APPENDIX 14

Aboriginal Cultural Heritage Assessment Report




Inspecting an exposure in Area B of the Proposed Disturbance Area.

ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT

MOUNT OWEN CONTINUED OPERATIONS MODIFICATION 2

SINGLETON LGA

MAY 2018

Report Prepared by

OzArk Environmental & Heritage Management Pty Ltd

for Umwelt (Australia) Pty Ltd on behalf of

Mt Owen Pty Limited

Environmental and Heritage Management P/L

OzArk EHM
145 Wingewarra St
(PO Box 2069)
Dubbo NSW 2830

Phone: (02) 6882 0118
Fax: (02) 6882 0630
enquiry@ozarkehm.com.au
www.ozarkehm.com.au

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ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT COVER SHEET

Report Title	Aboriginal Cultural Heritage Assessment Report: Mount Owen Continued Operations Modification 2.
Author(s) Name	Ben Churcher
Author(s)' Organisation Name (if applicable)	OzArk Environmental & Heritage Management Pty Limited
Author(s) contact details	Email: ben@ozarkehm.com.au Phone:02 6882 0118 Fax: 02 6882 0630
Address of Subject Area	300 Falbrook Road Falbrook NSW 2330 Title Reference: Lot 1221 DP709371; Lot 924, Lot 925, Lot 926 DP 862883; Lot 100 DP752462, Lot 121 DP752462, Lot 923 DP 844642, Lot 3 DP1206886, Lot 4 DP1180252. Local Government Area: Singleton Other:
Report prepared for	Company Name: Mt Owen Pty Limited Contact Person: Catherine Fenton Address: Hebden Road, Hebden Email: catherine.fenton@glencore.com.au Phone: 02 6520 2686 Fax:
Date of Report	May 2018
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Prepared For		Prepared By	
Penelope Williams Environmental Scientist Umwelt (Australia) Pty Limited 75 York Street Teralba, NSW 2284		Ben Churcher Principal Archaeologist OzArk Environmental & Heritage Management Pty. Limited 145 Wingewarra Street (PO Box 2069) Dubbo NSW 2830 P: 02 6882 0118 F: 02 6882 6030 ben@ozarkehm.com.au	

Acknowledgement

OzArk acknowledge Traditional Owners of the area on which this assessment took place and pay respect to their beliefs, cultural heritage and continuing connection with the land. We also acknowledge and pay respect to the post-contact experiences of Aboriginal people with attachment to the area and to the elders, past and present, as the next generation of role models and vessels for memories, traditions, culture and hopes of local Aboriginal people.

EXECUTIVE SUMMARY

The Mount Owen Complex (MOC) is located within the Hunter Coalfields in the upper Hunter Valley of New South Wales, approximately 20 kilometres northwest of Singleton. OzArk Environmental & Heritage Management (OzArk) has been engaged by Umwelt (Australia) Pty Limited (Umwelt), on behalf of Mt Owen Pty Limited (Mount Owen) to complete an Aboriginal Cultural Heritage Assessment Report for the Mount Owen Continued Operations Modification 2 (the Proposed Modification).

The Aboriginal cultural heritage assessment for the Proposed Modification follows extensive Aboriginal community consultation for the Mount Owen Continued Operations Project (Continued Operations Project) assessment (Umwelt 2015). Australian Cultural Heritage Management Pty Limited were engaged by Mount Owen to undertake Aboriginal community consultation for the Continued Operations Project assessment and to author the *Aboriginal Cultural Heritage Assessment* (ACHA). As the Proposed Modification is immediately adjacent to areas assessed for the Continued Operations Project assessment, the cultural, aesthetic and historic values examined in the Continued Operations Project ACHA have also been used for the assessment for the Proposed Modification.

The fieldwork component of this assessment was undertaken by an OzArk archaeologist and representatives of Registered Aboriginal Parties and Wonnarua Knowledge Holder Groups on Thursday 31 August 2017.

No Aboriginal sites were recorded during the assessment. Further, no landform within the Proposed Disturbance Area was seen as having potential to contain further, subsurface archaeological deposits due to the moderate level of disturbance across the Proposed Disturbance Area and the generally thin soils.

MOCO IF-3 (37−3−1198) is the only valid previously-recorded site within the Proposed Disturbance Area. This site was revisited during the site inspection, however, despite good areas of exposure, the artefact was unable to be located. One previously recorded site 37-3-0687 (MC-7) is located outside but close to the Proposed Disturbance Area. This site may be harmed by future erosion stabilisation works along Main Creek and management recommendations regarding this site are made here.

Based on the results of the assessment, recommendations concerning the Proposed Disturbance Area are as follows:

1. As disturbance to MOCO IF-3 is unavoidable by the Proposed Modification, the surface artefact should be collected for safe-keeping. The collection process should be undertaken under an approved MOC *Aboriginal Cultural Heritage Management Plan* (ACHMP) and follow the requirements of the ‘Group 2’ salvage process listed in **Section**

6.2 and as described by OzArk (OzArk 2016: 51–52) and within Section 7.2.2 of the MOC ACHMP.

2. As 37-3-0687 (MC-7) is located in close proximity to the Proposed Disturbance Area and may be impacted in the future by erosion stabilisation works including revegetation and/or drainage works. It is recommended here that the site remain *in situ* until impacts are planned, at which time, the site should be salvaged as a Group 2 site as set out in **Section 6.2.1** and as described by OzArk (OzArk 2016: 51–52) and within Section 7.2.2 of the MOC ACHMP.
3. Outside of MOCO IF-3 there are no archaeological constraints to the Proposed Modification, however, the following precautions should be made:
    a. Should any items be discovered during the Proposed Modification works that are suspected to be of Aboriginal origin, then work in the area should cease and the advice from a suitably qualified archaeologist sought to assess the nature of the find and to suggest an appropriate path forward. Protocols contained in the MOC ACHMP should be followed; and
    b. All staff and contractors involved in the Proposed Modification work should undergo cultural heritage inductions to ensure they are aware of the legislative protection of all Aboriginal sites and objects.

CONTENTS

FIGURES

TABLES

1 INTRODUCTION

1.1 TERMS AND ABBREVIATIONS

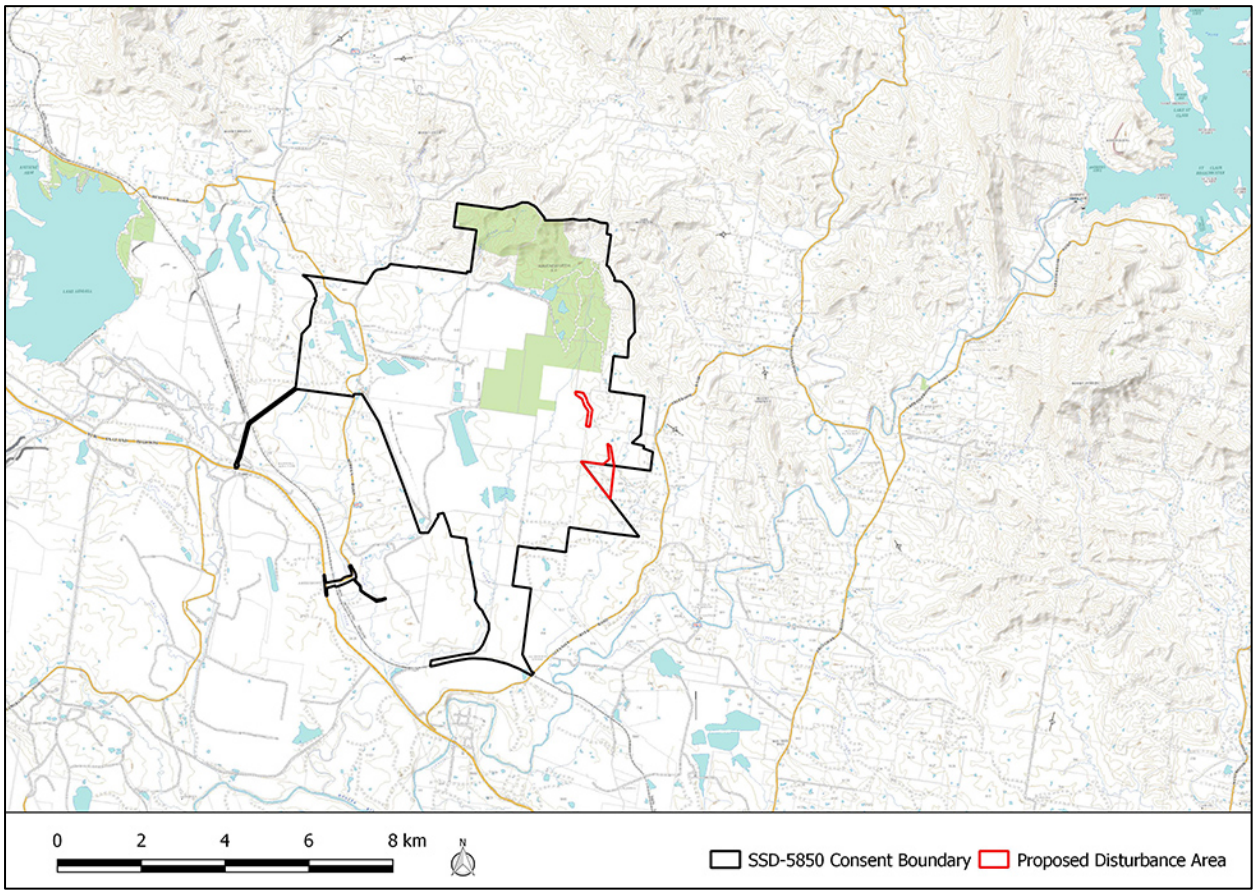
Table 1-1: Terms and abbreviations used in this report.

ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHM	Australian Cultural Heritage Management Pty Limited
ACHMP	Aboriginal Cultural Heritage Management Plan
AHIMS	Aboriginal Heritage Information Management System. Administered by OEH.
AHIP	Aboriginal Heritage Impact Permit.
Approved Operations	Mount Owen Continued Operations Project development consent (SSD-5850)
Code of Practice	*Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales.* Under Part 6 of the NPW Act.
EIS	Environmental Impact Statement
LGA	Local Government Area
NPW Act	*National Parks and Wildlife Act 1974*
OEH	The NSW Office of the Environment and Heritage. Formerly DECCW (Department of the Environment, Climate Change and Water), DECC (Department of the Environment and Climate Change) and DEC (Department of the Environment and Conservation)
OzArk	OzArk Cultural & Heritage Management Pty Limited
Proposed Modification	Mount Owen Continued Operations Modification 2
RAP	Registered Aboriginal Party
The Applicant	Mt Owen Pty Limited (Mount Owen) is the applicant of the Proposed Modification
Mount Owen	Mt Owen Pty Limited
MOC	Mount Owen Complex. Current mining operations at the Mount Owen Complex include Mount Owen Mine (North Pit) and associated infrastructure, Ravensworth East Mine (Bayswater North Pit) and Glendell Mine (Barrett Pit)
SSD	State Significant Development
ROM	Run-of-mine
Umwelt	Umwelt (Australia) Pty Limited

1.2 BRIEF DESCRIPTION OF THE PROPOSED MODIFICATION

The Mount Owen Complex (MOC) is located within the Hunter Coalfields in the upper Hunter Valley of New South Wales (NSW), approximately 20 kilometres (km) northwest of Singleton, 24 km southeast of Muswellbrook and to the north of Camberwell. OzArk Environmental & Heritage Management (OzArk) has been engaged by Umwelt (Australia) Pty Limited (Umwelt) (Umwelt), on behalf of Mt Owen Pty Limited (Mount Owen) to complete an Aboriginal Cultural Heritage Assessment Report (ACHAR) for the Mount Owen Continued Operations Modification 2 (the Proposed Modification). The MOC is situated in the Singleton Local Government Area (LGA) (**Figure 1-1**).

Figure 1-1. Location of the Proposed Modification.



1.3 BACKGROUND

Mount Owen received development consent (SSD-5850) from the NSW Planning Assessment Commission for the Mount Owen Continued Operations Project (Continued Operations Project) in November 2016. The Continued Operation Project development consent incorporates all previously approved operations at the Mount Owen Mine and Coal Handling and Preparation Plant (CHPP) and Ravensworth East Mine and allows for continued and expanded mining until 2031, now referred to as the 'Approved Operations'. Consultation regarding Aboriginal cultural heritage for the Approved Operations assessment is presented in **Section 4.3.1**. Glendell Mine operates under a separate consent (DA 80/952) and does not form part of the Approved Operations.

In September 2017 Mount Owen modified SSD-5850 (Modification 1) to allow for the construction of a water pipeline from the Integra Underground Mine to the Mount Owen Complex and allow the integration of the Integra Underground Mine into the Greater Ravensworth Area Water and Tailings Scheme (GRAWTS). Mount Owen now proposes to modify development consent SSD-5850 to allow for the optimisation of the North Pit mine plan to access coal reserves from the mining tenements obtained by Glencore through its acquisition of the Integra Underground Mine (the Proposed Modification) (**Figure 1-2**).

The Proposed Modification will enable access to approximately 35 million tonnes (Mt) of additional run-of-mine (ROM) coal from the North Pit. Recovery of the additional coal reserves will result in approximately 46 hectares (ha) of additional disturbance (Proposed Disturbance Area) (**Figure 1-3**), representing an increase of approximately 1.8 per cent to the total disturbance area currently approved, and require an increased depth in the North Pit to provide for mining down to the Hebden Seam. The change to the North Pit mine plan will require the extension of the mine life through to 2037 (an additional 6 years).

Prior to the acquisition of the Integra Underground mining tenements, the mine plan design for the North Pit did not allow access to the deeper coal seams and was restricted to the east of the approved North Pit footprint.. This resulted in the pit floor 'stepping up' as it progressed further southwards and the 'stepping in' of the mine plan along its eastern boundary. The acquisition of the Integra Underground Mine and associated mining tenements has removed this previous constraint and allows for deeper and extended coal extraction across the proposed modified North Pit.

The Proposed Disturbance Area extends further east from the Proposed Modification pit boundary to provide for additional infrastructure such as water management structures and access. In addition, the northern extent of the Proposed Disturbance Area is identified to provide for earthworks to shape and improve the final landform of the North Pit to tie into the surrounding topography, these works are located in proximity to the existing approved Bettys Creek diversion. It is not proposed to modify the existing Bettys Creek diversion in this area which continues through the South East Offset and South East Corridor Offset areas into Main Creek.

No changes are proposed to current mining methods, extraction limits, transportation methods, operational hours or workforce numbers. The Proposed Modification will utilise the existing and approved infrastructure, with the exception of proposed water management structures to manage water from the mining operation.

1.4 PROPOSED DISTURBANCE AREA

The Proposed Disturbance Area consists of two portions: a smaller northern portion on both sides of, and south of, an existing diversion of Bettys Creek (Area A; approximately 9 ha); and a larger portion to the southeast of the current North Pit (Area B; approximately 37 ha) (**Figure 1-3**).

Area A consists of modified landforms on both sides of a major drainage diversion for Bettys Creek that redirects water flow from the original bed of Bettys Creek to Main Creek located approximately 1.5 km to the southeast. Apart from areas modified by the drainage works there are small pockets of open woodland, comprising approximately 2.3 ha of the total area, and small areas of cleared, grassed landforms. It is noted that the Proposed Modification will not alter the existing creek diversion in this area. This area is included to provide for earthworks to shape the final landform as part of the Proposed Modification's final rehabilitation of the North Pit.

Area B consists of approximately 37 ha of open, grassed paddocks with some scattered pockets of trees. Area B includes approximately 7.2 ha of a former olive plantation.

Figure 1-4 provides illustrations of typical views of the Proposed Disturbance Area. The photo points for the photographs shown on **Figure 1-4** are indicated on **Figure 1-3**.

Figure 1-2. Overview of the Proposed Modification.

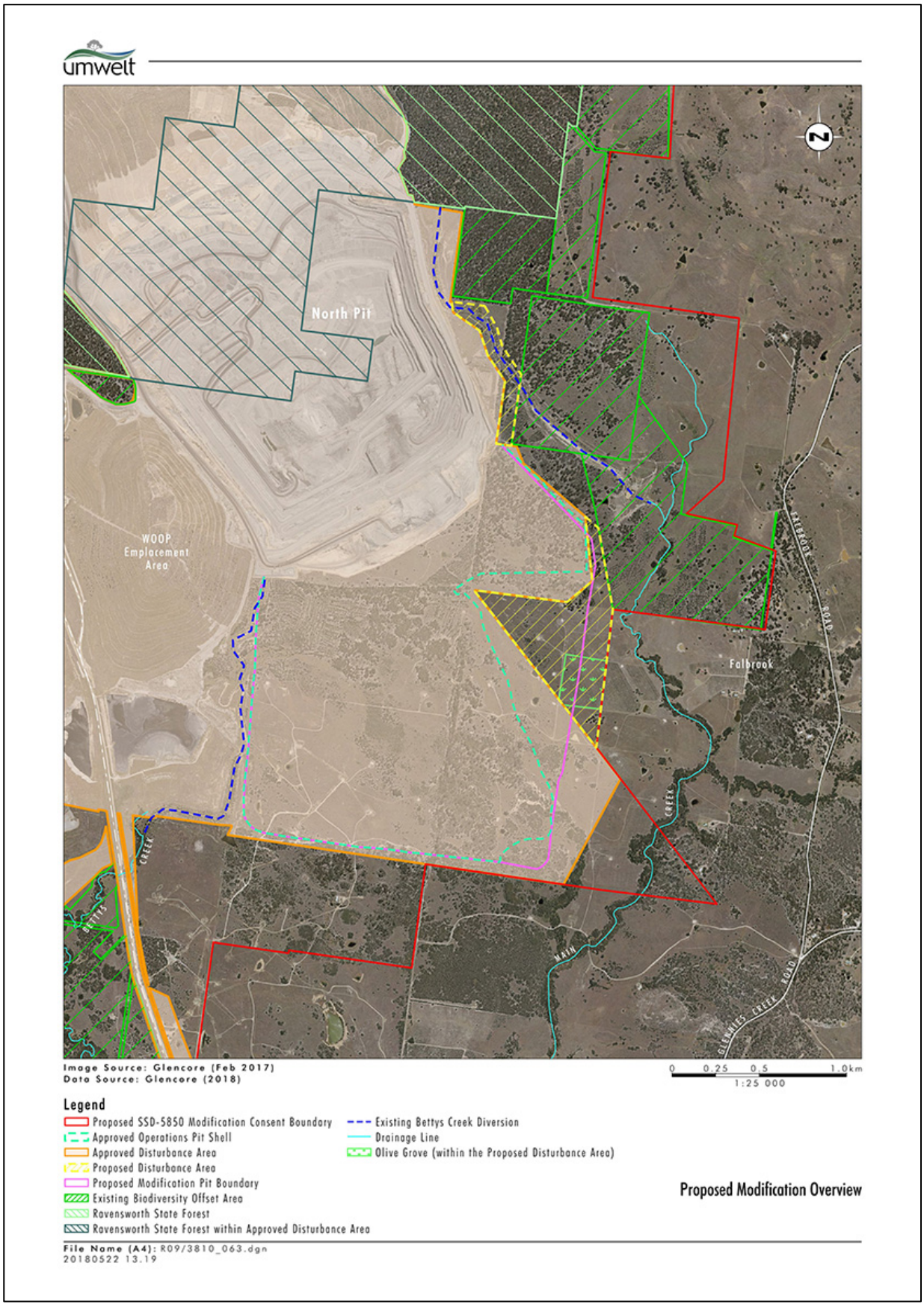


Figure 1-3. Aerial showing the Proposed Disturbance Area.

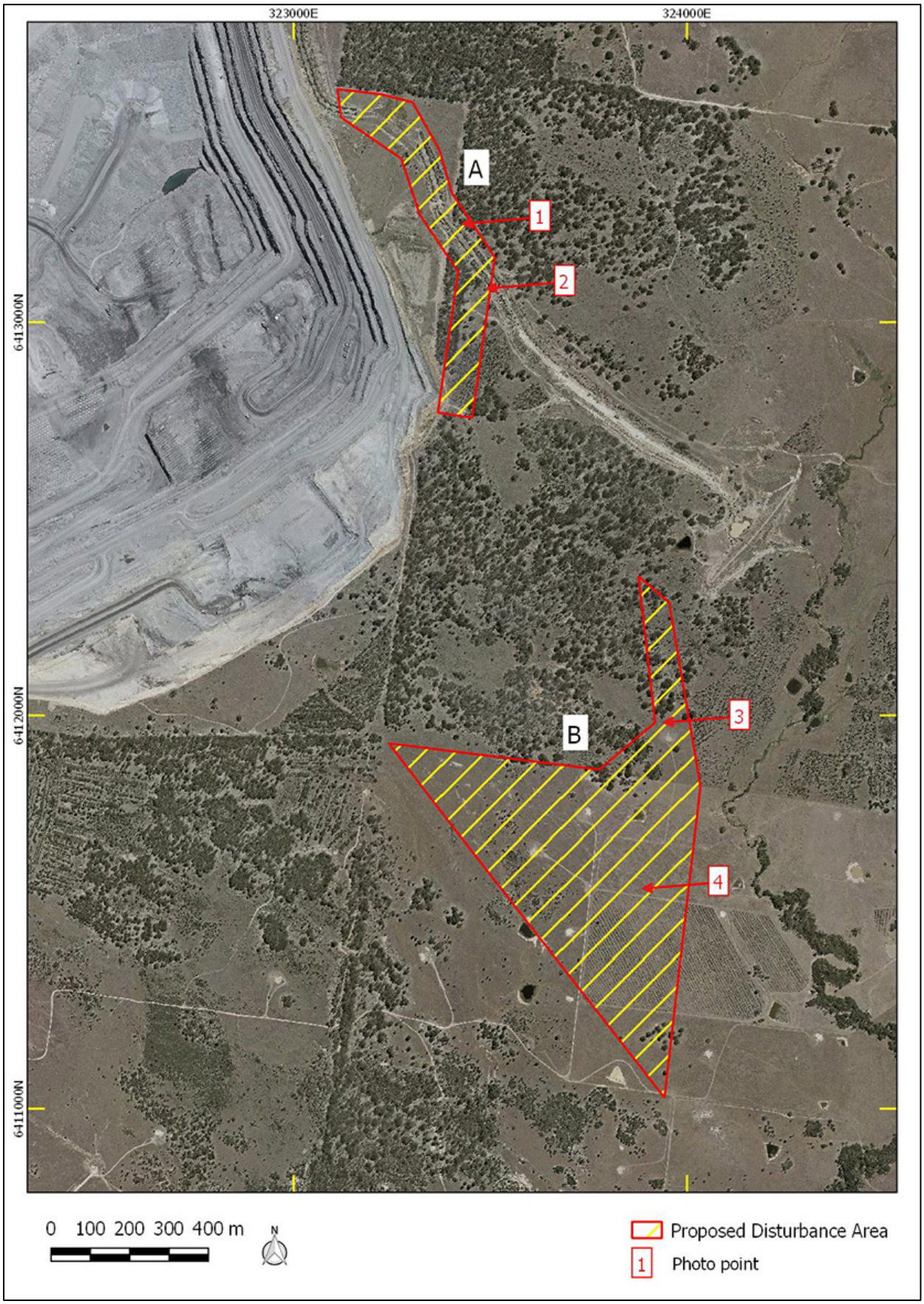


Figure 1-4. Views of the Proposed Disturbance Area.

1. View of the regenerating treed area in the north of Area A. View west.

2. View of disturbances in Area A adjacent to the Bettys Creek Diversion. View southeast.

3. View from the northern 'corridor' portion of Area B towards main portion of Area B. View south.

4. View from the crest landform across Area B. View northeast.

1.5 RELEVANT LEGISLATION

Cultural heritage is managed by a number of state and national Acts. Baseline principles for the conservation of heritage places and relics can be found in the *Burra Charter* (Australia ICOMOS 2013). The *Burra Charter* has become the standard of best practice in the conservation of heritage places in Australia, and heritage organisations and local government authorities have incorporated the inherent principles and logic into guidelines and other conservation planning documents. The *Burra Charter* generally advocates a cautious approach to changing places of heritage significance. This conservative notion embodies the basic premise behind legislation designed to protect our heritage, which operates primarily at a state level.

A number of Acts of parliament provide for the protection of heritage at various levels of government as outlined in the following sections.

1.5.1 State legislation

Environmental Planning and Assessment Act 1979 (EP&A Act)

The EP&A Act established requirements relating to land use and planning. The framework governing environmental and heritage assessment in NSW is contained within the following parts of the EP&A Act:

- **Part 4:** Local government development assessments, including heritage. May include schedules of heritage items;
    - **Division 4.1:** Approvals process for state significant development.

National Parks and Wildlife Act 1974 (NPW Act)

The NPW Act provides for the protection of Aboriginal objects (sites, objects and cultural material) and Aboriginal places. Under the NPW Act (Part 6), an Aboriginal object is defined as: any deposit, object or material evidence (not being a handicraft for sale) relating to indigenous and non-European habitation of the area that comprises NSW, being habitation both prior to and concurrent with the occupation of that area by persons of European extraction, and includes Aboriginal remains.

An Aboriginal place is defined under the NPW Act as an area which has been declared by the Minister administering the NPW Act as a place of special significance for Aboriginal culture. It may or may not contain physical Aboriginal objects.

As of 1 October 2010, it is an offence under Section 86 of the NPW Act to 'harm or desecrate an object the person knows is an Aboriginal object'. It is also a strict liability offence to 'harm an Aboriginal object' or to 'harm or desecrate an Aboriginal place', whether knowingly or unknowingly. Section 87 of the NPW Act provides a series of defences against the offences listed in Section 86, such as:

- The harm was authorised by and conducted in accordance with the requirements of an *Aboriginal Heritage Impact Permit* (AHIP) under Section 90 of the NPW Act;
- The defendant exercised 'due diligence' to determine whether the action would harm an Aboriginal object; or
- The harm to the Aboriginal object occurred during the undertaking of a 'low impact activity' (as defined in the regulations).

Under Section 89A of the NPW Act, it is a requirement to notify the Office of Environment and Heritage (OEH) Director-General of the location of an Aboriginal object. Identified Aboriginal items and sites are registered on Aboriginal Heritage Information Management System (AHIMS).

1.5.2 Commonwealth legislation

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Matters of National Environmental Significance listed under the EPBC Act include the National Heritage List and the Commonwealth Heritage List, both administered by the Commonwealth Department of the Environment and Energy. Ministerial approval is required under the EPBC Act for proposals involving significant impacts to National/Commonwealth heritage places.

1.5.3 Applicability to the Proposed Modification

The Proposed Modification will be assessed under Division 4.1 of the EP&A Act.

Any Aboriginal sites within the Proposed Disturbance Area are afforded legislative protection under the NPW Act.

In accordance with Section 89J(d) of the EP&A Act, Section 90 of the NPW Act does not apply to applications for state significant development under Division 4.1 of the EP&A Act. Accordingly the relevant impacts to matters protected under the NPW Act are managed in accordance with the relevant state significant development consents. In the case of the Approved Operations the impacts on matters protected under the NPW Act are managed through the approved *Aboriginal Cultural Heritage Management Plan* (ACHMP).

It is noted there are no Commonwealth or National heritage listed places within the Proposed Disturbance Area, and as such, the heritage provisions of the EPBC Act do not apply.

1.6 ASSESSMENT APPROACH

The current assessment follows the *Code of Practice for the Investigation of Aboriginal Objects in New South Wales* (Code of Practice; DECCW 2010).

Field assessment and reporting followed the Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011).

2 THE ARCHAEOLOGICAL ASSESSMENT

2.1 PURPOSE AND OBJECTIVES

The purpose of the current study is to identify and assess heritage constraints relevant to the Proposed Modification.

2.1.1 Aboriginal archaeological assessment objectives

The current assessment applies the Code of Practice, in the completion of an Aboriginal archaeological assessment, in order to meet the following objectives:

Objective One: Undertake background research regarding the Proposed Disturbance Area to formulate a predicative model for site location within the Proposed Disturbance Area;

Objective Two: Identify and record objects or sites of Aboriginal heritage significance within the Proposed Disturbance Area, as well as any landforms likely to contain further archaeological deposits; and

Objective Three: Assess the likely impacts of the Proposed Modification to Aboriginal cultural heritage and provide management recommendations.

2.2 DATE OF THE ARCHAEOLOGICAL ASSESSMENT

The fieldwork component of this assessment was undertaken by an OzArk archaeologist and representatives of Registered Aboriginal Parties (RAPs) and Wonnarua knowledge Holder Groups on Thursday 31 August 2017.

2.3 OZARK INVOLVEMENT

2.3.1 Field assessment

The fieldwork component of the heritage assessment was undertaken by:

- Ben Churcher: (BA [Hons]: University of Queensland, Dip. Ed.: University of Sydney; OzArk Principal Archaeologist).

2.3.2 Reporting

The reporting component of the heritage assessment was undertaken by:

- Report Author: Ben Churcher;
- Contributor: Stephanie Rusden (BS University of Wollongong, BA University of New England; OzArk Project Archaeologist); and
- Reviewer: Dr Jodie Benton (PhD [Archaeology] University of Sydney; OzArk Director).

2.4 ABORIGINAL COMMUNITY INVOLVEMENT

The fieldwork assessment was assisted by:

- Mary Franks (representing the Plains Clans of the Wonnarua People);
- Leanne Kirkman (representing the Gomery Cultural Consultants); and
- David Horton (representing the Gomery Cultural Consultants).

The Wonnarua Nation Aboriginal Corporation were invited to the survey but were unable to attend.

2.4.1 Aboriginal consultation for the Proposed Modification

This assessment has followed the *Aboriginal cultural Heritage Consultation Requirements for Proponents 2010* (ACHCRs).

Previous Aboriginal cultural heritage consultation for the Approved Operations assessment is presented in **Section 4.3.1**.

Stage 1

On 6 June 2017, Ben Churcher (OzArk Principal Archaeologist) contacted Nicole Davis (Archaeologist - Planning. Hunter Central Coast Region. Regional Operations Group. Office of Environment and Heritage) by email to ask, in part, whether the Proposed Modification "*could use the existing RAP list for the MOCO* (Approved Operations) *Project for Stage 1 of the ACHCRs. This RAP list is current and the MOCO Project is on-going. In February/March of this year* (i.e. 2017) *we undertook the archaeological salvage works associated with MOCO which obviously included assistance from the MOCO RAPs. The Proposed Disturbance Area for the Proposed Modification is immediately adjacent to areas surveyed by the MOCO RAPs for the MOCO Project."*

On 7 June 2017 Nicole replied by email "*I think that is a perfectly reasonable approach to the next Mod. It is my understanding that this is how most other similar operators manage their ongoing stakeholders.*"

Nicole also forwarded the OEH Hunter Central Coast Branch Regional Operations Division Aboriginal Stakeholder Register for the Singleton LGA. All individuals and/or groups who were on the OEH Stakeholder Register but not on the Approved Operations RAP list were contacted to see if they were interested in being consulted for the Proposed Modification (**Table 2-1**). The letter sent to the individuals on the OEH Stakeholder List is presented in **Appendix 1**.

The finalised RAP list for the Proposed Modification is presented in **Appendix 1**.

Table 2-1: Consultation regarding the OEH Stakeholder Register.

Name	Consultation	Response
Kerrie Brauer	Emailed on 6/7/17 to seek response whether she wanted to be consulted on the Proposed Modification.	Email received 6/7/17. "Thank you for your email, and just wanted to let you know that OEH is mistaken regarding our interest for the Singleton Shire Council. I am a descendant of the Awabakal people and our cultural boundary is south of the Hunter River, and therefore the proposed project is not within our Awabakal Cultural Boundary and are unable to make any comment regarding the Cultural Heritage concerning the Mt Owen Continued Operations Modification 2 – Aboriginal Cultural Heritage Survey".
Tracey Howie	Emailed on 6/7/17 to seek response whether she wanted to be consulted on the Proposed Modification.	Email received 6/7/17. "I do not wish to be consulted for this project as Guringai TLAC are not an Aboriginal Stakeholder for the Singleton area".
Paulette Ryan	Emailed on 6/7/17 to seek response whether she wanted to be consulted on the Proposed Modification.	No response
Tania Matthews	Emailed on 6/7/17 to seek response whether she wanted to be consulted on the Proposed Modification.	No response
Les Atkinson	Emailed on 6/7/17 to seek response whether he wanted to be consulted on the Proposed Modification.	No response
Norm Archibald	Emailed on 6/7/17 to seek response whether he wanted to be consulted on the Proposed Modification.	No response
Barry Anderson	Emailed on 6/7/17 to seek response whether he wanted to be consulted on the Proposed Modification. Email bounced back so letter posted on 6/7/17	No response
Ryan Johnson & Darleen Johnson-Carroll	Emailed on 6/7/17 to seek response whether they wanted to be consulted on the Proposed Modification.	No response
Maree Waugh	Emailed on 6/7/17 to seek response whether she wanted to be consulted on the Proposed Modification.	Email received on 6/7/17 advising that Maree wants to be included in consultation. Survey methodology was sent to Maree.
Richard Edwards	Letter posted on 6/7/17	No response
Carol Ridgeway-Bissett	Letter posted on 6/7/17	No response
Steve Talbott	Emailed on 6/7/17 to seek response whether he wanted to be consulted on the Proposed Modification.	No response

Stage 2

All Raps were presented with information regarding the Proposed Modification. This information is presented in **Appendix 1**.

Stage 3

On 28 July 2017 those RAPs without email contact were posted the survey methodology that had been prepared by OzArk. Those RAPs with email contact were emailed the survey methodology on 31 July 2017. This ensured that all RAPs had the same period of time to review and comment on the survey methodology. All comments were to be received by 29 August 2017.

In summary the following people responded:

- Tocomwall Pty Limited via letter (see **Appendix 2**); and
- Margaret Matthews, John Matthews and Darrel Matthews via phone call from Margaret. Margaret advised they endorse the survey methodology but made comment that if during the field survey a significant number of artefacts are located then they would like test pitting conducted.

OzArk provided answers and comments to the Tocomwall Pty Limited response (**Appendix 2**). On 7 August 2017 Tocomwall Pty Limited acknowledged by email the receipt of OzArk's response and stated, in part, "*Ben's* [author of OzArk's response] *responses are considered and I accept the vast majority of his explanations in relation to the study area. Any remaining questions can – as Ben has indicated – be dealt with during the fieldwork component.*"

Mount Owen ensured that all reports requested by Tocomwall Pty Limited were made available on 23 August 2017.

Stage 4

Following the closure of the review period for the survey methodology, the field assessment was undertaken on Thursday 31 August 2017. Representatives of the RAPs accompanied the field survey (see **Section 2.4**).

In accordance with the ACHCRs, a draft copy of the ACHAR was distributed for all RAPs for the purpose of review and input into the assessment and report (see consultation log and sample cover letter in **Appendix 1**). Once the 28 day RAP review period finalised on Monday 4 December 2017, no feedback requiring incorporation into this report had been received.

3 LANDSCAPE CONTEXT

An understanding of the environmental contexts of a study area is requisite in any Aboriginal archaeological investigation (DECCW 2010). It is a particularly important consideration in the development and implementation of survey strategies for the detection of archaeological sites. In addition, natural geomorphic processes of erosion and/or deposition, as well as humanly activated landscape processes, influence the degree to which these material culture remains are retained in the landscape as archaeological sites; and the degree to which they are preserved, revealed and/or conserved in present environmental settings.

3.1 TOPOGRAPHY

The Proposed Disturbance Area is entirely contained within lower slope landforms between 100 metres (m) and 150 m in altitude. Generally the land is sloping towards the east and is part of the Main Creek catchment. In the northern portion of the Proposed Disturbance Area (Area A) there are localised broad ridges with some associated steeper slopes, however, the southern portion (Area B) has a relatively gentler gradient.

Explanations for the terms used on **Figure 3-1** are in **Table 3-1**. **Table 3-2** quantifies the extent of these landform features specific to the Proposed Disturbance Area and examples of typical topography are shown on **Figure 3-2**. The photo points for the photographs shown on **Figure 3-2** are indicated on **Figure 3-1**.

Table 3-1. Landform descriptions (Speight 1990).

Landform	Description
Ridge	Compound landform element comprising a narrow crest and short adjoining slopes, the crest length being less than the width of the landform element.
Upper slope	Slope element adjacent below a crest or flat, but not adjacent above a flat or depression.
Mid-slope	Slope element not adjacent below a crest or flat and not adjacent above a flat or depression.
Lower slope	Slope element not adjacent below a crest or flat but adjacent above a flat or depression.
Flat / Drainage	Planar landform element that is neither a crest nor a depression and is level or very gently inclined. For much of the Proposed Disturbance Area, flat landforms are associated with drainage lines.

Table 3-2. Summary of key terrain features within the Proposed Disturbance Area.

Total Proposed Disturbance Area	Crest	Upper slope	Mid slope	Lower slope	Flat/ Drainage
46 ha	4 ha	8.6 ha	23.6 ha	9.2 ha	0.6 ha

Figure 3-1. Major landform units within the Proposed Disturbance Area.

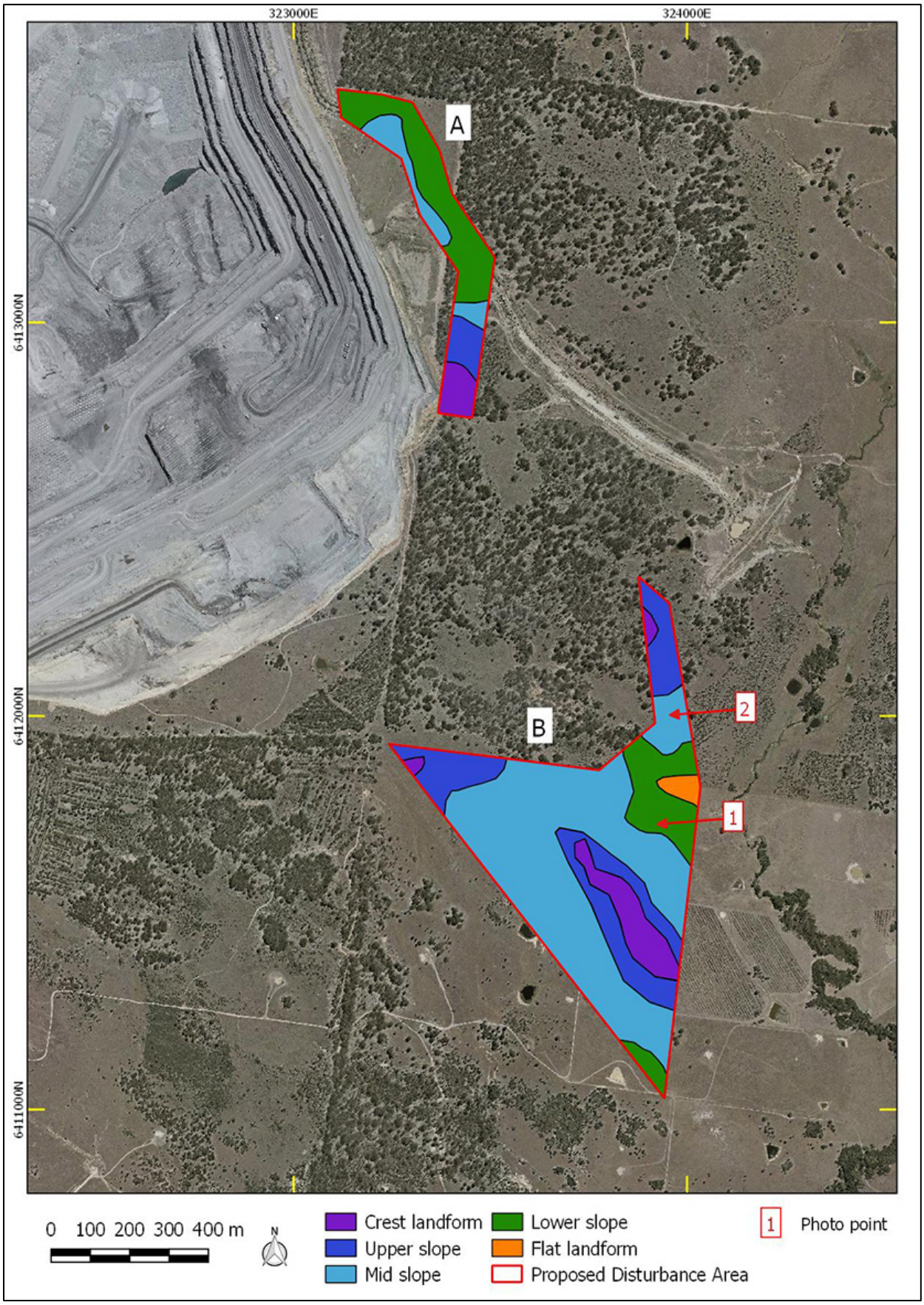


Figure 3-2. Topography of the Proposed Disturbance Area.

	
1. View of the crest landform in the centre of Area B. View south.	2. View of mid slope landforms in the northern 'corridor' portion of Area B. View north.

3.2 GEOLOGY AND SOILS

The Proposed Disturbance Area is confined to the Central Lowlands geological subregion. The subregion is located in the centre of the valley and is an area of undulating to hilly terrain dissected by the Hunter River and numerous creeks which have developed on largely un-resistant Permian sediments. Sandstones, shales, tuffs and conglomerates are the principal constituents. Coal resources come from this source. Alluvial flats extend up to 2.5 km from the Hunter River and its major tributaries where they flow through the Central Lowland belt. Soils on either side of the flood plain are Podzolics or Solodics with a sandy to silty A-Horizon which changes abruptly to clayey material with a blocky structure (B-Horizon). Results from detailed soil sampling and assessment within the Proposed Disturbance Area show that the majority of the soils are brown/grey/yellow Sodosols[1] with small areas of brown and stratic Kurosols[2]. Sodic soils are structurally unstable in water and are highly prone to erosion.

The A-Horizon is believed to be the result of sedimentary deposits forming within the last 5,000 years (Davies 1991: 5). Due to a combination of cultural and non-cultural processes, ground and vegetation disturbance has occurred throughout the region. Cattle grazing, cultivation, open cut coal mines as well as other industrial and commercial industries have altered the vegetation and disturbed the ground surface (and in some places have greatly modified the landscape). Natural processes such as erosion have been accelerated due to European impact in the area.

[1] Sodosols have a strong texture contrast between surface (A-Horizon) and subsoil (B-Horizon) and the subsoil horizons are sodic: i.e. have a high sodium content.

[2] Kurosols have strong texture contrast between the surface (A-Horizon) and the clay subsoil (B-Horizon). The subsoil is strongly acid, i.e. pH is 5.4 or less in water, and non-sodic (at least in the upper horizons).

As has been commonly reported in other surveys in this region (Brayshaw 1986a; Godwin 1987), there are two major soil depositional units in the Proposed Disturbance Area. An upper unit (commonly called the A-Horizon) composed primarily of sand and silt but sometimes with gravel present, overlying, and very distinct from, the clay B-Horizon which ranges from brown to yellow in colour. The upper unit is usually less than 50 centimetres (cm) thick and varies from grey to buff in colour, and is thought to be no older than mid-Holocene while the lower unit, which shows evidence of deep weathering and pedogenesis, is considered to be Pleistocene in origin. As many researchers (such as Brayshaw 1986a) have noted, open sites in the Hunter Valley tend to occur within the A-Horizon and are often exposed only when this is disturbed. Where the A-Horizon has been totally removed artefacts can be found resting on the B-Horizon surface (Godwin 1987: 5).

Specific to the Proposed Disturbance Area, particularly in Area B, are the presence of ancient river conglomerates folded into a series of hills, one of which is represented by the crest landform within the Proposed Disturbance Area. These conglomerates consist of rounded, medium-sized river pebbles, predominantly originating from sandstone sources. **Figure 3-3** illustrates two examples of the outcropping rock in Area B. Photograph 1 shows the outcropping conglomerate, while photograph 2 illustrates an outcrop of sandstone where the river pebble conglomerate is absent. By implication, this outcropping rock suggests very shallow soil depths over much of the Proposed Disturbance Area.

Figure 3-3. Views of outcropping rock in Area B.

1. Rock outcropping on the slopes in Area B. View east.

2. Rock outcropping on the slopes in Area B. View east.

3.3 HYDROLOGY

Hydrological features within the Proposed Disturbance Area are limited to two ephemeral drainage lines of Main Creek (**Figure 3-4**. The photo points for the photographs shown on **Figure 3-4** are indicated on **Figure 3-5**). There are no permanent or semi-permanent watercourses within the Proposed Disturbance Area, and therefore, the Proposed Disturbance Area does not include any extensive bank areas. At its closest, the Proposed Disturbance Area is approximately 20 m west of the top of high bank of Main Creek although the proposed pit boundary will be located

160 m from Main Creek. In the north, the Proposed Disturbance Area is approximately 375 m east of the original course of Bettys Creek (**Figure 3-5**). Bettys Creek has previously been altered by approved mining activities, and as such, no longer has a natural flow regime.

Two creek systems are close to, but outside of, the Proposed Disturbance Area: Bettys and Main Creeks.

Bettys Creek was once a third order watercourse (Umwelt 2013). It has been noted in previous archaeological assessments that during wet periods, Bettys Creek was characterised by a chain of ponds morphology. It was noted that a complete absence of water is also possible (Umwelt 2005). It is also accepted that changes to the hydrology of the area due to mining and creek diversions are likely to have greatly altered the pre-1788 form of Bettys Creek. Bettys Creek includes numerous meander cut-offs, swampy hollows and intermittent pools that may be the remnants of the 19th century 'chain of ponds' morphology.

Main Creek is a fourth order watercourse, with multiple lower order drainage lines occurring within its catchment area (Umwelt 2015). Main Creek, a tributary of Glennies Creek, holds water in deeper pools for longer periods after rain than its drainages (Umwelt 2013). The creek only flows for short periods of time after heavy rain.

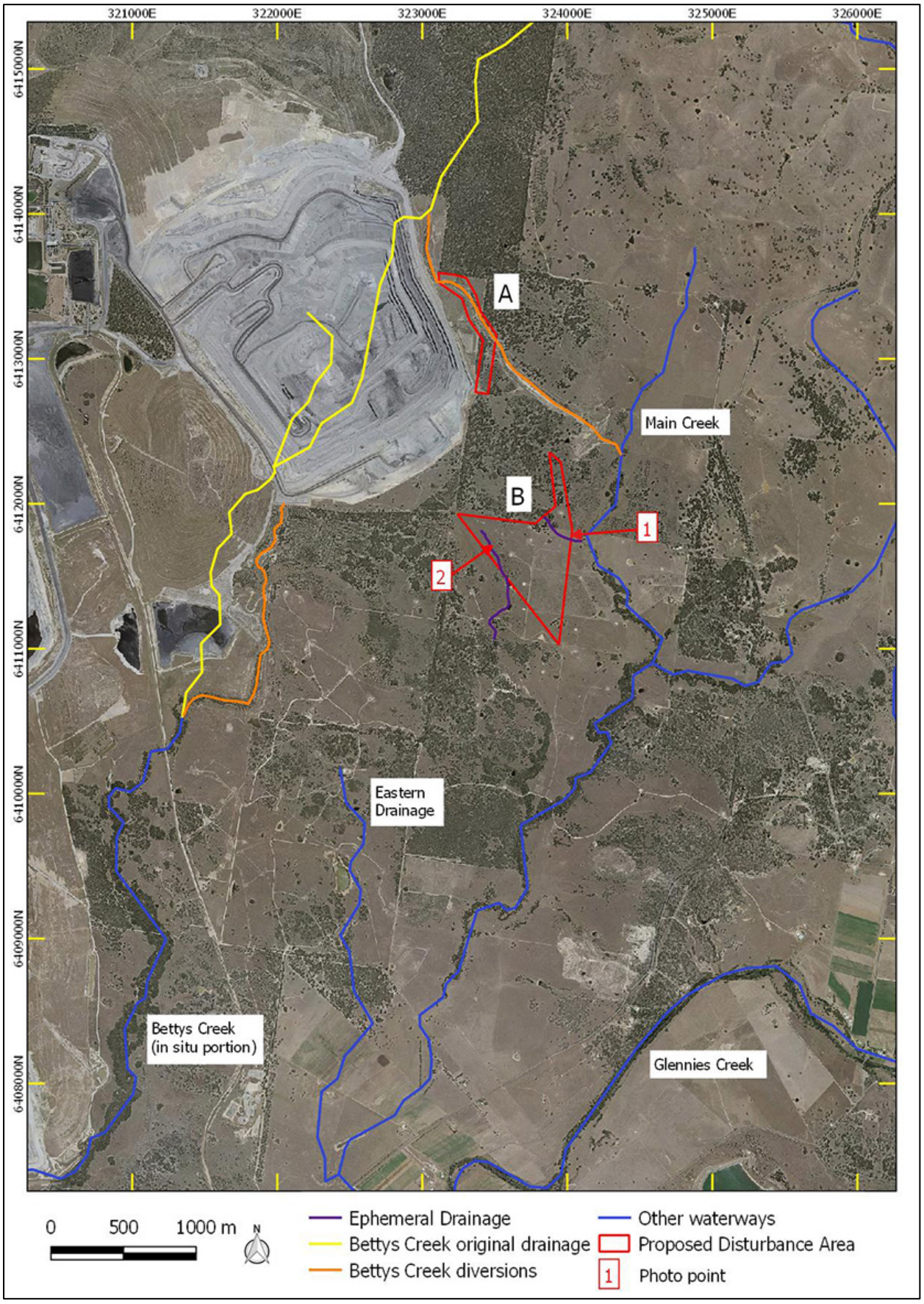
The closest major waterway to the Proposed Disturbance Area is Glennies Creek, a tributary of the Hunter River, which was noted by Appleton (2002) as being a permanent water source for the area. Glennies Creek only becomes dry during extended periods of drought. Glennies Creek is located at its closest 2.5 km southeast of the Proposed Disturbance Area.

Figure 3-4. Hydrology of the Proposed Disturbance Area.

1. View from the boundary of the Proposed Disturbance Area in Area B towards Main Creek. View east.

2. View of ephemeral drainage with rock outcropping in the central portion of Area B. View southeast.

Figure 3-5. Aerial showing waterways in the vicinity of the Proposed Disturbance Area.



3.4 VEGETATION

In terms of food and medicinal plants for Aboriginal use, researchers in the Bettys Creek catchment have noted food plants such as bulrush, chocolate lily, fringed lily, kangaroo grass, kurrajong, mat-rush, onion orchid, rushes and sedges, spike rush and water ribbon. All of these resources are at their best for consumption in the late spring to end of summer period. Medicinal plants included native geranium. Species providing fibre for the making of nets, bags and containers included narrow-leaved ironbark, rats tail grass, mat-rush, spike rush and other rushes and sedges (Umwelt 2013).

In the past, creek corridors such as Bettys Creek or Main Creek would have had limited and seasonal resources that could be utilised in a sporadic manner by Aboriginal groups. Larger systems such as Bowmans Creek, located south of the Proposed Disturbance Area, may have supported a more diverse resource base although, when compared to river systems such as along the nearby Hunter River, areas within the Proposed Disturbance Area itself would have been very limited in their appeal as locations for more intensively used camp sites.

Historical aerials covering the Proposed Disturbance Area show an almost complete clearance of native vegetation, cultivation and extensive sheet wash erosion (**Figure 3-6**). Today almost all woodland is regrowth and mature trees are very rare. This woodland, where it is regenerating, tends to be open Eucalyptus woodland on slopes. Extensive areas within the Proposed Disturbance Area have been previously cleared and are still open grasslands that are currently grazed. A substantial area has been utilised as an olive plantation that is now not maintained.

3.5 CLIMATE

The Sydney Basin Bioregion exhibits a temperate climate. Summers are warm and there is no dry season.

The closest climate data is from Singleton, approximately 21 km to the south of the Proposed Disturbance Area. Records since 2002 show that average annual rainfall is approximately 676.2mm. January is the warmest month, with mean temperatures peaking at 31.7 degrees Celsius. July and August are the coldest months with mean minimum temperatures of 4.2 and 4.1 degrees Celsius respectively.

3.6 LAND–USE HISTORY

The Proposed Disturbance Area is situated within a broader landscape subject to the following land uses:

- Agriculture, horticulture, viticulture and pastoralism
- Coal mining operations (open cut and underground); and
- Rural-residential holdings and rural towns.

3.6.1 Existing levels of disturbance

Crucial for the preservation of archaeological deposits is the history of past land use in a particular area. In particular, the European history of the Hunter Valley lowlands, where the Proposed Disturbance Area is located, is a stark example of land mismanagement leading to wide-spread erosion as the dispersible soils were exposed to rain.

An aerial photograph of the Proposed Disturbance Area in 1967 (**Figure 3-6**) shows that there is very little tree cover within the Proposed Disturbance Area, and particularly in Area B, there is ample evidence of sheet wash erosion with the majority of the area heavily impacted. Looking further afield, the 1967 image shows de-vegetated creek lines, such as that of Main Creek to the east of the Proposed Disturbance Area, with noticeable gully erosion within the channel and extensive sheet wash erosion at their margins.

Such widespread impacts have undoubtedly affected the archaeological landscape in that many tens of centimetres of top soils have been removed from areas such as the Proposed Disturbance Area, along with any archaeological deposits they may have contained. With such widespread soil movement it is also important to remember that accumulations of artefacts that may be termed a ‘site’ today may have, in fact, been washed into that location during the historic period and bear no relationship to past Aboriginal occupation patterns in the area.

On **Figure 3-6** portions of the Proposed Disturbance Area displaying severe erosion are indicated by arrows; namely:

- Blue arrows: severe gully erosion. In Area A, a tributary to Bettys Creek displays widened banks indicating long-standing gully erosion. In Area B, a tributary to Main Creek shows extensive sediment deposition from upstream erosion; and
- Green arrows: severe sheet wash erosion. In Area B there is extensive evidence of widespread soil loss from sheet wash erosion in the gently undulating landforms that are within this portion of the Proposed Disturbance Area. This form of erosion is probably attributable to the widespread vegetation clearing across the Proposed Disturbance Area, the sodic soils of the area, and many years of grazing impacts that can accelerate soil loss and/or artefact trampling/dispersal.

In addition, portions of the Proposed Disturbance Area have subsequently been subject to intensive horticultural impacts as a former olive plantation currently occupies 7.2 ha of the Proposed Disturbance Area.

Figure 3-7 shows views of two dominant disturbances within the Proposed Disturbance Area: erosion and agricultural land use. The photo points for the photographs shown on **Figure 3-7** are indicated on **Figure 3-6**.

Figure 3-6. A 1967 aerial showing the location of the Proposed Disturbance Area.

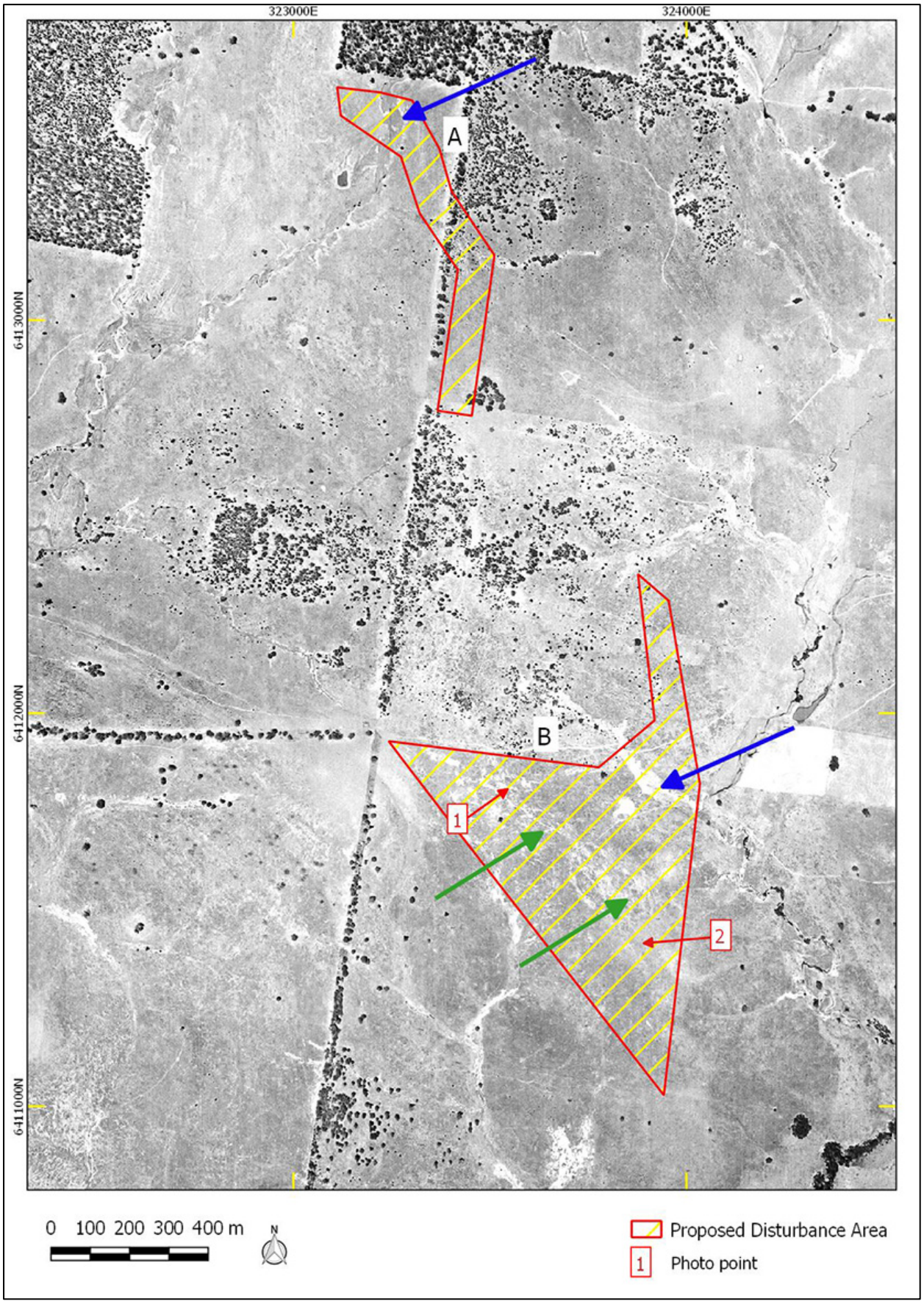


Figure 3-7. Views of disturbances within the Proposed Disturbance Area.

	
1. Indication of past erosion in Area B. View east.	2. View of the olive plantation in the centre of Area B. View southeast.

3.7 CONCLUSION

The Code of Practice requires that the following variables be considered when examining the environmental context of the Proposed Disturbance Area:

1. Describe the landscape history at a scale that allows the subject area (Proposed Disturbance Area) to be characterised into meaningful components (or units) for the archaeological investigation.
    - In **Section 3.1** the landform units present within the Proposed Disturbance Area are mapped and quantified. This shows that there is very little flat land associated with drainage features within the Proposed Disturbance Area and that the majority of the Proposed Disturbance Area contains sloping landforms; apart from a central crest landform in Area B.
2. Describe the landforms present within the subject area (Proposed Disturbance Area) using standard or generally accepted classifications.
    - The majority of the Proposed Disturbance Area is contained within sloping landforms. In the northern portion of the Proposed Disturbance Area (Area A) there are localised broad ridges with some associated steeper slopes, however, the southern portion (Area B) has a relatively gentler gradient and a central crest landform. The landforms closest to Main Creek are flat to gently sloping.
3. Identify the primary modes of geomorphic activity in the subject area: aggraded, degraded, eroded (stable), or eroded (active), and determine if objects are likely to be concealed below the ground surface or revealed by erosional processes.
    - Most landforms in the Proposed Disturbance Area are degraded following the loss of vegetation cover during the agricultural phase of land use. Active, widespread, erosion is absent from the Proposed Disturbance Area although historical aerial photographs of the area **Figure 3-6**) suggest that erosion has historically been a feature of the area. The implication of these observations is

that Aboriginal sites that may have been present in the Proposed Disturbance Area have probably been removed or disturbed by the historic erosion and soil loss that has occurred.

4. Identify the forms of erosion within the archaeologically surveyed area, and where appropriate, the subject area (Proposed Disturbance Area) as a whole.
    - Erosion has been historically present across the Proposed Disturbance Area but is now relatively stable with no large active exposures being evident. This is mostly due to improved land management practices that have allowed grass cover to spread.

5. Describe the soils present and, where available, outline their formation history.
    - Soils display thin A-Horizon soils above deep B-Horizon clays. At several locations, creek banks indicated a leached A-Horizon of no more than 10 cm depth. Within the A-Horizon, humic topsoil is limited to the upper-most few centimetres. The soils appear to have low nutritional values probably as a result of previous soil loss.

6. Describe the land use history of the subject area (Proposed Disturbance Area).
    - The Proposed Disturbance Area has a long history of agricultural use before being replaced by intensive mining land use. This has resulted in an observable modification of the land's surface brought about by the initial vegetation clearing and the following intensive grazing. The previously occupied nature of this area is attested by a wide range of farm infrastructure including tracks, fences and dams. The current period of mining land use has impacted the ground surface primarily through exploration drill pads and creek diversion channels.

7. Describe, and if relevant, map the natural resources and natural features that will have influenced the use of the landscape in the past.
    - The generally sloping topography within the Proposed Disturbance Area wouldn't have encouraged or hindered past Aboriginal occupation. However, the ridge landform at the southern portion of Area A would have been traversed when moving from the Bettys Creek catchment to the more-easterly Main Creek catchment. There are also no particular resources that would have necessarily attracted Aboriginal occupation of the area apart from the presence of generally semi-permanent waterways (such as nearby Bettys and Main Creeks) that must have provided pathways and resources for past populations.

4 ABORIGINAL ARCHAEOLOGY BACKGROUND

4.1 ETHNO-HISTORIC SOURCES OF REGIONAL ABORIGINAL CULTURE

The Proposed Disturbance Area is located in the Wonnarua tribal area of the upper Hunter River Valley.

The Wonnarua people lived in an environment rich in food resources. Freshwater fish, shellfish, reptiles, mammals, birds and plant food provide a diverse diet (see Brayshaw 1981). Brayshaw (1986b: 82) suggests that inland groups visited the coast during the summer when marine resources were plentiful, and coastal groups travelled inland to participate in the winter kangaroo hunts. Trade and/or exchange also occurred between the coastal and inland groups. Reed spears and shells were traded inland for possum skin rugs and fur cord (Brayshaw 1986b: 41). Social gatherings were a feature of Aboriginal life in this area.

Visiting by coastal and inland groups for initiations and ceremonies seemed to occur. These were conducted within earthen circles. Carved trees were associated with these sites (Brayshaw 1981: 12).

Material culture items for this area included many items made of bark obtained from various trees. For example, tea tree bark (*Melaleuca quinguenervia*) was used for the construction of huts, and the bark of the cabbage-tree (*Livistona australis*) and kurrajong (*Brachychiton eopulneus*) were used to make cord for the manufacture of fishing lines and nets and also for sewing up canoes (Brayshaw 1981b). Baskets, shields and canoes were also made from bark. Some shields, however, were also made from the wood of the nettle tree (*Orticaceael* or fig (Ficus spp.). Boomerangs, clubs, spear throwers and hatchets were also manufactured. Spears were of composite manufacture, usually being lengths of grass tree (*Xanthorrhoea australis*) to which points of hard wood were attached. Maintenance tools included stone adzes and chisels, abrasive stones, small fishhook files, bone awls and sharpened shell knives and scrapers (Brayshaw 1981: 10). After 1788 glass and iron hatchets became sought after items.

There is virtually no reference to flaked stone tools in the nineteenth century descriptions of Aboriginal material culture in the Hunter Valley. This paucity of information is at odds with the types of occupation evidence which are preserved in the valley. By far the most common type of Aboriginal site in the inland part of the valley is the "open campsite" or stone artefact scatter.

There are few records of the Aboriginal population of the central valley. Howe in 1819 reports five people at Jerry's Plains, Dangar in 1824 reports 15 people at Dartbrook, Mathew in 1830 reports 60 people on the Wollombi and 300 men are reported at Patricks Plains in 1834. At least 200 men were involved in the 1826 attack on Merton. Scott and McLeod in 1826 estimated a total of about 500 people at that time (Resource Planning 1991: 17) although this estimate, and the

others above, are likely to be highly inaccurate as they are based on assumptions rather than detailed censuses.

From 1825 there is documented conflict between the Aboriginal population and settlers within the Hunter Valley, including the Ravensworth/Foy Brook area (for example, The Australian, 9 September 1826 [http://trove.nla.gov.au/ndp/del/page/4248909]). Although the exact location of these conflicts is unknown, the history of raids and counter-raids demonstrate that the Wonnarua people were fierce defenders of their tribal lands.

4.2 REGIONAL ARCHAEOLOGICAL CONTEXT

The primary concern of archaeology is with the interpretation of human history and cultural evolution through the study of material remains. This archaeological record is both fragile and non-renewable and any major disturbance of the environment through landscape changing development poses a threat to this valuable cultural resource. The major cause of obliteration of much of the evidence, from which the prehistory of Australia may be constructed, is development during the historic period, with the impact by natural processes, generally, playing a minor role. Thus, that which remains is made the more valuable by its rarity.

The Aboriginal occupation of Australia begins prior to 40,000 BP (years before present) and possibly earlier than 50,000 BP. Dates exceeding 20,000 years occur in almost all parts of Australia resulting in the expectation that most areas should have a Pleistocene (>12,000 BP) occupational signature. However, such dates remain relatively rare due to a range of factors, both behavioural and post-depositional. These factors include a possible low density of occupation in the Pleistocene period, poor preservation of archaeological materials (particularly dateable organic materials) and significant coastline change over the past 18,000 years.

In 1986, Koettig undertook an archaeological survey between Glennies Creek and Singleton (cited in Umwelt 2003). Following that survey, Koettig carried out several excavations at six locations along Glennies Creek. Koettig considered artefacts found in Site SGCD 16 (about one metre deep in Unit B of on an old alluvial terrace) were ‘markedly different’ to artefacts recovered from the artefacts in Unit A. Her conclusion was formed on the basis of the raw material used, large number of cores, the large percentage of cortex remaining on artefacts and larger sizes of artefacts. Artefacts from Unit B were from volcanic rocks while those in Unit A were predominantly mudstone and silcrete. Later, a date of >20,200 BP was obtained from a hearth associated with the artefacts placing the site well into the Pleistocene.

Archaeological excavations have so far determined that human occupation of the Hunter Valley has occurred since the last Glacial Maximum (approximately 27,000–17,000 years BP (HLA-Envirosciences 2005). It is hypothesised that it is likely that evidence predating this period will be unearthed/studied in the future.

A review of GHD (2005), HLA-Envirosciences (2005) and Umwelt (2007) provides the following regional synthesis:

- Archaeological sites, even where surface evidence is not present, occur on most landforms. This was confirmed by a HLA-Envirosciences (2005) excavation program, in which Aboriginal sites were encountered on alluvial terraces, flats, slopes, bench areas, spurs and ridgelines. HLA-Envirosciences acknowledges that the sample areas were biased somewhat as they were all near creek lines;
- Site frequency and density are dependent on their location in the landscape. This theme is consistent throughout NSW and is influenced by a range of factors, the most relevant of which the existing level of disturbance. More specifically, the potential for undisturbed *in situ* deposits remaining in the upper Hunter on a mining property is generally low;
- The highest concentration of Aboriginal sites on the valley floor surrounds creeks and waterways;
- Few scarred trees are recorded reflecting the high degree of tree clearing in the region;
- The most frequently recorded raw material is indurated mudstone (a fine gained siliceous material) associated with Hunter River gravels. Other frequently recorded materials include locally sourced silcrete, quartz and volcanic stones; and
- Assemblages recorded in the region consist largely of unmodified flakes with few formed tools. Backed blades comprise the characteristic diagnostic artefact in the region. The mid- to late-Holocene appears to have witnessed this move to smaller tools, perhaps as an impetus to conserve raw material during tool manufacture or due to new functionality requirements. This impetus seems to have driven the development of what Hiscock (1993) calls the Redbank A Strategy (RAS, after three sites along Redbank Creek, near Singleton) of backed blade production.

The archaeological context of the Hunter Valley has been established by over 100 years of research and in the past 30 to 40 years by the increasing incidence of development driven projects. **Table 4-1** summarises landmark studies that have occurred in the region and it is noted that this research has established the earliest date of occupation in the general vicinity of the Proposed Disturbance Area (at Glennies Creek to the east of the Proposed Disturbance Area) as falling within the Pleistocene epoch (i.e. >12,000 BP; Koettig 1986).

Table 4-1. Landmark studies within the wider region.

Investigator	Year	Location(s)	Remarks
R.H. Mathews (surveyor) In Stern 1981	1879 to 1910	Singleton: Bulga-Milbrodale-Wollombi area	Shelter sites with paintings & engravings (Mathews 1879 to 1910 in Stern 1981).
Moore (archaeologist) In Stern 1981	1965 and 1981	Hunter Valley (x2); Headwaters of Goulburn River (x1).	Sites containing *in situ* archaeological material in the lower Hunter Valley were either destroyed or obliterated by development. Wollombi and lower MacDonald Valleys contained datable archaeological sequences (Moore 1965 and 1981, both in Stern 1981).
Moore	1970, 1981	Milbrodale, Sandy Hollow Divide near headwaters of Goulburn River.	Located datable arch sequences. Excavations.

Investigator	Year	Location(s)	Remarks
			Site on divide basal date of 5,000 to 6,000 BP. Assemblages recorded backed blades known as Bondi Points (5000 to 1000BP).
Haglund	1981a, 1981b	Goulburn River	Shelter site excavations. All shelter sites in Hunter Valley with basal dates of 4,000 to 2,000 BP. Bondaian assemblages: 5000 to 1000BP.
Attenbrow	1982	Mangrove Creek catchment, 10km south of watershed between Hawkesbury and Hunter Rivers	Located to the south of the Hunter Valley, most occupation evidence dated from last 5,000 years. Three of 16 shelters investigated contained older evidence, One (Loggers) dated to 11000BP.
Koettig	1986	Glennies Creek Dam	Artefacts and hearth material up to 1m below surface of colluvial / alluvial terrace: Pleistocene dates of 13000 and >20000BP. Discussed further below.

Mention will be made here of two Koettig's excavations, at Glennies Creek and Camberwell, due to their proximity to the Proposed Disturbance Area (Koettig 1986, 1992).

The initial survey of the Glennies Creek to Singleton pipeline recommended that excavations be undertaken at six locations along the northern section of pipeline route where visibility was poor. This resulted in the further identification of five sites. The soils were characterised as being texture contrast soils with strongly distinctive A- and B-Horizons. Artefacts were recorded in the B-Horizon which was estimated by a geomorphologist to date between 10,000 and 30,000 years old. A radiocarbon date was obtained from charcoal in the B Horizon that was 13020±360 BP.

Further archaeological work concentrated on two sites SGCD 9 and 16. These are located in the valley of Fal Brook (now known as Glennies Creek) near Mount Olive, approximately 10 km northeast of the Proposed Disturbance Area. The sites are on small alluvial flats adjacent to Glennies Creek and surrounded on either side by steeply rising slopes to ridge crests.

The investigation strategy was to excavate a series of pits along the pipeline route. Excavation was by using a backhoe to remove sediment and dump it on the ground where it was sorted by the archaeologists. The emphasis of the work was to obtain samples of artefacts from the B-Horizon. The results of the work established that the B-Horizon was dated to between 10,000 to 30,000 years ago and that artefacts recovered from that level in the profile must date to that age. A feature interpreted as a hearth was discovered and dated to greater than 20,000 BP (a more precise date was not able to be obtained due to the small sample of charcoal collected). The artefacts recovered from the B-Horizon were made from volcanic rock and contained a greater ratio of core to flakes than from the artefacts recovered from the A-Horizon. However, the analysis was limited by the low numbers of artefacts recovered. The conclusion of Koettig's work was that there were artefacts associated with the B-Horizon and that these, on stylistic and dating grounds, were between 10,000 to 30,000 years old. This is the oldest date in the vicinity of the Proposed Disturbance Area, although it must be remarked that the results do not come from systematically excavated areas and Aboriginal occupation associated with the B-Horizon levels have not been conclusively replicated elsewhere.

Also to the east of the Proposed Disturbance Area, the survey work at Camberwell Coal Mine recommended salvage archaeological work on a number of sites considered to have archaeological potential. This work was undertaken by Koettig in 1990 (reported in Koettig 1992).

Koettig's method was to lay out a series of transects around each site and to excavate 1 m by 0.25 m test trenches at regular intervals along the transects. This helped define the extent and nature of archaeological material. Once this was established then areas for further excavation were defined. The sites were located in three groups GCC3, 4, 5, 7, 8, 9, and 10 in a group along Martins Creek. GCC 27, 28, 29 at the lower end of Nowlands Creek and GCC 33 & 35 further up Nowlands Creek. No attempt was made to investigate sites away from the creek lines.

Koettig summarises the stone analysis as follows: "*The knapping of stone within the Camberwell area indicated a variety of knapping strategies, which usually appear to be directed towards the production of flakes suitable for backing*" (Koettig 1992: 45). The analysis of stone artefacts identified that two types of raw material were present: indurated mudstone and silcrete. Six reduction strategies were identified; five of these were using indurated mudstone and one on silcrete. Interestingly silcrete flakes were heat treated to improve flaking characteristics. Koettig notes that "*other types of activities*" were also carried out on the sites but does not investigate these (Koettig 1992: 42, 45). Other archaeological features discovered were hearths, "*ovens*" and a heat treatment area. Seven radiocarbon dates were obtained which dated cultural features. The dates range from 2,750 BP to 270 BP.

Overall it seems that Koettig's focus was on the minutiae of the technological differences between the reduction strategies used to make backed blades. This has resulted in some of the broader patterns of Aboriginal history not being considered. Koettig’s work also forms a watershed for the interest in reduction techniques that was enunciated by Hiscock in 1986 (Hiscock 1986). The patterning deduced from reduction techniques observed by Hiscock was not, however, able to be accurately replicated at other sites (for a range of reasons, including small sample sizes). During the 1990s and beyond, investigations have tended to move away from examining a minutiae of the technological differences associated with artefacts to more of a landscape/environmental approach where distribution patterning becomes more important. Given the disturbed nature of most open sites in the region, this broader approach has enabled an increased understanding of the region’s past without relying on tightly stratified deposits that are a prerequisite for many technological based research questions.

It is also entirely possible, given the rate of erosion in the district, that researchers in the 1980s had access to sites less disturbed than the sites that survive today. Thus, fine analyses of artefact assemblages may have been more warranted in the past than they are today given the present poor condition of most open sites in the area.

From those previous investigations summarised above, the following generalisations can be made about archaeological patterns in the Hunter Valley region:

- Sites are commonly open artefact scatters or isolated finds;
- Sites are generally of low density;
- Most sites are situated close to drainage lines;
- Archaeological material is densest within 30 m of the creek edge but continues at a lower density away from the creek;
- Some artefact concentrations are virtually continuous along larger creek lines and associated foot slopes;
- The most common raw materials were indurated mudstone and silcrete with smaller quantities of chert, siltstone, quartzite and quartz also identified;
- Flakes and flaked pieces accounted for the bulk of assemblages. Proportions of cores and backed blades are low;
- There is evidence of heat-treated artefacts; and
- Many recorded artefacts are characteristic of the Small Tool Tradition (Bondaian) of the late Holocene.

4.3 PREVIOUS ASSESSMENTS WITHIN OR NEAR THE PROPOSED DISTURBANCE AREA

The large number of archaeological studies undertaken within the vicinity of the Proposed Disturbance Area provides information to obtain a sound understanding of the nature and distribution of archaeological sites within the area. Although there is some conjecture about the relationship between stream order, site numbers and densities, the general pattern is that the majority of sites are present within 30 m of watercourses (Dean-Jones 1992: 26–27; AMBS 1997: 29). Although sites are present in locations at a greater distance from water, these sites are limited in terms of both number and size, constituting a lower density scatter than is found along the creek lines (Dean-Jones 1992: 24; ERM 1999: 22–23). The majority of sites are small, with larger sites typically found in association with permanent watercourses. Reduced visibility has been proffered as an explanation for the higher number of sites and artefacts present along the more heavily eroded and less vegetated minor watercourses as compared to major creeks (Umwelt 2004: 7.7; ERM 1999: 84).

4.3.1 Assessment for the Approved Operations

The assessment area for the Approved Operations covered approximately 500 ha and portions of the assessment area are located directly adjacent to the Proposed Disturbance Area to the west.

Australian Cultural Heritage Management Pty Limited (ACHM) were engaged by Mount Owen to undertake Aboriginal community consultation for the Approved Operations assessment and to author the Aboriginal Cultural Heritage Assessment (ACHA) to which OzArk 2014 contributed (ACHM 2013). The ACHM report appeared as Appendix 13a (Parts 1 and 2) of the Approved Operations Environmental Impact Statement (EIS) (Umwelt 2015). ACHM 2013 contains the cultural, aesthetic and historic values of the area, while OzArk 2014 contains an examination of the scientific values of the area.

4.3.1.1 Cultural values

ACHM 2013: 114 summarises the cultural values of the area in which the Proposed Disturbance Area is located. What follows is an edited excerpt of the Approved Operations Consolidated Statement of Significance (ACHM 2013: Section 5:10):

> *It is noted that the numerous Aboriginal stakeholders who participated in this cultural values assessment process hold values which relate to the wider Hunter Valley region generally, and less directly to the Project Area specifically. However, one of the Knowledge Holder groups holds very strong values over the Project Area. Other than the one group expressing strong connection to the Project Area, there was very little other information presented in the disclosed material or values workshops which relates specifically to the Project Area.*

A common theme in many Aboriginal cultural heritage assessments is the proprietary interest members of the relevant Aboriginal communities hold in regard to the wider cultural landscape including archaeological sites or places within any given area. The Proposed Modification is no exception in this regard. Within the context of the current assessment, there are strong on-going connections to places created and used by ancestors alongside demonstrably strong interests in the manner in which those places are managed or harmed as a result of this Proposed Modification. These sentiments are not unique, and must certainly be considered in the overall assessment of the significance of the places in question. The connection to these places is noted as often being relatively unspecific and generally do not appear to relate to any surviving traditional knowledge or customary cultural practices, apart from one of the Knowledge Holder groups who express a strong connection to on-going cultural knowledge and customary lore in this location.

The cultural values expressed by the participants in this assessment have been consistent in voicing an over-arching concern for the wider landscape and criticism of the negative impact of mining on that landscape. Consistent in the material disclosed is a sense of 'outrage' and grief at the treatment of Aboriginal people since First Settlement (dispossession and genocide are mentioned repeatedly) through to more contemporary experiences (i.e. the Stolen Generation).

ACHM 2013: Section 5:10 concludes:

> *There is little doubt that the wider cultural landscape surrounding (and encompassing) the Project Area is of high cultural and historical significance to Wonnarua people. The historical associations with early settlement, conflict, dispossession and survival are important, and the nature of the area as a surviving cultural landscape of significance to numerous members of the Wonnarua people makes this an area of regional and national significance. The regional archaeological record is also of high regional significance. Overall, the cultural significance of the wider region is considered to be high, and requires considerable additional research to fully understand.*

4.3.1.2 Scientific values

The archaeological survey for the Approved Operations took place over two weeks from 26 November 2012 to 7 December 2012. The archaeological test excavation program for the Approved Operations took place over one week from 11 March 2013 to 15 March 2013. In 2014, the proposed disturbance area for the Approved Operations was expanded slightly necessitating a further one day of survey that took place on 29 April 2014. The results of these investigations are detailed in OzArk 2014 and contained in Appendix 13b of the Approved Operations EIS (Umwelt 2015).

Large portions of the Approved Operations disturbance area (223 ha) had been subject to previous AHIPs with extensive areas having already undergone archaeological assessment and salvage. Within the disturbance area, 18 sites had already been salvaged by manual excavation and more expansive additional areas have been subject to grader scrapes to salvage subsurface artefacts. Over the years, both from within the disturbance area and from adjacent landforms, over 11,000 artefacts had already been recovered as a result of these programs.

As a result of the scientific values assessment for the Approved Operations, 39 Aboriginal sites were recorded; consisting of:

- 11 artefact scatters (37-3-1189 to 37-3-1199);
- 25 isolated finds (37-3-1170 to 37-3-1188 and 37-3-1212 to 37-3-1216); and
- Three extensions to previously recorded sites (Extension to site 37-3-0649, Extension to site 37-3-0611 and Extension to site 37-3-0600).

In addition, the Approved Operations disturbance area contained three previously recorded sites, 37-3-0611, 37-3-0985 (low density artefact scatters) and 37-3-0527 (isolated artefact). Thus, 42 sites were known to exist within or close to the Approved Operations disturbance area.

At two locations within the Approved Operations disturbance area, test excavations were carried out under the NSW Office of the Environment and Heritage (OEH) Code of Practice for the

Archaeological Investigation of Aboriginal Objects in NSW (OzArk 2014). At one location (37-3-1191; MOCO OS-3), no artefacts were recorded during the test excavations, while at the second location (37-3-1192; MOCO OS-4), 114 artefacts were recorded, with over 80% coming from one discrete concentration. As a result, it was determined that 37-3-1191 is a displaced site with no associated archaeological deposits, while 37-3-1192 is a low density artefact scatter along the banks of the 'eastern drainage' line (see **Figure 3-4**) with one known concentration of artefacts.

4.3.1.3 Conclusion

Those archaeological sites in the Approved Operations disturbance area investigated revealed relatively sparse artefact concentrations in shallow and disturbed contexts. Archaeologically, all of the places located and/or identified conform to the Australian Small Tool Tradition[3], and most likely date to no more than the last 2,000 to 3,000 years.

The majority of the Approved Operations disturbance area had been subjected to varying degrees of land clearing and mining since first settlement, destroying the primary context of much of the physical cultural material present, and irretrievably altering the landscape itself.

Given the nature and extent of the archaeological sites identified, there was little additional knowledge which could be added to the archaeological record from any further investigation of this material. There is little probability for the presence of undisturbed and deeply stratified archaeological sites within the Approved Operations disturbance area.

In general, the archaeological sites in the Approved Operations disturbance area offered:

- Limited research potential in regard to regional and/or localised subsistence and resource procurement activities;
- Limited research potential to address questions on stone tool technologies in the region;
- Limited potential for radiometric dating methods to be applied to the sites;
- Limited research potential to address questions about the timing of the first occupation of this region of the Hunter Valley;
- Limited research potential to address questions about the timing of the Aboriginal settlement history of the Hunter Valley; and
- Limited potential to reveal further unique spatiotemporal patterning which would add to the archaeological record.

[3] The Australian Small Tool Tradition (also sometimes referred to as 'Bondaian') is a term applied to the Holocene period Aboriginal tool kit; distinguishing it from the earlier Australian Core Tool and Scraper Tradition generally dated to the Pleistocene period.

4.3.2 Tocomwall Due Diligence 2017

In 2017 Tocomwall Pty Ltd undertook a Due Diligence assessment for the Mount Owen Exploration Drilling Program (Tocomwall 2017). The area investigated by Tocomwall included in part the Proposed Disturbance Area.

The Tocomwall study included 28 locations where drilling was proposed, of which six locations are within, or in close proximity to, the Proposed Disturbance Area.

The visual inspection of the 28 locations concluded that:

> *There is no need for further investigations and impact assessments in all areas of the study area identified as access areas or proposed drill pad locations, as these landforms have a low or zero potential for impacting any Aboriginal archaeological sites, objects,* [potential archaeological deposits] *PAD or Places.*
>
> Tocomwall 2017: 76

In addition to the visual inspection of the Proposed Disturbance Area, Tocomwall undertook auger testing at two locations to determine if these locations were PADs. The auger testing took place at locations STR04 and STR06, both located to the east of Main Creek and 420 m east of the Proposed Disturbance Area.

As a result of the auger program, Tocomwall concluded:

> *The fact that both STR04 and STR06 are located at the lower slope to floodplain boundary logically dictates that surficial deposits are derived from upslope as a result of colluvial processes such as sheet wash. These deposits are unlikely to reflect alluvial deposition since they are located some distance and elevation from the main channel and the texture classes of the alluvial soils reflect loamy sands to sandy clays, i.e. coarser texture classes than the silty clay to light clays identified as surface deposits.*
>
> *The surface deposits at STR04 and STR06 can only therefore be interpreted as recent colluvial sedimentation from upslope. The absence of texture classes reflective of topsoils amongst the various types of soil types present on the Bayswater soil landscape supports this interpretation.*
>
> Tocomwall 2017: 73–74.

4.3.2.1 Conclusion

Those archaeological sites in the Approved Operations disturbance area investigated revealed relatively sparse artefact concentrations in shallow and disturbed contexts. Archaeologically, all of the places located and/or identified conform to the Australian Small Tool Tradition, and most likely date to no more than the last 2,000 to 3,000 years.

The majority of the Approved Operations disturbance area had been subjected to varying degrees of land clearing and mining since first settlement, destroying the primary context of much of the physical cultural material present, and irretrievably altering the landscape itself.

Given the nature and extent of the archaeological sites identified, there was little additional knowledge which could be added to the archaeological record from any further investigation of this material. There is little probability for the presence of undisturbed and deeply stratified archaeological sites within the Approved Operations disturbance area.

In general, the archaeological sites in the Approved Operations disturbance area offered:

- Limited research potential in regard to regional and/or localised subsistence and resource procurement activities;
- Limited research potential to address questions on stone tool technologies in the region;
- Limited potential for radiometric dating methods to be applied to the sites;
- Limited research potential to address questions about the timing of the first occupation of this region of the Hunter Valley;
- Limited research potential to address questions about the timing of the Aboriginal settlement history of the Hunter Valley; and
- Limited potential to reveal further unique spatiotemporal patterning which would add to the archaeological record.

4.3.3 s90 consent #1762

Umwelt 2012 reports on salvage works that took place in December 2003 through to February 2004 and included sites close to the Proposed Disturbance Area including: 37-3-0304 (BC8; surface collection. Located 20 m east of the Proposed Disturbance Area, see **Figure 4-1**); 37-3-0305 (BC9; surface collection and grader scrapes. Located 70 m east of the Proposed Disturbance Area, see **Figure 4-1**); 37-3-0310 (BC14; surface collection and grader scrapes. Located 170 m west of the Proposed Disturbance Area, see **Figure 4-1**); and 37-3-0311 (BC15; surface collection and grader scrapes. Located 140 m west of the Proposed Disturbance Area, see **Figure 4-1**). In addition, manual excavation took place at Excavation Area 6 located on a relict creek terrace between sites 37-3-0311 (BC15) and 37-3-0305 (BC9) (within the Proposed Disturbance Area but now in an area that is highly modified).

The results of the surface collection in the vicinity of the Proposed Disturbance Area recorded a low artefact density with collection areas ranging from recording one artefact to 17 artefacts. By contrast, the higher surface artefact densities were associated with the main channel of Bettys Creek, Area 47a (a total of 246 artefacts or 21.39 per cent of the total surface assemblage) and Area 14 (a total of 117 artefacts or 10.17 per cent of the total surface assemblage), or close by

on a tributary to the main channel (Area 40: 73 artefacts or 6.35 per cent of the total surface assemblage).

Based on these results, Umwelt 2012 concluded that:

- Overall, the majority of the surface collection areas with 20 or more artefacts were associated with the lower slopes/banks of the main channel of Bettys Creek;
- With the exception of Area 40 there were generally lower numbers of artefacts (one to 14) collected from the lower slopes/banks of the tributaries of Bettys Creek; and
    - The highest artefact densities were associated with Area 14 (5.8/m^2) and Area 47a/Site 37-3-0309 (BC13) (2.4/m^2): both associated with the main channel of Bettys Creek and in the case of Area 47a/Site 37-3-0309 (BC13) also in association with a former swamp. Area 14 whilst not located beside a swamp is located just upstream (approximately 100 m) from a former swamp.

Excavation Area 6 was on a relict creek terrace between sites 37-3-0311 (BC15) and 7-3-0305 (BC9) on the western side of a second order tributary of Bettys Creek in an area within the Proposed Disturbance Area.

The top 3 cm of the soil profile was recent in nature and appeared to be formed from aeolian deposits and rotting vegetation. The remainder of the soil profile appeared to be alluvial in nature reflecting periods of high and low velocity flows in the adjoining creek line when pebbles (high flow) and silty sand (lower flow) were deposited beside the creek line before it moved further to the east. From 25–50 cm the gravel was extremely thick with very little soil interspersed between the pebbles. The pebbles were derived from the local conglomerates and had been size sorted reflecting the strength of the tributary flow over time.

A total of 72 artefacts were recovered from Excavation Area 6 from an area of 9.75 m^2: a density of 7.4 artefacts/m^2. Umwelt (2012: 6.44) concluded that, overall, the nature of the redeposited assemblage from the excavation area reflected to some degree the use of the upper slopes associated with tributary channels (the source area for the artefacts) by Aboriginal people. It also provided some information in relation to the area being very active in terms of erosion and redeposition associated with even the most minor of the tributaries in the upper Bettys Creek tributary system.

4.3.4 S90 consent #2267

Umwelt 2013 reports on salvage works that took place in 2005 and included sites close to the Proposed Disturbance Area including: 37-3-0653 (BC59); 37-3-0654 (BC60); 37-3-0662 (MC-1); 37-3-0663 (MC-2); 37-3-0664 (MC-3); 37-3-0665 (MC-4); 37-3-0666 (MC-5) and 37-3-0667 (MC-6) (see **Figure 4-1** for site locations).

The salvage program consisted of surface artefact collection, apart from at sites 37-3-0663 (MC-2), 37-3-0664 (MC-3) and 37-3-0667 (MC-6) where archaeological excavations also took

place. In total, 1,205 artefacts were recovered during the s.90 #2267 surface collection and subsurface salvage program for the Mount Owen Operations Area. Of the 1,205 stone artefacts salvaged from the Bettys Creek and Main Creek catchments, 292 were from surface collection with the remaining 913 artefacts recovered during subsurface investigation and salvage at 37-3-0663 (MC-2), 37-3-0664 (MC-3) and 37-3-0667 (MC-6). Sites within the Main Creek catchment (37-3-0662 to 37-3-0667) contained over 80 per cent of all artefacts recovered during the salvage program.

Sites 37-3-0653 (BC59); 37-3-0654 (BC60) recorded low artefact densities (37-3-0653: 15 artefacts; 37-3-0654: no artefacts) while the Main Creek sites recorded variable artefact densities (37-3-0662, 15 surface artefacts; 37-3-0663, 33 surface artefacts, 145 artefacts from mechanical excavation and 338 artefacts from manual excavation; 37-3-0664, 13 surface artefacts, 102 artefacts from mechanical excavation and 284 artefacts from the manual excavation; 37-3-0665, six surface artefacts; 37-3-0666, 62 surface artefacts; and 37-3-0667, 125 surface artefacts and 44 artefacts from mechanical excavation).

Overall, the salvage demonstrated that the sites containing the largest and most complex assemblages were the sites along the main channel of Main Creek and specifically in areas where second order tributaries had a confluence with Main Creek (though this result may have been biased by the advanced erosion of the 37-3-0667 [MC-6] site on the terrace beside the main channel of Main Creek).

4.3.5 Integra Underground Coal Project: Heritage Assessment (ERM 2009)

In 2009, ERM completed the *Integra Underground Coal Project: Heritage Assessment* for the proposed extension of mining activities at the Underground Operations (ERM 2009). The survey was completed over two days in 2007, and encompassed portions of the Proposed Disturbance Area. Three new sites were recorded as part of the assessment at Main Creek (37-3-0921, 37-3-0922 and 37-3-0923 [**Figure 4-1**]) located approximately 800 m southeast of the Proposed Disturbance Area and two previously recorded sites around Possum Skin Dam (PSDASA and PSDASB) were re-recorded (these sites are located approximately 3.8 km southeast of the Proposed Disturbance Area). The three sites along Main Creek were all recorded as isolated finds with no potential archaeological deposits (PADs), and were assessed as having low archaeological significance (ERM 2009). The two sites recorded at Possum Skin Dam were identified as being artefact scatters. PSDASA was recorded as an '*extensive low density artefact scatter*' around the southern end of the dam. The site was determined to have moderate potential for PAD. PSDASA was originally recorded as five different isolated artefact scatters and isolated finds; however, they were re-recorded as a larger, more complex site. PSDASB was recorded as a low density artefact scatter with no PAD. Recorded artefacts, largely complete and broken flakes, were comprised of silcrete, mudstone and chert.

4.3.6 Approved Operations Salvage Program

In early 2017 the Approved Operations salvage program took place under the authority of the 2016 MOC ACHMP (XMO SD PLN 0060) (OzArk 2016). This program was completed in the approved disturbance areas associated with the Approved Operations located adjacent to the Proposed Disturbance Area (OzArk 2017a).

This program included the collection of surface artefacts at 30 sites (13 artefact scatters and 17 isolated finds) resulting in 189 artefacts being recorded. Included in the tally of 30 sites, were two sites where limited archaeological excavation took place resulting in a further 187 artefacts being recorded.

Of all the sites investigated in the 2017 salvage program, 37-3-1192 (MOCO OS-4) recorded the highest artefact density with 71 surface artefacts (35.98% of all surface artefacts recorded during the salvage program) and 186 artefacts recorded in the excavation component of the program (constituting almost all of the artefacts recorded in the excavation component of the program). 37-3-1192 was located on an unnamed watercourse (termed the 'eastern drainage' [**Figure 3-4**]) approximately 420 m southwest from the closest point of the southern extent of the Proposed Disturbance Area. 37-3-1192 was located in area heavily affected by erosion and the investigation showed that while one concentration of artefacts remained *in situ*, the majority of the site had been displaced by the erosion.

Other sites that recorded more than 10 artefacts during the salvage program were MOCO OS-3, MOCO OS-9 and MOCO OS-10; all located at a distance to the Proposed Disturbance Area. All other sites recorded very low artefact numbers supporting the conclusion reached in OzArk 2014 that the remaining archaeological values at the Mount Owen Complex consist of low density, often displaced, artefact scatters.

A number of sites in close proximity to the Proposed Disturbance Area were salvaged in early 2017 as part of the Approved Operations salvage program.

These sites were all isolated finds: 37-3-1170 (MOCO IF-1); 37-3-1178 (MOCO IF-9); 37-3-1179 (MOCO IF-10); 37-3-1212 (MOCO IF-21); and 37-3-1213 (MOCO IF-22) (see **Figure 4-1** for site locations).

The recording of these sites affords with the general picture emerging that sites located away from permanent water are likely to have a low artefact density and low site complexity.

4.3.7 Previously recorded sites

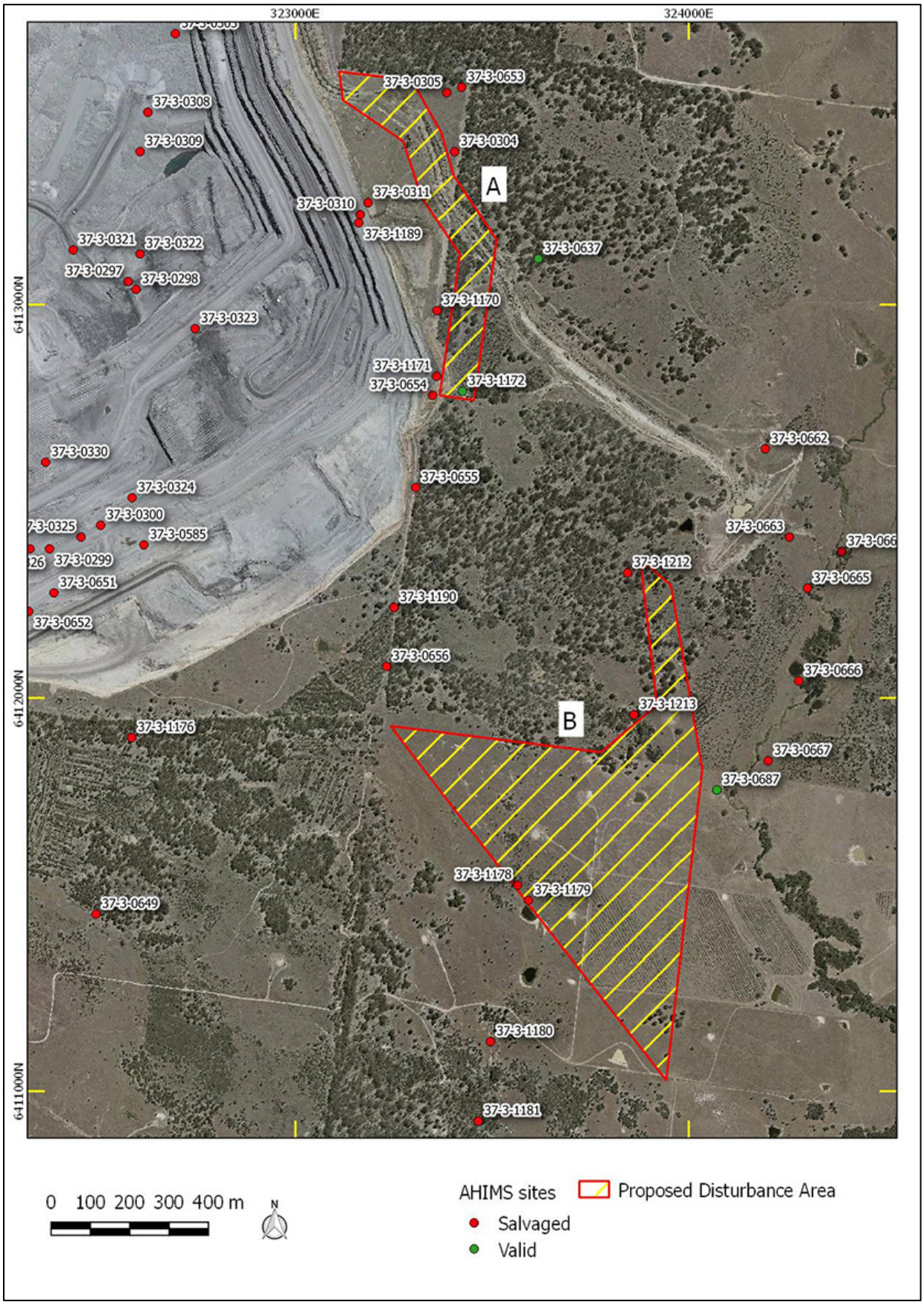
Due to the long history of archaeological investigation in the vicinity of the Proposed Disturbance Area, there have been a number of sites recorded either within the Proposed Disturbance Area, or in close proximity. As shown in **Figure 4-1**, the majority of the sites in the vicinity of the Proposed Disturbance Area have been salvaged under appropriate approvals. Three sites are

listed as being valid: 37-3-1172 (MOCO IF-3), an isolated find (see **Section 4.3.7.1**), remains extant within the northern portion of the Proposed Disturbance Area; 37-3-0637 (Bettys Creek Stone Arrangement), is located 112 m to the east of the Proposed Disturbance Area; and 37-3-0687 (MC-7), an artefact scatter, is recorded being located approximately 42 m east of the Proposed Disturbance Area.

Of these sites, the author cannot find any information regarding 37-3-0687 (MC-7) apart from what is available on its site card. This source of information records that the site is located on the 'eastern bank of Main Creek', however, the AHIMS location places it on the western bank. As the original report cannot, at this stage, be consulted to see where the discrepancy may lie, it will be assumed that the site is on the western bank and closer to the Proposed Disturbance Area. This scatter of 40 artefacts is located in a 25 m by 4 m exposure, 70 m south of a fence line.

The sites surrounding the Proposed Disturbance Area that have been salvaged were either salvaged as part of the Approved Operations salvage program (see **Section 4.3.6**) or under the auspices of s90 consents #1762 (Umwelt 2012) and #2267 (Umwelt 2013) (see **Sections 4.3.3** and **4.3.4**).

Figure 4-1. Previously recorded sites in the vicinity of the Proposed Disturbance Area.



4.3.7.1 37-3-1172 (MOCO IF-3)

One site recorded during the Approved Operations survey, 37-3-1172 (MOCO IF-3), remains in the Proposed Disturbance Area. 37-3-1172 is a silcrete flake that was recorded on a track on a crest within a mid slope landform (**Figure 4-1**, **Figure 4-2**). The site is located in an area of generally high disturbance as the track is well-used and graded. Further artefacts (37-3-1170 [MOCO IF-1] and 37-3-1171 [MOCO-IF2]) were recorded on or near this location. These sites indicate use of this ridge area that would have been traversed when moving from the Bettys Creek catchment to the more-easterly Main Creek catchment. It was assessed that there is A Horizon soil depth at the site, although it is unlikely that the site is associated with intact subsurface archaeological deposits.

Figure 4-2. Site 37-3-1172. Location and artefact.

	
1. The location of 37-3-1172 is marked by the bag.	2. Site 37-3-1172. Silcrete flake.

4.3.8 Settlement strategies

As a result of past archaeological investigations along Bettys Creek (approximately 0.5 km west of the Proposed Disturbance Area), two theories on settlement patterns have been advanced.

In essence, Umwelt (2005) identified two major models for Aboriginal activity along Bettys Creek, namely those proposed by AMBS (1997) and Umwelt (2005).

However, the investigations in the Mount Owen Extension Area[4] by Umwelt (2012) indicated that neither of the seasonal risk models were proven or disproven by the evidence acquired through the analysis of the spatial distribution of the artefacts recovered, or by the nature of the artefacts recovered. The residue and use-wear analysis, however, identified likely late spring and summer

[4] The Mount Owen Extension Area was then to the southeast of the North Pit where approval has been granted for Mount Owen Operations. This area is now part of the North Pit.

occupation in association with the former swamp on Bettys Creek (at Excavation 5; a swamp area of Bettys Creek).

This meticulous study with a robust data set therefore failed to produce evidence that could illuminate settlement patterns beyond the assessment '*that very small groups of Aboriginal people (most likely single family groups) hunted and gathered across the whole of the Mount Owen Extension Area*' (Umwelt 2012: 8.20).

Therefore, the results of over 30 years of archaeological research has demonstrated that the archaeological landscape of the Hunter Valley is generally not preserved to the level to allow detailed modelling of settlement patterns beyond the most basic attributes.

4.4 PREDICTIVE MODEL

Across Australia, numerous archaeological studies in widely varying environmental zones and contexts have demonstrated a high correlation between the permanence of a water source and the permanence and/or complexity of Aboriginal occupation. Site location is also affected by the availability of and/or accessibility to a range of other natural resources including: plant and animal foods; stone and ochre resources and rock shelters; as well as by their general proximity to other sites/places of cultural/mythological significance. Consequently sites tend to be found along permanent and ephemeral water sources, along access or trade routes or in areas that have good flora/fauna resources and appropriate shelter.

In formulating a predictive model for Aboriginal archaeological site location within any landscape it is also necessary to consider post-depositional influences on Aboriginal material culture. In all but the best preservation conditions very little of the organic material culture remains of ancestral Aboriginal communities survives to the present. Generally it is the more durable materials such as stone artefacts, stone hearths, shell, and some bones that remain preserved in the current landscape. Even these however may not be found in their original depositional context since these may be subject to either (a) the effects of wind and water erosion/transport - both over short and long time scales or (b) the historical impacts associated with the introduction of European farming practices including: grazing and cropping; land degradation associated with exotic pests such as goats and rabbits and the installation of farm related infrastructure including water-storage, utilities, roads, fences, stockyards and residential quarters. Scarred trees may survive for up to several hundred years but rarely beyond.

4.4.1 Landform modelling

The Proposed Disturbance Area is entirely contained within lower slope landforms between 100 m and 150 m in altitude. Generally the land is sloping towards the east and is part of the Main Creek catchment. In the northern portion of the Proposed Disturbance Area (Area A) there are

localised broad ridges with some associated steeper slopes, however, the southern portion (Area B) has a relatively gentler gradient.

As such there are few topographic features within the Proposed Disturbance Area that would have encouraged or hindered past Aboriginal occupation.

The greatest determinant in the likelihood of locating Aboriginal sites in the Proposed Disturbance Area is the distance to permanent water with the majority of the Proposed Disturbance Area being greater than 200 m from water.

4.4.2 Predictive model for site location

Knowledge of the environmental contexts of the Proposed Disturbance Area and a desktop review of the known local and regional archaeological record, the following predictions are made concerning the probability of those site types being recorded within the Proposed Disturbance Area.

- Isolated finds may be indicative of: random loss or deliberate discard of a single artefact, the remnant of a now dispersed and disturbed artefact scatter, or an otherwise obscured or sub-surface artefact scatter. They may occur anywhere within the landscape but are more likely to occur in topographies where open artefact scatters typically occur.
    - As isolated finds can occur anywhere, particularly within disturbed contexts, it is predicted that this site type could be recorded within the Proposed Disturbance Area. It is noted in **Section 4.3** that isolated finds are commonly recorded in the vicinity of the Proposed Disturbance Area. Additionally, the evidence of past salvage activities in the vicinity of the Proposed Disturbance Area show a marked decrease in artefact density away from the main channels of Bettys and Main Creeks. As the Proposed Disturbance Area is largely distant to these creeks, it is expected that the Proposed Disturbance Area will also have a low artefact density.
- Open artefact scatters are here defined as two or more artefacts, not located within a rock shelter, and located no more than 50 m away from any other constituent artefact. This site type may occur almost anywhere that Aboriginal people have travelled and may be associated with hunting and gathering activities, short or long term camps, and the manufacture and maintenance of stone tools. Artefact scatters typically consist of surface scatters or sub-surface distributions of flaked stone discarded during the manufacture of tools, but may also include other artefactual rock types such as hearth and anvil stones. Less commonly, artefact scatters may include archaeological stratigraphic features such as hearths and artefact concentrations which relate to activity areas. Artefact density can vary considerably between and across individual sites. Small ground exposures revealing low density scatters may be indicative of background scatter rather than a spatially or temporally distinct artefact assemblage. These sites are classed as 'open', that is, occurring on the land surface unprotected by rock overhangs, and are sometimes referred to as 'open camp sites'.

Artefact scatters are most likely to occur on level or low gradient contexts, along the crests of ridgelines and spurs, and elevated areas fringing watercourses or wetlands. Larger sites may be expected in association with permanent water sources.

Topographies which afford effective through-access across, and relative to, the surrounding landscape, such as the open basal valley slopes and the valleys of creeks, will tend to contain more and larger sites, mostly camp sites evidenced by open artefact scatters.

- As a majority of the Proposed Disturbance Area is within undifferentiated sloping landforms distant to permanent water, this site type is not predicted to be common. However, within the ridge landforms of Area A (**Figure 3-1**), this site type is possible. The high degree of impact from past agricultural practices (see **Figure 3-6**) in the Proposed Disturbance Area will probably mean that the scatter has become displaced. It is likely that any sites associated with landforms within the Proposed Disturbance Area are likely to have a low artefact density and a low complexity of tool types as the sites are either one-off events or only infrequently used. It is noted that the Proposed Disturbance Area already has a low number of recorded sites despite the various investigations over the years. This leads to the conclusion that all larger sites have probably been previously recorded and that the Proposed Disturbance Area probably lacks such sites. The evidence of past salvage activities in the vicinity of the Proposed Disturbance Area (**Sections 4.3.3** and **4.3.4**) show a marked decrease in artefact density away from the main channels of Bettys and Main Creeks. As the Proposed Disturbance Area is largely distant from these creeks, it is expected that if the Proposed Disturbance Area has artefact scatters they will have a low artefact density.

- Aboriginal scarred trees contain evidence of the removal of bark (and sometimes wood) in the past by Aboriginal people, in the form of a scar. Bark was removed from trees for a wide range of reasons. It was a raw material used in the manufacture of various tools, vessels and commodities such as string, water containers, roofing for shelters, shields and canoes. Bark was also removed as a consequence of gathering food, such as collecting wood boring grubs or creating footholds to climb a tree for possum hunting or bark removal. Due to the multiplicity of uses and the continuous process of occlusion (or healing) following removal, it is difficult to accurately determine the intended purpose for any particular example of bark removal. Scarred trees may occur anywhere old growth trees survive. The identification of scars as Aboriginal cultural heritage items can be problematical because some forms of natural trauma and European bark extraction create similar scars. Many remaining scarred trees probably date to the historic period when bark was removed by Aboriginal people for both their own purposes and for roofing on early European houses. Consequently the distinction between European and Aboriginal scarred trees may not be clear.

    - Due to the near-total clearance of trees from within the Proposed Disturbance Area (see **Figure 3-6**), this site type is not predicted to occur. It is also noted that this site type is very rare at a regional level due to historical tree clearance.

- Quarry sites and stone procurement sites typically consist of exposures of stone material where evidence for human collection, extraction and/or preliminary processing has survived. Typically these involve the extraction of siliceous or fine grained igneous

and meta-sedimentary rock types for the manufacture of artefacts. The presence of quarry/extraction sites is dependent on the availability of suitable rock formations.

  - Quarries could be present where outcrops of bedrock [e.g. silcrete] have been used by Aborigines as raw materials for the manufacture of stone artefacts. This site type could be recorded within the Proposed Disturbance Area should suitable rock outcroppings be available. However it is considered a low probability that there are suitable outcrops of rocks as the majority of the Proposed Disturbance Area, particularly in Area B, are comprised of ancient river conglomerates where silcrete and mudstone are absent.

- Burials are generally found in soft sediments such as aeolian sand, alluvial silts and rock shelter deposits. In valley floor and plains contexts, burials may occur in locally elevated topographies rather than poorly drained sedimentary contexts. Burials are also known to have occurred on rocky hilltops in some limited areas. Burials are generally only visible where there has been some disturbance of sub-surface sediments or where some erosional process has exposed them.

  - Although it is possible that this site type could be found within the Proposed Disturbance Area, it is considered a rare site type especially given the disturbance that has occurred within the Proposed Disturbance Area.

An examination of the landforms within the Proposed Disturbance Area (**Sections 3.1** and **3.2**) indicate that the Proposed Disturbance Area is in a degrading environment where soils have been moved from the slopes towards the creek systems. This would have the effect of displacing or impacting archaeological deposits had they existed in the Proposed Disturbance Area. The only exception to this is a small area of the Proposed Disturbance Area adjacent to Main Creek that is in an aggrading environment associated with erosion from a low hill to the northwest. This may mean that archaeological deposits may have become buried, or mixed with objects, such as artefacts, being washed down from adjoining hill slopes. Additionally, given the changes in hydrology within the area (**Section 3.3**), it is also possible that the bed of Main Creek has shifted in historic times, further impacting and disturbing the small areas of aggrading landforms adjacent to the creek.

4.5 RESEARCH QUESTIONS

Section 4.3.3 noted that the archaeological evidence at the MOC has not been sufficiently intact to help answer detailed questions concerning Aboriginal settlement strategies in the area. However, the evidence gained from previous investigations at the MOC indicate that a number of research questions can meaningfully be applied to the investigation of the Proposed Disturbance Area. These research questions include:

- What resources were available to the Aboriginal people using the Proposed Disturbance Area (food, stone and water)?

- How do the artefact assemblages from the sites along the slopes and ridge crests in the Proposed Disturbance Area differ from previously recorded sites that are located along Bettys and Main Creeks?
- What tasks were Aboriginal people undertaking at the sites?
- Did the Aboriginal people use the Proposed Disturbance Area at any particular time of the year?
- Are there hearths in the area?
- If there are hearths, do they contain remains (animal/plant) that may indicate what people were cooking/eating?
- Are there burials in the area?
- Is there evidence to suggest that Aboriginal people were using the area earlier than the mid to late Holocene?
- Can dates be obtained for the Aboriginal use of the area?
- What resources were transported to the area and where?

5 RESULTS OF ABORIGINAL ARCHAEOLOGICAL ASSESSMENT

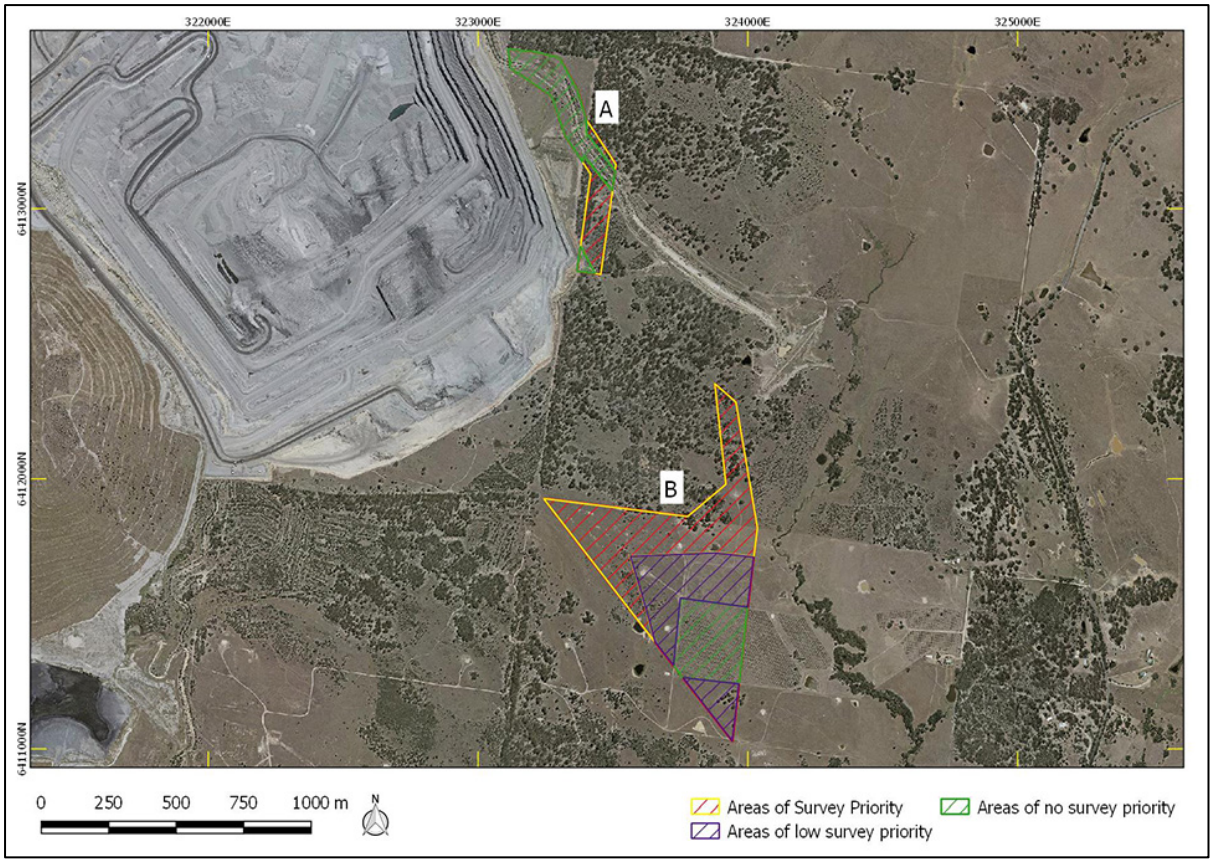
5.1 SAMPLING STRATEGY AND FIELD METHODS

The archaeological methods utilised in the Aboriginal archaeological assessment followed the Code of Practice and the survey methodology (OzArk 2017b) that had been sent to all RAPs (with valid contact details: see **Appendix 1**) for feedback between 31 July 2017 and 29 August 2017. Standard archaeological field survey and recording methods were employed in this survey (Burke & Smith 2004).

The following survey methods were employed in the three survey priority areas identified in OzArk 2017b (**Figure 5-1**):

- Areas of survey priority: The field survey was conducted in 50 m intervals, where possible, with the four surveyors spaced 5 m apart. Where field conditions did not allow straight transects, these landforms were investigated more opportunistically where exposures and/or vegetation allowed;
- Areas of low survey priority: The field survey did not include formal survey transects, but was rather focussed on areas of exposure where archaeological material had potential to be visible;
- Areas of no survey priority: The field survey comprised only spot checks in these areas as they were previously assessed as having been highly modified and extremely unlikely to contain archaeological sites.

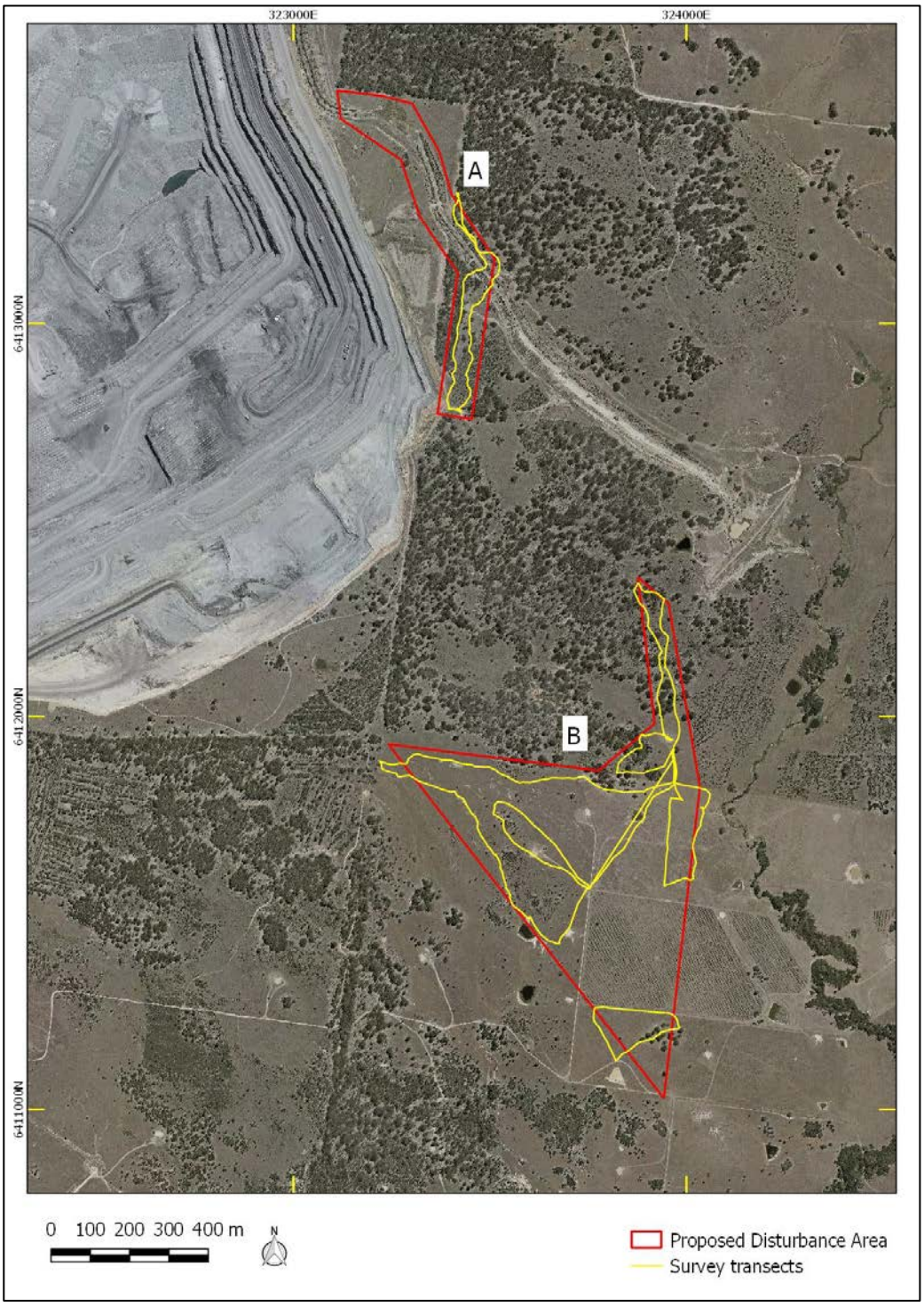
Figure 5-1. Areas of survey priority as established in OzArk 2017b.



The survey also included a buffer of at least 50 m around the outside of the Proposed Disturbance Area (where possible and warranted) and included the re-visiting and re-recording of any previously recorded sites within 100 m of the Proposed Disturbance Area to ensure that the site does not extend into areas where proposed impacts are to occur.

Figure 5-2 illustrates pedestrian coverage of the Proposed Disturbance Area. It should be noted that the below figure only displays transects of one surveyor although the Proposed Disturbance Area was assessed by an additional three surveyors.

Figure 5-2. The Proposed Disturbance Area showing survey transects.



5.2 SURVEY CONSTRAINTS

There were no constraints hindering the successful completion of the survey. As in any archaeological investigation, the incidence of exposures impacted the survey efficacy, and while the Proposed Disturbance Area contained sufficient exposures, much of the ground's surface within the Proposed Disturbance Area was obscured by thick grass cover. This diminished the survey efficacy in these areas but not to the extent that the archaeological potential of the area could be determined by an examination of the landform type, the distance to water and potential soil depth. In this way the archaeological potential of the Proposed Disturbance Area was adequately assessed (see **Section 5.3**).

5.3 EFFECTIVE SURVEY COVERAGE

Two of the key factors influencing the effectiveness of archaeological survey are ground surface visibility (GSV) and ground surface exposure (GSE). These factors are quantified in order to ensure that the survey data provides adequate evidence for the evaluation of the archaeological materials across the landscape. For the purposes of the current assessment, these terms are used in accordance with the definitions provided in the Code of Practice (DECCW 2010b).

GSV is defined as:

> *… the amount of bare ground (or visibility) on the exposures which might reveal artefacts or other archaeological materials. It is important to note that visibility, on its own, is not a reliable indicator of the detectability of buried archaeological material. Things like vegetation, plant or leaf litter, loose sand, stone ground or introduced materials will affect the visibility. Put another way, visibility refers to 'what conceals'* (DECCW 2010b: 39).

GSE is defined as:

> *… different to visibility because it estimates the area with a likelihood of revealing buried artefacts or deposits rather than just being an observation of the amount of bare ground. It is the percentage of land for which erosion and exposure was sufficient to reveal archaeological evidence on the surface of the ground. Put another way, exposure refers to 'what reveals'* (DECCW 2010b: 37).

Tables 5-1 and **5-2** quantify the survey efficacy of the assessment. The calculation of survey efficacy is generally low as there was an absence of extensive exposures within the Proposed Disturbance Area and large portions of the Proposed Disturbance Area contained a thick grass cover. However, as noted in **Section 5.2**, while GSE was low, the archaeological characteristics of the landforms within the Proposed Disturbance Area were determined through an investigation of landform type (i.e. the sloping landforms of the Proposed Disturbance Area are not conducive to long-term occupation), distance to water (i.e. no portions of the Proposed Disturbance Area

are associated with permanent water sources), potential soil depth (i.e. frequent rock outcropping indicates shallow soils) and previous disturbances (i.e. historical aerial photographs and existing erosion scalds indicate extensive past erosion events). Through a combination of these observations the survey efficacy indicated in **Table 5-1** was increased to a level that gave confidence that the Proposed Disturbance Area was effectively assessed.

Table 5-2 indicates that the only landform within the Proposed Disturbance Area to record evidence of Aboriginal occupation is crest landforms, albeit this recording is for a single artefact. While the survey efficacy of the crest landforms within the Proposed Disturbance Area is higher when compared to other landform types, it is felt that the one site recorded is probably due to the increased archaeological potential of crest landforms being potential transit pathways rather than the higher incidence of GSE.

Table 5-1. Survey coverage data.

Survey Unit	Landform	Survey Unit Area (sq m)	GSV %	GSE %	Effective Coverage Area (sq m) (= Survey Unit Area x GSV % x GSE %)	Effective Coverage % (= Effective Coverage Area / Survey Unit Area x 100)
1	Crest	40,000	60	10	2,400	6
2	Upper Slope	86,000	70	5	3,010	3.5
3	Mid slope	236,000	70	5	8,260	3.5
4	Lower slope	92,000	50	2	920	1
5	Flat	6,000	20	1	12	0.2

Table 5-2. Landform summary—sampled areas.

Landform	Landform area (sq m)	Area Effectively Surveyed (sq m) (= Effective Coverage Area)	% of Landform Effectively Surveyed (= Area Effectively Surveyed / Landform x 100)	Number of Sites	Number of Artefacts or Features
Crest	40,000	2,400	6	1[5]	1
Upper Slope	86,000	3,010	3.5	0	0
Mid slope	236,000	8,260	3.5	0	0
Lower slope	92,000	920	1	0	0
Flat	6,000	12	0.2	0	0

5.4 ABORIGINAL SITES RECORDED

No additional Aboriginal sites were recorded during the assessment. Further, no landform within the Proposed Disturbance Area was seen as having potential to contain further, subsurface archaeological deposits due to the moderate level of disturbance across the Proposed Disturbance Area and the generally thin soils.

[5] Previously recorded site MOCO IF-3 (37−3−1198).

5.5 PREVIOUSLY RECORDED ABORIGINAL SITES LOCATED WITHIN OR NEAR THE PROPOSED DISTURBANCE AREA

MOCO IF-3 (37−3−1198; see **Section 4.3.7.1**) is the only valid previously-recorded site within the Proposed Disturbance Area (**Figure 4-1**, **Figure 4-2** and **Figure 5-3**). This site was revisited during the site inspection, however, despite good areas of exposure, the artefact was unable to be located.

Figure 5-3. Inspection of the location of 37-3-1198 (MOCO IF-3).

The suspected location of 37-3-0687 (MC-7) was also inspected (see **Figure 4-1** for location). No artefacts were noted on the ground surface closer to Main Creek, although the long and thick grass may have obscured the artefacts (**Figure 5-4**). Importantly, no artefacts were noted within the Proposed Disturbance Area at the closest point to the site's location (where the photograph on **Figure 5-4** has been taken). Here the grass was less thick and views of the ground surface was afforded between tufts of grass. This gives confidence that MC-7 does not extend into the Proposed Disturbance Area.

Figure 5-4. View towards of the location of MC-7.

5.6 ABORIGINAL COMMUNITY INPUT

The representatives of the RAPs who attended the survey considered the survey coverage adequate and provided no further management recommendations concerning the Aboriginal cultural heritage values of the Proposed Disturbance Area.

5.7 DISCUSSION

The predictive model set out in **Section 4.4** indicates that isolated finds and low density artefact scatters were the most likely sites to be recorded within the Proposed Disturbance Area.

The fact that no new sites were recorded is possibly indicative of the following:

- Limited portions of the Proposed Disturbance Area intersect archaeologically sensitive landforms with the potential to contain sub-surface deposits. A-Horizon soils are thin across the Proposed Disturbance Area, with rock outcropping evident in many locations. This diminishes the opportunity to record Aboriginal sites;
- There has been a moderate to high degree of landform modification across the Proposed Disturbance Area due to past agricultural land uses (**Section 3.6**). Past land uses have had the effect of stripping top soils and potentially removing low density sites from the Proposed Disturbance Area had they once existed; and
- Large portions of the Proposed Disturbance Area, particularly surrounding the Bettys Creek diversion in Area A have been heavily modified by approved mining activities.

These activities have altered the ground surface in clear and observable ways and any sites in these areas have either been appropriately salvaged or have been irrevocably lost.

5.7.1 Response to research questions

Given the limited results of the survey, there is little light that can be shed on the research questions set out in **Section 4.5**. Despite this, brief answers to each research question will be provided below.

- What resources were available to the Aboriginal people using the Proposed Disturbance Area (food, stone and water)?
    - The Proposed Disturbance Area appears to have provided few resources to past Aboriginal populations as stone and water resources are absent and it is likely that food resources were limited given the paucity of water.
- How do the artefact assemblages from the sites along the slopes and ridge crests in the Proposed Disturbance Area differ from previously recorded sites that are located along Bettys and Main Creeks?
    - Too little data is available to allow a meaningful comparison, however, the paucity of sites in the Proposed Disturbance Area and the relatively more-frequent sites associated with Bettys and Main Creeks reinforce the strong observed correlation between site location and distance to water.
- What tasks were Aboriginal people undertaking at the sites?
    - Too little data is available to allow a meaningful understanding of this research question, however, it could be said that it appears that the sloping landforms of the Proposed Disturbance Area were not being utilised for camping, while the crest landforms may have had low level or transient occupation; probably associated with people moving through the landscape.
- Did the Aboriginal people use the Proposed Disturbance Area at any particular time of the year?
    - Too little data is available to allow a meaningful understanding of this research question
- Are there hearths in the area?
    - There are no known hearths in the Proposed Disturbance Area. Further, as the sloping landforms of the Proposed Disturbance Area were not conducive to camping, the existence of hearths becomes more unlikely.
- If there are hearths, do they contain remains (animal/plant) that may indicate what people were cooking/eating?
    - Not applicable.
- Are there burials in the area?

- There are no known burials in the Proposed Disturbance Area. Further, as the thin soils of the Proposed Disturbance Area are not conducive to burials, the existence of burials becomes more unlikely.

- Is there evidence to suggest that Aboriginal people were using the area earlier than the mid to late Holocene?
    - Like most locations in the Hunter Valley, there is no evidence of Pleistocene occupation within the Proposed Disturbance Area.
- Can dates be obtained for the Aboriginal use of the area?
    - No dateable materials were recorded during the survey.
- What resources were transported to the area and where?
    - No materials, apart from the silcrete that constitutes 37-3-1172 (MOCO IF-3), were recorded that indicates materials were being transported into the area.

5.7.1.1 Assessment of significance

5.7.2 Assessed significance of previously recorded sites

5.7.2.1 37-3-1172 (MOCO IF-3)

The scientific significance of 37-3-1172 (MOCO IF-3) has been assessed in OzArk 2013 (**Table 5-3**). It has been described as having low scientific / archaeological significance based on the following factors:

- Low density of artefacts;
- No formal tool types;
- Soil loss from erosion in the A-Horizon; and
- Existing disturbance from a vehicle access track.

The cultural, aesthetic and historical value of 37-3-1172 was assessed in the Approved Operations cultural values report (ACHA 2013). The site, like others in the Approved Operations disturbance area, has high cultural values as it is an indicator of past Aboriginal occupation in the area. 37-3-1172 has low aesthetic values due to past disturbances and its scant representation within the landscape. There are no known historical associations with the site and 37-3-1172 was assessed as having no historical values.

Table 5-3. 37-3-1172 significance assessment.

Site Name	Social or Cultural Value	Archaeological / Scientific Value	Aesthetic Value	Historic Value
37-3-1172 (MOCO IF-3)	High	Low	Low	None

5.7.2.2 37-3-0687 (MC-7)

37-3-0687 was recorded by Umwelt in 2003 and, as noted in **Section 4.3.7**, the author has not been able to consult the report associated with the recording. As such, information on the site card will be used to determine the site's significance.

The site, like others in the Approved Operations disturbance area, has high cultural values as it is an indicator of past Aboriginal occupation in the area. 37-3-0687 has low aesthetic values due to past disturbances and its scant representation within the landscape (no artefacts were visible at the time of the current assessment). There are no known historical associations with the site and 37-3-0687 was assessed as having no historical values.

The site card records that 37-3-0687 is:

- Situated on A2 skeletal soils;
- Severely disturbed by cattle grazing and European land use practices; and
- Of a low level of archaeological integrity.

While the site appears stable today with thick grasses obscuring the ground surface, the original recording in 2003, at the high point of a major drought period, afforded the recorders a much better view of the site condition than is available today. As noted above, the highly disturbed nature of the site was clear in 2003 and this has been used here to assess that the site has low scientific significance (**Table 5-4**) as this disturbance reduces the site's ability to accurately increase our knowledge of the region's archaeological context.

Table 5-4. 37-3-0687 significance assessment.

Site Name	Social or Cultural Value	Archaeological / Scientific Value	Aesthetic Value	Historic Value
37-3-0687 (MC-7)	High	Low	Low	None

5.8 LIKELY IMPACTS TO ABORIGINAL HERITAGE FROM THE PROPOSED MODIFICATION

Due to the nature of the proposed work across the entirely of the Proposed Modification, previously recorded Aboriginal site, 37-3-1172 (MOCO IF-3) would be totally destroyed should the Proposed Modification be approved (**Table 5-5**).

As 37-3-0687 (MC-7) is outside of the Proposed Disturbance Area, the site will not be directly impacted by the Proposed Modification. However, as the site is in close proximity to the Proposed Disturbance Area there is a chance that the site may be indirectly impacted by the Proposed Modification. As such, management of these indirect impacts will also be included in this assessment (**Section 6.2.2**).

Should the Proposed Modification be approved, no further known sites or archaeological deposits would be harmed.

Table 5-5. Impact assessment.

Site Name	Type of Harm (Direct/Indirect / None)	Degree of Harm (Total/Partial / None)	Consequence of Harm (Total/Partial/No Loss of Value)
37-3-1172 (MOCO IF-3)	Direct	Total	Total loss of value
37-3-0687 (MC-7)	Indirect	Total	Total loss of value

5.8.1 Ecological sustainable development principles

The goal of ecological sustainable development (ESD) is:

Development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.

The Core Objectives of ESD are:

- to enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;
- to provide for equity within and between generations; and
- to protect biological diversity and maintain essential ecological processes and life-support systems.

As such, the ESD principles have limited applicability to cultural heritage although the notion of inter-generational equity is relevant. This is understood to refer to future generations being able to enjoy, interact with and study aspects of cultural heritage that are available to current generations.

5.8.1.1 Applicability to the Proposed Modification

The Proposed Modification will result in the destruction of one previously recorded Aboriginal site. How to quantify this loss of heritage value to future generations is difficult. In an effort to understand the overall impact to heritage values, a series of guidelines have been developed by the Department of Planning and Environment to quantify and standardise impact assessments (DP&E 2016). The rubric outlined in DP&E 2016 leads to all impacts being graded within the matrix shown in **Figure 5-5**. **Table 5-6** assesses the heritage item liable to be harmed to arrive at a standardised 'value of impact'.

As can be seen in **Table 5-6**, the proposed impact to the recorded site has been evaluated as having a low heritage impact value. This 'value' should be read as an interplay between the heritage significance criteria and the degree of impact. In other words, the impacts arising from the proposal could be said to have an overall low heritage impact on the region's heritage values as impacts attributable to the proposal are limited to sites with overall low heritage values.

It needs to be borne in mind that this statement is not a reflection that artefacts are considered to have a 'low value', rather that the loss of heritage value has a 'low value' when considered at a regional setting. It is accepted that the Aboriginal cultural heritage sites discussed within the report are part of the Aboriginal cultural landscape of the area, and that they are linked and collectively tell an important story about the Aboriginal use of the area. As a result, they are significant and valued by Aboriginal people and should ideally be protected. However, if they must be impacted, then the sites under discussion here have a 'low value' in that they can add little to our knowledge or understanding of this Aboriginal cultural landscape.

As the overall heritage impact of the Proposed Modification is a 'low value of heritage impact', the intergenerational loss arising from the Proposed Modification is considered to be minimal and of low value.

5.8.2 Cumulative harm

As noted in **Section 5.9.1** the Proposed Modification will result in a low loss of heritage value. The loss of this isolated find contributes marginally to cumulative harm in the region but as the site itself is neither remarkable in its manifestation nor contains artefacts that are not commonly represented in the region, this loss of heritage value will not greatly add to the cumulative harm to Aboriginal cultural heritage in the region.

Figure 5-5. Potential impact to heritage items reference matrix.

	Significance of heritage object or place				
Degree of potential impact on heritage item		Very high	High	Medium	Low
	Total impact	Very high value	High value	Medium value	Low value
	High partial impact	High value	High value	Medium value	Low value
	Medium partial impact	Medium value	Medium value	Low value	Minimal value
	Minimal partial impact	Low value	Low value	Minimal value	Minimal value

Table 5-6: Overall value of potential impact on heritage item.

	Heritage item 1
Name or location of the heritage object or place	MOCO IF-3
Social or cultural value	2
Historical	0
Scientific	0
Aesthetic	0
Significance of heritage item	Low importance
Degree of impact (partial or full)	Full impact
Overall value of potential impact on heritage item	Low value
Reasoning behind scores	General disturbance at site; low artefact density.

6 MANAGEMENT AND MITIGATION: ABORIGINAL HERITAGE

6.1 GENERAL PRINCIPLES FOR THE MANAGEMENT OF ABORIGINAL SITES

Appropriate management of cultural heritage items is primarily determined on the basis of their assessed significance as well as the likely impacts of the proposed development. **Section 5.8.1** and **Section 5.9** describe, respectively, the significance / potential of the recorded sites and the likely impacts of the development. In **Section 5.9.2** the overall heritage impact was assessed as having a low value for the potentially impacted site. The following management options are general principles, in terms of best practice and desired outcomes, rather than mitigation measures against individual site disturbance.

- Avoid impact by altering the development proposal or in this case by avoiding impact to a recorded Aboriginal site. If this can be done, then a suitable curtilage around the site must be provided to ensure its protection both during the short-term construction phase of development and in the long-term use of the area. If plans are altered, care must be taken to ensure that impacts do not occur to areas not previously assessed.

- If impact is unavoidable then approval to disturb sites will be required under the authority of an approved MOC ACHMP. Aboriginal community consultation will need to continue during the formulation of the ACHMP and any revised ACHMP would need approval from the Department of Planning and Environment. The ACHMP would establish the appropriate management processes for any artefacts salvaged from within the Proposed Disturbance Area.

6.2 MANAGEMENT AND MITIGATION OF RECORDED ABORIGINAL SITES

6.2.1 37-3-1172 (MOCO IF-3)

One previously recorded isolated find, 37-3-1172 (MOCO IF-3), has been identified within the Proposed Disturbance Area. Due to the nature of the Proposed Modification, the site cannot be avoided. As the current survey has been undertaken in association with the comprehensive Continued Operations Project assessment, the site should be managed as a 'Group 2' site based on its low scientific significance (**Section 5.8.1**) and the low heritage impact of the proposed works (**Section 5.9.2**). 'Group 2' archaeological salvage equates to a recorded surface collection of the artefact as set out in the MOC ACHMP Section 7.2.2. More specifically, this should include:

- All visible artefacts at the sites should be flagged in the field;
- The sites should be photographed after flagging and before recording;
- All artefacts should have the following artefact information entered directly into a GPS unit:
    - Location;

- Artefact class;
- Artefact type;
- Size;
- Reduction level;
- Raw material; and
- Notes.

- Analysis will attempt to record a statistically valid artefact assemblage with which to compare to other sites salvaged under the terms of the MOC ACHMP during 2017 as part of the Approved Operations salvage program (see OzArk 2016).

- The supervising archaeologist is responsible for submitting an *Aboriginal Site Impact Recording Form* (ASIRF) to the AHIMS to update the register with the results of the salvage works.

6.2.2 37-3-0687 (MC-7)

37-3-0687 (MC-7) is located outside of the Proposed Disturbance Area but is located in an area of erosion associated with Main Creek. As part of existing commitments, Mount Owen regularly monitor Main Creek and as necessary undertake works within this area including erosion stabilisation works such as native vegetation reestablishment and other minor stabilisation works. Accordingly, the location of 37-3-0687 may require disturbance in this area as part of completing future erosion stabilisation works in this area. 37-3-0687 will remain *in situ*, and should further erosion stabilisation works occur in this area that may impact on 37-3-0687, prior to disturbance 37-3-0687 would be salvaged in accordance with the procedures for 'Group 2' sites in the approved ACHMP (as set out in **Section 6.2.1**).

7 RECOMMENDATIONS

Under Section 89A of the NPW Act it is mandatory that all newly-recorded Aboriginal sites be registered with OEH AHIMS. As a professional in the field of cultural heritage management it is the responsibility of OzArk to ensure this process is undertaken.

To this end it is noted that **no new Aboriginal sites** were recorded during the assessment. One previously recorded site, 37-3-1172 (MOCO IF-3), is located within the Proposed Disturbance Area and one previously recorded site 37-3-0687 (MC-7) is located outside but close to the Proposed Disturbance Area.

The following recommendations are made on the basis of these impacts and with regard to:

- Legal requirements under the terms of the NPW Act whereby it is illegal to damage, deface or destroy an Aboriginal place or object without the prior written consent of OEH;
- The findings of the current investigations undertaken within the Proposed Disturbance Area; and
- The interests of the Aboriginal community.

Recommendations concerning the Proposed Disturbance Area are as follows:

1. As disturbance to 37-3-1172 (MOCO IF-3) is unavoidable by the Proposed Modification, the surface artefact should be collected for safe-keeping. The collection process should be undertaken under an approved MOC ACHMP and follow the requirements of the 'Group 2' salvage process as set out in **Section 6.2.1** and as described by OzArk (OzArk 2016: 51–52) and within Section 7.2.2 of the MOC ACHMP. It is noted that the revised MOC ACHMP should focus on the outcomes of this study with the management processes identified in the approved MOC ACHMP remaining valid.
2. As 37-3-0687 (MC-7) is located in close proximity to the Proposed Disturbance Area and may be impacted in the future by erosion stabilisation works including revegetation and/or drainage works. It is recommended here that the site remain *in situ* until impacts are planned, at which time, the site should be salvaged as a Group 2 site as set out in **Section 6.2.1** and as described by OzArk (OzArk 2016: 51–52) and within Section 7.2.2 of the MOC ACHMP.
3. Outside of 37-3-1172 there are no archaeological constraints in the Proposed Disturbance Area, however, the following precautions should be made:
    a. Should any items be discovered during the Proposed Modification work that are suspected to be of Aboriginal origin, then work in the area should cease and the advice from a suitably qualified archaeologist sought to assess the nature of the

find and to suggest an appropriate path forward. Protocols contained in the MOC ACHMP (XMO SD PLN 0060) should be followed; and

b. All staff and contractors involved in the Proposed Modification work should undergo cultural heritage inductions to ensure they are aware of the legislative protection of all Aboriginal sites and objects.

REFERENCES

ACHM 2013 — Australian Cultural Heritage Management (Victoria) Pty Limited. 2013. *Mount Owen Continued Operations Project. Aboriginal Cultural Heritage Assessment Report and Consultation Records. Volume 1*. Report for Mt Owen Pty Ltd.

AMBS 1997 — Australian Museum Business Services. 1997. *Archaeological test Excavations of Aboriginal Sites at Bettys Creek Mt Owen Mine, Hunter Valley, NSW*. Report for Mt Owen Mine, BHP Coal Australia.

Appleton 2002 — Appleton, J. 2002. *Archaeological Assessment Ventilation Shaft Site and Powerline Glennies Creek*. Report to Consol Energy Australia.

Attenbrow 1982 — Attenbrow, V. 1982. The Archaeology of Upper Mangrove Creek Catchment: research in progress. In S. Bowdler (ed), *Coastal Archaeology in Eastern Australia, Proceedings of the 1986 Valla Conference on Australian Prehistory*. Department of Prehistory, Research School of Pacific Studies, ANU, Canberra: 67–78.

Australia ICOMOS 2013 — International Council on Monuments and Sites 2013. *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance*, 2013.

BoM 2017 — Bureau of Meteorology. 2017. www.bom.gov.au/

Brayshaw 1981 — Brayshaw, H. 1981. *Archaeological survey of Authorisation 89, proposed site of Bloomfield Collieries' Coal Mine at Rix's Creek, Singleton*. Report to NSW NPWS.

Brayshaw 1986a — Brayshaw, H. 1986. *Archaeological Survey of Glennies Creek Coal Authorisation Areas 81 and 308, Hunter Valley, NSW*. Report to Southland Coal Limited.

Brayshaw 1986b — Brayshaw, H. 1986. Aborigines of the Hunter Valley: a study of colonial records. Scone and Hunter Historical Society: Scone.

Burke & Smith 2004 — Burke, H. and Smith, C. 2004. *The Archaeologist's Field Handbook*, Blackwell, Oxford.

Davies 1991 — S.J. Davies. *An Archaeological Assessment of the Proposed Optic Fibre Cable Route between Cessnock and Scone, New South Wales*. A report to Telecom Australia.

Dean-Jones 1992 — Dean-Jones, P. 1992. *Archaeological Report Subsurface Analysis Swamp Creek, Mount Owen Mine Site*.

DECCW 2010 Department of Environment, Climate Change and Water, Sydney (now OEH). *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*.

DP&E 2016 Department of Planning and Environment. Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals.

ERM 1999 ERM Mitchell McCotter Pty Limited. 1991. Ravensworth East Mine Environmental Impact Statement. Report for Peabody Resources Limited.

ERM 2004 Environmental Resources Management Australia. 2004. *Upper Hunter Valley Aboriginal Heritage Baseline Study*. Report for Upper Hunter Heritage Trust.

ERM 2009 Environmental Resources Management Australia. 1999. *Integra Underground Coal Project Heritage Assessment*. Report to Integra Underground.

GHD 2005 GHD (International) Pty Limited. 2005. *Proposed Coal Stockpile at Newpac No. 1 Colliery, Ravensworth. Environmental Impact Statement, Volume 1*. Report to Resource Pacific Ltd.

Godwin 1987 Godwin, L. 1987. *A Preliminary Archaeological Survey of a Proposed Open-cut Coalmine at Ravensworth in the Hunter Valley of N.S.W*. A report to Croft and Associates Pty. Ltd.

Haglund 1981b Hagland, L. 1981. *Archaeological investigations in the area of the proposed Kerrabee dam*. Report to NSW Water Resources Commission.

Haglund 1982 Hagland, L. 1981. *Archaeological Survey of Pikes Gully Colliery Area, Liddell, N.S.W.* Report for Longworth and McKenzie Pty. Limited.

Hiscock 1986 P. Hiscock. *A technological analysis of stone artefact assemblages from the Hunter River Valley region*. A report to NPWS.

Hiscock 1993 Hiscock, P. 1993. Bondaian Technology in the Hunter Valley, New South Wales, *Archaeology in Oceania* 28(1993): 65–76.

HLA-Envirosciences 2005 HLA Envirosciences (J. Czastka). 2005. *Preliminary Research Permit #1982: Excavations and Findings at Newdell Junction, Ravensworth*. Report to Macquarie Generation.

Koettig 1986 Koettig, M. 1986. *Test excavations at six locations along the proposed pipeline route between Singleton and Glennies Creek Dam, Hunter Valley Region, NSW*.

Koettig 1990 — Margrit Koettig. *Camberwell Coal Project - Glennies Creek Supplementary Report on Aboriginal Sites*. Report to Epps and Associates Pty Limited.

Koettig 1992 — Margrit Koettig. *Salvage Excavations of Aboriginal sites on the Camberwell Lease Volumes 1 to 4*. Report to Camberwell Coal Pty. Limited.

Moore 1970 — Moore, D.R. 1970. Results of an archaeological survey of the Hunter River Valley, New South Wales, Australia. *Records of the Australian Museum* 28: 25-64.

Moore 1981 — Moore, D.R. 1981. Results of an archaeological survey of the Hunter River Valley, New South Wales, Australia. *Records of the Australian Museum* 33: 388-442.

OEH 2011 — Office of Environment and Heritage 2011. *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW.*

OzArk 2014 — OzArk Environmental & Heritage Management Pty Limited. 2014. *Aboriginal Archaeological Values Assessment. Mount Owen Continued Operations. Near Ravensworth, Upper Hunter Valley, NSW*. Report for Mt Owen Pty Ltd.

OzArk 2016 — OzArk Environmental & Heritage Management Pty Limited. 2016*. Mount Owen Open Cut: Aboriginal Cultural Heritage Management Plan*. Management Plan for Mt Owen Pty Limited.

OzArk 2017a — OzArk Environmental & Heritage Management Pty Limited. 2017. *Aboriginal Archaeological Salvage Report. Mount Owen Continued Operations. Near Ravensworth, Upper Hunter Valley,* NSW. Report for Mt Owen Pty Ltd.

OzArk 2017b — OzArk Environmental & Heritage Management Pty Limited. 2017. *Aboriginal Cultural Heritage Survey Methodology: Mount Owen Continued Operations Modification 2, Singleton LGA*. Report for Mt Owen Pty Limited.

Resource Planning 1991 — Resource Planning Pty Limited*.* 1991. *Environmental Impact Statement Mount Owen Coal Project Hebden - New South Wales.* Report for Hunter Valley Coal Corporation Pty Limited.

Speight 1990 — Speight, J.G. 1990. *Australian Soil and Land Survey Field Handbook*. CSIRO Publishing, Collingwood.

Stern 1981 — N. Stern. *Salvage excavation and surface collection at Nine Mile Creek, Saxonvale Coal Mine, Hunter Valley*. Report to the Central Engineering Division BHP, Sydney.

Tocomwall 2017 — Tocomwall Pty Ltd. 2017. *Due Diligence Assessment. Mt Owen Exploration Drilling Program, NSW*. Report for Mt Owen Pty Limited.

Umwelt 2003 — Umwelt (Australia) Pty Limited. 2003. *Survey and Assessment of Impact on Aboriginal Cultural Heritage and Archaeological Values, Main Creek, Hunter Valley, NSW*. Prepared for Glennies Creek Coal Management.

Umwelt 2004 — Umwelt (Australia) Pty Limited. 2004. *Survey of Aboriginal Archaeology in the Area of the Proposed C-Pit Extension and Overburden Dump, Eastern Rail Pit, Bettys Creek Diversion Canal and Dam, and Glendell to Mount Owen Haul Road. Mount Owen Mine, near Hebden, NSW*. A Report to Hunter Valley Coal Corporation.

Umwelt 2005 — Umwelt (Australia) Pty Limited. 2005. *Research Design and Methodology to Accompany a Section 90 Consent Application for Aboriginal Sites within the Glendell Open Cut Mine Project, Singleton, NSW*. Report to Hunter Valley Coal Corporation.

Umwelt 2007 — Umwelt (Australia) Pty Limited. *Statement of Environmental Effects for the Bulga Underground Southern Mining Area Modification – Section 96(2) Application to Modify Consent DA 376-8-2003*. Report for Bulga Coal Management Pty Limited.

Umwelt 2012 — Umwelt (Australia) Pty Limited. 2012. *Part 1 – Bettys Creek Salvage Program, Mount Owen Extension Area Surface and Subsurface Salvage under Section 90 Aboriginal Heritage Impact Permit #1762*. Report for Xstrata Mount Owen.

Umwelt 2013 — Umwelt (Australia) Pty Limited. 2013. *Part 3: Bettys Creek Salvage Program. Mount Owen Operations Area. Surface and Subsurface Salvage under Section 87/90 Aboriginal Heritage Impact Permit #2267*. Report for Xstrata Mount Owen.

Umwelt 2015 — Umwelt (Australia) Pty Limited. 2015. *Mount Owen Continued Operations Project Environmental Impact Statement*.

APPENDIX 1: ABORIGINAL COMMUNITY CONSULTATION

RAP list and consultation log (Stages 1–4).

Group	Contact Person	ACHCRs Stages 1-3	ACHCRs Stage 4
Hunter Valley Cultural Consultants	Christine Archbold	Posted Survey Methodology on 28/7/17	Posted draft ACHAR on 7/11/17.
JLC Cultural Services	Jenny-Lee Chambers	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Wanaruah Local Aboriginal Land Council	Noel Downs	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
DRM Cultural Management	Helen Faulkner	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Wonn 1 Contracting	Arthur Fletcher	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017. Email received on 8/11/17 requesting a copy of the salvage report on a USB. Sent on 22/11/17.
Aliera French Trading	Aliera French	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Kauma Pondee Consultants	Jill Green	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Wonnarua Cultural Heritage	Gordon Griffiths	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
T & G Culture Consultants	Tony Griffiths	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Hunter Valley Cultural Surveying	Luke Hickey	Posted Survey Methodology on 28/7/17	Posted draft ACHAR on 7/11/17.
Wattaka Wannarua Cultural Consultancy Services	Des Hickey	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Kayaway Eco Cultural and Heritage Services	Mark Hickey	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Widescope Indigenous Group Pty Ltd Wonnarua Traditional Custodians (WTC) / Amanda Hickey Cultural Consultants	Amanda Hickey	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Gidawaa Walang Cultural Heritage Consultancy	Ann Hickey	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Gomery Cultural Consultants	David Horton	Posted Survey Methodology on 28/7/17	Posted draft ACHAR on 7/11/17
Muswellbrook Cultural Consultants	Brian Horton	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Waabi Gabinya Cultural Consultancy	Elizabeth Howard	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Heilamon Cultural Consultants	Clifford Johnson	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Bunda Consultants	Tammy Knox	Posted Survey Methodology on 28/7/17	Posted draft ACHAR on 7/11/17. Received correspondence back returned to sender 30/11/17.
Wonnarua Cultural & Heritage	Rebecca Lester	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Wunda Cultural Consultants	Travis Matthews	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Roger Noel Matthews	Roger Matthews	Posted Survey Methodology on 28/7/17	Posted draft ACHAR on 7/11/17. Received correspondence back returned to sender 30/11/17.

Group	Contact Person	ACHCRs Stages 1-3	ACHCRs Stage 4
Breeza Plains Culture & Heritage Consultants	Terry Matthews	Posted Survey Methodology on 28/7/17	Posted draft ACHAR on 7/11/17.
Carrawonga Consultants	Justin Matthews	Posted Survey Methodology on 28/7/17. Call received from Margaret Matthews on 7/8/17 to advise that Justin doesn't live at listed address. Attempted to contact Justin on all phone numbers listed in Consultation Manager to get updated address but was only able to leave messages.	Unable to send draft ACHAR report as no valid contact details. Called all numbers listed in Consultation Manage but they are either not connected or there was no answer.
Bullem Bullem	Lloyd Matthews	Posted Survey Methodology on 28/7/17. Call received from Margaret Matthews on 7/8/17 to advise that her brother in-law Lloyd is deceased.	
Aboriginal Native Title Consultants	Margaret Matthews	Posted Survey Methodology on 28/7/17. Call received from Margaret on 7/8/17 to enquire why she hadn't been sent a copy of the Survey Methodology. The postal address we had on file was incorrect and has now been updated. Margaret advised that John Matthews, Darrel Matthews and her endorse the Survey Methodology but made comment that if during the field survey a significant number of artefacts are located then they would like test pitting conducted.	Posted draft ACHAR on 7/11/17.
Galamaay Consultant	Karen Matthews	No valid email or postal address or phone number in Consultation Manager	Unable to send draft ACHAR report as no valid contact details. Called all numbers listed in Consultation Manage but they are either not connected or there was no answer.
Mingga Consultants	Clifford Matthews	Posted Survey Methodology on 28/7/17	Posted draft ACHAR on 7/11/17.
Upper Hunter Heritage Consultants	Darrel Matthews	Emailed Survey Methodology on 31/7/17. See Margaret Matthews.	Emailed draft ACHAR on 7/11/2017
Giwirr Consultants	Rodney Matthews	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Deslee Talbot Consultant	Deslee Matthews	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Lower Hunter Wonnarua Council Inc	Thomas Miller	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Cheryl Moodie Consulting	Cheryl Moodie	No valid email or postal address or phone number in Consultation Manager	Unable to send draft ACHAR report as no valid contact details.
Ungooroo Aboriginal Corporation	Allen Paget	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Divine Diggers ACC	Deidre Mensah	Emailed Survey Methodology on 31/7/17. Email received on 16/10/17 stated "I am letting you know all good with me" regarding the survey methodology, however, this was received after the survey was conducted.	Emailed draft ACHAR on 7/11/2017
Wonnarua Nation Aboriginal Corporation	Laurie Perry	Emailed Survey Methodology on 31/7/17. Laurie responded to email saying that he would provide comment by 29 August. No further comment was received.	Emailed draft ACHAR on 7/11/2017

Group	Contact Person	ACHCRs Stages 1-3	ACHCRs Stage 4
Upper Hunter Wonnarua Council Incorporated	Victor Perry	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
AGA Services	Adam Sampson	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Cacatua Culture Consultants	George Sampson	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Bawurra Consultants	Kevin Sampson	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
KL.KG Saunders Trading Services	Kylie G Saunders	Posted Survey Methodology on 28/7/17. Received Survey Methodology back returned to sender on 30/8/17. Attempted to update details via phone but all numbers in Consultation Manager are disconnected.	Unable to send draft ACHAR report as no valid contact details. Called all numbers listed in Consultation Manager but they are either not connected or there was no answer.
Myland Cultural & Heritage Group	Warren Schillings	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Culturally Aware	Tracey Skene	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017. Email received from Tracey on 21/11/17 which said "I have no issues at this point of time".
Kawal Cultural Services	Vicky Slater	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017 Email received from Vicky on 7/11/17 that she no longer wants to be consulted on any Glencore Hunter Valley projects as she no longer lives in the area.
Warragil Cultural Services	Aaron Slater	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Smith Dhagaans Cultural Group	Timothy Smith	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Yinarr Cultural Services	Kathie Steward-Kinchela	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Ungooroo Cultural and Community Services Inc	Rhonda Ward	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Ngarramang- Kuri Aboriginal Cultural Heritage Group	Abie Wright	Posted Survey Methodology on 28/7/17	Posted draft ACHAR on 7/11/17.
I & E Aboriginal Culture and Heritage	Ivy Jaeger	Posted Survey Methodology on 28/7/17	Posted draft ACHAR on 7/11/17.
EMT Cultural & Heritage	Esther Tighe	Posted Survey Methodology on 28/7/17	Posted draft ACHAR on 7/11/17. Received draft ACHAR returned to sender on 22/11/17.
Moreeites	Susan Cutmore	Posted Survey Methodology on 28/7/17 Received Survey Methodology back returned to sender on 30/8/17. Attempted to update details via phone but phone number in Consultation Manager is disconnected.	Attempted to contact Susan to confirm current contact details but only contact number is not connected. Unable to send MOCO Mod 2 draft ACHAR survey report to Susan.
L.J. Culture Management	Les Field	Posted Survey Methodology on 28/7/17	Emailed draft ACHAR on 7/11/2017
Murrawan Cultural Consultants	Robert Smith	Posted Survey Methodology on 28/7/17	Posted draft ACHAR on 7/11/17
Lower Hunter Aboriginal Incorporated	David Ahoy	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
DFTV Enterprises	Derrick F Vale	Posted Survey Methodology on 28/7/17	Emailed draft ACHAR on 7/11/2017

Group	Contact Person	ACHCRs Stages 1-3	ACHCRs Stage 4
Crimson-Rosie	Jeffrey N Matthews	Posted Survey Methodology on 28/7/17	Posted draft ACHAR on 7/11/17.
Hunter Valley Aboriginal Corporation	Rhonda Griffiths	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017. Email received on 7/11/17 requesting a hardcopy of the MOCO salvage report be posted to HVAC. Report posted on 22/11/17.
Tocomwall Pty Limited	Scott Franks	Emailed Survey Methodology on 31/7/17. Received letter dated 3/8/17 commenting on Survey Methodology – refer to **Appendix 2**.	Emailed draft ACHAR on 7/11/2017
Hunter Wonnarua Traditional Owners Wattaka Wonnarua Cultural Consultants Services; Wonnarua Traditional Custodian (WTC)	Desmond Hickey	Emailed Survey Methodology on 31/7/17	Emailed draft ACHAR on 7/11/2017
Maree Waugh	Maree Waugh	Emailed methodology on 31/7/17.	Emailed draft ACHAR on 7/11/17
Jarban + Mugrebea	Les Atkinson	Emailed on 6/7/17 to seek response whether he wanted to be consulted on the Proposed Modification. Email received on 30/10/17 to advise that Jarban + Mugrebea wish to be consulted. Survey methodology was not sent to them as they responded after the field survey was conducted.	Emailed draft ACHAR on 7/11/17

Letter to individuals on the OEH Stakeholder Register.

MT OWEN
OPEN CUT
GLENCORE

6 July 2017

[redacted]

Dear [redacted],

Re: Mt Owen Continued Operations Modification 2 – Aboriginal Cultural Heritage Survey

We are contacting you as you are listed on the Office of Environment & Heritage Aboriginal Stakeholder Register for the Singleton Shire Council. We are seeking your response as to whether you would like to be included in the consultation for the Mt Owen Continued Operations Modification 2 (proposed Modification).

In December 2015, Glencore obtained mining tenements associated with its acquisition of the Integra Underground Mine. Prior to this acquisition, non-Glencore ownership of these tenements restricted the North Pit mine plan that formed part of the Mt Owen Continued Operations Project approval. A drilling program completed in 2016 has confirmed the presence of mineable reserves over these acquired tenements. We are now seeking to modify our Project Approval (SSD-5850) to increase the life and mining area of the North Pit.

Recovery of the additional coal resource (41 million tonnes of run-of-mine coal) will come from a further 46 ha of disturbance on land wholly owned by Mt Owen. The area represents an increase of approximately 3.5% to the area currently approved. This change to the North Pit will allow the extension of the approved mine life through to 2035 (an additional 4 years).

OzArk Environmental & Heritage Management has been engaged to prepare an Aboriginal Cultural Heritage Survey Methodology for the proposed Modification area. The Aboriginal Cultural Heritage Assessment of the proposed Modification area will follow the Code of Practice for the Investigation of Aboriginal Objects in New South Wales (DECCW 2010). The field inspection will follow the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales (OEH 2011).

If you would like to be included in consultation for the proposed Modification, or wish to discuss any matter further, please contact myself on 0404 384 808, 02 6520 2686 or catherine.fenton@glencore.com.au.

Yours sincerely

Catherine Fenton
Approval Officer
Mt Owen Complex

Attachment: Community Information Sheet 1 - June 2017

PO Box 320, Singleton, NSW 2330
Hebden Road, Hebden, NSW 2330
T + 61 2 6570 0880 F + 61 2 6576 1643 www.glencore.com

Mt Owen Pty Ltd ABN 83 003 827 361

Information sent to all RAPs as part of Stage 2.

MT OWEN
CONTINUED OPERATIONS

GLENCORE

Community Information Sheet
June 2017

01

This information sheet provides an overview of a proposed modification to the approved North Pit mine plan at Mount Owen. It describes the key aspects of the modification, further consultation and timeline for the government approvals process.

About the Project

Mount Owen received approval from the Planning Assessment Commission for the Mount Owen Continued Operations Project in November 2016. The Mount Owen Continued Operations Project approval combines the existing development consents for the Mount Owen and Ravensworth East operations and allows for mining until 2031.

In late 2015, Glencore obtained mining tenements associated with its acquisition of the Integra Underground Mine. Prior to this acquisition, non-Glencore ownership of these tenements restricted the North Pit mine plan that formed part of the Mount Owen Continued Operations Project approval. A drilling program completed in 2016 has confirmed the presence of mineable reserves over these acquired tenements. We are now seeking to modify our Project Approval to increase the life and mining area of the North Pit by an additional 41 million tonnes (Mt) of run-of-mine (ROM) coal.

Recovery of the additional coal resource will come from a further 46 ha of disturbance and mining down to the Lower Hebden Seam. The area shown in Figure 1 represents an increase of approximately 3.5% to the area currently approved. This change to the North Pit will allow the extension of the approved mine life through to 2035 (an additional 4 years).

Why wasn't the modification to the North Pit mine plan included in the Mount Owen Continued Operations Project?

The timing of the Integra Underground Mine acquisition and the time required for the development of an optimised North Pit mine design did not allow for this area to be included in the Mount Owen Continued Operations Project.

What stays the same?

- No change to mining methods
- No change to annual production
- No change to hours of operation
- No additional infrastructure requirements, with the exception of some changes to water management

What changes?

- Increased length of mining and employment to 2035 (an additional 4 years)
- Increased total volume of coal mined (approximately additional 41 Mt ROM spread out over the life of the mine)
- Increased disturbance of approximately 46 hectares

In designing the modified mine plan, we have considered:

- Limiting new areas of disturbance
- Avoiding biodiversity offset areas
- Maintaining a set back from Main Creek
- In-built management features to minimise air quality & noise impacts
- Outcomes of 2016 exploration program

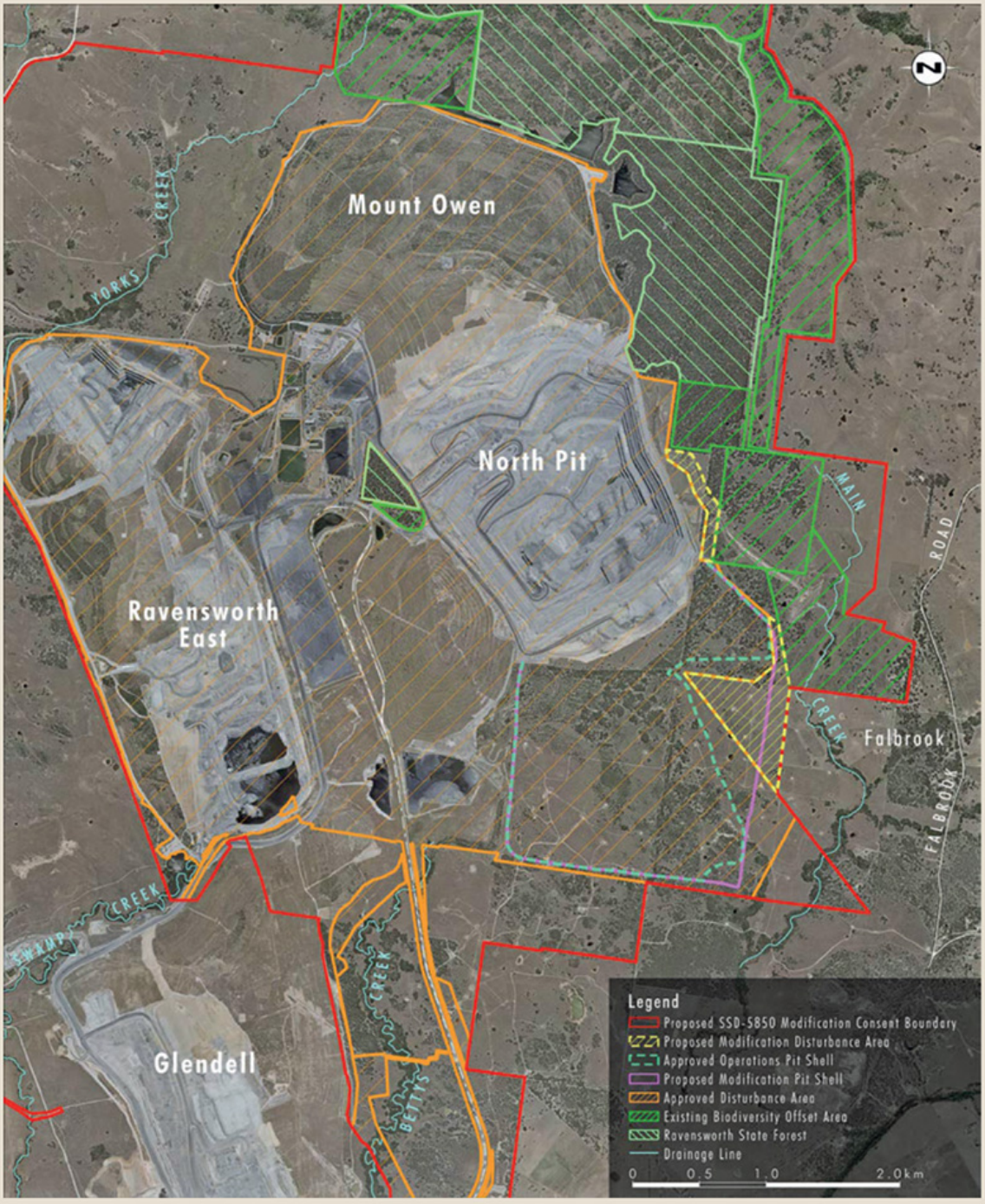
Glencore | Mount Owen Continued Operations Modification - Community Information Sheet | 1

Keys aspects of the proposed modification

The following is an overview of the proposed modification compared to the current Mount Owen operations.

Component	Proposed Modification	Approved Operations
Mining Method	No change	Truck and excavator
Resource	No change	To Lower Hebden Seam
Disturbance Area	Additional 46 ha disturbance area (increase of 3.5% of total approved disturbance area) Up to 380 m depth (average 340 m) Modification to consent boundary to include proposed disturbance area	1,335 ha disturbance. Up to 300 m depth
Annual Production	No change	Ravensworth East – 4 Mtpa Mount Owen – 10 Mtpa
Mine Life	2035 (increase of 4 years)	2031
Total Resource Recovered	Approximately additional 41 Mt ROM coal spread out over the life of the mine (16% of total approved resource)	Total of 257 Mt ROM coal (Ravensworth East – 48 Mt Mount Owen – 209 Mt)
CHPP Production	No change	17 Mtpa
Management of Mining Waste	Emplacement of waste in approved disturbance areas (up to maximum approved height of 230 m) Tailings emplacement within West Pit and regional tailings management scheme	Emplacement of waste in-pit and out-of-pit (ERP, WOOP Dump), up to maximum approved height of 230 m Tailings emplacement in Ravensworth East Voids (including West Pit)
Product Transportation	No increase in train movements	4 to 5 trains per day
Water Management	Extension of water management system to additional disturbance area No changes to existing approved creek diversions	Upper and Middle Bettys Creek Diversions Minimal drawdown of Main and Bettys Creek alluvium
Operational Workforce	No change	920
Hours of Operation	No change	24 hours, 7 days per week
Final Landform	No additional void in final landform Proposed changes to the final void arrangement in North Pit Final landform to be designed to incorporate detailed design commitments relating to landform design (including micro relief), conservation and water management considerations	Two final voids at Bayswater North Pit and North Pit Final landform approved with commitments relating to landform design (including micro relief), conservation and water management considerations as part of further detailed mine design

Figure 1 - Proposed Modification to Mount Owen Continued Operations Project



Discussion with Landholders

Consulting the community is a key part of the environmental and social assessments that Mount Owen will complete as part of the proposed modification. This will include one-on-one meetings, phone discussions, community information sheets and a community information day. Our aims are to:

- Provide the community with an overview of the proposal and identify the key issues for consideration in the assessment process
- Inform the planning and development of appropriate strategies to better manage the effects the project may have, and
- Allow key stakeholders to have a voice in the assessment program.

Mount Owen has commenced engagement with key government agencies, the community consultative committee and our near neighbours.

The results of the environmental and social impact assessments will be communicated in an upcoming community information sheet and a community information day prior to lodging the modification. Near neighbours will be contacted when the impact assessments are completed and personal meetings offered to discuss the outcomes of the studies.

Approvals Process

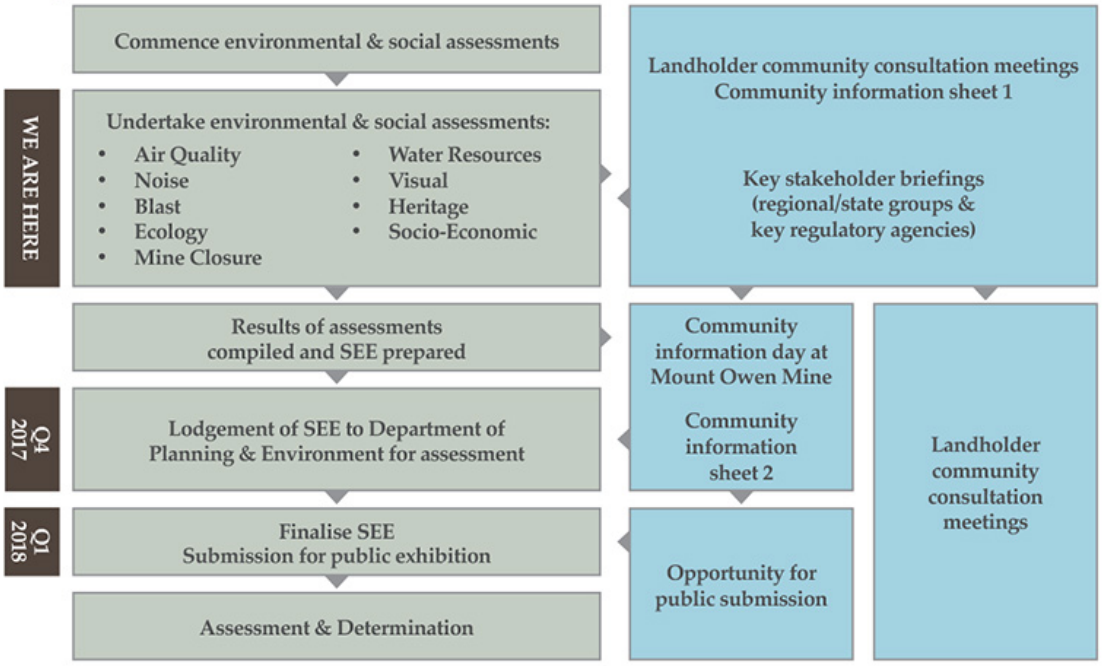
Approval for the modification will be sought under Section 96(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act). As a State Significant Development the Minister for Planning will be the consent authority.

The modification is considered to be substantially the same development as the approved operations because:

- The overall nature and scale of the development remains similar
- There is no change to annual production limits
- The majority of the approved development remains unchanged, and
- The environmental impacts associated with the proposed modification are expected to be substantially the same.

This approval pathway has been confirmed with the Department of Planning and Environment. We have commenced the environmental and social assessments which will inform the Statement of Environmental Effects (SEE) to support the proposed modification. Mount Owen plans to submit the application and accompanying SEE at the end of this year.

Steps in the Assessment Process



Further information

We hope that you have found this information sheet useful and welcome your feedback on the proposed modification for consideration as part of the detailed assessment process.

If you would like more information, or would like to schedule a meeting with the project team, please contact:

Vicki McBride
Approval Manager
Mount Owen Complex
T: 0438 646 286
E: Vicki.McBride@glencore.com.au

Catherine Fenton
Approval Officer
Mount Owen Complex
T: 0404 384 808
E: Catherine.Fenton@glencore.com.au

Letter to RAPs seeking comments on the survey methodology (Stage 3).

MT OWEN
OPEN CUT
GLENCORE

28 July 2017

[redacted]

Dear [redacted],

Re: Mount Owen Continued Operations Modification 2 – Aboriginal Cultural Heritage Survey

You are being contacted as you are listed as a Registered Aboriginal Party for the Mount Owen Continued Operations. We are seeking your feedback on the Mount Owen Continued Operations Modification 2 (proposed Modification) Aboriginal Cultural Heritage Survey Methodology.

In December 2015, Glencore obtained mining tenements associated with its acquisition of the Integra Underground Mine. Prior to this acquisition, non-Glencore ownership of these tenements restricted the North Pit mine plan that formed part of the Mount Owen Continued Operations Project approval. A drilling program completed in 2016 has confirmed the presence of mineable reserves over these acquired tenements. We are now seeking to modify our Project Approval (SSD-5850) to increase the life and mining area of the North Pit.

Recovery of the additional coal resource (41 million tonnes of run-of-mine coal) will come from a further 46 ha of disturbance on land wholly owned by Mount Owen. The area represents an increase of approximately 3.5% to the area currently approved. This change to the North Pit will allow the extension of the approved mine life through to 2035 (an additional 4 years).

OzArk Environmental & Heritage Management has been engaged to prepare an Aboriginal Cultural Heritage Survey Methodology for the proposed Modification area. The Aboriginal Cultural Heritage Assessment of the proposed Modification area will follow the Code of Practice for the Investigation of Aboriginal Objects in New South Wales (DECCW 2010). The field inspection will follow the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales (OEH 2011).

If you would like to provide feedback on the proposed methodology, or wish to discuss any matter further, please contact myself on 0404 384 808, 02 6520 2686 or catherine.fenton@glencore.com.au.

Yours sincerely

Catherine Fenton
Approval Officer
Mount Owen Complex

Attachments:
Community Information Sheet 1 - June 2017
Aboriginal Cultural Heritage Survey Methodology – July 2017

PO Box 320, Singleton, NSW 2330
Hebden Road, Hebden, NSW 2330
T + 61 2 6570 0880 F + 61 2 6576 1643 www.glencore.com

Mt Owen Pty Ltd ABN 83 003 827 361

Letter to RAPs seeking comments on the draft ACHAR (Stage 4).

MT OWEN
OPEN CUT
GLENCORE

6 November 2017

[redacted]

Dear [redacted],

Mount Owen Continued Operations - Modification 2
Draft Aboriginal Cultural Heritage Assessment Report

The accompanying draft Aboriginal Cultural Heritage Assessment Report details the recent field survey completed at Mount Owen on 31 August 2017. This document is provided for your information to give registered parties a reasonable opportunity to make submissions (whether written or oral). The *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* allows for a period of at least 28 days for those parties to review the report and respond with any comments or submissions.

Preferably, submissions should be directed to the below mentioned email address. However, please call if you would like to discuss personally.

If you would like a copy of the Aboriginal Cultural Heritage Salvage Report for the Mount Owen Continued Operations Project salvage program that was carried out between 6th and 14th February 2017 and on 4 April 2017 please contact me. This work completed all the Aboriginal Cultural Heritage Management Plan (ACHMP) commitments regarding archaeological salvage.

Yours sincerely,

Catherine Fenton
Approval Officer
Mount Owen Complex
Email: Catherine.fenton@glencore.com.au
Mobile: 0404 384 808

Attachments:
Aboriginal Cultural Heritage Assessment Report – November 2017

PO Box 320, Singleton, NSW 2330
Hebden Road, Hebden, NSW 2330
T + 61 2 6570 0880 F + 61 2 6576 1643 www.glencore.com

Mt Owen Pty Ltd ABN 83 003 827 361

APPENDIX 2: RESPONSES TO THE SURVEY METHODOLOGY.

Response from Tocomwall Pty Ltd.

Tocomwall Pty Ltd
PO Box 76 Caringbah NSW 1495
Tel: 02 9542 7714 Fax: 02 9524 4146
Email: info@tocomwall.com.au www.tocomwall.com.au
ABN: 13 137 694 618

Catherine Fenton
Approval Officer
Mount Owen Continued Operations

3 August 2017

Dear Catherine,

Re: Aboriginal Cultural Heritage Survey Methodology: Mount Owen Continued Operations Modification 2.

Tocomwall have reviewed the aforementioned Ozark methodology and have the following comments, suggestions and requests to make before we sign off on the proposed methodology.

The Ozark methodology states:

*'One site recorded during the Approved Operations survey, 37-3-1172, remains in the Proposed Modification study area. 37-3-1172 is a silcrete flake that was recorded on a track on a crest within mid slope landforms (**Figure 2-1**, **Figure 3-2**). The site is located in an area of generally high disturbance as the track is well-used and graded. Further artefacts (37-3-1170 and 37-3- 1171) were recorded on or near this location. These sites indicate use of this ridge area that would have been traversed when moving from the Bettys Creek catchment to the more-easterly Main Creek catchment. It was assessed that there is A-Horizon soil depth at the site, although it is unlikely that the site is associated with intact subsurface archaeological deposits* (pp8). '

On what basis is the statement '*although it is unlikely that the site is associated with intact subsurface archaeological deposits* (*ibid*)' made? It is fine to make such statements; however, scientific methods usually involve some form of evidence being presented to inform and substantiate such statements. For example, Ozark mentions the fact that the sites on the ridgeline indicate its use as a travel route between catchments. It would also be an excellent vantage point and be of use in terms of signaling to other groups in the area. Why couldn't the location also be a campsite or specific activity area – the absence of water not necessarily being an issue?

The report quotes Tocomwall's due diligence report from earlier this year. However, the quotes presented are somewhat misleading since one location – STR05 – was removed from the drilling program because it was *confirmed as a PAD*. Obviously, there is no way that Ozark would have known this, hence why we have mentioned it within this review. However, this point is raised because there is the potential that other PAD may still be located within the proposed modification areas (and see comments below that are also pertinent to this).

Ozark also make a bold statement in regards to predictive modeling on page 11 of the methodology:

'Therefore, the results of over 30 years of archaeological research has demonstrated that the archaeological landscape of the Hunter Valley is generally not preserved to the level to allow detailed modelling of settlement patterns beyond the most basic attributes.'

Tocomwall Pty Ltd
PO Box 76 Caringbah NSW 1495
Tel: 02 9542 7714 Fax: 02 9524 4146
Email: info@tocomwall.com.au www.tocomwall.com.au
ABN: 13 137 694 618

Tocomwall take exception to this very generalised and inaccurate statement. Whereas large areas of the Hunter Valley are most certainly destroyed in regards to high resolution archaeological modelling, areas remain where high-resolution data still exists. For example, the Hillcrest offset area associated with the Ravensworth Operations identified areas – including areas with multiple buried soil horizons – with superb potential for high-resolution data (Tocomwall 2017. *Hillcrest Cultural Values Assessment Report*. Unpublished Report to Cumnock Management Pty Ltd). Large tracts of the Valley associated with the floodplains and terrace systems of rivers (e.g. Pages, Goulbourn and Hunter, Nowlands Creek[1]) retain excellent potential for buried, *in situ* deposits. Additionally, certain areas where breaks of slope occur – for example on footslope/floodplain or benched/slope landforms - also have excellent potential for buried, *in situ* deposits. Furthermore, these generalised statements do little or nothing to improve archaeological approaches and reflect the fact that most archaeologists do not understand the geomorphic context of looking for anomalies within the landscape to locate high resolution archaeological data.

In terms of the study areas geomorphology, the methodology states (pp11-12

'An inspection of the study area 50 years ago supports Dr Mitchell's observations (Figure 3-1). In this 1967 view there is very little tree cover within the study area, and particularly in Area B, there is ample evidence of sheet wash erosion with the majority of the area heavily impacted. Looking further afield, the 1967 image shows de-vegetated creek lines, such as that of Main Creek to the east of the study area, with noticeable gully erosion within the channel and extensive sheet wash erosion at their margins.

Such widespread impacts have undoubtedly affected the archaeological landscape in that many tens of centimetres of topsoils have been removed from areas such as the study area, along with any archaeological deposits they may have contained. With such widespread soil movement it is also important to remember that accumulations of artefacts that may be termed a 'site' today may have, in fact, been washed into that location during the historic period and bear no relationship to past Aboriginal occupation patterns in the area.'

Whereas these qualitative statements are a fair estimation at a very coarse (i.e. landscape) scale, the nature of the archaeological record dictates that quantitative statements are made at a more fine-grained resolution applicable at the site scale. As mentioned previously, proposed borehole STR05 retained intact soil horizons at depth, whereas STR04 and 06 were truncated subsoil horizons with a sediment blanket cover resulting from colluvial processes. The point is therefore that making broad, sweeping qualitative statements (e.g. '*the results of over 30 years*….' and '*such widespread impacts*') at a landscape scale can be justified. However, when applying them to a particular study area they should be quantified and tied in with actual, rather than implied, evidence. This is particularly relevant to the statement made in relation to the olive grove on the study area:

[1] Refer to specific references cited in Tocomwall 2015 (Draft). *Glencore United Collieries Aboriginal Cultural Heritage Assessment.* Unpublished Report to Glencore Coal Australia Pty Ltd (Ozark have a copy).

Tocomwall Pty Ltd
PO Box 76 Caringbah NSW 1495
Tel: 02 9542 7714 Fax: 02 9524 4146
Email: info@tocomwall.com.au www.tocomwall.com.au
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'In addition, portions of the study area have subsequently been subject to intensive horticultural impacts as a former olive plantation currently occupies 7.2 ha of the Proposed Modification study area (pp12).'

STR05 was located within an olive grove.

In terms of predictive modeling for the Hunter Valley generally, a statement on page 17 of the methodology provides an excellent example of why some of these models are somewhat inaccurate:

'The remainder of the soil profile appeared to be alluvial in nature reflecting periods of high and low velocity flows in the adjoining creek line when pebbles (high flow) and silty sand (lower flow) were deposited beside the creek line before it moved further to the east.'

The underlined section is one of the principle reasons why predictive models in the Hunter Valley can be misleading in relation to distance to water. Most creeks and rivers have been modified since European methods of farming were introduced, for example by becoming entrenched and/or shifting laterally whilst becoming wider and more susceptible to erosion. When distance to water models are enacted, it is important to understand *where* a channel flowed 1Ka years ago, 5Ka years ago etc. This is important because:

- Channels migrate over time and particularly as hydrological regimes change and sea levels rise and fall causing either a rise or fall in flow regime base levels; and
- Many modern creeklines were once chain-of-ponds rather than the entrenched forms they reflect today (an excellent example of which is preserved on the Hillcrest study area at Coal Hole Creek).

Therefore, predictive models need to consider the massively modified post-Contact landscape as not being reflective of pre-Contact landforms, as well as the geomorphology of pre- and post-Contact hydrology.

In terms of geomorphology (ibid):

'*From 25–50 cm the gravel was extremely thick with very little soil interspersed between the pebbles. The pebbles were derived from the local conglomerates and had been size sorted reflecting the strength of the tributary flow over time*.'

In terms of the clast supported matrix (i.e. '*very little soil interspersed between the pebbles*') and the pebbles themselves: when referring to the pebbles, could you be more specific in terms of size classes (e.g. Standards Association of Australia), whether the profiles reflected upward finning or coarsing of clasts (reflective of depositional environments and whether they are slowing down or speeding up or reflect cyclic episodes of multiple events[2]) and whether they clasts were rounded or angular (e.g. Krumbein or Wentworth Scales) which would identify whether they are largely colluvial or fluvial in origin?

[2] In reference to this, Tocomwall would like copies of the following reports referenced in the methodology in order to review the methods, results and conclusions:

Tocomwall Pty Ltd
PO Box 76 Caringbah NSW 1495
Tel: 02 9542 7714 Fax: 02 9524 4146
Email: info@tocomwall.com.au www.tocomwall.com.au
ABN: 13 137 694 618

In regards to the absence or presence of sites, Ozark states (pp20) that:

'It is noted that the study area already has a low number of recorded sites despite the various investigations over the years.'

Is the low level of sites recorded a function of ground visibility? And, did Umwelt's excavations reported on in 2012 and 2013 test the models by test excavating in areas where they did not predict sites to be located (hence why we'd like copies of these reports: footnote 2)? These are important considerations since Ozark's statement that '*As the study area is largely distant from these creeks, it is expected that if the study area has artefact scatter they will have a low artefact density*' will only be validated if ground visibility was considered and testing of models occurred.

Furthermore, in terms of soil geomorphology the report summarizes that (21-22):

'An examination of the landforms within the study area (Section 3.4) indicate that the study area is in a degrading environment where soils have been moved from the slopes towards the creek systems. This would have the effect of displacing or impacting archaeological deposits had they existed in the study area. The only exception to this is a small area of the study area adjacent to Main Creek that is in an aggrading environment. This may mean that archaeological deposits may have become buried, or mixed with objects, such as artefacts, being washed down from adjoining hill slopes. Additionally, given the changes in hydrology within the area (see Appendix 2) it is possible that the bed of Main Creek has shifted in historic times, further impacting and disturbing the small areas of aggrading landforms adjacent to the creek.'

Possibly. If you review this paragraph from the perspective of soil chronosequences, you may find that you have time-transgressive sequences without historical overlap. Some field-testing of this would be judicious.

In terms of your research questions formulated on page 22, it would be prudent to add some soil geomorphology into the equation. For example, are there resident soils, buried soils or palaeosols and is there any evidence of chronosequences associated with the soil profiles? If no soils reflecting topsoil's are

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Umwelt. 2005. *Research Design and Methodology to Accompany a Section 90 Consent Application for Aboriginal Sites within the Glendell Open Cut Mine Project, Singleton, NSW*. Report to Hunter Valley Coal Corporation.

Umwelt 2012. *Part 1 – Bettys Creek Salvage Program, Mount Owen Extension Area Surface and Subsurface Salvage under Section 90 Aboriginal Heritage Impact Permit #1762*. Report for Xstrata Mount Owen.

Umwelt 2013. *Part 3: Bettys Creek Salvage Program. Mount Owen Operations Area. Surface and Subsurface Salvage under Section 87/90 Aboriginal Heritage Impact Permit #2267*. Report for Xstrata Mount Owen.

Australian Museum Business Services. 1997. *Archaeological test Excavations of Aboriginal Sites at Bettys Creek Mt Owen Mine, Hunter Valley, NSW. Vol. 1–4.* Report for Mt Owen Mine, BHP Coal Australia.

Additionally, we would also like copies of Part 2 of the Umwelt reports not mentioned in the bibliography.

Tocomwall Pty Ltd
PO Box 76 Caringbah NSW 1495
Tel: 02 9542 7714 Fax: 02 9524 4146
Email: info@tocomwall.com.au www.tocomwall.com.au
ABN: 13 137 694 618

encountered, there would no point in further testing. Furthermore, if Umwelt's previous works (2012 and 2013) have not tested their predictive models by undertaking excavations in areas where they predicted no material was likely to be present, it would be wise to test at this stage before the area is completely destroyed. These questions are also relevant in terms of the proposed survey methodology on pages 23-24. Finally, in terms of whether testing is warranted, identifying the presence of resident soils, buried soils or palaeosols is the first step prior to instigating costly testing programs.

In conclusion, some additional information is required in order to clarify some issues, as well as providing some of the previous reports on the Mt Owen works by AMBS and Umwelt. Finally, the inclusion of some form of geoarchaeological methods would be wise in order to identify the absence or presence of PAD. Once these issues have been addressed, Tocomwall will confirm whether they support the proposed methodology.

Regards,

Jakub Czastka (Chaz)

Senior Archaeologist
Tocomwall Pty Ltd
PO Box 76
CARINGBAH NSW 1495
m: 0418 738 521
p: 02 8843 1326
f: 02 9524 4146
e: jakub@tocomwall.com.au
www.tocomwall.com.au

OzArk response sent to Tocomwall Pty Ltd.

OzArk Environmental & Heritage Management Pty Ltd
ABN: 59 104 582 354

RESPONSE TO TOCOMWALL PTY LTD

7 August 2017

OzArk has had the opportunity to review the comments prepared by Tocomwall Pty Ltd regarding the draft survey methodology for the Mount Owen Modification 2 received on 3 August 2017.

OzArk appreciates the diligence of Tocomwall in providing such a detailed response. However, while generally agreeing with the essence of the comments, OzArk does not feel that they are directly applicable to the Proposed Modification study area due to the following reasons:

- The Proposed Modification study area is relatively small (approximately 46 hectares) and does not contain a wide variety of landforms;
- Specifically, the study area contains no waterways, floodplains or creek flats: landforms where "resident (sic) soils, buried soils or palaeosols" (Tocomwall page 5) are usually located;
- The sloping landforms of the Proposed Modification study area have lost the majority of their soil cover as evidenced by reference to historical aerial photography; and
- The area surrounding the Proposed Modification study area has been extensively examined by many archaeologists over many years. OzArk is confident in extrapolating their findings and conclusions to the study area regarding the types of sites that may be recorded, as well as the information these sites may reveal.

OzArk can assure Tocomwall that their interest in past landscapes will not be ignored during the survey as this is also of particular interest to all archaeologists as they attempt to characterise the archaeological potential of an area. Instead, it is OzArk's recommendation that the survey take place in the first instance, and if further investigation of the soil profile is warranted, then this will be a recommendation flowing from the survey results.

Specific responses to Tocomwall's comments follow.

Comment regarding site 37-3-1172 (Tocomwall page 1)

The assessment that this site is not associated with subsurface deposits was made for the following reasons:

- The site is an isolated find: a site type that by its nature is rarely associated with subsurface deposits;
- The site is located on a well-used track/road displaying considerable modification; and
- As the site is located on a ridge line there are demonstrably thin soils in the area precluding substantive subsurface deposits.

OzArk see no reason to alter the assessment that the site is not associated with subsurface deposits.

Comment regarding the Tocomwall assessment at STR05 (Tocomwall page 1)

OzArk agrees that this was not in the Tocomwall report that we referenced when compiling the survey methodology hence we were not aware of a potential archaeological deposit (PAD) in this area. STR05 is located outside of the Proposed Modification study area between the olive plantation and Main Creek. As there is virtually no portions of the Proposed Modification study area with similar landforms, OzArk notes Tocomwall's comments but it does not alter the survey methodology.

Brisbane | Dubbo | Queanbeyan
HEAD OFFICE: 145 Wingewarra St/PO Box 2069 DUBBO NSW 2830
ph 02 6882 0118 | enquiry@ozarkehm.com.au | www.ozarkehm.com.au

OzArk Environmental & Heritage Management Pty Ltd
ABN: 59 104 582 354

Comment on OzArk's statement on page 11 of the survey methodology (Tocomwall page 1)

OzArk provides reasons for this statement in the survey methodology (cf Appendix 1 of the survey methodology) and stands by the statement. The wording of this statement makes it clear it is a generalisation and while OzArk is aware that the landscape has potential to contain subsurface deposits in discrete areas, OzArk stands by the observation that the nature of these deposits rarely allow "detailed modelling of settlement patterns beyond the most basic attributes".

Comments on geomorphology (Tocomwall page 2)

OzArk again agrees this is a generalisation but one enunciated by the provision of a historical aerial image showing the widespread impact of land practices during the agricultural phase of the Proposed Modification study area. OzArk agrees with the Tocomwall statement: "when applying (sweeping qualitative statements) to a particular study area they should be quantified and tied in with actual, rather than implied, evidence" but notes that this needs to be done at the time of the survey, not when framing a methodology that, by its nature, is generalised prior to quantified data being gained during the survey.

Comment on stream migration (Tocomwall page 3)

OzArk is aware of this phenomenon but the Proposed Modification study area contains slopes and no floodplain/creek flat landforms. As such, determining stream migration is not applicable to this particular study.

Comment on gravels (Tocomwall page 3)

The included quote is from an Umwelt (Australia) Pty Ltd report demonstrating the nature of the deposits within Area A of the Proposed Modification study area. It was written by archaeologists to demonstrate the nature of the deposits, not as a detailed geomorphological study. The area in which this observation was made has been heavily modified by the construction of the Bettys Creek diversion and therefore is a historical reference to the types of subsoil deposits that once existed in this area. It was included to indicate that the observed alluvial actions would make this area a poor preserver of archaeological deposits.

Comment on ground surface visibility (Tocomwall page 4)

This distribution patterning has been noted by many archaeologists working across NSW in a wide variety of landforms. While available ground surface visibility is always a factor in the detection of sites, the over-riding correlation of sites and distance to water has been demonstrated widely and is accepted as a working hypothesis for the survey methodology.

Comment on amending the research questions formulated on page 22 of the survey methodology (Tocomwall page 4)

Ozark agrees that "it would be prudent to add some soil geomorphology into (these questions)". Should the survey indicate that further geomorphological testing within the Proposed Modification study area be warranted, then this will be a recommendation following the survey.

Comment on testing areas where sites are not predicted to occur (Tocomwall page 5)

This will be taken into account during the survey, and should it be assessed as being warranted, this will be a recommendation following the survey.

OzArk Environmental & Heritage Management Pty Ltd
ABN: 59 104 582 354

Comment on the inclusion of geoarchaeological methods in the survey methodology (Tocomwall page 5)

As mentioned above, as aggrading environments are rare within the Proposed Modification study area, it is not proposed to include a geomorphological testing program into the survey phase of the project. However, should the survey indicate that this would be warranted, then this will be recommended as a subsequent phase of investigation.

Ben Churcher
Principal Archaeologist
OzArk Environmental and Heritage Management Pty Ltd.