of any features or key evidence and soil descriptions;
- ❑ Soil from each level within an excavation unit would be placed into separate buckets and separately dry-sieved through 2-3 millimetre mesh. Material (both natural and cultural) remaining in the sieve would be sorted by a qualified archaeologist to retain all probable and potential cultural items and dispose of the natural items;
- ❑ Samples of soil would be retained;
- ❑ Charcoal samples would be retained where identified and where suitable for radiocarbon or other methods of direct dating, submitted to an accredited laboratory for dating;
- ❑ At the completion of excavation the trench would be lined with plastic and backfilled with the excavated/sieved sediment;

- ❑ The excavation and site would be photographed;
- ❑ Retrieved artefacts would be washed and dried if necessary and recorded by a qualified archaeologist. A minimal level of information would be recorded for every artefact collected (provenance, stone material type, lithic item type, size, weight, nature and quantity of cortex, and presence and nature of any use-wear or residues) with additional attributes recorded where necessary. Individual artefacts of significance may be photographed and/or illustrated;
- ❑ Any shell and bone material retrieved would be recorded, with identification to genus or species level where possible and counts of minimum numbers undertaken. Similar shell and bone items would be bagged together for each unit spit;
- ❑ Following recording of artefacts into a computer database, individual objects would be bagged separately in resealable, labelled plastic bags, with provenance information recorded on waterproof ink on the plastic bag label strips. Artefact bags would be grouped together for each excavation area and further provenance information included on metal tags;
- ❑ After recording and undermining has occurred, retrieved artefacts would be reburied in a container within the excavated/backfilled trench, unless a Care Agreement from the OEH is obtained by the relevant LALC;
- ❑ A report would be prepared by a qualified archaeologist with reference to the *Aboriginal Heritage Standards and Guidelines Kit* (1997) and the requirements of the AHMP, documenting the methods, results (including a plan of the site and excavation area, artefact databases and analysis with respect to relevant research questions) and Aboriginal involvement. The report would include a revised assessment of the significance of the site. Hard copies would be distributed to the DP&I, OEH and the relevant LALC within 25 working days of completion;
- ❑ Updated site records would be lodged with the OEH;
- ❑ On the basis of the initial test excavation, the qualified archaeologist in consultation with the relevant LALC, would determine whether more detailed salvage excavation is required. This decision would be made in consideration of the:
 - Revised significance assessment of the site;
 - Probability for serious and substantial and irreversible impacts to occur to the heritage resource from mining-induced subsidence and the consequent permanent loss of heritage value;
 - Potential for impacts to occur to the heritage resource from salvage excavation, should excavation occur but subsequent impacts from subsidence do not eventuate;
 - Potential for information obtained through salvage to contribute to address locally relevant research questions, refine the occupation model and further understanding of Aboriginal occupation of the locality, thereby offsetting impacts of the Project and assisting the ongoing management of heritage with respect to development impacts; and
 - Principles of ecologically sustainable development (integration of economic and cultural heritage considerations in the decision-making process), including the principle of intergenerational equity and the precautionary principle;

- ❑ Any salvage excavation, analysis, reporting and curation would occur in accordance with the methods outlined above for test excavation, but involve a larger sample from the rock shelter;
- ❑ The aim of any salvage excavation would be to mitigate the impacts of the Project on scientific and cultural values, through the retrieval and analysis of evidence and contribution to an improved understanding of Aboriginal occupation of the locality; and
- ❑ The excavation area and location would be determined by an appropriately qualified and experienced archaeologist, in consultation with the relevant LALC, with consideration of the potential subsidence impacts, extent of the habitable floor area and PAD, nature of the evidence, and the spatial area and quantity of data required to address relevant research questions and thereby successfully mitigate the impacts of the Project.

Although the primary potential impact of the proposed Modification relates to changes to the predicted level of underground mining induced subsidence, small areas may be directly impacted by surface works, for example in association with ventilation shafts. The locations of these impact areas is pending detailed design. Once the locations of these impact areas are known, archaeological survey remains warranted for those areas that have not been subject to systematic survey to current standards, consistent with Section 4.6 of the AHMP (but with the following amendment to provide clarification; refer to Appendix 8):

- ❑ Where direct surface impacts are proposed in the Underground Mine Area south of John Renshaw Drive in any areas outside of those previously subject to detailed heritage survey, a new heritage survey will be undertaken of those areas by a qualified archaeologist with the relevant LALC. Any identified Aboriginal heritage evidence or potential evidence will be managed in accordance with the specific procedures set out in Sections 4.4 and 4.5.

Considering that some level of flexibility is inherent with the design and location of these facilities, avoidance of impacts to obtrusive site types such as grinding grooves, rock shelters and scarred trees is feasible and warranted. Management of open artefact sites in accordance with existing approved procedures for heritage evidence within the surface impact area (refer to Section 4.4 of the AHMP) is warranted. This would necessitate minor changes to Sections 4.5.1 and 4.5.2 of the AHMP as follows (refer to Appendix 8):

- ❑ Minor direct surface impacts may occur within the Underground Mining Area in relation to ventilation shafts and other infrastructure. Where such impacts are proposed, archaeological investigation will occur as outlined in Section 4.6, and any Aboriginal sites identified will be managed in accordance with the procedures outlined for each site type in Section 4.4.

Consistent with an existing Project commitment, as outlined in Section 4.9 of the approved AHMP, monitoring of the grinding groove sites and rock shelter with PAD remains warranted. This will assist in identifying if any subsidence related impacts have occurred, can assist with refining the modelling involved in assessing potential subsidence impacts and thereby guide future assessments within the locality, and enable documentation of the actual impacts of the Project and provide an understanding of the intact heritage resource post-mining. Table 4 of the AHMP will require regular updates, including with the results of the current survey.

Revision of the AHMP (refer to Appendix 8) presents an opportunity to update certain terminology and other minor changes, such as:

- ❑ Replacement of previous references to DECCW with the OEH, and Department of Planning with the DP&I, along with other similar minor amendments;
- ❑ Replacement of Table 1 with an updated version (presented here as Table 1);
- ❑ Replacement of Figure 1 with an updated version (presented here as Figure 5); and
- ❑ Addition of the DP&I to the procedures in Section 4.8 relating to skeletal remains, Section 4.10 in relation to review of the plan, and elsewhere in relation to the provision of reports.

Revision of the AHMP also presents an opportunity to add provisions to address any potential future alterations that may be proposed to the mine plan. Provisions could include:

- ❑ Where future alterations are proposed to the underground mine plan, the potential impacts of any changes on the identified and potential Aboriginal heritage resource will be assessed;
- ❑ Where the alterations to the underground mine plan are proposed in areas already subject to heritage survey sampling (consistent with current standards), this will involve an assessment of potential subsidence impacts by a qualified subsidence expert and reconsideration of the management strategies for relevant identified sites by an appropriately qualified and experienced archaeologist, in consultation with the relevant LALC;
- ❑ Where the alterations to the underground mine plan are proposed in areas that have not been subject to heritage survey sampling consistent with current standards, the procedures outlined in Section 4.6 of the plan will be implemented, followed by the assessment of potential subsidence impacts by a qualified subsidence expert and consideration of management strategies for relevant identified sites by an appropriately qualified and experienced archaeologist, in consultation with the relevant LALC.

8. RECOMMENDATIONS

This Aboriginal heritage assessment has been commissioned in relation to the proposed Section 75W 'Abel Upgrade Modification' to the existing Part 3A Approval (05_0136) for the Abel Underground Mine. The key element of the proposed Modification subject to assessment relates to the change from bord and pillar to shortwall and longwall mining (and consequent changes to potential subsidence impacts) within three areas ('A - C', refer to Figures 2 and 3).

An archaeological survey involving a targeted sample of the highest risk formations (such as clifflines and major drainages) has been undertaken, with sampling of a total of 24% of the Modification investigation area. A total of 15 Aboriginal heritage sites (seven open grinding groove sites, six open artefact sites and two possible scarred trees) and one rock shelter with PAD have been recorded within the investigation area, along with several cultural values/places (Black Hill pathway and 'the Doghole' ceremonial area). The Black Hill locality is also a cultural landscape of significance to the Aboriginal community.

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

Consistent with the Part 3A Project Approval, Statement of Commitments, *Abel Underground Mine: Aboriginal Heritage Management Plan* (Donaldson Coal 2007) and Part 3A Project assessment (Kuskie 2006), and with consideration of legal requirements under the NSW *National Parks and Wildlife Act 1974* and *Environmental Planning and Assessment Act 1979*, the results of the investigation of the Modification and consultation with the local Aboriginal community, the following management measures are proposed:

- ❑ Provisions relating to Aboriginal heritage in the approved AHMP for the Project that are relevant to the Modification will continue to be implemented. In particular, these include but are not limited to¹⁰:
 - Aboriginal community involvement, as outlined in Section 4.2 of the AHMP;
 - Management of the Aboriginal Site Database, as outlined in Section 4.3 of the AHMP;
 - Staged systematic archaeological survey of all areas proposed to be undermined, with the Aboriginal stakeholders, as outlined in Section 4.6 of the AHMP¹¹;
 - Management of any previously unrecorded Aboriginal heritage evidence, if identified during the course of operations or further investigations, as outlined in Section 4.7 of the AHMP;
 - Management of any skeletal remains, if identified during the course of operations or further investigations, as outlined in Section 4.8 of the AHMP;
 - Monitoring of Aboriginal sites as outlined in Section 4.9 of the AHMP;
 - Periodic review of the AHMP, as outlined in Section 4.10 of the AHMP;

¹⁰ Refer to *Abel Underground Mine: Aboriginal Heritage Management Plan* (Donaldson Coal 2007), for all management policies and actions relevant to Aboriginal heritage that may require implementation for the Modification area.

¹¹ Further survey of the areas sampled for the Modification (ie. the survey areas marked on Figures 6 - 8) is not required.

- The AHMP will be revised to include new provisions relevant to the Modification and revision of several existing relevant provisions (refer to Appendix 8 for a revised version of the AHMP highlighting all proposed changes):
 - Section 4.5 will be revised to specify that the existing provisions are relevant to the bord and pillar mining area only (exclusive of the longwall and shortwall mining areas);
 - Section 4.5 will be revised to include new provisions relating only to the longwall and shortwall mining areas, as outlined here in Section 7 with respect to open grinding groove and rock shelter sites;
 - Section 4.5 will be revised to include detailed analysis of a sample of individual grinding grooves at each site within the longwall and shortwall mining areas that has a more than unlikely potential for subsidence impacts (ie. of the currently identified sites, Abel 2, AMB1/A, AMC2/A and AMC16/A), using residue and use-wear techniques and experimental data, in order to assist in addressing questions relating to the use of the grooves and the occupation model for the investigation area and offset the potential impacts of the Modification;
 - Sections 4.5 and 4.6 will be revised to clarify that any direct surface impacts proposed in the Underground Mine Area south of John Renshaw Drive will be assessed and any identified Aboriginal heritage evidence managed in accordance with the procedures set out in Sections 4.4 and 4.5 (as outlined here in Section 7);
 - Section 4.6 will be revised to add procedures to address any potential future alterations that may be proposed to the underground mine plan (as outlined here in Section 7);
- The AHMP will be revised to address minor changes (refer to Appendix 8) such as:
 - Replacement of previous references to DECCW with the OEH, and Department of Planning with the DP&I, along with other similar minor amendments;
 - Replacement of Table 1 with an updated version (presented here as Table 1);
 - Replacement of Figure 1 with an updated version (presented here as Figure 5); and
 - Addition of the DP&I to the procedures in Section 4.8 relating to skeletal remains, Section 4.10 in relation to review of the plan and elsewhere in relation to the provision of reports;
- Under the terms of the NP&W Act it is an offence to harm or desecrate an object that the person knows is an Aboriginal object, or to harm an Aboriginal object ('strict liability offence'). Therefore, no activities or work should be undertaken within the Aboriginal site areas as described in this report and marked on Figure 5 unless in accordance with the Project Approval and approved AHMP¹², or *in lieu*, a valid Section 90 AHIP;
- Copies of this report should be forwarded to each registered Aboriginal stakeholder and the DP&I and the OEH (North East Planning and Aboriginal Heritage Section) within 25 working days of completion¹³.

¹² Along with the approved Modification and revised AHMP where applicable.

¹³ Any revisions to the AHMP should not be implemented until approved by the DP&I.

Table 5: Summary of the significance of each Aboriginal site within the Abel Upgrade Modification area, the potential impacts of the Modification and appropriate management strategies.

Site OEH#	Site Name	Location	Site Type	Significance Assessment	Potential Subsidence Impacts	Consequence of Potential Impacts	Appropriate Management Strategy
38-4-341	Black Hill Quarry 1	Area B	open artefact site	low (local, regional)	unlikely	probably no loss of value	no action required
38-4-668	FMC6 Donaldson Mine	Area A	open artefact site	low (local, regional)	unlikely	probably no loss of value	no action required
38-4-985	Abel 1	Area C	open grinding groove site	low to moderate (local), low regional	unlikely (5% or less)	probably no loss of value	monitoring
38-4-986	Abel 2	Area C	open grinding groove site	low to moderate (local), low regional	possible	possibly partial or no loss of value	residue/use-wear analysis, monitoring
pending	AMA2/A	Area A	open artefact site	low (local, regional)	unlikely	probably no loss of value	no action required
pending	AMA2/B	Area A	open artefact site	low (local, regional)	unlikely	probably no loss of value	no action required
pending	AMA2/C	Area A	open artefact site	low (local, regional)	unlikely	probably no loss of value	no action required
pending	AMB1/A	Area B	open grinding groove site	low (local, regional)	possible	possibly partial or no loss of value	residue/use-wear analysis, monitoring
pending	AMC2/A	Area C	open grinding groove site	low to moderate (local), low regional	possible	possibly partial or no loss of value	residue/use-wear analysis, monitoring
pending	AMC2/B	Area C	rock shelter with PAD	low (local, regional)	unlikely (5% or less)	probably no loss of value	monitoring
pending	AMC2/C	Area C	open grinding groove site	low (local, regional)	unlikely (5% or less)	probably no loss of value	monitoring
pending	AMC2/D	Area C	scarred tree (possible)	low (local, regional)	unlikely	probably no loss of value	no action required
pending	AMC5/A	Area C	open artefact site	low (local, regional)	unlikely	probably no loss of value	no action required
pending	AMC10/A	Area C	open grinding groove site	low to moderate (local), low regional	unlikely (5% or less)	probably no loss of value	monitoring
pending	AMC12/A	Area C	scarred tree (possible)	low (local, regional)	unlikely	probably no loss of value	no action required
pending	AMC16/A	Area C	open grinding groove site	low (local, regional)	possible	possibly partial or no loss of value	residue/use-wear analysis, monitoring
n/a	Black Hill locality	Areas A, B and C	cultural values	high (local)	probable	possibly partial or no loss of value	no action required
n/a	Black Hill Pathway	Areas A, B and C	cultural place/value	high (local)	probable	possibly partial or no loss of value	no action required
n/a	'Doghole' ceremonial site	Area C	cultural place/value	high (local)	probable	possibly partial or no loss of value	no action required

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

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