Aboriginal Archaeological and Cultural Heritage Impact Assessment

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Drayton South Coal Project
Hansen Bailey Environmental Consultants
20 May 2012

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Prepared for

Hansen Bailey Environmental Consultants

Prepared by

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Glossary of Terms

Alluvium	"An unconsolidated accumulation of stream-deposited sediments, including sands, silts, clays or gravels" (www.geology.com, accessed 2011).
Archaeological potential	The likelihood of undetected surface and/or subsurface archaeological materials existing at a location.
Aboriginal archaeological site	The present spatial extent of visible Aboriginal archaeological material(s) at a given location.
Artefact	Any object which has been physically modified by humans.
Angular shatter	Small irregularly shaped fragments of knapped stone interpreted as an undiagnostic 'splinter' fragments.
Assemblage	A collection of artefacts.
Backing	Steep unidirectional or bidirectional retouch that is typically found on one lateral edge of an artefact.
Bedrock	Outcrop of *in situ* rock material.
Bipolar technique	Technique of resting a core on an anvil and striking it with a hammerstone.
Blocky fragment	Large angular fragment of stone that has detached fortuitously during the knapping process.
Bondi Point	A flake that has been 'backed' (i.e. retouched) along one lateral margin and comes to a point at its distal end. Bondi points are asymmetrical around their longitudinal axis.
Bulb of percussion	A bulge below the striking platform on the ventral surface of a flake.
Bulbar scar	A small flake scar on the bulb of percussion that results from a small flake being detached when the main flake is detached.
Bulbar fissures	Very fine lines present on the bulb or percussion that radiate out from the point of impact.
Broken flake	A flake that lacks a termination but retains one or more of the following: platform and/or intact point of impact, bulb of percussion, bulbar scar and lateral fissures.
Chert/tuff	In this report, the term 'chert/tuff' is used in place of 'chert' and 'tuff'. Despite differing geological origins, archaeologists working in northern and southeastern NSW have tended to use these terms interchangeably (see, for example, Corkill 1999). The use of the term 'chert/tuff' herein is intended to reduce confusion.
Compression waves	Prominent concentric rings on the ventral surface of the flake radiating out from the point of impact.
Conglomerate	"A poorly-sorted detrital sedimentary rock composed of rounded gravels, stones or cobbles in a matrix of much finer material" (Milford 1999).
Cortex	An altered, weathered outer surface or 'rind' on a piece of rock.

Complete flake	A complete flake is a flake that has a ventral surface that preserves a complete fracture plane, a platform (or impact point), lateral margins and a termination (Holdaway and Stern 2004: 111).
Core	"A mass of homogenous lithic material that has had flakes removed from its surface" (Andrefsky 2005: 14).
Crest	A landform element that "stands above all, or almost all, points in the adjacent terrain" (Speight 2009: 20).
Dorsal surface	The surface of a flake that was originally part of the outer surface of the core.
Effective coverage	A quantifiable estimate of the area in which archaeological materials are "*detectable*", i.e. exposed ground surface area.
Elouera	A backed, crescent-shaped implement that is symmetrical around its transverse axis but asymmetrical around its longitudinal axis.
Exposure	An area of land surface where the ground surface is visible, usually as the result of thinner vegetation cover, erosive forces or human-caused disturbance. In archaeological surveys, the percentage of ground surface that is visible is recorded. These percentages of exposure are then used to calculate effective coverage.
Flake	A sharp-edged sliver of stone that has been detached from a core. Flakes have a number of distinctive features or attributes that allow them to be distinguished from other lithic materials. These include a bulb of percussion, a striking platform, a dorsal surface, a ventral surface, a bulbar scar (also known as an eraillure scar), bulbar fissures, lateral fissures or hackles and compression waves.
Flake shatter	Any piece of flake debitage with no recognisable striking platform.
Flat	"Planar landform element that is neither a crest nor a depression and is level or very gently inclined" (Speight 2009: 22).
Floodplain	A large flat area, adjacent to a watercourse, characterised by frequent active erosion and aggradation by channelled and overbank stream flow.
Fluvial	Pertaining to rivers and streams. Deposits by flowing water.
Geometric microlith	A flake that has been 'backed' at one or other end, sometimes at both, and sometimes on one lateral margin as well. Geometric microliths are symmetrical around their transverse axis and have a maximum dimension of less than 80 mm.
Greywacke	A touch, well-indurated type of sandstone distinguished by detrital quartz crystals and rock fragments set in a finer-grained matrix (Milford 1999).
Grinding groove	A depression formed in rock from the sharpening of a stone hatchet head or use of a muller (topstone).
Ground Surface Visibility (GSV)	A term used to describe the area of the ground's surface that is visible during archaeological field surveys.
Hammerstone	A stone that has been used to strike a core to remove a flake, often causing pitting or other wear on the stone's surface.

Hearth	Fireplace often recognised archaeologically through the presence of charcoal or burnt ground. Historical hearths are usually associated with a brick or stone structure.
Holocene	The geological period covering the last 10,000 years.
In Situ	In the natural or original position. Applied to a rock, soil, or fossil when occurring in the situation in which it was originally formed or deposited.
Lateral fissures or hackles	Very fine lines present on the lateral margins of a flake.
Lithic	Of, or pertaining to, stone.
Lower slope	"Slope element not adjacent below a crest or flat but adjacent above a flat or depression" (Speight 2009: 21).
Metamorphic	"Rocks whose composition, texture and/or structure have been altered through tectonic pressure and/or heat" (Milford 1999).
Mudstone	A very fine-grained, hard, cohesive rock which generally has a dull, slightly porous appearance. Mudstone is composed of extremely fine-grained sediments such as rock flour, clay minerals and silt. Mudstone is macroscopically similar to chert but distinguished by its lack of lustre.
Pleistocene	The geological period equivalent to the last ice age and preceding the Holocene from about 2 million years to 10,000 years ago. The Late Pleistocene generally refers to the period of time from 40,000 – 10,000 years ago.
Potential Archaeological Deposit	PAD is the hypothesised presence of archaeological deposit where there is uncertainty due to a lack of visibly eroding artefacts, lack of test excavation either locally or in analogous landforms in the region.
Quartz	Quartz is one of the most common minerals on earth. A member of the silica family of minerals, quartz can occur in a variety of forms including free-standing crystals, as veins of milky quartz cutting through other rocks, and as tiny irregularly shaped grains that are components of many rocks.
Silcrete	"A very brittle, intensely indurated rock composed mainly of quartz clasts cemented by a matrix which may well be well-crystallised quartz, cryptocrystalline quartz or opaline silica. The texture of silcrete reflects the host rock and clasts may range in size from very fine grains to boulders" (Langford-Smith 1978: 3).
Stone artefact	Any piece of rock modified by human behaviour.
Striking platform	More-or-less planar surface struck to cause flake removal.
Survey Coverage	The area of a study area surveyed, usually expressed as a percentage. See also **Effective Coverage**.
Tuff	Rock-type consisting of consolidated volcanic ash ejected from a volcano.
Ventral surface	The surface of a flake that has broken away from the core. Ventral surfaces are typically smooth and show no evidence of previous flake removals.

Executive Summary

AECOM Australia Pty Ltd (AECOM) was commissioned by Hansen Bailey Environmental Consultants on behalf of Anglo American Metallurgical Coal Pty Ltd (Anglo American) to undertake an Aboriginal archaeological and cultural heritage impact assessment for the Drayton South Coal Project (the Project). Anglo American is seeking Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* for continuation of mining at Drayton Mine by the development of open cut and highwall mining areas within the Drayton South Mining Area while continuing to utilise the existing infrastructure and equipment from Drayton Mine.

The archaeological survey was undertaken within the Drayton South Study Area over a total of 26 days initially between 2 May and 4 June 2011 followed by a supplementary archaeological survey between 10 and 11 October 2011 by a combined field team of AECOM personnel and Aboriginal stakeholder representatives.

A search of the Aboriginal Heritage Information Management System (AHIMS) database prior to the survey identified 226 Aboriginal sites within the Project Boundary, of which, 18 were listed as destroyed or deleted. Of these, 85 occur within or directly adjacent to the Study Area. These include 83 artefact scatters and isolated finds, and two stone quarries. Registered AHIMS sites within the Study Area were inspected during the archaeological survey. In addition to previously recorded sites, 160 newly identified sites were recorded within and adjacent to the Study Area. During the assessment, the Aboriginal community and an arborist reassessed two previously recorded scarred trees 37-2-1944 and 37-2-1945 as being scarred by natural processes.

A total of 205 discrete sites were identified during the assessment, including both existing AHIMS sites (modified into complexes) and newly recorded sites. High significance was attributed to four sites, based on their rarity and research potential. Moderate significance was attributed to 18 sites and low significance to 183 sites. Consultation with registered Aboriginal stakeholders to date indicates that all Aboriginal archaeological sites within the Study Area are culturally significant and need to be cared for appropriately.

To manage potential impacts to Aboriginal sites from the Project, a detailed Aboriginal Heritage Management Plan (AHMP) will need to be prepared. The AHMP will be prepared in consultation with registered Aboriginal stakeholders and the Office of Environment and Heritage, and to the satisfaction of the Department of Planning and Infrastructure. The commitment for the development of this AHMP is outlined in this report.

To mitigate Project impacts to Aboriginal sites, it is recommended that surface artefact collection be undertaken for all artefact scatters and isolated finds impacted by the Project. This should occur prior to the commencement of the Project. Details of the surface artefact collection should be addressed within the AHMP.

In recognition that the majority of the archaeological resource of the Study Area is not identifiable by surface survey alone, a program of subsurface test excavation and salvage excavation should be undertaken to obtain a more detailed understanding of the nature and extent of Aboriginal archaeology within the Study Area. The excavation program should include an initial detailed geomorphological assessment, followed by test excavation and salvage excavation. The excavation program will need to be developed in consultation with registered Aboriginal stakeholders and should include, at a minimum, salvage excavation of sites identified as having high significance. In addition, the excavation program should utilise the results of the archaeological survey, including identified PAD areas and areas of archaeological sensitivity, to develop an appropriate scientific research methodology. Details for the excavation program will need to be addressed within the AHMP.

The conservation and management of all Aboriginal sites within the Project Boundary not impacted by the Project is recommended. Protected sites should be identified on site plans with mine activities avoiding those sites. Where mine activities occur in close proximity to recorded sites, fencing should be erected as necessary to protect these sites. Provisions for the long-term management of sites outside the Study Area will need to be addressed within the AHMP.

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) has been commissioned by Hansen Bailey Environmental Consultants (Hansen Bailey) on behalf of Anglo American Metallurgical Coal Pty Ltd (Anglo American) to undertake an Aboriginal archaeological and cultural heritage impact assessment for the Drayton South Coal Project (the Project). The assessment is to form part of an Environmental Assessment (EA) being prepared by Hansen Bailey to support an application for Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to facilitate the development of an open cut and highwall coal mining operation and associated infrastructure.

This assessment has been undertaken in accordance with the *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (NSW Department of Environment & Conservation 2005) and with reference to the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a), *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b), and *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011).

The scope of work completed by AECOM for this study included:

- Searching the Office of Environment and Heritage's (OEH) AHIMS register;
- Describing the existing environment within and surrounding the Study Area;
- Reviewing relevant archaeological and ethno historic information for the Study Area and surrounding area;
- Preparing a predictive model for Aboriginal archaeological sites within the Study Area;
- Undertaking an archaeological and cultural heritage survey of the Study Area and reporting on the findings;
- Identifying, notifying and registering Aboriginal people who hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and / or places in the Study Area;
- Providing registered Aboriginal parties with information about the Project;
- Facilitating a process whereby registered Aboriginal parties can:
    - Contribute culturally appropriate information to the assessment methodology;
    - Provide information that will enable the cultural significance of Aboriginal objects and / or places within the Study Area to be determined; and
    - Provide input into the development of any cultural heritage management options.
- Preparing and finalising an Aboriginal archaeological and cultural heritage impact assessment with input from registered Aboriginal parties.

1.1 Project Description

Drayton Mine is managed by Anglo Coal (Drayton Management) Pty Ltd which is owned by Anglo American Metallurgical Coal Pty Ltd (Anglo American). Drayton Mine commenced production in 1983 and currently holds Project Approval 06_0202 (dated 1 February 2008) which expires in 2017, at which time the operation will have to close.

The Project will allow for the continuation of mining at Drayton Mine by the development of open cut and highwall mining operations within the Drayton South mining area while continuing to utilise the existing infrastructure and equipment from Drayton Mine.

The Project is located approximately 10 km north-west of the village of Jerrys Plains and approximately 13 km south of the township of Muswellbrook in the Upper Hunter Valley of New South Wales (NSW). The Project is predominately situated within the Muswellbrook Shire Local Government Area (LGA), with the south-west portion falling within the Singleton LGA. **Figure 1** shows the location of the Project. The Project is located adjacent to two thoroughbred horse studs, two power stations and several existing coal mines.

The Project will extend the life of Drayton Mine by a further 27 years ensuring the continuity of employment for its workforce, the ongoing utilisation of its infrastructure and the orderly rehabilitation of Drayton Mine's completed mining areas.

Anglo American is seeking Project Approval under Part 3A of the *Environmental Planning & Assessment Act 1979* (EP&A Act) to facilitate the extraction of coal by both open cut and highwall mining methods within Exploration Licence (EL) 5460 for a period of 27 years. The Project Application Boundary (Project Boundary) is shown on **Figure 2**.

The Project generally comprises:

- The continuation of operations at Drayton Mine as presently approved with minor additional mining areas within the East, North and South Pits;
- The development of an open cut and highwall mining operation extracting up to 7 Mtpa of ROM coal over a period of 27 years;
- The utilisation of the existing Drayton Mine workforce and equipment fleet (with an addition of a highwall miner and coal haulage fleet);
    - The Drayton Mine fleet consists of at least a dragline, excavators, fleet of haul trucks, dozers, graders, water carts and associated supporting equipment.
- The use of Drayton Mine's existing voids for rejects and tailings disposal and water storage to allow for the optimisation of the Drayton Mine final landform;
- The utilisation of the existing Drayton Mine infrastructure including the Coal Handling and Preparation Plant (CHPP), rail loop and associated loadout infrastructure, workshops, bath houses and administration offices;
- The construction of a transport corridor between Drayton South and Drayton Mine;
- The utilisation of the Antiene Rail Spur off the Main Northern Railway to transport product coal to the Port of Newcastle for export;
- The realignment of a section of Edderton Road; and
- The installation of water management and power reticulation infrastructure at Drayton South.

The conceptual layout of the Project is shown in **Figure 2**.

Drayton Mine will continue to operate under and in accordance with the existing Project Approval 06_0202 and there will be a period when Drayton Mine and Drayton South operate concurrently.

1.2 Study Area

The total Study Area comprises of 2267 ha (**Figure 2**). The Study Area incorporates the surface disturbance footprint of 1928 ha, which includes a 100 m corridor allowed for the Edderton Road realignment. A 100 m buffer has been assigned around mining areas and associated infrastructure only. The Study Area does not include Drayton Mine as this area was previously assessed by Archaeological Risk Assessment Services Pty Ltd (ARAS) in 2007 as part of the Drayton Mine Extension EA (Hansen Bailey 2007).

1.3 Project Team

The assessment was managed and report prepared by AECOM archaeologist Geordie Oakes. Chelsea Kavanagh (Hansen Bailey) undertook Aboriginal consultation and arranged Aboriginal fieldwork participation. Geordie Oakes, Abbee Warskitt and Matteui Catteau (AECOM) undertook fieldwork. Ruth Baker (Associate Director, AECOM) and Luke Kirkwood (Archaeologist, AECOM) provided QA review of all assessment outputs. Unless otherwise specified, Tim Osborne (Designer, AECOM) created all figures within this report. Jodie Glennan (IAP Team Secretary, AECOM) provided administrative support throughout the assessment process.

1.4 Report Structure

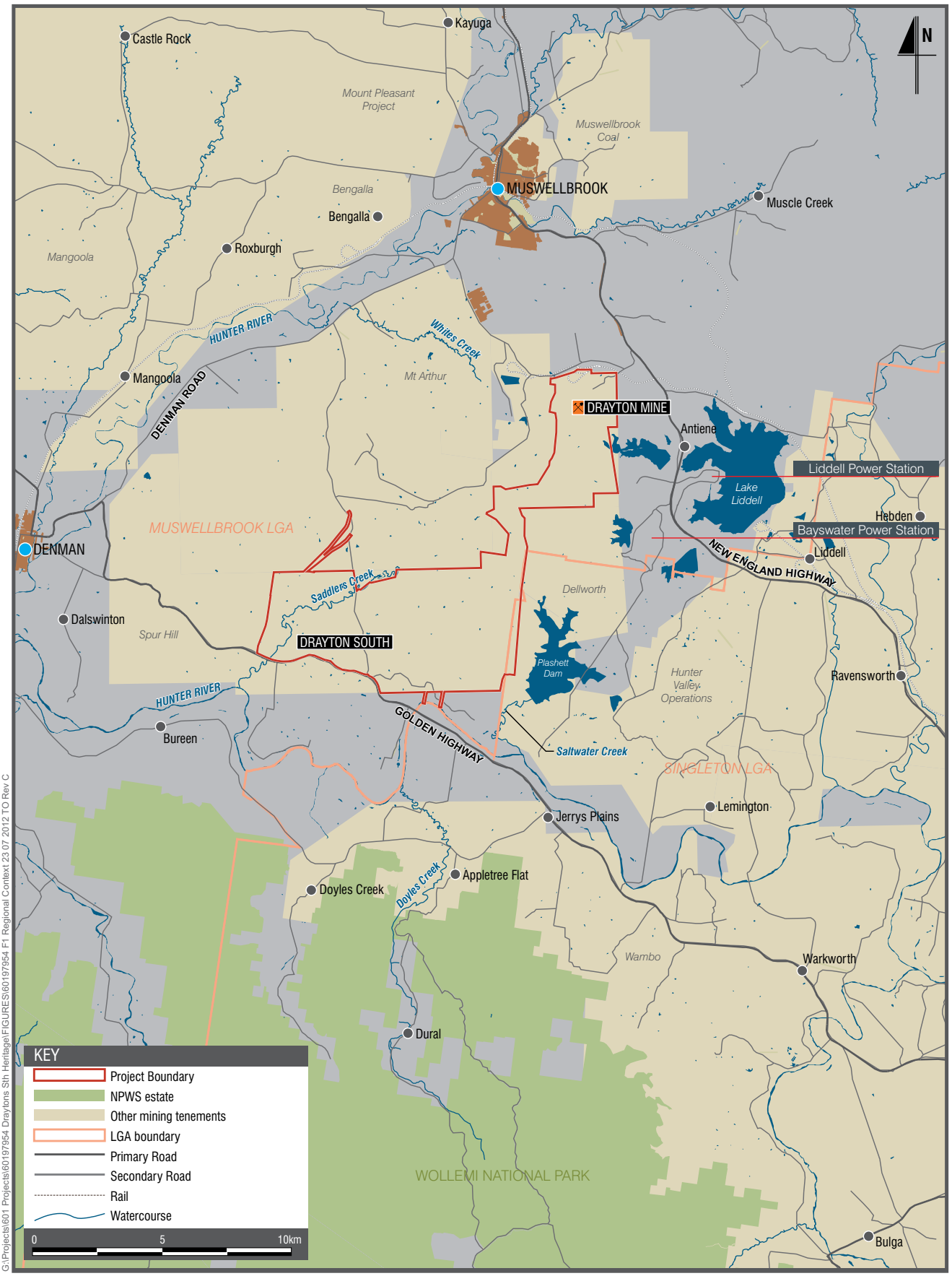
The report is structured as follows:

- **Section 2.0** outlines the relevant statutory framework for the assessment;
- **Section 3.0** discusses the Aboriginal consultation processes adopted, the archaeological survey strategy and Aboriginal cultural values;
- **Section 4.0** describes the existing environment within and surrounding the Study Area (including land use) and outlines the key archaeological implications;
- **Section 5.0** details the archaeological context of the Study Area and its surrounds on both a regional and local scale;
- **Section 6.0** summarises relevant ethnographic information for the Study Area and its surrounds;
- **Section 7.0** presents a predictive model for Aboriginal archaeology within the Study Area, specifying probable site type occurrence, content, distribution and integrity;
- **Section 8.0** presents the archaeological survey methodology;
- **Section 9.0** describes the archaeological survey including objectives, field team members, survey strategy and methodology, Aboriginal archaeological sites recorded and an evaluation of the predictive model;
- **Section 10.0** discusses the finding of the assessment;
- **Section 11.0** outlines the scientific (i.e. archaeological) and cultural significance of identified Aboriginal archaeological sites within the Study Area;
- **Section 12.0** provides an assessment of the potential impacts of the Project on the sites identified;
- **Section 13.0** assesses the cumulative impact of the Project on Aboriginal heritage;
- **Section 14.0** details appropriate management options and / or recommendations for identified Aboriginal archaeological sites within the Study Area; and
- **Section 15.0** lists the references cited in-text.

1.5 Related Studies

The following studies are to be read in conjunction with this assessment:

- The EA Surface Water Impact Assessment;
- The EA Soils and Land Capability Impact Assessment; and
- The EA Ecology Impact Assessment.



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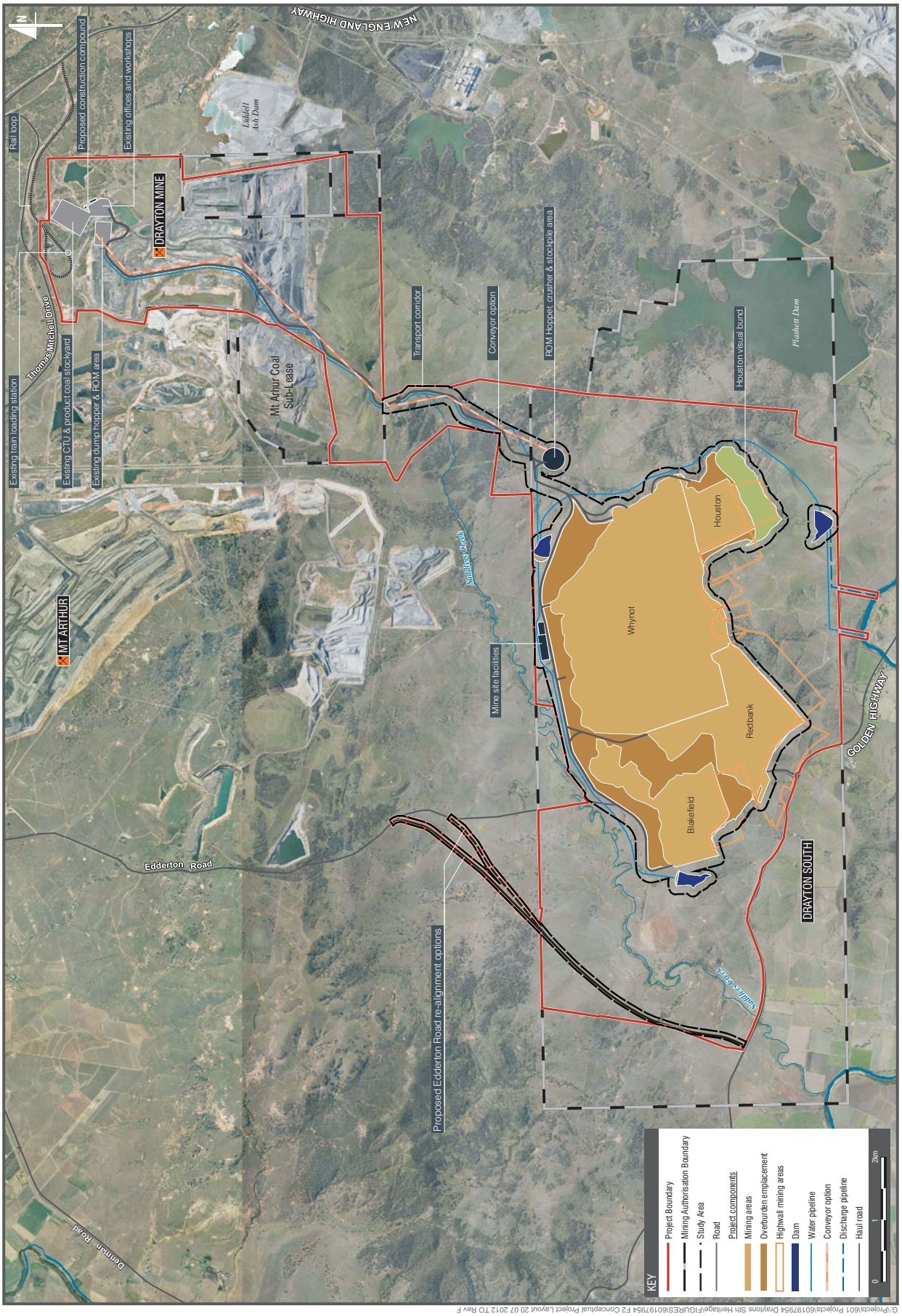
REGIONAL LOCALITY

Aboriginal Archaeological and Cultural Heritage Impact Assessment
Drayton South Coal Project, New South Wales

FIGURE 1



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CONCEPTUAL LAYOUT PLAN
Aboriginal Archaeological and Cultural Heritage Impact Assessment
Drayton South Coal Project, New South Wales

FIGURE 2

2.0 Applicable Policy and Legislation

2.1 Commonwealth Legislation

2.1.1 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (the ATSIHP Act) provides for the preservation and protection of places, areas and objects of particular significance to Indigenous Australians. The stated purpose of the ATSIHP Act is the 'preservation and protection from injury or desecration of areas and objects in Australia and in Australian waters, being areas and objects that are of particular significance to Aboriginals in accordance with Aboriginal tradition' (section 4).

Under the Act, 'Aboriginal tradition' is defined as "the body of traditions, observances, customs and beliefs of Aboriginals generally or of a particular community or group of Aboriginals, and includes any such traditions, observances, customs or beliefs relating to particular persons, areas, objects or relationships" (Section 3). A 'significant Aboriginal area' is an area of land or water in Australia that is of 'particular significance to Aboriginals in accordance with Aboriginal tradition' (Section 3). A 'significant Aboriginal object', on the other hand, refers to an object (including Aboriginal remains) of like significance.

For the purposes of the Act, an area or object is considered to be injured or desecrated if:

- In the case of an area:
    - it is used or treated in a manner inconsistent with Aboriginal tradition;
    - the use or significance of the area in accordance with Aboriginal tradition is adversely affected;
    - passage through, or over, or entry upon, the area by any person occurs in a manner inconsistent with Aboriginal tradition
- in the case of an object:
    - it is used or treated in a manner inconsistent with Aboriginal tradition.

The ATSIHP Act can override state and territory laws in situations where a state or territory has approved an activity, but the Commonwealth Minister prevents the activity from occurring by making a declaration to protect an area or object. However, the Minister can only make a decision after receiving a legally valid application under the ATSIHP Act and, in the case of long term protection, after considering a report on the matter. Before making a declaration to protect an area or object in a state or territory, the Commonwealth Minister must consult the appropriate Minister of that state or territory (section 13).

2.1.2 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) took effect on 16 July 2000. Under Part 9 of the EPBC Act, any action that is likely to have a significant impact on a matter of National Environmental Significance may only progress with the approval of the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities (SEWPaC).

An action is defined as a project, development, undertaking, activity, series of activities, or alteration. An action will also require approval if:

- It is undertaken on Commonwealth land and will have or is likely to have a significant impact;
- It is undertaken outside Commonwealth land and will have or is likely to have a significant impact on the environment on Commonwealth land; and
- It is undertaken by the Commonwealth and will have or is likely to have a significant impact.

The EPBC Act defines 'environment' as both natural and cultural environments and therefore includes Aboriginal and historic heritage items. Under the Act, protected heritage items are listed on the National Heritage List (items of significance to the nation) or the Commonwealth Heritage List (items belonging to the Commonwealth or its agencies). These two lists replaced the Register of the National Estate (RNE). While the RNE has been suspended and is no longer a statutory list, Section 391A of the Act requires the Minister to consider RNE listing if a referral is made. This requirement expires in 2012, by which time all RNE listings are to be transferred to a relevant heritage register. Items on the RNE can have a variety of statuses, including Registered (it is inscribed on

the Register) and Indicative (it is in the database, but no formal nomination has been received or an assessment has not been completed).

The heritage registers mandated by the EPBC Act have been consulted and there are no Aboriginal heritage items located within the Project Boundary.

2.2 State Legislation

2.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act requires that consideration be given to environmental impacts as part of the land use planning process. In NSW, environmental impacts are interpreted as including impacts to cultural heritage.

Part 3A of the EP&A Act provides an approvals regime for all 'major projects'. Major projects are defined under Schedule 1 of the *State Environmental Planning Policy (Major Development) 2005* (SEPP (Major Development)) and are identified by way of declaration as a listed project in the SEPP (Major Development) or by notice in the NSW Government Gazette. The Minister is the consent authority for all projects to which Part 3A applies. Under Part 3A, the Minister can issue a project approval or a concept approval. Both maintain the requirement for consultation with the community and relevant State Government agencies. The requirement for certain other permits and licences is removed under Part 3A.

Aboriginal archaeological and cultural heritage impact assessments carried out under Part 3A of the EP&A Act must address the steps and requirements outlined in *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DECCW 2005) to ensure statutory compliance. As stated in **Section 1.0**, this assessment has been undertaken in accordance with these guidelines.

In October 2011, Part 3A of the EP&A Act was repealed. However the Project has been granted the benefit of transitional provisions, and despite the recent repeal, is a project to which Part 3A applies.

2.2.2 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act), administered by OEH, is the primary legislation for the protection of Aboriginal cultural heritage in NSW. The NPW Act gives the Director General of OEH responsibility for the proper care, preservation and protection of 'Aboriginal objects' and 'Aboriginal places', defined under the Act as follows:

- An *Aboriginal object* is any deposit, object or material evidence (that is not a handicraft made for sale) relating to Aboriginal habitation of NSW, before or during the occupation of that area by persons of non-Aboriginal extraction (and includes Aboriginal remains).
- An *Aboriginal place* is a place declared so by the Minister administering the NPW Act because the place is or was of special significance to Aboriginal culture. It may or may not contain Aboriginal objects.

Part 6 of the NPW Act provides specific protection for Aboriginal objects and places by making it an offence to harm them. An Aboriginal Heritage Impact Permit (AHIP) must be obtained if impacts to Aboriginal objects and or places are anticipated. AHIPs are issued under Section 90 of the NPW Act. Consultation with Aboriginal communities is required under OEH policy when an application for an AHIP is considered and is an integral part of the process. AHIPs may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or persons.

Pursuant to Section 75U of the EP&A Act, any project approved under Part 3A of the EP&A Act is exempt from the requirement to obtain an AHIP under Section 90 of the NPW Act.

Section 89A of the NPW Act requires notification of the location of identified Aboriginal objects within a reasonable time, with penalties for non-notification, including daily penalties. Section 89A is binding in all instances, including Part 3A projects.

2.3 Local Government

2.3.1 Muswellbrook Local Environmental Plan 2009

The Muswellbrook Local Environmental Plan (LEP) is the comprehensive statutory planning document that applies to the Muswellbrook LGA. Clause 5.10 of the LEP provides specific provisions for the protection of heritage items and relics within Muswellbrook LGA. The objectives of the clause are:

- to conserve the environmental heritage of Muswellbrook;
- to conserve the heritage significance of items and heritage conservation areas including associated fabric, settings and views;
- to conserve archaeological sites; and
- to conserve places of Aboriginal heritage significance.

Clause 5.10 (2) requires development consent for the following:

- demolishing or moving a heritage item or a building, work, relic or tree within a heritage conservation area;
- altering a heritage item or a building, work, relic, tree or place within a heritage conservation area, including (in the case of a building) making changes to the detail, fabric, finish or appearance of its exterior;
- altering a heritage item that is a building by making structural changes to its interior;
- disturbing or excavating an archaeological site while knowing, or having reasonable cause to suspect, that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed,
- disturbing or excavating a heritage conservation area that is a place of Aboriginal heritage significance;
- erecting a building on land on which a heritage item is located or that is within a heritage conservation area; and
- subdividing land on which a heritage item is located or that is within a heritage conservation area.

Before granting consent, Council must consider the impact of the development on the heritage significance of the item. However, development consent is not required if Council considers the proposed development to not adversely affect the heritage significance of the item concerned.

Schedule 5 of the LEP provides a list of heritage items and relics within Muswellbrook LGA. There are no Aboriginal heritage items listed in the heritage schedule that fall within the boundaries of the Study Area.

2.3.2 Singleton Local Environmental Plan 1996

The Singleton Local Environmental Plan (LEP) is the comprehensive statutory planning document that applies to the Singleton LGA. Part 9 of the LEP provides specific provisions for the protection of heritage items and relics within Singleton LGA. The following controls apply with respect to the development of heritage items:

A person shall not, in respect of a building, work, relic, tree or place that is a heritage item, except with the consent of council:

- demolish or alter the building or work;
- damage or move the relic, or excavate for the purpose of exposing the relic;
- damage or despoil land on which the building, work or relic is situated or land which comprises the place;
- erect a building on or subdivide land on which the building, work or relic is situated or on the land which comprises the place; or
- damage any tree on the land on which the building, work or relic is situated or on the land which comprises the place.

The Council shall not grant consent to a development application required by this clause unless it has made an assessment of:

- the significance of the item as a heritage item;
- the extent to which the carrying out of the development in accordance with the consent would affect the heritage significance of the item and its site;
- whether the setting of the item and, in particular, whether any stylistic, horticultural, or archaeological features of the setting should be retained;
- whether the item constitutes a danger to the users or occupiers of that item or to the public; and
- measures to be taken to conserve heritage items, including any conservation plan prepared by the applicant.

Schedule 3 of the LEP provides a list of heritage items and relics within Singleton LGA. There are no Aboriginal heritage items listed in the heritage schedule that fall within the boundaries of the Study Area.

3.0 Aboriginal Community Consultation

Aboriginal community consultation for the Project was conducted by Hansen Bailey in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010). Hansen Bailey has prepared the following section.

3.1 Notification and Registration

In accordance with Section 4.1.2 of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010), the following agencies were notified of the Project and requests made to provide assistance for identifying and notifying Aboriginal people who may hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects or places within the Study Area:

- OEH Newcastle;
- Wanaruah Local Aboriginal Land Council (WLALC);
- NSW Department of Aboriginal Affairs – Office of the Registrar;
- National Native Title Tribunal (NNTT);
- Native Title Services Corporation Limited (NTSCorp);
- Singleton Shire Council (SSC);
- Muswellbrook Shire Council (MSC); and
- Hunter-Central Rivers Catchment Management Authority (CMA).

Notifications were issued in writing to agencies on 4 March 2011.

A public notification of the Project was provided in the local newspapers to identify Aboriginal stakeholders who wished to be consulted in relation to the Aboriginal cultural heritage impact assessment. One identical public notice was printed in the Singleton Argus and the Muswellbrook Chronicle on 4 March 2011 (**Appendix** a**)**.

In response to the above, the WLALC provided a list of contact details for 31 known Aboriginal groups with an association to the area on 7 March 2011. This was followed by similar listings from OEH on 8 March 2011 and MSC on 11 March 2011, identifying 32 and 34 Aboriginal groups respectively. An expression of interest letter was mailed to each Aboriginal stakeholder group, as identified by Wanaruah LALC, OEH and MSC informing them of the Project and inviting them to register their interest in consultation.

From the public notice and personalised expression of interest letters, 25 groups registered an interest and have since been involved in the Aboriginal community consultation program for the Project (**Table 1**).

Table 1: Registered Aboriginal Groups

Ref	Group Name	Primary Contact
1	Aboriginal Native Title Consultants (ANTC)	Margaret Matthews
2	Buddang	Larry Foley
3	Bullen Bullen Consultants (BBC)	Lloyd Matthews
4	Cacatua Culture Consultants (CCC)	Donna Sampson
5	Claimants for the Plains Clan of the Wonnarua (CPCW)	Scott Franks
6	Culturally Aware (CA)	Tracey Skene
7	Gidawaa Walang Cultural Heritage Consultancy (GWCHC)	Annie Hickey
8	Hunter Traditional Owners (HTO)	Paulette Ryan
9	Hunter Valley Aboriginal Corporation (HVAC)	Rhonda Griffiths

Ref	Group Name	Primary Contact
10	Hunter Valley Cultural Surveying (HVCS)	Luke Hickey
11	Hunter Valley Natural and Cultural Resources Management (HVNCRM)	David French
12	Kayaway Eco Cultural and Heritage Services (KECHS)	Mark Hickey
13	Lower Hunter Wonnarua Council Inc. (LHWCI)	Tom Miller
14	Murong Gialinga Aboriginal and Torres Strait Islander Corporation (MGATSIC)	Debbie Foley
15	Ungooroo Aboriginal Corporation (UAC)	Allen Paget
16	Ungooroo Cultural and Community Services (UCCS)	Rhonda Ward
17	Upper Hunter Heritage Culture Consultants (UHHCC)	Darrel Matthews
18	Upper Hunter Wonnarua Council Inc. (UHWCI)	Rhoda Perry
19	Wanaruah Custodians (WC)	Barbara Foot
20	Wanaruah Local Aboriginal Land Council (WLALC)	Suzie Worth
21	Wattaka Wonnarua Traditional Owners (WWTO)	Des Hickey
22	Wonn 1 Contracting (W1C)	Arthur Fletcher
23	Wonnarua Nation Aboriginal Corporation (WNAC)	Laurie Perry
24	Yarrawalk	Scott Franks & Barry McTaggart
25	Yinarr Cultural Services (YCS)	Kathleen Steward-Kinchella

In accordance with Section 4.1.6 of the Aboriginal Consultation Guidelines 2010, a copy of the following documentation was provided to OEH and the WLALC on 6 April 2011:

- A copy of the public notice advertised in the Muswellbrook Chronicle and Singleton Argus on 4 March 2011;
- A copy of the letter issued to all identified Aboriginal groups providing notification of the assessment for the Project; and
- A record of registered Aboriginal groups whom have expressed interest in the Project.

As a result of additional Aboriginal groups registering their interest in the Project following the 6 April 2011, a revised record of stakeholders was issued to OEH and the WLALC on 21 July 2011.

As specified in Section 4.1.5 of the Aboriginal Consultation Guidelines 2010, each of the registered Aboriginal stakeholder groups were given the opportunity to withhold their information from being provided to OEH and the WLALC, if requested. No groups made this request.

3.2 Archaeological Survey Strategy and Cultural Heritage Values

3.2.1 Archaeological Survey Methodology

All registered Aboriginal groups at the time were issued a hard copy of the proposed archaeological survey methodology developed by AECOM on 18 March 2011. The letter provided a description of the Project, the proposed archaeological survey methodology and other requirements. Aboriginal stakeholders from each group were encouraged to provide comments and raise any concerns in relation to the Project, the draft archaeological survey methodology or cultural heritage issues more generally. See **Section 8.3** for further details of the methodology adopted for the archaeological survey.

3.2.2 Summary of Responses

Five written responses and acceptances of the proposed methodology were received from the registered Aboriginal groups. All written responses and acceptances of the methodology are provided in **Appendix** a.

All groups that responded agreed with the proposed archaeological survey methodology. Buddang emphasised that the Drayton South area is a place rich in Aboriginal cultural heritage and a potential pathway between local areas. MGATSIC expressed concern regarding the protection of Aboriginal artefacts found at the entrance to the Study Area off Edderton Road and the timeframe associated with the archaeological survey. MGATSIC also requested further clarification regarding strategies to direct traffic away from Aboriginal artefacts and the due diligence assessment associated with onsite drilling. KECHS requested a culturally-based and scientific approach be adopted for the assessment in addition to 100% survey coverage of the Study Area. KECHS recommended subsurface investigations be performed following the archaeological survey prior to construction. Each of the responses was addressed as part of the archaeological survey and this assessment.

In response to issues raised by MGATSIC, tracks within the Study Area were surveyed first. Stone artefacts were identified on the majority of vehicle tracks within the Study Area, though none were assessed as of high significance. Given the virtual continuum of artefactual material across the Study Area, directing traffic away from existing tracks into undisturbed areas was not pragmatic. Impacts to stone artefacts identified on tracks as a result of vehicle access are considered “trivial or negligible acts” (New South Wales Minerals Council Ltd 2010), therefore no vehicle management strategy was adopted.

Issues regarding the archaeological survey timeframe were clarified at the planning meeting and in the field. The survey was initially scheduled as a four week program; however, it was contingent upon the survey coverage. Hansen Bailey was later advised by archaeologist Geordie Oakes, following further consultation with the Aboriginal groups in the field, that an additional week of fieldwork was required to complete the archaeological survey within the Study Area.

A due diligence assessment associated with onsite drilling was prepared for all exploration and groundwater monitoring sites. A member of the Aboriginal community involved in the archaeological survey was present during the preparation and topsoil removal at each groundwater monitoring location.

As requested by KECHS and as a component of the archaeological survey methodology, the Study Area was surveyed in its entirety, with the exception of areas of steep terrain and limited visibility. Issues raised regarding subsurface investigations are discussed as part of this assessment and will be detailed in the Aboriginal Heritage Management Plan for the Project.

3.2.3 Planning Meeting

In accordance with Section 4.2.1 of the Aboriginal Consultation Guidelines 2010, correspondence was issued on 18 March 2011 to all registered Aboriginal groups at the time inviting Aboriginal stakeholders to attend a planning meeting to discuss the various aspects of the Project including the consultation program, draft methodology and participation in the archaeological survey.

The planning meeting was held at The John Hunter Motel on 8 April 2011. In total, 16 Aboriginal stakeholders representing 15 of the 25 registered groups attended the planning meeting. Glen Morris from OEH was also present.

Items discussed during the planning meeting included:

- Study Area background;
- An overview of the Project including critical timelines and milestones;
- The Aboriginal stakeholder consultation process;

- An overview of the draft methodology and discussion of any concerns;
- Archaeological survey requirements;
- Contact details;
- The sharing of cultural heritage information; and
- An open discussion on any other aspects of interest.

3.2.4 Community Participation in the Field Assessment

Aboriginal groups that registered by 8 April 2011 were offered a role to participate in the archaeological survey. From the 25 Aboriginal groups registered in the consultation program, 23 groups were able to participate. WC declined the invitation to be involved in the survey. Each Aboriginal group was personally contacted by phone and / or email from the 21 April 2011 to confirm dates representatives were required in the field, request insurances and to provide other logistics. From this, a field roster was developed for the archaeological survey.

The archaeological survey was originally scheduled to be completed over 20 business days from 2 to 27 May 2011. All Aboriginal groups involved in the archaeological survey provided valid insurances and attended an Anglo American induction prior to commencing work. Survey was divided equally, with each group eligible to participate for five days on a rotating roster pending weather conditions. A maximum of six representatives from registered Aboriginal groups were required per day. See **Appendix** a for a listing of Aboriginal groups that participated in the archaeological survey.

Hansen Bailey was later advised by archaeologist Geordie Oakes, following further consultation with the Aboriginal groups in the field, that an additional week of fieldwork was required to complete the archaeological survey of the Study Area. To maintain the efficiency of the field assessment, six registered groups were randomly selected to participate in the final week of the survey from 30 May to 4 June 2011. On 24 May 2011, correspondence was provided to registered Aboriginal stakeholders notifying them if they were or were not required to participate in the remaining portion of fieldwork.

At the completion of each fieldwork week, Geordie Oakes from AECOM prepared a brief field summary that was distributed to all registered Aboriginal groups to keep stakeholders informed as to how the fieldwork was progressing. Correspondence was issued on 31 May 2011 to all registered Aboriginal groups inviting Aboriginal stakeholders to attend a close out meeting to discuss the findings from the field assessment. The close out meeting was held at The John Hunter Motel on 10 June 2011. A copy of the presentation (**Appendix** a) was provided to all registered Aboriginal groups on 15 June 2011.

Survey of the entire Study Area was scheduled to be completed during the initial program; however, access to a portion of land owned by Mt Arthur Coal, where Edderton Road is to be realigned, was not able to be arranged within the assessment timeframe. Therefore, an additional two days of survey was conducted from 10 to 11 October 2011 in accordance with the original methodology developed by AECOM. Six registered groups were randomly selected to participate in the archaeological survey. This selection followed the roster system that had been employed for the Project. On 4 October 2011, correspondence was provided to registered Aboriginal stakeholders notifying them if they were or were not required to participate in the remaining portion of fieldwork. See **Appendix** a for a listing of Aboriginal groups that participated in the archaeological survey.

3.2.5 Cultural Heritage Exchange Sessions

As a component of the consultation program, Hansen Bailey sought the views and cultural knowledge from the Aboriginal community regarding the sites within and surrounding the Study Area. Correspondence was issued on 31 May and 15 June 2011, and offered at the close out meeting on 10 June 2011 to all registered Aboriginal groups inviting Aboriginal stakeholders to participate in cultural heritage exchange sessions. From the 25 groups registered, two groups participated in these sessions (WNAC and UPWCI).

Both groups advised Hansen Bailey that the Study Area and its immediate surrounds was a corridor between locales, which retained significant archaeological evidence of past Aboriginal utilisation. From further discussions, it was able to be concluded that no specific features or places of Aboriginal cultural heritage were known to occur within the Study Area.

3.3 Stakeholder Review of Draft Aboriginal Cultural Heritage Impact Assessment Report

The draft Aboriginal cultural heritage impact assessment report was issued to all Aboriginal stakeholders on the 1 February 2012. Responses to the report were provided by 23 Aboriginal groups. A summary of the responses is provided below. The reviews of the report can be seen in full in **Appendix** b.

3.3.1 Stakeholder Responses

A summary of the stakeholder responses are outlined below:

- From the responses received, 16 of the Aboriginal groups accepted the content in the report and did not wish to make further comment. HVAC did not wish to make an individual comment on the report. The group preferred to support the views provided by WLALC in regards to the Project.
- Both Buddang and MGASTIC provided similar views and recommendations regarding the report, in that archaeology identified as being impacted by the Project should be collected and conserved in a designated area on site or in an offsite keeping place.
- In the response received by UHWCI, it was recommended that should the Project receive approval, employment, education and/or health initiatives should be established to benefit and support the local Aboriginal community.
- A proposal was provided by WNAC in response to the report, suggesting an additional Aboriginal Cultural Heritage Assessment be prepared by the group in line with OEH's recently released *Guide to Investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011)*.
- CPCW/Yarrawalk did not agree with the content in the report. In their response, it was noted that no cultural heritage information was provided by Aboriginal groups for consideration in the report.
- Wanaruah LALC stated that it could not support any further destruction of Aboriginal sites or landforms within the area due to their cultural significance.

Responses to the Aboriginal community's review of the draft report are outlined in **Appendix** b.

4.0 Existing Environment

The type and distribution of Aboriginal archaeological sites that occur in a given area is connected to the environment in which they occur. Environmental factors such as topography, geology, hydrology, flora and fauna will have played a significant role in influencing how Aboriginal people interacted with the landscape. Consequently, attempts to predict or interpret the character and distribution of sites in the landscape must include an analysis of environmental factors. The following section presents an overview of each of these issues which, when viewed in conjunction with the archaeological context, provides a broad background to the archaeological predictive model.

4.1 Climate

The climate in the Drayton South area can be described as having warm to hot and humid summers and cool to mild winters. Temperatures range from a maximum mean high of 31.7 ºC during January, to a minimum mean low of 3.8ºC in July, although daily temperatures can reach considerably higher or lower than these averages. The average annual rainfall for the area is 644.7 mm (Bureau of Meteorology 2011).

4.2 Hydrology

The principal watercourse associated with the Study Area is Saddlers Creek, a 4th order creekline located in the western portion of the Project Boundary. While not actually located within the Study Area, Saddlers Creek is fed by a number of small ephemeral creeks and drainage lines that traverse the centre and northern sections of the Study Area. These creeks and drainage lines form a complex drainage network that comprises the central reaches of Saddlers Creek catchment area. While these watercourses are dry for much of the year, they commonly flood after large rain events, and as a result flood Saddlers Creek. The watercourses vary in width from less than a metre at their headwaters to greater than 20 m on Saddlers Creek floodplain. Many of the watercourses, including Saddlers Creek show traces of heavy erosion, particularly along their mid and lower reaches of which vegetation clearance is a likely contributing factor. During rain events, soils eroded from the banks of these watercourses are redeposited across Saddlers Creek floodplain (Mills 2000).

In the southeast section of the Study Area, another series of ephemeral creeks and drainage lines incise a number of steep hills and feed into Saltwater Creek, with its main channel occurring outside the Project Boundary. As with watercourses feeding Saddlers Creek, these feeder creeks are mostly dry; only running during rain events. Heavy erosion is likewise a feature, particularly along the mid to lower reaches, with soils draining to the Saltwater Creek floodplain. Plashett Dam, constructed to supply water to the nearby Bayswater Power Station now occupies a large portion of the original alignment of Saltwater Creek. Both Plashett Dam and Bayswater Power Station are outside the eastern extent of the Project Boundary.

4.3 Topography

Drayton South is located within the Central Lowlands sub-region of the Hunter Valley (Story et al. 1963). The topography of the Study Area consists principally of flats interspersed with low undulating to steeply sloping hills over open paddock grazing land. Slopes range from 20% to 30%. Saddlers Creek and its major tributaries are bordered by alluvial flats. Elevation ranges from approximately 100 m near the Hunter River to 200 m where a distinct ridgeline dissects Drayton South in a northeast southwest trend.

4.4 Geology

According to the Singleton 1:250,000 geological mapsheet (Singleton 1:250,000 Geological Series Sheet SI 56-1) the underlying geology of the Study Area comprises two distinct formations: Quaternary alluvial deposits and Permian coal measures, of which the Singleton Supergroup (formerly known as the Singleton Coal Measures) comprises the overwhelming majority. Quaternary alluvial deposits are associated with Saddlers and Saltwater Creeks, and the Hunter River, and comprise gravels, sand, silt and clays derived from Permian shales and sandstones. The Singleton Supergroup incorporates several geological sub-groups including the Newcastle Coal Measures, Tomago Coal Measures, Watts Sandstone and the Wittingham Coal Measures. Lithic materials associated with the Singleton Supergroup include coal seams, claystone, siltstone, sandstone, conglomerate, tuff, and shale.

Two geological features of note are associated with the Study Area and are likely to have had a direct bearing on the nature and composition of Aboriginal stone assemblages within it: the Hunter River Gravels, and two identified sources of silcrete cobbles. The Hunter River Gravels are a well-known source of indurated mudstone, often referred to as tuff (see Hughes et al. 2011 for a discussion), silcrete, and quartz raw material that was utilised by Aboriginal people in the manufacture of stone tools in the Central Lowlands. The gravels are exposed at numerous locations along the Hunter River, both as active gravel bars and on former terraces. Gravel locations have been noted at Muswellbrook, Denman, Jerrys Plains and Singleton (Dean-Jones et al. 1993). However, as Esteves (1999) has suggested, when discussing the location of these gravels it is important to note the Hunter River's alignment is considerably different today than it was prior to European settlement due to channel modifications, land management practices, and natural processes. The implications of this are the Hunter River gravels may be located adjacent to old channelization and be a considerable distance from its current alignment. In addition, current gravels exposures may not necessarily have been available to Aboriginal people in the past.

MacDonald and Davidson (2005), in an assessment of several Hunter River gravel bars, found that the bars consist primarily of local materials, reflecting the River's underlying geology, and smaller deposits of non-local material transported from other parts of the system. Both indurated mudstone/tuff and silcrete are considered locally derived; indurated mudstone/tuff being part of the Singleton Supergroup, and silcrete derived from Tertiary fluvial sands and gravels. Surveys undertaken by Esteves (1999) along the Hunter River concluded that while these raw materials are present throughout the Hunter River gravel bars, there is spatial variability in their availability.

Naturally occurring outcrops of silcrete cobbles have been identified at two confirmed locations, and one unconfirmed location within the Study Area. Mills (2000) recorded two outcrops of silcrete cobbles, one confirmed outcrop east of Edderton Road and associated with Saddlers Creek floodplain, and one unconfirmed location on a spur in the eastern portion of the Study Area. A further confirmed location was identified during the current survey of Edderton Road realignment. These natural outcrops of silcrete are a source of raw material for stone tool production and are an important factor in characterising the local archaeology.

4.5 Soils

The 1:250,000 Singleton Soil Landscape Series Sheet (SI 56-1) (Kovac et al. 1991) indicates that soils in the majority of the Study Area are characterised by the Brays Hill soil landscape. Land in the north-west of the Study Area associated with Saddlers Creek and its tributaries are underlain by soils of the Bayswater soil landscape. In addition, land within the eastern portion of the Study Area is characterised by the Liddell soil landscape.

The Brays Hill landscape grouping is characterised by red clays (*Vertosol*) on the mid-slopes, black earths on steeper slopes and grey and brown clays (*Vertosols*) with linear gilgai (small ephemeral water bodies) and yellow solodic soils (soils with a strong texture contrast between the A and B horizon and a bleached A2 horizon) (*Sodosols*) on some lower slopes. The crests and upper slopes are characterised by red-brown earths (*Chromosols and Dermosols*) and alluvial soils are present in drainage lines. Soil erodibility varies from low to moderate throughout the soil landscape, although Alluvial subsoils have a high level of erodibility (Environmental Earth Sciences NSW 2012). Soils on cleared hillslopes are susceptible to minor sheet erosion and drainage lines may have moderate gullying. Potential for mass movement of soils is moderate to low (Kovac et al. 1991). Both erosion and mass movement of soils are factors that potentially contribute to disturbance of archaeological sites.

The Bayswater landscape grouping is characterised by yellow solodic soils (*Sodosols)* on slopes with alluvial soils in drainage lines. Within this landscape grouping, yellow solodic soils and red-brown earth (*Chromosols and Dermosols*) intergrades also occur. Brown and yellow earths and prairie soils (a soil type occurring in temperate areas formerly under prairie grasses and characterized by a black A horizon) are present in some drainage lines. Soils on slopes also comprise yellow and brown podzolic soils (*Chromosols)* ((Environmental Earth Sciences NSW 2012). Moderate sheet and gully erosion is common on slopes (Kovac et al. 1991). As a result, archaeological sites present on slopes may have been subject to varying degrees of disturbance.

The Liddell landscape grouping is generally duplex in character with varying degrees of change between A and B horizons. Lower-slopes are comprised of Yellow Solodic Soils, which consist of weakly structured dark brown loam A_1 horizons over bleached orange clay loam A_2. Below these, a clearly changed soil profile of blocky bright reddish brown light clay, becoming more yellow at depth is located. Mid-slopes are comprised of Earthy/Siliceous Sands, which consist of brown sand/loamy sand to brown sandy loams, gradually changing to dull yellow-brown sandy loam or bright brown loamy sand in the B horizon. Upper-slopes are comprised of Yellow Soloths, which consist of Brown loamy sand to sandy loam over a bleached light grey/yellow orange sandy loam or sandy clay

loam, clearly changing to bright brown/dull orange sandy clay in the B horizon (Environmental Earth Sciences NSW 2012). Soils on the lower and upper-slopes (Soloths and Solodics) are susceptible to moderate to high erosion, particularly sheet, gully and, to a lesser extent, rill erosion. Soils on the mid-slopes (sands) have a low potential for erosion. Mass movement hazard is low throughout the soil landscape (Kovac and Lawrie 1991). In these contexts, archaeological sites may be well preserved.

A large number of archaeological sites within the Hunter Valley occur in texture contrast (duplex) soils (Hughes 1984, Koettig & Hughes 1985). Texture contrast soils, as defined by Hughes (1984), consist of an A horizon of massive, sandy to silty material overlaying a B horizon of clayey material with a blocky structure. These soils are prevalent in the Central Lowlands and mantle the undulating to hilly landscapes on Permian and Carboniferous rocks and the older alluvial terraces and valley fills (Hughes 1984). Archaeological excavations in the Hunter Valley have consistently shown Bondaian assemblages, dated to the late Holocene, associated with the A soil horizon. This result has led Hughes and others to conclude that soil materials that make up the A horizon are sedimentary in origin and have accumulated over the last 5000 years (Hughes 1984). In contrast, Pleistocene dates for archaeological material in the Hunter Valley, confirmed through carbon dating of charcoal, have been associated with B unit soils (see Koettig 1986).

Texture contrast soils, particularly the A horizon, due to its loose sandy and silty material, are prone to extensive erosion resulting in the exposure and subsequent disturbance of subsurface archaeological deposit its original context. During excavations in Drayton South in the mid 1980s, Hughes (1984) noted sheet erosion was the dominant erosional process in the area, and resulted in partial stripping of A horizon soils, with only little deep rilling and gullying of the underlying B unit.

4.6 Flora and Fauna

The following flora and fauna section is extracted from the ecology impact assessment (Cumberland Ecology, 2012) prepared for the Project.

The original character of the vegetation in the Study Area has been greatly altered as a result of historical and current land uses. Remnant forest and woodland now exist as scattered patches across the landscape, typically in gully and riparian areas that have historically been difficult to farm. These patches, although fragmented, occur in reasonable proximity of each other and form a relatively well-connected “stepping stone” corridor of vegetation across the local landscape. Some patches are large enough to provide reasonable interior habitat for native fauna and flora and these areas support a diversity of species in the understorey.

The predominant vegetation unit within the Study Area is native grassland that has been derived from the clearing of the original woodland and forest communities. The native grassland unit is largely dominated by a variety of native perennial grass and forb species but many exotic species are present as is typical of grazing lands. The majority of the remaining remnant woodland across the site is dominated by *Eucalyptus moluccana* (Grey Box) and comprises the community Central Hunter Box-Ironbark Woodland. Many of the woodland communities in the Study Area conform to communities that are listed as Threatened Ecological Communities (TECs) under the TSC Act and/or the EPBC Act. Some of these vegetation communities conform to the EPBC Act and TSC Act listed Box-Gum Woodland.

A suite of bird species, and to a lesser extent, bats, dominates the faunal assemblage within the Study Area. Arboreal mammals were restricted to common and disturbance-adapted species such as possums. Small ground dwelling native fauna (mammals, reptiles and amphibians) are not as well represented within the Study Area. These trends may reflect the high degree of modification to the understorey habitat and general lack of forage and shelter, as well as the fragmented nature of woodland that may restrict movement. These animals represent potential food resources for Aboriginal peoples in the past.

4.7 Land Use and Disturbance

The current dominant land uses within and around the Study Area include open cut coal mining, power generation, thoroughbred horse breeding, viticulture, cattle grazing and rural residential areas. Since European settlement of the area in the 1820s, flora and fauna, hydrology and the Hunter Valley landform has been subject to considerable impacts primarily as a result of European agricultural activities and coal mining operations. Notable recent and historic land use impacts include:

- Native vegetation clearance;
- Trampling from cattle grazing;

- Fencing works;
- Earthworks and excavation for damming;
- Topsoil disturbances from ploughing;
- Contour banking;
- Sheet, gully and rill erosion, particularly along creeklines;
- Landscape disturbances from construction of vehicle tracks;
- Landscape disturbances from the construction of farmhouses and associated buildings; and
- Landscape disturbances from coal mining activities including minor excavation for exploratory drilling activities.

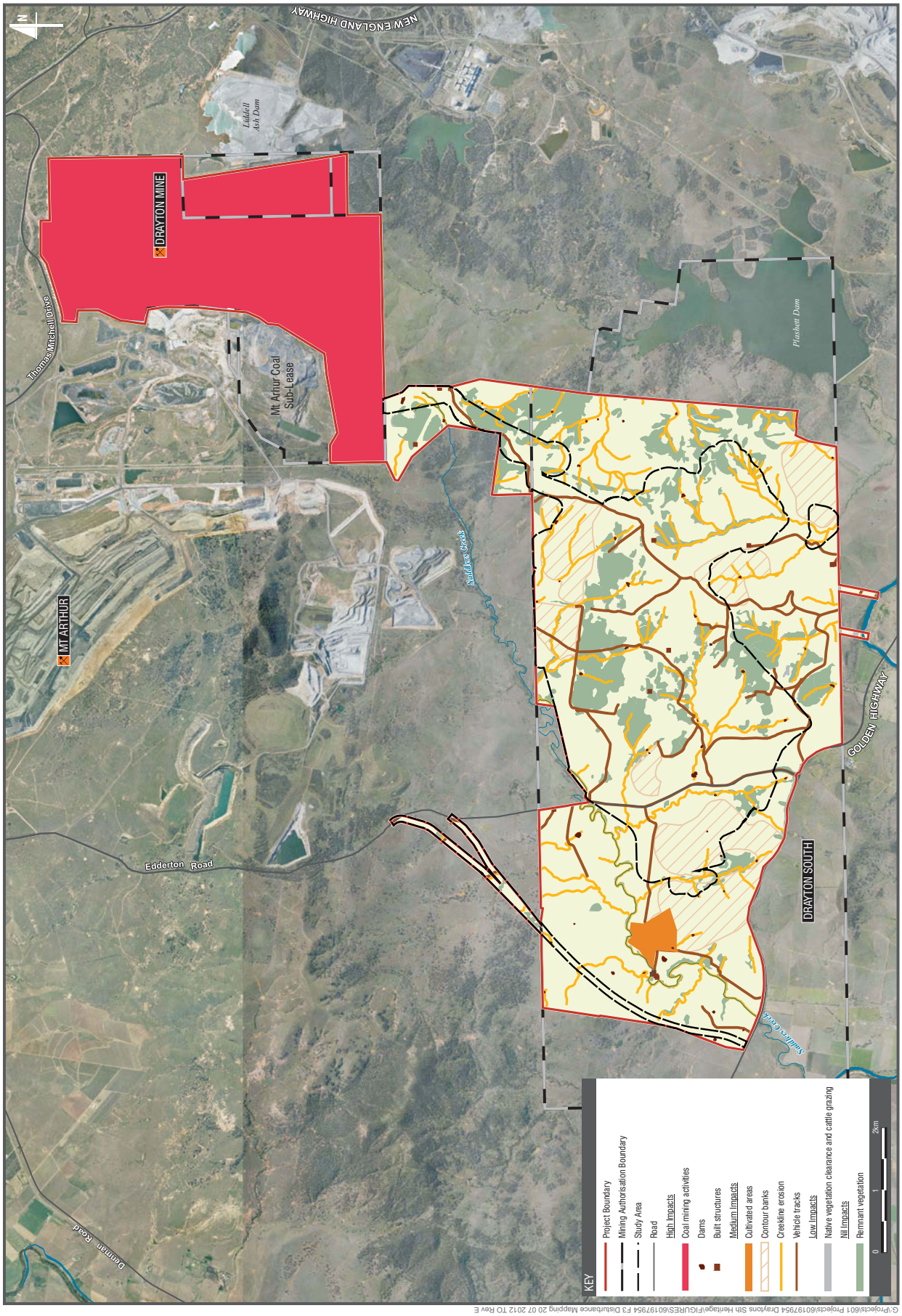
Figure 3 provides disturbance mapping for the Project Boundary.

4.8 Implications for Aboriginal Archaeology and Cultural Heritage

Environmental conditions discussed above, such as climate, access to fresh water, flora and fauna provide a basis to argue that land within the Study Area was sufficient to support repeated occupation by Aboriginal people. Evidence of occupation is likely to be found concentrated along/adjacent to creeklines where there is easy access to potable water and marine food resources. More intense evidence of Aboriginal occupation, in the form of higher artefact densities, is anticipated adjacent to major creeklines such as Saddlers and Saltwater Creeks, with lower densities along ephemeral feeder creeks and drainage lines. Accordingly, there is a high potential for Aboriginal archaeological and cultural heritage sites to occur within the Study Area. However, while sites are expected, their condition will be dependent on the level of disturbance they have undergone.

To varying degrees, the impacts listed above are relevant to the survival, integrity and identification of Aboriginal archaeological evidence within the Study Area. Key archaeological implications, as a result of these impacts are:

- The destruction, in areas of grossly modified terrain, of sites and deposit;
- The disturbance of sites and deposit through direct (e.g., ploughing) and indirect (e.g., erosion) means, resulting in a loss of archaeological integrity (complete or partial); and
- An increase in ground surface visibility, and subsequently the detection of sites, due to the effects of erosion.



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AECOM

DISTURBANCE MAPPING
Aboriginal Archaeological and Cultural Heritage Impact Assessment
Drayton South Coal Project, New South Wales

FIGURE 3

5.0 Archaeological Context

5.1 Regional Archaeology

This section summarises key Aboriginal archaeological studies that have been undertaken at a regional scale in the Hunter Valley over the past 25 years.

Hughes (1984) *Hunter Valley Region Archaeology Project Stage 1, Volume 1 – An Overview of the Archaeology of the Hunter Valley, its Environment Setting and Impact of Development (cited in Koettig, 1990 and ERM , 2004)*

Hughes (1984) undertook a review of archaeological data for the Hunter Valley and found that a large variety of Aboriginal sites were located across the region, with the majority in the Central Lowlands. Sites in the Central Lowlands were typically characterised by open campsites (isolated finds and artefact scatters) which were consistently found in areas up to 50 m from watercourses, irrespective of their size. However, site sizes were seen to diminish as the size of watercourse decreases. Sites were also recorded on hills and slopes although these were comparatively scarce. As a result of the study, Hughes (1984) concluded that Aboriginal occupation of the Hunter Valley did not appear to be older than the mid to late Holocene.

Burton et al. (1990) *Regional Study of Heritage Significance Central Lowlands Hunter Valley Electricity Commission Holdings*

Burton et al. (1990) were commissioned by the Electricity Commission of NSW to assess the heritage significance of the natural landscape, and the historic and Aboriginal archaeology within their holdings in the Hunter Valley. The study provided a summary and review of known Aboriginal sites in the Hunter Valley. Similar to Hughes' (1984) study, the results of this study found that most Aboriginal archaeological sites were found to be in the Central Lowlands; however, this is explained as being due to sampling bias as a result of continued development in the region. The study found a total of 195 sites had been recorded since Hughes' (1984) review six years prior. Of these sites, 191 were open artefact scatters, two were possible scarred trees, one was a confirmed scarred tree and one was a set of grinding grooves. The majority of artefact scatters recorded were located in the A soil horizon and on the surface of the eroding B-horizon. Radiocarbon dating undertaken from two charcoal samples found at a depth of one metre at a hearth site were dated at + 20, 000 BP, indicating that Aboriginal occupation commenced in the area by at least the Late Pleistocene.

ERM (2004) *Upper Hunter Valley Aboriginal Baseline Study*

ERM (2004) undertook a study that provided a synthesis of Aboriginal archaeological work that had been completed in the Upper Hunter until 2004. The study noted the majority of sites reviewed (over 98%) were open sites with surface scatters of stone artefacts. These were concentrated along major creeks flowing into the Hunter River and its tributaries. Sites were found to occur wherever erosion had removed topsoil. However, sites were much more likely to occur and artefact densities were likely to be greater near creeklines than on the slopes or ridge crests. Sites were also noted as increasingly being identified in aeolian sand deposits. Most sites comprised of flaked stone artefacts of silcrete and indurated mudstone/tuff with minor components of quartz, petrified wood, chalcedony, porcellanite and other igneous rocks. Backed artefacts typically made up 1% or 2% of recorded assemblages. Sites identified along creeklines generally had the potential for subsurface deposits, while sites in aeolian dunes and sand-sheets had significant potential for deep Pleistocene archaeological deposits.

5.2 Local Archaeology

This section summarises the Aboriginal archaeological assessments that have been carried out in the environs of the Study Area.

Dyall (1977) *Environmental Studies – Mt Arthur Project (Hunter Valley): Full Report on Aboriginal Relics.*

In this study, Dyall (1977) provides a synthesis of all Aboriginal sites located during his surveys of the Mt Arthur Coal lease area. The survey was conducted as a forerunner to the construction of the Bayswater Power Station. The study divided the area into various creeklines including Ramrod, Emu, Saddlers, Saltwater and Ponds Creeks and provided the total number of artefacts identified at each location. Of interest to this study are the results of survey along Saddlers and Saltwater Creeks. Dyall (1977) identified three main clusters of artefacts along Saddlers Creek, one of which was estimated to contain 'tens of thousands' of artefacts. All artefacts were located on a terrace adjacent to creek, and within 50 m of it. Of the artefacts located, a sample of 512 waste flakes, 46 flaking cores and 99 stone implements were collected during the survey. Dyall (1977) located a number of sites

along the banks of Saltwater Creek. One site was located eight metres above the creek on a terrace and was described as 'one of the largest Aboriginal camps' he had seen. A thick scatter of stone flakes and flaking cores covered at least one acre, extending back at least 100 m from the creek. Dyall (1977) also identified 27 axe-sharpening grooves on the western side of a sandstone shelf and additional artefact scatters along both sides of the creek bank. Dyall (1977) collected 201 waste flakes, 13 flaking cores, and 21 stone implements from the sites during the survey. The waters of Plashett Dam cover much of this area today.

(Dyall 1980b) *Mt. Arthur North Coal Lease: Report on Aboriginal Relics*

Dyall (1980b) undertook a survey for a proposed open cut at Mt. Arthur Coal Lease that focussed on Whites, Quarry and Ramrod Creeks. During the course of the survey, Dyall (1980) located a large number of artefact scatters adjacent to creeklines, and noted the majority occurred at creek junctions or on a level bank at a 'sweeping creek bend'. Between these higher density clusters, a low-density (less than one artefact per 50 m) distribution of artefacts was identified (now commonly referred to as 'background scatter'). Artefact types recorded included flakes, Bondi points, geometric microliths and basalt axes. In addition, Dyall (1980) located three grinding grooves on a narrow sandstone platform on the slopes of Mt. Arthur. The majority of flakes were found to be of rhyolite (silcrete), which was noted as occuring as small cobbles and boulders on the hill slopes and creek beds. Chert was identified as the next most commonly used raw material, though Dyall could not locate its source. Sources of basalt used for axes were identified in the bed of Muscle Creek to the east, and in Saddlers Creek to the east of Mt. Arthur.

Hughes (1981) *An Archaeological Survey of the Bayswater No. 2 Colliery Proposed Lease Extension Area, Muswellbrook, The Hunter Valley*.

Hughes (1981) undertook a survey of the proposed extension area to the Bayswater Colliery. The survey resulted in the identification and recording of nine Aboriginal sites scattered throughout the proposed lease extension area. All of the sites comprised open camp sites with scatters of stone artefacts. A number of these sites were situated along Ramrod Creek.

Hughes (1982) *A Preliminary Report on Archaeological Survey and Salvage Work in the Saltwater Creek Plashett Dam Site Area, Hunter Valley, New South Wales.*

Hughes (1982) undertook an archaeological survey, recording and salvage of sites in the Saltwater Creek catchment in the area to be affected by the construction of Plashett Dam and downstream dam wall. A total of 86 artefact scatters were identified, the majority of which occurred on exposures along Saltwater Creek. Identified artefacts consisted of indurated mudstone/tuff, silcrete, chert, quartzite, quartz, porcellanite and a variety of igneous materials. Most were unmodified flakes and cores. However, a range of retouched artefacts was also present. A programme of salvage work was carried out to collect samples of the stone artefacts.

Davidson et al. (1993) *Archaeological Investigations: Proposed Bayswater No.3 Colliery Authorisation Area (A437)*.

Davidson et al. (1983) conducted an archaeological survey at Bayswater Colliery No. 3, as part of the Bayswater No. 3 EIS. The total survey area was 47 km^2, although a small sample of only 112 ha (0.024%) was actually surveyed. The survey strategy primarily concentrated on two of the drainage lines within the survey area not previously examined – a major tributary of Saddlers Creek, and Quarry Creek. Almost half of the survey sample (41%) was focused on creeklines with the remaining 59% of the survey area allocated to transects extending away from the creeklines. The survey strategy targeted exposed areas of the landscape following an initial assessment that indicated major visibility constraints due to dense grasses throughout the area.

As a result of the survey, 84 Aboriginal sites were recorded, including 78 artefact scatters, four scarred trees and two axe-grinding grooves. Artefacts were found to occur over 31% of surfaces associated with drainage lines, and only 25% of surfaces away from drainage lines. A total of 224 artefacts were identified during the survey, comprising 76 flakes, 62 broken flakes, 52 flaked pieces, five cores, 24 flakes with tranchet retouch and five backed artefacts. Indurated mudstone/tuff was the dominant raw material utilised, with silcrete the next most common.

Site size ranged from 1 to 62,500 m^2 with artefact densities varying between 0.0007 and 0.72 per m^2. However, these densities referred to the gross area of the survey area not the levels of effective coverage or effective site area, and were therefore not readily comparable with other studies. The survey did, however identify there was only a minor decrease in artefact density away from creeklines, with a moderate level of materials identified within hillslopes and ridge crests.

Rich (1993) *Archaeological Survey for Aboriginal Sites, Proposed Bengalla Coal Mine*

Rich (1993) undertook an archaeological survey within the disturbance area of the proposed Bengalla Mine Project Area, extending from Wybong Road in the north to the Muswellbrook-Merriwa Railway line in the south, and from Bengalla Road in the east. A total of 56 Aboriginal sites were recorded, comprising 39 artefact scatters and 17 isolated finds. Artefacts were found to occur on all landforms within the Project Area, including the main unnamed creek, gullies, flats, rises, slopes and ridge tops. The most significant site recorded was a silcrete quarry (B10) associated with tertiary ridge gravels.

Rich (1993) hypothesises that three stone industries were present in the area: a microblade (i.e. backed blade) industry, a small flake tool industry, and a large tool industry that included large retouched flakes, unifacial and bifacial pebble tools, edge ground axes, hammerstones and a grindstone. Interestingly, Rich (1993) found that the various stone industries tended to be found on different landform units. Microblade industries were concentrated along the main creek and around the confluence of minor gullies. Small flake tool assemblages tended to occur along minor gullies and on hill slopes and ridges while artefacts of the large tool industry were found on most land units, but most frequently on land units close to the Hunter flats and on slopes and ridges away from the flats. Silcrete was the predominant raw material recorded in the Project Area, accounting for 60% of all artefacts. Much of this material was found naturally occurring at the quarry site B10 and likely procured there. Indurated mudstone/tuff was the next most commonly recorded raw material (26%). The majority of recorded artefacts comprised flake and non-flake debitage (82%) with cores and tools reasonably well represented at 8.5% and 8.2% respectively.

(Rich 1995b) *Mt Pleasant Coal Lease, near Muswellbrook, NSW: Archaeological Survey for Aboriginal Sites.*

Rich (1995b) undertook an assessment of Mount Pleasant Mine. A total of 327 sites were identified by the survey – 180 isolated finds and 93 artefact scatters. Most sites were identified along gullies and lower portions of ridges and slopes. The total number of artefacts recorded was 1408, with silcrete being the dominant material (58%), followed by indurated mudstone/tuff (28%). Rich (1995) stated that the ability to locate artefacts was constrained due to limited ground exposure and surface visibility. Artefact densities were found to be higher along gullies than on hillslopes and ridges.

White (1996) *Archaeological Survey in Plashett Dam Catchment*.

White (1996) surveyed two watercourses within the catchment of Plashett Dam to assess the impact of soil erosion control works proposed by Macquarie Generation on Aboriginal sites. Twenty-eight artefact scatters, seven isolated finds and 20 areas of PAD were recorded during the survey. Creek flats and footslopes adjacent to Saltwater Creek contained very high densities of visible artefacts. Indurated mudstone/tuff and silcrete was the most commonly used raw material, followed by quartz, quartzite, porcellanite, igneous material and petrified wood. Artefact types included axes, hammerstones/anvils, cobble tools, various retouched and/or used tools, elouera, Bondi points, geometrics and various other backed pieces, cores and core-tools, as well as debitage. White (1996) argues that the archaeology of Plashett Dam is typical of the Central Hunter Lowlands.

McDonald (1997) *The Bayswater Archaeological Research Project: Preliminary Fieldwork Report, Bayswater Colliery Company No. 3 Lease, March – June 1997.*

McDonald (1997) undertook a combination of archaeological survey and test excavation for Bayswater Colliery No. 3. A total of 35 sites were recorded, most of which were located within proximity to watercourses. Four areas were excavated – one adjacent to a major creek, one on a ridge crest, one adjacent to a spring fed waterhole, and areas adjacent to McDonald Road South. The site adjacent to the creekline recovered 70 artefacts from 155 test pits of 0.25m² while the ridge crest site recovered 840 artefacts from an area of 15m². The site adjacent to the waterhole recovered 283 artefacts from a 5m² pit and excavations at MacDonald Road recovered 587 artefacts from 120 1m² pits. Unlike the typical trend, a greater number of artefacts were found on the ridge rather than the watercourse.

Umwelt (1997) *Archaeological Assessment – Proposed Modifications to Coal Preparation and Transportation System – Bayswater Coal Mine Project.*

In 1997, Umwelt Pty Ltd undertook an archaeological assessment of proposed modifications to the coal preparation and transportation system at Bayswater Colliery. The assessment, which included archaeological survey, reviewed three areas of impact in the southern section of the Bayswater No. 3 mining lease; the coal processing plant, haul road, and mine access road; the overland conveyer; and the stockpile area. A total of 36 sites were recorded during the survey, including 28 artefact scatters and eight isolated finds. The majority of sites were located on stream banks, particularly around Saddlers Creek and its tributaries. A number of sites were also

found on upper slopes and ridges adjacent to watercourses. Artefacts consisted primarily of flakes and flaked pieces. Retouched flakes and cores were also recorded as well as a hammerstone.

Kuskie (2000a) *An Aboriginal Archaeological Assessment of the Proposed Mount Arthur North Coal Mine, Near Muswellbrook, Hunter Valley, New South Wales.*

Kuskie (2000a) conducted an assessment of the Mt Arthur North lease area prior to proposed mining activities. The assessment examined 244 ha (6.6%) of the total Mt Arthur North lease area (3,700 ha). Unlike previous surveys, Kuskie (2000a) based his survey on a system of Archaeological Terrain Units (ATUs) i.e. landscape divisions based on a combination of landform elements and slope class. Archaeological survey areas were segments of an ATU that were surrounded on all sides by a different ATU. Kuskie (2000a) recorded artefactual materials in terms of *sites* (defined as the presence of one or more artefacts in a survey area – when an artefact is found in a survey area the whole survey area is regarded as a site) and *site loci* (spatially separate locations of evidence within a site).

The assessment identified a total of 305 sites within the survey area, 112 of which were previously recorded. Of these sites, 304 were stone artefact scatters and one was a grinding groove site – the same site (#37-2-0111 – Fairford 1) recorded by Dyall (1980a). The sites were recorded in 1,188 separate site loci, which ranged in size from 0.3 m^2 to 60,000 m^2 and averaged 334 m^2. Sites comprised of 1 to 21 site loci, but averaged two separate site loci. Total site size ranged from 540 m^2 to 1,444,487 m^2. Kuskie (2000a) calculated that the sites occupied 81% of the whole Mt Arthur North EIS area. This figure is derived from the practice of defining a whole survey area (Kuskie's definition of survey area) as a site if physical evidence is found anywhere within it.

A total of 17,330 stone artefacts were identified during this assessment, with 15,982 recorded in detail. Sites were found at an average density of one site per hectare, and the number of artefacts recorded within each site ranged from 1 to 2,602. Within individual loci, recorded artefacts ranged from 1 to 670. Site loci had artefact densities between 0.0004 and 850 artefacts / m^2 and a mean of 0.183 artefacts / m^2. This is 2.6 times higher than the average artefact density for all exposures, including those that did not contain artefacts. The majority of artefacts (86%) were recorded on surfaces exposed by sheet erosion. Artefacts were also noted in areas of stream bank erosion, gully erosion, rill erosion, dense vegetation, aggrading surface deposits and modified surfaces. Kuskie (2000a) recorded the following artefact distribution across the terrain units of Mt Arthur North. Overall, artefact densities were relatively low throughout the Study Area, despite artefacts being identified within a virtual continuum. All the landforms or variables sampled (geology, soils) contained archaeological materials.

Table 2: Artefact Distribution Recorded at Mt Arthur North by Kuskie (2000a)

Landform	No. Artefacts	Effective Site Loci Area (m^2)	Artefact Density (No./m^2)
Ridge crest (3.6%)	405	10,944	0.037
Spur crest (9%)	1,045	8,435	0.124
Simple slope (56.6%)	4,470	57,056	0.078
Bench (0.01%)	153	660	0.232
Flat (1%)	4	2	2.000
Valley flat (8.9%)	8,608	8,021	1.073
Drainage depression (18.4%)	2,645	9,647	0.274
Totals	**17,330**	**94,765**	**0.183**

Note: The percentage in brackets refers to the relative percentage of that landform unit to the whole Study Area.

Although sites were widely distributed throughout the Mt Arthur North landscape, Kuskie (2000a) noted several patterns in artefact distribution. Artefacts occurred at substantially higher densities within the valley flat landform element, on level to very gently inclined slopes, within 50 m of a watercourse (particularly if it was a higher order stream) and on level to very gentle valley flat ATU. Artefacts were widely distributed on ridge crests and spurs but in lower densities than expected. Artefact densities were higher than expected on simple slopes within all classes of slope (upper, mid, lower) and aggrading surfaces.

This distribution pattern led Kuskie (2000a) to argue that the most important landform units within the survey area were:

- The ridge crests / gentle sloping spurs;
- Moderate to steep simple slopes;
- Level / very gently sloping benches; and
- Level / very gently sloping valley flats.

Although Kuskie (2000a) identified the importance of valley flats and watercourses in this analysis, it is equally clear that occupation and use of higher terrain landform units is an important element in the assessment of this landscape.

The recorded assemblage contained 37 different types of artefacts, dominated by flakes (53.4%), microblades (16%) and flaked portions (15.1%). Evidence of utilised and / or retouched artefacts was not common (1.65%). The primary raw materials utilised were silcrete (51%) and indurated mudstone/tuff (34.6%), although 13 other stone materials were also identified.

Kuskie (2000a) concluded that the survey results indicated that a substantial body of Aboriginal heritage evidence existed at this site, of which only a small fraction was identified during the archaeological survey (due to the visibility constraints). The survey results also indicated that the major watercourses of the area were the focus of Aboriginal occupation, with level to gently inclined land typically preferred. Campsites tended to be positioned within 50 m of a watercourse, particularly on the third and fourth order streams. However, Kuskie (2000a) also noted the importance of vantage points within the landscape. The results indicated that the entire landscape was utilised to varying extents.

Kuskie (2000b) *An Aboriginal Archaeological Assessment of the Proposed Bayswater Rail Loading Facility, Near Muswellbrook, Hunter Valley, New South Wales.*

Kuskie (2000b) undertook an assessment for a proposed rail loop and coal loading facility. This assessment examined 16.6 ha (10.7%) of the total Study Area (Authorisation 171 adjacent to Bayswater No. 2 Colliery) and the area required for a 2.7 km rail loop (173 ha). The alignment of the rail route was designed with the objective of minimising impacts to areas with potential heritage constraints along Ramrod Creek.

Kuskie (2000b) recorded artefactual materials in terms of *sites* (location of evidence of Aboriginal occupation commonly refers to an artefact scatter) and *site loci* (spatially separate location of evidence within a site). The nature of archaeological material across the landscape is discussed in terms of *artefact density*, which is defined as the mean number of artefacts within each square metre of visible ground surface.

The assessment identified a total of 14 sites, all of which were open artefact scatters. A total of 271 artefacts were recorded, the majority of which (n=156) were located in association with drainage depressions. Higher numbers of artefacts were also found to occur on simple slopes (n=91). The most common raw material recorded was indurated mudstone/tuff (49.4%), followed by silcrete (27%), porcellanite (6.3%), other volcanics (5.9%), quartzite (4.8%), quartz (3.3%) chert (1.5%) and banded rhyolite (1.1%).

The recorded assemblage contained 18 different types of artefacts, dominated by flakes (36.9%), microblades (13.7%), lithic fragments (12.9%), proximal portions of flakes (10.7%), distal flake portions (7.7%), cores (6.3%), and flaked pieces (5.2%). The dominance of flakes, flaked portions and flaked pieces (62.7% in all) was interpreted as indicating that the majority of the evidence relates to general or non-specific knapping activities.

Kuskie (2000b) concluded by arguing that the evidence "is typical of that from the Central Lowlands of the Hunter Valley, although specific differences may exist with evidence reported from other localities. Taken individually, none of the items or contexts located within the Study Area appears to be unique in the region" (Kuskie 2000b: 87).

Kuskie & Clarke (2004) *Salvage of Aboriginal Heritage Sites in the Mount Arthur North Coal Mine Lease, Hunter Valley, New South Wales.*

As a result of the Mt Arthur North Aboriginal heritage assessment undertaken by Kuskie (2000a) and in view of the limited scope for avoiding impacts to sites identified, Kuskie and Clarke (2004) conducted a program of salvage excavation in 2004. The salvage excavations were conducted in four phases comprising of mechanical test scrapes, broad-area hand excavations, mechanical surface scrapes and localised hand excavations within the surface scrapes. Mechanical excavations covered a total of 15.5 ha, although additional mechanical surface

scrapes (totalling 23 ha) were conducted along an extensive portion of the Whites Creek valley flats following the identification of a burial site. Therefore, a combined total of 38 ha of surface scrapes were completed, resulting in a total of 138.7m^3 of soil being excavated and sieved. In addition, a total of 779.75 m^2 was excavated by hand.

In all, the excavations retrieved a total of 32,866 stone artefacts with a total of 43 stone artefact types. Kuskie and Clarke (2004) identified a total of six activity categories including non-specific stone flaking, bipolar flaking, microblade production, backing retouch of microliths, loss or intentional discard of microliths and loss or intentional discard of non-microlith tools. The production of backed artefacts was the most common specific activity and the generally small size classes that characterised much of the assemblage was attributed to backed-blade production, However, these specific-activity attributes accounted for a small proportion of the overall assemblage with the remainder (97%) the result of non-specific knapping.

A total of 16 discrete stone materials were identified with silcrete being the most common (59.4%) followed by tuff or indurated mudstone/tuff (19.4%) and then, porcellanite (10%), quartz (4.3%) and petrified wood (3.5%). Other raw materials recorded (at much lower frequencies) included quartzite, chert, chalcedony, basalt, sandstone, volcanic glass, glass, ochre and two unidentified types of volcanic stone.

Stone artefacts occurred at varying densities throughout the landscape and within the soil profile. Artefact densities resulting from the main hand excavations ranged from 11 artefacts / m^3 at the ridge and Hunter River upper section to 271.7 artefacts / m^3 in the Whites Creek upper section, with a mean of 106.8 artefacts / m^3.

Kuskie and Clarke (2004) concluded from these results, that proximity to Whites Creek was more important to Aboriginal people than proximity to the Hunter River. The surface scrapes and excavations at Whites Creek contained much higher frequencies of 'background discard', higher frequencies of focussed activity areas, and a greater range and quantity of activities. Moreover, activity areas along Whites Creek represent substantially more intense activity and involve a greater range of stone materials than those along the ridge from Mt Arthur to the Hunter River.

In addition, Kuskie and Clarke (2004) suggested that the Whites Creek activity areas reflect a lifestyle involving several short-term temporary encampments used by small groups of people during the course of daily/seasonal hunting, in comparison to evidence along the ridge from Mt Arthur to the Hunter River, which indicates transitory movement. Radiocarbon dating, geomorphological and lithic evidence indicates that there is a high probability that occupation of the area was limited to the mid to late Holocene.

Umwelt (2007) *Mt Arthur North South Pit Extension.*

In 2005, Umwelt conducted an archaeological assessment of the southeastern corner of the Mt Arthur Coal operations in preparation for an extension to Mt Arthur North's South Pit. The Study Area covered a total of approximately 327 ha, although Umwelt's (2007) archaeological survey area covered approximately 252 ha (the remaining 75 ha was within lands previously surveyed by Kuskie (2000a) which was considered sufficient). The summary provided below is based on Umwelt's (2007) survey area only.

In an effort to obtain comparative data, Umwelt used a slightly modified version of the same methodology as Kuskie (2000a) basing the survey on comparative ATUs and landform elements. However, the definition used to describe 'sites' differed slightly in that isolated finds were differentiated from artefact scatters.

Surface visibility varied from 1 and 95% throughout the area. Survey coverage within Umwelt's archaeological survey area was based on the ATUs surveyed, ranging from 6% of the ATU (simple slope gentle) to 74% (drainage depression moderate to steep). In all, Umwelt's archaeological survey covered 57 ha (22.6%) of the total survey area. Survey effort was biased towards watercourses on the basis of a predictive model.

Like Kuskie (2000a), Umwelt recorded artefactual material in terms of *sites* (location of evidence of Aboriginal occupation; the boundary of a site was defined by the boundary of a survey area) and *site loci* (the visible extent of artefacts). The survey identified a total of eight sites, which consisted of 42 site loci within eight ATUs. All site loci were occupation sites (stone artefact scatters) with the majority (n = 27) being low-density artefact scatters and the remainder (n = 15) being isolated finds. No other site types were recorded. Total site size (i.e. survey area size) ranged from 540 m^2 to 1,444,487 m^2. The sites were recorded in 1,188 separate site loci, which ranged in size from 0.3 m^2 to 60,000 m^2, averaging 334 m^2. Sites comprised 1 to 21 site loci, but averaged two separate site loci. Umwelt (2007) calculated that the sites occupied 81% of the whole survey area (197 ha).

A total of 810 stone artefacts were identified during this assessment. Site loci were found at an average density of 1 site loci / 6 ha, and the number of artefacts recorded within each site loci ranged from 1 to 500.

The recorded assemblage contained several different types of artefacts, dominated by flakes. Other types recorded include broken flakes, flaked pieces, cores, flakes used as cores and choppers. Actual numbers of each artefact type were not recorded. Evidence of utilised and / or retouched artefacts and microblade manufacturing was not recorded within the assemblage. The primary raw materials utilised were indurated mudstone/tuff, followed by silcrete, with much lower proportions of grey siltstone, basalt, quartzite, porcellanite, heat-treated petrified wood and flaked volcanic river pebble (percentages not recorded).

Umwelt (2007) states that the results of the survey fit with the predictive model developed from previous archaeological work. However, this may have been a result of focussed sampling within watercourses.

Table 3: Artefact Distribution Recorded at Mt Arthur North South Pit Extension by Umwelt (2007)

Landform	No. Artefacts	Effective Site Loci Area (m^2)	Artefact Density (No./m^2)
Ridge crest (gentle)	0	0	0
Spur crest	6	5	1.2
Simple slope (v. gentle)	2	35	0.0571
Simple slope (gentle)	50	6,672	0.0075
Simple slope (moderate – steep)	2	2	1.0000
Drainage depression (gentle)	722	29,586	0.0244
Drainage depression (moderate – steep)	2	N/A	N/A
Modified terrain	26	186	0.1398
Totals	**810**	**36,479**	**0.0222**

Umwelt (2008) *Mt Arthur Underground Project.*

Umwelt (2008) conducted an assessment of Mt Arthur Underground to support an EA for the project. This assessment examined approximately 1,233 ha (32.7%) of the Mt Arthur Underground Project Area (3,800 ha).Like Umwelt's (2007) South Pit Extension survey, Umwelt (2008) used a modified version of the methodology used by Kuskie (2000a, 2000b), basing the survey on comparative ATUs and landform elements in an effort to obtain comparative data. However, the definition used to describe 'sites' differed slightly from Kuskie's (2000a, 2000b) and Umwelt's (2007) methodologies in that isolated finds were differentiated from artefact scatters and, more significantly, sites were defined on the basis of PADs connecting two or more loci or only loci if PADs were not defined.

Surface visibility varied between 0 and 90% throughout the area (excluding exposures) and between 5 and 90% within exposures. The level of effective survey coverage was not calculated. The assessment identified a total of 77 sites comprising of 509 site loci within the survey area. Of these sites, 76 were occupation sites (46 stone artefact scatters and 30 isolated finds) and one was a scarred tree site. The sizes of separate site loci were not recorded. Sites comprised 1 to 45 site loci, but averaged six separate site loci.

A total of 9,603 stone tool artefacts were identified during this assessment. Sites were found at an average density of 0.02 sites per ha and loci were found at an average density of 0.1 loci per ha. The number of artefacts recorded within each site ranged from 1 to 2,768. Within individual loci, recorded artefacts ranged from 1 to 2000, although less than 10 artefacts was the norm.

The recorded assemblage contained 11 different types of artefacts, dominated by flakes and broken flakes (percentages not calculated). Evidence of utilised and/or retouched artefacts and microblade manufacturing was not common within the assemblage. The primary raw materials utilised were indurated mudstone/tuff, followed by silcrete, with lower utilisation of porcellanite, quartz, chert, quartzite, hornfels, basalt, silicified sandstone, petrified wood, chalcedony, tuff and river pebbles (manuports) in site loci with larger assemblages.

The majority of recorded artefacts were identified on surfaces exposed by sheet erosion. Artefacts were also identified in areas of stream bank erosion, gully erosion, rill erosion, dense vegetation, aggrading surface deposits and modified surfaces.

Table 8 shows Umwelt's (2008) recordings of artefact distribution across the terrain units of Mt Arthur Underground.

Table 4: Artefact Distribution Recorded at Mt Arthur Underground by Umwelt (2008)

Landform	No. Artefacts	Effective Site Loci Area (m^2)	Artefact Density (No./m^2)
Simple slope (level – v. gentle)	199	1,734	0.1148
Simple slope (gentle)	391	15,691	0.0249
Simple slope (moderate – steep)	817	45,493	0.0180
Drainage depression (level – v. gentle)	1,912	224,808	0.0085
Drainage depression (gentle)	4,592	50,593	0.0908
Drainage depression (moderate – steep)	973	23,297	0.0418
Ridge crest Ridge Line	82	11,682	0.0070
Spur crest	447	2,472	0.1808
Modified terrain	190	3,199	0.0594
Totals	**9,603**	**378,969**	**0.0253**

Note: For the purposes of calculating total number of artefacts for an ATU, where a range of artefacts is given for a site (loci) the higher number is used for the calculation. Therefore, the number of artefacts shown is the upper limit and consequently the actual artefact densities may be lower.

Overall, artefact densities were relatively low throughout the Study Area, although densities were markedly higher on the spur crests and, to a lesser extent, on level to very gentle slopes.

Although sites were widely distributed throughout the Mt Arthur Underground landscape, Umwelt noted several patterns in artefact distribution. The majority of site loci occurred within gentle drainage depressions, on gently inclined slopes, and on creek banks or within 50 m of a watercourse (particularly if it was a higher order stream in proximity to confluences). Artefacts occurred in low frequencies on ridge crests and spurs, with Umwelt attributing the use of these landforms by Aboriginal people as a result of their views. Artefact densities were lower than expected on simple slopes within all classes of slope (upper, mid, lower), compared with Kuskie's (1999) findings. Artefact densities were much higher than expected in moderate to steep drainage depressions, which Umwelt postulates is due to these gullies being used as travel routes to the tops of ridges. This distribution pattern led Umwelt to argue that the most important landform units within the survey area were drainage depressions regardless of slope class.

Although Kuskie (2000a) identified the importance of valley flats and watercourses in his analysis, he also believed that occupation and use of higher terrain landform units including higher slopes, spurs and ridges, was also important. This view is not supported by Umwelt's (2008) findings; however, the survey results also indicated that the major watercourses of the area were the focus of Aboriginal occupation, with gently inclined land preferred for occupation. Campsites tended to be positioned within 50 m of a watercourse, particularly on the third and fourth order streams.

AECOM (2009a) *Aboriginal Archaeology and Cultural Heritage Impact Assessment, Mount Arthur Coal, Muswellbrook, NSW*.

AECOM (2009a) undertook an archaeological survey for Aboriginal sites on the Mt Arthur Coal lease resulting in the identification of 94 previously unrecorded sites. including both low density and high density stone artefact scatters and two scarred trees within a variety of landform contexts, but mostly within close proximity to permanent or ephemeral water sources. Sites were more prevalent along gentle drainage depressions, and most of these occurred along Ramrod Creek in the Offset survey area. In all, 69.1% of sites occurred within 50 m of a drainage depression, which corresponds with the findings of previous studies. AECOM (2009a) also identified a

decline in the range of raw material within assemblages in areas more distant from watercourses such as Ramrod Creek, which correlates with the findings of Kuskie and Clarke (2004).

AECOM (2009b) *Bayswater B Power Station Part 3A Environmental Assessment: Heritage*.

AECOM (2009b) undertook a heritage assessment for the proposed Bayswater B Power Station. Survey of the proposed area identified the major watercourse of Saltwater Creek and its tributaries as sensitive areas with likely subsurface deposit occurring up to 200 m away. A total of 47 Aboriginal sites and an extensive area of PAD occurred within the project site. Prior to the Aboriginal heritage assessment, four Aboriginal sites had been recorded within the project site and several more close to its boundaries. During the course of the archaeological survey, an additional 43 Aboriginal stone artefact scatter sites were located, predominantly on soil exposures next to Saltwater Creek and its tributaries. Sites on elevated landforms or hillslopes occurred with less frequency and comprised fewer artefacts in lower densities. Sites were equally distributed between artefact scatters (n = 23) and isolated finds (n = 19).

5.3 Archaeological Work within the Project Boundary

The following Aboriginal heritage assessments have been carried out within the Project Boundary.

(Dyall 1980a) *Aboriginal Relics on the Drayton Coal Lease, Muswellbrook.*

Dyall (1980a) undertook a survey of an area immediately south of the Bayswater Colliery and north of the Drayton South area at Drayton Mine. Three sites, all artefact scatters, were recorded on the banks of Saddlers Creek. The sites contained flakes, cores and backed blades of chert, rhyolite (tuff) and quartz.

(Dyall 1981) *Aboriginal Relics on the Mt Arthur Coal Lease*

Dyall (1981) undertook a survey for Mt Arthur Coal of an area immediately south of Mt Arthur. The area, leased by Mt Arthur Coal, was surveyed in anticipation of it being open cut mined. A total of 24 open campsites were found along creeklines (Saltwater and Saddlers Creeks) within the lease area. Two of the sites were large, containing more than 500 stone flakes scattered on the ground surface. Artefact types included stone implements such backed blades, stone axes, choppers and grinding slabs. Other artefact types included waste flakes, and flaking cores.

Koettig & Hughes (1985) *Archaeological Investigation at Plashett Dam, Mount Arthur North, and Mount Arthur South in the Hunter Valley, NSW. Volumes 1-3.*

Koettig et al. (1985) undertook an archaeological survey of three separate development areas in the Hunter Valley. The areas included the Plashett Dam site and water storage area on Saltwater Creek; a coal mine development on Mt Arthur North; and a coal mine development on Mt Arthur South.

Within the Plashett Dam area, a total of 86 open campsites consisting of stone artefacts scatters were recorded. The sites were concentrated along creeklines, especially Saltwater Creek, with artefacts recorded on bare, eroded exposures. Six of these sites were excavated.

Within the Mt Arthur South Project Area a total of 136 archaeological sites were located and recorded. These comprised 135 open campsites with stone artefact scatters and one site consisting of grinding grooves. The survey focused on areas adjacent to Saddlers Creek. Artefact scatters were the most common site type identified during the survey and were identified eroding out of the A soil horizon. The general pattern of site distribution was one of higher numbers of sites along major creeklines i.e. Saltwater Creek, with numbers decreasing along tributaries. Artefact densities along the whole of Saddlers Creek were typified by sites of high average densities, with a marked increase in the lower section of the creek. Indurated mudstone/tuff and silcrete were the most frequently recorded raw material.

Survey of the Mt Arthur North area resulted in the locating of 93 open campsites consisting of stone artefact scatters. A programme of excavation and collection was carried out. The survey focused on areas adjacent to Whites Creek. Koettig and Hughes (1985) noted that sites tended to correspond in area to the surface exposures in which they were identified. Very few sites were recorded on hill slopes, ridges or along the upper portions of some creeklines where there were large areas of eroded ground.

Consents to Destroy were granted by the National Parks and Wildlife Service for sites at Plashett Dam and Mt Arthur South. A salvage program of excavation and collection work was carried out and artefacts from eight sites were subsequently collected (MAS12, MAS21, MAS24, MAS39, MAS44, MAS46, MAS47 and MAS48). Artefacts recorded during excavations in all three development areas occurred within the lower portion of the A soil horizon.

Indurated mudstone/tuff, silcrete and porcellanite were the most common material in the assemblage. All artefacts were assessed as belonging to Phase I Bondaian.

Mills (2000) *An Archaeological Survey for a Feasibility Study for Saddlers Creek Mine, Near Muswellbrook*.

Mills (2000) undertook an archaeological survey to identify Aboriginal sites, and areas of potential archaeological sensitivity within the proposed mine and haul road areas for the Saddlers Creek Mine. The focus of the survey was Saddlers Creek; however, a number of its tributaries were also surveyed. Forty Aboriginal sites were identified, including seven isolated artefacts, 29 artefact scatters (nine with PAD), two quarry sites, and two scarred trees. The majority of artefact scatters and isolated finds were identified along ephemeral feeder creeks of Saddlers Creek. Mills (2000) found evidence of Aboriginal activity was associated with the full length of these creeklines from their headwaters to the floodplain. In addition, at least two sites were identified on ridges and. eight sites were identified at least 200 m from creeklines.

A total of 238 artefacts were recorded, including 127 (53.4%) flakes, 41 (17.2%) block fracture fragments, 28 (11.8%) cores, 19 (8%) flake fragments, seven (2.9%) scrapers, five (2.1%) manuports, four (1.7%) hammerstones, three (1.3%) backed blades, one sharpening stone, one millstone, one anvil and one pebble axe. Indurated mudstone/tuff was the dominant material (48.32%), followed by silcrete (31.51%), quartzite (5.46%), chert (5.04%), quartz (2.94%), porcellanite (2.10%), siltstone (2.10%), sandstone (0.84%), basalt (0.84%), fossilised wood (0.42%), and glass (0.42%).

HLA-Envirosciences (2002) *Archaeological Assessment of Proposed Drayton Mine Extension EIS*.

HLA Envirosciences (2002) completed an archaeological survey for the Drayton Mine extension. A total of 14 artefact scatters were located during survey. Indurated mudstone/tuff was the dominant material (51%), followed by silcrete (39%), quartz (5%) and porcellanite (5%). Artefacts comprised flakes (49%), flaked pieces (41%), cores (9%), and backed blades (1%). All sites were located along creeklines, ridgelines or crests.

ARAS (2006) *Aboriginal Archaeology & Cultural Heritage Assessment Report on Drayton Mine Extension.*

ARAS (2006) undertook an assessment for the Drayton Mine extension. A total of 480 stone artefacts were recorded from 39 sites that were identified, comprising of 22 artefact scatters and 17 isolated finds. A large proportion of the sites contained less than 10 artefacts, though five sites had over 50 artefacts and were associated with drainage lines or gullies. Of the 480 artefacts identified, 38% were complete flakes, 31% broken flakes, 26% flaked pieces and 5% cores. A majority of artefacts were of indurated mudstone/tuff (55%), followed by silcrete (25%), porcellanite (14%) and quartz (4.6%).

ARAS (2010) *Cultural Heritage Management Report: Drayton Mine Extension Project*

ARAS (2010) undertook a program of salvage excavation for 26 Aboriginal sites for the Drayton Mine Extension Project. The salvage included surface collection of artefacts at 22 sites, mechanical grader scrapes at 11 locations and hand excavation at three locations. A total of 8505 artefacts were recovered as part of the works. Of these, 7500 artefacts were recovered from three distinct knapping locations at Ramrod Creek, identifying the creek as archaeologically sensitive. OSL (optically stimulated luminescence) dating of deposits at Ramrod Creek and Delpah returned dates of 3-1.4 ka years ago placing them in the Late Holocene. Raw materials utilised included porcellanite, silcrete, tuff and chert. At Ramrod Creek, porcellanite was the dominant raw material, while at Delpah, silcrete and tuff were dominant.

ARAS (2010) proposed two main site types, reflecting two differing site functions, were present within the Project Area: fringe sites representing short-term occupation, and sites principally focused on the manufacture of backed artefacts. On the basis of site size (i.e. number of artefacts) and the ratio of discarded tools to waste material, ARAS (2010) proposed that sites adjacent to ridgelines and overlooking ephemeral water systems were the result of ‘short term settlement”. Conversely, ARAS (2010) found sites associated with Ramrod Creek were specific to stone tool manufacturing activities, with particular emphasis on producing Bondi points from porcellanite.

5.4 Occupation Models

Existing models for Aboriginal site occupation in the Hunter Valley region are summarised in **Table 5**. Although most of these models can be considered flawed on the basis of site bias and/or sample size, they nonetheless provide a useful interpretive framework for the current assessment.

Table 5: Existing Models for Aboriginal Site Occupation in the Hunter Valley Region

Researcher(s)	Location	Summary of Model
Dyall 1980	Mt Arthur	Dyall proposed that creek confluences or junctions were most commonly used landforms for Aboriginal campsites.
Hughes 1984	Hunter Valley	Hughes proposed the often-quoted model of Aboriginal campsite location as commonly being found within 50 m of watercourses. Hughes argues that site sizes will diminish as the size of the watercourse decreases.
Koettig 1994	Hunter Valley	Using ethnographic accounts, Koettig proposed camps were ordered according to strict rules based on: the location of water sources, the size and composition of the group or groups camping, and the length of the stay. Koettig further proposes: • Where occupation is infrequent, archaeological features at a site may be widely distributed and relatively infrequent. • If, over time, occupation episodes are overprinted at the same site, then the evidence from different activity areas would be closer together and even superimposed. • The longer the stay of groups at a campsite, the greater the types of activities that should be reflected and the greater the disturbance of occupation debris on the ground.
Dean-Jones, Pam & Mitchell 1993	Hunter Valley	Dean-Jones and Mitchell found that while the large majority of sites in the Hunter Valley have been distributed along drainage lines, there is potential for occupation to be associated with ridgelines as they provide linkage routes across the landscape. Elevated positions, particularly adjacent to fresh water supply are also noted as favourable occupation sites. Other landscapes such as terraces and mid slopes are also given preference, particularly during colder months when lower terrain may have been subject to frost hollow effects, and insects. Larger sites were noted to occur in valleys, as a result of greater resources.
Rich 1995	Mt Pleasant	Rich argued that Aboriginal people making use of the Mt Pleasant area might have occupied residential bases for one or several days. At such locations, they may have carried out a range of activities including stone tool production and maintenance, use of stone tools to make and maintain items, food processing and cooking, and other social/domestic tasks. From these residential bases, they might have made trips to the surrounding areas to produce food and various materials.
Mills 2000	Drayton South	Mills found evidence of Aboriginal activity was associated with the full length of creeklines from their headwaters to the floodplain.
Kuskie 2000a	Mt Arthur North	Kuskie's work indicated that the entire landscape was utilised by Aboriginal people to varying extents. Kuskie refines Hughes' (1984) model that relates Aboriginal occupation sites adjacent to watercourses, by proposing that level to gently inclined landforms were preferred. Kuskie also finds that occupation sites are more commonly associated with 3rd and 4th order creeks. Vantage points are noted as important features for Aboriginal occupation sites. Kuskie found that Aboriginal people used and occupied the entire Mt Arthur North area but at varying intensities and at different times.

5.5 Stone Artefact Studies

In the late 1960s, McCarthy (1967) developed the *Eastern Regional Sequence* (ERS), which remains, with some modification[1], the dominant chronological framework for Aboriginal prehistory in the region. The ERS hypothesises a three phase sequence of 'Capertian' (earliest), 'Bondaian*'* and 'Eloueran' (most recent) assemblages and was developed on the basis of McCarthy's (1948, 1964) pioneering analyses of stratified chipped stone assemblages excavated at Lapstone Creek rockshelter (McCarthy 1948), on the lower slopes of the Blue Mountains eastern escarpment, and Capertee 3 rockshelter (McCarthy 1964), in the Capertee Valley to the north of the Project Area. Lapstone Creek, excavated in 1935 and1936 by McCarthy in collaboration with C.C. Towle, contained Eloueran and Bondaian assemblages (McCarthy 1948: 5-22). Capertee 3, in contrast, contained Bondaian and Capertian assemblages but no Eloueran assemblage (McCarthy, 1964: 200). The Capertian was named after the site at which it was first identified (Capertee 3) whilst the Bondaian and Eloueran were named after Bondi point and Elouera respectively.

Drawing on the results of his analyses of both rockshelter assemblages, McCarthy argued that the earliest of the ERS phases, the Capertian, was characterised by uniface pebble implements, cores and blocks, dentated saws and hammerstones (McCarthy 1961: 98-99; 1964: 238-39). The Bondaian, he proposed, saw the introduction of Bondi points, geometric microliths and Elouera adze flakes, whilst the most recent phase, the Eloueran, was depicted as being dominated by ground-edged implements, Elouera and bipolar artefacts, with an absence of Bondi points (see Attenbrow & Hiscock 2002, 2003, 2005 for a detailed critique of the ERS). Complementing these dominant tool and artefact types throughout all three phases of the ESR, McCarthy argued there was a basic series of chert flake and blade implements dominated by scrapers' but also including 'burins, knives, saws and fabricators (McCarthy 1976: 96-98).

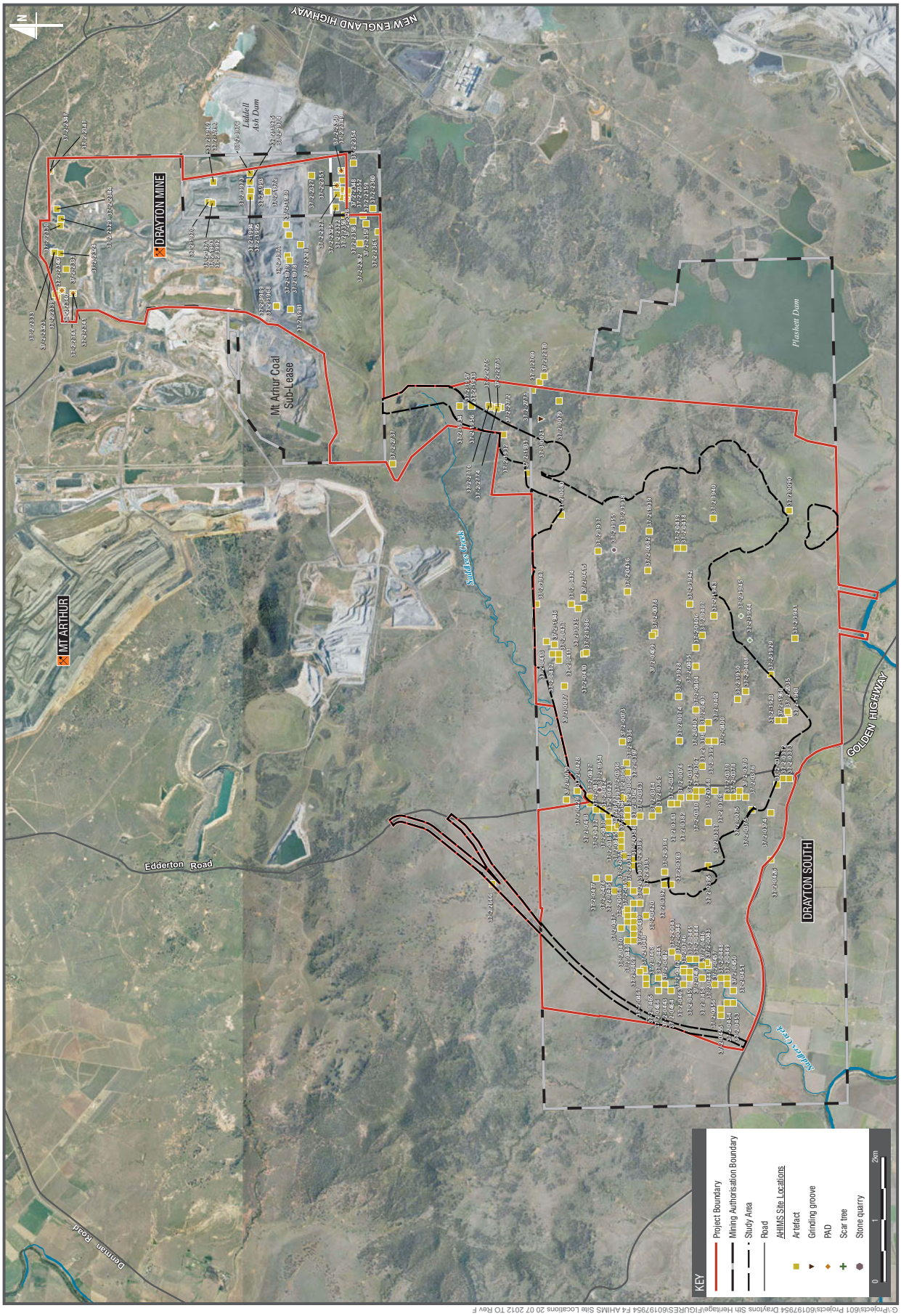
Stone artefact assemblages belonging to McCarthy's Capertian phase are described by archaeologists as belonging to the 'Large Core and Scraper Tool Tradition', a term first used by Bowler *et al*. (1970) to describe the Pleistocene assemblages recovered from Lake Mungo in western NSW. Bowler *et al*. (1970) saw the main components of these assemblages, core tools, steep-edged scrapers and flat scrapers, as characteristic of early Australian Aboriginal assemblages and as being of a distinctly different character to those appearing in the mid Holocene around 6,000 BP and persisting into the contact period (i.e. the last 200 years).

In eastern Australia, these later assemblages are typically referred to as 'Bondaian' assemblages (after McCarthy, 1948). However, they also form part of what is known as the 'Australian small tool tradition', a term coined by Gould (1969) to signal the appearance during the mid to late Holocene of a new suite of chipped stone tool forms in the Aboriginal archaeological record of Australia, including backed blades, geometric microliths, tula and burren adzes and points, both unifacially and bifacially flaked. These forms are commonly found in the Hunter Valley, and in the areas surrounding the Study Area. Hiscock (1994), in particular, has argued that the appearance of these new tool forms is best understood as a technological response on the behalf of Aboriginal knappers to increasing risk associated with environmental change, high mobility and the colonization of previously unoccupied landscapes. Tools of the 'Australian Small Tool Tradition', it has been suggested formed part of a portable, standardized and multifunctional tool kit aimed specifically at risk reduction (Hiscock 1994: 277).

5.6 AHIMS Database Search

A search of the AHIMS database for the Project Boundary was conducted on 14 March 2011. A total of 226 registered Aboriginal sites were identified within the Project Boundary. Of these, 18 are listed as destroyed or deleted. The remaining 208 sites comprise 199 artefact scatters and isolated finds, four PAD sites, two stone quarries, two scarred trees, and one grinding groove site. Of the AHIMS listed sites, 85 occur within the Study Area. These include 83 artefact scatters and isolated finds, and two stone quarries. Further detail on these sites is provided in **Section 9.0** and **Appendix** c.

[1] Following Stockton and Holland (Stockton et al. 1974), McCarthy's ESR is now routinely characterised as a four-phase sequence, with the term 'Capertian' retained and 'Bondaian' subdivided into three phases: 'Early Bondaian', 'Middle Bondaian' and 'Late Bondaian'. The 'Late Bondaian' is equivalent to McCarthy's 'Eloueran' phase.



AHIMS SITE LOCATIONS
Aboriginal Archaeological and Cultural Heritage Impact Assessment
Drayton South Coal Project, New South Wales

FIGURE 4

6.0 Ethnographic Context

Information regarding the ways in which Aboriginal people used the pre-contact landscape is available to archaeologists through two primary sources: archaeological data and ethnohistoric records. **Section 5.0** has summarised the archaeological context of the Study Area on both a regional and local scale. This section builds on this foundation by summarising relevant ethnohistoric information for the Study Area and its environs. As in other parts of Australia, Europeans living in the Hunter regions began to document Aboriginal culture from first contact, with explorers, missionaries, settlers and the like recording their encounters with, and observations of Aboriginal people and their material culture in letters, journals and official reports. Most of these accounts are overtly Eurocentric in tone and content and the veracity of some is, at best, questionable. Nonetheless, taken together, they form an important source of information on Aboriginal lifeways at the time of British colonisation and can, in conjunction with available archaeological data, be used to generate working predictive models of Aboriginal land use practices.

6.1 The Wonnarua

Prior to European settlement, the Muswellbrook district was inhabited by people of the Wonnarua language group (many spelling variations include Wanaruwa, Wanarua, Wannarawa, Wannerawa, Wonarua, Wonnah Kuah, Wonnuaruah). This language group covered a relatively small area of some 5,200 km^2 which, according to Tindale (1974: map supplements), straddled the Upper Hunter Valley and extended from just west of Maitland and Kurri Kurri to the Dividing Range (just west of Widden Brook). The Wonnarua's lands border the Darkinjung territory to the south near Wollombi, the Worimi and Awabakal of the Lower Hunter to the east near Maitland, and the Geawegal to the north near Muswellbrook.

The Study Area lies near the northern limits of the Wonnarua's territory and therefore the area may also have been influenced by the neighbouring Geawegal group to the north. According to Brayshaw (1987: 38) both the Wonnarua and the Geawegal were closely affiliated with the Kamilaroi people of the Liverpool Plains. Indeed, Brayshaw (1987) concludes that the Kamilaroi were the dominant cultural influence throughout the Upper Hunter region. Their social systems covered both the Goulburn Valley and Hunter Valley as far south as Wollombi Brook. Brayshaw (1987: 51) considers that the Wonnarua, Geawegal and probably the Gringai (Worimi) were all part of the 'Kamilaroi Nation'.

The Wonnarua people's social structure was comprised of many self-governing units, with the smallest residential units known as hearth groups. These typically consisted of a man, his wife or wives, and their dependent children. Several hearth groups camped together temporarily forming slightly larger residential units called bands of perhaps 40 to 60 people (Lourandos 1977). The largest residential groupings consisted of either seasonal (summer) band aggregations or irregular ceremonial band aggregations forming local communities of at least 150 people.

Spiritual authority was vested in a large number of supernatural beings. One of the most important was *Baiami* ('The Great Shaper,' 'Thunder-God' or 'Great One'). Baiami formed the world by shaping the cosmos from a pre-existing primeval void (O'Rourke 1997). Society was divided into two matrilineal moieties and based their political organisation on a council of Elders (Djekic 1984).

Varieties of foods, particularly animals, were consumed. Unlike other areas of Australia, plant foods were not as readily consumed except for grass-seed, especially in the form of seed cakes. Kangaroo grass, as well as other grass types, was gathered in large quantities, ground between flat stones, and baked in hot ovens (Gardiner, cited in O'Rourke, 1997:150-154). The people of the lower slopes and plains were known to erect complex huts of grass and tree branches, or grass and mud over a frame of boughs (Allen, cited in O'Rourke, 1997: 148). These huts were often erected in large, semi-permanent summer camps, especially along river margins of the plains country. These communities usually dispersed into the smaller hearth-groups during winter.

The population density for the Wonnarua is difficult to estimate, and certainly pre-European numbers have not been estimated with any accuracy. Various historical accounts of early European interactions with the Wonnarua, cited by Brayshaw (1987: 46-48), suggest relatively low numbers for that language group. For example, five individuals were observed by John Howe near Jerrys Plains in 1819. In 1824, fifteen Aborigines visited Dangar's camp at Dart Brook, and soon after, a group of 150 attacked his party just beyond the Liverpool Range. These figures tend to correlate with the population numbers based on the social groupings discussed above. However, Brayshaw (1987: 47) suggests that actual numbers were higher than this with reports of groups of 200 and 300 able-bodied men observed in separate groups. Curr (1986: 352) stated that the Wonnarua numbered 500

individuals in 1841, but by the 1880s population numbers had seriously declined, citing various diseases as the principal cause.

7.0 Predictive Model

Consideration of the environmental, archaeological and ethnohistoric context of the Study Area and its surrounds allows a series of predictions to be made concerning the nature and distribution of Aboriginal archaeological sites within it. This section provides a working predictive model for the Aboriginal archaeology within the Study Area based on the data summarised in **Sections 4.0, 5.0** and **6.0**. Predictions are made concerning the type of sites likely to occur within the Project Area, as well as their likely content, distribution and integrity.

Table 6: Key Predictions for Aboriginal Site Distribution, Content and Integrity

Site type	Distribution	Content	Integrity
Open artefact scatters	- The majority of scatters will occur in association with creeklines - Scatters are also likely to occur on hillslopes and ridge crests, often at a vantage point over the surrounding landscape.	- Chipped stone artefacts will be the most common form of artefact present within identified scatters. - Indurated mudstone/tuff will be the dominant raw material across the majority of sites, followed by silcrete. - Flake and non-flake debitage will dominate recorded site assemblages whilst retouched will be rare.	- Open surface scatters along creeklines, slopes and ridgetops will exhibit varying degrees of archaeological integrity, depending on the effects of erosion.
Isolated finds	- The majority of isolated finds will occur within and in association with creeklines.	- The majority of isolated finds will comprise chipped stone artefacts.	- Isolated finds will exhibit varying degrees of integrity.
Archaeological Deposit	- Archaeological deposits are likely to occur along higher order creeklines.	- Archaeological deposit will likely comprise of chipped stone artefacts. Hearths may also be present.	- Archaeological deposits will have varying degrees of integrity, particularly along creeklines, which experience significant erosion.
Scarred trees	- Scarred trees may occur where original remnant vegetation remains.	- Scarred trees will likely be eucalypts i.e. box.	- Scarred trees are likely to be extremely old, dying or dead.
Axe grinding grooves	- Axe grinding grooves on sandstone bedrock will occur in direct association with creeklines.	- Most sites will exhibit more than one groove.	- The majority of axe grinding groove sites will exhibit moderate to high archaeological integrity as such sites are more resistant to impacts.

8.0 Archaeological Survey Methodology

8.1 Aim and Objectives

The aim of the archaeological survey was to identify, record and map Aboriginal heritage values within the Study Area. These values include both the tangible remains of past Aboriginal activity (i.e. archaeological evidence) as well as intangible cultural values. More specific survey objectives were as follows:

- To relocate and re-record all previously recorded Aboriginal archaeological sites within the Study Area;
- To comprehensively survey by pedestrian transects land within the Study Area, sampling all landform types;
- To inspect, where appropriate, areas of known or potential Aboriginal cultural value, including AHIMS sites, and areas identified by Aboriginal stakeholder representatives; and
- To provide sufficient data to facilitate the development of appropriate management and mitigation measures for identified Aboriginal sites and areas of archaeological sensitivity.

8.2 Archaeological Survey Team

Survey was conducted by a field team of one AECOM archaeologist (Geordie Oakes), one AECOM technical assistant (Abbee Warskitt or Matteui Catteau) and 26 Aboriginal stakeholder representatives rostered over the 28 days. A list of representatives in attendance is provided in **Appendix** a**.**

8.3 Survey Methodology

Archaeological survey was undertaken over a total of 26 days initially between 2 May and 4 June 2011 followed by a supplementary survey on 10 and 11 October 2011 to survey Edderton Road re-alignment options. Survey was confined to the Study Area, which encompasses all areas at Drayton South required for the proposed mining activities and infrastructure. Historically, areas outside the Study Area have been surveyed by Hughes *et al.,* 1985; Dyall 1981b; Mills 2000; HLA 2002; and ARAS 2006.

The survey strategy employed was to undertake pedestrian transects over the entire Study Area, with the exception of landscapes deemed too steep or dangerous. As a result, a landform based sampling strategy was not adopted, as full survey coverage was proposed.

For the purpose of archaeological site descriptions and analysis, the Study Area has been divided into discrete landform based areas. **Table 7** and provides the landform elements identified within the Study Area and **Figure 5** provides a map of those elements.

Table 7: Landform Elements Identified in the Study Area

Landform Element	Description
Hilltop / Ridge/Crests	Landform that stands above all, or almost all, points in the adjacent terrain.
Upper slope	Slope element adjacent below a crest.
Mid slope	Slope element lying between the upper slope and lower slope.
Lower slope	A waning slope, below a mid slope and above a flat.
Flat	A planar landform that is neither a crest nor a depression and is level or very gently inclined (less than 3% tangent approximately).
Creekline	The channel of a creek/watercourse. Defined as area approximately 100 m adjacent to creekline.

All survey was undertaken on foot, with the archaeological survey team walking in line abreast at 10 m to 20 m intervals. Individual linear transect widths were dependent on the number of Aboriginal stakeholder representatives participating each day (range 70 to 100 m). Each transect was recorded using a handheld Differential GPS (DGPS). Landform, soils and surface exposure characteristics along transects were recorded through descriptive notes, and photographs.

All Aboriginal archaeological sites identified during survey were recorded to a standard comparable to that required by the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (NSW Department of Environment Climate Change & Water 2010b). For each site located or re-visited, individual artefact locations were captured by DGPS. Associated site data (e.g. location, type and content) was documented using AECOM's standard open site recording form. Attribute data recorded for identified chipped stone artefacts varied by technological type, with additional attributes recorded for complete flakes, cores and implements. However, as a minimum, recorded attributes comprised raw material, technological type and maximum linear dimension. Where more than 50 artefacts were identified within a site, recording was limited to a sample of 50 artefacts, and a count of the remaining artefacts. Photographic records of each site were also taken.

8.4 Site Definition – Surface Features and Deposit

A discussion is provided below of the difficulties of defining a 'site' and a supporting argument for the methodology employed for this assessment.

The definition, in spatial terms, of Aboriginal archaeological 'sites' is a topic of considerable importance to modern cultural heritage management and one that has generated significant debate in Australian archaeology. Aboriginal archaeological 'sites' can be broadly defined as places in the landscape that retain physical evidence of past Aboriginal activity. Such evidence can assume a wide variety of forms, depending on both the nature of the activity (or activities) that produced it. Some archaeological sites are, by their very nature, easy to define in spatial terms. A scarred tree, for example, can be readily delineated from the surrounding landscape.

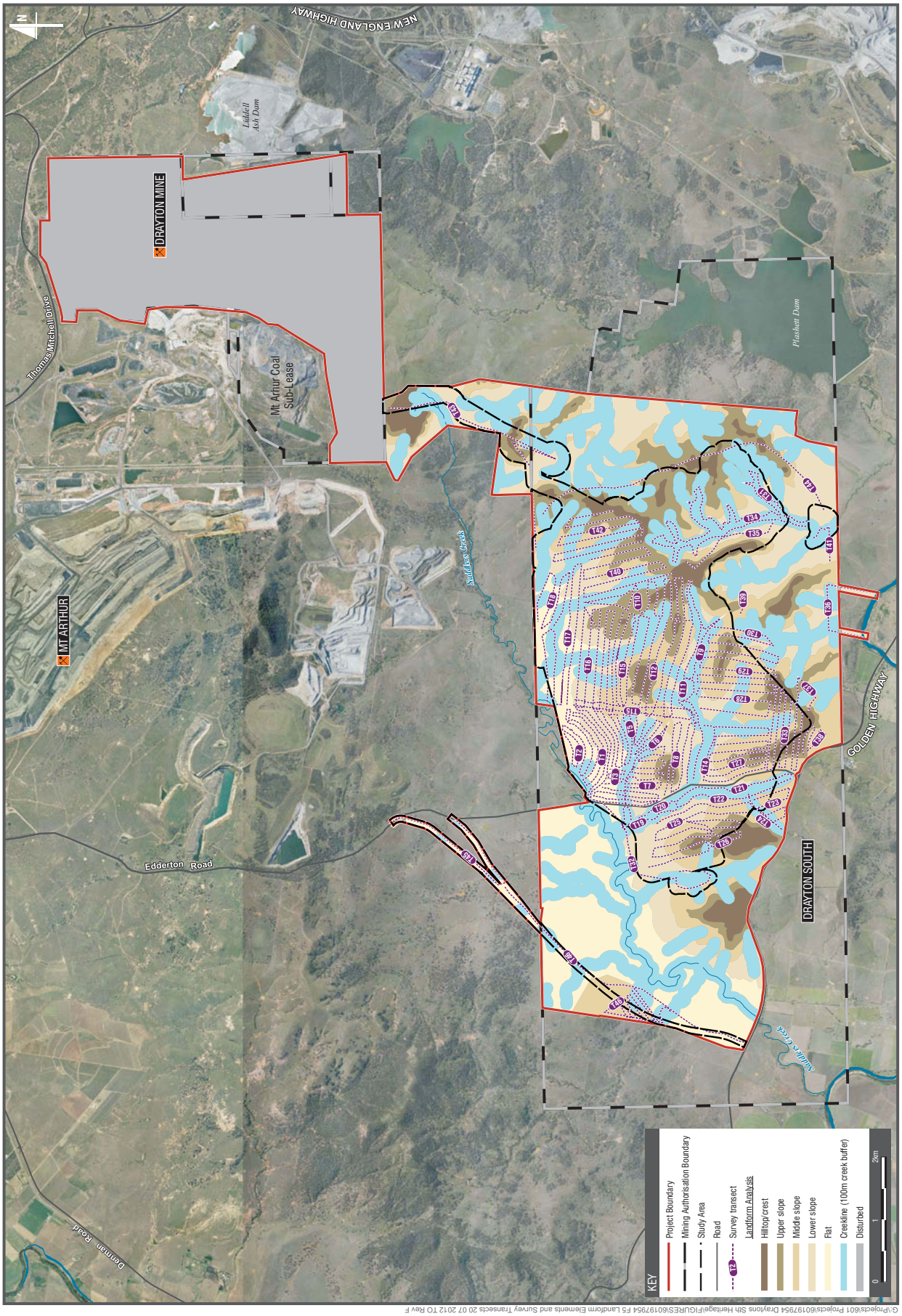
Difficulties arise, however, for sites whose visible physical extent is difficult to determine. More often than not, the visible extent of a site is determined by the degree of surface visibility, which is regularly limited to areas of erosion and disturbance, and not necessarily representative of the actions of Aboriginal people in the past. Surface scatters of stone artefacts, commonly referred to as open 'camp sites' provide a case in point. As demonstrated by countless large-scale excavations programs in southeastern Australia, and the Hunter Valley in particular, surface artefacts at most open artefact scatters represent only a fraction of the total number of artefacts present within these sites, with the majority occurring in subsurface contexts. At the same time, in many instances, recorded surface artefacts have been found to form part of a more-or-less continuous subsurface distributions of artefacts across the areas being investigated, albeit with highly variable artefact densities linked to key environmental variables such as stream order, landform, aspect and distance to water.

Defining 'sites', in spatial terms, on the basis of surface artefacts alone is clearly problematic, with modern site boundaries more commonly reflecting the distribution and size of surface exposures and not the nature of the activity that produced them in the past. Nevertheless, for pragmatic reasons, this is the most commonly used approach in Australian archaeology. Some of the more commonly employed definitions, for example, are 'artefacts within 50 m of each other', 'artefacts within 100 m of each other' and 'concentrations of artefacts at a higher density than background scatter'. The first two definitions do not require a great deal of explanation. If two artefacts are within 50 or 100 m of each other, then a line is drawn around them and the entire area becomes the 'site'. These distance 'rules' are not derived from any coherent theoretical approach – they are simply a pragmatic device. The density model, in contrast, defines an arbitrary 'background scatter' (commonly 1 artefact per 100 m squared) and draws a line around clusters of artefacts that occur at higher frequencies than the 'background scatter' so defined. The alternative to the distance and density definitions is to 'couch' the definition of sites within a 'cultural landscape' perspective. Kuskie's (2000a) 'environmental context' approach is one such example. In this approach, the Study Area is divided into a series of ATUs based on landform type and then broken down further into slope classes and survey areas. Landform element and slope are considered the two "important environmental attributes that are assumed to relate to the way in which Aboriginal people occupied the land" (Kuskie 2000a). A survey is then undertaken within each ATU and should surface features be identified, the entire survey area or ATU is regarded as a site. This result is then extrapolated across the entire survey area for the site prediction model, arguing that similar ATUs will have comparable results.

Effective management of cultural heritage requires the identification of 'sites' for reasons of recording (AHIMS database), relocation, protection, and management. To this end, defining discrete 'sites' where there is definitive evidence of Aboriginal activity in the form of surface features perhaps offers the most pragmatic approach to Aboriginal heritage management and limits assumptions about the extent of a 'site'. Surface features can then be easily defined, relocated and managed. For this reason, and given the large number of surface features identified during survey, this assessment has adopted the distance model of 'artefacts within 100 m of each other'.

Subsurface archaeological potential is addressed in the context of this assessment by the concept of 'archaeological sensitivity'. For the purposes of this assessment, archaeologically sensitive areas are those that

are deemed to have the potential for archaeological deposit (see **Section 10.5**). Archaeological assessments of subsurface archaeological potential are based on analysis of three key factors including the nature and extent of visible surface artefacts at the site, a review of the findings of previous archaeological excavations in analogous landforms in the surrounding area, and on-site observations of post-depositional processes affecting artefact exposure and burial.



LANDFORM ELEMENTS AND SURVEY TRANSECTS
Aboriginal Archaeological and Cultural Heritage Impact Assessment
Drayton South Coal Project, New South Wales

FIGURE 5

AECOM

9.0 Archaeological Survey Results

9.1 Survey Coverage and Effective Coverage

The total Study Area comprises of 2267 ha. The Study Area incorporates the surface disturbance footprint of 1928 ha, which includes a 100 m corridor allowed for the Edderton Road realignment. A 100 m buffer has been assigned around mining areas and associated infrastructure only. A total of 46 pedestrian transects were completed over the 28 day period, with transect lengths ranging from 100 m to approximately 10 km (**Figure 5**). Together, these resulted in total survey coverage of approximately 1617.9 ha, representing 71.36% of the Study Area. The remaining 28.64% comprises parts of the southeast corner of the Study Area that were not surveyed due to steep terrain and limited visibility.

As a sampling strategy was not adopted and full survey coverage attempted, breaking down survey coverage by landform to justify the survey strategy is not necessary. However, for the purpose of analysis and to satisfy the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010), **Table 8** provides a breakdown of survey coverage by landform type and provides an assessment of effective survey coverage. An assessment of effective coverage, required by OEH, is not an estimate of the area that was surveyed, but rather an estimate of the area in which archaeological materials are 'detectable'. Some Aboriginal archaeological site types, such as rockshelters and scarred trees, are more readily observed as they are not typically obscured by vegetation cover. By comparison, detection of sites such as chipped stone artefact scatters and isolates are often entirely dependent on prevailing ground surface conditions.

Table 8: Landform Summary

Landform	Total Landform in Study Area (ha)	Total Landform Area Surveyed (ha)	% of Area Surveyed	Area Effectively Surveyed (ha)	% of Landform Effectively Surveyed
Hilltop/Ridge/Crest	234.8	152.4	64.9	8.0	3.4
Upper-slope	316.3	203.2	64.2	7.6	2.4
Mid-slope	283.9	179.0	63.0	6.2	2.1
Lower-slope	395.7	286.8	72.4	11.0	2.7
Flat	142.7	116.3	81.4	11.4	7.9
Creekline	745.3	680.2	91.2	207.6	27.8
Disturbed	148.3	0	0	0	0
Total	**2267.0**	**1617.9**	**71.4**	**251.8**	**11.1**

Results in **Table 8** show that the predominant landform type within the Study Area is creekline, accounting for 31.9% of all landforms. The greatest surface visibility was found along creeklines, where effective survey coverage of 27.8% was calculated. This result was due to erosional processes, particularly sheet erosion, exposing ground surfaces along creek banks and adjacent areas. All other landform types had an effective survey coverage of less than 10% due to varied and at times thick covering of pasture grasses.

Appendix d provides tabulated estimates of the effective survey coverage achieved for each transect completed during the archaeological survey. As shown, this was typically low, as it is with almost all 'greenfield' assessments, with an overall effective coverage of 10.8% of the Study Area.

9.2 Previously Recorded AHIMS Sites

9.2.1 AHIMS Sites within the Project Boundary

As previously described in **Section 5.6**, a search of the AHIMS database for the Project Boundary was conducted on 14 March 2011. A total of 208 valid registered Aboriginal sites were identified.

Table 9 provides a summary of Aboriginal site types located within the Project Boundary. Further site details are provided in **Appendix c**.

Table 9: Previously Recorded AHIMS Sites within Project Boundary

Site Type	Number of Features	Percentage (%)
Artefact scatter and isolated finds	199	95
PADs	4	2
Stone quarries	2	1
Scarred trees	2	1
Grinding groove	1	1
Total	**208**	**100**

9.2.2 AHIMS Sites within the Study Area

Appendix c provides details of Aboriginal sites located within the Study Area. From the 208 previously recorded AHIMS sites presented in **Table 9**, a total of 85 were identified as being located within the Study Area. These include 83 artefact scatters and isolated finds, and two stone quarries.

A number of sites within the Study Area have had Section 90 permits granted for them by the NPWS in 1984 for surface artefact collection and test excavation (see Hughes *et al* 1985). While Section 90 permits were granted for all for these sites, collections only occurred for eight sites. In all instances where collections have occurred additional artefacts have been identified during the current survey as a result of natural weather processes exposing sub-surface material. These sites are considered valid on the AHIMS register.

9.2.3 AHIMS Sites Complexes

A reassessment of each AHIMS site within the Study Area was made during the archaeological survey. As a result of the reassessment, many existing AHIMS site boundaries and the number of artefacts within them effectively became redundant, as artefacts were identified as a continuum between sites. **Figure 6** clearly illustrates this, and shows artefacts distributed in clusters over multiple AHIMS site areas. Applying the 'artefacts within 100 m of each other' definition to these sites, results in 19 instances where multiple AHIMS sites can be consolidated into a single site or 'complex'. For the purpose of consistent analysis, these complexes have been renamed and are presented in **Table 10**.

Table 10: AHIMS Site Complexes

Complex ID	Site Type	No. of Artefacts	AHIMS ID	Easting (MGA)	Northing (MGA)
DS-C1	Artefact Scatter	13	37-2-0387, 37-2-0386	294505	6411304
DS-C2	Artefact Scatter	29	37-2-0393, 37-2-0394	294351	6410754
DS-C3	Artefact Scatter	308	37-2-0053, 37-2-0006, 37-2-0004, 37-2-0393, 37-2-0394, 37-2-0362, 37-2-0076, 37-2-0363, 37-2-0364, 37-2-0365, 37-2-0366, 37-2-0382	295326	6411061
DS-C4	Artefact Scatter	159	37-2-0380,37-2-0381, 37-2-0367, 37-2-0368	295673	6410303
DS-C5	Artefact Scatter	114	37-2-0369, 37-2-0379, 37-2-0370, 37-2-0075, 37-2-0376, 37-2-0378	295604	6409754
DS-C6	Artefact Scatter	70	37-2-0371, 37-2-0372, 37-2-0373	295826	6409128

DS-C7	Artefact Scatter + PAD	156	37-2-0397, 37-2-1936, 37-2-0073	296391	6411293
DS-C8	Artefact Scatter + PAD	981	37-2-1943, 37-2-0399, 37-2-0400, 37-2-0402, 37-2-0403, 37-2-0404, 37-2-1928, 37-2-0405, 37-2-0406, 37-2-0407	297494	6410390
DS-C9	Artefact Scatter	3	37-2-1923, 37-2-1960	296844	6408947
DS-C10	Artefact Scatter	N/A	37-2-2035, 37-2-1961	296961	6408820
DS-C11	Artefact Scatter	193	37-2-0078, 37-2-0409	298211	6411041
DS-C12	Artefact Scatter	85	37-2-0411, 37-2-0417, 37-2-0412, 37-2-0078, 37-2-0409	297789	6412557
DS-C13	Artefact Scatter + PAD	212	37-2-1937, 37-2-0415, 37-2-0411, 37-2-0412, 37-2-1946, 37-2-0413, 37-2-0414, 37-2-0417, 37-2-0078, 37-2-0409, 37-2-1935	299015	6412142
DS-C14	Artefact Scatter + PAD	57	37-2-0410, 37-2-1986	297932	6412066
DS-C15	Artefact Scatter	106	37-2-0419, 37-2-0418	299665	6410642
DS-C16	Artefact Scatter+ PAD	23	37-2-1934, 37-2-1933	301839	6414007
DS-C17	Artefact Scatter	N/A	37-2-0396, 37-2-0369	295589	6411481
DS-C18	Artefact Scatter	21	37-2-0470, 37-2-0440	293132	6411467
DS-C19	Artefact Scatter	80	37-2-0384, 37-2-0425, 37-2-0385	294953	6411467

9.3 Newly Recorded Sites

Approximately 4,519 individual stone artefacts were identified within the Study Area during the archaeological survey. Artefacts were identified across all landforms, with varying densities (see **Figure 6**). Given the large number of artefacts recorded, defining 'site' boundaries becomes difficult. As explained in **Section 8.4**, the site definition employed in the current assessment was the 'visible extent of artefacts within 100m of each other'. In instances where additional artefacts are found within 100 m of previously recorded AHIMS sites, that site has been expanded to include those artefacts, and are therefore not recorded as new sites.

A total of 160 newly recorded archaeological sites were identified within the Study Area (**Figure 6)**. These comprise 58 isolated finds, 101 artefact scatters and one stone quarry. **Table 11** lists the newly recorded Aboriginal sites and their coordinates, with coordinates reflecting centre points or centroids of each site.

Table 11: Newly Recorded Aboriginal Sites

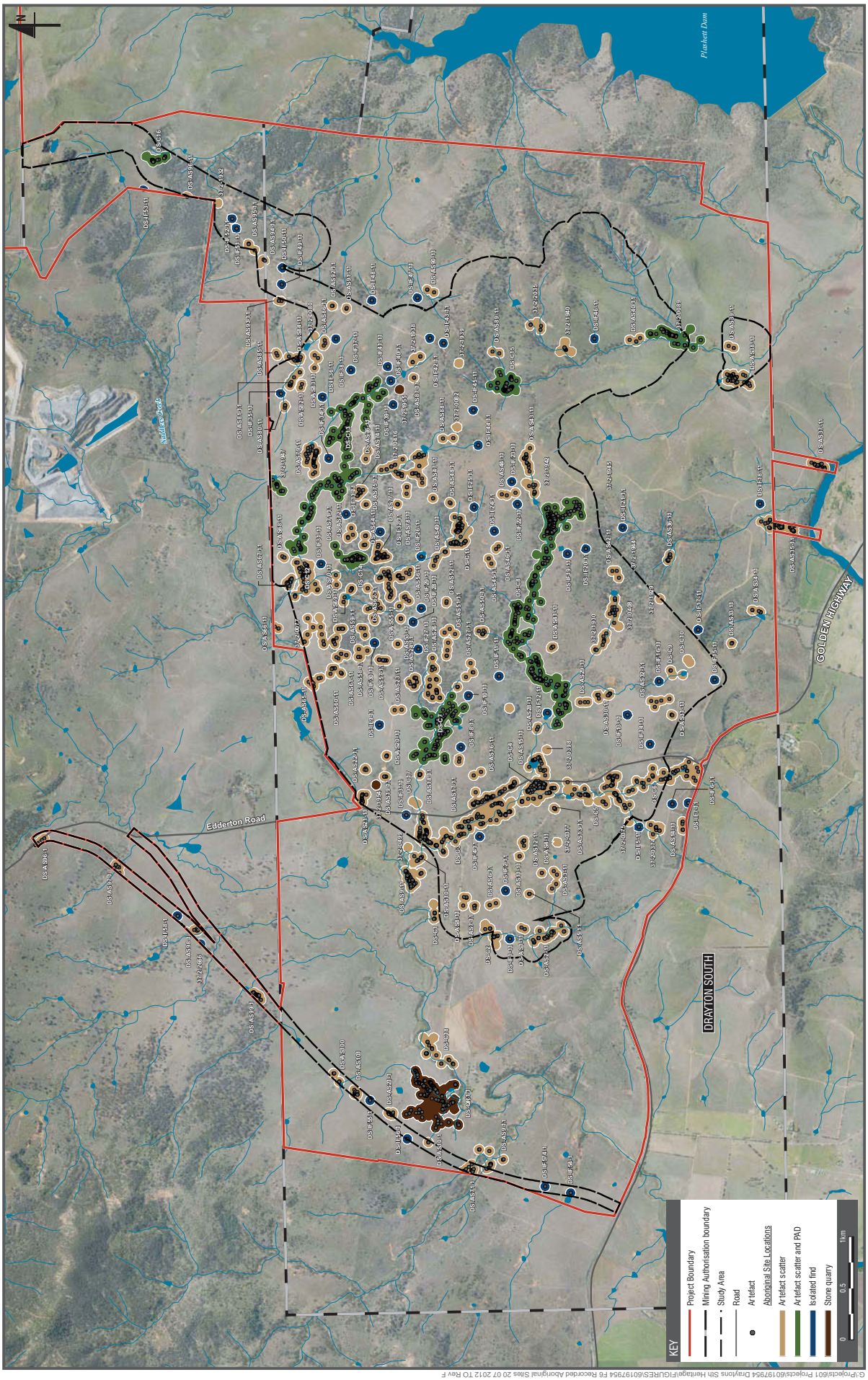
Site ID	Site Type	No. of Artefacts	MGA E	MGA N	Site ID	Site Type	No. of Artefacts	MGA E	MGA N
DS-IF1-11	IF	1	294259	6410556	DS-AS23-11	AS	2	296497	6411650
DS-IF2-11	IF	1	294726	6410597	DS-AS24-11	AS	15	296763	6411501
DS-IF3-11	IF	1	295466	6411564	DS-AS25-11	AS	36	296824	6411321
DS-IF4-11	IF	1	295244	6410852	DS-AS26-11	AS	3	296719	6411061
DS-IF5-11	IF	1	295343	6409301	DS-AS27-11	AS	4	296871	6410958
DS-IF6-11	IF	1	295567	6408977	DS-AS28-11	AS	2	296315	6410289
DS-IF7-11	IF	1	295575	6408819	DS-AS29-11	AS	3	296574	6409844
DS-IF8-11	IF	1	296128	6411034	DS-AS30-11	AS	16	296640	6409660

Site ID	Site Type	No. of Artefacts	MGA E	MGA N	Site ID	Site Type	No. of Artefacts	MGA E	MGA N
DS-IF9-11	IF	1	296345	6411822	DS-AS31-11	AS	4	296444	6408982
DS-IF10-11	IF	1	296635	6410961	DS-AS32-11	AS	5	296574	6409114
DS-IF11-11	IF	1	296813	6410660	DS-AS33-11	AS	3	297146	6408401
DS-IF12-11	IF	1	296469	6410194	DS-AS34-11	AS	6	297462	6408170
DS-IF13-11	IF	1	296438	6409410	DS-AS35-11	AS	179	298286	6407977
DS-IF14-11	IF	1	296149	6409194	DS-AS36-11	AS	13	297984	6409014
DS-IF15-11	IF	1	296783	6408569	DS-AS37-11	AS	35	298862	6407566
DS-IF16-11	IF	1	296762	6409107	DS-AS38-11	AS	72	299689	6408350
DS-IF17-11	IF	1	297281	6408725	DS-AS39-11	AS	2	300034	6408409
DS-IF18-11	IF	1	298490	6408122	DS-AS40-11	AS	3	300081	6409349
DS-IF19-11	IF	1	298007	6409991	DS-AS41-11	AS	4	297098	6410141
DS-IF20-11	IF	1	298055	6409818	DS-AS42-11	AS	3	297820	6409534
DS-IF21-11	IF	1	298266	6409457	DS-AS43-11	AS	18	298927	6410406
DS-IF22-11	IF	1	298494	6410484	DS-AS44-11	AS	3	298592	6410580
DS-IF23-11	IF	1	298711	6410535	DS-AS45-11	AS	2	297941	6410753
DS-IF24-11	IF	1	298247	6410707	DS-AS46-11	AS	2	298078	6410679
DS-IF25-11	IF	1	298463	6410904	DS-AS47-11	AS	2	298547	6411303
DS-IF26-11	IF	1	297982	6411419	DS-AS48-11	AS	2	298496	6411138
DS-IF27-11	IF	1	297075	6411447	DS-AS49-11	AS	11	292051	6410750
DS-IF28-11	IF	1	297337	6411497	DS-AS50-11	AS	13	297243	6410834
DS-IF29-11	IF	1	297474	6411417	DS-AS51-11	AS	5	297076	6411173
DS-IF30-11	IF	1	297134	6411870	DS-AS52-11	AS	3	297264	6411150
DS-IF31-11	IF	1	297904	6412393	DS-AS53-11	AS	3	297132	6411648
DS-IF32-11	IF	1	298229	6411818	DS-AS54-11	AS	6	297372	6411620
DS-IF33-11	IF	1	298398	6412148	DS-AS55-11	AS	2	297540	6411164
DS-IF34-11	IF	1	298928	6412315	DS-AS56-11	AS	6	297567	6411595
DS-IF35-11	IF	1	299574	6412781	DS-AS57-11	AS	21	296974	6411800
DS-IF36-11	IF	1	299532	6412377	DS-AS58-11	AS	5	297052	6411996
DS-IF37-11	IF	1	299793	6412098	DS-AS59-11	AS	4	297257	6411988
DS-IF38-11	IF	1	300098	6412248	DS-AS60-11	AS	11	296881	6412258
DS-IF39-11	IF	1	299468	6411690	DS-AS61-11	AS	6	297027	6412205

Site ID	Site Type	No. of Artefacts	MGA E	MGA N	Site ID	Site Type	No. of Artefacts	MGA E	MGA N
DS-IF40-11	IF	1	299699	6411712	DS-AS62-11	AS	12	297489	6411902
DS-IF41-11	IF	1	299822	6411745	DS-AS63-11	AS	64	297740	6411706
DS-IF42-11	IF	1	300105	6411330	DS-AS64-11	AS	49	298018	6411815
DS-IF43-11	IF	1	300049	6411200	DS-AS65-11	AS	9	296770	6412464
DS-IF44-11	IF	1	299059	6410865	DS-AS66-11	AS	4	297298	6412833
DS-IF45-11	IF	1	299391	6410911	DS-AS67-11	AS	25	297727	6412708
DS-IF46-11	IF	1	300100	6409734	DS-AS68-11	AS	3	297980	6412760
DS-IF47-11	IF	1	300498	6411453	DS-AS69-11	AS	10	297600	6412139
DS-IF48-11	IF	1	300471	6411898	DS-AS70-11	AS	2	297752	6412247
DS-IF49-11	IF	1	300630	6412771	DS-AS71-11	AS	20	291999	6410952
DS-IF50-11	IF	1	300797	6412767	DS-AS72-11	AS	4	298219	6412114
DS-IF51-11	IF	1	301169	6413214	DS-AS73-11	AS	6	298135	6411973
DS-IF52-11	IF	1	301277	6413247	DS-AS74-11	AS	9	298610	6412019
DS-IF53-11	IF	1	301558	6414107	DS-AS75-11	AS	2	298490	6411959
DS-IF54-11	IF	1	291795	6409956	DS-AS76-11	AS	2	298966	6411953
DS-IF55-11	IF	1	292694	6411907	DS-AS77-11	AS	4	298499	6411650
DS-IF56-11	IF	1	292318	6411550	DS-AS78-11	AS	3	298636	6411564
DS-IF57-11	IF	1	291858	6410205	DS-AS79-11	AS	102	298909	6412509
DS-IF58-11	IF	1	294490	6413779	DS-AS80-11	AS	4	299458	6412742
DS-QR1-11	QR	260	292596	6411360	DS-AS81-11	AS	10	299715	6412663
DS-AS1-11	AS	2	294363	6410434	DS-AS82-11	AS	2	299646	6412585
DS-AS2-11	AS	29	294305	6410209	DS-AS83-11	AS	3	299883	6412447
DS-AS3-11	AS	4	294816	6410138	DS-AS84-11	AS	17	299931	6412657
DS-AS4-11	AS	2	294906	6410248	DS-AS85-11	AS	2	299960	6412822
DS-AS5-11	AS	3	294696	6410369	DS-AS86-11	AS	3	300064	6412361
DS-AS6-11	AS	3	294596	6410729	DS-AS87-11	AS	2	299719	6411491
DS-AS7-11	AS	3	294572	6410899	DS-AS88-11	AS	2	299134	6411165
DS-AS8-11	AS	6	294618	6411002	DS-AS89-11	AS	2	299972	6410699
DS-AS09-11	AS	3	292116	6410612	DS-AS90-11	AS	3	300585	6411328
DS-AS10-11	AS	12	292285	6411343	DS-AS91-11	AS	2	300396	6412145
DS-AS11-11	AS	2	295067	6410466	DS-AS92-11	AS	2	300424	6412283

Site ID	Site Type	No. of Artefacts	MGA E	MGA N	Site ID	Site Type	No. of Artefacts	MGA E	MGA N
DS-AS12-11	AS	6	295198	6410432	DS-AS93-11	AS	2	300476	6412796
DS-AS13-11	AS	4	295528	6410124	DS-AS94-11	AS	3	300972	6413070
DS-AS14-11	AS	7	295355	6408882	DS-AS95-11	AS	2	301488	6413693
DS-AS15-11	AS	3	292213	6410820	DS-AS96-11	AS	6	295215	6415115
DS-AS16-11	AS	2	295869	6410882	DS-AS97-11	AS	8	294957	6414353
DS-AS17-11	AS	2	296004	6411051	DS-AS98-11	AS	26	294357	6413605
DS-AS18-11	AS	12	295865	6411434	DS-AS99-11	AS	39	293715	6413016
DS-AS19-11	AS	4	295851	6411773	DS-AS100-11	AS	6	292915	6412228
DS-AS20-11	AS	4	296044	6411757	DS-AS101-11	AS	19	292763	6412035
DS-AS21-11	AS	23	292570	6411704	DS-AS102-11	AS	23	292570	6411704
DS-AS22-11	AS	5	295914	6411965					

** IF = Isolated Find ** AS = Artefact Scatter *** QR = Stone Quarry*



RECORDED ABORIGINAL SITES

Aboriginal Archaeological and Cultural Heritage Impact Assessment
Drayton South Coal Project, New South Wales

FIGURE 6

Note: Archaeological site boundaries shown above reflect the 100m site definition methodology adopted for the assessment (see Section 8.4)

10.0 Discussion of Findings

10.1 Total Number of Sites

Applying the 'artefacts within 100 m of each other' definition to all archaeological features identified within the Study Area results in 205 discrete sites (see **Figure 6**). These comprise:

- 160 newly recorded sites;
- 19 site complexes (multiple AHIMS sites); and
- 26 AHIMS sites (not included in complexes).

Site descriptions are provided in **Appendix** d.

10.2 Summary of Site Types

Table 12: Summary of Site Types within Study Area

Site Type	Count	% of Total
Artefact Scatter	135	66
Isolated Find	59	29
Artefact Scatter + PAD	8	4
Stone Quarry	3	1
Total	**205**	**100**

10.2.1 Artefact Scatters & Isolated Finds

A total of 143 artefact scatters, eight of which have associated PAD, and 59 isolated finds were recorded within the Study Area. The number of surface artefacts identified was 4519, of which the largest scatter contained 981 individual artefacts over an area of 45.7 ha (DS-C8). Artefact counts for scatter sites ranged from two to 981 artefacts, with a mean count of 33.8 per site. Most (55%, n = 79) scatters contained less than ten artefacts.

10.2.2 Stone Quarries

Three stone quarry sites have been identified within the Study Area including two previously recorded AHIMS sites (37-2-1954 and 37-2-1955, see Mills 2000), and one newly recorded site (DS-QR1-11). AHIMS site 37-2-1954 consists of a broad scatter of silcrete cobbles where Mills (2000) identified associated artefacts. During the current assessment, no artefacts were identified directly amongst the silcrete cobbles. Despite several attempts, site 37-2-1955 could not be located.

DS-QR1-11 consists of a large cobble scatter, approximately 300 x 200 m, of complete and thermally fractured silcrete cobbles on the lower slope of a hillside and adjacent to a confluence of creeklines. The cobbles are of variable quality, ranging from fine siliceous to course grained with large quartz inclusions. While 95% of the exposed rock was silcrete, a small portion of the exposed cobbles was of petrified wood, quartzite, and quartz.

Evidence of use of the quarry consists of low density/intensity exploitation of the silcrete cobbles suggested by a small number of silcrete primary flakes and cores scattered over the cobble area. In addition, stone artefacts comprising of flaked pieces, flakes and tools are scattered throughout the cobbles but with particular focus at its southern end adjacent to the feeder creek. Stone artefacts are also found away from the cobbles, along the feeder creek to the north and along Saddlers Creek.

10.2.3 Scarred Trees

Two previously recorded AHIMS scarred trees and two possible Aboriginal scarred trees noted by the Aboriginal community have been identified within the Project Boundary. All four trees were inspected by an arborist and Aboriginal community members on 11 October 2011. The inspection by both the arborist and the Aboriginal community members present found the scarring on all four trees was the result of natural causes (see **Appendix e**). Accordingly, the trees will not be registered on AHIMS or managed as Aboriginal archaeological sites.

Table 13: Trees with Scarring

Tree ID	Easting (MGA)	Northing (MGA)	Comment	Arborist Finding
37-2-1944	298158	6409404	Grey Box (*Eucalyptus moluccana*)	Likely to be lighting strike or wind damage leading to subsequent stem tear.
37-2-1945	298581	6409633	Grey Box (*Eucalyptus moluccana*)	Early loss of lower branch or secondary stem leading to tearing, sapwood damage and consequent rot.
DS-SC1	295856	6410846	Grey Box (*Eucalyptus macrocarpa*)	Likely branch tear or secondary stem tear.
DS-SC2	296656	6410700	Grey Box (*Eucalyptus macrocarpa*)	Mechanical damage from farming activities.

10.3 Spatial Distribution

Given the difficulties in defining discrete sites, the following discussion of spatial distribution presents the archaeological data collected from two perspectives: individual surface artefacts and as discrete sites. Results of this analysis are then used to undertake archaeological sensitivity mapping for the Study Area.

There is also the issue of erosion i.e. the distribution of sites is, to a great extent, a product of surface visibility rather the actions of Aboriginal people in the past. An initial impression of the spatial distribution of artefacts within the Study Area is one of numerous discrete Aboriginal sites, concentrated along creeklines. However, as discussed in **Section 8.4**, archaeological excavations over the past two decades in the Hunter Valley have demonstrated a virtual continuum of subsurface archaeological deposit along local watercourses, albeit with highly variable densities linked to key environmental variables such as stream order and proximity to active channels.

10.3.1 Single Artefacts

A total of 4,519 individual stone artefacts were recorded within the Study Area, including both the reassessment of AHIMS sites and newly recorded sites. In order to discuss the distribution of these artefacts across the landscape, two analyses were undertaken. These include distance to water and stream order, and landform analysis.

10.3.1.1 Distance to Water and Stream Order

An assessment of Aboriginal artefacts identified within the Study Area finds that the greatest proportion of artefacts (n = 3042, 36.7%) were recorded within 50 m of a creekline. **Table 14** shows a pattern of decreasing artefact numbers with distance from creekline, with a marked decline in numbers from 200 m. From 200 m, less than 10% of the total numbers of artefacts are present within the 201 to 250 m and 250 to 300 m ranges.

The greatest proportion of artefacts are associated with 1st order creeklines within the Study Area, a figure that is not surprising given 56.1% of creekline within the Study Area is 1st order. Table 15. Artefacts associated with 2nd order creeklines are also well represented accounting for 41.4% of the total. Artefacts associated with 3rd and 4th order creeklines are 5.1% and 7.3%, respectively.

Artefact density calculations, based on creekline order, indicate that, within the Study Area, 2nd order creeklines have the highest artefact densities at 4.4 artefacts per hectare. Calculations show the next highest artefact density is associated with 1st order at 2.3 artefacts per hectare, then 3rd & 4th order at 2 artefacts per hectare.

There are a number of limitations to this analysis, which would require subsurface testing to clarify. It could be argued that proportional emphasis of the 0-50 m range may be a reflection of the greater level of visibility along creeklines. There is also an unequal distribution of creekline types within the Study Area, with 1st and 2nd order well represented, and 3rd and 4th poorly represented. In addition, creekline buffers used to calculate the artefact totals begin to overlap as distance from the creeklines increases, particularly around the 200 m point. A consequence of this is a single artefact is counted in several creeklines order analyses.

Table 14: Distribution of Aboriginal Artefacts Associated with Watercourses

Distance to Water Source (m)	Creekline Order				Total	% of Total vs. Distance
	1	2	3	4		
0 – 50	1599	1285	37	121	**3042**	36.7
51 – 100	870	600	170	60	**1700**	20.5
101 – 150	403	615	97	111	**1226**	14.8
151 – 200	386	466	27	98	**977**	11.8
201 – 250	191	284	55	79	**609**	7.4
251 – 300	381	187	34	135	**737**	8.8
Total	3830	3437	420	604	**8291**	100
% of Total vs. Stream Order	**46.2**	**41.4**	**5.1**	**7.3**	**100**	**N/A**

Table 15: Creekline Totals

Creek Order	Total Length in Study Area (km)	Total Area (km²)	% of Total Creekline	Artefact density per ha
1st Order	54.5	16.35 (1635 ha)	56.1	2.3
2nd Order	25.8	7.74 (774 ha)	26.6	4.4
3rd Order	6.9	2.07 (207 ha)	7.1	2.0
4th Order	9.9	2.97 (297 ha)	10.2	2.0
Total	**97.1**	**29.13**	**100**	**NA**

10.3.1.2 Landform Analysis

Table 16 presents the number of individual artefacts identified within each landform type over the Study Area. Results show that the majority of artefacts were found adjacent to creeklines (n = 3448, 76.3%) and lower slopes (n = 511, 11.3%). Relatively few artefacts were located on flats; however, much of the Study Area is sloped, and areas of flat are in many instances included within the creekline landform. The highest artefact density per hectare is within the creekline class where 4.62 artefacts were identified per hectare. Conversely, the lowest artefact density per hectare was within the hilltop/crest/ridge class where 0.07 artefacts were identified per hectare.

Table 16: Correlation between Artefact Distribution and Landform Type

Landform Type	No. of Artefacts	% of Artefacts	Landform total (ha) in Study Area	Artefact density per ha
Hilltop/Crest/Ridge	18	0.4	234.8	0.07
Upper slope	34	0.8	316.3	0.11
Mid slope	123	2.7	283.9	0.43
Low slope	511	11.3	395.7	1.29
Flat	255	5.6	142.7	1.78
Creekline	3448	76.3	745.3	4.62
N/A	130	2.9	N/A	N/A
Total	**4519**	**100**	**N/A**	**N/A**

N/A indicates some artefacts were recorded in disturbed landforms or are outside the Study Area.

10.3.2 Discrete Sites

A total of 205 discrete Aboriginal sites were identified within the Study Area, including both AHIMS sites (modified into complexes) and newly recorded sites (the figure does not include discounted scarred trees). All sites were open camp sites generally located in areas of exposure formed by erosion.

In order to discuss the distribution of sites found within the Study Area, an analysis has been made of a number of factors that affect site location. These include, distance to water and stream order, and landform.

10.3.2.1 Distance to Water, Stream Order and Landform Element

Attempting to model large site complexes in terms of their relationship with ordered watercourses is problematic. As Mills (2000) points out, evidence of Aboriginal activity can be found from the headwaters of a creekline to its related flat, or in other words, from an ephemeral 1st order drainage lines to its higher order relative. Consequently, a single site complex will be associated with multiple creek orders, making analysis difficult at best and results of such analysis largely spurious. A similar issue is encountered when defining a site's distance from a creekline or when attempting to place a site in a single landform element. A single large site complex may traverse multiple distance ranges. Therefore, an analysis of sites in relation to creeklines and landform has not been undertaken for this assessment.

10.3.2.2 Assemblage Size

Table 17 shows the number of artefacts recorded for each Aboriginal site within the Study Area. Results indicate that the majority of sites contain less than 10 artefacts.

Table 17: Discrete Site Assemblage Size

No. Of Artefacts	No. of Sites
<11	140
11-20	19
21-50	14
51-100	6
101-500	11
501-1000	1
N/A	14
Total	**205**

N/A indicates that sites are not stone artefacts i.e. stone quarry or the number of artefact is unknown as they are old AHIMS sites where no artefacts were located.

10.4 Artefact Analysis

10.4.1 Typology

A total of 4,519 stone artefacts were identified during the archaeological survey, with basic attribute data recorded for 2,272 artefacts. **Table 18** provides a typological breakdown of the recorded sampled assemblage. As indicated, complete flakes dominate, accounting for 50.2% (n = 1140) of the assemblage. Flake debitage (*sensu* Andrefsky 2005: 82) consisting of broken flakes (n = 431, 18.9%) and flake pieces (n = 573, 25.2%) account for 44.1% of the total. Raw material most commonly associated with both complete flakes and flake debitage consists predominantly of indurated mudstone/tuff. Cores (n = 77) are comparatively poorly represented at 3.4%, with indurated mudstone/tuff being the most common raw material. Retouched implements, including 20 miscellaneous retouched flakes, 7 backed artefacts, six scrapers and six Bondi points, are rare accounting for 1.7% of the total. Of these, indurated mudstone/tuff is the most common raw material. Non-ground edge axes (n=9) are represented at 0.5% of the total. Finally, two hammerstones, with clear pitting make up the remaining 0.1% of the assemblage.

The presence of non-ground edge axes is indicative of a well-developed bifacial flaking technology. In the absence of microscopic use-wear analysis, it is difficult to ascertain whether the axes recorded represent unfinished blanks or were utilised without grinding.

Table 18: Breakdown of Recorded Sample Assemblage

Type	Count	Total %	IM	SI	CH	QU	CY	BA	PO	QT	OT
Complete waste flake	1140	50.2	651	362	89	22	2	0	1	1	12
Broken flake	431	18.9	252	117	55	4	0	0	1	0	2
Flaked piece	573	25.2	362	143	49	5	0	0	5	1	9
Core	77	3.4	37	30	7	1	0	1	0	0	1
Misc. retouched flake	20	0.9	4	8	7	0	0	0	0	0	1
Axe	10	0.4	0	0	0	0	0	9	0	0	1
Hammerstone	2	0.1	0	0	0	0	0	1	0	0	1
Scraper	6	0.3	2	2	1	0	0	1	0	0	0
Bondi point	6	0.3	5	1	0	0	0	0	0	0	0
Backed artefact	7	0.3	5	1	1	0	0	0	0	0	0
Total	**2272**	**100**	**1318**	**664**	**209**	**32**	**2**	**12**	**7**	**2**	**27**

IM=Indurated Mudstone; SI = Silcrete; CH=Chert; QU=Quartz; CY=Chalcedony; BA=Basalt; PO=Porcellanite; QT=Quartzite; OT=Other

10.4.2 Raw Materials

Table 18 provides a breakdown of the relative frequencies of raw material types in the sampled assemblage. In common with previous studies within and surrounding the Study Area (AECOM 2009; Koettig & Hughes 1985), the dominant raw material is indurated mudstone/tuff (n = 1318) accounting for 58% of the total assemblage. Hunter Valley indurated mudstone/tuff is commonly a dark red/brown, and often yellowish fine grained hard rock, volcanic or sedimentary in origin (see Hughes et al. 2011). Silcrete (n = 664) is the second most common raw material represented at 29.2%, followed by chert (n = 209), accounting for 9.2%. The remainder of the assemblage is a mixture of small numbers of chalcedony, basalt, porcellanite, quartzite and other sedimentary and volcanic material.

These results are broadly comparable to Koettig & Hughes (1985) excavations in the Study Area where analysis shows 53% of artefacts were indurated mudstone/tuff, 30% were silcrete and 6% were chert. Conversely, the results differ from ARAS's (2010) findings in Drayton where the overwhelming majority of raw material recorded was porcellanite, with only small representations of indurated mudstone/tuff and silcrete. Kuskie & Clarke (2004) on the other hand, recorded a predominance of silcrete (59.37%) at Mt Arthur, several kilometres to the north, with only modest frequencies of indurated mudstone/tuff (19.42%) and porcellanite (10.03%).

Past studies have shown differences in the relative representation of raw material types is often a result of differences in the distribution and availability of these materials, in addition to their quality. Surprisingly, this proposition is not reflected by the survey results, which found indurated mudstone/tuff as the predominant raw material. Given the location of at least two confirmed sources of silcrete cobbles within the Study Area, a predominance of indurated mudstone/tuff rather than silcrete is an unexpected result. There are several possible expansions for this. One explanation is the silcrete cobbles are of poor quality and as a result were not a preferred knapping material by Aboriginal people. Another possible explanation is that the silcrete cobbles were not easily accessible in the past, only being exposed as a result of erosion and slope-wash during the past two centuries. Finally, there may have been a cultural preference for indurated mudstone/tuff by Aboriginal people.

10.4.3 Chronology

Without the use of absolute dating techniques, such as carbon dating of charcoal material from hearths, it is not possible to construct an absolute chronology of Aboriginal occupation for the Study Area. This said, on typological grounds, some broad statements could be made about occupation dates. A number of artefacts identified during the survey, particularly backed blades such as Bondi points, are part of the 'Australian small tool tradition'. Such artefacts have been dated to the mid to late Holocene (c. 6000 to 0BP), and are commonly found throughout the Hunter Valley. Therefore, in very broad terms, Aboriginal occupation of the Study Area can be dated to between 6000 BP and 0 BP.

10.5 Archaeological Sensitivity of the Study Area

Subsurface archaeological potential is addressed in the context of this assessment by the concept of 'archaeological sensitivity'. **Figure 7** provides archaeological sensitivity mapping based on three key factors including the nature and extent of visible surface artefacts at the site, a review of the findings of previous archaeological excavations in analogous landforms in the surrounding area, and on-site observations of post-depositional processes affecting artefact exposure and burial. Using these variables, the level of archaeological sensitivity has been graded into three categories:

- nil, where an area is considered highly disturbed or extremely unlikely to have subsurface deposit;
- low, where the archaeological potential is considered to be equal to that of 'background scatter'; and
- high, where key variables assessed has shown a high likelihood for archaeological deposit.

Visible Surface Evidence

Results from the analysis of visible surface artefacts within the Study Area have produced two key findings. Firstly, the highest densities of surface artefacts within the Study Area are associated with creeklines, a result that is consistent with numerous archaeological assessments undertaken throughout the Hunter Valley. While visibility bias is likely to have played a role in the degree to which creeklines are preferred, the results of the survey suggest creeks, irrespective of their Strahler order, are the most archaeologically sensitive landform in the Study Area.

Furthermore, what is evident from the distribution of surface artefacts in the Study Area is that the proximity to water is a critical factor in determining the density of the surface scatter. Results shown in **Table 14** indicate the greatest number of surface artefacts occur within 50 m of a creekline, with only a moderate decrease between 50 and 100 m. A further decrease in artefact numbers occurs between the 100 to 150 m and 150 to 200 m ranges; nonetheless, each of these ranges still account for more than 10% of total artefacts. Finally, less than 10% of the total artefacts identified occur within the 201 to 250 m and the 251 to 300 m ranges. Results indicate the majority of artefacts within the Study Area (i.e. 57.2%) are recorded within 100 m of a creekline and that 2nd order creeklines have the highest densities of artefacts. Therefore, on this basis, and acknowledging the limitations of the assessment, the area of greatest archaeological sensitivity within the Study Area is considered to be within 100 m of any creekline, but with a particular focus on 2nd order.

Previous Excavations

During their work at Mt Arthur North and South, Koettig & Hughes (1985) found that although artefacts occurred on slopes and ridge crests there was a definite decline in densities away from watercourses. Kuskie (2004) found a similar pattern during the Mt Arthur North Project, where sites excavated along Whites Creek contained far greater densities of artefacts than those excavated along a ridge to the Hunter River. The results of excavations at Drayton Mine (ARAS 2010) found association with drainage lines and water sources, particularly Ramrod Creek, to be the greatest contributing factor to artefact density. The assessment notes that ridge and spur landforms did not contain comparatively high artefact densities unless located within 100 m of a water source.

Post Depositional Processes

In order to adequately assess post deposition processes that have affected the integrity of archaeological sites within the Study Area, a detailed geomorphological assessment, with an emphasis on known sites and areas of sensitivity is required. In the absence of this assessment, some broad statements can be made, however these are somewhat general in nature.

As noted in **Section 4.2**, many watercourses, including Saddlers Creek show traces of heavy erosion, particularly along their mid and lower reaches. Mills (2000) has argued that during rain events, soil, and subsequently archaeological material, is redeposited across Saddlers Creek floodplain. Hughes (1984) has also concluded that in the Hunter Valley, soils within the A horizon, where the majority of artefactual material occurs, are sedimentary in origin and prone to extensive erosion resulting in the exposure and disturbance of subsurface deposit. During excavations at Drayton South in the mid-1980s, Hughes (1984) notes that sheet erosion was a significant factor affecting archaeological deposit, and in many cases resulted in partial stripping of A horizon soils. As a result, the accumulation of soils and therefore archaeological deposit at Aboriginal sites across the Study Area may be the result of post depositional processes rather than definitive areas of past Aboriginal activity. This is consistent with observations made during the archaeological survey.

The results provided in **Table 19** are preliminary only and are based on limited surface evidence. Detailed subsurface archaeological investigations would be required to confirm these predictions.

Table 19: Assessment of Archaeological Sensitivity

Rating	Definition	Finding
Nil	Land with little to no potential for subsurface archaeological deposit(s) due to past ground disturbance(s).	Areas of past mining activity associated with Drayton Mine have nil potential for archaeological deposit.
Low	Land with low potential for subsurface archaeological deposit(s). Low density 'background scatter' anticipated.	Landforms with low potential for subsurface deposit include hilltop/crest/ridge, upper slope, midslope, low slope, and areas of flat.
High	Land with considerable potential for subsurface archaeological deposit(s). Large, complex assemblages of chipped stone tools anticipated. Features such as hearths and spatially discrete knapping 'floors' possible. Highly favourable environmental conditions.	The landform with highest potential for archaeological deposit are creeklines, irrespective of order, at a distance of up to 100 m. However, this would need to be confirmed through subsurface investigation.

10.6 Evaluation of Predictive Model

Section 7.0 outlined a predictive model for Aboriginal archaeology in the Study Area. **Table 20** compares the predictions with the results of the archaeological survey as basis for informing future archaeological investigations within and around the Study Area.

Table 20: Evaluation of Predictive Model

Prediction	Archaeological Survey Result
Site types likely to occur within the Study Area include open artefact scatters, isolated finds, archaeological deposit, scarred trees, and axe grinding grooves.	**Supported.** Open artefact scatters dominate the surface archaeological record within the Study Area, accounting for 69.7% (n = 143) of known (n = 205) sites. Isolated finds (n = 59) are also well represented at 28.7 %. No scarred trees or axe grinding groove sites were identified during the current survey.
The majority of open artefact scatters will occur within 200 m of a creekline.	**Nominally supported.** The results of the archaeological survey found that the majority of artefacts are situated within 100 m of creeklines and substantially diminishing after 100 m.
Artefact scatters are also likely to occur on hillslopes and ridge crests, often with a vantage point over the surrounding landscape.	**Not supported.** Only a small number of artefacts (n = 18, 0.039%) were identified on hilltops and crests.
Isolated finds will exhibit varying degrees of integrity.	**Supported.**
Artefact Scatters will have varying degrees of integrity. Creeklines will likely be eroding.	**Supported.**
Chipped stone artefacts will be the most common form of artefact present within identified scatters.	**Supported.**
Indurated mudstone/tuff will be the dominant raw material across these sites, followed by silcrete.	**Supported.** The results of archaeological survey support this prediction with indurated mudstone/tuff accounting for 58% of the assemblage.
Flake and non-flake debitage will dominate recorded site assemblages; retouched artefacts will be rare.	**Supported.** The results of the archaeological survey support this prediction with 94.2% of the assemblage consisting of flake and non-flake debitage. Only 1.7% of the

Prediction	Archaeological Survey Result
	assemblage is retouched artefacts.
The majority of isolated finds will comprise chipped stone artefacts	**Supported.** The results of the archaeological survey support this prediction.
Archaeological deposit is likely to occur along higher order creeklines.	**Nominally supported.** The results of the archaeological survey infer that archaeological deposit is likely to occur on all creeklines within the Study Area with a bias towards 2nd order creeklines.
Scarred trees may occur where original remnant vegetation remains.	N/A
Axe grinding grooves on sandstone bedrock will occur in direct association with creeklines.	N/A
Scarred trees will likely be eucalypts i.e. Box Gum.	N/A
Most axe grinding groove sites will exhibit more than one groove.	N/A
Scarred trees are likely to be extremely old, dying or dead.	N/A
The majority of axe grinding groove sites will exhibit moderate to high archaeological integrity as such sites are more resistant to impacts.	N/A

N/A indicates that sites where not identified during the survey.

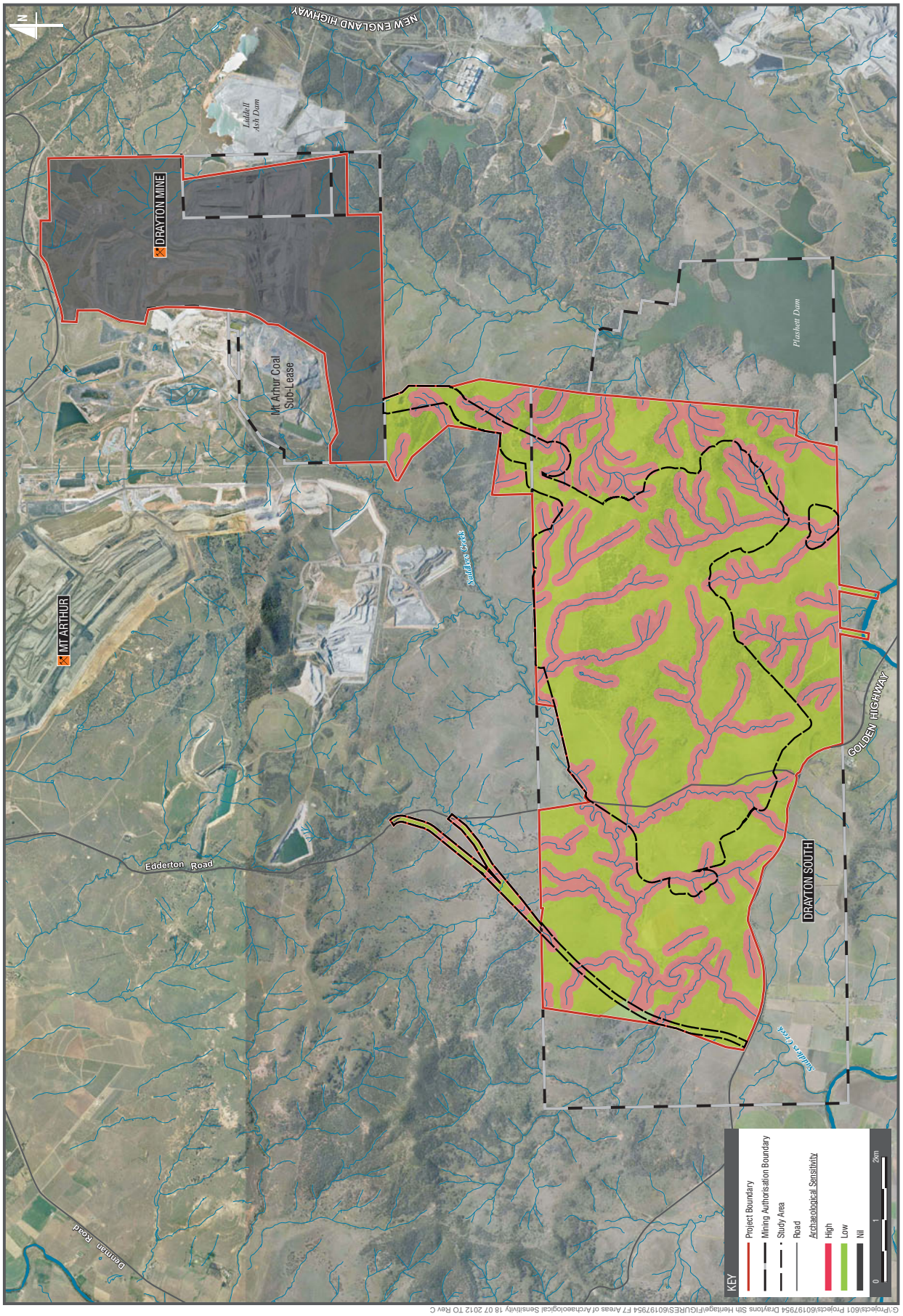
10.7 Assessment of Occupation Models

Section 5.4 outlined models of Aboriginal occupation in the Hunter Valley proposed in past archaeological assessments. **Table 21** discusses these models with reference to the findings of the archaeological survey.

Table 21: Assessment of Occupation Models

Researcher(s)	Summary of Model	Archaeological Survey Results
Hughes (1984)	Hughes proposed the often-quoted model of Aboriginal campsite location as commonly being found within 50 m of watercourses. Hughes argues that site sizes will diminish as the size of the watercourse decreases.	Survey results support this assessment in part but extend the prediction area to the 50 m to 100 m zone. The greatest percentage of artefacts 57.2% were recorded within 100 m of a creekline. Of those, the largest number (64.2%) were located within the 0-50 m range. These Artefact numbers begin to significantly decrease after 200 m.
Koettig (1994)	Using ethnographic accounts, Koettig proposed camps were ordered according to strict rules based on: the location of water sources, the size and composition of the group or groups camping, and the length of the stay. Koettig further proposes: • Where occupation is infrequent, archaeological features at a site may be widely distributed and relatively infrequent. • If, over time, occupation episodes are overprinted at the same site, then the evidence from different activity areas would be closer together and even superimposed. • The longer the stay of groups at a campsite, the greater the types of activities that should be reflected and the greater the disturbance of occupation	Interpreting the results of the survey using Koettig's hypothesis generates three key models of occupation. • A number of sites within the Study Area can be interpreted as sites of infrequent visitation and activity by Aboriginal people. • Given the high artefact densities at several sites and dispersed spatial distribution, it is likely more than one occupation episode has occurred at a number of sites. • Artefact analysis and test excavation at larger sites within the Study Area is likely to demonstrate a greater number of activities were occuring at these sites. This result could be interpreted as representing extended occupation of a site by Aboriginal people.

Researcher(s)	Summary of Model	Archaeological Survey Results
	debris on the ground.	
Dean-Jones and Mitchell (1993)	Dean-Jones and Mitchell (1993) correlate Aboriginal occupation with ridgelines due to their elevated position providing ease of movement across the landscape and greater visibility. Other landscapes such as terraces and mid slopes are also given preference, particularly during colder months when lower terrain may have been subject to frost hollow effects. Larger sites were noted to occur in valleys, as a result of greater resources. Water salinity was also raised as a potential influence on seasonality of occupation.	The archaeological survey does not support the notion that Aboriginal people used upper slopes and ridgelines as only a small number of artefacts (n = 18, 0.039%) were identified on hilltops, ridges and crests. Terraces and mid slopes do not appear to be given preference within the Study Area. Seasonal use of areas cannot be easily assessed based on surface survey alone.
Rich (1995)	Rich argued that Aboriginal people utilised technological solutions in conjunction with other survival strategies. Aboriginal groups were mobile and moved according to the location of resources in an area.	The model is difficult to assess, given that resources present today may not be reflective of past resource availability.
Witter (1995)	Witter proposed that the majority of occupation sites are peripheral to one or more base camps in close association with the Hunter River. These base camps would contain archaeological evidence of more intensive use from larger groups of Aboriginal people.	The archaeological survey included only a small section of the Hunter River, where no sites were identified. Large artefact scatters were found associated with 1st and 2nd order creeklines suggesting that notional 'base camps' could be associated with these watercourses. However, the concept of base camps and archaeological evidence supporting occupation that is more intensive is difficult to assess as they are time slice models and this information is lost over repeated occupation of a site.
Mills (2000)	Mills found evidence of Aboriginal activity associated with the full length of creeklines from their headwaters to the floodplain. Mills agreed with Dyall (1981b) that Aboriginal people used upper hill slopes for hunting and foraging after rain, when grasses and fruits were plentiful and adequate water was retained in pools to attract animals and sustain humans.	The archaeological survey supports Mills' model that Aboriginal activity was associated with the full length of creeklines within the Study Area, however, what activities occurred in these areas cannot be easily surmised from the survey alone.
Kuskie (2000)	Kuskie (2000) indicated that the entire landscape was utilised by Aboriginal people to varying extents. Kuskie refines Hughes' model (1984) relating Aboriginal occupation sites adjacent to watercourses by proposing that level to gently inclined landforms were preferred. Kuskie also finds that occupation sites are more commonly associated with third and fourth order creeks and vantage points. Kuskie found that Aboriginal people used and occupied the entire Mt Arthur North area but at varying intensities and at different time.	The survey supports Kuskie's findings that the entire landscape was utilised by aboriginal people, though finds that greater levels of activity occurred in particular landscapes i.e. creeklines. The survey also supports the idea that level to gently inclined landforms was preferred. The idea that occupation sites are more commonly associated with 3rd and 4th order creeklines is difficult to assess due the limited occurrence of these within the survey area. However, the model is not fully supported by the survey results as large clusters of artefacts are found along 1st and 2nd order creeklines in the Project Disturbance area. Uses of landscape based on seasonality are difficult to assess from the archaeological survey alone.



AREAS OF ARCHAEOLOGICAL SENSITIVITY
Aboriginal Archaeological and Cultural Heritage Impact Assessment
Drayton South Coal Project, New South Wales

FIGURE 7

11.0 Significance Assessment

Heritage sites and places hold value for different communities in a variety of different ways. As recently highlighted by Burke and Smith (Burke et al. n.d.: 227), one of the primary responsibilities of cultural heritage practitioners is determine which heritage sites and places are worthy of preservation and management (and why) and, conversely, which are not (and why). This, by necessity, requires an assessment of relative cultural significance.

In Australia, the primary guide to the assessment of cultural significance is the *Australian ICOMOS Charter for the Conservation of Places of Cultural Significance* (1999), informally known as the *Burra Charter*, which defines it as the "*aesthetic, historic, scientific, social or spiritual value for past, present or future generations*" of a site or place. With respect to Aboriginal sites and places, it is possible to identify two major streams in the overall significance assessment process: the assessment of scientific significance by archaeologists and the assessment of cultural or social significance by Aboriginal people.

11.1 Scientific Significance

Scientific value refers to the contribution that the heritage resource (i.e. an Aboriginal site or archaeological distribution) can make to knowledge and understanding of the past. It is assessed according to the rarity, representativeness or research potential of a site. These factors are inter-related. The degree to which the heritage resource can contribute to knowledge is summed up in the notion of significance, which increases according to the degree of research potential and rarity of a site or area.

11.1.1 Levels of Scientific Significance

To adequately assess significance, evidence is required, which includes information about the presence of subsurface deposits, integrity of these deposits, nature of site contents and extent of the site. A review of information about previously recorded sites within the local area and region enables the rarity and representativeness of a site to be assessed.

- *High significance* is usually attributed to sites, which are so rare or unique that the loss of the site would affect our ability to understand aspects of past Aboriginal use / occupation for an area. In some cases, a site may be considered highly significant because its type is now rare due to destruction of the archaeological record through development.
- *Moderate significance* can be attributed to sites that provide information on an established research question or on the basis of moderate rareness.
- *Low significance* is attributed to sites that cannot contribute new information about past Aboriginal use / occupation of an area. This may be due to site disturbance or the nature of the site's contents.

11.1.2 Research Potential

Research potential or demonstrated research importance is considered according to the contribution that a heritage site can make to present understanding of human society and the human past. Heritage sites, objects or places of high scientific significance are those that provide an uncommon opportunity to inform us about the specific age of people in an area, provide a rare glimpse of artistic endeavour or provide a rare chronological record of changing life through deep archaeological stratigraphy.

The capacity of a site to address research questions is predicated on a definition of what the key research issues are for a region. In the Hunter Valley such questions will revolve around stone tool manufacture, settlement patterning; how regional resources were used; how uses changed throughout the Holocene; and how these changes manifested in the archaeological record.

Some archaeologists suggest that the value of a place / object can be judged by answering the following questions:

- Can the site contribute knowledge that no other resource can?
- Can it provide information not available on other sites?
- Can it answer pertinent research questions?

11.1.3 Rarity and Representativeness

Rarity and representativeness are related concepts. The comparative rarity of a site is a consideration in assessing scientific significance; a certain site type may be "one of a kind" in one region, but very common in another. Artefacts of a particular type may be common in one region, but outside the known distribution in another.

11.1.4 Integrity

The integrity of a site is also a consideration in determining scientific significance. While disturbance of a topsoil deposit with artefacts does not entirely diminish research value, it may limit the types of questions that may be addressed. A heavily cultivated paddock may be unsuited to addressing research questions of small-scale site structure, but it may still be suitable for answering more general questions about artefact distribution and raw material logistics.

11.1.5 Application of the Significance Assessment for the Project

A significance assessment has been undertaken for all Aboriginal sites within the Study Area (**Figure 8**). **Table 22** presents a summary of these findings.

Table 22: Summary of Significance Assessment

Site Type	Significance			
	High	Moderate	Low	Total
Artefact Scatters	1	17	126	144
Isolated Finds	0	1	57	58
Stone Quarries	3*	0	0	3
Total	**4**	**18**	**183**	**205**

**Stone Quarry site 37-2-1955 included above was not located during this survey*

High Significance

A total of four sites have been rated as highly significant. Two of these are stone quarry sites 37-2-1954 and 37-2-1955 (not relocated) recorded by Mills (2000), which are considered rare in the Central Lowlands and offer high research value given their ability to answer questions related to raw material use and procurement. A third quarry site was identified during the current archaeological survey (DS-QR1-11), which is also considered of high significance.

Artefact scatter site (DS-C8) is also considered as highly significant due to the identification of two non-ground edge stone axes, large artefact count (n=981), which is considerably higher than other sites within the Study Area, and high potential for archaeological deposit. Based on the combination of these elements, this site is considered to have potential to answer research questions related to subsistence patterning and the organisation of technology within the Study Area.

Moderate Significance

A total of 18 sites have been rated as moderately significant. Moderate significance has been attributed to sites where artefacts of moderate rarity in the local area (i.e. axe heads and hammerstones) were identified, where PAD or significant (>100) artefact numbers were recorded.

Table 23: Sites of Moderate Significance

Site ID	Site Type	Site ID	Site Type
37-2-0089	Artefact Scatter + PAD	DS-C13	Artefact Scatter + PAD
37-2-1930	Artefact Scatter	DS-C14	Artefact Scatter + PAD
37-2-1947	Artefact Scatter + PAD	DS-C15	Artefact Scatter + PAD
DS-C3	Artefact Scatter	DS-C16	Artefact Scatter + PAD
DS-C4	Artefact Scatter	DS-IF6-11	Isolated Find
DS-C5	Artefact Scatter	DS-AS35-11	Artefact Scatter
DS-C7	Artefact Scatter + PAD	DS-AS52-11	Artefact Scatter
DS-C11	Artefact Scatter	DS-AS69-11	Artefact Scatter

Site ID	Site Type	Site ID	Site Type
DS-C12	Artefact Scatter	DS-AS79-11	Artefact Scatter

Low Significance

A total of 183 sites have been rated as of low significance. Low significance is attributed to sites that are common in the local and regional area, are highly disturbed, or have few artefact numbers.

Table 24: Sites of Low Significance

Site ID	Site Type	Site ID	Site Type	Site ID	Site Type
37-2-0074	Artefact Scatter	DS-IF34-11	Isolated Find	DS-AS38-11	Artefact Scatter
37-2-0077	Artefact Scatter	DS-IF35-11	Isolated Find	DS-AS39-11	Artefact Scatter
37-2-0080	Artefact Scatter	DS-IF36-11	Isolated Find	DS-AS40-11	Artefact Scatter
37-2-0082	Artefact Scatter	DS-IF37-11	Isolated Find	DS-AS41-11	Artefact Scatter
37-2-0374	Artefact Scatter	DS-IF38-11	Isolated Find	DS-AS42-11	Artefact Scatter
37-2-0375	Artefact Scatter	DS-IF39-11	Isolated Find	DS-AS43-11	Artefact Scatter
37-2-0377	Artefact Scatter	DS-IF40-11	Isolated Find	DS-AS44-11	Artefact Scatter
37-2-0398	Artefact Scatter	DS-IF41-11	Isolated Find	DS-AS45-11	Artefact Scatter
37-2-0408	Artefact Scatter	DS-IF42-11	Isolated Find	DS-AS46-11	Artefact Scatter
37-2-0416	Artefact Scatter	DS-IF43-11	Isolated Find	DS-AS47-11	Artefact Scatter
37-2-0427	Artefact Scatter	DS-IF44-11	Isolated Find	DS-AS48-11	Artefact Scatter
37-2-0499	Artefact Scatter	DS-IF45-11	Isolated Find	DS-AS49-11	Artefact Scatter
37-2-1929	Artefact Scatter	DS-IF46-11	Isolated Find	DS-AS50-11	Artefact Scatter
37-2-1931	Artefact Scatter	DS-IF47-11	Isolated Find	DS-AS51-11	Artefact Scatter
37-2-1932	Artefact Scatter	DS-IF48-11	Isolated Find	DS-AS53-11	Artefact Scatter
37-2-1938	Artefact Scatter	DS-IF49-11	Isolated Find	DS-AS54-11	Artefact Scatter
37-2-1939	Artefact Scatter	DS-IF50-11	Isolated Find	DS-AS55-11	Artefact Scatter
37-2-1940	Artefact Scatter	DS-IF51-11	Isolated Find	DS-AS56-11	Artefact Scatter
37-2-1942	Artefact Scatter	DS-IF52-11	Isolated Find	DS-AS57-11	Artefact Scatter
37-2-2035	Artefact Scatter	DS-IF53-11	Isolated Find	DS-AS58-11	Artefact Scatter
37-2-2666	Isolated Find	DS-IF54-11	Isolated Find	DS-AS59-11	Artefact Scatter
DS-C1	Artefact Scatter	DS-IF55-11	Isolated Find	DS-AS60-11	Artefact Scatter
DS-C2	Artefact Scatter	DS-IF56-11	Isolated Find	DS-AS61-11	Artefact Scatter
DS-C6	Artefact Scatter	DS-IF57-11	Isolated Find	DS-AS62-11	Artefact Scatter
DS-C9	Artefact Scatter	DS-IF58-11	Isolated Find	DS-AS63-11	Artefact Scatter
DS-C10	Artefact Scatter	DS-AS1-11	Artefact Scatter	DS-AS64-11	Artefact Scatter
DS-C17	Artefact Scatter	DS-AS2-11	Artefact Scatter	DS-AS65-11	Artefact Scatter
DS-C18	Artefact Scatter	DS-AS3-11	Artefact Scatter	DS-AS66-11	Artefact Scatter
DS-C19	Artefact Scatter	DS-AS4-11	Artefact Scatter	DS-AS67-11	Artefact Scatter
DS-IF1-11	Isolated Find	DS-AS5-11	Artefact Scatter	DS-AS68-11	Artefact Scatter
DS-IF2-11	Isolated Find	DS-AS6-11	Artefact Scatter	DS-AS70-11	Artefact Scatter
DS-IF3-11	Isolated Find	DS-AS7-11	Artefact Scatter	DS-AS71-11	Artefact Scatter
DS-IF4-11	Isolated Find	DS-AS8-11	Artefact Scatter	DS-AS72-11	Artefact Scatter
DS-IF5-11	Isolated Find	DS-AS9-11	Artefact Scatter	DS-AS73-11	Artefact Scatter
DS-IF7-11	Isolated Find	DS-AS10-11	Artefact Scatter	DS-AS74-11	Artefact Scatter
DS-IF8-11	Isolated Find	DS-AS11-11	Artefact Scatter	DS-AS75-11	Artefact Scatter
DS-IF9-11	Isolated Find	DS-AS12-11	Artefact Scatter	DS-AS76-11	Artefact Scatter
DS-IF10-11	Isolated Find	DS-AS13-11	Artefact Scatter	DS-AS77-11	Artefact Scatter
DS-IF11-11	Isolated Find	DS-AS14-11	Artefact Scatter	DS-AS78-11	Artefact Scatter
DS-IF12-11	Isolated Find	DS-AS15-11	Artefact Scatter	DS-AS80-11	Artefact Scatter
DS-IF13-11	Isolated Find	DS-AS16-11	Artefact Scatter	DS-AS81-11	Artefact Scatter
DS-IF14-11	Isolated Find	DS-AS17-11	Artefact Scatter	DS-AS82-11	Artefact Scatter
DS-IF15-11	Isolated Find	DS-AS18-11	Artefact Scatter	DS-AS83-11	Artefact Scatter
DS-IF16-11	Isolated Find	DS-AS19-11	Artefact Scatter	DS-AS84-11	Artefact Scatter

Site ID	Site Type	Site ID	Site Type	Site ID	Site Type
DS-IF17-11	Isolated Find	DS-AS20-11	Artefact Scatter	DS-AS85-11	Artefact Scatter
DS-IF18-11	Isolated Find	DS-AS21-11	Artefact Scatter	DS-AS86-11	Artefact Scatter
DS-IF19-11	Isolated Find	DS-AS22-11	Artefact Scatter	DS-AS87-11	Artefact Scatter
DS-IF20-11	Isolated Find	DS-AS23-11	Artefact Scatter	DS-AS88-11	Artefact Scatter
DS-IF21-11	Isolated Find	DS-AS24-11	Artefact Scatter	DS-AS89-11	Artefact Scatter
DS-IF22-11	Isolated Find	DS-AS25-11	Artefact Scatter	DS-AS90-11	Artefact Scatter
DS-IF23-11	Isolated Find	DS-AS26-11	Artefact Scatter	DS-AS91-11	Artefact Scatter
DS-IF24-11	Isolated Find	DS-AS27-11	Artefact Scatter	DS-AS92-11	Artefact Scatter
DS-IF25-11	Isolated Find	DS-AS28-11	Artefact Scatter	DS-AS93-11	Artefact Scatter
DS-IF26-11	Isolated Find	DS-AS29-11	Artefact Scatter	DS-AS94-11	Artefact Scatter
DS-IF27-11	Isolated Find	DS-AS30-11	Artefact Scatter	DS-AS95-11	Artefact Scatter
DS-IF28-11	Isolated Find	DS-AS31-11	Artefact Scatter	DS-AS96-11	Artefact Scatter
DS-IF29-11	Isolated Find	DS-AS32-11	Artefact Scatter	DS-AS97-11	Artefact Scatter
DS-IF30-11	Isolated Find	DS-AS33-11	Artefact Scatter	DS-AS98-11	Artefact Scatter
DS-IF31-11	Isolated Find	DS-AS34-11	Artefact Scatter	DS-AS99-11	Artefact Scatter
DS-IF32-11	Isolated Find	DS-AS36-11	Artefact Scatter	DS-AS100-11	Artefact Scatter
DS-IF33-11	Isolated Find	DS-AS37-11	Artefact Scatter	DS-AS101-11	Artefact Scatter

11.2 Social (Cultural) Significance

Social or cultural values, within an Aboriginal Cultural Heritage Assessment refer to the spiritual, traditional, historical or contemporary associations and attachments a place or area has for Aboriginal people (OEH 2011). As such, these values and their social significance can only be identified through consultation with Aboriginal people. Accordingly, throughout the assessment process, Hansen Bailey and AECOM have actively sought the opinions of Aboriginal stakeholders on this matter, both verbally and in writing. Opportunities for the provision of cultural information have been provided at all stages of the assessment process.

Social or cultural values are applicable to sites, items and landscapes. Aboriginal sites with archaeological evidence are all of value to the Aboriginal community because they represent a tangible connection with pre-European Aboriginal life.

11.2.1 Places of Social, Spiritual, and Cultural Value

Aboriginal stakeholder representatives who participated in the assessment have highlighted Mt Arthur, 5 km north of the Study Area, and Saddlers Creek on the northern boundary of the Study Area as culturally important features in the local landscape.

Mt Arthur is the dominant landscape feature in the local area. Such landmarks or dominant landscape features are often recognised as highly significant to Aboriginal people. One of the first references to the importance of Mt Arthur to the local Aboriginal community was from Dyall (1977) during his archaeological assessment of Mt Arthur. Dyall noted that during his enquiry with local residents there were 'suggestions (of a very vague nature) that Mt Arthur itself was of special significance to the Aborigines' (Dyall 1977: p1). Since that time, several archaeological and cultural heritage assessments have reported on the significance of Mt Arthur to Aboriginal people. Umwelt (2006) note the significance of Mt Arthur as the dominant topographic feature of the region and additionally identify the prominent ridgeline that radiates southeast of the mountain towards Saddlers Creek. Perhaps the most important find, with respect to the importance of the Mt Arthur area to Aboriginal people, was an Aboriginal burial identified on the Mt Arthur Coal Mining Lease. Such sites are regionally rare and of major cultural significance to Aboriginal people.

In terms of an Aboriginal cultural landscape, the Mt Arthur landscape will include its immediate surrounds, its views, vistas, and other associated landscape features. The Study Area is within the visual extent of the Mt Arthur landscape, with views of the mountain available from several locations within the Study Area, particularly north facing hillslopes and crests. The principal landscape feature associated with the Mt Arthur landscape and the Study Area is Saddlers Creek, which occurs close to the northern boundary of the Study Area.

During fieldwork and the consultation process, Aboriginal stakeholders indicated, in general terms, the importance of Saddlers Creek as a focal point for past Aboriginal activity. The cultural significance of Saddlers Creek lies in its importance as a source of aquatic resources. Saddlers Creek is likely to have been the principal source of water

and also a major food resource for Aboriginal people travelling to and through the area. Stakeholders expressed some general concern during fieldwork for the Project, that the section of Saddlers Creek that occurs within close proximity to the Study Area is protected. As part of the Project, Anglo American has committed to not impacting the section of Saddlers Creek that occurs within the Project Boundary. Furthermore, Anglo American has committed to rehabilitating Saddlers Creek and making it an ecological offset in perpetuity, linking it with Mt Arthur Coal's established conservation area along Saddlers Creek.

11.2.2 Aboriginal Objects

The archaeological survey for the Project identified a rich landscape of Aboriginal activity as evidenced from the high counts of stone artefacts recorded over the Study Area. These surface artefacts, which form Aboriginal archaeological and cultural sites, were reordered over the entire landscape but most intensely associated with creeklines and drainage lines, including Saddlers Creek. While having varying degrees of scientific significance, these stone artefacts are of cultural importance to Aboriginal people as they attest to the occupation and use of the Study Area by Aboriginal people in the past and provide an important tangible link to their heritage. Concern has been expressed, both in writing (see **Section 3.3.1)** and verbally, by Aboriginal stakeholders that these artefacts and sites be cared for appropriately.

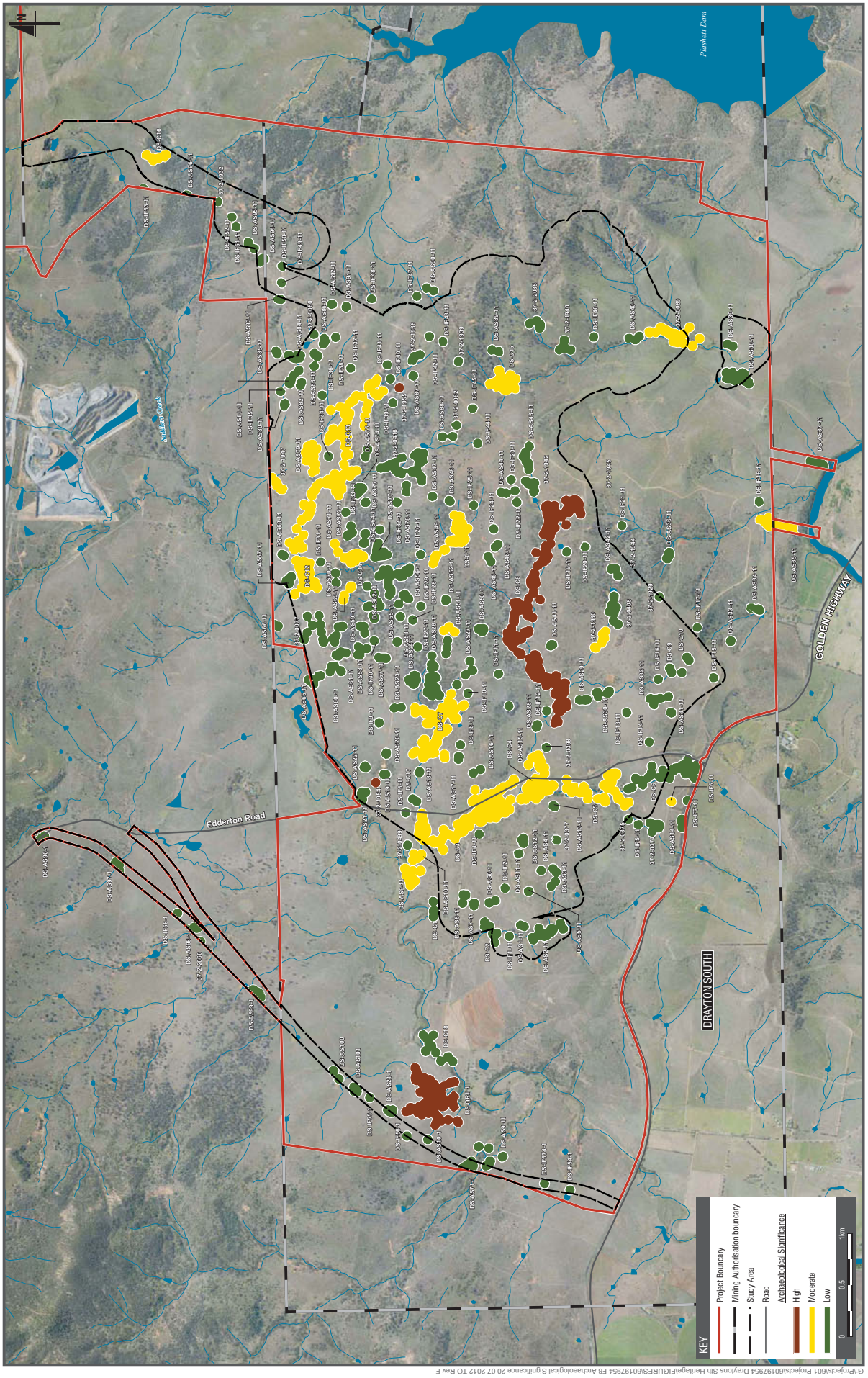
The identification of stone artefacts and archaeological sites notwithstanding, Aboriginal stakeholders involved in the assessment process have not disclosed any specific knowledge concerning these artefacts or sites or their cultural significance. However, in-field discussions between stakeholders and AECOM archaeologists have indicated the importance of viewing the Study Area in context, that is, as part of a broader cultural landscape incorporating Saddlers Creek and more broadly Mt Arthur.

11.2.3 Summary and Impacts

In summary, the cultural values of the Study Area, as identified through the assessment process, have been defined in relation to several key elements in the landscape. Principally, the cultural values are associated with the broader Mt Arthur landscape, which has been identified through previous assessments as a culturally significant feature in the local landscape. The Study Area is located approximately 5 km south of Mt Arthur and therefore it is anticipated that the Project will not result in significant impacts to the Mt Arthur landscape.

Saddlers Creek is another key feature identified as having cultural values within the local landscape both in itself and as part of the Mt Arthur landscape. Saddlers Creek is located at the northern boundary of the Study Area and all sections of the creek occuring within the Project Boundary are to be part of an ecological offset in perpetuity. Therefore, no impacts to Saddlers Creek are anticipated from the Project.

Lastly, the cultural heritage values of the Study Area are related to the identification of a large number of stone artefacts across the Study Area landscape. As discussed, these artefacts are important to contemporary Aboriginal people as a tangible link to their heritage. Impacts to, and management of these stone artefacts, should be considered with reference to their cultural significance and in consultation with registered Aboriginal stakeholders. Proposed impacts and management of these artefacts are provided in **Section 12.0** and **Section 14.0**.



ARCHAEOLOGICAL SIGNIFICANCE
Aboriginal Archaeological and Cultural Heritage Impact Assessment
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FIGURE 8

Note: Archaeological site boundaries shown above reflect the 100m site definition methodology adopted for the assessment (see Section 8.4)

AECOM

12.0 Impact Assessment

12.1 Project Construction Details and Impacts

As outlined in **Section 1.0**, Anglo American is seeking a new Project Approval under Part 3A of the EP&A Act for continuation of mining at Drayton Mine by the development of open cut and highwall mining areas within Drayton South while continuing to utilise the existing infrastructure, equipment and workforce from Drayton Mine.

In addition to areas of open cut and highwall mining, surface infrastructure consisting of a transport corridor, mine site facilities, water management infrastructure, a visual bund, and the realignment of Edderton Road will be undertaken. A discussion is made below of each proposed activity and its potential impact on Aboriginal archaeological and cultural heritage values within the Study Area (**Figure 9**).

12.2 Direct Impacts

12.2.1 Open Cut Mining

Open cut operations are proposed within the Whynot, Blakefield, Redbank and Houston mining areas, as shown on **Figure 9**. Open cut mining refers to a method of extracting rock or minerals from the earth through surface intrusion. This involves the sequential removal of soil, overburden and interburden above and between each coal seam, coal removal, progressive backfilling and rehabilitation of mined-out areas. This method of extraction will result in the disturbance or destruction of the ground surface. **Table 25** lists the 135 Aboriginal sites that will be directly impacted by open cut mining.

12.2.2 Transport Corridor

The Project includes two options for the transport of coal from Drayton South to Drayton Mine. These include:

- Road transport along a dedicated haul road; or / and
- Overland conveyor from a ROM pad and crushing station located at Drayton South.

The proposed haul road is shown on **Figure 9**. A light vehicle access road will generally run parallel to the haul road to allow safe separation between light and heavy vehicles.

If haulage by overland conveyor is to occur, the conceptual alignment is shown on **Figure 9.** ROM coal from Drayton South will be transported from the mining face, supplied to a newly constructed ROM hopper and then conveyed to the existing ROM facilities at Drayton Mine. Initially the haul road option will be used for operations, with the conveyor system only constructed once coal production reaches a level that makes this option economically feasible. **Table 25** lists the 11 Aboriginal sites that will be directly impacted by the transport corridor.

12.2.3 Mine Site Facilities

As the Project intends to replace current mining operations at Drayton Mine, minimal changes to surface facilities will be required. The current administration office, bathhouse and workshops will continue to be used. New mine site facilities will be required to support the operations at Drayton South. These facilities include:

- Parking facilities for heavy and light vehicles;
- Remote maintenance workshop with supporting services;
- Fuel and lubricant facilities;
- Operations building, including training and crib room and amenities;
- Heavy and light vehicle wash station facilities;
- Dragline refurbishment pad;
- Fire systems, including raw and fire water tanks;
- Waste management systems, including septic tanks and offsite domestic waste transfer arrangements; and
- A helicopter pad.

Construction of the mine site facilities will result in ground surface disturbance, directly impacting Aboriginal sites DS-AS67-11 and DS-AS68-11.

12.2.4 Visual Bund

Potential visual impacts and concerns of key stakeholders have driven the development and design of the mine plans. This has ultimately resulted in the development of the visual bund, with consideration of natural features and topography, to screen mining areas from sensitive receptors. The construction of the visual bund will include activities such as removal (stripping), haulage and emplacement of topsoil and overburden. The visual bund will directly impact on Aboriginal site 37-2-0089.

12.2.5 Realignment of Edderton Road

An approximate 7 km realignment of Edderton Road is required at the western extent in the Project Boundary. Approximately 4 km of the existing road passes through the land within the Project Boundary, with the remaining 3 km located on load owned by Hunter Valley Energy Coal. The proposed realignment is shown on **Figure 9**. **Table 25** lists the 16 Aboriginal sites impacted by Edderton Road realignment.

During the course of the assessment, it was identified that the proposed route of Edderton Road realignment would impact on Aboriginal quarry site DS-QR1-11. As a result of the significance of this site, based on its rarity and potential research value, considerable effort was made to avoid all impacts to the site. The original route of the realignment was modified, involving a process of land sharing with the adjacent property owner, to pass 200 m to the west of the site, to ensure it is not impacted.

12.2.6 Water Management Infrastructure

The Drayton South water management system will be integrated with the existing Drayton Mine water management system to enable optimal collection, use, recovery and recycling of water within the Project Area. The Drayton South mining area will require a system of catch dams, bunds, piped transfers and diversion drains to ensure the water upstream does not inundate the mining area during large rainfall events. Aboveground polypropylene piping that connects areas of water storage will not result in surface impacts. Therefore, its use has not been considered as a potential impact to Aboriginal sites. The construction of water management infrastructure will result in ground surface disturbance, impacting Aboriginal sites. **Table 25** lists the ten Aboriginal sites that will be directly impacted by the water management infrastructure.

12.3 Highwall Mining

Highwall mining is proposed for a number of areas within the Project Boundary, as shown on **Figure 9**. Highwall mining enables coal to be mined without the need for overburden or interburden removal. Coal is recovered via the excavation of unmanned entries beyond the final highwall position. This allows for the recovery of coal that would otherwise be sterilised beyond the open cut highwall.

It is a key statement of commitment for the Project that highwall mining will be designed and undertaken in such a way as to ensure there will be no subsidence. This will be included as a design parameter within the engineering plans for the Project. As such, no surface related impacts are anticipated as a result of highwall mining for the Project. Further details with regard to the design of highwall mining are provided in the Project Description section of the Drayton South Coal Project Environmental Assessment (main volume of the EA).

As no subsidence or ground surface impacts are anticipated for areas where highwall mining is proposed, no impacts to Aboriginal sites in those areas are predicted.

Table 25: Summary of Impacts to Known Aboriginal Sites

Impact	Site ID	Site Type	Significance
Open Cut *– Direct Impact*	37-2-0074	Artefact Scatter	Low
	37-2-0077	Artefact Scatter	Low
Significance Tally	37-2-0082	Artefact Scatter	Low
High – 3	37-2-0377	Artefact Scatter	Low
Moderate – 14	37-2-0398	Artefact Scatter	Low
Low – 118	37-2-0408	Artefact Scatter	Low
	37-2-0416	Artefact Scatter	Low
	37-2-1930	Artefact Scatter	Moderate
	37-2-1938	Artefact Scatter	Low
	37-2-1939	Artefact Scatter	Low
	37-2-1940	Artefact Scatter	Low
	37-2-1942	Artefact Scatter	Low
	37-2-1947	Artefact Scatter + PAD	Moderate
	37-2-1954	Stone Quarry	High
	37-2-1955	Stone Quarry	High
	37-2-2035	Artefact Scatter	Low
	37-2-0427	Artefact Scatter	Low
	DS-C3	Artefact Scatter	Moderate
	DS-C4	Artefact Scatter	Moderate
	DS-C5	Artefact Scatter	Moderate
	DS-C6	Artefact Scatter	Low
	DS-C7	Artefact Scatter + PAD	Moderate
	DS-C8	Artefact Scatter + PAD	High
	DS-C9	Artefact Scatter	Low
	DS-C10	Artefact Scatter	Low
	DS-C11	Artefact Scatter	Moderate
	DS-C12	Artefact Scatter	Moderate
	DS-C13	Artefact Scatter + PAD	Moderate
	DS-C14	Artefact Scatter + PAD	Moderate
	DS-C15	Artefact Scatter + PAD	Moderate
	DS-C17	Artefact Scatter	Low
	DS-IF2-11	Isolated Find	Low
	DS-IF3-11	Isolated Find	Low
	DS-IF4-11	Isolated Find	Low
	DS-IF8-11	Isolated Find	Low
	DS-IF9-11	Isolated Find	Low
	DS-IF10-11	Isolated Find	Low
	DS-IF11-11	Isolated Find	Low
	DS-IF12-11	Isolated Find	Low
	DS-IF13-11	Isolated Find	Low
	DS-IF14-11	Isolated Find	Low
	DS-IF15-11	Isolated Find	Low
	DS-IF16-11	Isolated Find	Low
	DS-IF19-11	Isolated Find	Low
	DS-IF20-11	Isolated Find	Low
	DS-IF22-11	Isolated Find	Low
	DS-IF23-11	Isolated Find	Low
	DS-IF24-11	Isolated Find	Low
	DS-IF25-11	Isolated Find	Low
	DS-IF26-11	Isolated Find	Low
	DS-IF27-11	Isolated Find	Low
	DS-IF28-11	Isolated Find	Low
	DS-IF29-11	Isolated Find	Low
	DS-IF30-11	Isolated Find	Low
	DS-IF31-11	Isolated Find	Low
	DS-IF32-11	Isolated Find	Low

Impact	Site ID	Site Type	Significance
	DS-IF33-11	Isolated Find	Low
	DS-IF34-11	Isolated Find	Low
	DS-IF36-11	Isolated Find	Low
	DS-IF37-11	Isolated Find	Low
	DS-IF38-11	Isolated Find	Low
	DS-IF39-11	Isolated Find	Low
	DS-IF40-11	Isolated Find	Low
	DS-IF41-11	Isolated Find	Low
	DS-IF42-11	Isolated Find	Low
	DS-IF43-11	Isolated Find	Low
	DS-IF44-11	Isolated Find	Low
	DS-IF45-11	Isolated Find	Low
	DS-IF46-11	Isolated Find	Low
	DS-AS3-11	Artefact Scatter	Low
	DS-AS4-11	Artefact Scatter	Low
	DS-AS5-11	Artefact Scatter	Low
	DS-AS6-11	Artefact Scatter	Low
	DS-AS7-11	Artefact Scatter	Low
	DS-AS8-11	Artefact Scatter	Low
	DS-AS11-11	Artefact Scatter	Low
	DS-AS12-11	Artefact Scatter	Low
	DS-AS13-11	Artefact Scatter	Low
	DS-AS16-11	Artefact Scatter	Low
	DS-AS17-11	Artefact Scatter	Low
	DS-AS18-11	Artefact Scatter	Low
	DS-AS19-11	Artefact Scatter	Low
	DS-AS20-11	Artefact Scatter	Low
	DS-AS22-11	Artefact Scatter	Low
	DS-AS23-11	Artefact Scatter	Low
	DS-AS24-11	Artefact Scatter	Low
	DS-AS25-11	Artefact Scatter	Low
	DS-AS26-11	Artefact Scatter	Low
	DS-AS27-11	Artefact Scatter	Low
	DS-AS28-11	Artefact Scatter	Low
	DS-AS29-11	Artefact Scatter	Low
	DS-AS30-11	Artefact Scatter	Low
	DS-AS31-11	Artefact Scatter	Low
	DS-AS32-11	Artefact Scatter	Low
	DS-AS40-11	Artefact Scatter	Low
	DS-AS41-11	Artefact Scatter	Low
	DS-AS42-11	Artefact Scatter	Low
	DS-AS43-11	Artefact Scatter	Low
	DS-AS44-11	Artefact Scatter	Low
	DS-AS45-11	Artefact Scatter	Low
	DS-AS46-11	Artefact Scatter	Low
	DS-AS47-11	Artefact Scatter	Low
	DS-AS48-11	Artefact Scatter	Low
	DS-AS50-11	Artefact Scatter	Low
	DS-AS51-11	Artefact Scatter	Low
	DS-AS52-11	Artefact Scatter	Moderate
	DS-AS53-11	Artefact Scatter	Low
	DS-AS54-11	Artefact Scatter	Low
	DS-AS55-11	Artefact Scatter	Low
	DS-AS56-11	Artefact Scatter	Low
	DS-AS57-11	Artefact Scatter	Low
	DS-AS58-11	Artefact Scatter	Low
	DS-AS59-11	Artefact Scatter	Low
	DS-AS60-11	Artefact Scatter	Low

Impact	Site ID	Site Type	Significance
	DS-AS61-11	Artefact Scatter	Low
	DS-AS62-11	Artefact Scatter	Low
	DS-AS63-11	Artefact Scatter	Low
	DS-AS64-11	Artefact Scatter	Low
	DS-AS65-11	Artefact Scatter	Low
	DS-AS69-11	Artefact Scatter	Moderate
	DS-AS70-11	Artefact Scatter	Low
	DS-AS72-11	Artefact Scatter	Low
	DS-AS73-11	Artefact Scatter	Low
	DS-AS74-11	Artefact Scatter	Low
	DS-AS75-11	Artefact Scatter	Low
	DS-AS76-11	Artefact Scatter	Low
	DS-AS77-11	Artefact Scatter	Low
	DS-AS78-11	Artefact Scatter	Low
	DS-AS79-11	Artefact Scatter	Moderate
	DS-AS83-11	Artefact Scatter	Low
	DS-AS86-11	Artefact Scatter	Low
	DS-AS87-11	Artefact Scatter	Low
	DS-AS88-11	Artefact Scatter	Low
	DS-AS89-11	Artefact Scatter	Low
	DS-AS92-11	Artefact Scatter	Low
Transport Corridor *- Direct Impact* *Significance Tally* High – 0 Moderate – 1 Low - 10	37-2-1932	Artefact Scatter	Low
	37-2-1931	Artefact Scatter	Low
	DS-C16	Artefact Scatter + PAD	Moderate
	DS-IF49-11	Isolated Find	Low
	DS-IF50-11	Isolated Find	Low
	DS-IF51-11	Isolated Find	Low
	DS-IF52-11	Isolated Find	Low
	DS-AS91-11	Artefact Scatter	Low
	DS-AS94-11	Artefact Scatter	Low
	DS-AS95-11	Artefact Scatter	Low
	37-2-0080	Artefact Scatter	Low
Mine Site Facilities *– Direct Impact* *Significance Tally* High – 0 Moderate – 0 Low - 2	DS-AS67-11	Artefact Scatter	Low
	DS-AS68-11	Artefact Scatter	Low
Visual Bund *– Direct Impact* *Significance Tally* High – 0 Moderate – 1 Low - 0	37-2-0089	Artefact Scatter + PAD	Moderate
Realignment of Edderton Road *– Direct Impact* *Significance Tally* High – 0 Moderate – 0 Low - 16	37-2-2666	Isolated Find	Low
	DS-IF54-11	Isolated Find	Low
	DS-IF55-11	Isolated Find	Low
	DS-IF56-11	Isolated Find	Low
	DS-IF57-11	Isolated Find	Low
	DS-IF58-11	Isolated Find	Low
	DS-AS10-11	Artefact Scatter	Low
	DS-AS21-11	Artefact Scatter	Low
	DS-AS49-11	Artefact Scatter	Low
	DS-AS71-11	Artefact Scatter	Low

Impact	Site ID	Site Type	Significance
	DS-AS96-11	Artefact Scatter	Low
	DS-AS97-11	Artefact Scatter	Low
	DS-AS98-11	Artefact Scatter	Low
	DS-AS99-11	Artefact Scatter	Low
	DS-AS100-11	Artefact Scatter	Low
	DS-AS101-11	Artefact Scatter	Low
Water Management *– Direct Impact* *<u>Significance Tally</u>* High – 0 Moderate – 0 Low – 10	DS-IF1-11	Isolated Find	Low
	DS-IF35-11	Isolated Find	Low
	DS-AS1-11	Artefact Scatter	Low
	DS-AS2-11	Artefact Scatter	Low
	DS-AS38-11	Artefact Scatter	Low
	DS-AS39-11	Artefact Scatter	Low
	DS-AS80-11	Artefact Scatter	Low
	DS-AS81-11	Artefact Scatter	Low
	DS-AS82-11	Artefact Scatter	Low
	DS-AS84-11	Artefact Scatter	Low
Not Impacted *<u>Significance Tally</u>* High – 1 Moderate – 2 Low - 27	DS-QR1-11	Stone Quarry	High
	37-2-0375	Artefact Scatter	Low
	37-2-0499	Artefact Scatter	Low
	37-2-0374	Artefact Scatter	Low
	37-2-1929	Artefact Scatter	Low
	DS-C1	Artefact Scatter	Low
	DS-C2	Artefact Scatter	Low
	DS-C18	Artefact Scatter	Low
	DS-C19	Artefact Scatter	Low
	DS-IF5-11	Isolated Find	Low
	DS-IF6-11	Isolated Find	Moderate
	DS-IF7-11	Isolated Find	Low
	DS-IF17-11	Isolated Find	Low
	DS-IF18-11	Isolated Find	Low
	DS-IF21-11	Isolated Find	Low
	DS-IF47-11	Isolated Find	Low
	DS-IF48-11	Isolated Find	Low
	DS-IF53-11	Isolated Find	Low
	DS-AS9-11	Artefact Scatter	Low
	DS-AS14-11	Artefact Scatter	Low
	DS-AS15-11	Artefact Scatter	Low
	DS-AS33-11	Artefact Scatter	Low
	DS-AS34-11	Artefact Scatter	Low
	DS-AS36-11	Artefact Scatter	Low
	DS-AS37-11	Artefact Scatter	Low
	DS-AS66-11	Artefact Scatter	Low
	DS-AS85-11	Artefact Scatter	Low
	DS-AS90-11	Artefact Scatter	Low
	DS-AS93-11	Artefact Scatter	Low
	DS-AS35-11	Artefact Scatter	Moderate

13.0 Cumulative Impact Assessment

13.1 Assessment of Ecologically Sustainable Development (ESD)

In NSW, the NPW Act provides the legislative framework for the protection of Aboriginal objects and places. Section 2A(2) of the NPW Act stipulates that such protection is to be achieved by applying the principles of Ecologically Sustainable Development (ESD). ESD requires the integration of *economic* and *environmental* considerations (including cultural heritage) in decision-making processes and, in the context of Aboriginal cultural heritage in NSW, can be achieved through the implementation of two key principles: intergenerational equity and the precautionary principle.

Intergenerational equity is the principle whereby the present generation should ensure the health, diversity and productivity of the environment for the benefit of future generations. With regards to Aboriginal heritage, intergenerational equity can be assessed in terms of cumulative impacts to Aboriginal objects and places in a region. Central to any assessment of intergenerational equity is the proposition that regions with fewer Aboriginal objects and places necessarily retain fewer opportunities for future generations of Aboriginal people to enjoy their cultural heritage. Accordingly, information regarding the known and potential Aboriginal heritage resource within a given region lies at heart of any assessment of intergenerational equity.

The precautionary principle holds that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation. In NSW, the precautionary principle is relevant to OEH's consideration of potential impacts to Aboriginal cultural heritage in situations where:

- The proposed development involves a risk of serious or irreversible damage to Aboriginal objects or places or to the value of those objects or places; and
- There is uncertainty about the Aboriginal cultural heritage values or scientific or archaeological values, including in relation to the integrity, rarity or representativeness of the Aboriginal objects or places proposed to be impacted.

In these instances, OEH has indicated that a precautionary approach should be taken and all cost-effective measures implemented to prevent or reduce damage to Aboriginal objects and/or places.

13.1.1 Intergenerational Equity - Cumulative Impacts of the Project on Aboriginal Heritage

In the context of the current assessment, three avenues for assessing the cumulative impact of the Project on Aboriginal heritage can be pursued:

- A comparison, using archaeological survey undertaken for the current project in conjunction with an AHIMS search, of sites impacted within the Study Area against those of the broader Project Boundary;
- A comparison, using the results of an AHIMS search, of the identified Aboriginal heritage resource of the Study Area with that of the surrounding region; and
- The use of aerial photographs, topographic maps and GIS data to identify the *potential* Aboriginal heritage resource of the surrounding region.

Identified Resource-Project Boundary

A total of 308 Aboriginal archaeological sites have been identified within the Project Boundary as a result of the archaeological survey and an AHIMS search. From this total, 175 will be impacted by the Project. A breakdown of the remaining 133 sites types is provided in **Table 26**. A majority of these sites occur along Saddlers Creek.

Table 26: Cumulative Impact Identified Resource

Site Type	Total Sites in Project Boundary	Sites Impacted	Sites Not Impacted
Artefact scatter and isolated finds	300	173	127
PADs	4	0	4
Stone quarries	3	2	1
Grinding groove	1	0	1
Total	**308**	**175**	**133**

As indicated above, 175 sites have been identified as being potentially impacted by the Project, of which 173 are isolated finds and artefact scatters. Based on these figures, stone artefacts sites that would be impacted by the Project account for 56% of all known stone artefact sites within the Project Boundary. These results suggest that the loss of the 173 isolated finds and artefact scatter sites in question would constitute a moderate impact to the identified Aboriginal heritage resource within the Project Boundary.

Impacts to stone quarry site 37-2-1954 (37-2-1955 could not be relocated) accounts for 50% of the known quarry sites within the Project Boundary. A comparison of quarry sites 37-2-1954 and DS-QR1-11 finds 37-2-1954, which will be impacted by the Project, to be a poor example of a stone quarry site due to the lack of directly associated artefactual material and low potential for archaeological deposit. On the other hand, quarry site DS-QR1-11, which will not be impacted by the Project, is an excellent example of a quarry site due to its relatively good condition, significant numbers of associated artefactual material, and high potential for archaeological deposit. Through the conservation of quarry site DS-QR1-11, (see **Section 12.2.5**) the loss of quarry site 37-2-1954 should not constitute a significant impact to the identified Aboriginal heritage resource of the Project Boundary.

Identified Resource-30 x 30 km

A search of the AHIMS database for a 30 x 30 km region (study region) centred on the Study Area provides another method of assessing the cumulative impact of the Project on the existing Aboriginal heritage resource of the study region. A search of the database was undertaken in December 2011 and returned 2678 records of currently valid sites. A breakdown of site types is provided in **Table 27**.

Table 27: Site Types 30 x 30 km Region

Site Type	Number of Features AHIMS
Artefact scatters and isolated finds	2625
PADs	33
Stone quarries	5
Grinding groove sites	15
Total	**2678**

Alongside those identified within the Project Boundary, existing Aboriginal sites in the study region offer opportunities for future research, conservation and education. As indicated above, a total of 173 isolated finds and artefact scatters finds will be impacted by the Project. On current evidence, these sites represent 6.6% of all known artefact scatters and isolated sites within the study region. Due to significant differences in the quantity and quality of information available on AHIMS site cards for stone artefact sites in the region, a direct comparison of the significance and character of stone artefact sites within and outside the Project Area is not possible. Nonetheless, it should be noted that of the sites impacted, only one has been attributed high significance as a result of its research potential (DS-C8). Together with the figures above, this suggests that the loss of the 173 sites in question would not constitute a significant impact to the identified Aboriginal heritage resource of the region.

In addition, one stone quarry site 37-2-1954 (37-2-1955 could not be relocated, therefore is not considered here) will be impacted as a result of the Project. On current evidence, this site represents 20% of all known stone quarry

sites in the study region. Destruction of this site therefore may represent a moderate impact to the known quarry site resource in the region. However viewed in conjunction with the site's limited research potential, its loss will not constitute a significant impact to the identified Aboriginal heritage resource of the region.

Potential Resource

AHIMS results only represent a fraction of the likely archaeological resource present within a region. These results are only representative of land that has been subject to archaeological investigations. Accordingly, an assessment of the *potential* Aboriginal heritage resource of the study region is also required. For the present analysis, aerial photographs, topographic maps and GIS data have been used to prepare a preliminary assessment of this resource.

As shown in **Table 28**, analysis of available aerial photography and GIS data for study region indicates that, when combined with the total amount of land proposed to be impacted by open cut mining operations within the Project Area, grossly modified or disturbed terrain (i.e. urban areas, roads, coal mines, power stations, etc) accounts for 11.5% of the total study region. Within these areas, there is considered to be a low potential for archaeological sites. The vast majority of land within the area is low-intensity rural land use (69.8%). Areas specifically reserved for conservation (i.e., World Heritage Areas) account for 5.27% of the total study region, and undisturbed 'natural' terrain makes up the remaining 13.35%.

Viewed from an archaeological perspective, the results of the land use analysis presented in **Table 28** suggest that a significant portion of the study region represents a potential Aboriginal heritage resource. As noted above, Aboriginal heritage is unlikely to survive in areas of disturbed terrain (11.5%). However, numerous studies have shown that rural areas can, and frequently do, retain evidence of past Aboriginal occupation and/or activity, albeit typically of lower integrity to that identified in otherwise undisturbed areas. Therefore, combining low-intensity rural land use (69.8%), conservation areas (5.27%) and undisturbed terrain (13.35%), it can be argued that 88% of the study region has the potential to retain evidence of past Aboriginal occupation and/or activity.

With regards to the existence, outside of the Project Area, of environmental contexts that have the potential to contain sites comparable to that identified within it, an examination of available topographic mapping for the study region indicates that many such contexts exist. Particular attention, for example, is drawn to Saddlers and Saltwater Creeks, directly adjacent to the Project Boundary. North of the Project Boundary, Whites, Ramrod and Quarry Creeks also present contexts for comparable archaeological sites. As indicated by the results of the current assessment and previous archaeological investigations in the region, stone artefact sites are typically located in landform contexts within 100 or 200 m of watercourses, with larger, more complex sites associated with higher order streams. On the basis of this evidence alone, it can be concluded that the study region retains a significant, as yet unidentified, stone artefact resource.

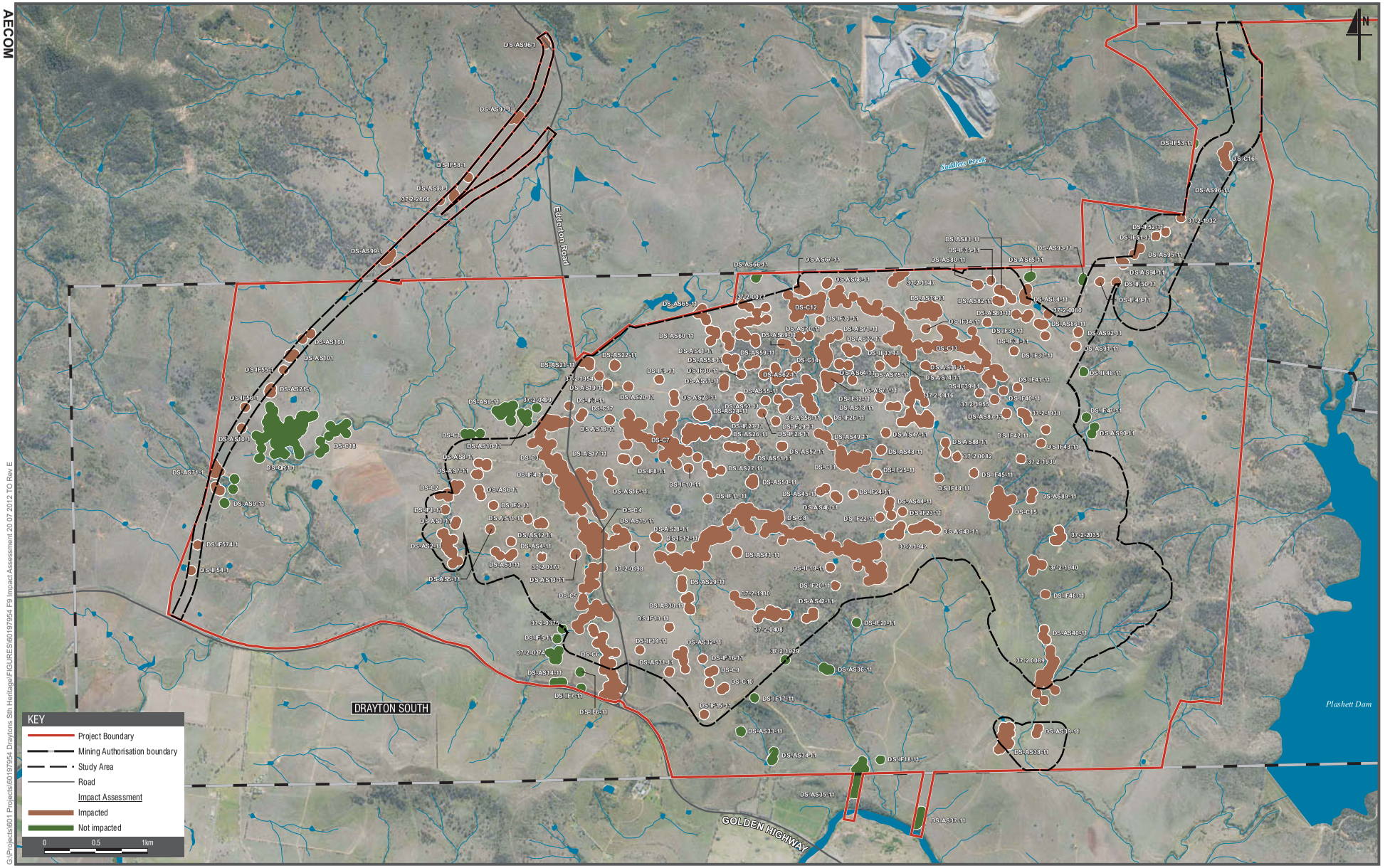
Table 28: Land Use Analysis

Disturbance category	Area (ha)	%
Grossly modified/disturbed	10,360	11.5
Low-intensity rural land use	62,873	69.8
Conservation areas	4747	5.3
Undisturbed/minimally disturbed 'natural' terrain	12,020	13.4
Total	90,000	**100**

13.1.2 The precautionary principle

As indicated above, the precautionary principle holds that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

In the context of the current assessment, it can be stated that AECOM has adopted a precautionary approach in our assessment of the impacts of the Project on identified Aboriginal sites within the Project Area and that this approach is reflected in our proposed management strategy (**Section 14.0**).



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Note: Archaeological site boundaries shown above reflect the 100m site definition methodology adopted for the assessment (see Section 8.4)

IMPACT ASSESSMENT

Aboriginal Archaeological and Cultural Heritage Impact Assessment
Drayton South Coal Project, New South Wales

FIGURE 9

14.0 Management Recommendations

14.1 Statutory Requirements

As indicated in **Section 1.0**, this Aboriginal archaeology and cultural heritage impact assessment forms part of an EA being prepared by Hansen Bailey to support Anglo American's Part 3A Project Application under Section 75E of the EP&A Act. Project Approvals under Part 3A of the EP&A Act are exempt from the provisions of Section 87 and 90 of the NPW Act 1974.

OEH's *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DECCW 2005) and *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010) detail the relevant requirements for Aboriginal cultural heritage impact assessments conducted for Part 3A Project Applications. Although not statutorily binding for Part 3A Aboriginal heritage assessments, OEH's recently released *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (2010) and *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) provide 'best practice' documents for Aboriginal archaeological and cultural heritage impact assessments in NSW.

Each guideline has been utilised in the preparation of this Aboriginal archaeology and cultural heritage impact assessment.

14.2 Management Strategy

The Project will directly impact 175 Aboriginal archaeological sites (173 isolated finds and artefact scatters, and two quarry sites). The remaining 133 sites within the Project Boundary will not be impacted by the Project. A staged management strategy to mitigate impacts from the Project is provided below. This management strategy should be detailed in an AHMP for the Project, which should be prepared in consultation with registered Aboriginal stakeholders, OEH and DP&I.

14.2.1 AHIMS Site Cards

AHIMS sites cards will be completed and submitted to OEH for all newly recorded sites at the completion of the assessment.

Aboriginal Site Impact Record (ASIR) cards are to be completed and submitted to OEH for previously recorded scarred tree sites 37-2-1944 and 37-2-1945 as their scars have been reassessed as being natural in origin during this assessment.

14.2.2 Surface Artefact Collection (Salvage)

One hundred and seventy three isolated finds and artefact scatters will be directly impacted by the Project, resulting in their destruction. To mitigate these impacts, surface artefact collection of all 173 artefact scatters and isolated finds will be undertaken prior to the commencement of construction works. **Table 29** provides a list of sites to be surface collected.

Recovered artefacts should be subject to appropriate forms of analysis and managed in accordance with the AHMP. Registered Aboriginal stakeholder groups should be involved in the collection of surface artefacts. Appropriate long-term management options for recovered artefacts should be developed in consultation with Aboriginal stakeholders during the preparation of the AHMP.

ASIR cards for all salvaged sites are required to be submitted to OEH at the completion of the salvage.

14.2.3 Test Excavation and Salvage Excavation

In recognition that the majority of the archaeological resource of the Study Area is not identifiable by surface survey alone, a program of subsurface test excavation and salvage excavation is recommended to be undertaken to obtain a more detailed understanding of the nature and extent of Aboriginal archaeology within the Study Area. The excavation program should include an initial detailed geomorphological assessment, followed by test excavation and salvage excavation. The excavation program will need to be developed in consultation with registered Aboriginal stakeholders and should, at a minimum, include salvage excavation of sites identified as having high significance and impacted by the Project. In addition, the excavation program should utilise the results of the archaeological survey, including identified PAD areas and areas of archaeological sensitivity, to develop an

appropriate scientific research methodology. Details for the excavation program will need to be addressed within the AHMP.

14.2.4 Conservation

The conservation and management of all Aboriginal sites within the Project Boundary not impacted by the Project should be undertaken. Protected sites will need to be identified on site plans with mine activities avoiding those sites. Where mine activities occur in close proximity to recorded sites, fencing should be erected as necessary to protect these sites. Provisions for the long-term management of sites outside the Study Area will need to be addressed within the AHMP. **Table 29** provides a list of sites that should be managed and conserved within the Project Boundary.

As a result of the high significance of stone quarry site DS-QR1-11, the proposed realignment of Edderton Road has been modified in order to avoid potential impacts to this site (see **Appendix** f). In addition, fencing should be erected around the site, including the artefact scatters associated with the nearby ephemeral drainage line of Saddlers Creek.

14.3 Summary of Management and Mitigation Measures

Table 29: Summary of Management Mitigation Measures

Management and Mitigation Measures	Site ID	Site Type
Surface Collection of Artefacts	37-2-0074	Artefact Scatter
	37-2-0077	Artefact Scatter
	37-2-0080	Artefact Scatter
	37-2-0082	Artefact Scatter
	37-2-0089	Artefact Scatter + PAD
	37-2-0377	Artefact Scatter
	37-2-0398	Artefact Scatter
	37-2-0408	Artefact Scatter
	37-2-0416	Artefact Scatter
	37-2-0427	Artefact Scatter
	37-2-1930	Artefact Scatter
	37-2-1931	Artefact Scatter
	37-2-1932	Artefact Scatter
	37-2-1938	Artefact Scatter
	37-2-1939	Artefact Scatter
	37-2-1940	Artefact Scatter
	37-2-1942	Artefact Scatter
	37-2-1947	Artefact Scatter + PAD
	37-2-2035	Artefact Scatter
	37-2-2666	Isolated Find
	DS-C3	Artefact Scatter
	DS-C4	Artefact Scatter
	DS-C5	Artefact Scatter
	DS-C6	Artefact Scatter
	DS-C7	Artefact Scatter + PAD
	DS-C8	Artefact Scatter + PAD
	DS-C9	Artefact Scatter
	DS-C10	Artefact Scatter
	DS-C11	Artefact Scatter
	DS-C12	Artefact Scatter
	DS-C13	Artefact Scatter + PAD
	DS-C14	Artefact Scatter + PAD
	DS-C15	Artefact Scatter + PAD
	DS-C16	Artefact Scatter + PAD
	DS-C17	Artefact Scatter
	DS-IF1-11	Isolated Find
	DS-IF2-11	Isolated Find
	DS-IF3-11	Isolated Find
	DS-IF4-11	Isolated Find

Management and Mitigation Measures	Site ID	Site Type
	DS-IF8-11	Isolated Find
	DS-IF9-11	Isolated Find
	DS-IF10-11	Isolated Find
	DS-IF11-11	Isolated Find
	DS-IF12-11	Isolated Find
	DS-IF13-11	Isolated Find
	DS-IF14-11	Isolated Find
	DS-IF15-11	Isolated Find
	DS-IF16-11	Isolated Find
	DS-IF19-11	Isolated Find
	DS-IF20-11	Isolated Find
	DS-IF22-11	Isolated Find
	DS-IF23-11	Isolated Find
	DS-IF24-11	Isolated Find
	DS-IF25-11	Isolated Find
	DS-IF26-11	Isolated Find
	DS-IF27-11	Isolated Find
	DS-IF28-11	Isolated Find
	DS-IF29-11	Isolated Find
	DS-IF30-11	Isolated Find
	DS-IF31-11	Isolated Find
	DS-IF32-11	Isolated Find
	DS-IF33-11	Isolated Find
	DS-IF34-11	Isolated Find
	DS-IF35-11	Isolated Find
	DS-IF36-11	Isolated Find
	DS-IF37-11	Isolated Find
	DS-IF38-11	Isolated Find
	DS-IF39-11	Isolated Find
	DS-IF40-11	Isolated Find
	DS-IF41-11	Isolated Find
	DS-IF42-11	Isolated Find
	DS-IF43-11	Isolated Find
	DS-IF44-11	Isolated Find
	DS-IF45-11	Isolated Find
	DS-IF46-11	Isolated Find
	DS-IF49-11	Isolated Find
	DS-IF50-11	Isolated Find
	DS-IF51-11	Isolated Find
	DS-IF52-11	Isolated Find
	DS-IF54-11	Isolated Find
	DS-IF55-11	Isolated Find
	DS-IF56-11	Isolated Find
	DS-IF57-11	Isolated Find
	DS-IF58-11	Isolated Find
	DS-AS1-11	Artefact Scatter
	DS-AS2-11	Artefact Scatter
	DS-AS3-11	Artefact Scatter
	DS-AS4-11	Artefact Scatter
	DS-AS5-11	Artefact Scatter
	DS-AS6-11	Artefact Scatter
	DS-AS7-11	Artefact Scatter
	DS-AS8-11	Artefact Scatter
	DS-AS10-11	Artefact Scatter
	DS-AS11-11	Artefact Scatter
	DS-AS12-11	Artefact Scatter
	DS-AS13-11	Artefact Scatter
	DS-AS16-11	Artefact Scatter

Management and Mitigation Measures	Site ID	Site Type
	DS-AS17-11	Artefact Scatter
	DS-AS18-11	Artefact Scatter
	DS-AS19-11	Artefact Scatter
	DS-AS20-11	Artefact Scatter
	DS-AS21-11	Artefact Scatter
	DS-AS22-11	Artefact Scatter
	DS-AS23-11	Artefact Scatter
	DS-AS24-11	Artefact Scatter
	DS-AS25-11	Artefact Scatter
	DS-AS26-11	Artefact Scatter
	DS-AS27-11	Artefact Scatter
	DS-AS28-11	Artefact Scatter
	DS-AS29-11	Artefact Scatter
	DS-AS30-11	Artefact Scatter
	DS-AS31-11	Artefact Scatter
	DS-AS32-11	Artefact Scatter
	DS-AS38-11	Artefact Scatter
	DS-AS39-11	Artefact Scatter
	DS-AS40-11	Artefact Scatter
	DS-AS41-11	Artefact Scatter
	DS-AS42-11	Artefact Scatter
	DS-AS43-11	Artefact Scatter
	DS-AS44-11	Artefact Scatter
	DS-AS45-11	Artefact Scatter
	DS-AS46-11	Artefact Scatter
	DS-AS47-11	Artefact Scatter
	DS-AS48-11	Artefact Scatter
	DS-AS49-11	Artefact Scatter
	DS-AS50-11	Artefact Scatter
	DS-AS51-11	Artefact Scatter
	DS-AS52-11	Artefact Scatter
	DS-AS53-11	Artefact Scatter
	DS-AS54-11	Artefact Scatter
	DS-AS55-11	Artefact Scatter
	DS-AS56-11	Artefact Scatter
	DS-AS57-11	Artefact Scatter
	DS-AS58-11	Artefact Scatter
	DS-AS59-11	Artefact Scatter
	DS-AS60-11	Artefact Scatter
	DS-AS61-11	Artefact Scatter
	DS-AS62-11	Artefact Scatter
	DS-AS63-11	Artefact Scatter
	DS-AS64-11	Artefact Scatter
	DS-AS65-11	Artefact Scatter
	DS-AS67-11	Artefact Scatter
	DS-AS68-11	Artefact Scatter
	DS-AS69-11	Artefact Scatter
	DS-AS70-11	Artefact Scatter
	DS-AS71-11	Artefact Scatter
	DS-AS72-11	Artefact Scatter
	DS-AS73-11	Artefact Scatter
	DS-AS74-11	Artefact Scatter
	DS-AS75-11	Artefact Scatter
	DS-AS76-11	Artefact Scatter
	DS-AS77-11	Artefact Scatter
	DS-AS78-11	Artefact Scatter
	DS-AS79-11	Artefact Scatter
	DS-AS80-11	Artefact Scatter

Management and Mitigation Measures	Site ID	Site Type
	DS-AS81-11	Artefact Scatter
	DS-AS82-11	Artefact Scatter
	DS-AS83-11	Artefact Scatter
	DS-AS84-11	Artefact Scatter
	DS-AS86-11	Artefact Scatter
	DS-AS87-11	Artefact Scatter
	DS-AS88-11	Artefact Scatter
	DS-AS89-11	Artefact Scatter
	DS-AS91-11	Artefact Scatter
	DS-AS92-11	Artefact Scatter
	DS-AS94-11	Artefact Scatter
	DS-AS95-11	Artefact Scatter
	DS-AS96-11	Artefact Scatter
	DS-AS97-11	Artefact Scatter
	DS-AS98-11	Artefact Scatter
	DS-AS99-11	Artefact Scatter
	DS-AS100-11	Artefact Scatter
	DS-AS101-11	Artefact Scatter
Salvage Excavation (minimum)	37-2-1954	Stone Quarry
	37-2-1955	Stone Quarry (not relocated)
	DS-C8	Artefact Scatter + PAD
No Impact - Conservation	37-2-0041	Artefact Scatter
	37-2-0043	Artefact Scatter
	37-2-0044	Artefact Scatter
	37-2-0068	Artefact Scatter
	37-2-0071	Artefact Scatter
	37-2-0079	Artefact Scatter
	37-2-0146	Artefact Scatter
	37-2-0374	Artefact Scatter
	37-2-0375	Artefact Scatter
	37-2-0388	Artefact Scatter
	37-2-0389	Artefact Scatter
	37-2-0390	Artefact Scatter
	37-2-0391	Artefact Scatter
	37-2-0392	Artefact Scatter
	37-2-0395	Artefact Scatter
	37-2-0420	Artefact Scatter
	37-2-0421	Artefact Scatter
	37-2-0422	Artefact Scatter
	37-2-0423	Artefact Scatter
	37-2-0424	Artefact Scatter
	37-2-0430	Artefact Scatter
	37-2-0431	Artefact Scatter
	37-2-0432	Artefact Scatter
	37-2-0433	Artefact Scatter
	37-2-0434	Artefact Scatter
	37-2-0435	Artefact Scatter
	37-2-0436	Artefact Scatter
	37-2-0437	Artefact Scatter
	37-2-0438	Artefact Scatter
	37-2-0439	Artefact Scatter
	37-2-0441	Artefact Scatter
	37-2-0442	Artefact Scatter
	37-2-0443	Artefact Scatter
	37-2-0444	Artefact Scatter
	37-2-0445	Artefact Scatter
	37-2-0446	Artefact Scatter
	37-2-0447	Artefact Scatter

Management and Mitigation Measures	Site ID	Site Type
	37-2-0448	Artefact Scatter
	37-2-0449	Artefact Scatter
	37-2-0450	Artefact Scatter
	37-2-0451	Artefact Scatter
	37-2-0453	Artefact Scatter
	37-2-0454	Artefact Scatter
	37-2-0455	Artefact Scatter
	37-2-0456	Artefact Scatter
	37-2-0457	Artefact Scatter
	37-2-0458	Artefact Scatter
	37-2-0459	Artefact Scatter
	37-2-0460	Artefact Scatter
	37-2-0461	Artefact Scatter
	37-2-0462	Artefact Scatter
	37-2-0463	Artefact Scatter
	37-2-0464	Artefact Scatter
	37-2-0465	Artefact Scatter
	37-2-0466	Artefact Scatter
	37-2-0471	Artefact Scatter
	37-2-0472	Artefact Scatter
	37-2-0473	Artefact Scatter
	37-2-0474	Artefact Scatter
	37-2-0475	Artefact Scatter
	37-2-0476	Artefact Scatter
	37-2-0477	Artefact Scatter
	37-2-0491	Artefact Scatter
	37-2-0493	Artefact Scatter
	37-2-0499	Artefact Scatter
	37-2-0499	Artefact Scatter
	37-2-1929	Artefact Scatter
	37-2-1941	Artefact Scatter
	37-2-1989	Artefact Scatter
	37-2-1990	Artefact Scatter
	37-2-1991	Artefact Scatter
	37-2-1992	Artefact Scatter
	37-2-2321	Artefact Scatter
	37-2-2322	Artefact Scatter
	37-2-2323	Artefact Scatter
	37-2-2324	Artefact Scatter
	37-2-2325	Artefact Scatter
	37-2-2327	Artefact Scatter
	37-2-2328	Artefact Scatter
	37-2-2329	Artefact Scatter
	37-2-2330	Artefact Scatter
	37-2-2331	Artefact Scatter
	37-2-2333	Artefact Scatter
	37-2-2338	Artefact Scatter
	37-2-2339	Artefact Scatter
	37-2-2340	Potential Archaeological Deposit (PAD)
	37-2-2341	Artefact Scatter
	37-2-2344	Artefact Scatter
	37-2-2347	Potential Archaeological Deposit (PAD)
	37-2-2348	Artefact Scatter
	37-2-2349	Artefact Scatter
	37-2-2350	Potential Archaeological Deposit (PAD)
	37-2-2351	Potential Archaeological Deposit (PAD)
	37-2-2356	Artefact Scatter
	37-2-2357	Artefact Scatter

Management and Mitigation Measures	Site ID	Site Type
	37-2-2358	Artefact Scatter
	37-2-2359	Artefact Scatter
	37-2-2361	Artefact Scatter
	37-2-2362	Artefact Scatter
	37-2-2737	Artefact Scatter
	37-2-2771	Artefact Scatter
	37-2-2772	Artefact Scatter
	37-2-2773	Artefact Scatter
	37-2-2774	Artefact Scatter
	37-2-2775	Artefact Scatter
	37-2-2776	Artefact Scatter
	37-3-0021	Grinding Groove
	DS-AS9-11	Artefact Scatter
	DS-AS14-11	Artefact Scatter
	DS-AS15-11	Artefact Scatter
	DS-AS33-11	Artefact Scatter
	DS-AS34-11	Artefact Scatter
	DS-AS35-11	Artefact Scatter
	DS-AS36-11	Artefact Scatter
	DS-AS37-11	Artefact Scatter
	DS-AS66-11	Artefact Scatter
	DS-AS85-11	Artefact Scatter
	DS-AS90-11	Artefact Scatter
	DS-AS93-11	Artefact Scatter
	DS-C1	Artefact Scatter
	DS-C2	Artefact Scatter
	DS-C18	Artefact Scatter
	DS-C19	Artefact Scatter
	DS-IF5-11	Isolated Find
	DS-IF6-11	Isolated Find
	DS-IF7-11	Isolated Find
	DS-IF17-11	Isolated Find
	DS-IF18-11	Isolated Find
	DS-IF21-11	Isolated Find
	DS-IF47-11	Isolated Find
	DS-IF48-11	Isolated Find
	DS-IF53-11	Isolated Find
	DS-QR1-11	Stone Quarry

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Appendix A

Aboriginal Stakeholder Correspondence

Appendix A Aboriginal Stakeholder Correspondence

Aboriginal Consultation Log		
Date	**Method of Consultation**	**Aboriginal Stakeholder Group**
04/03/11	Letter sent to relevant agencies notifying them of the Project and requesting assistance in identifying and notifying Aboriginal people who may hold cultural knowledge relevant to determining the significance of Aboriginal objects or places within the Study Area.	OEH, WLALC, NSW Department of Aboriginal Affairs – Office of the Registrar, NNTT, NTSCorp, MSC, SSC and Hunter – Central Rivers CMA
04/03/11	Letter issued to known Aboriginal groups notifying and inviting them to register an interest in the Aboriginal cultural heritage impact assessment for the Project.	ANTC, Black Creek Aboriginal Corporation, BBC, CCC, Carrawonga Consultants, CA, GWCHC, Giwirr Consultants, HTO, HVAC, Hunter Valley Cultural Consultants, HVCS, HVNCRM, KECHS, LHWCI, Lower Wonnarua Tribal Consultancy Pty Ltd, Mingga Consultants, Muswellbrook Cultural Consultants, St Clair Singleton Aboriginal Corporation, UAC, UCCS, UHHCC, UHWCI, Valley Culture, Wanaruah Custodians Aboriginal Corporation, WC, WWTO, Widescope Indigenous Group, W1C, Wonnarua Cultural Heritage, Wonnarua Elders Council, WNAC, Yarrawalk and YCS
04/03/11	Public notice printed in the Singleton Argus and the Muswellbrook Chronicle advertising for Aboriginal stakeholders who wish to be consulted in relation to the Aboriginal cultural heritage impact assessment for the Project.	Open audience
04/03/11	Letter received from NNTT indicating no outstanding claims within the Muswellbrook Local Government Area.	NNTT
05/03/11	Email received from Paulette Ryan, HTO registering an interest to be consulted with regards to the Project.	Paulette Ryan, HTO
06/03/11	Facsimile received from Rhonda Ward, UCCS registering an interest to be consulted with regards to the Project.	Rhonda Ward, UCCS
07/03/11	Letter received from WLALC providing a list of contact details for 31 known Aboriginal groups with an association to the area.	Noel Downs, WLALC
07/03/11	Letter received from NSW Department of Aboriginal Affairs – Office of the Registrar indicating no Registered Aboriginal Owners pursuant to Division 3 of the *Aboriginal Land Rights Act 1983* (NSW).	Tabatha Dantoine, NSW Department of Aboriginal Affairs – Office of the Registrar

07/03/11	Facsimile received from Donna Sampson, CCC registering an interest to be consulted with regards to the Project.	Donna Sampson, CCC
07/03/11	Email received from Tracey Skene, CA registering an interest to be consulted with regards to the Project.	Tracey Skene, CA
07/03/11	Letter received from Taasha Layer, UAC registering an interest to be consulted with regards to the Project.	Taasha Layer, UAC
07/03/11	Letter received from Annie Hickey, GWCHC registering an interest to be consulted with regards to the Project.	Annie Hickey, GWCHC
07/03/11	Facsimile received from Arthur Fletcher, W1C registering an interest to be consulted with regards to the Project.	Arthur Fletcher, W1C
08/03/11	Letter received from OEH providing a list of contact details for 32 known Aboriginal groups with an association to the area.	Sarah Paddington, OEH
08/03/11	Letter issued to Aboriginal groups identified by relevant agencies notifying and inviting them to register an interest in the Aboriginal cultural heritage impact assessment for the Project.	Buddang, MGATSIC and Gidawaa Walang and Barkuma Neighbourhood Centre Inc.
08/03/11	Facsimile received from Luke Hickey, HVCS registering an interest to be consulted with regards to the Project.	Luke Hickey, HVCS
08/03/11	Facsimile received from Mark Hickey, KECHS registering an interest to be consulted with regards to the Project.	Mark Hickey, KECHS
08/03/11	Facsimile received from Des Hickey, WWTO registering an interest to be consulted with regards to the Project.	Des Hickey, WWTO
08/03/11	Phone call received from Barbara Foot, WC registering an interest to be consulted with regards to the Project.	Barbara Foot, WC
09/03/11	Letter received from SSC indicating no listings of Aboriginal groups with an association to the area.	A. Clark, SSC
09/03/11	Phone call received from Peter Schultz, NTSCorp indicating that Aboriginal groups' contact details could not be provided due to privacy agreements. Information to be forwarded to through NTSCorp.	Peter Schultz, NTSCorp
09/03/11	Facsimile received from Lloyd Matthews, BBC registering an interest to be consulted with regards to the Project.	Lloyd Matthews, BBC

11/03/11	Letter received from MSC providing a list of contact details for 34 known Aboriginal groups with an association to the area.	Ben Oliver, MSC
14/03/11	Letter received from Peter Schultz, NTSCorp reiterating that Aboriginal groups' contact details could not be provided due to privacy agreements. Information to be forwarded to through NTSCorp.	Peter Schultz, NTSCorp
14/03/11	Letter received from Larry Foley, Buddang registering an interest to be consulted with regards to the Project.	Larry Foley, Buddang
14/03/11	Letter received from Debbie Foley, MGATSIC registering an interest to be consulted with regards to the Project.	Debbie Foley, MGATSIC
14/03/11	Facsimile received from Barry McTaggart, Yarrawalk registering an interest to be consulted with regards to the Project.	Barry McTaggart, Yarrawalk
15/03/11	Facsimile received from Kathleen Steward-Kinchella, YCS registering an interest to be consulted with regards to the Project.	Kathleen Steward-Kinchella, YCS
15/03/11	Facsimile received from Kathleen Steward-Kinchella, YCS with the relevant insurances attached.	Kathleen Steward-Kinchella, YCS
17/03/11	Facsimile received from Ellaine Freihaut, HVAC registering an interest to be consulted with regards to the Project.	Ellaine Freihaut, HVAC
17/03/11	Facsimile received from Rhoda Perry, UHWCI registering an interest to be consulted with regards to the Project.	Rhoda Perry, UHWCI
17/03/11	Facsimile received from Laurie Perry, WNAC registering an interest to be consulted with regards to the Project.	Laurie Perry, WNAC
18/03/11	Draft archaeological survey methodology developed by AECOM sent to registered Aboriginal groups.	BBC, CCC, CA, GWCHC, HTO, HVAC, HVCS, HVNCRM, KECHS, MGSTSIC, Buddang, UAC, UCCS, UHWCI, WC, WLALC, WWTO, W1C, WNAC, Yarrwalk and YCS
18/03/11	Letter issued inviting registered Aboriginal groups to the planning meeting and outlining archaeological survey requirements.	BBC, CCC, CA, GWCHC, HTO, HVAC, HVCS, HVNCRM, KECHS, MGSTSIC, Buddang, UAC, UCCS, UHWCI, WC, WLALC, WWTO, W1C, WNAC, Yarrwalk and YCS
20/03/11	Facsimile received from Larry Foley, Buddang with the relevant insurances attached.	Larry Foley, Buddang

22/03/11	Facsimile received from David French, HVNRM registering an interest to be consulted with regards to the Project.	David French, HVNRM
23/03/11	Facsimile received from Lloyd Matthews, BBC with the relevant insurances attached.	Lloyd Matthews, BBC
28/03/11 – 06/04/11	Phone conversation with registered Aboriginal groups to confirm receipt of the draft archaeological survey methodology and attendance at the planning meeting and request to forward contact details to OEH.	BBC, CCC, CA, GWCHC, HTO, HVAC, HVCS, HVNCRM, KECHS, MGSTSIC, Buddang, UAC, UCCS, UHWCI, WC, WLALC, WWTO, W1C, WNAC, Yarrwalk and YCS
31/03/11	Facsimile received from Debbie Foley, MGATSIC with the relevant insurances attached.	Debbie Foley, MGATSIC
01/04/11	Facsimile received from Suzie Worth, WLALC registering an interest to be consulted with regards to the Project.	Suzie Worth, WLALC
01/04/11	Received an acceptance of the draft methodology and expression of interest to be involved in the field assessment.	Arthur Fletcher, W1C
06/04/11	A copy of the public notice advertised in the Muswellbrook Chronicle and Singleton Argus on 4 March 2011 issued to OEH and WLALC.	OEH and WLALC
06/04/11	A copy of the letter issued to all identified Aboriginal groups providing notification of the assessment for the Project issued to OEH and WLALC.	OEH and WLALC
06/04/11	A record of registered Aboriginal groups whom have expressed interest in the assessment for the Project issued to OEH and WLALC.	OEH and WLALC
08/04/11	Written confirmation from Darrel Matthews, UHHCC registering an interest to be consulted with regards to the Project.	Darrel Matthews, UHHCC
08/04/11	Written confirmation from Melissa Matthews, ANTC registering an interest to be consulted with regards to the Project.	Melissa Matthews, ANTC
08/04/11	Planning meeting held at The John Hunter Motel.	GWCHC, UCCS, WNAC, W1C, UAC, HTO, HVAC, CCC, UHHCC, ANTC, WC, MGATSIC, YCS, Yarrawalk, Buddang and OEH
11/04/11	Received an acceptance of the draft methodology and expression of interest to be involved in the field assessment.	Larry Foley, Buddang

12/04/11	Email received from Scott Franks, CPCW registering an interest to be consulted with regards to the Project.	Scott Franks, CPCW
13/04/11	Received an acceptance of the draft methodology and expression of interest to be involved in the field assessment.	Debbie Foley, Buddang
14/04/11	Facsimile received from Donna Sampson, CCC with the relevant insurances attached.	Donna Sampson, CCC
19/04/11	Facsimile received from Barry McTaggart, Yarrawalk with the relevant insurances attached.	Barry McTaggart, Yarrawalk
20/04/11	Facsimile received from Suzie Worth, WLALC with the relevant insurances attached.	Suzie Worth, WLALC
20/04/11	Email received from Tom Miller, LHWCI registering an interest to be consulted with regards to the Project.	Tom Miller, LHWCI
21/04/11	Email received from Mark Hickey, KECHS with the relevant insurances attached.	Mark Hickey, KECHS
21/04/11	Facsimile received from Fiona White, WNAC with the relevant insurances attached.	Fiona White, WNAC
21/04/11 – 23/05/11	Correspondence by phone and email to confirm the initial archaeological survey roster, provide adhoc logistics and request insurances.	Buddang, MGATSIC, HVAC, W1C, Yarrawalk, HVNCRM, UCCS, GWCHC, WNAC, CA, UHHCC, ANTC, BBC, YCS, CCC, UAC, HVCS, KECHS, WWTO, WLALC, UHWCI and HTO
27/04/11	Facsimile received from Arthur Fletcher, W1C with the relevant insurances attached.	Arthur Fletcher, W1C
28/04/11	Facsimile received from Rhonda Griffiths, HVAC with the relevant insurances attached.	Rhonda Griffiths, HVAC
28/04/11	Received comments on the draft methodology.	Mark Hickey, KECHS
29/04/11	Email received from Tracey Skene, CA with the relevant insurances attached.	Tracey Skene, CA
29/04/11	Email received from David French, HVNCRM with the relevant insurances attached.	David French, HVNCRM
29/04/11	Facsimile received from Rhoda Perry, UHWCI with the relevant insurances attached.	Rhoda Perry, UHWCI

02/05/11 – 27/05/11	Archaeological survey (initial survey).	Buddang, MGATSIC, HVAC, W1C, Yarrawalk, HVNCRM, UCCS, GWCHC, WNAC, CA, UHHCC, ANTC, BBC, YCS, CCC, UAC, HVCS, KECHS, WWTO, WLALC, UHWCI and HTO
03/05/11	Facsimile received from Des Hickey, WWTO with the relevant insurances attached.	Des Hickey, WWTO
04/05/11	Facsimile received from Allen Paget, UAC with the relevant insurances attached.	Allen Paget, UAC
04/05/11	Facsimile received from Margaret Matthews, ANTC with the relevant insurances attached.	Margaret Matthews, ANTC
04/05/11	Facsimile received from Darrel Matthews, UHHCC with the relevant insurances attached.	Darrel Matthews, UHHCC
05/05/11	Facsimile received from Rhonda Ward, UCCS with the relevant insurances attached.	Rhonda Ward, UCCS
10/05/11	Facsimile received from Luke Hickey, HVCS with the relevant insurances attached.	Luke Hickey, HVCS
13/05/11	Archaeological survey summary one issued to registered Aboriginal groups by mail, email or fax.	Buddang, MGATSIC, HVAC, W1C, Yarrawalk, HVNCRM, UCCS, GWCHC, WNAC, CA, UHHCC, ANTC, BBC, YCS, CCC, UAC, HVCS, KECHS, WWTO, WLALC, UHWCI and HTO
17/05/11	Archaeological survey summary two issued to registered Aboriginal groups by mail, email or fax.	Buddang, MGATSIC, HVAC, W1C, Yarrawalk, HVNCRM, UCCS, GWCHC, WNAC, CA, UHHCC, ANTC, BBC, YCS, CCC, UAC, HVCS, KECHS, WWTO, WLALC, UHWCI and HTO
18/05/11 – 19/05/11	Phone conversation to confirm the additional archaeological survey roster and provide adhoc logistics.	Yarrawalk, GWCHC, CCC, UAC, HVCS and WLALC
10/05/11	Email received from Paulette Ryan, HTO with the relevant insurances attached.	Paulette Ryan, HTO
24/05/11	Letter issued to select registered Aboriginal groups not required to complete the additional archaeological survey.	ANTC, Buddang, BBC, CA, HTO, HVAC, HVNCRM, KECHS, MGATSIC, UHHCC, UHWCI, UCCS, WWTO, W1C, WNAC and YCS

26/05/11	Archaeological survey summary three issued to registered Aboriginal groups by mail, email or fax.	Buddang, MGATSIC, HVAC, W1C, Yarrawalk, HVNCRM, UCCS, GWCHC, WNAC, CA, UHHCC, ANTC, BBC, YCS, CCC, UAC, HVCS, KECHS, WWTO, WLALC, UHWCI and HTO
30/05/11 – 04/06/11	Archaeological survey (additional survey).	Yarrawalk, GWCHC, CCC, UAC, HVCS and WLALC
30/05/11 – 08/06/11	Phone conversation with registered Aboriginal groups to confirm attendance at the close-out meeting.	ANTC, Buddang, BBC, CCC, CPCW, CA, GWCHC, HTO, HVAC, HVCS, HVNCRM, KECHS, LHWCI, MGATSIC, UAC, UCCS, UHHCC, UHWCI, WC, WLALC, WWTO, W1C, WNAC, Yarrawalk and YCS
31/05/11	Letter issued inviting registered Aboriginal groups to the close-out meeting and cultural heritage exchange sessions.	ANTC, Buddang, BBC, CCC, CPCW, CA, GWCHC, HTO, HVAC, HVCS, HVNCRM, KECHS, LHWCI, MGATSIC, UAC, UCCS, UHHCC, UHWCI, WC, WLALC, WWTO, W1C, WNAC, Yarrawalk and YCS
03/06/11	Archaeological survey summary four issued to registered Aboriginal groups by mail, email or fax.	Buddang, MGATSIC, HVAC, W1C, Yarrawalk, HVNCRM, UCCS, GWCHC, WNAC, CA, UHHCC, ANTC, BBC, YCS, CCC, UAC, HVCS, KECHS, WWTO, WLALC, UHWCI and HTO
10/06/11	Close-out meeting held at The John Hunter Motel.	W1C, CCC, MGATSIC, UAC, HVNCRM, WLALC, Buddang, HVAC and Yarrawalk
15/06/11	Close-out meeting presentation and letter inviting registered Aboriginal groups to cultural heritage exchange sessions issued.	ANTC, Buddang, BBC, CCC, CPCW, CA, GWCHC, HTO, HVAC, HVCS, HVNCRM, KECHS, LHWCI, MGATSIC, UAC, UCCS, UHHCC, UHWCI, WC, WLALC, WWTO, W1C, WNAC, Yarrawalk and YCS
21/07/11	A revised record of registered Aboriginal groups whom have expressed interest in the assessment for the Project issued to OEH and WLALC.	OEH and WLALC
18/08/11	Cultural heritage exchange session.	WNAC and UHWCI
29/09/11 – 30/09/11	Correspondence by phone and email to confirm the archaeological survey (supplementary survey) roster and provide adhoc logistics.	ANTC, BBC, CA, KECHS, UCCS and WNAC
04/10/11	Letter issued to select registered Aboriginal groups not required to complete the supplementary archaeological survey.	CCC, GWCHC, HTO, HVAC, HVCS, HVNCRM, UAC, UHHCC, UHWCI, W1C, WLALC, WWTO, Yarrawalk and YCS

10/10/11 – 11/10/11	Archaeological survey (supplementary survey).	WNAC and CA
01/02/2012	Draft Aboriginal cultural heritage impact assessment issued by mail to registered Aboriginal groups for review and comment.	ANTC, Buddang, BBC, CA, CCC, CPCW, GWCHC, HTO, HVAC, HVCS, HVNCRM, KECHS, LHWCI, MGATSIC, UAC, UCCS, UHHCC, UHWCI, WC, WLALC, WWTO, W1C, WNAC, Yarrawalk and YCS
08/02/2012	Phone call received from Scott Franks, CPCW to discuss the draft Aboriginal cultural heritage impact assessment.	Scott Franks, CPCW
13/02/2012	Written response received from Laurie Perry, WNAC commenting on the draft Aboriginal cultural heritage impact assessment.	Laurie Perry, WNAC
24/02/2012	Written response received from Scott Franks, CPCW commenting on the draft Aboriginal cultural heritage impact assessment.	Scott Franks, CPCW/Yarrawalk
29/02/2012	Phone conversation with registered Aboriginal groups requesting comments on the draft Aboriginal cultural heritage impact assessment.	ANTC, Buddang, BBC, CA, CCC, GWCHC, HTO, HVAC, HVCS, HVNCRM, KECHS, LHWCI, MGATSIC, UAC, UCCS, UHHCC, UHWCI, WLALC, WWTO, W1C, Yarrawalk and YCS
29/02/2012	Written response received from Donna Sampson, CCC commenting on the draft Aboriginal cultural heritage impact assessment.	Donna Sampson, CCC
29/02/2012	Written response received from Larry Foley, Buddang commenting on the draft Aboriginal cultural heritage impact assessment.	Larry Foley, Buddang
29/02/2012	Written response received from Debbie Foley, MGATSIC commenting on the draft Aboriginal cultural heritage impact assessment.	Debbie Foley, MGATSIC
29/02/2012	Email to Noel Downs, WLALC requesting comments on the draft Aboriginal cultural heritage impact assessment.	Noel Downs, WLALC
01/03/2012	Phone conversation with registered Aboriginal groups requesting comments on the draft Aboriginal cultural heritage impact assessment.	BBC, LHWCI and UAC
06/03/2012	Email to Noel Downs, WLALC requesting comments on the draft Aboriginal cultural heritage impact assessment.	Noel Downs, WLALC
06/03/2012	Phone conversation with registered Aboriginal groups requesting comments on the draft Aboriginal cultural heritage impact assessment.	BBC, HVCS, LHWCI, UAC, WLALC, WWTO and W1C

07/03/2012	Email to registered Aboriginal groups requesting comments on the draft Aboriginal cultural heritage impact assessment.	LHWCI and UAC
09/03/2012	Phone conversation with registered Aboriginal groups requesting comments on the draft Aboriginal cultural heritage impact assessment.	HVCS and WWTO
09/03/2012	Email to Noel Downs, WLALC requesting comments on the draft Aboriginal cultural heritage impact assessment.	Noel Downs, WLALC
12/03/2012	Phone conversation with registered Aboriginal groups requesting comments on the draft Aboriginal cultural heritage impact assessment.	HVCS, LHWCI and UAC
12/03/2012	Email to Noel Downs, WLALC requesting comments on the draft Aboriginal cultural heritage impact assessment.	Noel Downs, WLALC
19/03/2012	Email to Scott Franks offering a meeting to discuss cultural heritage knowledge.	Scott Franks, CPCW/Yarrawalk
20/03/2012	Phone conversation with registered Aboriginal groups requesting comments on the draft Aboriginal cultural heritage impact assessment.	LHWCI and UAC
20/03/2012	Email to Noel Downs, WLALC requesting comments on the draft Aboriginal cultural heritage impact assessment.	Noel Downs, WLALC
21/03/2012	Written response received from Taasha Layer (on behalf of Allen Paget), UAC commenting on the draft Aboriginal cultural heritage impact assessment.	Taasha Layer (on behalf of Allen Paget), UAC
26/03/2012	Written response received from Noel Downs, WLALC commenting on the draft Aboriginal heritage impact assessment.	Noel Downs, WLALC
28/03/2012	Written response received from Scott Franks, CPCW/Yarrawalk regarding the arrangement of a cultural heritage knowledge meeting.	Scott Franks, CPCW/Yarrawalk
28/03/2012	Email to Scott Franks, CPCW/Yarrawalk regarding the arrangement of a cultural heritage knowledge meeting.	Scott Franks, CPCW/Yarrawalk

Registered Aboriginal Groups that Participated in the Archaeological Survey		
Fieldwork	**Aboriginal Stakeholder Group**	**Representative**
Group 1 02/05/11 to 06/05/11	Buddang	Larry Foley
	Murong Gialinga Aboriginal and Torres Strait Islander Corporation	Shannon Foley
	Hunter Valley Aboriginal Corporation	Delilah Williams
		Rhonda Griffiths
		Deidre Perkins
	Wonn 1 Contracting	Arthur Fletcher
Group 2 09/05/11 to 13/05/11	Yarrawalk	Barry French
	Hunter Valley Natural and Cultural Resources Management	David French
	Ungooroo Cultural and Community Services	Colleen Stair
		Luke Hickey
	Gidawaa Walang Cultural Heritage Consultancy	Annie Hickey
	Wonnarua Nation Aboriginal Corporation	Maree Waugh
	Culturally Aware	Tony Waugh
Group 3 16/05/11 to 20/5/11	Upper Hunter Heritage Culture Consultants	Darrel Matthews
	Aboriginal Native Title Consultants	Melissa Matthews
	Bullen Bullen Consultants	Lloyd Matthews
	Yinarr Cultural Services	Adam Sampson
		Deidre Perkins
		Steve Sampson
	Cacatua Culture Consultants	George Sampson
	Ungooroo Aboriginal Corporation	Allen Paget
Group 4 23/05/11 to 27/05/11	Hunter Valley Cultural Surveying	Luke Hickey
		David French
	Kayaway Eco Cultural and Heritage Services	Mark Hickey

Registered Aboriginal Groups that Participated in the Archaeological Survey		
Fieldwork	**Aboriginal Stakeholder Group**	**Representative**
	Wattaka Wonnarua Traditional Owners	Katrina Kavanagh
	Wanaruah Local Aboriginal Land Council	Wayne French
	Upper Hunter Wonnarua Coucil Inc.	Georgina Berry
	Hunter Traditional Owners	Aaron Slater
Group 5 30/05/11 to 04/06/11	Yarrawalk	Barry French
	Gidawaa Walang Cultural Heritage Consultancy	Annie Hickey
	Cacatua Culture Consultants	George Sampson
		Adam Sampson
		Deidre Perkins
	Ungooroo Aboriginal Corporation	Allen Paget
	Hunter Valley Cultural Surveying	Luke Hickey
	Wanaruah Local Aboriginal Land Council	Wayne French
Group 6 10/10/11 to 11/10/11	Wonnarua Nation Aboriginal Corporation	Maree Waugh
	Culturally Aware	Jeffrey Waugh

AECOM
Level 8,
17 York Street
Sydney NSW 2000

T +61 2 8023 9333 tel
F +61 2 8023 9399 fax

18 March 2010

Drayton South Project: Aboriginal Heritage Impact Assessment Draft Methodology

Introduction

AECOM had been commissioned by Hansen Bailey on behalf of Anglo American Metallurgical Coal Pty Ltd (Anglo American) to undertake an Aboriginal heritage impact assessment for the Drayton South Project (the Project) Environmental Assessment (EA). The Project will allow for the continuation of mining at Drayton Mine by the development of open cut and highwall mining operations within the Drayton South area (Drayton South) while continuing to utilise the existing infrastructure, equipment and workforce from Drayton Mine. The Project is located approximately 10 km northwest of the village of Jerry Plains and approximately 13 km south of the township of Muswellbrook in the Upper Hunter Valley of NSW (see Figure 1 attached).

The objectives of the Aboriginal heritage impact assessment are to identify the Aboriginal heritage values - both archaeological and cultural - of lands within the Project Boundary (hereafter, the 'Project Area') and to determine appropriate mitigation and/or management measures. The assessment will involve background research, Aboriginal community consultation and targeted archaeological field survey.

This draft methodology provides some background information about the Project Area and describes the proposed assessment methodology.

Aboriginal stakeholders are invited to comment on this draft. Comments from Aboriginal stakeholders will be reviewed and addressed in the final methodology. Aboriginal stakeholders are also invited to provide initial comments regarding the Aboriginal heritage values of the Project Area.

Project Overview

Anglo American will apply for a Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the development of the Project. The Project comprises:

- The development of an open cut and highwall mining operation extracting up to 7 Million tonnes per annum (Mtpa) Run of Mine (ROM) coal over a period of 26 years;
- The utilisation of the existing Drayton Mine workforce and equipment fleet (with an addition of a highwall miner and coal haulage fleet);
    - The Drayton Mine fleet consists of at least a dragline, excavators, fleet of haul trucks, dozers, graders, water carts and associated supporting equipment;
- The use of Drayton Mine's existing voids for rejects and tailings disposal and water storage to allow for the optimisation of the Drayton Mine final landform;
- The utilisation of the existing Drayton Mine infrastructure including the Coal Handling and Preparation Plant (CHPP), rail loop and associated loadout infrastructure, workshops, bath houses and offices;
- The construction of a transport corridor between Drayton South and Drayton Mine;
- The utilisation of the Antiene Rail Spur off the Main Northern Railway to transport product coal to the Port of Newcastle for export;
- The realignment of Edderton Road; and
- The installation of water management and power reticulation infrastructure for Drayton South.

Drayton Mine will continue to operate under and in accordance with the existing Project Approval 06_0202 and there will be a period when Drayton Mine and Drayton South operate concurrently. Currently all of the land required for the Project is owned by Anglo American with the exception of a parcel of land required for the proposed relocation of Edderton Road. This is owned by Hunter Valley Energy Coal Pty Limited (HVEC) who is the owner of the Mount Arthur Coal Mine.

Background

3.1 AHIMS Search

A search of the AHIMS database for previously recorded Aboriginal sites within the Project Area was lodged with the Department of Environment, Climate Change and Water (DECCW) on 22 February 2011. Preliminary results indicate a large number of recorded Aboriginal sites within the Project Area and AECOM is currently in the process of arranging an Aboriginal Heritage Information License Agreement (AHILA) with DECCW for the release of this data. An AHILA lists the terms under which AHIMS data will be released by DECCW and lists the licensee's obligations in using the data provided.

3.2 Archaeological Context

A large number of Aboriginal archaeological assessments incorporating survey and/or excavation have been conducted in the greater Muswellbrook area over the past three decades. A review of previous assessments within and adjacent to the Project Area will be conducted prior to fieldwork and will used to generate a predictive model for Aboriginal site type and distribution within the Project Area. Key assessments include Mill's (2000) archaeological survey of then named Saddlers Creek Mine, incorporating the majority of the current Project Area, as well as surveys and excavations undertaken at Drayton Mine, Mount Arthur South, Mount Arthur North, Bayswater Colliery No. 3, Bayswater B Power Station and Carrington Mine.

3.3 Environmental Context

3.3.1 Topography

The topography of the Project Area consists of moderately undulating foothills to steeply sloping hills over open paddock grazing land. The topographic elevation ranges from approximately RL 100 m near the Hunter River to RL 200 m. The land surface within is primarily cleared, open-paddock grazing land, with minimal tree cover and good grass cover, dependent upon weather and seasonal conditions.

3.3.2 Hydrology

The Project Area lies within the catchment of the Hunter River. The Hunter River is located to the immediate south of the Project Area and meanders from northwest to southeast. Major drainage lines within the Project Area include Saddlers Creek, which flows from northeast to southwest in the south western portion of the Project Area. Saltwater Creek is located outside the Project Area to the South West and flows from north to south toward the Hunter River. A number of other minor ephemeral, unnamed gullies feed these creeks and the Hunter River. Some of these gullies have had farm dams constructed over history of farming in the area.

3.3.3 Geology

The stratigraphic sequence across the Project Area comprises two distinct units: a Permian coal seam sequence unconformably overlain by thin Quaternary alluvial deposits. The Quaternary alluvial and colluvial deposits consist of sand and gravel, and occur along parts of Saddlers Creek and Saltwater Creek. Well-developed alluvial beds are located adjacent to the Hunter River. The Project Area is located in the northern Hunter Coalfield on the western side of the Muswellbrook Anticline. Strata of the Late Permian Wittingham Coal Measures outcrop in the area and generally dip gently to the southwest. The coal measures include a sequence of coal seams, shales, siltstones, sandstones and conglomerates.

3.3.4 Flora and fauna

The Project Area comprises farmland where the original native forest and woodland have been extensively cleared. However, it contains a mosaic of regenerating forest and woodland among native grassland. Highly-modified open forests and denser woodland can be found on the upper rises and ridge tops and in the depressions, often in association with the drainage lines. Most remnant vegetation in the Project Area is Central Hunter Box-Ironbark Woodland and features *Eucalyptus moluccana* (Grey Box), *Eucalyptus crebra* (Narrow-leaved Ironbark) supported by *Brachychiton populneus* (Kurrajong). Narrabeen Footslopes Slaty Gum Woodland, which is dominated by *Eucalyptus dawsonii* (Slaty Gum), is also widespread across the Project Area. The cleared areas represent native grassland that has been derived from woodland understorey and are a result of clearing and grazing.

The native fauna species that have been recorded in the Project Area are comprised predominantly of highly mobile species such as kangaroos. Various species of birds and bats also frequent the area with some aquatic fauna found in parts of creeks in the area.

3.3.5 Land use

The Upper Hunter region has a long history of rural land use for a variety of agricultural and industrial activities, predominantly grazing and coal mining. The current dominant land uses within and adjacent to the Project Area include, open cut coal mining, power generation, thoroughbred horse breeding viticulture, agriculture and rural residential areas.

Methodology

4.1 Approach

This section provides information on the approach AECOM intends to use for undertaking this Aboriginal heritage impact assessment. The assessment process has been divided into three broad sets of tasks:

- Desktop study;
- Targeted archaeological field survey of the Drayton South area and proposed transport corridor area (not including existing Drayton Mine area); and
- Consultation with Aboriginal stakeholder groups in order to define the cultural heritage values of the Project Area.

4.2 Desktop Study

The desktop survey methodology comprises:

- A search of DECCW's Aboriginal Heritage Information Management System (AHIMS) prior to field survey;
- A review of the landscape (i.e. environmental) context of the Project Area;
- A review of relevant archaeological and ethnohistoric information for the Project Area and surrounding environment; and
- Preparation of a predictive model for Aboriginal archaeological site type and distribution within the Project Area.

4.3 Planning Meeting

A Planning meeting will be held with all interested Registered Aboriginal Stakeholder groups prior to commencement of the fieldwork. The aim of the meeting will be to provide registered Aboriginal parties with information about the scope of the Project, and the proposed cultural heritage assessment process. In particular, the meeting will:

- Present the Project and outline project details relevant to the nature, scope, methodology, and environmental and other impacts;
- Outline the impact assessment process including the input points into the investigation and assessment activities;
- Specify critical timelines and milestones for the completion of assessment activities and delivery of reports;
- Clearly define agreed roles, functions, and responsibilities; and
- Identify, raise and discuss the Aboriginal groups cultural concerns, perspectives and assessment requirements (if any).

A site visit will also be undertaken as part of the planning meeting. Morning tea and lunch will be provided.

4.4 Field Survey

An archaeological field survey will be conducted to identify Aboriginal archaeological sites. A targeted survey strategy involving the division of the study area into its constituent landform elements and a proportional field emphasis on those deemed to have higher archaeological potential (e.g. creeklines and their associated terraces) is proposed. The entire survey is expected to take four weeks. The area will be walked by AECOM archaeologists and registered stakeholder representatives spaced appropriately to ensure adequate coverage.

A survey team consisting of two AECOM archaeologists and a maximum of six Aboriginal community representatives (as organised by Hansen Bailey) will be required to complete the survey. ***Given the steep terrain***

in parts of the survey area survey participants will be expected to possess adequate fitness for such survey work and be able to provide for themselves all appropriate personal protective equipment (PPE).

Relevant safety inductions will be required prior to the commencement of survey and these will be coordinated by Anglo American personnel. Each day of survey will begin with a safety tool box meeting to discuss the proposed survey areas for the day and any particular safety and health hazards. Toolbox meeting minutes will be provided to Anglo American personnel at completion of survey work for documentation. In addition, notification to current Property Lessee on movements and survey locations will be given by the Study Team to ensure all potential farm hazards or impacts are identified.

All previously registered and/or recorded sites located within, or directly adjacent (i.e. within 50 m of), to the study area will be ground-truthed and their nature, extent and significance reassessed. All Aboriginal archaeological sites identified during the survey will be recorded to the standard required by the Department of Environment, Climate Change and Water's (DECCW) *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (2010). For each site located or re-recorded, individual artefact locations will be captured by differential GPS. Associated site data (e.g. type, content, and surrounding environment) will be documented using AECOM's standard open site recording form. Photographic records of each site will also be taken. AHIMS site cards will be produced for all newly identified sites.

4.4.1 Recording of Transects

For each survey transect walked, the following information will be recorded:

- Landform element(s);
- Ground Surface Visibility (GSV) estimated to the nearest 10%;
- Exposure estimated to the nearest 10%;
- Factors responsible for identified ground surface exposures;
- The character and depth of any exposed soil profiles; and
- Presence or absence of Aboriginal heritage material.

4.4.2 Stone Artefact Recording

Information recorded for identified stone artefacts will, as a minimum, include raw material type, technological type and maximum linear dimension (mm). Where more than 50 artefacts are identified within a site, recording will be limited to a sample of 50 artefacts.

4.4.3 Scarred Tree Recording

The following attributes will be recorded for all Aboriginal scarred tree sites identified during field survey:

- Tree location
- Tree species
- Tree condition
- Girth of the tree (at 1.5m)
- Scar dimensions
- Overgrowth
- Scar orientation
- Origin of scar
- Type of scar
- Scar preservation
- Toe holds (presence/absence)
- Tool marks (presence/absence)
- Type of tool marks
- Epicormic stem(s) (presence/absence)

4.4.4 Other Site Types

If other site types are identified during survey then site recording will be conducted to a degree comparable to that required by the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010).

4.5 Social/Cultural Values Assessment

Aboriginal stakeholders are in the best position to provide information on the Aboriginal social/cultural heritage values of a given area. During the assessment process, Hansen Bailey will consult with Aboriginal stakeholders regarding the cultural heritage values of the Project Area. This will include as a minimum:

- a request (in this draft methodology) for any initial comments regarding the Aboriginal heritage values of the Project Area;
- the provision of this draft assessment methodology to all registered stakeholders for comment prior to fieldwork;
- discussion of cultural heritage values during field survey; and
- the provision of a draft Aboriginal heritage impact assessment to all registered stakeholders for comment prior to finalisation.

The above will be undertaken in accordance with DECCW's *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*.

Drayton South Coal Project
Aboriginal Cultural Heritage Impact Assessment

Fieldwork Results

10 June, 2011

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

AECOM

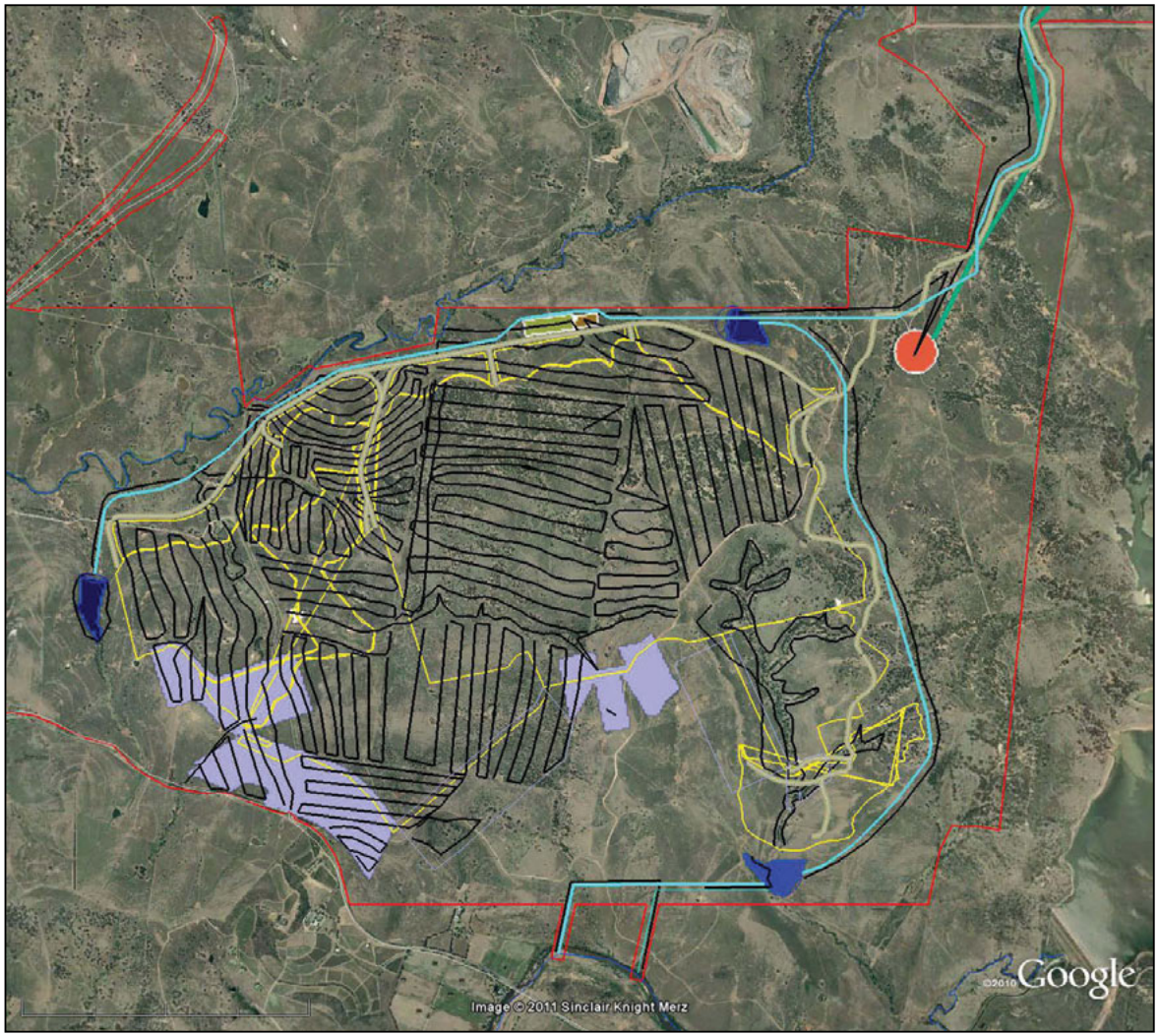
Agenda

- Welcome to Country
- Introductions
- Summary of Results
- Questions / Discussion

Survey Coverage

- A total of 44 transects have been completed
- Transect lengths varied from 100m to 10km
- Transects were completed on foot
- Ground Surface Visibility (GSV) has varied considerably, ranging from low to excellent
- Survey coverage within the disturbance areas has been excellent
- All landform types have been surveyed
- Archaeologically sensitive areas have been targeted, including areas of erosion and remnant vegetation

Survey Coverage



Terrain & Ground Surface Visibility

Steep

Flat

Creekline

Low Hills

Summary of Results

A total of approximately 3500 individual artefacts were recorded:

- 14 large scatters of 50+ artefacts
  - Note: these included a number of previously recorded sites combined
- Several hundred small scatters and isolated finds
  - Note: exact number to be defined
- 2 trees with scarring
- 10 PAD sites
  - 7 previously recorded, 3 new
- 95 previously recorded AHIMS sites have been revisited

Large Artefact Scatters

- 14 large open artefact scatters have been identified
  - Artefact numbers have ranged from 60 to c.400
- Eight sites had more than 100 artefacts:
  - Saddlers 3: 129 artefacts
  - DS-AS19-11: 124 artefacts
  - DS-AS27-11: 182 artefacts
  - DS-AS35-11: 154 artefacts
  - DS-AS19b-11: 400 artefacts
  - DS-AS49-11: 186 artefacts
  - DS-AS64-11: 109 artefacts
  - Saddlers 7: 153 artefacts

(exact names of sites to be confirmed)

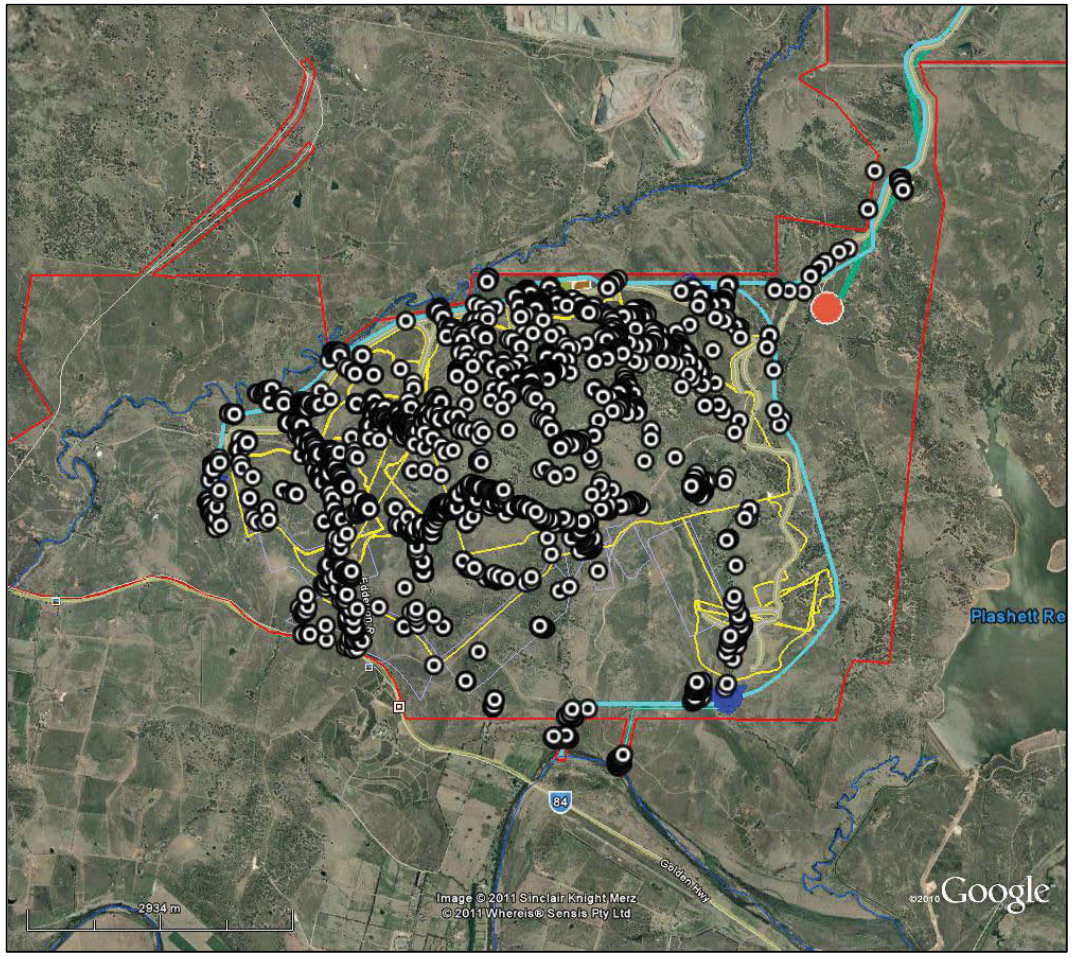
Large Artefact Scatter DS-AS19b-11

Large artefact scatter and PAD

- Lower slope
- Adjacent to creekline
- 400+ artefacts
- PAD site (excavation?)
- Axe head, backed blades
- Variety of material
  - Mudstone
  - Silcrete
  - Quartz
  - Chalcedony
  - Basalt

Small Artefact Scatters and Isolated Finds

- Several hundred small scatters and isolated finds



Trees

Two trees with scarring – to be confirmed

PAD Sites

- 10 PAD sites
  - 7 previously recorded and on AHIMS register
    - Several of these were assessed as not being PADs during the survey
  - 3 newly recorded PAD sites

- All newly recorded PADs associated with large surface artefact scatters and adjacent to creeks

Axe Heads

- 14 axe heads recorded

Axe Heads

- Winner

Hammerstones

2 Hammerstones Identified

- 1 x river cobble
- 1 x basalt

Backed Blades

A variety of backed blades identified

- Bondi points
  - Mudstone
  - Silcrete
- Geometric Microlith

Stone Tool Technology

- 3500 stone artefacts have been recorded
- Raw materials are locally abundant – Hunter Valley mudstone, silcrete, chert, porcellanite and quartzite
- Mudstone was dominant raw material
- Cores reduced by freehand percussion using hand held hammerstones
- No bipolar cores or flakes identified
- Backed artefacts and scrapers were identified as the most common tool forms
- Edge-ground axes also well represented

Raw Material

Types of raw material present include:

- Mudstone
- Silcrete
- Chert
- Porcellanite
- Quartzite
- Chalcedony

Interesting Finds

Preliminary Management Recommendations

- Sites to be fenced and avoided
- Salvage and excavation of sites within the disturbance footprint
  - Opportunity for video documentation during the salvage and excavation phase
  - Participation of Aboriginal community during the salvage and excavation phase
- Select significant sites outside the disturbance footprint will be recommended as offsets

Exchange of Cultural Heritage Knowledge

- As part of the consultation process, Hansen Bailey would like to seek the views and cultural knowledge from the Aboriginal community to identify:
  - Objects of cultural value to Aboriginal people in the Project area; and
  - Places of cultural value to Aboriginal people in the Project area.
- Cultural knowledge exchange sessions can be arranged with groups independently or in a larger forum.
- If groups are interested in participating in such sessions, please advise Hansen Bailey and a meeting can be scheduled at the group's convenience.

Aboriginal Cultural Heritage Impact Assessment Report

- AECOM will prepare a draft Aboriginal cultural heritage impact assessment report with the input from registered Aboriginal groups
- The draft report will be provided to all registered groups for review and comment
- Aboriginal groups will have 28 days from the date the report is issued to submit comments in writing
- The report will then be finalised with consideration to comments received from Aboriginal groups

Future Consultation

- Salvage and excavation events will only occur at a later stage once the Project receives approval (approximately one and a half to two years)
- The Aboriginal community will be informed and invited to participate in future events

Thank You

Questions/Discussions

Hansen Bailey | ENVIRONMENTAL CONSULTANTS | AECOM

Appendix B

Aboriginal Stakeholder Responses to Draft Assessment Report

Appendix B Aboriginal Stakeholder Responses to Draft Assessment Report

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Noel Downs	Date/Time:	9:55am 29/2/12.
Company:	Wanaruah Local Aboriginal Land Council	Job No:	1049
Phone No:	0429 773 900	Recorded by:	C. Kavanagh
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

- Called office - not available 9:55am
- Called mobile - 9:58am
- ND - advised that he is aware of the report, however, is yet to review the document. Requested an email be sent as a reminder to review the report.

Called 6/3/12 - office - no answer 11:24am
- mobile - 11:25am

- ND - advised that he has not yet reviewed the report & requested further time. Requested an email be sent as a reminder to review the report.

Action:

Email sent 29/2.
Email sent 6/3.
Email sent 12/3.

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Arthur Fletcher	Date/Time:	10:00am
Company:	Worn / contracting	Job No:	1049
Phone No:	4954 7751	Recorded by:	C. Kavanagh
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

- called mobile at 10:00am - not available
- called home at 10:01am - left message.
- called 29/2 - AF - requested an extension to review the report & provide comment. Requested an electronic version of the report.
- called mobile 11:23am 6/3 - AF advised that he accepts the content in the draft Aboriginal CHIA. Requested that the comments made by other groups be considered when finalising the report.
- CH - Advised that all comments will be considered.

Action:

- CH - send electronic version of report. (sent 29/2)

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Lloyd Matthews	Date/Time:	29/12/12
Company:	Bullen Bullen Consultants	Job No:	1049
Phone No:	6742 0658	Recorded by:	C. Kavanagh
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

- Called mobile 2:51 - no answer
- Called home 2:52 - left message
- Called mobile 12:09pm - left message (1/3/12)
- Called home 12:10pm (1/3/12) - left message.
- Called home 6/3/12 at 11:34am - LM advised that he accepts the content in the draft Aboriginal CHIA for the Project.

Action:

29-FEB-2012 08:34 FOLEY 0263720859 P. 3

Return Fax: (02) 6575 2001

Attention: Chelsea Kavanagh

RE: DRAYTON SOUTH COAL PROJECT – DRAFT ABORIGINAL ARCHAEOLOGICAL AND CULTURAL HERITAGE IMPACT ASSESSMENT

Aboriginal Stakeholder Group: Murong Gialing 9

I have read and have understood the Drayton South Coal Project – Aboriginal Archaeological and Cultural Heritage Impact Assessment which has been prepared by AECOM. With regard to the impact assessment, I would like to confirm that our group:

☑ Agrees with the content ☐ Disagrees with the content

We would like to make the following comments on the impact assessment:

We at murong Gialing 9 find it not a easy task to comment as we only did a few days work and did not see the whole Culture Sab done. we would like to Recommend that the artifacts that wont be impacted on stay on site and the Artifacts that will be impacted be collected and moved to a area eg Conservation or where there is No impact Also where there is going to be impact the Artifact under neath be collected as there is to much of our Culture being destroyed. If there is no place for the Artifacts that will be impacted can the coal mine / Stakeholders have a keeping place on the mine until they can be place back on Country. we need to protect our Culture for our new / old generatio

Signed in support: D. Foley

On behalf of (Group): Murong Gialing 9

Date: 10/2/12

Cacatua Culture Consultants

Entity of Carcatchua Pty Ltd

ABN: 87 145 082 480 ACN: 145 082 480

February 29, 2012

Your Ref:

Chelsea Kavanagh
Hansen Bailey

Emailed: ckavanagh@hansenbailey.com.au

RE: Drayton Coal

Chelsea,

Thank you for your report we have read and discussed the report with the staff that has already been on site with some of the survey.

We understand the significance of all areas within the Drayton's foot print and understand the impact they will or may occur. We are in support of the information that was supplied in the above report.

- However it should be noted that if our view differs from TO's or Determined Native Tittle Holders within this area with regards to how items should be undertaken then we will support these changes.

Yours truly

Donna Sampson
Report Manager

Email: cacatua@resetdsl.net.au

UNIT 1b, 11 Glenwood Drive THORNTON NSW 2322 Ph: 02 4028 6942 Fax: 02 4028 6943

Return Fax: (02) 6575 2001

Attention: Chelsea Kavanagh

RE: DRAYTON SOUTH COAL PROJECT – DRAFT ABORIGINAL ARCHAEOLOGICAL AND CULTURAL HERITAGE IMPACT ASSESSMENT

Aboriginal Stakeholder Group: Upper Hunter Aboriginal Council Inc.

I have read and have understood the Drayton South Coal Project – Aboriginal Archaeological and Cultural Heritage Impact Assessment which has been prepared by AECOM. With regard to the impact assessment, I would like to confirm that our group:

☑ Agrees with the content ☐ Disagrees with the content

We would like to make the following comments on the impact assessment:

The following recommendations are made should the Project receive approval:
- employment opportunities, including training and apprenticeships;
- education programs, including scholarships; and
- health programs.

These initiatives will benefit and support the local Aboriginal community.

Signed in support: R Lenny

On behalf of (Group): Upper Hunter Aboriginal Council Inc.

Date: 29/02/2012

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Barry McTaggart	Date/Time:	10:02
Company:	Yarrawalk	Job No:	1049
Phone No:	65 79 1185	Recorded by:	CHavenaar
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

BM - Refer comments back to Scott Franks.
CH - Noted that Scott Franks has already provided comments on the draft report.

Action:

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Kathleen Steward - Kinchella	Date/Time:	29/2/12
Company:	Yuin Cultural Services	Job No:	1049
Phone No:	0432 720 623	Recorded by:	C. Kavanagh
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

KSK - Advised that she accepts the content in the draft Aboriginal CHIA for the Project.

Action:

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Melissa Matthews	Date/Time:	9:45
Company:	Upper Hunter	Job No:	1049
Phone No:	0488 331 934	Recorded by:	C. Kavanagh.
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

MM - Advised that Daniel Matthews accepts the content in the draft Aboriginal CHIA for the Project.

Action:

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Mark Hickey	Date/Time:	9:32 29/12/12
Company:	Kayaway Eco Cultural Heritage	Job No:	1049
Phone No:	0432 829 335	Recorded by:	C. Kavanagh
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

- MH advised that he accepts the content in the Aboriginal CHIA for the Project.

Action:

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Tracey Skene	Date/Time:	9:21am 29/2/12
Company:	Culturally Aware	Job No:	1049
Phone No:	0458 983 941	Recorded by:	C. Kavanagh
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

- TS advised that she accepts the content in the draft Aboriginal CHIA for the Project.

Action:

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Annie Hickey	Date/Time:	9:23am 29/ 2/12
Company:	Gidawaa Walang Culture Heritage Consultancy	Job No:	1049
Phone No:	0411 196 991	Recorded by:	C. Kavanagh
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

- AH advised that she accepts the content in the draft Aboriginal CHIA for the Project.

Action:

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Paulette Ryan	Date/Time:	9.25am 29/2/12.
Company:	Hunter Traditional Owners	Job No:	1049
Phone No:	0432 672 273	Recorded by:	C Kavanagh
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

PR advised that she accepts the content in the draft Aboriginal CHIA report for the Project.

Action:

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Margaret Matthews	Date/Time:	9:12am 29/2/12
Company:	Aboriginal Native Title Consultants	Job No:	1049
Phone No:	0417 725 956	Recorded by:	C. Kavanagh
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

- Called mobile at 9:12 am 29/2 - no answer
- Called mobile at 2:49 pm 29/2 - MM advised that she accepts the content in the draft Aboriginal CHIA for the Project.

Action:

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Rhonda Griffiths	Date/Time:	9.25am 29/2/12
Company:	Hunter Valley Aboriginal Corp.	Job No:	1049
Phone No:	6543 1180	Recorded by:	C. Kavanagh
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

Called 9:25am at office - no answer
Called (pm) - RG advised that HVAC supports the views & comments of the Wonnarua Local Aboriginal Land Council.

Action:

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Rhonda Ward	Date/Time:	9:40 29/11/12
Company:	Ungooroo Cultural & Community Services	Job No:	1049
Phone No:	0450 754 199	Recorded by:	C. Kavanagh
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

- Called mobile at 9:40am - left message
- Called mobile at 2:58pm - left message
- Called mobile at 12:07pm (05/12/12) - RW noted that she accepts the content in the draft Aboriginal CHIA report for the Project. Advised that she had no further comment.

Action:

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	David French	Date/Time:	9:30 29/2/12
Company:	Hunter Valley Network Cultural Resource Mgt.	Job No:	1049
Phone No:	0413 242 613	Recorded by:	C. Kavanagh
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

Called at 9:30am - left message.
Called mobile at 12:12pm on 1/3/12 -
- DF advised that he accepts the content in the draft Aboriginal CHIA for the Project.

Action:

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Tom Miller	Date/Time:	9:35 29/2/12
Company:	Lower Hunter Wonnarua Council Inc.	Job No:	1049
Phone No:	0402 636 521	Recorded by:	C. Kavanagh
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

- Called mobile 9:35 am 29/2 - left message
- Called mobile 2:55pm 29/2 - left message
- Called mobile 12:11pm 1/3/12 - left message
- Called mobile 11:38am 6/3/12 - left message
- Called mobile 4:37 pm 12/3/12
- cc - ask if TM accepted the content in the report ... or if he would like to provide further comment. Noted that an email was sent.
- TM - advised that he has not yet reviewed the report, however, would look into it further.
- Called 3:05pm 20/3/12 - reiterated the last conversation of the 12/3/12. Requested if TM accepted the content in the report or if he would like to provide further comments on the draft report.

Action:

From: Scott Franks
To: Chelsea Kavanagh
Subject: RE: Drayton South - Response to Draft Aboriginal Cultural Heritage Impact Assessment
Date: Friday, 24 February 2012 8:30:15 AM

Chelsea,

Further to our phone conversation.

I have read threw the report and can see that know culture information has been provided from the stake holders groups, the area in question is extremely important to our people and our Native TITLE CLAIMANT GROUP. We are more than happy to meet with you and your client to discuss the importance of that area. we do confirm that we do not support the current report its findings or the possible approval of this project.

Regards,

Scott Franks
Director & Aboriginal Heritage Manager

TOCOMWALL PTY LTD
Po Box 76
CARINGBAH NSW 1495
p: 0404 171544
f: 02 95244146
e: scott@tocomwall.com.au

From: Chelsea Kavanagh [mailto:ckavanagh@hansenbailey.com.au]
Sent: Wednesday, 8 February 2012 10:29 AM
To: yarrawalk@tpg.com.au
Subject: Drayton South - Response to Draft Aboriginal Cultural Heritage Impact Assessment

Hi Scott,

Thank you for your feedback. As requested, please see my contact details below.

Regards,

Chelsea Kavanagh
Environmental Scientist

HANSEN BAILEY
Telephone: (02) 6575 2012
Fax: (02) 6575 2001
Mobile: +61 431 301 043
Email: ckavanagh@hansenbailey.com.au

Wonnarua Nation Aboriginal Corporation
Ground Floor 254 John St Singleton
PO Box 3066, Singleton Delivery Centre NSW 2330
Phone: 02 6571 8595 **Fax**: 02 6571 8551
Mobile: 0412 593 020
Web Site: www.wonnarua.org.au
Email: wonnarua@bigpond.com
ABN: 50 012 829 925

Chelsea Kavanagh
Hansen Bailey
Environmental Scientist
NSW 2330

Dear Chelsea

Re: Drayton South Coal Project Aboriginal Cultural Heritage Report

We would like to present the following proposal on behalf of the Wonnarua People, Registered Native Title Claimants for the greater Hunter region. In registering the Wonnarua People as Native Title Claimants, the Federal Court recognised the Claimants as traditional cultural knowledge holders of the Greater Hunter Region.

Since April 2010, in NSW there have been a number of changed requirements for proponents in relation to both part 4 EIS and ACHA and AHIP applications with OEH. These changed requirements are more aligned to the Burra Charter! international principles of recording cultural heritage and archaeological assessment.

The improved approach by the office of Environment and Heritage NSW [OEH] guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW requires proponents to undertake ACHA assessments which now assess beyond a purely archaeological and technical research potential context to ensure a balanced and integrated assessment of social [cultural] historic, scientific cultural interpretation and values and aesthetic values assessment.

In keeping with the Office of Environment and Heritage NSW [OEH] Guide" ACHA reports now need to recognise that:

Social/ cultural values –refers to the spiritual, traditional, historical or contemporary associations the attachment to the object place has for Aboriginal people;

Cultural values are how people express the value of an area;

Places of social value have associations with contemporary community identity;

OEH state that the objective of community consultation is to ensure that Aboriginal People have the opportunity to improve assessment outcomes by;

Providing relevant information about the cultural significance and values of the Aboriginal object[s] and/or place[s] actively contributing to the development of cultural heritage management options and recommendations for any Aboriginal object[s] and place[s] within the proposed project area;

Commenting on draft assessment reports before they are submitted by the proponent to OEH.

Further OEH recognise that;

Consultation with Aboriginal People is an integral part of the process of investigating and assessing Aboriginal cultural heritage, Aboriginal people who hold cultural knowledge about the area, objects and places that may be directly or indirectly affected by the proposed activity must be given the opportunity to be consulted. This is done through the process of investigating, assessing and working out how to manage the harm from the proposed activity; consultation must adhere to the requirements set out in clause 80c of the NPW Regulation: OEH Guide 2011 p2.

As knowledge holders in the region, the Wonnarua Registered Native Title Claimants while welcoming the improvements to an integrated assessment approach also hold concerns regarding our

‘ Indigenous Cultural and Intellectual Property Rights’ refers to Indigenous Australians’ rights to their heritage and that heritage consists of:

The intangible and tangible aspects of the whole body of cultural practices, resources and knowledge systems developed, nurtured and refined by Indigenous people and passed on to them as part of expressing their cultural identity.

As an integral part of the consultation requirements for proponents is the need to guarantee cultural knowledge protection - refer to sheet 3. This OEH guide clearly articulates the need to respect the protection of cultural knowledge and sacred cultural knowledge.

In order to achieve this protection of cultural knowledge while informing Anglo American of the cultural knowledge and interpretation of all their sites we are able to fulfil our cultural obligations while also providing a depth of understanding in relation to Anglo American current exploration sites and operation sites.

As such, we propose that the Wonnarua Registered Native Title Claimants develop an Aboriginal Cultural Heritage Assessment in relation to all Anglo American sites in the greater Hunter region.

The site-wide report would remain the intellectual property of the Wonnarua Registered Native Title Claimants. However, information that is not affected by cultural restrictions may then be used to inform all future draft Cultural Heritage Assessment Reports for AHIPs and Part 4 DP&I assessments.

These may also be prepared by us, should you agree.

This initiative may also assist Anglo American in their constraints analysis.

In order to address the specific issues noted in the Scope of Work, we will need to:

- Conduct original research in relation to the cultural history of the sites
- Consult with identified Wonnarua knowledge holders
- Convene meetings and consult with Wonnarua people who are recognised Cultural and Heritage stakeholders
- Brief, consult with and take advice from Wonnarua Elders
- Consult with WNAC Board members and Wonnarua Native Title Claimants as defined by our claimant description
- Prepare a draft report which satisfies the brief and has consensus agreement of consulted stakeholders
- Project manage the overall assignment

The project will be administered by the Wonnarua Nation Aboriginal Corporation (WNAC).

Our approach is to engage a qualified and experienced Wonnarua facilitator to coordinate the gathering and reporting of cultural content, as assisted by a Management Consultant regularly engaged by WNAC. This approach ensures that the process has the momentum necessary to bring the assignment to fruition in an environment focused on Wonnarua cultural impacts and values assessment i.e. cultural interpretation of the landscape.

In a more strategic sense, we view this as an opportunity to create a stronger working relationship between the Wonnarua People and Anglo American, with appropriate recognition being given to the recognised Traditional Owners and the knowledge that they hold. We also see this as an innovative step forward that may be a positive influence in ultimately reforming the way that Cultural and Heritage site evaluation and Cultural Heritage Assessment Reports are conducted in the future with Anglo American Metallurgical Pty Ltd.

In any event, due to the ever expanding register of stakeholders in the region, we would like to be consulted separately now, and in the future, in any matters related to Aboriginal Culture and Heritage. This is the only way that we can protect the cultural and intellectual property in our traditional knowledge.

We would welcome a meeting to discuss the implementation of this proposal and determine a meaningful and collaborative way in which we can work with Anglo American while retaining and protecting our cultural knowledge.

Should you have any enquiries in relation to this, please call the writer on 0412 593 020.

Yours Truly

CEO WNAC

11/2/2012

Attached:

- **Proposal (draft)**
- **Aboriginal Stakeholder list**

Step	Description	Approximate Timing
Pre Contract		
Overview	Mining representatives to address Wonnarua People Stakeholders regarding history and intent of program.	
Stage 1		
Research Phase		On signing of contract
Inception Meeting	Introduce consultants and obligations under contract. Discuss historic information from research and cultural significance.	Mid
Inspection Meeting	Site visit to attend as one group and discuss sites relative to historical information. Debrief site visit while information is fresh. Make a video on site to capture stories and images of country	End
Record Wonnarua People Oral Histories Meeting	To record detail oral histories for those that have knowledge and information that have been indicated through Inspection or other means. This will establish the connections between other aspects of Wonnarua and the site.	Early
Review Archaeological Report	Stakeholders to review content of draft archaeological report, discuss and consolidate feedback and prepare report	Early
Submit stage 1 report incorporating above		Mid
Feedback Meetings (if required)	Provision for meeting to discuss feedback from Principal if required.	Late
Stage 2		
Intergenerational Equity meeting	Establish the connections between the strategic growth needs of the Wonnarua people and the specific requirements and strategies to mitigate cultural loss for future generations as a result of the project.	Late
Wonnarua Elders Meeting	Gathering to present findings to Wonnarua Elders and gain their endorsement and input prior to the preparation of the final report.	Late
Draft Final Report		Early
Feedback Meetings (if required)	Provision for meeting to discuss feedback from Principal if required.	Late
Final Report		Early

NAME	FIRST_NAME	CORPORATION	ADDRESS_1	PHONE	MOBILE
Mr Barry Anderson	Barry	Lower Wonnarua Tribal Consultancy Pty Ltd	156 Inlet Road Via Bulga NSW 2330	*Ph/Fax: 02 6574 5303*	*Mob: 0417 403 153*
Mr Des Hickey	Des	Wattaka Wonnarua Cultural Consultants Service	4 Kennedy Street Singleton NSW 2330	*Ph: 02 6571 1713*	*Mob: 0432 977 178*
Mrs Rhoda Perry	Rhoda	Upper Hunter Wonnarua Council	PO Box 184 Singleton NSW 2330	*Ph: 02 6571 4888*	
Mr Arthur Fletcher	Arthur	Wonn1 Contracting	619 Main Road Glendale NSW 2285	*Ph: 02 4915 6833*	*Mob: 0402 146 193*
Mr Luke Hickey	Luke	Hunter Valley Cultural Surveying	165 Susan Street Scone NSW 2337	*Ph: 02 6545 1668*	*Mob: 0402 446 223*
Ms Tracey Skeene	Tracey	Culturally Aware	7 Crawford Place Millfield NSW 2325		*Mob: 0447 266 595*
Mr Tom Miller	Tom	Lower Hunter Wonnarua Council	51 Bowden Street Heddon Greta NSW 2321		*Mob: 0402 636 521*
Mr Laurie Perry	Laurie	Wonnarua Nation Aboriginal Corporation	PO Box 3066 Singleton Delivery Centre NSW 2330	*Phone 0265 718595 Fax 0265 718551*	*Mob: 0412 593 020* *Mob (Fiona): 0409 829 764*
Mr Mark Hickey	Mark	Kayaway Eco-Cultural and Heritage Services	6/20 Government Street Thornton NSW 2322		*Mob: 0432 829 335*
Ms Paulette Ryan	Paulette	Hunter Traditional Owner Environmental Management Ser	14 Barton Avenue Singleton NSW 2330		*Mob: 0432 672 273*
Mr Stephen Hickey	Steven	Widescope Indigenous Group	PO Box 1042 Singleton NSW 2330		*Mob: 0431 179 978*
Mr Rodney Hickey	Rodney	Kawul Cultural Services	Po Box 817 Singleton NSW 2330		*mob:0431720887*
Mr Victor Perry	Victor	Junburra Consultancy Service	PO Box 184 Singleton NSW 2330		*Mob:0403746966*
Mr Keith Rogers	Keith	Keith Rogers Consulting non Aboriginal	Po Box 2234 Gateshead NSW		*Mob:0419447301*
Wonnarua Elders		Wonnarua Elders Council Inc	PO Box 184 Singleton NSW 2330	*Ph :02 6571 4888*	

EMAIL

deshickey@bigpond.com.au

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hto.paulette@gmail.com

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kawul-culturalservices@hotmail.com

junburra@bigpond.com
keith@krconsult.com.au

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Scott Franks	Date/Time:	8/2/12 10:00
Company:	Claimants for the Native Title of the Wonnarua	Job No:	1049
Phone No:	0404 171 544	Recorded by:	C. Kavanagh
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

SF: Advised that he 'rejected the proposal'. He noted that the Aboriginal CHIA did not demonstrate sufficient cultural knowledge of the area. Noted that the information provided in this phone conversation is confidential. Advised that there was a known massacre (recorded) site in the area, whereby 6-8 people (Indigenous) were killed. The event occurred along Saddlers Creek area on Mt Arthur Coal land.

CK: Asked if this information was publically available.

SF: Advised that it was a private/confidential report. Explained that, although the site is not directly impacted by the Project it has a continued connection to the area. Noted that there is also a mythological site associated with the Mt Arthur Coal operations that links to the area. Advised that Saddlers Creek should not be impacted.

CK: Advised that Saddlers Creek is not impacted by the Project & will be protected.

SF: Advised that he was happy to discuss

Action:

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Scott Franks	Date/Time:	8/2/12 10:00
Company:		Job No:	1049
Phone No:		Recorded by:	C. Kavanagh
Subject:	continued.		

Details:

cultural heritage knowledge of the area for the assessment, however, information is confidential & not to be disclosed to other stakeholders, only to OEH. Explained that he wanted a signed agreement stating that information provided would not be released in the report etc. Noted that Hansen Bailey received limited response back regarding the sharing of cultural knowledge following issue of invites. Asked that SF provide a written response to the Aboriginal CHA to ensure no details were missed.

Action:

Send SF email address.
SF to provide written response.

LOCAL ABORIGINAL LAND COUNCIL
WANARUA
P.O. BOX 127
19 MAITLAND STREET,
MUSWELLBROOK 2333
ABN 33 251 730 169
PH: (02) 6543 1288
(02) 6543 1962
FAX: (02) 6542 5377
EMAIL: wanarua@bigpond.net.au

Chelsea Kavanagh
Environmental Scientist
HANSEN BAILEY
Telephone: (02) 6575 2012
Fax: (02) 6575 2001
Mobile: +61 431 301 043
Email: ckavanagh@hansenbailey.com.au

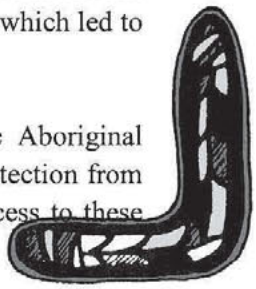
Re: Drayton South Coal Project - Draft Aboriginal Cultural Heritage Impact Assessment

Dear Chelsea,

Thank you for this opportunity to comment on the Drayton South project. Like all areas in the Hunter Valley the land, vegetation and water ways hold cultural significance to the Aboriginal community. Both oral and European written history tells us that the area was resource rich, the land being very fertile, the flats open and grassy the hills well treed.

This area is in close proximity to the song line, Mount Arthur being one of the guiding markers, and a cross roads between the routes to the coast, the Sydney basin, Western Plains, the Northern Tablelands and possibly the Lithgow region. It is also in easy walking distance to a number of known ceremonial areas. Yes the area around here is very significant, perhaps even more so by this being the area of the last stand of the local inhabitants against the invading whites' occupation, theft, kidnappings, rapes, murders and domination. In 1826 after fighting broke out there between Wonnarua and Kamilaroi people and settlers. The local tribes retreated into the swampy scrubland around Mount Arthur to conduct guerrilla warfare against the settlers in one of Australian's many frontier wars. When the white settles found they were unable to combat the resistance, the government of the day was contacted for aid and assistance. The settlers received arms ammunition and military support which led to the destruction of the Aboriginal resistance.

In regard to management of this area, the high cultural significance to the Aboriginal community needs the upmost consideration. The land forms and sites need protection from destruction and the Aboriginal community need to be able to have ongoing access to these



areas. This is because as quickly as we begin to understand something about how our people lived, (the activities they partook in and the time lines showing when, "history" that was not passed on because of the savage impact of European settlement), it is lost because of development. Many of the people still living in this area cannot speak the language of their tribe, we cannot sing the songs, we cannot tell our children the stories of all creation. This was lost because these things were considered "Evil" by the missionaries. What little is still known is closely guarded by those entrusted with it who pass it on as "need to know" on those occasions when something vital to the dreamtime is endangered. All that is left is to the majority is the few markers that remain of a once full and harmonious society and culture. These markers along with the snippets allowed to us by those entrusted, is all we have to link us to our mother the earth. Culturally, these places give us an insight to our forbearers. The level of occupation and the length of occupation give us insight to what the landscape was like and the activities the conducted. With no culture of writing, history has been passed by word of mouth. To aid the telling, many of the creation stories incorporated the land forms. This included how they came to be. No amount of written language can adequately describe or replace the value and meaning of being in touch with the living remnants of our dreamtime.

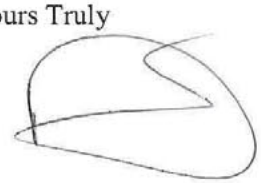
On a social level these remnants and markers give hope to a displaced people. No longer is it "Shame" to be Aboriginal. We have for many years been told that our culture was "Bad, Heathen, Satanical, Backward, Uncivilised and generally unacceptable". Employment, education, and health issues can be directly linked to ones vision of ones self and community. We still suffer from stereotyping and bigotry. We need something that is ours to take pride in. All we have is tied to the land in the remnants and markers.

We do not know how the Aboriginal community could be compensated for the loss of an area of such significance. Is it going to ensure closing the GAP initiatives being enabled in this area towards employment, housing, health and education by this loss, to ensure that the Aboriginal Community do not suffer from further depression and trauma at the hands of those who want to further destroy their culture? The answer of course is that there will be no initiatives, nothing for the community, as big business will do what it always does and bribe the government to avoid having any obligation to helping close theGAP.

In light of the significance of the area Wanaruah LALC (on behalf of the 3000 + Aboriginal persons who live within our boundary who are not representing themselves) cannot support any further destruction of sites and landforms in this area.

Thank you again for this opportunity.

Yours Truly



Noel Downs
CEO 26 · 3 · 2012

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Luke Hickey	Date/Time:	9.29am 29/2/12
Company:	Hunter Valley Cultural Surveying	Job No:	1049
Phone No:	0423 930 690	Recorded by:	C. Kavanagh
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

- LH - advised that he was in the process of reviewing the report, however, required further time to provide comment.
- CK - advised that she would call back early the following week to discuss progress on the review.

Called 6/3/12 at 11:29am

- LH - advised that he would provide comment on the report by 9/3.

Called 9/3/12 5:45pm - Left message.

Called 12/3/12 4:44pm - LH advised that he accepts the content in the draft Aboriginal CHIA report for the Project.

Action:

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

RECORD OF CONVERSATION

Name:	Des Hickey	Date/Time:	9:59am 29/2/12
Company:	Wattaka Wonnarua Traditional Owners	Job No:	1049
Phone No:	0432 977178	Recorded by:	C. Kavanagh.
Subject:	Drayton South - Response to Aboriginal CHIA.		

Details:

Called mobile at 9:59 - Left message
Called mobile at 3:02pm
· DH - advised that he was in the process of reviewing the report, however required further time to provide comment.
· CK - advised that she would call back early the following week to discuss progress on the review
Called 6/3/12
· DH - requested an extension for review of the report until 9/3/12.
Called 9/3/12
· DH - advised that he accepts the content in the draft Aboriginal CHIA report for the Project. Suggested that in the future, the proponent hold a workshop to discuss the content of the report due to the document size.

Action:

Oakes, Geordie

From: Chelsea Kavanagh [ckavanagh@hansenbailey.com.au]
Sent: Wednesday, March 21, 2012 3:12 PM
To: Oakes, Geordie
Subject: FW: Comment on report from Ungooroo Aboriginal Corporation

Hi Geordie,

Please consider this response in the finalisation of the draft report.

Cheers,

Chelsea Kavanagh
Environmental Scientist

HANSEN BAILEY
Telephone: (02) 6575 2012
Fax: (02) 6575 2001
Mobile: +61 431 301 043
Email: ckavanagh@hansenbailey.com.au

From: Taasha Layer [mailto:taasha@ungooroo.com.au]
Sent: Wednesday, 21 March 2012 3:01 PM
To: Chelsea Kavanagh
Cc: 'Admin'
Subject: Comment on report from Ungooroo Aboriginal Corporation

Hi Chelsea,

Apologies in the delayed response. I have spoken with Allen Paget, and he commented that ' he agreed with the methodology in the report from Hansen & Bailey and didn't need to add anything and was happy with the report'..

Hopefully these are satisfactory for you , if not and you need further clarification on the comments, please do not hesitate to contact us on the numbers provided below..

Regards,

Taasha Layer
Manager
Ungooroo Aboriginal Corporation (UAC)
PO Box 3095
26 George St
SINGLETON NSW 2330
Ph: 02 65 71 5111
Fax: 02 65 71 5777
Mobile: 0423736661
taasha@ungooroo.com.au
www.ungooroo.com.au

*'WINNER' INDIGENOUS BUSINESS OF THE YEAR - HUNTER REGION BUSINESS ENTERPRISE CENTRE BUSINESS AWARDS **2011***

'HIGHLY COMMENDED' *INDIGENOUS BUSINESS OF THE YEAR - HUNTER REGION BUSINESS ENTERPRISE CENTRE BUSINESS AWARDS* ***2010***

'WINNER' *INDIGENOUS BUSINESS OF THE YEAR - HUNTER REGION BUSINESS ENTERPRISE CENTRE BUSINESS AWARDS* ***2009***

Appendix C

AHIMS Search Results

Appendix C AHIMS Search Results

Sites Within the Project Boundary (not in Study Area)					
37-2-0040	Lower Saddler's Creek;	Artefact	37-2-0462	MAS 109;Mt Arthur South;	Artefact
37-2-0041	Saddler's Creek;	Artefact	37-2-0463	MAS 110;Mt Arthur South;	Artefact
37-2-0043	Saddler's Creek;	Artefact	37-2-0464	MAS 111;Mt Arthur South;	Artefact
37-2-0044	Saddler's Creek;	Artefact	37-2-0465	MAS 112;Mt Arthur South;	Artefact
37-2-0068	Saddler's Creek;	Artefact	37-2-0466	MAS 113;Mt Arthur South;	Artefact
37-2-0071	Saddler's Creek;	Artefact	37-2-0467	MAS114;Mt Arthur South;	Artefact
37-2-0079	Saltwater Creek;	Artefact	37-2-0468	MAS 115;Mt Arthur South;	Artefact
37-2-0089	Saltwater Creek;	Artefact	37-2-0469	MAS 116;Mt Arthur South;	Artefact
37-2-0090	Saltwater Creek;	Artefact	37-2-0470	MAS 117;Mt Arthur South;	Artefact
37-2-0146	Bowfield;	Artefact	37-2-0471	MAS 118;Mt Arthur South;	Artefact
37-2-0371	MAS 25;Mt Arthur South;	Artefact	37-2-0472	MAS 119;Mt Arthur South;	Artefact
37-2-0372	MAS 26;Mt Arthur South;	Artefact	37-2-0473	MAS 120;Mt Arthur South;	Artefact
37-2-0373	MAS 27;Mt Arthur South;	Artefact	37-2-0474	MAS 121;Mt Arthur South;	Artefact
37-2-0374	MAS 28;Mt Arthur South;	Artefact	37-2-0475	MAS 122;Mt Arthur South;	Artefact
37-2-0375	MAS 29;Mt Arthur South;	Artefact	37-2-0476	MAS 123;Mt Arthur South;	Artefact
37-2-0384	MAS 38;Mt Arthur South;	Artefact	37-2-0477	MAS 124;Mt Arthur South;	Artefact
37-2-0385	MAS 40;Mt Arthur South;	Artefact	37-2-0491	MAS 9;Mount Arthur South;	Artefact
37-2-0386	MAS 41;Mt Arthur South;	Artefact	37-2-0493	MAS1;Mount Arthur South;	Artefact
37-2-0387	MAS 42;Mt Arthur South;	Artefact	37-2-0499	MAS 10;Mount Arthur South;	Artefact
37-2-0388	MAS 43;Mt Arthur South;	Artefact	37-2-1941	SC-OS-11	Artefact
37-2-0389	MAS 44;Mt Arthur South;	Artefact	37-2-1944	SC-ST-2	Modified Tree (Carved or Scarred)
37-2-0390	MAS 45;Mt Arthur South;	Artefact	37-2-1945	SC-ST-1	Modified Tree (Carved or Scarred)
37-2-0391	MAS 46;Mt Arthur South;	Artefact	37-2-1989	DR1 (Drayton Coal)	Artefact
37-2-0392	MAS 47;Mt Arthur South;	Artefact	37-2-1990	DR2 Drayton Coal	Artefact
37-2-0395	MAS 50;Mt Arthur South;	Artefact	37-2-1991	DR3 (Drayton Coal)	Artefact
37-2-0420	MAS 79;Mt Arthur South;	Artefact	37-2-1992	DR4 Drayton Coal	Artefact
37-2-0421	MAS 5;Mt Arthur South;	Artefact	37-2-2321	Delpah D3	Artefact
37-2-0422	MAS 6;Mt Arthur South;	Artefact	37-2-2322	Delpah D4	Artefact
37-2-0423	MAS 7;Mt Arthur South;	Artefact	37-2-2323	Ramrod R16	Artefact
37-2-0424	MAS 8;Mt Arthur South;	Artefact	37-2-2324	Ramrod R17	Artefact
37-2-0425	MAS 39;Mt Arthur South;	Artefact	37-2-2325	Delpah D1	Artefact
37-2-0430	MAS 4;Mt Arthur South;	Artefact	37-2-2327	Delpah D6	Artefact
37-2-0431	MAS 3;Mt Arthur South;	Artefact	37-2-2328	Delpah D7	Artefact

Sites Within the Project Boundary (not in Study Area)					
37-2-0432	MAS 2;Mt Arthur South;	Artefact	37-2-2329	Ramrod R11	Artefact
37-2-0433	MAS 80;Mt Arthur South;	Artefact	37-2-2330	Ramrod R12	Artefact
37-2-0434	MAS 81;Mt Arthur South;	Artefact	37-2-2331	Ramrod R13	Artefact
37-2-0435	MAS 82;Mt Arthur South;	Artefact	37-2-2333	Ramrod R15	Artefact
37-2-0436	MAS 83;Mt Arthur South;	Artefact	37-2-2338	Ramrod R1	Artefact
37-2-0437	MAS 84;Mt Arthur South;	Artefact	37-2-2339	Ramrod R2	Artefact
37-2-0438	MAS 85;Mt Arthur South;	Artefact	37-2-2340	Ramrod R3	Potential Archaeological Deposit (PAD)
37-2-0439	MAS 86;Mt Arthur South;	Artefact	37-2-2341	Ramrod R4	Artefact
37-2-0440	MAS 87;Mt Arthur South;	Artefact	37-2-2344	Ramrod R7	Artefact
37-2-0441	MAS 88;Mt Arthur South;	Artefact	37-2-2347	Ramrod R10	Potential Archaeological Deposit (PAD)
37-2-0442	MAS 89;Mt Arthur South;	Artefact	37-2-2348	Delpah D8	Artefact
37-2-0443	MAS 90;Mt Arthur North;	Artefact	37-2-2349	Delpah D9	Artefact
37-2-0444	MAS 92;Mt Arthur South;	Artefact	37-2-2350	Delpah D10	Potential Archaeological Deposit (PAD)
37-2-0445	MAS 91;Mt Arthur South;	Artefact	37-2-2351	Delpah D11	Potential Archaeological Deposit (PAD)
37-2-0446	MAS 93;Mt Arthur South;	Artefact	37-2-2356	Delpah D16	Artefact
37-2-0447	MAS 94;Mt Arthur South;	Artefact	37-2-2357	Delpah D17	Artefact
37-2-0448	MAS 95;Mt Arthur South;	Artefact	37-2-2358	Delpah D18	Artefact
37-2-0449	MAS 96;Mt Arthur South;	Artefact	37-2-2359	Delpah D19	Artefact
37-2-0450	MAS 97;Mt Arthur South;	Artefact	37-2-2361	Delpah D21	Artefact
37-2-0451	MAS 98;Mt Arthur South;	Artefact	37-2-2362	Delpah D22	Artefact
37-2-0453	MAS 100;Mt Arthur South;	Artefact	37-2-2737	Liddell EW 1	Artefact
37-2-0454	MAS 101;Mt Arthur South;	Artefact	37-2-2771	MGA 13	Artefact
37-2-0455	MAS 102;Mt Arthur South;	Artefact	37-2-2772	MGA 14	Artefact
37-2-0456	MAS 103;Mt Arthur South;	Artefact	37-2-2773	MGA 15	Artefact
37-2-0457	MAS 104;Mt Arthur South;	Artefact	37-2-2774	MGA 16	Artefact
37-2-0458	MAS 105;Mt Arthur South;	Artefact	37-2-2775	MGA 17	Artefact
37-2-0459	MAS 106;Mt Arthur South_Lease Area;	Artefact	37-2-2776	MGA 18	Artefact
37-2-0460	MAS 107;Mt Arthur South;	Artefact	37-3-0021	Falbrook; Arizona;	Grinding Groove
37-2-0461	MAS 108;Mt Arthur South;	Artefact			

Sites within Study Area					
Site ID	**Site Type**	**No. of Artefacts**	**Landform**	**Recorder / Date**	**Comment**
37-2-0004	Artefact Scatter	49	Creekline	M.Koettig (1984)	Valid
37-2-0006	Artefact Scatter	18	Creekline	Koettig (1984)	Valid
37-2-0053	Artefact Scatter	109	Creekline	Koettig (1984)	Valid
37-2-0069	Artefact Scatter	20	Creekline	L.K.Dyall (1981)	Valid
37-2-0073	Artefact Scatter	20	Creekline	N/A	Valid
37-2-0074	Artefact Scatter	20	Creekline	N/A	Valid
37-2-0075	Artefact Scatter	>50	Creekline	N/A	Valid
37-2-0076	Artefact Scatter	>20	Creekline	N/A	Valid
37-2-0077	Artefact Scatter	>30	Creekline	N/A	Valid
37-2-0078	Artefact Scatter	N/A	Creekline	N/A	Valid
37-2-0080	Artefact Scatter	N/A	Creekline	N/A	Valid
37-2-0082	Artefact Scatter	<20	Dam	N/A	Valid
37-2-0089	Artefact Scatter	N/A	Ceekline	N/A	Valid
37-2-0362	Artefact Scatter	N/A	Creekline	Koettig (1984)	Valid
37-2-0363	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0364	Artefact Scatter	19	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0365	Artefact Scatter	55	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0366	Artefact Scatter	14	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0367	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0368	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0369	Artefact Scatter	8	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0370	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0376	Artefact Scatter	85	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0377	Artefact Scatter	N/A	Low Slope	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0378	Artefact Scatter	107	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0379	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0380	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0381	Artefact Scatter	35	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0382	Artefact Scatter	N/A	Footslope	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0383	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984).

Sites within Study Area					
Site ID	**Site Type**	**No. of Artefacts**	**Landform**	**Recorder / Date**	**Comment**
37-2-0393	Artefact Scatter	N/A	Creekline	Koettig (1984)	Valid
37-2-0394	Artefact Scatter	N/A	Creekline	Koettig (1984)	Valid
37-2-0396	Artefact Scatter	36	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0397	Artefact Scatter	34	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0398	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0399	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0400	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0401	Artefact Scatter	N/A	Creekline		M.Koettig (1984)
37-2-0402	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0403	Artefact Scatter + PAD	33	Creekline	M.Koettig (1984)	Section 90 granted (c.1984). Assessed as having PAD during this assessment.
37-2-0404	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0405	Artefact Scatter	16	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0406	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0407	Artefact Scatter	N/A	Footslope	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0408	Artefact Scatter	12	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0409	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0410	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0411	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0412	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0413	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0414	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0415	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0416	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0417	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0418	Artefact Scatter + PAD	12	Creekline	M.Koettig (1984)	Section 90 granted (c.1984). Assessed as having PAD during this assessment
37-2-0419	Artefact Scatter	N/A	Creekline	M.Koettig (1984)	Section 90 granted (c.1984) for collection
37-2-0427	Artefact Scatter	N/A	N/A	Koettig (1984)	Valid
37-2-0505	Artefact Scatter	N/A	N/A	Koettig (1984)	Valid
37-2-1923	Artefact Scatter	200	Hillslope	R.Mills (2000)	Valid

Sites within Study Area					
Site ID	**Site Type**	**No. of Artefacts**	**Landform**	**Recorder / Date**	**Comment**
37-2-1928	Artefact Scatter	31	Creekline	R.Mills (2000)	Valid
37-2-1929	Artefact Scatter	4	Sandstone ridge	R.Mills (2000)	Valid
37-2-1930	Artefact Scatter	35	Flat	R.Mills (2000)	Valid
37-2-1931	Artefact Scatter	N/A	N/A	R.Mills (2000)	Valid
37-2-1932	Artefact Scatter	5	N/A	R.Mills (2000)	Valid
37-2-1933	Artefact Scatter	N/A	N/A	R.Mills (2000)	Valid
37-2-1934	Artefact Scatter	21	Spur	R.Mills (2000)	Valid
37-2-1935	Artefact Scatter + PAD	>100	Creekline	R.Mills (2000)	Valid
37-2-1936	Artefact Scatter + PAD	124	Creekline	R.Mills (2000)	Valid
37-2-1937	Artefact Scatter	29	Creekline	R.Mills (2000)	Valid
37-2-1938	Artefact Scatter	96	Creekline	R.Mills (2000)	Valid
37-2-1939	Artefact Scatter	11	Ridgeline	R.Mills (2000)	Valid
37-2-1940	Artefact Scatter	26	Creekline	R.Mills (2000)	Valid
37-2-1942	Artefact Scatter	3	Hillslope	R.Mills (2000)	Valid
37-2-1943	Artefact Scatter + PAD	19 per m²	Creekline	R.Mills (2000)	Valid
37-2-1946	Artefact Scatter + PAD	>100	Terrace	R.Mills (2000)	Valid
37-2-1947	Artefact Scatter	N/A	N/A	R.Mills (2000)	Valid
37-2-1954	Stone Quarry	1	Creekline	R.Mills (2000)	Valid
37-2-1955	Stone Quarry	1	Creekline	R.Mills (2000)	Valid
37-2-1956	Artefact Scatter	N/A	N/A	R.Mills (2000)	Valid
37-2-1957	Artefact Scatter	N/A	N/A	R.Mills (2000)	Valid
37-2-1960	Artefact Scatter	7	Dam	R.Mills (2000)	Valid
37-2-1961	Artefact Scatter	3	Hillslope	R.Mills (2000)	Valid
37-2-1986	Artefact Scatter + PAD	100	Creekline	R.Mills (2000)	Valid
37-2-2035	Artefact Scatter	4	Creekline	R.Mills (2000)	Valid
37-2-2666	Isolated Find	1	Hillslope	N/A	Valid

Appendix D

Survey Coverage

Appendix D Survey Coverage

Transect	Landform	Survey Unit Area (m^2)	Survey Unit Area (ha)	Visibility	Exposure	Effective Coverage Area (m^2)	Effective Coverage Area (ha)	Effective Coverage %
1	Creekline	38500	3.85	90%	100%	34650	3.465	90
1	Hilltop	30800	3.08	90%	100%	27720	2.772	90
1	Lower slope	23100	2.31	90%	100%	20790	2.079	90
1	Mid slope	30800	3.08	10%	20%	616	0.0616	2
1	Upper slope	23100	2.31	90%	100%	20790	2.079	90
2	Creekline	38500	3.85	80%	80%	24640	2.464	64
2	Creekline	616000	61.6	20%	10%	12320	1.232	2
3	Creekline	15400	1.54	80%	80%	9856	0.9856	64
3	Lower slope	61600	6.16	20%	20%	2464	0.2464	4
3	Mid slope	15400	1.54	20%	20%	616	0.0616	4
4	Creekline	38500	3.85	80%	80%	24640	2.464	64
4	Lower slope	277200	27.72	20%	20%	11088	1.1088	4
5	Lower slope	100100	10.01	10%	10%	1001	0.1001	1
5	Creekline	100100	10.01	10%	10%	1001	0.1001	1
5	Upper slope	100100	10.01	10%	10%	1001	0.1001	1
6	Creekline	101640	10.164	80%	80%	65049.6	6.50496	64
6	Hilltop	69300	6.93	20%	20%	2772	0.2772	4
6	Hilltop	69300	6.93	20%	20%	2772	0.2772	4
7	Creekline	84700	8.47	10%	10%	847	0.0847	1
7	Lower slope	84700	8.47	10%	10%	847	0.0847	1
7	Creekline	84700	8.47	10%	10%	847	0.0847	1
7	Upper slope	84700	8.47	10%	10%	847	0.0847	1
8	Hilltop	87934	8.7934	10%	10%	879.34	0.087934	1
8	Lower slope	87934	8.7934	10%	10%	879.34	0.087934	1
8	Hilltop	87934	8.7934	10%	10%	879.34	0.087934	1
8	Upper slope	87934	8.7934	10%	10%	879.34	0.087934	1
9	Creekline	360800	36.08	80%	80%	230912	23.0912	64
10	Hilltop	63712	6.3712	20%	20%	2548.48	0.254848	4
10	Lower slope	221408	22.1408	10%	10%	2214.08	0.221408	1
10	Creekline	176000	17.6	10%	10%	1760	0.176	1
10	Upper slope	176000	17.6	10%	10%	1760	0.176	1
11	Creekline	157520	15.752	80%	90%	113414.4	11.34144	72
12	Lower slope	192104	19.2104	10%	10%	1921.04	0.192104	1
12	Creekline	192104	19.2104	10%	10%	1921.04	0.192104	1
12	Upper slope	192104	19.2104	20%	20%	7684.16	0.768416	4
13	Creekline	52800	5.28	10%	20%	1056	0.1056	2
13	Hilltop	32560	3.256	20%	20%	1302.4	0.13024	4
13	Lower slope	96800	9.68	10%	10%	968	0.0968	1
13	Creekline	88000	8.8	10%	10%	880	0.088	1
13	Upper slope	79200	7.92	10%	10%	792	0.0792	1
14	Flat	96800	9.68	10%	20%	1936	0.1936	2
15	Lower slope	352000	35.2	20%	30%	21120	2.112	6
15	Mid slope	323840	32.384	20%	30%	19430.4	1.94304	6
16	Creekline	880000	88	30%	30%	79200	7.92	9
17	Creekline	192720	19.272	80%	80%	123340.8	12.33408	64
17	Creekline	440000	44	20%	20%	17600	1.76	4

Transect	Landform	Survey Unit Area (m^2)	Survey Unit Area (ha)	Visibility	Exposure	Effective Coverage Area (m^2)	Effective Coverage Area (ha)	Effective Coverage %
18	Creekline	154880	15.488	80%	80%	99123.2	9.91232	64
18	Hilltop	176000	17.6	20%	20%	7040	0.704	4
19	Flat	131120	13.112	80%	80%	83916.8	8.39168	64
20	Creekline	101200	10.12	80%	80%	64768	6.4768	64
21	Creekline	175120	17.512	80%	80%	112076.8	11.20768	64
22	Creekline	168080	16.808	80%	80%	107571.2	10.75712	64
23	Hilltop	183920	18.392	20%	10%	3678.4	0.36784	2
24	Creekline	73040	7.304	80%	80%	46745.6	4.67456	64
25	Creekline	255200	25.52	20%	20%	10208	1.0208	4
26	Hilltop	48400	4.84	10%	20%	968	0.0968	2
26	Lower slope	96800	9.68	10%	10%	968	0.0968	1
26	Creekline	123200	12.32	10%	10%	1232	0.1232	1
26	Upper slope	105600	10.56	10%	10%	1056	0.1056	1
27	Hilltop	82720	8.272	20%	20%	3308.8	0.33088	4
27	Lower slope	205304	20.5304	10%	10%	2053.04	0.205304	1
27	Mid slope	205304	20.5304	10%	10%	2053.04	0.205304	1
27	Upper slope	205304	20.5304	10%	10%	2053.04	0.205304	1
28	Creekline	26400	2.64	80%	80%	16896	1.6896	64
28	Hilltop	35200	3.52	20%	10%	704	0.0704	2
28	Lower slope	35200	3.52	10%	10%	352	0.0352	1
28	Mid slope	35200	3.52	10%	10%	352	0.0352	1
28	Upper slope	35200	3.52	10%	10%	352	0.0352	1
29	Creekline	88000	8.8	80%	80%	56320	5.632	64
29	Hilltop	96800	9.68	30%	20%	5808	0.5808	6
29	Lower slope	123200	12.32	10%	10%	1232	0.1232	1
29	Mid slope	132000	13.2	10%	10%	1320	0.132	1
29	Upper slope	123200	12.32	10%	10%	1232	0.1232	1
30	Creekline	55440	5.544	80%	80%	35481.6	3.54816	64
30	Hilltop	79200	7.92	10%	20%	1584	0.1584	2
30	Lower slope	70400	7.04	10%	10%	704	0.0704	1
30	Mid slope	105600	10.56	10%	10%	1056	0.1056	1
30	Upper slope	96800	9.68	10%	10%	968	0.0968	1
31	Creekline	274560	27.456	80%	80%	175718.4	17.57184	64
32	Creekline	142560	14.256	80%	80%	91238.4	9.12384	64
32	Flat	142560	14.256	15%	20%	4276.8	0.42768	3
33	Creekline	280896	28.0896	10%	10%	2808.96	0.280896	1
33	Lower slope	140448	14.0448	10%	10%	1404.48	0.140448	1
33	Creekline	140448	14.0448	10%	10%	1404.48	0.140448	1
33	Upper slope	140448	14.0448	10%	10%	1404.48	0.140448	1
34	Creekline	733920	73.392	80%	80%	469708.8	46.97088	64
35	Mid slope	158400	15.84	20%	20%	6336	0.6336	4
36	Lower slope	63360	6.336	40%	40%	10137.6	1.01376	16
36	Mid slope	52800	5.28	40%	50%	10560	1.056	20
36	Upper slope	52800	5.28	40%	50%	10560	1.056	20
37	Creekline	27896	2.7896	50%	60%	8368.8	0.83688	30
37	Lower slope	27896	2.7896	50%	60%	8368.8	0.83688	30

Transect	Landform	Survey Unit Area (m^2)	Survey Unit Area (ha)	Visibility	Exposure	Effective Coverage Area (m^2)	Effective Coverage Area (ha)	Effective Coverage %
37	Mid slope	27896	2.7896	30%	10%	836.88	0.083688	3
37	Upper slope	27896	2.7896	50%	60%	8368.8	0.83688	30
38	Mid slope	147840	14.784	10%	10%	1478.4	0.14784	1
39	Mid slope	8800	0.88	10%	10%	88	0.0088	1
40	Flat	235840	23.584	20%	20%	9433.6	0.94336	4
40	Hilltop	58960	5.896	20%	20%	2358.4	0.23584	4
40	Lower slope	117920	11.792	20%	20%	4716.8	0.47168	4
40	Mid slope	117920	11.792	20%	20%	4716.8	0.47168	4
40	Upper slope	58960	5.896	20%	20%	2358.4	0.23584	4
41	Flat	33000	3.3	20%	20%	1320	0.132	4
41	Mid slope	26400	2.64	20%	20%	1056	0.1056	4
42	Flat	285472	28.5472	20%	20%	11418.88	1.141888	4
42	Hilltop	71280	7.128	20%	20%	2851.2	0.28512	4
42	Lower slope	142736	14.2736	20%	20%	5709.44	0.570944	4
42	Creekline	142736	14.2736	20%	20%	5709.44	0.570944	4
42	Upper slope	71280	7.128	20%	20%	2851.2	0.28512	4
43	Flat	144320	14.432	10%	10%	1443.2	0.14432	1
43	Hilltop	36080	3.608	10%	10%	360.8	0.03608	1
43	Lower slope	72160	7.216	10%	10%	721.6	0.07216	1
43	Mid slope	72160	7.216	10%	10%	721.6	0.07216	1
43	Upper slope	36080	3.608	10%	10%	360.8	0.03608	1
44	Flat	93280	9.328	10%	10%	932.8	0.09328	1
44	Hilltop	93280	9.328	10%	10%	932.8	0.09328	1
44	Lower slope	93280	9.328	10%	10%	932.8	0.09328	1
44	Mid slope	93280	9.328	10%	10%	932.8	0.09328	1
44	Upper slope	93280	9.328	10%	10%	932.8	0.09328	1
45	Hilltop	61500	6.15	40%	40%	9840	0.984	16
45	Lower slope	123000	12.3	20%	20%	4920	0.492	4
45	Mid slope	123000	12.3	20%	20%	4920	0.492	4
45	Upper slope	123000	12.3	20%	20%	4920	0.492	4
45	Creekline	61500	6.15	60%	60%	22140	2.214	36
46	Hilltop	59512.5	5.95125	40%	40%	9522	0.9522	16
46	Lower slope	59512.5	5.95125	20%	40%	4761	0.4761	8
46	Mid slope	119025	11.9025	20%	20%	4761	0.4761	4
46	Upper slope	119025	11.9025	20%	20%	4761	0.4761	4
46	Creekline	59512.5	5.95125	20%	20%	2380.5	0.23805	4
46	Creekline	59512.5	5.95125	20%	20%	2380.5	0.23805	4

Appendix E

Aboriginal Archaeological Site Descriptions

Appendix E Aboriginal Archaeological Site Descriptions

Site ID	Type	Number of Artefacts	MGA E	MGA N	Scientific Significance	Comment	Site Description
DS-C1	Artefact Scatter	13	294505	6411304	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-C1 is an open artefact scatter that extends approximately 150 m along the southern bank of Saddlers Creek. Artefacts were exposed as a result of sheet erosion. A total of 13 artefacts were identified consisting of indurated mudstone/tuff and chert flakes and a core. The site includes AHIMS sites 37-2-0387 and 37-2-0386.
DS-C2	Artefact Scatter	29	294351	6410754	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-C2 is an open artefact scatter that extends over 200 m along the banks of a feeder creek of Saddlers Creek. Artefacts were exposed as a result of sheet erosion. A total of 29 artefacts were identified consisting of indurated mudstone/tuff, silcrete and chert flakes. Site includes AHIMS sites 37-2-0393, 37-2-0394.
DS-C3	Artefact Scatter	332	295326	6411061	Moderate	Common site type. Relatively high number of artefacts. Moderate site integrity.	DS-C3 is an open extensive artefact scatter that extends over 1 km along both banks of a feeder creek of Saddlers Creek. Artefacts were exposed as a result of sheet erosion. A total of 332 artefacts were identified consisting of indurated mudstone/tuff silcrete, chert, and quartz flakes and cores. Site includes AHIMS sites 37-2-0053, 37-2-0006, 37-2-0004, 37-2-0393, 37-2-0394, 37-2-0362, 37-2-0076, 37-2-0363, 37-2-0364, 37-2-0365, 37-2-0366 and 37-2-0382.
DS-C4	Artefact Scatter	185	295673	6410303	Moderate	One moderately rare item (axe head). Limited research potential. Moderate site integrity.	DS-C4 is an extensive artefact scatter that extends over 500 m along both banks of a feeder creek of Saddlers Creek both sides of Edderton Road. Artefacts were exposed as a result of sheet erosion. A total of 185 artefacts were identified consisting of indurated mudstone/tuff and silcrete flakes and a basalt axe. Site includes AHIMS sites 37-2-0381, 37-2-0380, 37-2-0367, and 37-2-0368.
DS-C5	Artefact Scatter	114	295604	6409754	Moderate	Two moderately rare items including a hammerstone and edge-ground axe head. Limited research potential. Moderate site integrity.	DS-C5 is an artefact scatter that extends over 500 m along both banks of a feeder creek of Saddlers Creek. Artefacts were exposed as a result of sheet erosion. A total of 114 artefacts were identified consisting of indurated mudstone/tuff, chert, silcrete flakes, a silcrete scraper, a basalt hammerstone and edge-ground axe. Site includes AHIMS sites 37-2-0369, 37-2-0379, 37-2-0370, 37-2-0075, 37-2-0376 and 37-2-0378.
DS-C6	Artefact Scatter	70	295826	6409128	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-C6 is an artefact scatter that extends over 700 m along both banks of a feeder creek of Saddlers Creek. Artefacts were exposed as a result of sheet erosion. A total of 70 artefacts were identified consisting of indurated mudstone/tuff, chert and silcrete flakes. Site includes AHIMS sites 37-2-0371, 37-2-0372, and 37-2-0373.

DS-C7	Artefact Scatter + PAD	156	296391	6411293	Moderate	Common site type. No rare artefacts. Some research potential due to likely archaeological deposit, as identified by Mills (2000). Moderate site integrity.	DS-C7 is an artefact scatter with PAD that extends 700 m along both banks of a feeder creek of Saddlers Creek. Artefacts were exposed as a result of sheet erosion. A total of 156 artefacts were identified consisting of indurated mudstone, chert, and silcrete flakes. Site includes AHIMS sites 37-2-0397, 37-2-1936, and 37-2-0073.
DS-C8	Artefact Scatter + PAD	981	297494	6410390	High	Artefact scatter site (DS-C8) is considered as highly significant due to the identification of two non-ground edge stone axes, large artefact count (n=981), which is considerably higher than other sites within the Study area, and high potential for archaeological deposit. Based on the combination of these elements this site is considered to have potential to answer research questions related to subsistence patterning and the organisation of technology within the Study area.	DS-C8 is an extensive artefact scatter with PAD that extends over 2 km along both banks of a feeder creek of Saddlers Creek. Artefacts were exposed as a result of sheet erosion. A total of 981 were identified consisting of indurated mudstone, silcrete, chert, quartz flakes and tools. In addition, two basalt axes were recorded. Site includes AHIMS sites 37-2-1943, 37-2-0399, 37-2-0400, 37-2-0402, 37-2-0403, 37-2-0404, 37-2-1928, 37-2-0405, 37-2-0406, and 37-2-0407.
DS-C9	Artefact Scatter	3	296844	6408947	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-C9 is a low-density artefact scatter located on the east side of the feeder creek of Saddlers Creek. Artefacts consisted of chert flakes. Site includes AHIMS sites 37-2-1923, and 37-2-1960.
DS-C10	Artefact Scatter	N/A	296961	6408820	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-C10 is a previously artefact scatter. No artefacts were identified during the current assessment. Site includes AHIMS sites 37-2-2035, and 37-2-1961.
DS-C11	Artefact Scatter	200	298211	6411041	Moderate	One moderately rare item (axe head). Limited research potential. Moderate site integrity.	DS-C11is an artefact scatter that extends over 600 focused on a confluence of two feeder creeks of Saddlers Creek. Artefacts were exposed as a result of sheet erosion. A total of 200 artefacts were identified consisting of indurated mudstone and chert flakes, and one basalt axe. Site includes AHIMS sites 37-2-0078 and 37-2-0409.
DS-C12	Artefact Scatter	85	297789	6412557	Moderate	One moderately rare item (axe head). Limited research potential. Moderate site integrity.	DS-C12 is an artefact scatter that extends over 400 metres along both banks of a feeder creek of Saddlers Creek. A total of 85 artefacts consisting of indurated mudstone, silcrete, chert, and quartz flakes and cores. Site includes AHIMS sites 37-2-0411, 37-2-0417, 37-2-0412, 37-2-0078 and 37-2-0409.

DS-C13	Artefact Scatter + PAD	211	299015	6412142	Moderate	Common site type. Some research potential due to likely archaeological deposit. Relatively high artefact count. Moderate site integrity.	DS-C13 is an extensive artefact scatter with PAD that extends over 2 km along both banks of a feeder creek of Saddlers Creek. A total of 211 artefacts were identified consisting of indurated mudstone, silcrete, and chert flakes and cores. In addition, a basalt axe was recorded. Site includes AHIMS sites 37-2-1937, 37-2-0415, 37-2-0411, 37-2-0412, 37-2-1946, 37-2-0413, 37-2-0414, 37-2-0417, 37-2-0078, 37-2-0409 and 37-2-1935.
DS-C14	Artefact Scatter + PAD	157	297932	6412066	Moderate	Common site type. No rare artefacts. Some research potential due to likely archaeological deposit. Moderate site integrity.	DS-C14 is an artefact scatter with PAD that extends over 400 m along the eastern bank of a feeder creek of Saddlers Creek. . A total of 157 artefacts were identified consisting of indurated mudstone, chert, and silcrete flakes. Site includes AHIMS sites 37-2-0410 and 37-2-1986
DS-C15	Artefact Scatter + PAD	106	299665	6410642	Moderate	Common site type. No rare artefacts. Artefact numbers comparatively high. Some potential for deposit. Moderate site integrity.	DS-C15 is an artefact scatter with PAD that extends 300 m along a feeder creek of Saltwater Creek. A total of 106 artefacts were identified consisting of indurated mudstone/tuff, chert, silcrete and quartz flakes and retouched flakes. Site includes AHIMS sites 37-2-0419, 37-2-0418 and 37-2-1936.
DS-C16	Artefact Scatter + PAD	24	301839	6414007	Moderate	Common site type. No rare artefacts. Some research potential due to likely archaeological deposit, as identified by Mills (2000). Moderate site integrity.	DS-C16 is a small artefact scatter with PAD that extends over 200 m on the western bank of a feeder creek of Saltwater Creek. A total of 24 artefacts were identified consisting of indurated mudstone/tuff, chert silcrete and porcellanite flakes and retouched flakes.
DS-C17	Artefact Scatter	N/A	295589	6411481	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-C17 is a previously artefact scatter. No artefacts were identified during the current assessment. Site includes AHIMS sites 37-2-0396, 37-2-0369.
DS-C18	Artefact Scatter	21	293132	6411267	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-C18 is a small artefact scatter that extends over 500 m along both banks of Saddlers Creek on the Bowfield property. A total of 80 artefacts were identified consisting of indurated mudstone/tuff, silcrete and chert flakes and cores were recorded. Site includes AHIMS sites 37-2-0470 and 37-2-0440.
DS-C19	Artefact Scatter	80	294953	6411467	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-C19 is an artefact scatter that extends over 500 m on the southern bank of Saddlers Creek. A total of 80 artefacts consisting of indurated mudstone/tuff, silcrete, chert and chalcedony flakes and cores were recorded. Site includes AHIMS sites 37-2-0384, 37-2-0425 and 37-2-0385.
DS-IF1-11	Isolated Find	1	294259	6410556	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF1-11 is an isolated find located west of the current alignment of Edderton Road on the western bank of a 2nd order tributary of Saddlers Creek. The recorded artefact was a single quartz flake.

DS-IF2-11	Isolated Find	1	294726	6410597	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF2-11 is an isolated find located on the upper slope of a hill on the Bowfield property west of the current alignment of Edderton Road. The recorded artefact was a single mudstone broken flake.
DS-IF3-11	Isolated Find	1	295466	6411564	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF3-11 is an isolated find located approximately 120 m from a tributary of Saddlers Creek on the Bowfield property west of the current alignment of Edderton Road. The recorded artefact was a silcrete flake.
DS-IF4-11	Isolated Find	1	295244	6410852	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF4-11 is an isolated find located on a lower slope adjacent to a tributary of Saddlers Creek west of the current alignment of Edderton Road. The recorded artefact was a single mudstone flake.
DS-IF5-11	Isolated Find	1	295343	6409301	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF5-11 is an isolated find located on a tributary of Saddlers Creek on the Bowfield property west of the current alignment of Edderton Road. The recorded artefact was a single mudstone flake.
DS-IF6-11	Isolated Find	1	295567	6408977	Moderate	One moderately rare item (axe head). Limited research potential. Moderate site integrity.	DS-IF6-11 is an isolated find located on the upper slope of a hill on the Bowfield property west of the current alignment of Edderton Road. The recorded artefact consisted of a large non-ground basalt axe.
DS-IF7-11	Isolated Find	1	295575	6408819	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF7-11 is an isolated find located on a dirt vehicle track on a hill west of the current alignment of Edderton Road. The recorded artefact was a single mudstone flake.
DS-IF8-11	Isolated Find	1	296128	6411034	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF8-11 is an isolated artefact located on a mid slope east of the current alignment of Edderton Road. The recorded artefact was a single silcrete core.
DS-IF9-11	Isolated Find	1	296345	6411822	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF9-11 is an isolated artefact located on a flat east of the current alignment of Edderton Road. The recorded artefact was a single mudstone flake.
DS-IF10-11	Isolated Find	1	296635	6410961	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF10-11 is an isolated artefact located 120 m from an ephemeral tributary of Saddlers Creek on a low slope east of the current alignment of Edderton Road. The recorded artefact was a single silcrete flake.
DS-IF11-11	Isolated Find	1	296813	6410660	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF11-11 is an isolated artefact located on a dirt vehicle track on a low slope east of the current alignment of Edderton Road. The recorded artefact was a single mudstone flake.

DS-IF12-11	Isolated Find	1	296469	6410194	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF12-11 is an isolated artefact located on an exposure adjacent to a dam on an ephemeral tributary of Saddlers Creek. The site is located approximately 600 m east of the current alignment of Edderton Road. The recorded artefact was a single mudstone flaked piece.
DS-IF13-11	Isolated Find	1	296438	6409410	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF13-11 is an isolated artefact located on the mid slope of a hill approximately 400 east of the current alignment of Edderton Road. The recorded artefact was a single chert flake.
DS-IF14-11	Isolated Find	1	296149	6409194	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF14-11 is an isolated artefact located on the low slope of a hill approximately 130 east of the current alignment of Edderton Road. The recorded artefact was a single chert flake.
DS-IF15-11	Isolated Find	1	296783	6408569	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF15-11 is an isolated artefact located on a dirt vehicle track on a hill approximately 800 east of the current alignment of Edderton Road. The recorded artefact was a single flaked piece.
DS-IF16-11	Isolated Find	1	296762	6409107	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF16-11 is an isolated artefact located on an ephemeral tributary of Saddlers Creek approximately 700 m east of Edderton Road. The recorded artefact consists of a single mudstone broken flake.
DS-IF17-11	Isolated Find	1	297281	6408725	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF17-11 is an isolated artefact located on a dirt vehicle track on a broad ridge approximately 1.2 km east of Edderton Road. The recorded artefact consists of a single chert retouched flake.
DS-IF18-11	Isolated Find	1	298490	6408122	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF18-11 is an isolated artefact located adjacent to an ephemeral feeder creek of the Hunter River 1 km north of the Golden Highway. The recorded artefact consists of a single mudstone broken flake.
DS-IF19-11	Isolated Find	1	298007	6409991	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF19-11 is an isolated artefact located on a midslope approximately 70 m from a dam 2 km west of Edderton Road. The recorded artefact consists of a single chert flake.
DS-IF20-11	Isolated Find	1	298055	6409818	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF20-11 is an isolated artefact located on a dirt vehicle track on a broad crest approximately 2 km east of the current alignment of Edderton Road. The recorded artefact consists of a single mudstone flake.
DS-IF21-11	Isolated Find	1	298266	6409457	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF21-11 is an isolated artefact located on an exposure between two ephemeral creeklines approximately 2 km east of the current alignment of Edderton Road. The recorded artefact consists of a single silcrete broken flake.

DS-IF22-11	Isolated Find	1	298494	6410484	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF22-11 is an isolated artefact located on a crest approximately 2.5 km east of Edderton Road. The recorded artefact consists of a single mudstone flake.
DS-IF23-11	Isolated Find	1	298711	6410535	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF23-11 is an isolated artefact located on a ridge approximately 3 km east of Edderton Road. The recorded artefact consists of a single mudstone flaked piece.
DS-IF24-11	Isolated Find	1	298247	6410707	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF24-11 is an isolated artefact located on an upper slope of a moderate hill 2.5 km east of Edderton Road. The recorded artefact was a single silcrete flaked piece.
DS-IF25-11	Isolated Find	1	298463	6410904	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF25-11 is an isolated artefact located on the northern side of a 1st order ephemeral drainage line feeding Saddlers Creek. The site is located approximately 3km east of Edderton Road. The recorded artefact consists of a single mudstone flaked piece.
DS-IF26-11	Isolated Find	1	297982	6411419	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF26-11 is an isolated artefact located on the eastern side of a 2nd order ephemeral drainage line feeding Saddlers Creek. The site is located approximately 2.5km east of the current alignment of Edderton Road. The recorded artefact consists of a single mudstone flake.
DS-IF27-11	Isolated Find	1	297075	6411447	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF27-11 is an isolated artefact located on a broad ridgeline approximately 1.5 km east of the current alignment of Edderton Road. The recorded artefact consists of a single mudstone flake.
DS-IF28-11	Isolated Find	1	297337	6411497	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF28-11 is an isolated artefact located on a broad ridgeline approximately 1.5 km east of the current alignment of Edderton Road. The recorded artefact consists of a single silcrete flake.
DS-IF29-11	Isolated Find	1	297474	6411417	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF29-11 is an isolated artefact located on a broad ridgeline approximately 2 km east of the current alignment of Edderton Road. The recorded artefact consists of a single mudstone flaked piece.
DS-IF30-11	Isolated Find	1	297134	6411870	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF30-11 is an isolated artefact located on a low slope approximately 1.5km east of the current alignment of Edderton Road. The recorded artefact consists of a single silcrete flake.
DS-IF31-11	Isolated Find	1	297904	6412393	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF31-11 is an isolated artefact located on a flat adjacent to an ephemeral creekline feeding Saddlers Creek. The site is located approximately 2.5km east of Edderton Road. The recorded artefact consists of a single mudstone flake.

DS-IF32-11	Isolated Find	1	298229	6411818	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF32-11 is an isolated artefact located on a low slope approximately 2 km east of the current alignment of Edderton Road. The recorded artefact consists of a single mudstone broken flake.
DS-IF33-11	Isolated Find	1	298398	6412148	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF33-11 is an isolated artefact located on a flat approximately 3 km east of Edderton Road. The recorded artefact consists of a single silcrete flake.
DS-IF34-11	Isolated Find	1	298928	6412315	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF34-11 is an isolated artefact located on a flat approximately 3.5 km east of Edderton Road. The recorded artefact consists of a single silcrete flake.
DS-IF35-11	Isolated Find	1	299574	6412781	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF35-11 is an isolated artefact located on northern bank of a 2nd order feeder creek of Saddlers Creek. The site is approximately 4 km east of Edderton Road. The recorded artefact consists of a single mudstone flake.
DS-IF36-11	Isolated Find	1	299532	6412377	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF36-11 is an isolated artefact located on the northern bank of a 1st order ephemeral feeder creek of Saddlers Creek. The site is approximately 4 km east of Edderton Road. The recorded artefact consists of a single mudstone scraper.
DS-IF37-11	Isolated Find	1	299793	6412098	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF37-11 is an isolated artefact located on the midslope of a hill approximately 4 km west of Edderton Road. The recorded artefact consists of a single silcrete flake.
DS-IF38-11	Isolated Find	1	300098	6412248	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF38-11 is an isolated artefact located on a 1st order feeder creek of Saddlers Creek approximately 4.5 km east of Edderton Road. The recorded artefact consists of a single mudstone core.
DS-IF39-11	Isolated Find	1	299468	6411690	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF39-11 is an isolated artefact located on an upper slope approximately 4 km east of Edderton Road. The recorded artefact consists of a single mudstone flaked piece.
DS-IF40-11	Isolated Find	1	299699	6411712	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF40-11 is an isolated artefact located on the eastern bank of an ephemeral feeder creek of Saddlers Creek approximately 4.5 km east of Edderton Road. The recorded artefact consists of a single quartz broken flake.
DS-IF41-11	Isolated Find	1	299822	6411745	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF41-11 is an isolated artefact located on an upper slope approximately 4.5 km east of Edderton Road. The recorded artefact consists of a single silcrete flake.
DS-IF42-11	Isolated Find	1	300105	6411330	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF42-11 is an isolated artefact located on a ridge approximately 4.5 km east of Edderton Road. The recorded artefact consists of a single mudstone core.

DS-IF43-11	Isolated Find	1	300049	6411200	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF43-11 is an isolated artefact located on a ridge approximately 4.5 km east of Edderton Road. The recorded artefact consists of a single mudstone flake.
DS-IF44-11	Isolated Find	1	299059	6410865	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF44-11 is an isolated artefact located on the headwater of a 1st order ephemeral drainage line of Saddlers Creek approximately 3.5 km east of Edderton Road. The recorded artefact consists of a single mudstone broken flake.
DS-IF45-11	Isolated Find	1	299391	6410911	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF45-11 is an isolated artefact located on a dirt vehicle track on an upper slope approximately 4 km east of Edderton Road. The recorded artefact consists of a single mudstone broken flake.
DS-IF46-11	Isolated Find	1	300100	6409734	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF46-11 is an isolated artefact located on a 1st order ephemeral creekline feeding Saltwater Creek approximately 4 km east of Edderton Road. The recorded artefact consists of a single chert broken flake.
DS-IF47-11	Isolated Find	1	300498	6411453	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF47-11 is an isolated artefact located on a steep ephemeral creekline feeding Saltwater Creek approximately 4.5 km east of Edderton Road. The recorded artefact consists of a single mudstone flaked piece.
DS-IF48-11	Isolated Find	1	300471	6411898	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF48-11 is an isolated artefact located on a steep ephemeral creekline feeding Saltwater Creek approximately 4.5 km east of Edderton Road. The recorded artefact consists of a single mudstone core.
DS-IF49-11	Isolated Find	1	300630	6412771	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF49-11 is an isolated artefact located on an upper slope approximately 4.5 km east of Edderton Road. The recorded artefact consists of a single mudstone flake.
DS-IF50-11	Isolated Find	1	300797	6412767	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF50-11 is an isolated artefact located on a 1st order ephemeral creekline feeding Saltwater Creek approximately 4.5 km east of Edderton Road. The recorded artefact consists of a single mudstone flaked piece.
DS-IF51-11	Isolated Find	1	301169	6413214	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF51-11 is an isolated artefact located on a dirt vehicle traversing a ridgeline approximately 5.5 east of Edderton Road. The recorded artefact consists of a single silcrete broken flake.
DS-IF52-11	Isolated Find	1	301277	6413247	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF52-11 is an isolated artefact located on a dirt vehicle traversing a ridgeline approximately 5.5 east of Edderton Road. The recorded artefact consists of a single mudstone flaked piece.
DS-IF53-11	Isolated Find	1	301558	6414107	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF53-11 is an isolated artefact located on a mid slope approximately 6 km east of Edderton Road. The recorded artefact consists of a single mudstone flake.

DS-IF54-11	Isolated Find	1	291795	6409956	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF54-11 is an isolated artefact located on a flat adjacent to a feeder creek of Saddlers Creek approximately 500 m north of the Golden Highway. The recorded artefact consists of a single mudstone broken flake.
DS-IF55-11	Isolated Find	1	292694	6411907	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF55-11 is an isolated artefact located on a low slope approximately 3 km west of Edderton Road. The recorded artefact consists of a single chert broken flake.
DS-IF56-11	Isolated Find	1	292318	6411550	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF56-11 is an isolated artefact located on a mid slope approximately 3 km west of Edderton Road. The recorded artefact consists of single volcanic core.
DS-IF57-11	Isolated Find	1	291858	6410205	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF57-11 is an isolated artefact located on a flat approximately 700 m north of the Golden Highway. The recorded artefact consists of a single silcrete flake.
DS-IF58-11	Isolated Find	1	294490	6413779	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-IF58-11 is an isolated artefact located on flat approximately 2.5 km east of Edderton Road. The recorded artefact consists of a single mudstone broken flake.
DS-QR1-11	Stone Quarry	260	292596	6411360	High	Sites assessed as highly significant due to rareness & research potential	DS-QR1-11 is an Aboriginal stone quarry site located on the Bowfield property approximately 3 km west of Edderton Road. The site is located on a low slope and adjacent to a confluence of creeklines associated with Saddlers Creek. Artefactual material was found over a 400 x 400 m area amongst an outcrop of natural silcrete cobbles.
DS-AS1-11	Artefact Scatter	2	294363	6410434	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS1-11 is an artefact scatter located on the eroding bank of a 2nd order creekline approximately 1.5 km west of Edderton Road. The scatter consists of 1xMF and 1xMBF.
DS-AS2-11	Artefact Scatter	29	294305	6410209	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS2-11 is an artefact scatter located on a 2nd order feeder creek of Saddlers Creek approximately 1.5 west of Edderton Road. The scatter consists of 29 stone artefacts comprising mudstone and chert flakes and a core.
DS-AS3-11	Artefact Scatter	4	294816	6410138	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS3-11 is an artefact scatter located along the banks of a 1st order feeder creek of Saddlers Creek approximately 1 km west of Edderton Road. The scatter consists of 4 stone artefacts comprising flakes of mudstone and silcrete.
DS-AS4-11	Artefact Scatter	2	294906	6410248	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS4-11 is an artefact scatter located on a hilltop/crest approximately 1 km west of Edderton Road. The scatter consists of 2 mudstone flaked pieces.

DS-AS5-11	Artefact Scatter	3	294696	6410369	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS5-11 is an artefact scatter located on and upper slope approximately 1.5 km west of Edderton Road. The scatter consists of 3 stone artefacts comprising mudstone and silcrete flakes and broken flakes.
DS-AS6-11	Artefact Scatter	3	294596	6410729	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS6-11 is an artefact scatter located on a low slope approximately 1 km east of Edderton Road. The scatter consists of 3 mudstone flakes.
DS-AS7-11	Artefact Scatter	3	294572	6410899	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS7-11 is an artefact scatter located on a flat approximately 1 km west of Edderton Road. The scatter consists of 3 stone artefacts comprising 2 mudstone flakes and 1 silcrete flake.
DS-AS8-11	Artefact Scatter	6	294618	6411002	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS8-11 is an artefact scatter located on a flat approximately 1 km west of Edderton Road. The scatter consists of 6 mudstone and chert flakes and flaked pieces.
DS-AS9-11	Artefact Scatter	3	292116	6410612	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS9-11 is an artefact scatter located on the southern bank of feeder creek of Saddlers Creek approximately 1.2 km north of the Golden Highway on the Bowfield Property. The scatter consists of 3 stone artefacts comprising chert and silcrete flakes and broken flakes.
DS-AS10-11	Artefact Scatter	12	292285	6411343	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS10-11 is an artefact scatter located on a low slope adjacent to quarry site DS-QR1-11 approximately 3 km west of Edderton Road. The scatter consists of 1 silcrete flake and 1 core.
DS-AS11-11	Artefact Scatter	2	295067	6410466	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS11-11 is an artefact scatter located on a low slope approximately 600 m west of Edderton Road. The scatter consists of 1 silcrete broken flake and 1 mudstone flaked piece.
DS-AS12-11	Artefact Scatter	6	295198	6410432	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS12-11 is an artefact scatter located on a low slope and flat approximately 500 west of Edderton Road. The scatter consists of 6 stone artefacts comprising mudstone and silcrete flakes and flaked pieces.
DS-AS13-11	Artefact Scatter	4	295528	6410124	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS13-11 is an artefact scatter located on a dirt vehicle track/low slope approximately 250 west of Edderton Road. The scatter consists of 4 mudstone and chert flakes.
DS-AS14-11	Artefact Scatter	7	295355	6408882	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS14-11 is an artefact scatter located on a dirt track/upper slope adjacent to the Golden Highway on the Bowfield property. The scatter consists of 7 stone artefacts comprising mudstone, silcrete, chert flaked pieces, flakes and one backed artefact.

DS-AS15-11	Artefact Scatter	3	292213	6410820	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS15-11 is an artefact scatter located on the northern bank of a feeder creek of Saddlers Creek. The scatter consists of 3 silcrete and chert flakes.
DS-AS16-11	Artefact Scatter	2	295869	6410882	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS16-11 is an artefact scatter located on dirt vehicle track/upper slope approximately 300 m east of Edderton Road. The scatter consists of 1 silcrete core and 1 quartz flaked piece.
DS-AS17-11	Artefact Scatter	2	296004	6411051	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS17-11 is an artefact scatter located on a contour bank/low slope approximately 500 m, east of Edderton Road. The scatter consists of 1 mudstone flake and 1 flaked piece.
DS-AS18-11	Artefact Scatter	12	295865	6411434	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS18-11 is an artefact scatter located on the southern bank of feeder creek of Saddlers Creek approximately 400 m east of Edderton Road. The scatter consists of 12 stone artefacts comprising silcrete cores, flakes and flaked pieces.
DS-AS19-11	Artefact Scatter	4	295851	6411773	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS19-11 is an artefact scatter located on a dirt vehicle track/flat approximately 300 m east of Edderton Road. The scatter consists of 4 silcrete flakes.
DS-AS20-11	Artefact Scatter	4	296044	6411757	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS20-11 is an artefact scatter located on a dirt vehicle track/flat approximately 500 m east of Edderton Road. The scatter consists of 4 stone artefacts.
DS-AS21-11	Artefact Scatter	23	292570	6411704	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS21-11 is an artefact scatter located on a low slope adjacent to quarry site DS-QR1-11 approximately 3 km west of Edderton Road. The scatter consists of 23 stone artefacts comprising mudstone, chert and silcrete flakes, flaked pieces and a core.
DS-AS22-11	Artefact Scatter	5	295914	6411965	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS22-11 is an artefact scatter located on a flat adjacent to Saddlers Creek approximately 350 east of Edderton Road. The scatter consists of 5 stone artefacts.
DS-AS23-11	Artefact Scatter	2	296497	6411650	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS23-11 is an artefact scatter located on a low slope approximately 1 km east of Edderton Road. The scatter consists of 2 stone artefacts.
DS-AS24-11	Artefact Scatter	15	296763	6411501	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS24-11 is an artefact scatter located on the northern bank of a 1st order feeder creek of Saddlers Creek. The scatter consists of 15 stone artefacts comprising mudstone and silcrete flakes and flaked pieces.
DS-AS25-11	Artefact Scatter	36	296824	6411321	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS25-11 is an artefact scatter located adjacent to the confluence two 1st order feeder creeks of Saddlers Creek. The scatter consists of 36 stone artefacts comprising mudstone and silcrete flakes, flaked pieces and broken flakes.

DS-AS26-11	Artefact Scatter	3	296719	6411061	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS26-11 is an artefact scatter located on the southern bank of a 1st order feeder creek of Saddlers Creek. The scatter consists of 3 mudstone flakes and flaked pieces.
DS-AS27-11	Artefact Scatter	4	296871	6410958	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS27-11 is an artefact scatter located on a 1st order ephemeral creekline of Saddlers Creek approximately 1.3 km east of Edderton Road. The scatter consists of 4 silcrete and mudstone flakes.
DS-AS28-11	Artefact Scatter	2	296315	6410289	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS28-11 is an artefact scatter located on the northern bank of a feeder creek of Saddlers Creek approximately 500 east of Saddlers Creek. The scatter consists of 2 mudstone flakes.
DS-AS29-11	Artefact Scatter	3	296574	6409844	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS29-11 is an artefact scatter located on flat approximately 800 m east of Edderton Road. The scatter consists of 3 mudstone flakes and flaked pieces.
DS-AS30-11	Artefact Scatter	16	296640	6409660	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS30-11 is an artefact scatter located on the western bank of a 1st order feeder creek of Saddlers Creek approximately 700 m east of Saddlers Creek. The scatter consists of 16 stone artefacts comprising mudstone and silcrete flakes and flaked pieces.
DS-AS31-11	Artefact Scatter	4	296444	6408982	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS31-11 is an artefact scatter located on an upper slope 350 m east of Edderton Road. The scatter consists of 4 mudstone flakes, flaked pieces and a core.
DS-AS32-11	Artefact Scatter	5	296574	6409114	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS32-11 is an artefact scatter located on a low slope approximately 500 m east of Edderton Road. The scatter consists of 5 mudstone flakes and flaked pieces.
DS-AS33-11	Artefact Scatter	3	297146	6408401	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS33-11 is an artefact scatter located on a dirt vehicle track/low slope approximately 800 m east of the Golden Highway. The scatter consists of 1 mudstone flake and 2 silcrete flaked pieces.
DS-AS34-11	Artefact Scatter	6	297462	6408170	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS-3411 is an artefact scatter located on a feeder creek of the Hunter River approximately 600 m north of the Golden Highway. The scatter consists of 6 mudstone and chert flakes and flaked pieces.
DS-AS35-11	Artefact Scatter	179	298286	6407977	Moderate	Common site type. Relatively high number of artefacts. Moderate site integrity.	DS-AS35-11 is an artefact scatter located on a feeder creek of the Hunter River approximately 100 m north of it. The scatter consists of 179 stone artefacts comprising mudstone chert and silcrete. Artefact types comprised flakes, flakes pieces, broken flakes and cores.

DS-AS36-11	Artefact Scatter	13	297984	6409014	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS36-11 is an artefact scatter located between two 1st order creeks feeding the Hunter River approximately 1.4 km north of it. The scatter consists of 13 mudstone and silcrete artefacts. Artefact types included flakes, broken flakes, a core and a retouched flake.
DS-AS37-11	Artefact Scatter	35	298862	6407566	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS37-11 is an artefact scatter located on the Hunter River approximately 500 m northern of the Golden Highway. The scatter consists of 35 artefacts of mudstone silcrete and chert. Artefact types included flakes, flaked pieces, broken flakes and a core.
DS-AS38-11	Artefact Scatter	72	299689	6408350	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS38-11 is an artefact scatter located on a feeder creek of Saltwater Creek approximately 3.5 km west of Plashett Dam. The scatter consists of 72 stone artefacts of mudstone, silcrete quartz, chert, and porcellanite. Artefact types consist of flakes, flaked pieces, broken flakes and a core.
DS-AS39-11	Artefact Scatter	2	300034	6408409	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS39-11 is an artefact scatter located on the eastern bank of a feeder creek of Saltwater Creek approximately 3 km west of Plashett Dam. The scatter consists of one mudstone flakes piece and one chert flake.
DS-AS40-11	Artefact Scatter	3	300081	6409349	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS40-11 is an artefact scatter located on the eastern bank of a feeder creek of Saddlers Creek approximately 3 km west of Plashett Dam. The scatter consists of 4 mudstone flakes and flaked pieces.
DS-AS41-11	Artefact Scatter	4	297098	6410141	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS41-11 is an artefact scatter located on a dirt vehicle track/low slope approximately 1.2 km east of Edderton Road. The scatter consisted of 4 mudstone and silcrete flakes and flaked pieces.
DS-AS42-11	Artefact Scatter	3	297820	6409534	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS42-11 is an artefact scatter located on a dirt vehicle track/low slope approximately 1.8 km east of Edderton Road. The scatter consists of 3 mudstone flakes and flakes.
DS-AS43-11	Artefact Scatter	18	298927	6410406	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS43-11 is an artefact scatter located on both banks of a 1st order creekline 2.7 km east of Edderton Road. The scatter consists of 18 silcrete, mudstone and quartz. Artefact types comprised flakes and cores.
DS-AS44-11	Artefact Scatter	3	298592	6410580	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS44-11 is an artefact scatter located on an upper slope/crest approximately 4 km east of Edderton Road. The scatter consists of 3 stone artefacts comprising 2 mudstone flakes and one silcrete flake.
DS-AS45-11	Artefact Scatter	2	297941	6410753	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS45-11 is an artefact scatter located on a broad ridge approximately 2.3 km east of Edderton Road. The scatter consists of 2 mudstone artefacts.

DS-AS46-11	Artefact Scatter	2	298078	6410679	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS46-11 is an artefact scatter located on the upper slope approximately 2.4 km east of Edderton Road. The scatter consists of 2 stone artefacts comprising two mudstone artefacts.
DS-AS47-11	Artefact Scatter	2	298547	6411303	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS47-11 is an artefact scatter located on an dirt vehicle track/upper slope approximately 3 km east of Edderton Road. The scatter consists of 2 mudstone flaked pieces.
DS-AS48-11	Artefact Scatter	2	298496	6411138	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS48-11 is an artefact scatter located between two 1st order creeklines approximately 3 km east of Edderton Road. The artefact scatter consists of 2 stone artefacts of chert and silcrete.
DS-AS49-11	Artefact Scatter	11	292051	6410750	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS49-11 is an artefact scatter located on a feeder creek of Saddlers Creek on the Bowfield Property approximately 3.5 km west of Edderton Road. The scatter consists of 11 stone artefacts of mudstone, silcrete and chert. Artefact types comprised flakes and broken flakes.
DS-AS50-11	Artefact Scatter	13	297243	6410834	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS50-11 is an artefact scatter located on both banks of a 1st order creekline feeding Saddlers Creek approximately 1.5 km east of Edderton Road. The scatter consists of 13 artefacts of mudstone and silcrete flakes, broken flakes and flaked pieces.
DS-AS51-11	Artefact Scatter	5	297076	6411173	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS51-11 is an artefact scatter located on a hill crest approximately 1.5 km east of Edderton Road. The scatter consists of 5 mudstone and silcrete stone artefacts.
DS-AS52-11	Artefact Scatter	3	297264	6411150	Moderate	One moderately rare item (axe head). Limited research potential. Moderate site integrity.	DS-AS52-11 is an artefact scatter located on the upper slope and crest approximately 1.5 km east of Edderton Road. The scatter consists of 3 stone artefacts comprising of 2 mudstone flakes and one basalt non-ground axe.
DS-AS53-11	Artefact Scatter	3	297132	6411648	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS53-11 is an artefact scatter located on a hill top approximately 1.6 km east of Edderton Road. The scatter consists of 3 mudstone artefacts.
DS-AS54-11	Artefact Scatter	6	297372	6411620	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS54-11 is an artefact scatter located on a crest approximately 1.9 km east of Edderton Road. The scatter consists 6 mudstone artefacts.
DS-AS55-11	Artefact Scatter	2	297540	6411164	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS55-11 is an artefact scatter located on the hill top approximately 2 km east of Edderton Road. The scatter consists of 2 mudstone flakes.

DS-AS56-11	Artefact Scatter	6	297567	6411595	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS56-11 is an artefact scatter associated with a 1st order creekline approximately 2 km east of Edderton Road. The scatter consists of 6 mudstone flakes and flaked pieces.
DS-AS57-11	Artefact Scatter	21	296974	6411800	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS57-11 is an artefact scatter located on a low slope approximately 1.4 km east of Edderton Road. The scatter consists of 21 mudstone artefacts.
DS-AS58-11	Artefact Scatter	5	297052	6411996	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS58-11 is an artefact scatter located on a low slope approximately 1.5 km east of Edderton Road. The scatter consists of 5 stone artefacts comprising silcrete and mudstone.
DS-AS59-11	Artefact Scatter	4	297257	6411988	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS59-11 is an artefact scatter located on a low slope approximately 1.6 km east of Edderton Road. The artefact scatter consists 4 mudstone flaked pieces.
DS-AS60-11	Artefact Scatter	11	296881	6412258	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS60-11 is an artefact scatter located on a flat south of Saddlers Creek approximately 1.4 km east of Edderton Road. The scatter consists of 11 stone artefacts comprising mudstone flakes and flaked pieces.
DS-AS61-11	Artefact Scatter	6	297027	6412205	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS61-11 is an artefact scatter located on a lower slope/flat approximately 1.5 km east of Edderton Road. The scatter consists of 6 flaked stone artefacts.
DS-AS62-11	Artefact Scatter	12	297489	6411902	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS62-11 is an artefact scatter located on both banks of an ephemeral feeder creek of Saddlers Creek approximately 2 km east of Edderton Road. The scatter consists of 12 mudstone and silcrete flakes and flaked pieces
DS-AS63-11	Artefact Scatter	64	297740	6411706	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS63-11 is an artefact scatter located on the banks and extending over an area of 400 away from an ephemeral creekline approximately 2.5 km east of Edderton Road. The scatter consists of primarily mudstone flakes with a smaller number of silcrete flakes. One retouched basalt artefact was recorded.
DS-AS64-11	Artefact Scatter	49	298018	6411815	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS64-11 is an artefact scatter located east of an ephemeral creekline on a flat approximately 2.5 east of Edderton Road. The scatter consists of 49 stone artefacts over a 100x100 m area. Artefacts consisted of mudstone and silcrete flakes, flaked pieces and broken flakes.
DS-AS65-11	Artefact Scatter	9	296770	6412464	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS65-11 is an artefact scatter located on a flat south of Saddlers Creek approximately 1.2 km east of Edderton Road. The scatter consists of 9 stone artefacts.

DS-AS66-11	Artefact Scatter	4	297298	6412833	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS66-11 is an artefact scatter located on Saddlers Creek approximately 1.9 km east of Edderton Road. The scatter consists of 4 mudstone flaked pieces.
DS-AS67-11	Artefact Scatter	25	297727	6412708	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS67-11 is an artefact scatter located on the northern bank of a feeder creek of Saddlers Creek approximately 2.2 km east of Edderton Road. The scatter consists of 25 mudstone, silcrete and chert artefacts. Artefact types consisted of flakes, flaked pieces and a core.
DS-AS68-11	Artefact Scatter	3	297980	6412760	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS68-11 is an artefact scatter located on a flat south of Saddlers Creek approximately 2.5 km east of Edderton Road. The scatter consists of 3 mudstone and silcrete flakes.
DS-AS69-11	Artefact Scatter	10	297600	6412139	Moderate	One moderately rare item (axe head). Limited research potential. Moderate site integrity.	DS-AS69-11 is an artefact scatter located on both banks of an 1st order feeder creek of Saddlers Creek. The scatter consists of 10 stone artefacts comprising mudstone and silcrete flakes and one basalt non-ground axe.
DS-AS70-11	Artefact Scatter	2	297752	6412247	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS70-11 is an artefact scatter located on the western bank of a feeder creek of Saddlers Creek approximately 2.2 km east of Edderton Road. The scatter consists of one silcrete and one mudstone flake.
DS-AS71-11	Artefact Scatter	20	291999	6410952	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS71-11 is an artefact scatter located on the northern bank of a feeder creek of Saddlers Creek. The scatter comprises mudstone, silcrete and chert artefacts. Artefacts types included flakes and broken flakes in addition to one generic retouched artefact and one Bondi point.
DS-AS72-11	Artefact Scatter	4	298219	6412114	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS72-11 is an artefact scatter located on a lower slope approximately 2.6 km east of Edderton Road. The scatter consists of 4 stone artefacts including 3 mudstone flakes and a silcrete core.
DS-AS73-11	Artefact Scatter	6	298135	6411973	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS73-11 is an artefact scatter located on a low slope approximately 2.6 km east of Edderton Road. The scatter consists of 6 stone flaked artefacts.
DS-AS74-11	Artefact Scatter	9	298610	6412019	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS74-11 is an artefact scatter located on a low slope west of a creekline approximately 3 km east of Edderton Road. The scatter consists of 9 mudstone stone flaked artefacts.
DS-AS75-11	Artefact Scatter	2	298490	6411959	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS75-11 is an artefact scatter located on a mid slope approximately 3 km east of Edderton Road. The scatter consists of 2 mudstone flaked artefacts.

DS-AS76-11	Artefact Scatter	2	298966	6411953	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS76-11 is an artefact scatter located on a flat east of a creekline approximately 3.5 km east of Edderton Road. The scatter consists of one mudstone flake and one core.
DS-AS77-11	Artefact Scatter	4	298499	6411650	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS77-11 is an artefact scatter located on an upper slope approximately 3 km east of Edderton Road. The scatter consists of 4 mudstone flakes.
DS-AS78-11	Artefact Scatter	3	298636	6411564	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS78-11 is an artefact scatter located on a midslope approximately 3.1 km east of Edderton Road. The scatter consists of 2 mudstone flakes and one mudstone Bondi point.
DS-AS79-11	Artefact Scatter	102	298909	6412509	Moderate	Two moderately rare items including a hammerstone and axe head. Limited research potential. Moderate site integrity.	DS-AS79-11 is an artefact scatter located on a feeder creek of Saddlers Creek approximately 3.5 km east of Edderton Road. The scatter consists of 102 stone artefacts over an area 350 x 200 m. Artefacts comprised mudstone, silcrete and basalt. Types included flakes, flaked pieces, cores, a basalt non ground axe, and a hammerstone.
DS-AS80-11	Artefact Scatter	4	299458	6412742	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS80-11 is an artefact scatter located on the southern bank of a feeder creek of Saddlers Creek. The scatter consists of 4 artefacts comprising silcrete, chert, mudstone flakes and flaked pieces.
DS-AS81-11	Artefact Scatter	10	299715	6412663	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS81-11 is an artefact scatter located on the southern bank of a feeder creek of Saddlers Creek approximately 4 km east of Edderton Road. The scatter consists of 10 mudstone, quartz, silcrete flakes and flaked pieces.
DS-AS82-11	Artefact Scatter	2	299646	6412585	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS82-11 is an artefact scatter located on a low slope south of Saddlers Creek approximately 4.1 km east of Edderton Road. The scatter consists of 2 mudstone broken flakes.
DS-AS83-11	Artefact Scatter	3	299883	6412447	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS83-11 is an artefact scatter located on a low slope south of Saddlers Creek approximately 4.3 km east of Edderton Road. The scatter consists of 2 silcrete flakes and one chert retouched flake.
DS-AS84-11	Artefact Scatter	17	299931	6412657	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS84-11 is an artefact scatter located at the confluence of a two ephemeral creeklines feeding Saddlers Creek approximately 4.5 km east of Edderton Road.
DS-AS85-11	Artefact Scatter	2	299960	6412822	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS85-11 is an artefact scatter located on an ephemeral feeder creek of Saddlers Creek approximately 4.5 km east of Edderton Road. The scatter consists of one mudstone and one silcrete flake.

DS-AS86-11	Artefact Scatter	3	300064	6412361	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS86-11 is an artefact scatter located between two 1st order creeklines feeding Saddlers Creek approximately 4.5 km east of Saddlers Creek. The scatter consists of chert mudstone and silcrete flakes and flaked pieces.
DS-AS87-11	Artefact Scatter	2	299719	6411491	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS87-11 is an artefact scatter located on 1st order feeder creek of Saddlers Creek approximately 4.2 km east of Edderton Road. The scatter consists of 2 mudstone flaked pieces.
DS-AS88-11	Artefact Scatter	2	299134	6411165	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS88-11 is an artefact scatter located on the eastern bank of a feeder creek of Saddlers Creek approximately 3.6km east of Edderton Road. The scatter consists of 2 mudstone flaked pieces.
DS-AS89-11	Artefact Scatter	2	299972	6410699	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS89-11 is an artefact scatter located on a 1st order feeder creek of Saddlers Creek approximately 4.3 km east of Edderton Road. The scatter consists of 2 mudstone flakes.
DS-AS90-11	Artefact Scatter	3	300585	6411328	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS90-11 is an artefact scatter located at the confluence of two 1st order creeklines feeding Saddlers Creek approximately 5 km east of Saddlers Creek. The scatter consists of 2 silcrete broken flakes and one chert flaked piece.
DS-AS91-11	Artefact Scatter	2	300396	6412145	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS91-11 is an artefact scatter located on an upper slope approximately 4.8 km east of Edderton Road. The scatter consists of one mudstone broken flake and one silcrete retouched flake.
DS-AS92-11	Artefact Scatter	2	300424	6412283	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS92-011 is an artefact scatter located on a dirt vehicle track/ridge approximately 5 km east of Edderton Road. The scatter consists of one mudstone flake and one silcrete broken flake.
DS-AS93-11	Artefact Scatter	2	300476	6412796	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS93-11 is an artefact scatter located on a crest approximately 5 km east of Edderton Road. The scatter consists of one mudstone broken flake and one flaked piece.
DS-AS94-11	Artefact Scatter	3	300972	6413070	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS94-11 is an artefact scatter located on a west facing hillside approximately 5.5 km east of Edderton Road. The scatter consists of two chert flakes and one porcellanite flake.
DS-AS95-11	Artefact Scatter	2	301488	6413693	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS95-11 is an artefact scatter located on a low slope approximately 6 km east of Edderton Road south of Drayton mine. The scatter consists of one mudstone flake and one broken flake.
DS-AS96-11	Artefact Scatter	6	295215	6415115	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS96-11 is an artefact scatter located adjacent to Edderton road on a low slope. The scatter consists of 6 stone artefacts comprising a chert flake, a silcrete core, and mudstone flakes and flaked pieces.

DS-AS97-11	Artefact Scatter	8	294957	6414353	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS97-11 is an artefact scatter located on a 1st order feeder creek of Saddlers Creek approximately 300 west of Edderton Road. The scatter consists of 8 stone artefacts comprising silcrete mudstone and chert flakes and flaked pieces.
DS-AS98-11	Artefact Scatter	26	294357	6413605	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS98-11 is an artefact scatter located on the eastern bank of a feeder creek of Saddlers Creek approximately 900 east of Edderton Road. The scatter consists of 26 stone artefacts comprising mudstone, silcrete, chert and quartz. Artefact types included retouched flakes including two backed artefacts and one geometric microlith
DS-AS99-11	Artefact Scatter	39	293715	6413016	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS99-11 is an artefact scatter located on the southern bank of a feeder creek of Saddlers Creek 1.6 km east Edderton Road. The scatter consists 39 stone artefacts comprising silcrete, chert, and mudstone. Artefact types include flakes, flaked pieces and cores.
DS-AS100-11	Artefact Scatter	6	292915	6412228	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS100-11 is an artefact scatter located east of a feeder creek of Saddlers Creek approximately 2.5 km east of Edderton Road. The scatter consists of chert mudstone and silcrete flakes and flaked pieces.
DS-AS101-11	Artefact Scatter	19	292763	6412035	Low	Common site type. No rare artefacts. Limited research potential. Moderate site integrity.	DS-AS101-11 is an artefact scatter located lower slope/creekline approximately 3.5 km east of Edderton Road. The scatter consists of 19 stone artefacts of mudstone, chert, and silcrete. Artefact types included broken flakes, flaked pieces and cores.

Appendix F

Arborist Scarred Tree Assessment

Appendix F Arborist Scarred Tree Assessment

SCAR TREE ASSESSMENT

DRAYTON SOUTH COAL PROJECT

Prepared for: Hansen Bailey

Prepared by:
Global Soil Systems

October 2011

SCAR TREE ASSESSMENT
DRAYTON SOUTH COAL PROJECT

OCTOBER 2011

Prepared for:

Hansen Bailey

Prepared By:

Dr. M. Burns
Principal,
Global Soil Systems

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1.0 BACKGROUND AND OBJECTIVES

AECOM Australia Pty Ltd (AECOM) was commissioned by Hansen Bailey Environmental Consultants (Hansen Bailey) on behalf of Anglo American Metallurgical Coal Pty Ltd (Anglo American) to undertake an Aboriginal archaeology and cultural heritage impact assessment for the Drayton South Coal Project (the Project). Anglo American is seeking Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* for continuation of mining at Drayton Mine. As part of AECOM's Aboriginal archaeology and cultural heritage impact assessment four trees were identified as requiring further clarification of the likely cause(s) of observed tree scarring. To this effect Dr. Mark Burns of Global Soil Systems was engaged by Hansen Bailey to examine the trees and provide an opinion on the origin of scars

The primary objective was to clarify whether observed scarring related to early aboriginal activity or other origins.

2.0 CAUSES OF TREE SCARRING

Scars can be attributed to a range of man-made and natural causes. The main causes of scarring include the following.

Aboriginal Scarred Trees

Aboriginal scars often have differing forms.

1. Curved (pre-form) bark removal scars. This category consists of circular, oval or elongated scars resulting from the removal of a pre-formed artifact, such as a canoe or container that took shape from a curved section of either the tree bole, a major limb or a large burl.
2. Bark slab (sheet) removal scars. Sheet and slab artifacts are produced from rectangular or square sheets of bark.
3. Toe holds. Toe holds are a series of small incisions into the bank designed to create a hold to.
4. Resource extraction holes such as smoke holes and access holes.
5. Other scar forms such as bark strip removal scars, grub procurement scars, marked and carved trees and wood removal scars.

European Scarred Trees

A range of scars can also be related to European activity and European bark removal. Scars are generally limited to rectangular panels, approximately 1 – 3m in length, which reflects their primary use for building cladding. European scars can also include survey and blaze marks and bark strip scars.

Natural Scarred Trees

One of the most common causes of tree scarring can be attributed to natural causes including lightning strikes, branch tears, larval activity, termite activity, bird damage, fire damage, abrasion and numerous other minor impacts which can create small or large scars on trees. The exact cause of natural scarring is often difficult to identify as several factors can often combine to produce a scar.

3.0 LOCAL EXAMPLES OF RELATIVE WOUND REGROWTH

Past experience by the author in scar tree assessment in the Muswellbrook area was drawn upon to determine both the age of trees, and the likely age of wound regrowth in the study trees. Past relevant experience has also included extensive forestry and farm tree assessment in the upper Hunter Valley over a 30 year period.

Experience has shown that the maximum life span of most dominant eucalypt species (iron bark, box, red gums etc) in open woodland environments in the upper Hunter Valley is approximately 100 to 120 years. Many trees have shorter life spans. Life span is determined by the innate genetic potential of species, as well as the propensity for trees to suffer from lightning strike, wind damage, physical damage to trunks during past clearing, accelerated crown die back (enhanced leaf eating and sap sucking insect activity due to changed land use practices) and insect attack such as termites and borers which can be secondary effects following weakening from other causes. Other factors can also be involved.

The estimated age of scarring is based on the estimated rate of wound repair as indicated by the depth of new wood around the wound.

For the purpose of this study a very slow and conservative rate of wound repair of 5mm per year has been assumed. Justification for this assumption has been based on other studies in the area. One particularly relevant study involved a scar of known age on a Narrow–leaf Ironbark (*Eucalyptus crebra*) located on the corner of Common and Coal Roads approximately two kilometers north east of Muswellbrook on similar soil to that in the study area. The marked tree is shown below.

Inquiry revealed that this tree was marked for survey purposes on 10 February 1972 by John Dennis Hickey from the East Maitland Lands office and identified as D5057/2003. While the tree had been lopped and had recently died six months prior to the assessment, the recent date of the tree's death (at that time) allowed an assessment of the growth rate of wound repair. The scar revealed that the tree had put on 200mm of scar tissue (depth of over-growth) over a 30 year period. While this species is different (Narrow-leaf Ironbark versus Coastal Grey Box in the Drayton South Coal Project Scar Tree Assessment) the result is relevant in that it gives us an indicative repair rate of 6.6mm per annum and thus supports the conservative growth rate of 5mm per annum assumed for this study. Furthermore, the growth rate of Coastal Grey Box (the four trees in this study) is generally more rapid than ironbark thus making any assessment of scar age, based on the above conservative repair rate, older than may be the case. In summary, this means that the estimated age of scarring on trees in this study is likely to be younger than estimated. However, a conservative approach has been adopted to remove any equivocation.

A secondary point is that, due to the pyramidal way a tree puts on growth, any damage to a tree trunk does not get any higher off the ground with age. Consequently, the heights of scars in this study are still the same as when damage first occurred.

4.0 METHODOLOGY

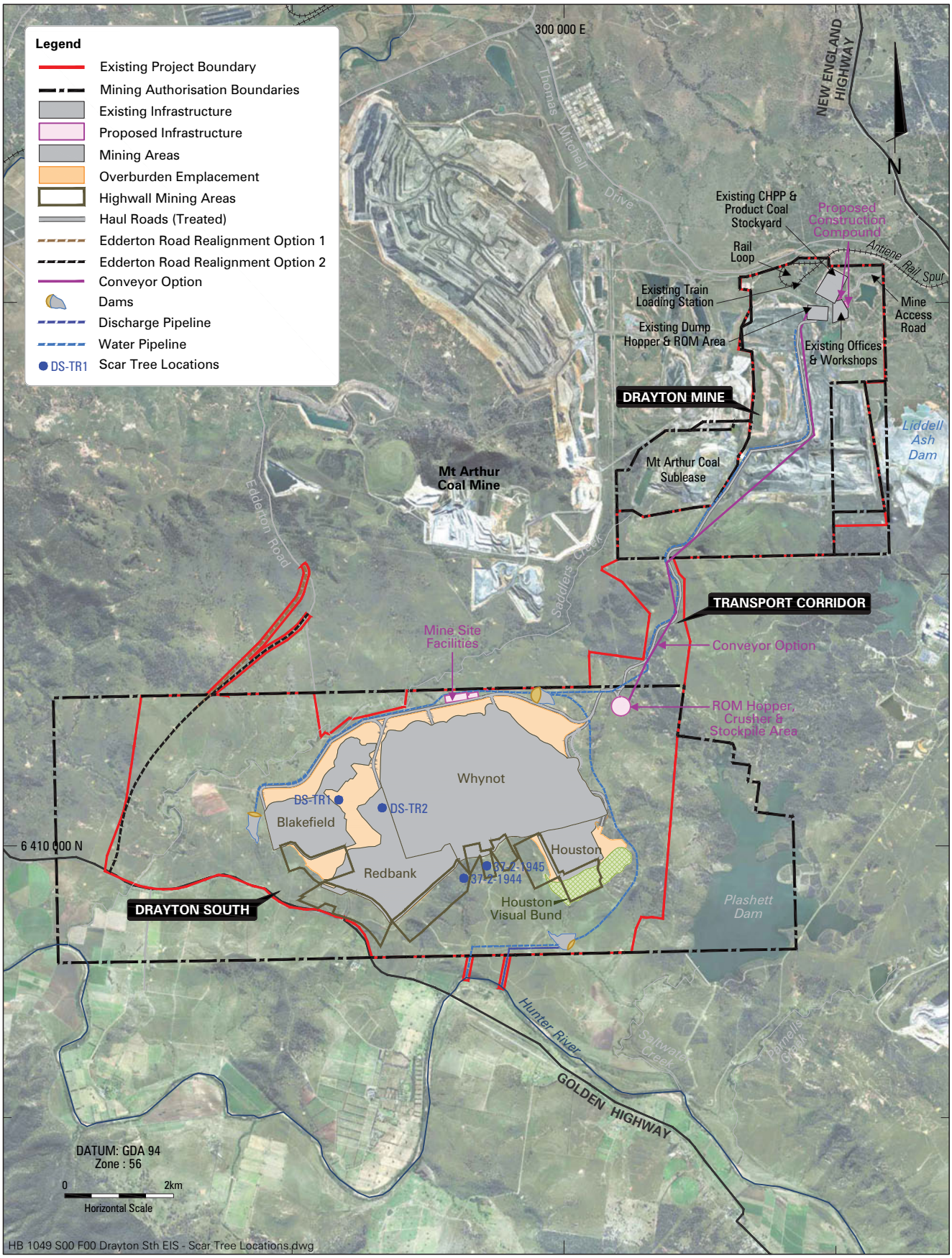
In conjunction with AECOM archaeologists and representatives of the local Aboriginal community, scars on four trees were examined on the 11th October 2011. These trees are referred to as:

Tree 1 - DRSCI (initial archeology description).
Tree 2 - DRSC2.
Tree 3 - 37-2-1945.
Tree 4 - 37-2-1944.

The location of these trees is shown on **Figure 1**.

The methodology employed was in accordance with "Scarred Trees, An Identification and Recording Manual" (Andrew Long 2003). Past experience over a 35 year period by the author in forestry and tree advice in the Hunter Valley was also drawn upon in the evaluation process. For each scar tree the following data was recorded:

- Tree species.
- Tree age.
- Condition of tree.
- Girth of tree at 1.5m height.
- Scar dimensions (length, width, height from ground).
- Overgrowth measurements including thickness and width.
- Scar orientation.
- Origin of scar – European/Aboriginal/natural and uncertain, including explanation for selection.
- Type of scar.
- Axe marks present and type (parallel, horizontal).
- Stem regrowth present.



DRAYTON SOUTH COAL PROJECT

Scar Tree Locations

FIGURE 1

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5.0 RESULTS AND DISCUSSION

Tree 1 (DRSC1)

A photograph of Scar Tree 1 is shown in ***Plate 1*** below.

Plate 1. Tree 1 (DRSC1) showing the recorded scar.

Recorded Details

Species	-	*Eucalyptus moluccana* (Coastal Grey Box).		
Age	-	Estimated at 80 to 90 years old.		
Condition	-	Poor. Extensive trunk damage on opposite side of tree (see photo below).		
Girth at 1.5m height	-	278cm		
Scar dimensions	-	Length	=	60cm
	-	Width	=	20cm
	-	Height from ground	=	110cm (base of scar).
Over growth measurement	-	Thickness	=	28cm
	-	Width	=	42cm
Scar orientation	-	Vertical scar facing west.		
Origin of scar	-	Natural causes. No evidence of being man made.		
Type of scar	-	Natural.		
Stem Regrowth Present	-	None.		

Discussion and Conclusions

This tree also has extensive damage on the opposite side of the trunk (see ***Plate 2*** below). The exact cause of both scars on this tree is unclear however appears to relate to natural causes and most likely branch tear or secondary stem tear (note dead timber on ground). It is possible that the scar may be a secondary effect of the more extensive damage on the opposite side of the trunk (damage appears to pass through the full diameter of the tree).

Plate 2. Extensive damage to opposite side of tree.

No axe marks or any sign of intentional human activity was noted around or within the scar.

In summary it can be reasonably concluded that scarring on Tree 1 (DRSC1) is not due to intentional aboriginal use of the tree for the following reasons:

1. The age of the tree. Discussion with AECOM archaeologists suggests that aboriginal use of such trees in the Hunter Valley most likely ceased approximately 150 years ago. The estimated age of the tree (80 to 90 years) therefore eliminates aboriginal activity as the cause of scarring.
2. Wound Regrowth. The estimated age of the wound at 50 to 60 years further eliminates aboriginal activity as the cause.

3. Extensive damage to other parts of the trunk supporting the possibility of related effects.
4. This type of scarring is common to many older Grey box in the area. This suggests it is a common, natural feature of Grey Box growth and maturation. This is supported by the author's own experience.
5. The absence of any sign of axe marks or other intentional human interference.

Tree 2 (DRSC2)

A photograph of Scar Tree 2 **i**s shown in ***Plate 3*** below.

Plate 3. Tree 2 (DRSC2) showing the recorded scar.

Recorded Details

Species	-	*Eucalyptus moluccana* (Coastal Grey Box).		
Age	-	Estimated at 70 to 80 years old.		
Condition	-	Significant trunk damage on opposite side to scar.		
Girth at 1.5m height	-	216cm		
Scar dimensions	-	Length	=	56cm
	-	Width	=	14cm
	-	Height from ground	=	15cm (base of scar).
Over growth measurement	-	Thickness	=	16cm
	-	Width	=	20cm
Scar orientation	-	Vertical/south.		
Origin of scar	-	Most likely mechanical damage from farming activity.		
Type of scar	-	Vertical/non intentional.		
Axe marks present	-	Nil.		
Stem Regrowth Present	-	Nil.		

Discussion and Conclusions

The same comments as for Tree 1 apply. In summary, it can be reasonably concluded that scarring is not due to intentional aboriginal use of the tree for the following reasons:

1. The age of the tree. Discussion with AECOM archaeologists suggests that aboriginal use of such trees in the Hunter Valley most likely ceased approximately 150 years ago. The estimated age of the tree (70 to 80 years) therefore eliminates aboriginal activity as the cause of scarring.
2. Wound Regrowth. The estimated age of the wound at approximately 32 years further eliminates aboriginal activity as the cause.
3. This type of scarring is apparent on many older Grey Box in the upper Hunter Valley. This suggests that scarring is a common and natural feature of Grey Box growth and maturation.
4. The absence of any sign of axe marks or other intentional human interference.
5. The low positioning of the scar at the base of the tree is not consistent with general aboriginal practice (Long 2003).

Tree 3 (37-2-1945)

A photograph of Scar Tree 3 **i**s shown in ***Plate 4*** below.

Plate 4. Tree 3 (37-2-1945) showing the recorded scar.

Recorded Details

Species	-	Eucalyptus moluccana (Coastal Grey Box).		
Age	-	Estimated at approximately 70 to 80 years old.		
Condition	-	Healthy other than scar.		
Girth at 1.5m height	-	280cm		
Scar dimensions	-	Length	=	168cm
	-	Width	=	15cm
	-	Height from ground	=	10cm (base of scar).
Over growth	-	**T**hickness	=	22cm
measurement	-	Width	=	32cm
Scar orientation	-	Vertical/north facing.		
Origin of scar	-	Early loss of lower branch or secondary stem leading to tearing, sapwood damage and consequent rot.		
Type of scar	-	Natural.		
Axe marks present	-	Nil.		
Stem Regrowth Present	-	Nil.		

Discussion and Conclusions

The same comments as for Trees 1 and 2 apply. In summary, it can be reasonably concluded that scarring is not due to intentional aboriginal use of the tree for the following reasons:

1. The age of the tree. Discussion with AECOM Archaeologists suggests that aboriginal use of such trees in the Hunter Valley most likely ceased approximately 150 years ago. The estimated age of the tree (approximately 70 to 80 years) eliminates aboriginal activity as the cause of scarring.
2. Wound Regrowth. The estimated age of the wound at approximately 44 years further eliminates aboriginal activity as the cause.
3. This type of scarring is apparent on many older Grey Box trees in the area. This suggests it is a common, natural feature of Grey Box growth and maturation.
4. The absence of any sign of axe marks or other intentional human interference.
5. The base of the scar is lower than would be expected for aboriginal activity (Long 2003).

Tree 4 (37-2-1944)

A photograph of Scar Tree 4 **i**s shown in ***Plate 5*** below.

Plate 5. Tree 4 (37-2-1944) showing the recorded scar.

Recorded Details

Species	-	Eucalyptus moluccana (Coastal Grey Box).		
Age	-	Estimated at 90 to 100 years old.		
Condition	-	Poor. Extensive damage to trunk from branch or secondary stem tear.		
Girth at 1.5m height	-	230cm		
Scar dimensions	-	Length	=	352cm
	-	Width	=	32cm
	-	Height from ground	=	0cm (base of scar).
Over growth measurement	-		=	24cm
Scar orientation	-	Vertical/facing west		
Origin of scar	-	Most likely lightning strike or wind damage leading to subsequent stem tear.		
Type of scar	-	Natural		
Axe marks present	-	Nil		
Stem Regrowth Present	-	Nil		

Discussion and Conclusions

The same comments as for Trees 1, 2 and 3 apply. In summary, it can be reasonably concluded that scarring is not due to intentional aboriginal use of the tree for the following reasons:

1. The age of the tree. Discussion with AECOM Archaeologists suggests that aboriginal use of such trees in the Hunter Valley most likely ceased approximately 150 years ago. The estimated age of the tree (approximately 90 to 100 years old) therefore eliminates aboriginal activity as the likely cause of scarring.
2. Wound Regrowth. The estimated age of the wound at approximately 48 years further eliminates aboriginal activity as the cause.
3. This type of scarring is apparent on many older Grey Box trees in the area suggesting it is a common, natural feature of Grey Box growth and maturation.
4. The absence of any sign of axe marks or other intentional human interference.
5. The base of the scar is at ground level and was therefore not to be expected from aboriginal activity.
6. Evidence of past lightning strike and/or wind damage higher up the tree.
7. Surrounding dead timber on the ground matching the wound.

6.0 SUMMARY

For the reasons discussed in Section 5.0 of this report it is concluded that scarring on all four study trees is not related to past aboriginal activity or intentional human interference.

Appendix G

Inspection Advice - Quarry Site DS-QR1-11

Appendix G Inspection Advice - Quarry Site DS-QR1-11

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4 November 2011

Chelsea Kavanagh
Hansen Bailey

Dear Chelsea,

RE: Quarry Site, Bowfield Property, Drayton South

Please find below a description and potential management options for the Quarry Site (DS-QS1-11) located on the Bowfield Property, Draytons South. The purpose of this letter report is to provide preliminary management options for detailed designing to realign Edderton Road.

1.0 Location

DS-QS1-11 is located on the western side of Saddlers Creek, at the confluence of one its smaller feeder creeks. The site lies at the back of the Bowfield Property, a moderately sized farm, approximately 100 m from the main house. Access to the site is from Edderton Road along the main Bowfield driveway.

2.0 Description

An Aboriginal quarry site can be broadly defined as a rocky outcrop or the remains of an outcrop where Aboriginal people procured and/or undertook knapping activities. Evidence of the use of a quarry is usually in the form of scars from flaking, crushing and battering of rock. There may also be identifiable artefacts near or within the site such as unfinished tools, hammerstones, anvils and grinding stones.

DS-QS1-11 consists of a large cobble scatter, approximately 300 x 200 m, of complete and thermally fractured silcrete cobbles on the lower slope of a hillside and adjacent a confluence of creeklines. The cobbles are of variable quality, ranging from fine siliceous to course grained with large quartz inclusions. While 95% of the exposed rock is silcrete, a small portion of the exposed cobbles are of petrified wood, quartzite, and quartz.

Evidence of use of the quarry consists of low density/intensity exploitation of the silcrete cobbles suggested by a small number of silcrete primary flakes and cores scattered over the cobble area. In addition, stone artefacts comprising of flaked pieces, flakes and tools are scattered throughout the cobbles but with particular focus on at its southern end adjacent to the feeder creek. Stone artefacts are also found away from the cobbles, along the feeder creek to the north and along the Sadders Creek (**Figure 1**).

The boundary of the quarry itself is defined as the visible extent of the cobbles. However, consideration of the site as a whole must include the associated artefactual material located nearby on both the feeder creek and Saddlers Creek, and the flat between. Archaeologically, based on limited survey and no test excavation, the site should comprise all these features and be considered a complex. Archaeological test excavation would be required to better define the site's boundary.

Some minor disturbances have occurred to the site. Principal amongst these is the collection and stockpiling of large numbers of the cobbles as a result of farming activities. In addition, a contour bank has been excavated laterally across the northern section of the cobble area some time ago. Finally, erosion, as a result of vegetation clearance, has exposed archaeological deposit along the banks of the feeder creek and Saddlers Creek, and likely disturbed it from its original context. Despite these disturbances, the site is considered in good condition.

3.0 Significance

Site significance is defined in terms of cultural significance and scientific significance. The Aboriginal community is in the best position to comment on cultural significance. Scientific significance is assessed by the concepts of Rarity, Integrity, Representativeness and Research Potential, which are allocated a low, medium or high rating. An assessment using these criteria is likely to find the quarry is of high significance in relation to rarity, representativeness and research potential. The reasoning behind this rating is a result of the rarity of these sites in the Hunter Valley and the lack of archaeological work undertaken at such sites in the area and broader NSW.

Only seven quarry sites are listed on OEH's AHIMS register in the Hunter Valley, two of which are in Drayton South, and will be destroyed (not including DS-QS1-11). A further two are listed as destroyed, leaving three – one at Ravensworth, one at Warkworth which is raw material only (no artefacts) and one at Rothbury. No quarry sites remain locally to Drayton South.

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4.0 Potential Impacts

The two AHIMS quarry sites within Drayton South are located in proposed open cut areas and will be destroyed. One consists of silcrete cobbles and few associated artefacts, and the other could not be located. DS-QS1-11 is located in the direct path of Edderton Road and will be partially destroyed based on current plans.

In NSW, the NPW Act provides the legislative framework for the protection of Aboriginal objects and places. Section 2A(2) of the NPW Act stipulates that such protection is to be achieved by applying the principles of Ecologically Sustainable Development (ESD). ESD requires the integration of *economic* and *environmental* considerations (including cultural heritage) in decision-making processes and, in the context of Aboriginal cultural heritage in NSW, can be achieved through the implementation of two key principles: intergenerational equity and the precautionary principle.

Intergenerational equity is the principle whereby the present generation should ensure the health, diversity and productivity of the environment for the benefit of future generations. With regards to Aboriginal heritage, intergenerational equity can be assessed in terms of cumulative impacts to Aboriginal objects and places in a region. Central to any assessment of intergenerational equity is the proposition that regions with fewer Aboriginal objects and places necessarily retain fewer opportunities for future generations of Aboriginal people to enjoy their cultural heritage. Accordingly, information regarding the known and potential Aboriginal heritage resource within a given region lies at heart of any assessment of intergenerational equity.

Given, the few instances of quarry sites identified within the Hunter Valley, there is a clear risk that the destruction of DS-QS1-11 will have a negative effect on intergenerational equity. This is something that OEH takes very seriously.

5.0 Management Options

The following management options are proposed in order of preference for conservation outcomes and are suggested in light of current legislation, codes of practice and experience.

1. Full Conservation. All impacts to DS-QS1-11 should be avoided. Included is the entire cobble area, the adjacent section of feeder creek and the associated section of Saddlers Creek. In this option, Edderton Road will pass at least 100 m to the west of DS-QS1-11. This option is likely to be the preferred option of the Aboriginal community, OEH, and DoPI. This is also AECOM's preferred option.
2. Partial Destruction 1. This option consists of altering the current alignment by moving it west as far as possible within the existing Project area. It is anticipated, depending upon engineering constraints, that the resulting alignment may impact 5-10% of the cobble area. To mitigate impacts, test excavation to determine the extent of the site, followed by salvage excavation will be required. The remainder of the site will be preserved. The Aboriginal community or OEH may not support partial destruction of the site; given that the site's cultural and scientific value will be compromised.
3. Partial Destruction 2. This option consists of altering the current alignment by moving it east and subsequently impacting Saddlers Creek. It is anticipated that the resulting alignment may impact surface artefacts and archaeological deposit associated with the quarry and Saddlers Creek. To mitigate impacts, test excavation to determine the extent of the site, followed by salvage excavation will be required. The remainder of the quarry site, including the cobble area will be preserved. The Aboriginal community or OEH may not support partial destruction of the site; given that the site's cultural and scientific value will be compromised.
4. Partial Destruction 3. This option consists of keeping the current alignment. It is anticipated that 10-20% of the cobble area will be impacted. To mitigate impacts, test excavation to determine the extent of the site, followed by salvage excavation will be required. The remainder of the site will be preserved. The Aboriginal community or OEH may not support partial destruction of the site; given that the site's cultural and scientific value will be compromised.
5. Full Mitigation. This option consists of keeping the current alignment, which passes through the western section of the extent of the cobble area, and undertaking a program of excavation for the entire site. Excavation would include a full program of testing, baseline recording, photography, topographic mapping, and geomorphological assessment. The Aboriginal community and OEH would be unlikely to support this option and the destruction of the site without careful consideration of options 1-4 by the proponent.

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The management options provided above are preliminary only. Management options that result in impacts to site DS-QS1-11 would require full consultation with the Aboriginal community and OEH.

Yours faithfully

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AECOM

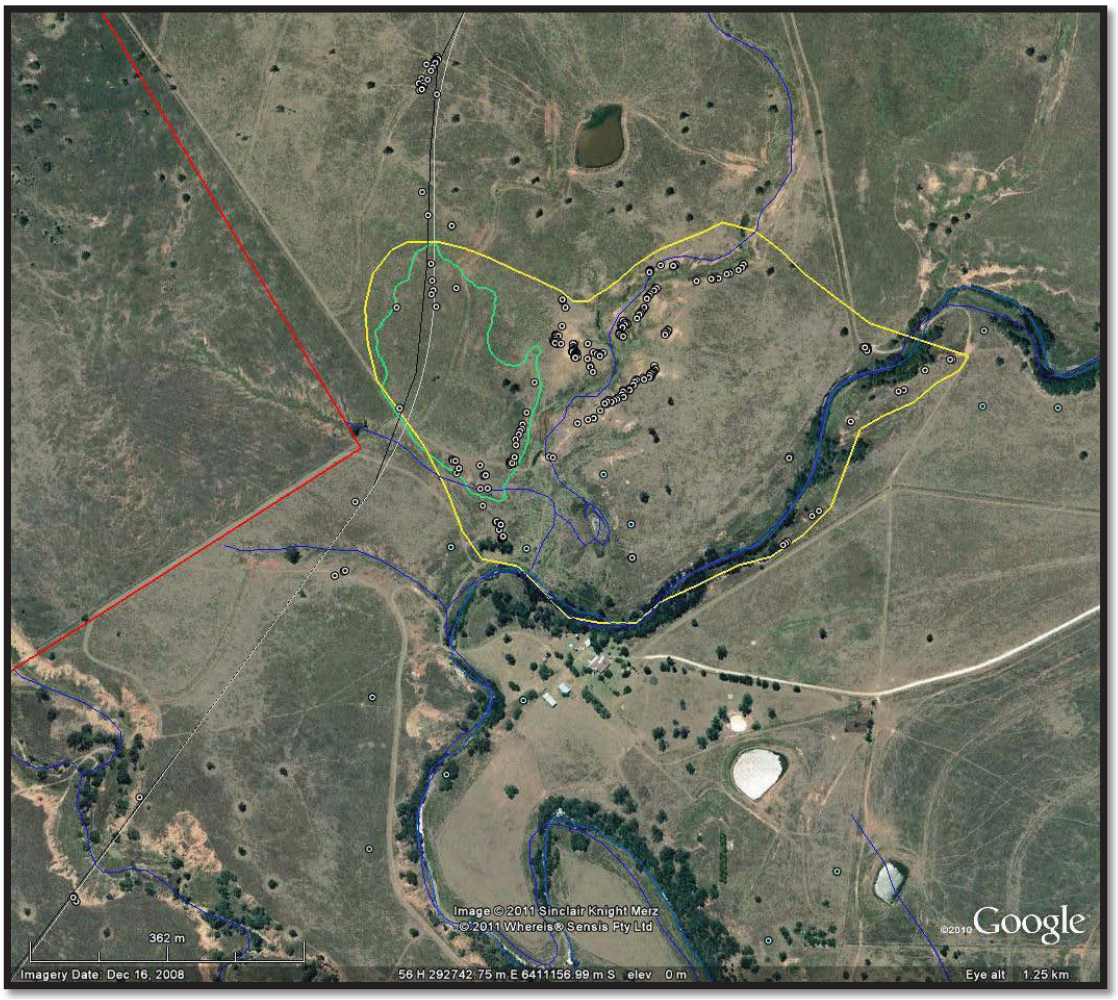

Figure 1: Survey Results

Yellow = Area Assessed
Green = Raw Material
White dots = Artefacts

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13 November 2011

Chelsea Kavanagh
Hansen Bailey
6/127-129 John St
Singleton, NSW 2330

Dear Chelsea,

RE: Inspection of Quarry and Lot 41/DP1105798

Please find below a brief description and findings of the additional inspection undertaken for the proposed Edderton Road realignment on Lot 41/DP1105798. The purpose of the inspection was to identify potential heritage constraints for realigning the current plans for Edderton Road to avoid Aboriginal archaeological quarry site DS-QS1-11.

1.0 Description

Geordie Oakes (Archaeologist) and Andrew McLaren (Archaeologist) undertook the site inspection on 8 December 2011. The area inspected consisted of approximately 25 hectares of paddock on Lot 41/DP1105798 (see Figure 1 below). Transects were walked across the area in order to identify Aboriginal archaeological sites.

2.0 Findings

The inspection area consisted of an east facing moderate to steeply inclined hillslope comprising pasture land. An ephemeral drainage line and a small section of a larger feeder creek of Saddlers Creek were identified in the eastern and southern section of the area, respectively. All original vegetation had been cleared with thick pasture grass covering the area inspected.

Archaeological findings consisted of three low-density surface artefact scatters and one isolated find (see Figure 1). Note: site names assigned below will be revised as part of the larger Drayton South Coal Project Aboriginal Heritage Assessment (2011).

AS1

AS1 consists of two silcrete flakes recorded on the bank of the drainage line in the eastern portion of the inspection area. The site was identified on the midslope of the hillside. Subsurface deposit is not anticipated at the site given its location.

AS2

AS2 consists of six silcrete and quartzite flakes recorded amongst an outcrop of silcrete cobbles exposed along the banks of the drainage line on the lower slope of the hillside and is likely part of quarry site (DS-QS1-11). The site is considered to have moderate potential for archaeological deposit given its association with the silcrete outcrop, and its proximity to Saddlers Creek.

AS3

AS3 was recorded in the southern portion of the inspection area, associated with the larger feeder of Saddlers Creek, consisting of 13 mudstone and silcrete flakes and one core. The site is considered to have moderate potential for subsurface deposit given its surface artefacts, its landform and proximity to a major feeder creek of Saddlers Creek.

IF1

IF1 consists of a single stone core of volcanic material recorded on the steep midslope of the hillside. Subsurface deposit is not anticipated at the site given its location.

3.0 Recommendations

On the basis of the above findings, the following recommendations are made for potential options for the proposed Edderton Road realignment:

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1. Edderton Road realignment should avoid archaeological site AS2 identified amongst the outcrop of silcrete cobbles in the eastern portion of the inspection area (see Figure 1), as this site is likely to be associated with quarry site DS-QS1-11.
2. Impacts to archaeological sites AS1, AS3, and IF1 from the construction of Edderton Road should be mitigated as part of the larger management strategy being developed for the Drayton South Coal Project.

Yours faithfully

Geordie Oakes
Archaeologist
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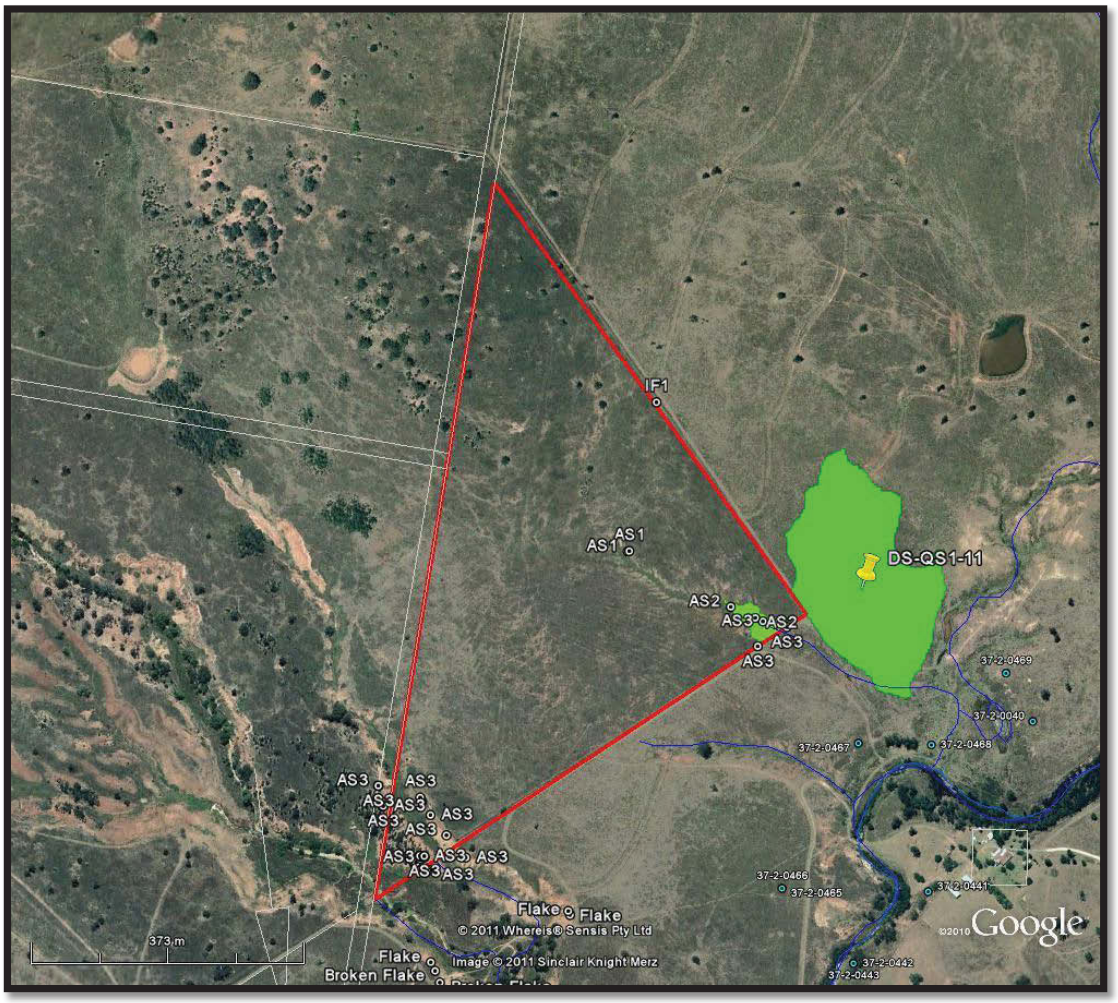

Figure 1: Survey Results

Red: Inspection Area / Lot 41/DP1105798 Boundary
Light Green: Silcrete Cobbles (Quarry)
White Dots: Artefacts
Blue Dots: AHIMS Sites

Plates

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Plate 1 **DS-QR1-11 (View west)**

Plate 2 **DS-QR1-11 (Artefacts)**

Plate 3 **DS-QR1-11 (Silcrete cobbles)**

Plate 4 **DS-QR1-11 (Silcrete cobbles)**

Plate 5 **DS-C8 (View south)**

Plate 6 **DS-C8 (View north)**

Plate 7 **Non-ground axe (DS-IF6-11)**

Plate 8 **Non-ground axe (DS-C8)**

Plate 9 **Non-ground axe (DS-AS79-11)**

Plate 10 **Non-ground axe (DS-C13)**

Plate 11 **Hammerstone (DS-AS79-11)**

Plate 12 **Edge ground Axe with secondary pitting (likely from use as an anvil) (DS-C5)**

Plate 13 Silcrete scraper/core (DS-C7)

Plate 14 Chalcedony (DS-C19)

Plate 15 Mudstone blade core (37-2-0374)

Plate 16 Bondi point (DS-C4)