Tasman Extension Project
Environmental Impact Statement

APPENDIX K

ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Resource Strategies

DONALDSON COAL
Part of Gloucester Coal

TASMAN EXTENSION PROJECT, CESSNOCK AND LAKE MACQUARIE LOCAL GOVERNMENT AREAS, HUNTER VALLEY, NEW SOUTH WALES: ABORIGINAL CULTURAL HERITAGE ASSESSMENT

A report to

Donaldson Coal Pty Limited

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by

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This report contains information which is of a sensitive nature to members of the Aboriginal community and should not be reproduced or used in a culturally insensitive manner.

EXECUTIVE SUMMARY

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

Donaldson Coal owns and operates the Tasman Underground Mine, located approximately 20 kilometres west of Newcastle, New South Wales. Donaldson Coal is seeking consent for the extension of underground mining operations at the existing Tasman Underground Mine (herein referred to as the 'Tasman Extension Project' or 'the Project'). Donaldson Coal is a wholly owned subsidiary of Gloucester Coal Ltd.

Approval is being sought from the Department of Planning and Infrastructure for the Tasman Extension Project under Division 4.1 ('State Significant Development') of Part 4 of the *Environmental Planning and Assessment Act 1979*. The approval would consolidate and replace the existing Development Consent for the Tasman Underground Mine. Resource Strategies is assisting Donaldson Coal with the preparation of an Environmental Assessment for the Project, for submission to the Department of Planning and Infrastructure.

The Project is a proposed extension of the underground mining operations and development of surface infrastructure, including a new pit top (and associated run-of-mine coal handling infrastructure) and ventilation surface infrastructure. The proposed mining operations would involve continued use of the bord and pillar method, with total and partial pillar extraction. Longwall mining would not be undertaken.

The Project area is situated in the Cessnock and Lake Macquarie local government areas, immediately south of George Booth Drive, east of Mulbring and west of West Wallsend in the lower Hunter Valley. The heritage investigation area is marginally larger than the Project area and measures around 1,260 hectares (12.6 square kilometres) in area. It comprises:

- The approximate extent of proposed West Borehole Seam workings and the extent of approved Fassifern Seam workings not previously subject to heritage survey, including a buffer zone around the workings based on a 26.5 degree angle of draw; and
- The small area adjacent to George Booth Drive in which development of a new pit top and associated run-of-mine coal handling infrastructure is proposed.

The principal aims of this assessment were to identify and record any Aboriginal heritage evidence or cultural values within the investigation area, assess the potential impacts of the Project on this evidence, assess the significance of this evidence, and formulate recommendations for the conservation and management of this evidence, in consultation with the local Aboriginal community.

The investigation proceeded by recourse to the archaeological, cultural and environmental background of the locality, followed by consultation with the Aboriginal community and a field survey undertaken with the assistance of representatives of the registered Aboriginal parties, in accordance with the relevant Department of Planning and Infrastructure and Office of Environment and Heritage (OEH) in the Department of Premier and Cabinet (formerly the Department of Environment, Climate Change and Water) requirements. Primarily these requirements involved reference to the 2005 *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation*, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, 2010 *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* and 2011 *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*.

Field inspection of the investigation area was undertaken over 24 days between 12 September and 27 October 2011, with the assistance of representatives of the registered Aboriginal parties. Fifteen parties registered an interest in the heritage assessment and all have been consulted throughout the course of the assessment in accordance with the relevant OEH guidelines. All registered parties were invited to attend (and many participated in) a site inspection and meeting on 27 January 2012, and a further meeting on 22 March 2012.

Comprehensive archaeological survey coverage was obtained across the geographic extent of the investigation area (potential impact area), apart from an approximately 130 hectare portion that could not be sampled due to property access constraints at the time of the survey. This *heritage study area* of approximately 1,132 hectares, or 90% of the overall investigation area, was subdivided into a total of 209 archaeological survey areas, each representing a specific combination of landform unit and class of slope. Each archaeological survey area was inspected for Aboriginal heritage evidence.

The total survey coverage (ground physically inspected for heritage evidence) equated to approximately 605,404 m^2, or 5.3% of the heritage study area or 4.8% of the overall investigation area. As this coverage only refers to an area of several metres width directly inspected by each member of the survey team, the actual coverage for obtrusive site types (for example, rock shelters) was significantly greater than this. The total effective survey coverage (*visible* ground surface physically inspected with potential to host heritage evidence) equated to around 39,666 m^2, or 0.35% of the heritage study area or 0.3% of the overall investigation area.

The survey resulted in a substantial increase in the known heritage resource within the Tasman Extension investigation area, with 54 Aboriginal sites and 26 rock shelters with Potential Archaeological Deposits recorded, in addition to re-recording of a number of previously known sites.

At the conclusion of the survey, a total of 74 sites and 26 rock shelters with Potential Archaeological Deposits are known to occur directly within or immediately adjacent to the Tasman Extension investigation area, comprising:

- 38 open artefact sites;
- 35 open grinding groove sites;
- 26 rock shelters with Potential Archaeological Deposits; and
- One open grinding groove and open artefact site.

Nine of these sites and eight rock shelters with Potential Archaeological Deposits are located marginally outside of the investigation area boundary, although several occur under an area of currently proposed mine workings.

Significant and widespread traditional, historical and contemporary cultural values and associations with the investigation area have been identified by the registered Aboriginal parties (and are also known through ethnohistorical evidence). These do not necessarily involve Aboriginal objects or physical evidence. These associations and cultural values include:

- The entire Mount Sugarloaf area (including the investigation area) being a cultural landscape of high traditional, historical and contemporary cultural significance to the Aboriginal community;

- The Men's Area in the north-east of the investigation area and extending into the existing Tasman Mine, associated with male initiation ceremonies and protected by significant naturally formed keeper warrior sandstone formations and with a large centrally located phallic sandstone pillar;
- The Keepa Keepa Pathways Area in the south-west of the investigation area, comprising the southern access route from the Central Lowlands to Sugarloaf Ridge and the Watagan Mountains and Mount Vincent;
- The Grinding Groove Area in the central-eastern portion of the investigation area, with strong associations with men's business, maintenances of hatchets and axes, preparation of medicine and other uses;
- Other pathways from Mount Sugarloaf, including to the north-east of the investigation area, linking with the Black Hill Spur and Hexham Swamp and along Sugarloaf Ridge to the south;
- The association of Mount Sugarloaf with the supreme being 'Koe-in';
- The presence of the supernatural spirit being 'Puttikan', which inhabited the Sugarloaf area;
- The use of a cave on the side of Mount Sugarloaf for the burial of important people and some small children;
- The important connection, or 'heirophany', Mount Sugarloaf represents between the secular and the sky-world;
- The presence of quartz in the investigation area, and its associations with the clever man;
- In general terms, the use of subsistence and other resources from within the investigation area;
- In general terms, the traditional use of the area by Awabakal and Wonnarua people, and an ongoing cultural and spiritual connection to the land by the descendants of these people; and
- In relation to the Aboriginal objects identified within the investigation area (for example, stone artefact sites, grinding grooves and rock shelters), the contemporary significance of these to the Aboriginal community, as they represent a tangible link with the traditional past and with the lifestyle and values of community ancestors.

Information pertaining to certain cultural values and places (for example, the men's area) are subject to gender restrictions, and registered parties have requested that this information is not made available to females or the general public. Registered parties have also requested that other information pertaining to certain cultural values and places, due to their secret/sacred nature, are not divulged to other persons or the general public. This report seeks to respect the confidential nature of the information disclosed by the Aboriginal informants and to respect the special significance of these values to the Aboriginal community, while balancing the needs to assess the potential impacts of the Project on these values and ensure that management measures are implemented to ensure that these values/places of high significance are not adversely affected.

A total of 174 lithic items were recorded during the survey, within the 38 open artefact sites (including one open artefact and grinding groove site). The combined artefact assemblage is dominated (95%) by items that may represent the fragmented debris of on-site knapping of primary flakes and/or microblades or other on-site fracture, such as accidental breakage, or accidental discard. The stone materials silcrete (55.7% of the assemblage) and tuff (37.4%) are most common.

The evidence identified at the open artefact sites is consistent with background discard, manuport and artefact material which is insufficient either in number or in association with other material to suggest focused activity in a particular location. The only higher artefact counts and densities (sites TE85/A, TE135/A and TE157/A) occur in areas where superimpositioning of evidence from repeated visits (for example, during the course of transitory movement) is likely to have occurred.

A total of 385 grinding grooves were identified within the 28 open groove sites recorded during the current survey. These provide evidence of the production and maintenance of stone hatchets/axes, and potentially other activities such as seed-grinding, or processing of other plant food, animal food or ochre, or preparation of medicine. Other naturally formed holes occur in the sandstone rock formations, often at the grinding groove sites, and the possible use of these by Aboriginal people cannot be discounted. Many of the grinding groove sites may be associated with the use of Mount Sugarloaf for male initiation ceremonies, rather than for simply utilitarian purposes during the course of the normal daily round.

Although the use of the 26 rock shelters is uncertain, as direct evidence of occupation was not located (potentially a function of sediment deposition), similar to the grinding grooves many of the shelters may also be associated with the use of Mount Sugarloaf for male initiation ceremonies.

The results have been analysed in relation to broader models of occupation for the region devised by South East Archaeology. No portions of the investigation area comprise areas that can be characterised as being primary or secondary resource zones, where occupation is expected to have been focused. A large part of the investigation area (the elevated mountainous terrain) is consistent with occupation involving special purpose journeys (access for ceremonial/spiritual purposes) and non-secular activities (ceremonial activities). Within this area, evidence is present of usage of a generally low intensity, involving transitory movement between locations and production and maintenance of stone hatchets/axes, and potentially other activities such as seed-grinding, or processing of other plant food, animal food or ochre, or preparation of medicine.

The lower elevation portion of the investigation area (north-western area, which can be characterised as being part of the 'Central Lowlands') may best be characterised by occupation of a generally low intensity that involved hunting and gathering activities by small parties of men and/or women and children, along with transitory movement between locations. This area may generally have been exploited during the course of the normal daily round by inhabitants of encampments located in the primary or secondary resource zones (eg. along Wallis Creek) that foraged within an area of up to ten kilometres radius from their campsites.

Consistent with the conclusions of Boot (2002), *the economy was secondary to the sacred and that, ultimately, the primary purpose of economic life was to sustain the sacred worlds of the Aboriginal people.* The spiritual/ceremonial use of Mt Sugarloaf was a significant cultural factor in the occupation of the locality of the investigation area, and potentially contributed to limited utilitarian activities having been undertaken within the area (or portions of it, particularly the elevated terrain).

In view of the survey results, the predictive model of site location for the investigation area has been reassessed. The potential for additional rock shelters, lithic quarries, bora/ceremonial, scarred trees and stone arrangements to occur within the portions of the investigation area that were sampled (but not directly inspected) has been reassessed as low, with a very low potential for carved trees, and a moderate to high potential for additional grinding grooves. There remains a very low potential for rock shelter sites, low potential for carved trees and bora/ceremonial sites, low to moderate potential for scarred tree and lithic quarry sites, moderate potential for stone arrangement sites, and a high potential for additional grinding groove sites to occur within the portion of the investigation area that could not be sampled due to access constraints. The potential for burial sites remains low to moderate within rock shelters, but very low elsewhere, although cannot be discounted.

There is potential for stone artefacts to occur in a widespread distribution of variable density across virtually all landform units of the investigation area, apart from in areas which have been substantially impacted by recent land-use. However, none of the investigation area can be characterised as being located within a primary or secondary resource zone, and therefore evidence will typically be of a low to very low density, as demonstrated by the survey results. The potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value to occur is generally low.

The significance of the Aboriginal heritage sites, cultural areas/values and potential deposits within or immediately adjacent to the investigation area has been assessed against criteria widely used in Aboriginal heritage management, derived from the relevant aspects of the ICOMOS *Burra Charter*. Six of the cultural places/values have been assessed as being of high significance within a regional context and two of low to moderate significance within a regional context. One grinding groove site has been assessed as being of high significance within a regional context, and two (including the grinding groove and open artefact site) as being of low to moderate significance within a regional context. A number of other sites have also been assessed as being of some significance within a local context. The high cultural significance of the entire Project area, along with all objects and cultural areas within it, have been stressed by the registered Aboriginal parties.

The potential impacts of the Project will be limited, largely due to the implementation of Subsidence Control Zones, including those already in place for the approved Tasman Mine.

Surface impacts would largely be confined to the small area adjacent to George Booth Drive where a new pit top and associated coal handling infrastructure would be constructed. No Aboriginal heritage evidence has been identified in this location. Direct surface impacts elsewhere within the Project area would be very limited in extent and primarily relate to exploratory drilling, subsidence and environmental monitoring, subsidence remediation and continued use of existing vehicle tracks.

Potential subsidence impacts to Aboriginal sites and cultural areas/values will be significantly reduced by the implementation of the proposed Subsidence Control Zones (above those already in place for the Tasman Mine/Approved Project). After the implementation of the additional Subsidence Control Zones for the Extension Project, only one rock shelter with Potential Archaeological Deposits and five open grinding groove sites would have a greater than 10% probability of perceptible impacts from subsidence. This represents just 10% of all rock shelter with Potential Archaeological Deposits and grinding groove sites in the investigation area. The potential impacts of subsidence on many of the cultural values/areas is inferred to be minimal. Many of the most significant areas (for example, the Men's Area, Grinding Groove Area, Sugarloaf Pathways and Keepa Keepa Pathways Area) are located within proposed or existing Subsidence Control Zones, and as such subsidence impacts will be minimised.

The following recommendations are made on the basis of legal requirements under the *Environmental Planning and Assessment Act 1979* and *National Parks and Wildlife Act 1974*, the results of the investigation and consultation with the registered Aboriginal parties:

1) Provisions relating to Aboriginal heritage will be included in an Aboriginal Heritage Management Plan (AHMP) for the Project. These provisions will be formulated in consultation with the registered Aboriginal parties and the Department of Planning and Infrastructure and the OEH and specify the policies and actions required to manage the potential impacts of the Project on Aboriginal heritage after Part 4 approval is granted. The AHMP will comprise detail that, subject to Part 4 Project Approval, will guide management of the Aboriginal heritage resource *in lieu* of a Section 90 Aboriginal Heritage Impact Permit. The primary elements of the AHMP are outlined below:

    a) The Subsidence Control Zones will be established and maintained and managed in accordance with relevant guidelines to minimise the potential impacts of subsidence within these zones below the relevant specified criteria;

    b) Further investigation will occur for specific heritage sites or areas, including:

        i) Detailed analysis of a sample of individual grinding grooves, in order to address the requests of registered Aboriginal parties and relevant questions relating to the use of the grooves and the occupation model for the investigation area, and to assist in offsetting the potential impacts of the Project on several grinding groove sites (particularly TE57/A). This analysis will involve residue and use-wear techniques and experimental data;

        ii) Reassessment of any proposed surface disturbance works outside of the surface investigation area, once detailed design plans are available for each proposed activity. This would involve review of the works location against the known Aboriginal site data. Where survey sampling has already occurred to current OEH standards, further archaeological inspection would not be warranted. Where survey sampling has not occurred to the current standards, survey sampling would be required by a qualified archaeologist in consultation with the registered Aboriginal parties, prior to any impacts occurring, using the same methodology as for the present investigation. Any sites identified or potentially affected can be managed in accordance with procedures specified in the AHMP, but would include avoidance of impacts to all grinding groove and rock shelter sites, and any other sites of significance that are identified during further surveys;

        iii) Archaeological survey of all potential impact areas that could not be sampled during the present investigation, currently totalling about 130 hectares for the potential subsidence impact area. The survey will be conducted by a qualified archaeologist in consultation with the registered Aboriginal parties using the same methodology as for the present investigation, prior to any impacts occurring. Subsequent to the survey, management strategies can be implemented as outlined in the AHMP for previously unrecorded sites;

    c) In order to mitigate the impacts of the Project on scientific and cultural values and/or to retrieve and conserve samples of the heritage evidence, mitigation measures will be implemented prior to any impacts occurring to specified sites and areas, including:

        i) A modification to the mine plan to ensure that the risk of perceptible subsidence impacts is lowered from 'unlikely' to 'very unlikely' for the grinding groove site #38-4-447;

ii) Where requested by the registered Aboriginal parties, salvage of stone artefacts by systematic surface collection from the open artefact sites TE135/A and TE157/A;

iii) Where requested by the registered Aboriginal parties, in a sample of the area of proposed surface impacts within the surface investigation area, reinspection of the ground surface after the initial removal of vegetation and/or the use of controlled mechanical surface scrapes with localised hand excavation of any features of significance identified during the scrapes;

d) Monitoring of subsidence impacts will be conducted for all rock shelter sites and open grinding groove sites in the Project area, along with the significant rock formations in the Men's Area and the ridgelines which form the Sugarloaf Pathways and Keepa Keepa Pathways Areas. This will comprise inspection and recording of the condition of these sites/areas after undermining has taken place, and comparison with the condition recorded prior to undermining to identify any subsidence impacts. Monitoring will assist with refining the modelling involved in assessing potential subsidence impacts and thereby guide future assessments within the locality and any refinements to the Subsidence Control Zones, enable documentation of the actual impacts of the Project and provide an understanding of the heritage resource left intact post-mining. Provisions will be included in the AHMP for alterations to be made to the mine plan to protect sites and cultural areas should monitoring indicate that impacts are in excess of predictive levels;

e) Donaldson Coal will facilitate and fund further documentation of the Aboriginal cultural values of the Project area by those registered Aboriginal parties with cultural knowledge and traditional connections with the Project area;

f) Donaldson Coal will undertake a further subsidence and stability assessment of the rock formations within the Men's Area prior to undermining, and where necessary will alter the mine plan to ensure that these features are not subject to impacts;

g) All heritage mitigation and monitoring measures undertaken for the Project will be adequately documented with reference to relevant OEH guidelines. Reports will be prepared consistent with the Project Approval and AHMP, and provided to relevant stakeholders (such as the Department of Planning and Infrastructure and the OEH and the registered Aboriginal parties) within appropriate timeframes;

h) All heritage evidence salvaged under the Project Approval will be curated in an appropriate manner, as determined in consultation with the registered Aboriginal parties and the OEH during preparation of the AHMP;

i) Where impacts from surface works will be avoided to identified heritage evidence, appropriate site-specific precautionary measures will be implemented for those sites within close proximity of the area of works;

j) As a general principle, all relevant contractors and staff engaged on the Project who are undertaking tasks on site that may give rise to any interactions with Aboriginal heritage will receive heritage awareness training prior to commencing work on-site;

k) The Aboriginal Site Database established for this Project that lists known Aboriginal sites within the Project area, in both tabular and electronic form, will continue to be maintained and regularly updated;

l) Site records will be lodged in a timely manner with the OEH for any previously unrecorded Aboriginal heritage evidence that is identified within the Project area during the course of operations and/or further heritage assessments, or that is subject to salvage;

m) Provisions will be included to guide the assessment of any future alterations that may be proposed to the mine plan. This will include an assessment of the potential impacts of any changes on the heritage resource, and formulation of management strategies in consultation with the registered Aboriginal parties;

n) Provisions will be included to guide the assessment of any future works that may be proposed (that are not currently anticipated), which may cause impacts within the underground investigation area (outside of the surface investigation area), or outside of the investigation area altogether;

o) Provisions will be included to guide the management of any previously unrecorded Aboriginal heritage sites within the Project area, that may be identified during future investigations or works, *in lieu* of a Section 90 Aboriginal Heritage Impact Permit;

p) Should any skeletal remains be detected during the course of the Project, work in that location will cease immediately and the finds will be reported to the appropriate authorities, including the Police, the OEH and the registered Aboriginal parties. Subject to the Police requiring no further involvement, the management of any Aboriginal skeletal remains will be determined in consultation with the Department of Planning and Infrastructure, the OEH and the registered Aboriginal parties;

q) Archaeological investigations will only be undertaken by archaeologists qualified and experienced in Aboriginal heritage, in consultation with the registered Aboriginal parties, and occur prior to any development impacts occurring to those specific areas or sites;

r) Provisions will be included to ensure that Aboriginal community representatives are permitted access to any identified sites or cultural areas within Donaldson Coal controlled land when requested, in consideration of safety and operational requirements at the time;

s) The AHMP will be regularly verified to establish that it is functioning as designed (ie. policies adhered to and actions implemented) to the standard required;

t) The AHMP will be revised in the event that a Native Title Claim is granted within the Project area, with future Aboriginal involvement in the area that is the subject of the granted Claim to only involve the successful Claimant;

2) Under the terms of the *National Parks and Wildlife Act 1974* it is an offence to harm or desecrate an object that the person knows is an Aboriginal object, or to harm an Aboriginal object ('strict liability offence'). Therefore, no activities or work should be undertaken within the Aboriginal site areas as described in this report without a valid Section 90 Aboriginal Heritage Impact Permit or *in lieu*, Part 4 State Significant Development approval;

3) Other land users (for example, the OEH, State Forests and essential service providers) should be made aware of the nature and location of the Aboriginal sites identified during the present investigation along the roads and power easements, to ensure that inadvertent impacts are avoided; and

4) Copies of this report should be forwarded to each registered Aboriginal party and the Department of Planning and Infrastructure and the OEH.

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PLATES (APPENDIX 5)

1. INTRODUCTION

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

Donaldson Coal owns and operates the Tasman Underground Mine, located approximately 20 kilometres west of the Port of Newcastle, New South Wales (NSW), in the Newcastle Coalfield (refer to Figure 1). The Tasman Underground Mine operates in accordance with an existing Development Consent (DA 274-9-2002).

Donaldson Coal is seeking consent for the extension of underground mining operations at the existing Tasman Underground Mine (herein referred to as the 'Tasman Extension Project' or 'the Project'). Donaldson Coal is a wholly owned subsidiary of Gloucester Coal Ltd.

Approval is being sought from the Department of Planning and Infrastructure (DP&I) for the Tasman Extension Project under Division 4.1 ('State Significant Development') of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The approval would consolidate and replace the existing Development Consent for the Tasman Underground Mine.

Resource Strategies Pty Ltd (Resource Strategies) is assisting Donaldson Coal with the preparation of an Environmental Assessment for the Project, for submission to the DP&I.

The Project is a proposed extension of the underground mining operations and development of surface infrastructure, including a new pit top (and associated run-of-mine {ROM} coal handling infrastructure) and ventilation surface infrastructure. The proposed mining operations would involve continued use of the bord and pillar method, with total and partial pillar extraction. Longwall mining would not be undertaken.

The Project area is situated in the Cessnock and Lake Macquarie local government areas, immediately south of George Booth Drive, east of Mulbring and west of West Wallsend in the lower Hunter Valley (refer to Figures 1 - 3). The investigation area (refer to Figure 4) is marginally larger than the Project area and measures around 1,260 hectares (12.6 square kilometres) in area. It comprises:

- The approximate extent of proposed West Borehole Seam workings and the extent of approved Fassifern Seam workings not previously subject to heritage survey, including a buffer zone around the workings based on a 26.5 degree angle of draw; and
- The small area adjacent to George Booth Drive in which development of a new pit top and associated ROM coal handling infrastructure is proposed.

1.1 Description of the Project

The Project would involve the extension of underground mining west and north into Exploration Lease (EL) 5337, EL 5498 and EL 5497, and extend the operational life of the mine by about 15 years. The Project would include the following activities (Donaldson Coal 2011):

- Continued underground mining of the Fassifern Seam using a combination of total and partial pillar extraction methods within Mining Lease (ML) 1555;
- Underground mining of the West Borehole Seam using a combination of total and partial pillar extraction methods;
- Production of ROM coal up to 1.5 million tonnes per annum (Mtpa);
- Development of a new pit top and associated ROM coal handling infrastructure off George Booth Drive;
- Development of ventilation surface infrastructure;
- Continued transport of Fassifern Seam ROM coal from the existing Tasman Underground Mine pit top to the Bloomfield Coal Handling and Preparation Plant (CHPP) via truck on public and private roads;
- Transport of West Borehole Seam ROM coal from the new pit top to the Bloomfield CHPP via truck on public and private roads;
- Progressive development of sumps, pumps, pipelines, water storages and other water management equipment and structures;
- Ongoing exploration activities within existing exploration and mining lease tenements;
- Ongoing surface monitoring, rehabilitation and remediation of subsidence effects; and
- Other associated minor infrastructure, plant, equipment and activities.

An indicative Project general arrangement is shown on Figure 2 including proposed extents of underground mining in the Fassifern and West Borehole seams.

1.2 Objectives and Purpose of this Report

Approval is being sought from the DP&I for the Tasman Extension Project under Division 4.1 ('State Significant Development') of Part 4 of the EP&A Act.

The Director-General of the DP&I issued the Environmental Assessment Requirements (EARs) for the Project on 14 December 2011 (refer to Appendix 1). The requirements identify 'heritage' as a key issue for the Environmental Assessment, with the requirements in relation to Aboriginal heritage being to undertake an Aboriginal cultural heritage assessment (including both cultural and archaeological significance) which must:

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

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

- A detailed description of the existing environment;
- Consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments;

- Detailed assessment of the key issues (eg. heritage), including:

    - A description of the existing environment *using sufficient baseline data*[1];
    - An assessment of the potential impacts of all stages of the development, including cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; and
    - A description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to manage any significant risk to the environment;

- Consultation with the Office of Environment and Heritage (OEH) in the Department of Premier and Cabinet (formerly the Department of Environment, Climate Change and Water {DECCW[2]}); and

- An assessment of the key issues taking into account relevant guidelines, policies and plans. In relation to Aboriginal heritage, these are listed as the draft *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (DEC 2005) and *The Burra Charter*.

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

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

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

Although an application for a Section 90 Aboriginal Heritage Impact Permit (AHIP) from the OEH will not be required, due to exemptions under Section 89J of Part 4 of the EP&A Act, the OEH (2011a) *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* policy may also be of relevance.

Consequently, this investigation has sought to address the DEC (2005), DECCW (2010b, 2010c) and OEH (2011a) policies. The primary aims and tasks of this Aboriginal cultural heritage assessment have been to:

- Undertake register searches, research, Aboriginal community consultation and an archaeological survey, and where required excavations, to identify and record any Aboriginal heritage evidence or areas of potential evidence or cultural values within the investigation area;

[1] DP&I emphasis;

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

- Assess the potential impacts of the Project upon any identified or potential Aboriginal heritage evidence or cultural values;
- Assess the significance of any Aboriginal heritage evidence or cultural values identified;
- Provide details of any Aboriginal heritage evidence in accordance with the OEH requirements;
- Consult with the Aboriginal community as per the OEH policy entitled *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*[3];
- Present recommendations for the management of any identified Aboriginal heritage evidence and potential heritage resources or cultural values; and
- Prepare formal archaeological reports to meet the requirements of Donaldson Coal, the DP&I and the OEH (primarily with reference to the 2005 *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation*, 2010 *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* and 2011 *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*).

For the purposes of this Aboriginal cultural heritage assessment, the investigation area totals 1,260 hectares and can be subdivided into:

1) *Underground investigation area* - The area in which the primary impacts will potentially occur from underground mining related subsidence, with minimal direct surface impacts (primarily limited to small areas from continued use of existing access tracks, exploratory drilling, subsidence monitoring, environmental monitoring and subsidence remediation). This area comprises the approximate extent of proposed West Borehole Seam workings and the extent of approved Fassifern Seam workings not previously subject to heritage survey, including a buffer zone around the workings based on a 26.5 degree angle of draw. It measures approximately 1,242.7 hectares and is marked with a blue border on Figure 4; and

2) *Surface investigation area* - Areas in which the primary impacts will occur from surface works. This area is located adjacent to George Booth Drive, where development of a new pit top and associated ROM coal handling infrastructure is proposed. It measures 21.7 hectares (of which 2.4 hectares overlaps with the underground investigation area) and is marked with blue cross-hatching on Figure 4.

It is noted that the *Project area* shown on Figures 1 - 3 is marginally smaller than the *investigation area* (ie. refer to Figure 4), as the latter encompasses a buffer zone based on the angle of draw.

1.3 Authorship

This assessment has been prepared by Peter Kuskie, an archaeologist with a BA (Honours) degree in Aboriginal archaeology and over 20 years experience in the conduct of Aboriginal cultural heritage assessments throughout Australia.

[3] Although the *Interim Community Consultation Requirements for Applicants* (2004) policy is referenced in the *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (2005) it has been superseded by the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* which are therefore being implemented for this Project.

The field investigation was undertaken by Stephen Free and Leigh Bate. Stephen Free is an indigenous archaeologist with a BA (Honours) degree in Aboriginal archaeology and 17 years experience in the conduct of Aboriginal heritage assessments, along with senior roles within government in cultural heritage management and indigenous policy and liaison positions. Leigh Bate is an archaeologist with a Bachelor of Archaeology degree and Graduate Diploma in Archaeology and three years full-time experience in the conduct of Aboriginal heritage impact assessments. The analysis was assisted by Katarina Boljkovac, an archaeologist with a Bachelor of Archaeological Practice and Bachelor of Science (Honours) degree and experience over a three year period both in Australia and overseas.

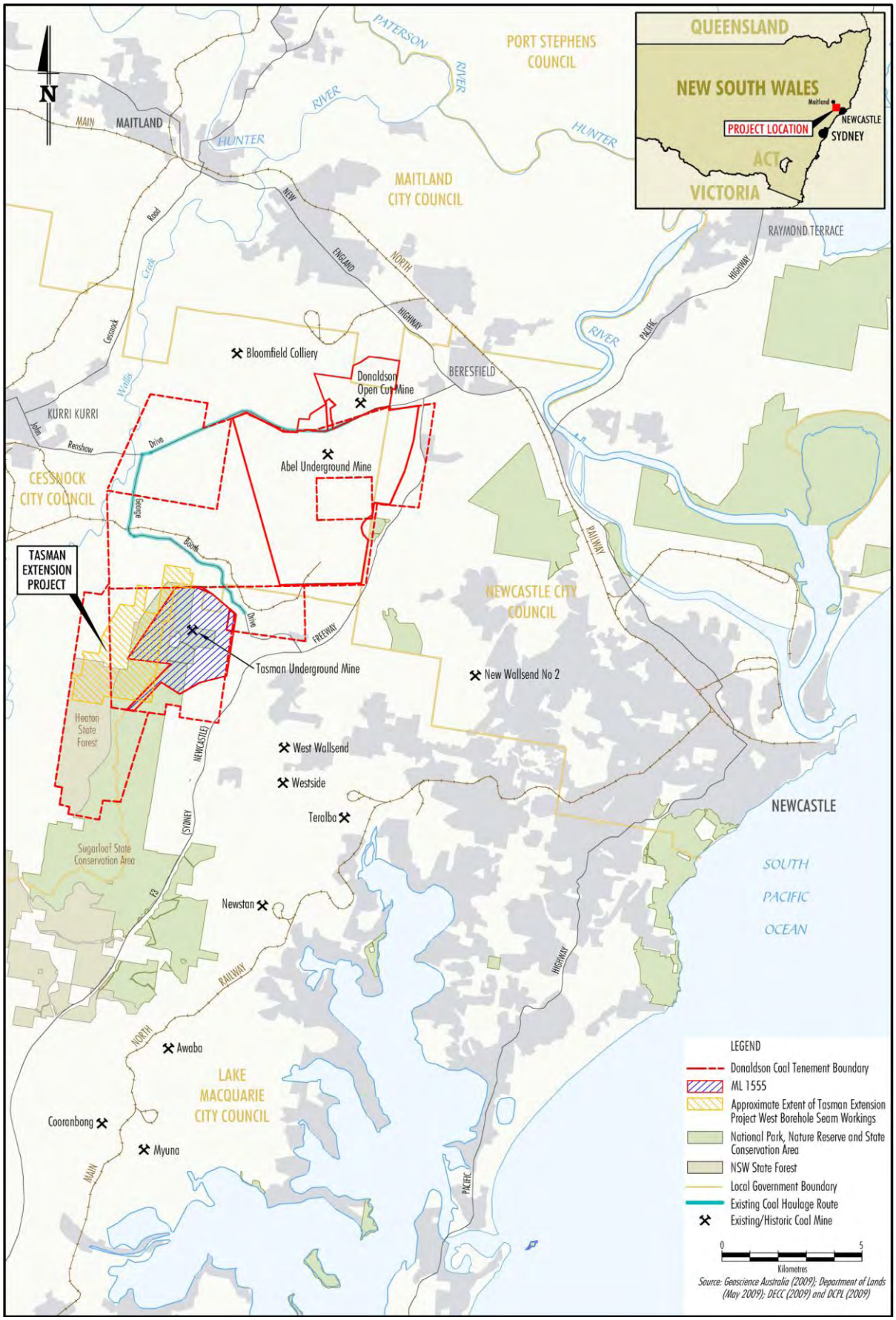


Figure 1: Location of Project area (courtesy Resource Strategies and Donaldson Coal).

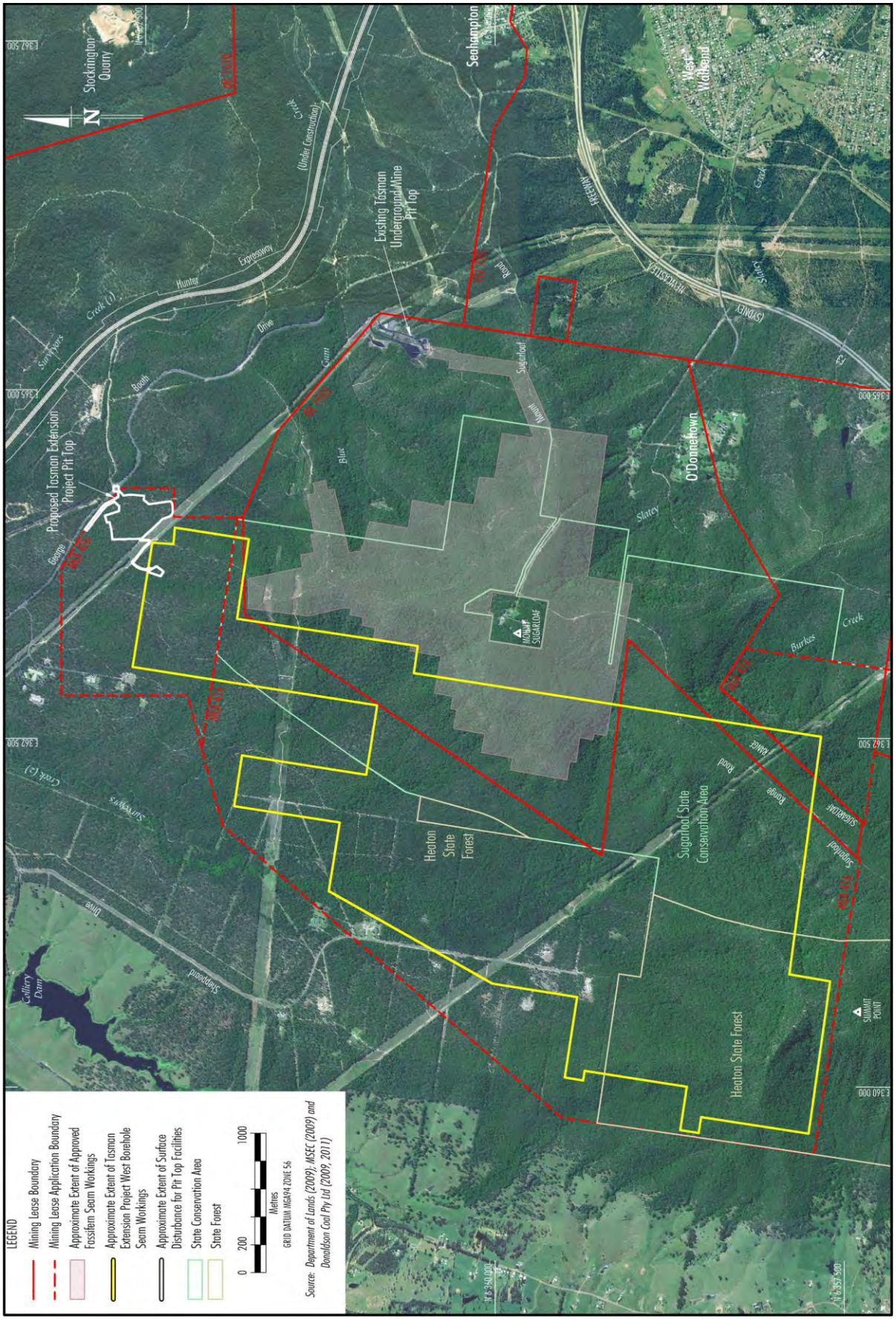


Figure 2: General arrangement of Project (courtesy Resource Strategies and Donaldson Coal).

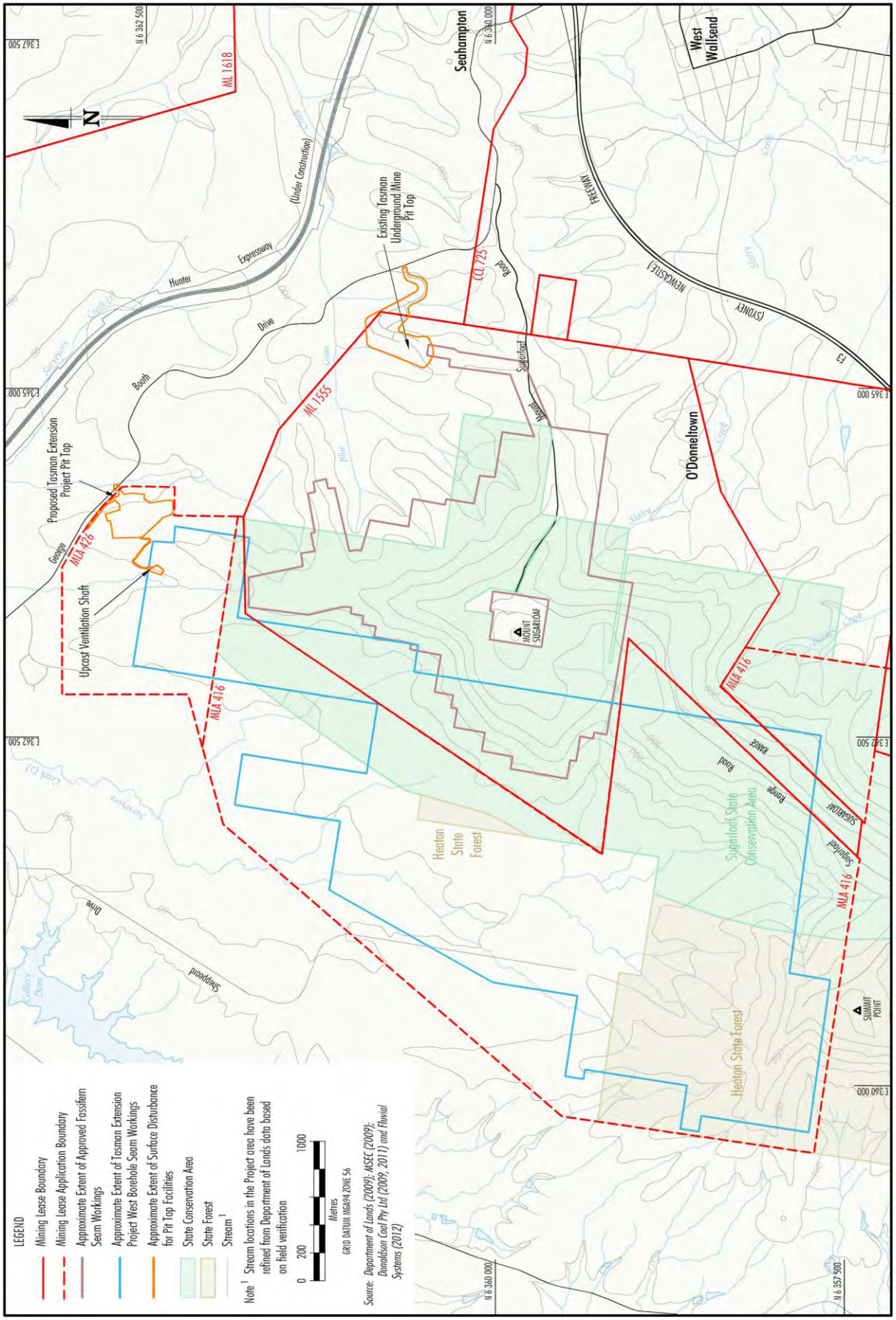


Figure 3: Topographic context of Project area (courtesy Resource Strategies and Donaldson Coal).

Figure 4: Investigation area for Aboriginal heritage (aerial photograph and 2 metre contours courtesy Resource Strategies; 1,000 metre MGA grid).

2. ENVIRONMENTAL CONTEXT

2.1 Location

The investigation area is located 25 kilometres west of Newcastle (mouth of the Hunter River at Nobbys Head) and 15 kilometres south-east of Cessnock, in the 'Southern Mountains' and 'Central Lowlands' regions of the Hunter Valley (Galloway 1963). It is situated in the Cessnock and Lake Macquarie local government areas and extends between MGA grid reference eastings 359600 and 364300 and northings 6357400 and 6363200 on the Beresfield 9232-3N, Wallsend 9232-3S and Quorrobolong 9132-2S 1:25,000 topographic maps.

The urban area of West Wallsend is located approximately 4.5 kilometres east of the investigation area, and Mulbring is 1.5 kilometres to the west. George Booth Drive forms part of the northern border of the investigation area, and Sugarloaf Range Road traverses the south-eastern portion. Much of the eastern portion of the investigation area comprises part of the Sugarloaf State Conservation Area (SCA), under the management of the OEH, with the south-western portion forming part of Heaton State Forest, under the management of NSW State Forests (refer to Figure 3). The lands forming Sugarloaf SCA formerly comprised part of Heaton State Forest. The remaining land in the west and north is privately owned.

2.2 Topography

The topography of the investigation area is defined by the Sugarloaf Range, trending north - south, with Mount Sugarloaf located immediately to the east of the central portion of the investigation area (Figure 3; Plates 1-6 in Appendix 5). Mt Sugarloaf, at 412 metres elevation, is a regionally dominant point that overlooks a substantial area along the Coastal Lowlands to the east, including Lake Macquarie, Newcastle Bight and the lower Hunter Valley, along with the Central Lowlands of the Hunter Valley to the north and west. It was named by Captain Cook as he sailed past in 1770 (Roy and Boyd 1996). Lake Macquarie is situated about ten kilometres to the south-east and the nearest coastline at Glenrock is 20 kilometres to the east.

The investigation area is characterised by the major ridgeline of Sugarloaf Range in the south-east, branching to Summit Point in the south-west, with steep side-slopes and spurs descending to lower elevation terrain in the west and north (Figure 3). Generally, the topography of the investigation area is dominated by moderate to steep gradients, with lower gradients in the north-western area which can be characterised as being part of the lower elevation 'Central Lowlands'. Much of the investigation area lies within the headwaters of the Wallis Creek catchment (via Surveyors Creek) on the western side of the range, and comprises lower order drainages with relatively limited catchment areas. Wallis Creek is located several kilometres west of the investigation area, and its major tributary Surveyors Creek is located less than one kilometre to the north of the investigation area. Wallis Creek flows north to its confluence with the Hunter River near Maitland. Minor portions in the south-east of the investigation area represent the headwaters of the Cockle Creek catchment (via Slatey Creek and Burkes Creek), which drain east of the range into Lake Macquarie.

The environment of much of the investigation area ('Southern Mountains') contrasts significantly with the adjacent Coastal Lowlands and Central Lowlands (which forms the north-western portion of the investigation area), the latter of which are of lower elevation and much lower relief and gradients (ie. predominantly level to gentle gradients) (refer to Plates 1-6 in Appendix 5).

A comprehensive heritage survey was undertaken of the investigation area, excluding approximately 130 hectares of land for which property access was not available (refer to Section 5.1). Landform units and gradients were characterised as follows for the 1,132 hectare area that was subject to survey sampling. This *heritage study area* was subdivided into a total of 209 archaeological survey areas, each representing a specific combination of landform unit and class of slope (refer to Appendix 3, Figure 10 and Table 3, definitions as per McDonald *et al* 1984).

In terms of the surface area of the heritage study area (as derived from two-dimensional base mapping), level to very gently inclined gradients (<1.45º) comprise 18.8% of the total area, gently inclined slopes (1.45-5.45º) 20.5% and moderately and steeply inclined slopes (>5.45º) 60.7%. Simple slopes occupy 60.2% of the heritage study area, drainage depressions 20.3%, ridge crests 7.8%, scarps 6.5%, spur crests 0.9% and flats 4.3%.

2.3 Geology and Soils

The investigation area is largely underlain by Permian Era conglomerate, sandstone, tuff, shale and coal of the Newcastle Coal Measures, with Triassic Era Narrabeen Group tuff, claystone, sandstone, conglomerate and coal along the Sugarloaf Range (Newcastle SI56-02 1:250,000 geological map). It is generally characterised by concave slopes ranging from less than 20 degrees to vertical cliffs, and has discontinuous cliff-line sedimentary outcrops at various elevations.

As documented within the survey coverage database (Appendix 3), sandstone rock formations occur widely in the investigation area, including open surfaces, outcrops, boulders and scarps/cliffs, with shelters and overhangs. These can host evidence of Aboriginal occupation, such as deposits of artefacts and cultural material in rock shelters or overhangs, rock art on surfaces of shelters or overhangs, and grinding grooves on exposed bedrock or isolated cobbles/boulders.

The presence of tuff within the underlying geology and quartz within conglomerates indicates that stone materials suitable for manufacturing Aboriginal artefacts may occur in various locations throughout the investigation area. Klauss Diessel and Murray Little (*pers. comm.*, 1996; *cf.* Diessel 1983, Little 1995) have identified such outcrops of tuff on the foothills of Sugarloaf Range immediately north of the investigation area and in a tributary of Surveyors Creek immediately east of the northern portion of the investigation area.

The Department of Land and Water Conservation soil landscape maps (Matthei 1995) identify soil landscapes or areas of land with identifiable features and characteristic soil types. The primary soil landscapes within the investigation area are:

- Beresfield Soil Landscape - occurs on lower elevation portions of the investigation area, predominantly in the central-west. The topsoil (*be1*), or A_1 horizon, has been described at its type location (near John Renshaw Drive), as a friable brownish black loam occurring at 0-10 centimetres in depth. Underlying this is a hard-setting dull yellowish brown sandy loam (*be2*) (topsoil - A_2 horizon). It typically ranges from a sandy loam through clay loam to fine sandy clay loam and occurs at 10-15 cm depth at the type location. The B_2 horizon (*be3*) is a pedal brown plastic mottled clay, occurring at a depth between 15 and 120 cm. On moderately well drained crests, generally 5-15 cm *be1* overlies 5-30cm *be2*. On side-slopes, 5-10 cm *be1* overlies 10-30 cm *be2*. Where disturbed, *be1* has often been lost to erosion and *be2* is exposed at the surface. On better-drained upper slopes up to 10 cm *be1* overlies 10-35 cm *be2*. On some lower slopes and more poorly drained flat low crests up to 10 cm *be1* overlies 10-30 cm *be2* (Matthei 1995:30-33);

- Sugarloaf Soil Landscape - occurs in the investigation area as a colluvial soil on the side-slopes of Sugarloaf Range, while a vestigial variant occurs on the ridge crests. The soil landscape comprises shallow to moderately deep (50-150 cm) well to moderately well drained yellow Soloths and Yellow Earths, and rapidly drained Bleached Loams and Lithosols on summit surfaces, with moderately deep to deep (110->200 cm) well drained Yellow Podzolic Soils, yellow Soloths, Red Podzolic Soils and Yellow Earths on steep side-slopes (Matthei 1995:103);

- Killingworth Soil Landscape - occurs in the southwest and northern portions of the investigation area, as an erosional soil landscape. The soil landscape is characterised by a brownish black pedal loam topsoil over a bleached, hard-setting loamy sand to sandy clay loam A2 horizon and a pedal yellowish brown clay B horizon.

Hence, the investigation area comprises areas that are anticipated to be depositional contexts (for example, the lower portions of slopes and flats) and areas that are anticipated to be erosional contexts (for example, the mid and upper portions of slopes), however it is noted that soil formation processes are complex and can vary over time in any locality (for example, episodes of major erosion in a typically depositional context). These processes can both remove, obscure or affect the integrity of archaeological evidence (particularly stone artefacts).

2.4 Climate, Flora and Fauna

A warm temperate climate with a maritime influence prevails in the lower Hunter Valley. Summers are warm to hot and humid, and winters are cool to mild. In winter, the region has westerly winds and frosts form regularly inland. In summer, winds are onshore from the ocean and augmented by north-easterly or easterly sea breezes. Low pressure troughs bring north-westerlies and then southerlies. Autumn and spring are transitional periods with considerable rain in autumn from low-scale pressure systems in the Tasman Sea (Bridgman and Oliver 1995).

Average annual rainfall varies between 1,000 and 1,200 millimetres on the coastline (Bridgman and Oliver 1995). Data recorded at the Maitland climatological station indicates seven to eight wet days per month and a mean annual rainfall of 840 millimetres (Tweedie 1963). Data interpolated from historical records by Driscoll (2012) indicates that rainfall within the investigation area is 900 to 1,000 millimetres per year. Rainfall is summer-autumn dominated due to the predominance of easterly trade winds at this time (Matthei 1995).

Maximum coastal temperatures average 25° Celcius (°C) in summer and the minimum averages 9-10°C in winter. Inland average maximum temperatures exceed 30°C in summer and are 5°C in winter. Temperature minimums decrease further inland and the maximums increase further inland (Bridgman and Oliver 1995). Data recorded at the Maitland climatological station indicates a mean maximum temperature of 30°C in summer and a minimum of 6.7°C in winter (Tweedie 1963).

The investigation area predominantly comprises native forest, with minor cleared areas around easements. A range of vegetation communities have been mapped (National Parks and Wildlife Service 2000), with much of the study area dominated by:

- Coastal Plains Smooth-barked Apple Woodland - particularly in the south-western portion, dominated by *Angophora costata* (Smooth-barked Apple);

- Lower Hunter Spotted Gum - Ironbark Forest - particularly in the central and northern portions, dominated by *Corymbia maculata* (Spotted Gum) and *E. fibrosa* (Red Ironbark); and
- Coastal Foothills Spotted Gum - Ironbark Forest - particularly in the eastern portion, dominated by Spotted Gum and *E. paniculata* (Grey Ironbark).

Minor portions of other vegetation communities are present, including Alluvial Tall Moist Forest, Hunter Lowlands Redgum Forest and Hunter Valley Moist Forest (refer to Driscoll 2012).

Other common species include *A. floribunda* (Rough-barked Apple), *E. piperita* (Sydney Peppermint), *E. umbra* (Bastard Mahogany), *E. fibrosa* (Broad-leaved Ironbark), *E. punctata* (Grey Gum), *E. eugenioides* (Thin-leaved Stringybark), *E. oblonga* (Narrow-leaved Stringybark), *E. gummifera* (Red Bloodwood), *E. pilularis* (Blackbutt) and *Allocasuarina torulosa* (Forest Oak). Common understorey species include *Doryanthes excelsa* (Gymea Lily), *Xanthorrhoea* spp. (Grass Tree), *Macrozamia communis* (Burrawang), *Themeda australis* (Kangaroo Grass), wattles (eg. *Acacia falcata*) and *Imperata cylindrica* (Blady Grass) (Matthei 1995, Story 1963). *Casuarina* spp., *Exocarpus cupressiformis* (Native Cherry), *Persoonia* spp. (Geebungs) and abundant shrubs can form inpenetrable thickets in deep gullies (Story 1963). A list of flora species that were recorded during the flora surveys of the Project area is provided in Appendix 8.

The cover of vegetation acts to reduce ground surface visibility and thereby reduces the potential to identify archaeological evidence during a field survey. Most artefact occurrences within the Hunter Valley have been identified only when visible on exposures created by sheet erosion or ground disturbance (Dean-Jones and Mitchell 1993). Nevertheless, the limited removal of vegetation therefore doesn't preclude the potential occurrence of carved or scarred trees.

The abundance and variety of fauna has been recorded by numerous early settlers and explorers, including many species consumed by the local Aboriginal population. A range of food sources available in the locality is listed by Enright (1914), including "wombat, grey kangaroo, wallaroo, red wallaby, common kangaroo rat, flying fox, lizards, goanna, pademelon and bandicoot, with possum, flying squirrel and native cats being less common". Fish including "bass, mullet, herring, minnow, bullrout and gudgeons and also ocean species visiting the estuaries, including eel, estuary perch, sea mullet, sand flathead, black bream, jewfish and garfish", were noted (Enright 1914).

Shellfish would have been present in the nearby Hunter River estuary and Lake Macquarie, the populations varying in relation to salinity and temperature changes, disease and fluctuations in predator populations (Dean-Jones 1990). Typical estuarine species likely to occur in the estuarine water body include the Sydney cockle (*Anadara trapezia*), mud whelk (*Pyrazus ebeninus*) and small mud whelk (*Velacumantus australis*), which prefer muddy environments in upper estuaries, mud oyster (*Ostrea angasi*) which prefers sandy habitats in mid-reaches, and edible mussel (*Mytilus planulatus*) and hairy mussel (*Trichomya hirsutus*) which occur nearer the estuary mouth (Sullivan 1982). Rock oysters (*Crassostrea commercialis*) would also attach to rocky shorelines and mangrove roots.

From the sources discussed above, it is evident that a range of plants and animals would have been available for exploitation by Aboriginal occupants of the locality of the investigation area, many on a seasonal basis (refer to Table 1). Ethnohistorical observations of subsistence activities are documented in Section 3.3.2. The investigation area only comprises a single resource zone (forest), with the estuaries, lakes, riverine and coastal resources some distance. This is likely to have been a significant factor in relation to Aboriginal occupation of the locality.

Table 1: Plant resources of the locality and potential Aboriginal uses (Umwelt 2009).

Common and *Scientific* Name	**Use**	**Reference**
Apple berry *Billardiera scandens* var. *scandens.*	Fruit eaten.	Low 1989:40 Zola & Gott 1992:26
black wattle *Acacia* sp.	This plant has gum that is used for food. It has leaves which are crushed and soaked to waterproof nets. Wood used for boomerangs, clubs and digging sticks. A fat pink witchetty grub lives under this plant and is used as a food resource.	McBride 2006 (in Umwelt 2007 Appendix 1)
Banksia *Banksia spp.*	Nectar eaten; cones used to carry fire.	Low 1989:170 Stewart & Percival 1997:13
Bottle brush *Callistemon sp.*	Food plant. The flowers are sucked as a source of nectar.	Stewart & Percival 1997: 11
bracken fern *Pteridium esculentum*	The underground fibrous stem roasted and beaten with a stone to remove starch.	Zola & Gott 1992: 37
Burrawang cycad *Macrozamia communis*	Pounded seed washed in running water for days to remove toxins, pulp then made into a cake and roasted.	Stewart & Percival 1997:37
Casuarinas sp.	Resource plant. Clubs and boomerangs were made from casuarinas.	Australian National Botanic Gardens Education Services, 2000
coast wattle *Acacia longifolia* var. *longifolia*	Food plant.	Low 1989:85
false sarsaparilla *Hardenbergia violacea*	Medicinal plant.	Low 1989: 210
flax lily *Dianella cerulean* var. *producta*	The berries are eaten, seeds inside can be chewed and are nutty in flavour. The leaves can be split and used for weaving. The base of the leaves is edible. The roots are edible after pounding and roasting. The plant is used as a whistle to attract birds.	Low 1989:8 Stewart and Percival 1997:24
Geebungs *Persoonia sp.*	Ripe fruit pulp eaten; fine scrapings of wood from young stems mixed with breast milk for use as eye treatment; solution made from bark strengthened fishing lines.	Stewart & Percival 1997:42
grass tree *Xanthorrhoea sp.*	Food and resource plant.	Low 1989: 130; Zola & Gott 1992:58-59
gum tree *Eucalyptus sp.*	Food and resource plant.	Low 1989:100
Hakea *Hakea sp.*	Food plant. The flowers are sucked as a source of nectar.	Stewart & Percival 1997: 11
kangaroo grass *Themeda sp.*	Food and resource plant.	Zola & Gott 1992:58
Lemon-scented tea tree *Leptospermum polygalifolium subsp. polygalifolium*	Popularly used to make a drink with nectar and also used for food.	Low 1989:32
mat rush *Lomandra sp.*	Long pliable leaves used for weaving baskets, leaf bases and the flowers are edible.	Low 1989: 131, 174; Zola & Gott 1992:59
Melaleuca *Melaleuca decora*	Papery soft bark used to wrap babies, roof structures, wrap food; timber used to make spears, clubs and digging sticks; liquid from leaves boiled to make tea; blossoms soaked in water to make sweet drink; steam from boiling or burning leaves inhaled to treat cold & flu symptoms.	Zola & Gott 1992:63 Low 1989:32 Stewart & Percival 1997:39
Mistletoe *Amyema sp.*	Food plant. The berries are eaten.	Low 1989: 14; Zola & Gott 1992: 54
narrow-leaved geebung *Persoonia linearis*	Fruit eaten.	Low 1989: 43-44
native cherry *Exocarpos cupressiformis*	The enlarged succulent stalklet (pedicel) can be eaten.	Low 1989: 46

red ironbark *Eucalyptus fibrosa*	Resource plant.	Low 1989:110
red-stemmed wattle *Acacia myrtifolia*	Food plant.	Low 1989:85
snow in summer *Melaleuca linariifolia*	Blossoms used for nectar and honey as food resource.	Low 1989: 171
smooth-barked apple *Angophora costata*	Medicinal and resource plant.	Australian National Botanic Gardens (www.anbg.gov.au)
tea tree *Melaleuca sp.*	Some species of tea tree were used by Aboriginal people for medicinal purposes. Leaves could be crushed and inhaled for coughs and colds, leaves could be soaked to make an infusion. Sores and burns were washed with the leaf infusion. The bark was used for bedding and for bandages.	Low 1990: 95
sickle wattle *Acacia falcata*	Food plant.	Low 1989:85
wombat berry vine *Eustrephus latifolius*	Small sugary tubers eaten.	Low 1989: 17

2.5 Geomorphological History

Reconstructing the landscape prior to non-indigenous settlement is relevant to understanding the nature of Aboriginal occupation in the locality and the post-depositional processes that may have affected any evidence of occupation.

The Hunter Valley is a mature riverine estuary. Formation of the estuary is closely related to glacio-eustatic fluctuations in sea level that have occurred many times over the past million years. These cycles have frequencies of 100,000 years and amplitudes of 100-120 metres. The last cycle began 125,000 years ago with the Last Interglacial phase of high sea levels and warm temperatures.

During the Last Interglacial conditions were similar to present with an extensive deltaic floodplain in the lower valley. Raised estuarine shell beds described by David and Etheridge (1890) belong to this phase of sedimentation, indicating the sea level was about five metres higher than present. The associated terrace deposits are remnants of the Last Interglacial floodplain that covered the estuary and was up to ten metres higher than the present floodplain in the Maitland area (Roy *et al* 1995:70-71).

Slow cooling of temperatures and falling sea levels followed, culminating in the last glacial maximum about 24,000 to 17,000 years ago. By the end of the sea regression, the coastline was displaced 25 kilometres to the east (present continental shelf) (Roy *et al* 1995:70-71). The climate was cooler and drier than at present.

Deglaciation and melting of ice sheets occurred rapidly from 18,000 years ago and the Hunter River slowly incised its valley. Much of the Pleistocene floodplain deposited around 125,000 years ago was removed by sub-aerial weathering and lateral migration of the river channels. Post-glacial sea levels rose quickly (about one metre per 100 years) up to 8,000 years Before Present (BP), slowed to half that rate between 8,000 and 6,500 BP and then stabilised according to Roy and Boyd (1996:11). However, recent evidence suggests that the sea rose above its present level by around 7,000 BP and remained above that level until the late Holocene.

As the sea level rose from 18,000 BP to the mid-Holocene, the Hunter River retreated as a bay head delta up the valley to Bolwarra, near Maitland, leaving the valley infilled with marine to brackish water in an estuary stretching 32 kilometres inland from the present coastline (Roy and Boyd 1996:74).

Once the sea level stabilised, a new cycle of estuarine and deltaic sedimentation commenced in the lower Hunter valley (Roy *et al* 1995:70-71). Estuarine environments were most widespread in the mid-Holocene (7,000 - 4,000 years ago) when the valleys were first drowned, but have since decreased in size as they infilled with sediment and the deltaic flood plain prograded seaward from Bolwarra, infilling the valley (Roy *et al* 1995:74). The shoreline changes were accompanied by dramatic and rapid environmental transformations as the shallow, saline estuary was converted to swamps and terrestrial floodplains. Most of the larger coastal rivers in south-eastern Australia experienced these changes during the late Holocene (last 2,000 - 4,000 years) (Roy and Boyd 1996:31).

Hence, the environmental history of the study area can be tentatively reconstructed as follows:

- During the last glacial maximum from about 24,000 to 17,000 years ago, the coastline was located approximately 25 kilometres to the east of its current location, as the sea level was about 130 metres below the present level. The climate was cooler (possibly 6-10º C) and drier than at present. The investigation area would have been a greater distance than at present from coastal or riverine resources. Potable water was probably not frequently available, other than from soaks or springs. In terms of subsistence resources and potable water, the study area did not represent an environment conducive to Aboriginal occupation;

- Deglaciation and melting of the ice sheets occurred rapidly from 18,000 years ago as temperatures rose. Post-glacial sea levels rose quickly (about one metre per 100 years) up to 8,000 BP, before slowing to half that rate between 8,000 and 6,500 BP. Mean eustatic sea levels remained between 1.5 and 2.2 metres above the present level until around 3,600 years ago. The coastline was now in closer proximity to the study area than during the Pleistocene period;

- During the mid-Holocene, the Hunter Valley was infilled with marine to brackish water in an estuary stretching 32 kilometres inland from the present coastline. As estuarine, riverine and coastal resources were now in closer proximity to the investigation area, the general locality may have been subject to increased human occupation. However, the direct investigation area still remained some distance from these resources and potable water supplies may have remained largely ephemeral; and

- As the sea level fell in the mid-late Holocene, the environment of the Coastal Lowlands transformed further, from a shallow estuary to swamps and terrestrial floodplains.

2.6 Land Use History

The non-indigenous occupation of the investigation area has been addressed by Maxim Archaeology and Heritage (2012).

Historical records indicate that there has been a long period (approximately 200 years) of non-indigenous use of the locality of the investigation area, particularly for timber harvesting.

The Hunter region was identified by Lieutenant John Shortland of HMS Reliance on 16 September 1797. Shortland observed 'Nobby's Head' and coal seams present in the cliff face. The river was named 'Coal River', which was changed to the 'Hunter River' in 1804, in honour of Captain John Hunter, second Governor of New South Wales (Windross and Ralston 1897). The local Aborigines new the Hunter River as 'Coquun' and it was noted in an 1886 NSW Gazette as such (Anon 1904:12, 93).

A penal station, initially known as 'King's Town' was established at Newcastle in 1804. From the early 1800s convicts continually escaped from Newcastle, with the aim of making their way overland to settlements on the Hawkesbury River. Convicts were chiefly employed securing cedar, coal, salt and lime (Goold 1981).

Settlements were established at various points along the river between 1812 and 1824. In 1818 the Commandant of Newcastle, Captain James Wallis, placed eleven convicts on the alluvial flats where West Maitland is now located, and several others on the Paterson River, to engage in agricultural pursuits to supply produce to Newcastle. Maize, butter, poultry and eggs were produced (Hartley 1995). Newcastle became an important port as the valley subsequently flourished through timber, wool, beef, dairy and coal mining industries (Wood 1972).

Free selecting of land commenced on a small scale on the Hunter River in 1821 or 1822 (Windross and Ralston 1897). After the penal settlement of Newcastle was transferred to Port Macquarie in 1823, Assistant Surveyor Henry Dangar was instructed to survey the Hunter Valley with the view to opening it to settlement (Hartley 1995). Henry Dangar (1828) wrote that by November 1825, there were 372,141 acres appropriated to 792 persons, 132,164 acres allotted for church and schools, and 100,000 acres reserved for Government. At this time, the earliest non-Aboriginal settlers were exporting over 200 tonnes of farm produce weekly (Windross and Ralston 1897:14).

Timber getting was an important industry from the initial non-indigenous settlement and by 1815 had reached considerable proportions (Windross and Ralston 1897:17). Coal mining was also one of the first industries in the valley, commencing in 1798 (Windross and Ralston 1897). The Brown brothers started a coal mine in 1844 at Four Mile Creek, several kilometres from the present investigation area (Windross and Ralston 1897:46). Howard Styles discovered coal at Minmi in 1835 (Newcastle & Hunter District Historical Society 1991). Timber was used for pit props in the underground coal mines and for railway sleepers.

Although much of the investigation area comprises Heaton State Forest and Sugarloaf SCA, parts under private ownership include:

- Portions granted to William Austin Horn in or around 1890;
- A small portion taken up by John McManus in the 1920s; and
- Portion 11, Parish of Stockrington, taken up by William Matthews (undisclosed date) and later by J. and A. Brown for the extension to the Seaham Colliery (Maxim Archaeology and Heritage 2012).

Non-indigenous settlement has resulted in some impacts to the investigation area, most noticeably from timber harvesting, the Mt Sugarloaf Road and various unsealed vehicle tracks, walking tracks, electricity transmission line easements, essential services (eg. Telstra) and mineral exploration. However, these impacts are generally minor (or have affected small areas) and are not anticipated to have had a substantial impact on any heritage evidence, other than that the removal of mature trees may have impacted any scarred or carved trees, had they been present, and the focalised impacts (such as well-formed roads) may have reduced the integrity of any artefact evidence present. However, in general, disturbance levels are low across the investigation area and should sub-surface deposits of artefacts occur, they may exhibit reasonable integrity.

3. ABORIGINAL ARCHAEOLOGICAL CONTEXT

3.1 Heritage Register Searches

A search was undertaken on 21 March 2011 of the OEH Aboriginal Heritage Information Management System (AHIMS), between MGA grid coordinates 358000 and 368000 east and 6355000 and 6365000 north. A total of 100 Aboriginal sites or Potential Archaeological Deposits (PADs) are listed on the OEH register within this area of 100 square kilometres, which encompasses the present investigation area (Figure 5).

The sites/PADs identified in the broad search area comprise:

- 51 grinding groove sites;
- 41 open artefact sites (including isolated finds);
- 3 scarred trees;
- 2 stone arrangements;
- 1 grinding groove and open artefact site;
- 1 grinding groove and art (engraved or painted); and
- 1 PAD.

It is noted that there are numerous errors and inconsistencies in the OEH AHIMS information, particularly relating to the OEH ascribed 'features' and 'site types'. These have been corrected where possible above.

A total of 22 Aboriginal heritage sites listed on the OEH AHIMS register have previously been recorded directly within or immediately adjacent to the investigation area (Figure 5, Table 2). Full descriptions of these sites are presented in Appendix 2 and they are discussed further in Section 5. These sites comprise 19 grinding grooves, two open artefact sites and one stone arrangement[4].

No Aboriginal heritage sites are listed on the State Heritage Register, Register of the National Estate, National Heritage List or Commonwealth Heritage List under the *Environment Protection and Biodiversity Conservation Act 1999* or under the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* or on the *Cessnock Local Environmental Plan 1989* or *Hunter Regional Environmental Plan 1989 (Heritage)* within the investigation area. By virtue of their listing on the OEH AHIMS register, all Aboriginal sites within the Lake Macquarie local government area are also listed on the *Lake Macquarie Local Environmental Plan 2004*.

The Mulbring Valley Landscape Conservation Area, listed for Historic Values as an Indicative Place on the Register of the National Estate, occurs partly within the investigation area. Mount Sugarloaf and the Sugarloaf Range are listed for Historic Values on the State Heritage Inventory and Schedule 4 of the *Lake Macquarie Local Environmental Plan 2004*. These items are not the subject of further assessment herein (refer to Maxim Archaeology and Heritage 2012).

A search of the Native Title Tribunal on 27 January 2011 identified that no determinations of Native Title, registered Native Title Determination applications (Claimants) or Indigenous Land Use Agreements (ILUAs) apply to the investigation area.

[4] Examination of the site record for #38-4-0001 indicates that it is probably located around MGA reference 361500:6375000, 500 metres outside of the investigation area.

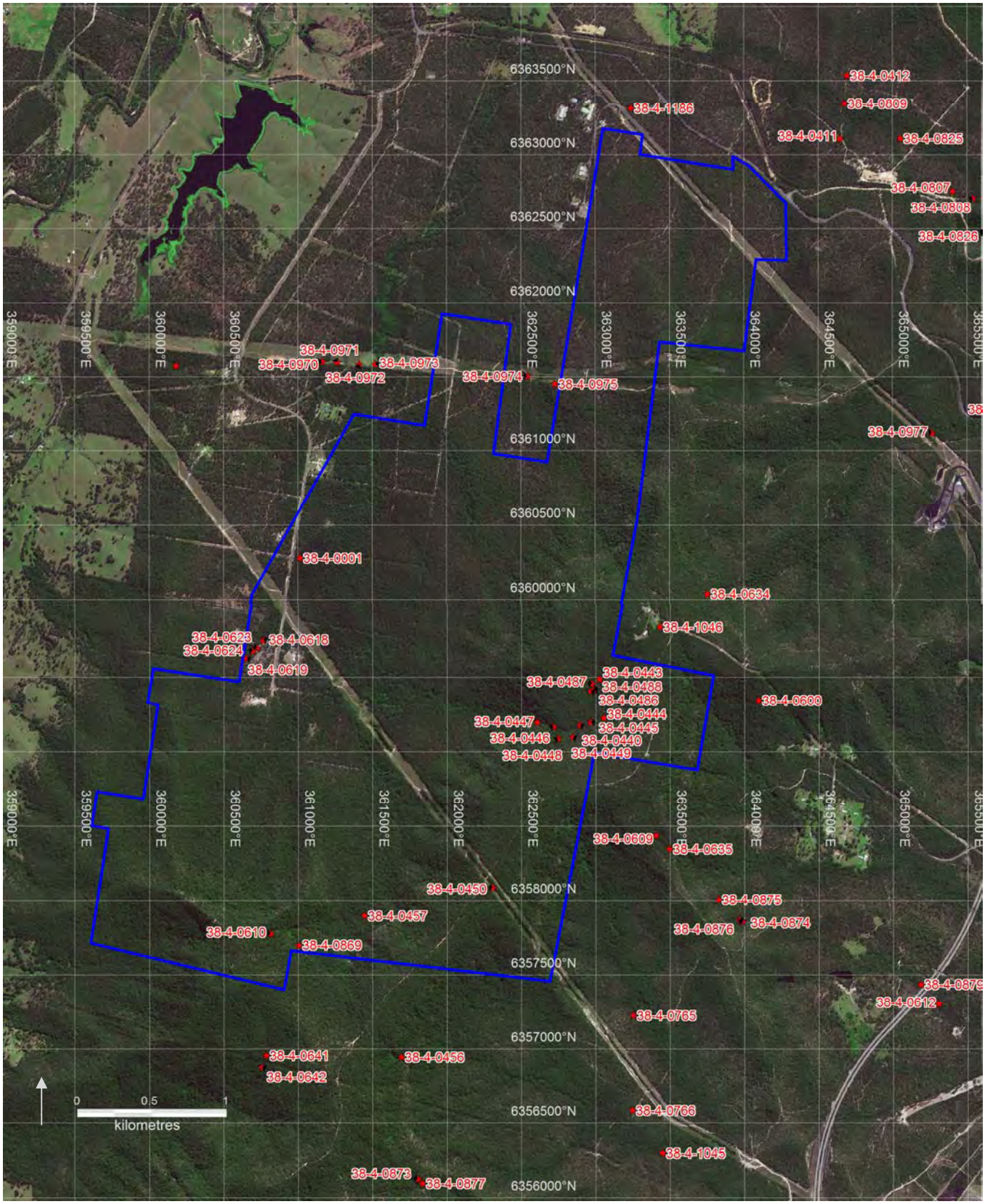


Figure 5: Location of investigation area (blue border) and previously recorded Aboriginal heritage sites (red stars) (aerial photograph courtesy Resource Strategies; 500 metre MGA grid; site data courtesy OEH but not guaranteed to be free from error or omission - refer to Figure 11 for latest version of Aboriginal site locations incorporating current survey results).

Table 2: Previously recorded Aboriginal sites within the investigation area as listed on the OEH AHIMS[5].

OEH AHIMS #	Site Name	Recorder	Site Type
38-4-0001	Great Sugar Loaf;	Unknown Author	Stone Arrangement
38-4-0440	Mt Sugarloaf;	Bluff, Miller	Grinding Groove
38-4-0443	Mt Sugarloaf;	Bluff, Miller	Grinding Groove
38-4-0444	Mt Sugarloaf;	Bluff, Miller	Grinding Groove
38-4-0445	Mt Sugarloaf;	Bluff, Miller	Grinding Groove
38-4-0446	Mt Sugarloaf;	Bluff, Miller	Grinding Groove
38-4-0447	Mt Sugarloaf;	Bluff, Miller	Grinding Groove
38-4-0448	Mt Sugarloaf;	Bluff, Miller	Grinding Groove
38-4-0449	Mt Sugarloaf;	Bluff, Miller	Grinding Groove
38-4-0450	Mt Sugarloaf;	Bluff, Miller	Grinding Groove
38-4-0457	Heaton State Forest;	Bluff	Grinding Groove
38-4-0486	Heaton S.F.;Heaton State Forest;	Bluff	Grinding Groove
38-4-0487	Heaton S.F.;Heaton State Forest;	Bluff	Grinding Groove
38-4-0488	Heaton S.F.;Heaton State Forest;	Bluff	Grinding Groove
38-4-0610	Sugarloaf Range 1	Bluff	Grinding Groove
38-4-0618	MT SUGAR LOAF	Bluff	Grinding Groove
38-4-0619	MT SUGAR LOAF	Bluff	Grinding Groove
38-4-0623	MT Sugarloaf	Bluff	Grinding Groove
38-4-0624	MT Sugarloaf 2	Bluff	Grinding Groove
38-4-0869	Heaton SF	Bluff	Grinding Groove
38-4-0974	Wallis Creek 2	Davies	Open Artefact Site
38-4-0975	Wallis Creek 1	Davies	Open Artefact Site

[5] Site data courtesy OEH AHIMS but not guaranteed to be free from error or omission - a number of errors associated with OEH listing of the site data have been identified and corrected where base data {site cards} were available. Also includes two sites adjacent to the investigation area but within approximately 100 metres of the boundary.

3.2 Previous Archaeological Research

A number of Aboriginal heritage investigations have been undertaken within the vicinity of the investigation area, principally for Environmental Impact Assessments relating to development proposals. Brief discussion of the most relevant investigations will highlight the range of site types and variety of site contents in the region, identify typical site locations, and assist with the construction of a predictive model of site location for the investigation area.

3.2.1 Tasman Mine and Tasman Extension Investigation Area

Limited systematic archaeological survey has previously been undertaken and reported on within the investigation area.

An amateur heritage site recorder and bushwalking enthusiast, Mr Warren Bluff, has identified many obtrusive site types in the locality, including almost all previously recorded sites within the investigation area[6] (refer to Table 2 and Appendix 2). Most of these sites were relocated and re-recorded during the present investigation (refer to Appendix 4) and grid references and descriptions updated. Systematic survey was not undertaken and most of Mr Bluff's inspections were on the eastern side of the Sugarloaf Range (Umwelt 2010:3.24).

In 2003, Umwelt staff re-recorded six grinding groove sites within the present study area, as part of the Lake Macquarie heritage study. Updated site records do not appear to have been lodged with the OEH. Highlighting the variations in surface visibility conditions that can occur over time and the intensity of recording (related to the different purposes of each inspection), a comparison of the number of grooves recorded by Bluff and Umwelt in 2003 (reported by Umwelt 2010:3.24) was made, which can be further compared with the results of the present study:

- Site #38-4-0440: 54 grooves recorded by Bluff, 75 by Umwelt and 92 by South East Archaeology during the present study;
- Site #38-4-0444: 12 grooves recorded by Bluff, 12 by Umwelt and 17 by South East Archaeology during the present study;
- Site #38-4-0445: 24 grooves recorded by Bluff, 21 by Umwelt and 28 by South East Archaeology during the present study;
- Site #38-4-0446: 15 grooves recorded by Bluff, 8 by Umwelt and 22 by South East Archaeology during the present study;
- Site #38-4-0448: 3 grooves recorded by Bluff, 3 by Umwelt and 9 by South East Archaeology during the present study;
- Site #38-4-0449: 7 grooves recorded by Bluff, 7 by Umwelt and 14 by South East Archaeology during the present study.

Umwelt (2002a) investigated the Tasman Mine for the Environmental Impact Statement (EIS) that culminated in Development Approval DA 274-9-2002 (16 March 2004) and Mining Lease 1555 (7 September 2004). The Umwelt (2002a) investigation focused on the eight hectare area in the northern portion of ML1555 in which the proposed surface facilities were to be located. This area is located two kilometres east of the present investigation area adjacent to George Booth Drive.

[6] Representatives of the registered Aboriginal parties wish to acknowledge the contribution of Mr Bluff to the identification and recording of cultural heritage evidence within the region.

A survey of this area was undertaken with the Awabakal Local Aboriginal Land Council (LALC) in April 2001. No Aboriginal heritage evidence was identified. Investigation of the area of proposed underground workings was not undertaken as part of the EIS.

Kuskie (2008a) undertook an assessment of Aboriginal heritage in relation to a Subsidence Management Plan (SMP) application by Donaldson Coal for Panels 1 to 17 of the Tasman Mine. The SMP area measured approximately 211 hectares, within Mining Lease 1555, and is located immediately east of the present investigation area, with minor overlap in places.

The principal aims of the Aboriginal heritage assessment were to identify the Aboriginal heritage resource, including cultural values, present within the SMP area, assess the potential impacts of subsidence upon this resource, identify and assess various management and mitigation options for this resource, and provide recommendations for the most appropriate management and mitigation options, in consultation with the local Aboriginal community.

The investigation proceeded by recourse to the archaeological and environmental background of the locality, followed by construction of a predictive model of site location. A field survey of the SMP area was undertaken by South East Archaeology and the Awabakal LALC over a period of six days in April 2007 and a further day in September 2007. The 227.7 hectare study area, encompassing the SMP Area and some ground immediately adjacent to it, was subdivided into 41 survey areas, all of which were sampled (Figure 6). A *total sample area* (ground surface physically inspected in such a manner as to reliably enable the detection of heritage evidence) of approximately 93,120 m^2 was surveyed, representing about 4.1% of the SMP area. As this coverage only refers to an area of several metres width directly inspected by the survey team, the actual coverage for site types susceptible to subsidence impacts, such as rock shelters, was significantly greater than this. The total *effective survey coverage* of the study area (*visible* ground surface physically inspected *with* potential to host evidence) equated to approximately 9,443 m^2, or 0.4%. Vegetation and leaf litter acted to reduce the survey coverage, particularly for less obtrusive evidence such as stone artefacts.

Two Aboriginal heritage sites occur within the SMP area, both grinding grooves (#38-4-0600 and 38-4-0634). One other small grinding groove site ('Tasman 24/A', #38-4-1046) was identified on the margin of the study area, adjacent to the boundary. In addition, it was identified that the Awabakal people hold strong traditional, historic and contemporary cultural associations with Mount Sugarloaf, for which physical evidence (ie. "objects" under the *National Parks and Wildlife Act 1974*) do not necessarily exist (Kuskie 2008a).

Mount Sugarloaf, situated immediately adjacent to the SMP area, holds strong traditional associations for the Awabakal people relating to male initiation ceremonies. Considering this special use of the mountain, along with the relatively limited subsistence resources, potable water or level ground suitable for camping available, along with the presence of the supernatural spirit being "Puttikan" which may have limited access to Mount Sugarloaf primarily to initiated men, any use of the SMP area was inferred to have primarily been of a low intensity and predominantly related to spiritual, rather than secular, activities (Kuskie 2008a).

The key recommendations included implementation of control measures where possible to reduce impacts to the two grinding groove sites, or alternatively obtaining a Section 90 AHIP for this evidence, along with a program of monitoring involving inspection of the known heritage sites after mining has occurred, in order to identify and record the effects of subsidence and provide baseline data to assist with an assessment of the potential effects of subsidence on heritage items identified in future SMP areas (Kuskie 2008a).

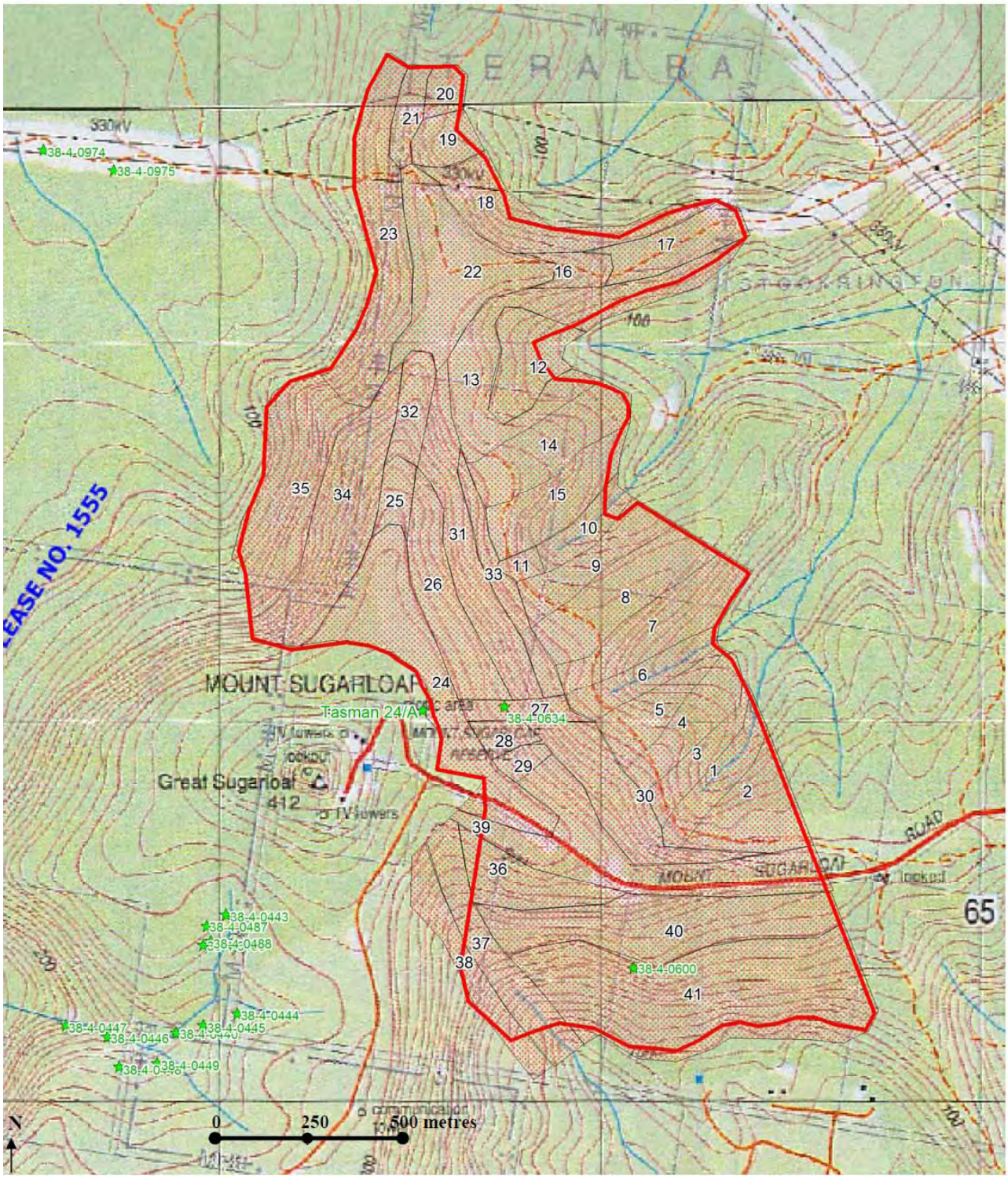


Figure 6: Location of Aboriginal heritage sites and archaeological survey areas in the Tasman Panels 1 - 17 SMP study area (Kuskie 2008a: Figure 4; base map Wallsend 9232-3S and Beresfield 9232-3N MGA 1:25,000 topographic maps, enlarged; survey areas denoted by black borders, text and pink shading; Aboriginal sites denoted by green stars/text; red line denotes SMP Area, which is 16.8 hectares smaller than Kuskie's 2008 study area).

Kinhill Engineers (1995) conducted an assessment of portions of Crown timber lands in the Morisset Forestry District, which comprises an extensive area west of the F3 Freeway and south from Kurri Kurri to Gosford. It included Heaton State Forest, portions of which occupy the present investigation area. Limited direct survey was undertaken, however Kinhill Engineers (1995:35) noted that a grinding groove site (#37-6-472) is located within Heaton State Forest and that a stone arrangement has been reported on the Sugarloaf Range north of the State Forest.

Kinhill Engineers (1995) identified 76 archaeological sites, including 67 artefact scatters (incorporating 35 isolated finds), five rock shelters with potential archaeological deposits and four grinding groove sites. Kinhill Engineers' (1995) predictive model included statements to the effect that:

- Valley bottoms of higher order drainage depressions and ridge tops between major catchments appeared to have a higher density of archaeological sites;
- Areas containing higher density distributions of archaeological sites would contain artefact scatters with other areas containing isolated finds;
- Rock shelters would only occur where suitable sandstone outcrops occurred and are found more frequently in the Hawkesbury sandstone than the Narrabeen sandstone; and
- Grinding grooves can occur wherever suitable sandstone outcrops occur in association with suitable water supply.

Umwelt (2005a) prepared a preliminary constraints analysis for Ellemby Resources for Exploration Leases EL 5497 and EL 5498. EL 5497 encompasses the northern-most portion of the present investigation area and EL 5498 encompasses the south-western portion. The desk-top analysis borrows heavily from the work of Kuskie and Kamminga (2000) and did not involve field investigation.

3.2.2 South of the Investigation Area

Further south of the present SMP study area, broader areas have been examined for projects such as the Awaba Coal Mine and for the then Electricity Commission of NSW (eg. Dyall 1977). However, the most relevant investigation is that by Umwelt (2010) of the West Wallsend Colliery Continued Operations Project.

Umwelt (2010) undertook a study for the West Wallsend Colliery Continued Operations Project. The study area comprised an area of proposed longwall mining measuring 1,085 hectares. The proposed mining method (longwall) differs substantially from the present Project (bord and pillar). Longwall mining tends to have significantly greater impacts to Aboriginal heritage, compared to bord and pillar mining.

The West Wallsend study area of Umwelt (2010) is located just over two kilometres south of the present investigation area, and extends further south to Rhyope, west of Wakefield. Approximately 86% of the area is located within the Sugarloaf State Conservation Area. It comprises similar environmental contexts to the present investigation area, with Sugarloaf Range, associated moderate to steep side-slopes, lower foothills and the headwaters of drainages present.

Umwelt (2010) conducted a field survey over 18 days, primarily between February and April 2009. The survey involved transects within the study area and did not result in comprehensive sampling across the geographic extent of the area. It was primarily targeted at areas with highest potential for grinding groove and rock shelter sites and areas of ground surface visibility. Umwelt (2010) report a total coverage of 40.7 hectares or 3.8% of the study area. An additional 18 hectares was directly sampled adjacent to the study area.

Consultation with the Aboriginal community involved the *Interim Community Consultation Requirements for Applicants* (DEC 2004) policy. Five stakeholders were identified (Awabakal Descendants Traditional Owners Aboriginal Corporation, Awabakal Traditional Owners Aboriginal Corporation, Awabakal LALC, Cacatua Culture Consultants and Koompahtoo LALC).

A total of 62 Aboriginal sites were recorded (or had been previously recorded), including 36 open artefact sites, 19 open grinding groove sites, one rock shelter with artefacts and grinding grooves, one rock shelter with PAD, three scarred trees and two stone arrangements.

The grinding groove sites were all identified on sandstone bedrock or outcrops within drainage depressions, some in association with natural potholes that would have retained water after rain. The sites contained between one and 40 grooves, with 14 (74%) containing ten or fewer grooves. The grooves were interpreted in relation to experimental data by Dickson (1981) and Wilson (1994) and various inferences were made about the creation of each groove and the time involved in the grinding processes. Umwelt (2010) speculate that some grooves resulted from the grinding of new cutting edges on axes, hatchets, chisels and fire-hardened wooden or bone spear points, some resulted from the resharpening of edges on axes, hatchets and chisels, and one 'bowl-like groove' resulted from food/ochre preparation. Re-use of a number of grooves is inferred.

The open artefact sites were mostly identified in exposures associated with ground disturbance. The sites typically contained low numbers of artefacts (less than 15), mostly of tuff or silcrete and predominantly flake portions. Low frequencies of quartz, petrified wood, quartzite, 'mudstone' and unidentified volcanics were also reported. Sites tended to occur on relatively low gradient ridge and spur crests, and a number of previously recorded sites occur in association with drainage depressions or soaks.

Thirteen rock shelters were inspected, but unless artefacts were present, these were not recorded as 'sites' or PADs (Umwelt 2010). Normal practice elsewhere is to record all shelters with habitable floor areas as 'rock shelters with PADs' in acknowledgement that artefacts may be present in sub-surface contexts, but are often not visible on the surface due to sedimentation or bioturbation processes.

Two stone arrangements were identified, 'Cockle Creek Stone Arrangement 1' on a narrow mid-slope spur adjacent to a creek channel, and 'Diega Creek Stone Arrangement 1' on the edge of the main Sugarloaf Range ridge at the intersection of a major south-east oriented spur (Umwelt 2010).

Eleven scarred trees were recorded, of which three were assessed as being of potential Aboriginal origin following an arboricultural assessment.

Seventeen landscape features were identified by the Awabakal Aboriginal participants as being of cultural significance. These included features such as natural springs, a stone arch, stone cairns and rock shelters. The stakeholders identified strong traditional, historical and contemporary cultural values associated with the study area, including with the physical archaeological evidence (eg. grinding groove sites).

Umwelt (2010) assessed the scientific significance of the sites. Six of the grinding groove sites (including one with an associated rock shelter) were assessed as being of high significance, five of moderate to high significance and two of moderate significance, with the remainder of low to moderate significance. All open artefact sites were assessed as being of low significance apart from three sites of low to moderate significance. The rock shelter site was assessed as being of high significance, the stone arrangements of moderate to high significance and the scarred trees as moderate significance.

The impacts of underground longwall mining on the sites and cultural values were assessed and a range of management recommendations presented by Umwelt (2010), including mitigation, conservation and substantial offset studies of the adjacent Sugarloaf SCA.

3.2.3 East of the Investigation Area

Numerous studies have been undertaken east of the investigation area, between Minmi and the northwest margin of Lake Macquarie.

Buchan (1975) surveyed part of the Natural Gas Pipeline route between Sydney and Newcastle, including the section between Ourimbah Creek and the Barnsley Terminal, near Killingworth. No sites were located in this section. Brayshaw (1979) surveyed the revised route of the pipeline between Mardi Dam and Kooragang Island, traversing east of the present investigation area near West Wallsend and Seahampton. Site #38-4-0070, described as a sparse scatter of flaked pieces of chert and silcrete, was located above Blue Gum Creek on the crest of a slightly eroding spur (Brayshaw 1979).

Bowdler and Happ (1982) surveyed the route of an electricity transmission line easement between West Wallsend and Tomago. The corridor traverses east of the present investigation area with only one site being identified (#38-4-0109), a set of grinding grooves in Burnt Creek. Bowdler and Happ (1982:6) argued that the archaeological potential for the remainder of the route was low and, despite limited surface visibility, further sites were not predicted to occur. This was attributed to the impacts from recent land use, the 'unprepossessing nature' of much of the land, the lack of recorded sites and the lack of suitable sandstone outcrops or exposures (Bowdler and Happ 1982:6).

Bowdler and Gollan (1982) surveyed the routes of 330 kV power lines between Eraring and Newcastle and between Tomago and Newcastle. One route crosses several kilometres southeast of the present investigation area. Grinding grooves were located in Cockle Creek and Slatey Creek, along with a small artefact scatter on an unnamed watercourse. A series of connected water holes in the sandstone bed of Palmers Creek was also thought to be of Aboriginal origin (Bowdler and Gollan 1982).

Kuskie (1992a, 1992b, 1993) surveyed the route of Optus Communications' fibre optic cable between Wyong and Coffs Harbour, which traverses east of the present investigation area. North of George Booth Drive at West Wallsend the cable route parallels Seahampton Road before connecting with power easements north to John Renshaw Drive. Intensive field survey was not undertaken in this location because of the extensive levels of ground disturbance, low surface visibility, the results of earlier studies and the minimal impact of cable installation.

Brayshaw (1986b) surveyed the 20 kilometre section of the F3 Freeway between Wakefield and Minmi Road. Dense vegetation limited surface visibility. Two sites were located, a set of grinding grooves on a tributary of Cocked Hat Creek (#38-4-0115) and an artefact scatter on a ridge west of Minmi Road (#38-4-0116). The latter site contained 21 artefacts within 330 m^2, at a maximum density of six artefacts/m^2.

Donlon and Brayshaw (1986) surveyed a seven kilometre route for the proposed F3 Freeway link road between Estelville and Wallsend. Donlon and Brayshaw (1986) identified three sites which may have been affected by the proposed road, including the grinding groove site (#38-4-0115) and two artefact scatters. Donlon and Brayshaw (1986) noted that the sites were consistent with other sites in the region and recommended that if the sites were to be affected by the proposed development, Section 90 Consent should be sought.

Effenberger (1996) investigated a 4.7 kilometre long corridor for a proposed sewage transportation scheme between West Wallsend and Boolaroo. Effenberger (1996) identified two artefact scatters near Cockle Creek. Effenberger (1996) noted moderate to high levels of disturbance within the one metre wide impact corridor and recommended that Awabakal representatives be engaged to periodically inspect excavated trenches in archaeologically sensitive areas and that a Section 90 Consent be sought for the two identified sites.

Dean-Jones (1989a) surveyed the proposed Summerhill Waste Disposal site, located between Minmi and Maryland. The 350 hectare property included the former Wallsend Borehole 1 and 2 Collieries, and only 10% comprised undeveloped land. It consisted of steeply dissected ridgelines, two kilometres south of Hexham Swamp. The property forms the steeper and more elevated sections of a spur leading into the wetlands. No sites were located, a result Dean-Jones (1989a) attributes to sedimentation along drainage lines, caused by runoff from overburden stockpiles, and low ground surface visibility. The potential for large artefact scatters within the property was considered to be lower than the spurs bordering the wetlands, because the landform units are more elevated, steeper and further from the wetlands (Dean-Jones 1989a). Dean-Jones (1989a) also noted the presence of pale grey-cream tuffs and silicified tuffs, 'with excellent flaking qualities', exposed in redistributed overburden and in deep rills.

Mills (1995) assessed the proposed residential subdivision of Fletcher, located south of Minmi Road, immediately west of Maryland. The 77 hectare area containing a ridge, side slopes and ephemeral watercourses was surveyed in a single day. Mills (1995) noted dense vegetation in parts with soil dumping and vehicle track also contributing to poor survey coverage. Mills (1995) did not locate any Aboriginal heritage sites.

Resource Planning (1991) conducted a survey along a four kilometre corridor for a proposed upgrade to George Booth Drive between Northville Roundabout and Cameron Park Drive. Both sides of George Booth Drive were inspected, with three artefact scatters identified (#38-4-0295, 38-4-0296 and 38-4-0297). Resource Planning (1991:5) assessed the sites as having no scientific, educational or significant value and recommended that a Section 90 Consent be sought.

Resource Planning (1993) also investigated a 650 hectare area for the proposed Northlakes Urban Release Area. This property is located between Edgeworth and West Wallsend, and bordered by Minmi Road, George Booth Drive, Cameron Park Drive and the Edgeworth urban area. With the exception of relocating grinding groove site #38-4-0115, no further sites were located during the very low intensity two day survey. Resource Planning (1993) noted dense vegetation and substantial amounts of refuse dumping in the Northlakes Urban Release Area.

Mills (1999) reinvestigated the Northlakes Urban Release Area and relocated site #38-4-115. Mills (1999) also identified a further three artefact scatters, seven isolated artefacts and six 'Potential Archaeological Deposits' within the area.

Besant (2003) investigated a proposed residential development of Lots 59, 70 and 114, DP 755262, immediately northwest of Edgeworth. Three isolated artefacts were identified.

Nearby at Cameron Park, Clarke and Kuskie (2006) investigated water reservoir upgrades for Hunter Water Corporation and identified one artefact site in a small study area.

Haglund (1986) undertook a broader regional assessment of the Lake Macquarie City Council area. Haglund (1986) noted that 151 sites were then listed on the AHIMS register, of which 46 were shell middens (or complexes including quarries), 65 were artefact scatters, and the remainder were rock shelters (including those with art or grinding grooves), grinding grooves (including a 'well' site), scarred trees, quarries and mythological sites. Haglund (1986) identified a number of areas which were archaeologically sensitive, most of which lie on the eastern margin of the lake.

One such area is a midden and Aboriginal burial site (#45-7-37) excavated by Dyall and Bentley (1975) on the south side of Swansea Channel near the entrance to Lake Macquarie. Dyall and Bentley (1975) suggested that the site was possibly the largest repeatedly occupied site in the area, with exploitation of predominantly marine resources including fish, shellfish and birds, supplemented with terrestrial mammals and reptiles. Artefacts identified included backed artefacts, edge-ground hatchets and over 81,000 ‘waste flakes’ (debitage). Thirteen bone implements with ground points were also identified. Several radiocarbon dates were obtained and occupation dates range from 7870±115 uncalibrated years BP to 1965±85 (uncalibrated BP). The burial was dated to 2080±150 (uncalibrated BP) (Dyall and Bentley 1975).

An updated regional study of the Aboriginal heritage of the Lake Macquarie local government area has recently been completed by Umwelt and is available from the Council office.

3.2.4 North and West of the Investigation Area

Immediately north of the present investigation area, a number of studies have been undertaken into the Donaldson Coal Mine, Abel Mine and Bloomfield Mine.

Brayshaw (1985) located two artefact scatters close to Four Mile Creek, during a survey for the then proposed 'Ironbark Colliery'.

Effenberger (1997) initially investigated the 546 hectare Donaldson Exploration Lease (EL5071) with a sample survey and located 11 heritage sites. With the exception of one large artefact scatter (WF1, over 100 artefacts on a rise adjacent to a floodplain) and a possible scarred tree, the sites comprised small artefact scatters (less than five artefacts) or isolated artefacts.

Umwelt (1998a, 1998b) conducted further investigation of the Donaldson Lease Area to address issues raised by the NPWS with the original Effenberger (1997) assessment. Additional predictive modelling and surveying was undertaken, only to result in the location of one further isolated artefact. Umwelt (2000) then prepared an Aboriginal Sites Management Plan for the Coal Mine to cover the first year of mine operations. In response to additional concerns raised by the NPWS, Umwelt (2001b) undertook further survey of the mine area, identifying three more isolated artefacts.

Also in the same year, Umwelt (2001c) surveyed for seven days two major conservation areas located in the Donaldson Lease Area. These areas, known as 'Bushland Area 1' and 'Bushland Area 2' total 956 hectares in size. An additional eight Aboriginal sites to those previously recorded were identified in the Bushland Conservation Areas. These were almost all isolated artefacts, with the exception of one small artefact scatter. All of the evidence was moved by Umwelt (2001c) to perceived safer locations.

Ongoing investigations at Donaldson Mine by Umwelt have included monitoring of selected 'Datum Points'. During one inspection in 2002, two additional isolated artefacts were recorded.

More recently, Kuskie (2006) assessed additional areas within Donaldson Mine and Bloomfield Colliery for Donaldson's Project Abel Part 3A application. The investigation area for the Abel Underground Mine consisted of the underground mining lease of approximately 2,750 hectares south of John Renshaw Drive (the 'southern investigation area') and the area north of John Renshaw Drive that will be used for surface facilities, primarily within the existing Donaldson open cut mine but also including a portion of the Bloomfield lease area (the 'northern investigation area'). This area included a broad corridor extending northwest from John Renshaw Drive to adjacent to the Bloomfield workshop area and northeast to the rail loop.

Kuskie (2006) located two grinding groove sites near Black Hill, south of John Renshaw Drive, two small artefact scatter site loci (F1/A and F2/A) and two isolated artefact loci (F1/B and F1/C) south of John Renshaw Drive, and ten small artefact scatter/isolated artefact site loci (A7/A, A15/A, A17/A, A17/B, A17/C, A20/A, A20/B, A20/C, A21/A and A22/A) in the Donaldson and Bloomfield lease areas north of John Renshaw Drive. Survey was limited to areas of potential surface impacts north of John Renshaw Drive and immediately south of this road. Investigation was not undertaken of the areas of potential subsidence impacts, although procedures for staged systematic survey prior to undermining were recommended and included in the Aboriginal Heritage Management Plan subsequently prepared by South East Archaeology (Donaldson Coal 2007).

Kuskie (2006) identified that the Black Hill Spur was a pathway used by Aboriginal people. This information derived from interviews with long-time Black Hill residents Mrs Beryl Hardes and Mrs Judith Crockett (Kuskie and Kamminga 2000). It is likely that this route or pathway extended west then south across George Booth Drive and up to Mount Sugarloaf, immediately to the east of the present investigation area.

Kuskie (2008b) undertook an assessment for the Part 3A project application for Bloomfield Collieries for the completion of open-cut coal mining and rehabilitation of areas within Mining Lease CCL761. The project area is located several kilometres south of East Maitland and measures a total of 290 hectares. The investigation focused on the "unmodified" portion of the study area of approximately 108 hectares in which there remained some potential for heritage evidence. The remaining 182 hectares comprised land that has been extensively impacted by earthmoving works and building, such that there was negligible potential for any Aboriginal heritage evidence to survive.

The "unmodified" portion of the study area was subdivided and inspected within 26 environmentally discrete survey areas. Even within this "unmodified" area, levels of ground disturbance were typically high, due to the removal of the forest vegetation in early 2004 by earthmoving equipment under existing approvals (Kuskie 2008b). Six Aboriginal heritage sites, comprising 19 loci of identified evidence, were recorded. These site loci are all stone artefact occurrences and contain a total of 53 artefacts. Salvage of these items has occurred subsequent to Part 3A approval (South East Archaeology, in prep.).

Extensive investigations have been undertaken of the F3 to Branxton highway connection (Hunter Expressway), a dual carriageway route of approximately 40 kilometres from the F3 at Seahampton to the New England Highway at the Belford Deviation west of Branxton. The route traverses along Surveyors Creek, a kilometre to the north of the present investigation area.

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

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

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

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

Four of the areas subject to testing were located around Surveyors Creek:

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

In addition, the 'Surveyors Creek Landform Testing' occurred within PAD 5, with 15 units excavated and 17 artefacts identified.

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

Umwelt (2009) investigated locations totalling 8 hectares in area within the Orica property, which occupies 292 hectares immediately south of George Booth Drive and overlaps with the northern portion of the present investigation area. The area surveyed by Umwelt (2009) marginally traverses the north-western corner of the present investigation area. One small artefact scatter site (#38-4-1186) was identified. An earlier investigation by Koettig (1990) did not identify any Aboriginal heritage evidence within the Orica property.

Umwelt (2002b) investigated proposed road works along John Renshaw Drive extending west to Stanford Merthyr. Three artefact scatter sites and one isolated artefact were identified on crests and slopes along John Renshaw Drive.

Gay investigated two bridges in 1999 on George Booth Drive, north of the present study area, across Surveyors Creek near the junction with John Renshaw Drive, and across a tributary of Surveyors Creek. No evidence was identified in the small investigation areas.

Dean-Jones (1989b) investigated the 60 hectare site of the Old Delta Colliery adjacent to Mt Vincent Road near East Maitland, for a proposed waste disposal facility. Approximately half of the property consisted of the remains of the Delta Colliery, with the remainder being native vegetation. Low gradient simple slopes and minor intermittent watercourses were present. Five artefact scatters, containing between two and 22 artefacts, and one isolated artefact, were located. The sites occurred along lower slopes or flats adjacent to watercourses, with the exception of one site on a ridge crest. Reddish brown ‘silcrete’ or silicified tuff was identified as the dominant stone material. In an addendum to the Old Delta Colliery report, Dean-Jones and Ruig (1992) described an additional site, a native well. The well was situated within a sandstone outcrop and interpreted as being a place for the procurement of potable water after rain, in addition to other, unspecified purposes.

Several kilometres to the north of the current study area, Greer and Brayshaw (1983) surveyed an area of 250 x 250 metres, on the ridge crest adjacent to the former quarry, for the Black Hill Quarry. One site, #38-4-106, containing seven artefacts was located. More recently Ruig (1993) investigated proposed extensions to the quarry. One isolated artefact was located within a 5.6 hectare area, immediately north of the Black Hill peak.

Other surveys by Brayshaw (1985), Dallas (1996) and Ruig (1992) in the East Maitland Hills terrain away from the wetlands have generally resulted in the identification of low numbers of small artefact scatter sites. Elsewhere in the East Maitland locality, several of the earliest sites were identified by Enright (1911, 1931, 1936). Enright (1911) reports on the discovery of stone artefacts on alluvial banks of the Hunter River, including an axe found at a depth of 3-4 metres at the Maitland Colliery Shaft, near West Maitland. Enright (1931) also reports on another ground-edge axe collected from a property at Tarro.

3.2.5 F3 Freeway at Black Hill

Numerous other heritage investigations have been undertaken on the elevated terrain northeast of the investigation area around Beresfield and Black Hill, for example Effenberger and Baker (1996), ERM Mitchell McCotter (1995, 1996a, 1996b), Kuskie (1997, 2002, 2004, 2005a), Kuskie and Kamminga (2000), Resource Planning (1992), Silcox (1998, 1999), Silcox and Ruig (1995) and Umwelt (2001a). These investigations have included surface surveys, test excavations and salvage excavations and have led to the identification and/or recovery of significant quantities of heritage evidence, predominantly stone artefacts.

The key study for this region is that by Kuskie and Kamminga (2000), who undertook extensive testing and salvage excavations along the F3 Freeway at Black Hill and Woods Gully, adjacent to Hexham Swamp, several kilometres northeast of the Tasman Extension investigation area.

A series of archaeological investigations had been undertaken along the route of the F3 Freeway between Minmi and John Renshaw Drive, involving surface surveys, monitoring and test excavations (Resource Planning 1992, Effenberger 1995, Effenberger and Baker 1996). South East Archaeology was engaged by the RTA to undertake an extensive salvage excavation of the areas to be impacted (Kuskie and Kamminga 2000).

The 14 week excavation program comprised an initial phase of testing, a second phase of broad area excavations and a third phase of mechanical surface scrapes. A total of 612 small test units were excavated in the first phase, for a total area of 38.25 m^2. These units, measuring 0.25 x 0.25 metres in area, were excavated three metres apart on a rectangular grid across each site. The main objectives of identifying the basic pattern of artefact distribution, characterising the nature and variety of archaeological evidence and selecting locations for broader area excavation were achieved (Kuskie and Kamminga 2000).

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

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

Within each of the hand excavations, deposit was excavated in 0.25 x 0.25 metre units in successive levels of five or ten centimetres depth. Each bucket of excavated deposit was labelled with provenance information and transported to a sieving station. The practice of 'total sieve retrieval' was employed for the first time on a major archaeological excavation in the Hunter Valley. This involved retention of all residue (cultural and natural material) in the sieve, which was then artificially dried and cultural items extracted by a qualified archaeologist in laboratory conditions. The process of total sieve retrieval has several significant advantages over traditional methods of sieving and artefact recovery, which involve (often untrained) personnel directly retrieving cultural items during sieving (Kuskie and Kamminga 2000).

An on-site lithic work-station was established, where every lithic item retrieved was examined under a low-magnification binocular microscope and identified and recorded in computer databases. This was the first instance of routine microscopic examination of lithic items from a large assemblage in the Hunter Valley. This procedure offered substantial benefits in terms of the accurate identification of stone material categories, artefact types and attributes, and the presence and nature of use-wear and residues (Kuskie and Kamminga 2000).

In total, an area of 196.25 m^2 was carefully excavated by hand. Surface scrapes with a combined area of 34,422 m^2 were undertaken. The excavations resulted in a total of 72.4 tonnes (64.6 cubic metres) of soil being dug by hand and wet-sieved. Through the hand excavations and surface scrapes, a total of 37,585 lithic items were identified and recorded. This assemblage comprised 22,921 identifiable Aboriginal artefacts and 14,664 items described as 'lithic fragments', which were lithic items that did not have sufficient morphological attributes to positively identify them as artefacts, even though many must be fragmentary debris from stone knapping (Kuskie and Kamminga 2000).

The mean density of artefacts per volume within the hand excavations equated to 546.2 artefacts/m^3 at Black Hill 2 and 209.5 artefacts/m^3 at Woods Gully. The density of artefacts varied widely within individual excavation unit spits (ranging from nil to 23,555 artefacts/m^3) (Kuskie and Kamminga 2000).

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

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

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

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

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

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

An inventory of traditional Aboriginal material culture for the lower Hunter region was compiled. The material culture was examined to reconstruct the role of stone technology in its production and maintenance, and in procuring food.

Methods of spatial distribution analysis enabled the identification of a number of activity areas, despite the horizontal and vertical movement of artefacts caused by various agencies of post-depositional disturbance.

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

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

3.2.6 Synthesis

Archaeological investigations in the foothills of the Sugarloaf Range northwest of Lake Macquarie and southwest of Hexham Swamp have resulted in the identification of a number of open artefact scatters and grinding grooves, with less common sites such as scarred tree, stone arrangement, natural mythological and rock engraving sites also identified. Strong traditional, historical and contemporary Aboriginal cultural values have also been identified. Mount Sugarloaf itself is documented for its association with male initiation ceremonies and the presence of the supernatural spirit being "Puttikan" and the supreme being "Koe-in", and is inferred to be an important connection between the secular and the sky-world, or 'heirophany', for example for the ascension of people to the sky-world after death (cf. Threlkeld in Gunson 1974, Boot 2002, Knight 2001).

Haglund (1986) reports that artefact scatters and shell middens are the dominant site types in the broader Lake Macquarie region, with rock shelters with deposit and/or art, grinding grooves, mythological sites, scarred trees and lithic quarries also present. Site density appears to be highest in the estuarine environments of the coastal zone and decreases further inland (Haglund 1986, Vinnicombe 1980).

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

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

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

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

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

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

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

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

- Models of occupation: - relationship between coastal and inland evidence, use of and proximity of resources, and influence of various site location factors;
- Chronology of occupation: - evidence for Holocene age occupation;
- Environmental issues: - relationship of evidence to resources and the changing nature of those resources and the environment over time, and the effects of environmental change on the distribution and visibility of evidence; and
- Cultural issues: - timing and nature of changes in technology, and the management of stone materials.

3.3 Local Aboriginal Culture

3.3.1 Group Identity and Boundaries

Traditional Aboriginal culture in south-eastern Australia was complex and varied. The present state of knowledge is based partially on studies of contemporary Aboriginal communities in northern and central Australia and on observations of the south-eastern communities after the immense disruption caused by European settlement (Thompson 1985).

Peterson (1976) describes Aboriginal society as being comprised of a hierarchy of organisational levels and groups, with fluid boundaries between them. The smallest group in the hierarchy are ‘families’; a man with one or more wives, their children and frequently some of their parents. The second level are bands; small groups consisting of members of several nuclear families, who perform the normal hunting and gathering tasks together for most of the year (Peterson 1976).

At the next level are regional networks consisting of a number of bands. Members of these regional networks usually share beliefs in a common ancestor and/or have a common language dialect. Network members assemble for specific ceremonies, when the subsistence resources of a locality are plentiful enough to support a large number of people over a period of time. The 'tribe' is at a higher level in the organisational hierarchy. 'Tribes' are generally recognised as a linguistic unit with flexible territorial boundaries. At the broadest level of social organisation, or the pinnacle of the hierarchy, is the 'cultural area'. All groups within a 'cultural area' share cultural characteristics, such as a common initiation ceremony, and speak closely related languages (Peterson 1976).

The nature of organisation of Aboriginal groups within the Central Coast and Lower Hunter regions is unclear, due to the limited ethnohistorical records and the immense disruption to traditional culture that had already occurred by the time these observations were made. Earlier observers used the term 'tribe' to refer to anything from ten to 500 people. Aborigines themselves used a variety of names which might have referred to dialects, territories of other groups, local bands or regional networks (Brayshaw 1986a).

According to Tindale (1974), the investigation area lies within the territory of the Awabakal, close to the Wonnarua territory (Figure 7). Tindale (1974) describes the territory of the Awabakal as being an area of 1800 km^2 extending south from the Hunter River to Norah Head and Wyong, and west to Kurri Kurri and Maitland. The Wonnarua occupied territory in the Upper Hunter River from a few miles above Maitland west to the Dividing Range and south to the Darkinjang (Darkinjung) on the divide north of Wollombi. They occupied an area of 5,200 km^2 (Tindale 1974). To the west and south of the Awabakal, lay the tribal territory of the Darkinjang. It is described as a 4,700 km^2 area extending south of the watershed of the Hunter River, from well south of Jerry's Plains extending east toward Wollombi and Cessnock; at Putty, and ranging over portions of the Macdonald and Colo Rivers (Tindale 1974).

Other authors (*cf*. Enright 1932, Howitt 1904) report different descriptions of group names and boundaries, although Howitt (1904:83) professes to knowing very little about this region. The reliability of both Howitt's and Enright's evidence is questionable, due to the late period in which it was obtained.

Professor S. A. Wurm (in Gunson 1974:30) argues that 'Awabakal' was probably a clan (or 'regional network') name, not a tribal name, because that is what the suffix '-gal' or '-kal' usually meant. However, it is also possible that the name applied to the largest clan (or 'regional network') of a tribe in the Lake Macquarie region, which became the name by which the tribe was subsequently known (Wurm in Gunson 1974:30; refer to Figure 8). Reverend Threlkeld observed that the Awabakal language was similar to the neighbouring Wonnarua, Darkinjung and Worimi languages (Gunson 1974:4). Gunson (1974) suggests linguistic evidence indicates that the Awabakal may have had most in common with the Wonnarua and also associated frequently with the Worimi. Mr Thomas Miller and other Wonnarua Elders state that the Awabakal were a sub-group of the Wonnarua people, and that Wonnarua boundaries extended to the ocean and past Wyong.

Modern Wonnarua and Awabakal people both identify strong contemporary, historical and traditional associations with the locality of the investigation area.

Official returns for Newcastle and Lake Macquarie in 1833 show a division of the Awabakal 'tribe' into four or five clans (which may in fact be bands or regional networks):

- Lake Macquarie 'tribe' (Awabakal) with Biraban (John M'Gill) as chief;
- Pambalong 'tribe' with Gorman/Coleman as chief;

- Ash Island 'tribe' with Wallungull as chief; and
- Kurungbong (Cooranbong) 'tribe' with Ben as chief.

In 1836 and 1840 Threlkeld referred to the Awabakal as 'King Ben's tribe'. In 1836 he listed 'Cobbera's Tribe' or the 'Sugar Loaf tribe' which frequented Mount Sugar Loaf, Lake Macquarie, the Swamps and surrounding neighbourhood. This 'Sugar Loaf' tribe may have been a 'tribe' called Pambalong in 1833, and was apparently a clan (or regional network) of the Awabakal (Wurm in Gunson 1974:30).

Figure 7: Cultural group boundaries after Tindale (1974) (from Kuskie and Kamminga 2000).

Gorman, described as chief of the 'Pambalong tribe' in 1833, was probably the same person as Bo-win-bah in 1828 and Kua-mun (Coleman) in 1836. Born around 1806, his wife's name was Nanny or Wil-le-kah, but there were no children (Gunson 1974:316). Biraban, or John M'Gill, born around 1800, was a 'chief' of the 'Lake Macquarie tribe' and Threlkeld's principal assistant. He spent his early years as an officer's servant in Sydney. Biraban was married to Patty or Ti-pah-mah-ah with a son Francis or Ye-row-wa, born around 1823. His own name was We-pohng and presumably did not take the name Biraban until fully initiated. He does not appear to have had the same tribal status as King Ben (Gunson 1974:317).

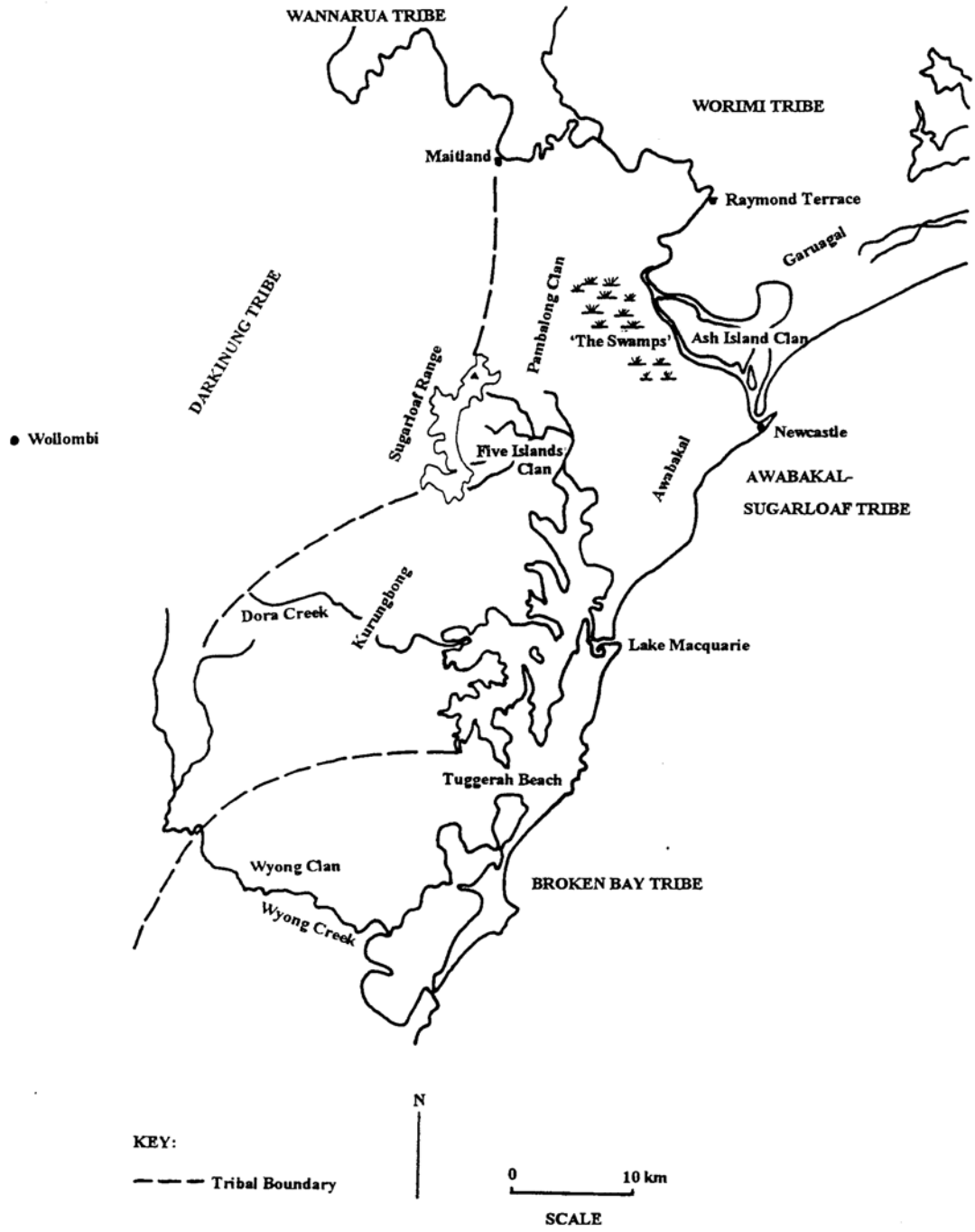


Figure 8: Cultural group boundaries after Gunson (1974) (from Kuskie and Kamminga 2000).

Threlkeld observed that the 'tribe' at his mission was localised to the area between Newcastle and Lake Macquarie. However, most 'tribes' in the Hunter River-Port Stephens area visited the mission according to Gunson (1974). William Walker commented on the smallness of the 'tribes' in 1821: 'That which is called a tribe probably never meets in one place once in six months . . . some tribes are so small that the aggregate is not more than ten . . . a whole tribe having perhaps never been seen together. They are generally divided into groups of 60 or 70; the largest company Mr Harper met with was about 200' (Threlkeld in Gunson 1974:60).

An account in the *Wallsend & Plattsburg Sun* (10/12/1890) based on the recollections of early settlers described the local 'Aboriginals of the Big Swamp' as occupying the country from Tarro to near Newcastle (Newcastle itself being the territory of the 'Stockton blacks'), the Hunter River and the Lake being the other boundaries. The Lake Macquarie Aboriginals were recognised as being a separate 'tribe'.

In a reply to the circular issued by the NSW Select Committee on the Condition of the Aborigines (NSW Legislative Council 1846) Reverend Bolton, Minister of the Church of England at Hexham, described the Hexham tribe as belonging to the swamps and visited places named 'Guacumba' and 'Tirto'. Their chief is noted as being sub-ordinate to the 'Newcastle tribe', of which they formed part of. Reverend Bolton observed that they visit Maitland but do not venture further west (NSW Legislative Council 1846).

From these accounts it is evident that the identification of names and boundaries of Aboriginal groups within the lower Hunter region is unclear and may never be resolved. The dramatic changes wrought on Aboriginal society before the time of the first ethnohistorical observations, combined with the lack of anthropological expertise of the recorders, has limited the usefulness of much of the information. Peterson's advice about the fluid nature of Aboriginal group boundaries is pertinent. Boundaries may have fluctuated within both short-term and long-term periods.

3.3.2 Subsistence Resources

As discussed in Section 2, a variety of subsistence resources were available to the local Aboriginal population from the forest. Several ethnohistorical observations have been recorded of the use of plants and animals in the lower Hunter region. While these observations have tended to focus on visible activities, they have often omitted details of less visible (and predominantly female) plant gathering activities (Brayshaw 1986a).

Threlkeld (in Gunson 1974:55) observed people eating cobra ('large maggots from grass tree stumps'), wild plum, lizards, goanna, snakes, cockles ('purramai' - Threlkeld 1834:55) on Lake Macquarie where they could be obtained year round, whales which were eaten when found stranded on beaches, craw-fish, kangaroo, swans, pigeons, geese, wild ducks, and fish. Bandicoot were hunted and killed using waddies, with 'high grassy bushy places' first beaten to make them appear (Threlkeld in Gunson 1974:54). Fish were cooked, occasionally in fires kept alight on earth in canoes when fishing. Threlkeld (in Gunson 1974:190) observed various methods of obtaining sea food:

> 'Their mode of fishing is curious, sometimes angling with hook and line thrown by the hand as they are seated in the bark canoe, sometimes diving for shell fish, sometimes standing in their frail bark darting their spears into the fish as they pass, or at other times using hand nets forming a circle in shallow waters and enclosing the fish, but the most curious method is that of planting sprigs of bushes in a zig-zag form across the streams leaving an interval at the point of every angle where the men stand with their nets to catch what others frighten towards them by splashing in water'.

Lycett describes the getting of sand mullet and mud oysters ('mokoi' - Threlkeld 1834:54) (Sokoloff 1978a). Generalised accounts in a series of articles in the *Wallsend & Plattsburg Sun* in 1890 and 1891, based on recollections of early settlers, report possum, wallaby, kangaroo rat, snakes, lizards, goanna and eels as having been consumed (*Wallsend & Plattsburg Sun* 24/12/1890). Grant (1803:161-162, 173) observed the consumption of mussel shells on the lower Hunter and 'cabra' (shipworm *Teredo nautalis*, which is actually a bivalve mollusc). Dawson (1830:119) describes the use of fire to trap a group of kangaroos, which when they are enclosed in a nook or bend in the river or some other obstacle, are then killed.

Special mention is made in the ethnohistorical literature about the dependence of estuarine dwelling Aboriginals on 'fern roots', which is presumably bracken fern (*Pteridum esculentum*) but possibly also bulbs and roots of swamp and marsh plants (Moore 1981). Barrallier (1802:81-83 in Brayshaw 1986a) witnessed a young Aboriginal looking for the roots of 'Fern' in June 1801. Threlkeld (in Gunson 1974:55) observed people eating the fern root which 'they roast, and beat it with a stone upon a larger one, when they use it for bread'. Brayshaw (1986a) considers this fern may have been *Blechnum* spp. (swamp fern). Ebsworth (1826:71 in Brayshaw 1986a) also documents its consumption at Dungog, where it was known as 'bungwall'.

An account in the *Wallsend & Plattsburg Sun* (3/1/1891) based on the recollections of early settlers, states that grinding 'between flat stones was done of one particular reed (name forgotten) and certain roots'. Fern roots were crushed, but it is unknown if the cake was baked or eaten raw (*Wallsend & Plattsburg Sun* 3/1/1891). Threlkeld (1834:48) reports that the Aboriginal name for the site of Newcastle, 'Mulubinba', came from an indigenous 'fern' named 'mulubin'. Bracken fern has thin, starchy rhizomes which are edible from late summer to autumn (Isaacs 1987:105). The rhizomes are sometimes pounded to extract the starch, which is cooked in cakes, as the rhizomes alone are very fibrous (Isaacs 1987:105).

Backhouse (1843:380) records from his and G. W. Walker's Aboriginal guides that the Aborigines had ceased to use the fern root, but they roasted and ate the flower stems of the gigantic-lily (*Doryanthus excelsa*). The roots of this plant were also eaten by being roasted and pounded into a sort of cake. This is similar to *Macrozamia* spp., but the macrozamia nuts are soaked for two to three weeks (Backhouse 1843:380).

Threlkeld (in Gunson 1974:55) observed people eating macrozamia, which had to be prepared by a special process to remove toxins, involving soaking the seeds in a swamp for a week or two, then roasting. David (1890) also recorded the preparation of macrozamia fruit: "the gins used to gather it when ripe and put it to soak in nets made of fur of opossums. After allowing it to soak for three or four days in rain water, they would bruise it and bake it into cakes fifteen inches in diameter . . ."

No references are made to seeds of kangaroo grass (*Themeda australis*) being ground, although their occurrence is widespread in the valley (Brayshaw 1986a). The seeds are normally ground and baked, and are available from December to March (Isaacs 1987:229).

3.3.3 Material Culture

The material culture of the local Aboriginal population would have included a range of items related to subsistence, cultural and social activities and shelter. Ethnohistorical observations of these items are discussed below. However, in the archaeological record, few of these items are preserved. Stone, bone and shell are the materials most frequently represented in archaeological sites.

Ensign Barrallier was one of the first to report on Aboriginal culture in the Hunter region. Barrallier (1802:83 in Brayshaw 1986a) described Aborigines navigating along the river in canoes, 'Wumarus' 3 feet 10 inches long, lances 18-22 feet long, fishing lines, and the remains of a fish net and weir on a creek at Newcastle. The use of canoes was also observed at Maitland by Mrs Ellen Bundock in 1826 (Brayshaw 1986a), Threlkeld (in Gunson 1974) and Grant (1803:173).

Reverend Threlkeld (in Gunson 1974:67) provides detail of the manufacture of fishing, hunting and fighting spears:

> The fish spear ('Kul-là-ra' and 'Mo-ting') are made 'from the stem of the grass tree, at the end there are four pieces of hard wood, about two feet long, (which) are fastened with a bark thread covered with the grass tree gum, heated in the fire until at a melting point, when it is worked round the thread fastening it . . . The three or four shorter spears thus fastened to the long stem of the grass tree, of about six feet length, becomes thus somewhere nigh eight feet in the total length. . . Small wooden wedges are inserted betwixt the attached short spears just at their base where they are tied, and likewise gummed over firmly. . . The points of each skewer is hardened in the fire, by charring; and when hot, covering it with a coating of the grass tree gum, fastening at the same time a barb of bone at the point'.
>
> 'The hunting spear, 'wa-rai', is likewise made from the stem of the grass tree, but having only one hardened joint of wood inserted at the end, as already described. The battle spear is made of the same material, but often with the addition of pieces of sharp quartz stuck along the hard wood joint on one side so as to resemble the teeth of a saw. The march of intellect directed the blacks, latterly, to use fragments of broken glass bottles instead of quartz, thus inflicting fearfully lacerated wounds . . .' (Threlkeld in Gunson 1974:67).

All spears are thrown by a throwing stick ('wom-mur-rur') generally four foot long by half an inch thick, tapering to a point at one end where a barb is fixed (Threlkeld in Gunson 1974:67). Threlkeld observed the trade of spears with populations further inland, in return for possum skin cloaks and 'hanks of line, spun by hand from the fur of animals of the opossum tribe' (Threlkeld in Gunson 1974:42, 61).

Threlkeld describes a variety of items including waddies, often made of ironbark wood (Ebsworth 1826:77 in Brayshaw 1986a); yamsticks, up to two metres long and four centimetres in diameter; fish hooks made of shell ground down on stone; wooden bowls cut from tree burls; water carriers of sheets of bark, tied at each end with a bent twig handle; oval wooden shields, three feet long by eighteen inches wide, painted with a white coloured earth resembling pipe-clay and crossed with two red bands or stripes; two forms of canoes made of bark from trees, one which measured 12-14 foot long by 3-4 foot wide; hand nets used for fishing; and fishing lines (Threlkeld in Gunson 1974:42, 54, 67, 190).

The convict artist R. Browne, illustrated in about 1813 a variety of implements, including four types of spears (four-pronged fish spear, plain and single-barbed hunting spears and a fighting spear with three wooden barbs), shields, clubs, a hafted axe with an iron blade, boomerang, palm leaf basket with handle, a water-carrier made from a tree gnarl, a twined dilly bag and a fishing line with shell hook (Gunson 1974).

Threlkeld (in Gunson 1974) observed bark stripped from trees to make canoes. The Awabakal used stringybark, white stringybark, thin-leaved stringybark or swamp mahogany for their canoes. Stringybark was favoured because of its pliant characteristics (Brayshaw 1986a). Dawson (1830) indicates that tea-tree bark was occasionally used to make small baskets.

Huts, or 'gunyers' were also made of bark. Threlkeld (in Gunson 1974:45) describes them at Lake Macquarie as 'mere erections of boughs of trees, or sheets of bark placed upright supported by stakes'. At Raymond Terrace they involved three sticks stuck in the ground and covered with bark (Caswell 1841 in Brayshaw 1986a) and at Port Stephens, Dawson (1830:171) describes them as 'supported by three forked sticks (about three feet long) brought together at the top in a triangular form: the two sides towards the wind are covered by long sheets of bark, the third is left open'. Dawson (1830:19-20) observed Aborigines removing bark, by cutting toe hold notches in the tree trunk for support, while stripping bark in lengths of one to two metres that were used as temporary sides and covers for huts. The incisions were made with a hatchet and spear-throwers were used to assist in peeling the bark.

While many items were made from wood, preservation conditions are generally limited so that evidence of these in an archaeological context is rare. Stone, bone and shell implements are common in archaeological sites. However, very few ethnohistorical references have been made to these materials.

Threlkeld (in Gunson 1974:67), as described above mentions the use of quartz flakes, and later broken glass, to form serrated edges along fighting spears. Barrallier (1802:81 in Brayshaw 1986a) also noted fighting spears with 'pieces of sharp quartz stuck along the hard wood joint on one side so as to resemble the teeth of a saw'. Stone hatchets were observed by Threlkeld (1834, in Gunson 1974) and Dawson (1830). Dawson (1830:202) observed grooved heads with a handle fastened by adhesive gum. The stone was mainly basalt or diorite and ground at the edge. Hatchets were used to cut saplings for building gunyahs, for stripping bark from trees, cutting notches in trees for climbing, and cutting toe-holds in trees to procure animals or honey from bee nests (Mathews 1894).

Dawson (1830) states that there is evidence that shell scrapers were used to sharpen spears, but with the introduction of glass, that material quickly became preferred. Shells were used to sharpen or shape wooden implements or as fishhooks. Kangaroo bones were made into awls to sew kangaroo and possum skin cloaks, belts and headbands (Brayshaw 1986a).

However, apart from quartz spear barbs and stone hatchets, no mention is made in the ethnohistorical literature of other types of stone artefacts. None of the ethnohistorical accounts explain the profusion of Bondi points within archaeological sites, nor do they identify the large core and flake component as having been used within the historical period (Brayshaw 1986a:68). Brayshaw (1986a) suggests that this may be due to these items having escaped the attention of observers, or that they were not in use at the time of contact, having been replaced by shell, wood or bone. Dean-Jones (1990:68) suggests that it was because most observations were made from a distance and the stone tools were too small to be seen. For whatever reason, the manufacture or use of stone artefacts, which make up the majority of evidence in archaeological sites, is scantly documented.

In the late 1800s and early 1900s a number of locals were taking an interest in remains of the material culture, collecting and reporting on stone and wooden artefacts. McKiernan (1911) reports that workers excavating a drain through a swamp, eight kilometres from Raymond Terrace, uncovered a woomera, two spear-heads and a shield. The 'whommerah' is described as being 39.75 inches long by 1 and 3/8 inches wide and made of 'headle wood' which does not grow locally. The spears measure 22 inches in length and are made of ironbark. The shield is made of ironbark and measures 19.5 inches by 2.25 inches (McKiernan 1911).

The surveyor Mathews (1894) exhibited a collection of artefacts from NSW to the Royal Society, including knives from the lower Hunter obtained by digging into the floors of rockshelters, and hatchets. Hatchet handles were described as being made from either a tough vine or part of a suitable sapling split longitudinally and placed in hot ashes. The hatchet head was secured by cord made from bark or sinews from the kangaroo's tail. Gum was applied to the binding to keep it secure. The largest knives were interpreted as having been used 'for skinning and dressing animals'.

In 1885 the Reverend Peter MacPherson (1885) exhibited a collection of artefacts before the Royal Society of NSW. The collection included a number of hatchets (two grooved) from the lower Hunter.

Thorpe (1928) describes an Australian Museum collection of implements from the Newcastle, Port Stephens and Lake Macquarie areas (first collected by D. F. Cooksey of Mayfield). 'Primitive flaked celts' were collected from Sandgate and are described as being made from 'grey chert'. Various 'chipped back' and other flaked implements are described. Thorpe (1928:246) observes that near Merewether, 'chert' (tuff) was abundant.

The ethnohistorical evidence reveals that a broad range of items were part of the local Aboriginal material culture. Other items not mentioned above but also likely to be present include message sticks, clapping sticks, bark and vine cords, netted and woven dilly bags, shell pendants and fur belts (*cf* Brayshaw 1986a).

3.3.4 Other Aspects of Society

Other aspects of Aboriginal behaviour and material culture were noted by the early settlers and explorers. Threlkeld (in Gunson 1974) described a burial, initiation ceremonies, cosmological beings and corroborees. Dyall (1971) and Sokoloff (1978b, c, d) note the importance of fire. Fire was used to burn scrub in winter, which encouraged early growth of spring grasses to attract kangaroos and wallabies and cleared the ground for easier hunting (Dyall 1971). Fire was also used for cooking, warmth, in signalling between groups, initiation ceremonies, disposal of corpses, mourning, making weapons and canoes, fishing and hunting (Sokoloff 1978c). Aboriginal use of fire in the lower Hunter was first noted by Captain James Cook in May 1770:

> 'We saw several smooks a little way in the Country rise up from the flat land, by this I did suppose that there were Lagoons which afforded subsistence for the natives such as shellfish . . .' (Cook in Sokoloff 1978b:314).

Threlkeld (in Gunson 1974:46) recorded a typical hunting expedition, one of many on which he accompanied the Awabakal:

> 'At sun rise the whole tribe prepares for the hunt by taking their spears, throwing-sticks, hatchets and fire-brands, proceeding to the hills, they scatter themselves so as to surround a valley, leaving the entrance guarded by several good marksmen armed with spears. The surrounding party then begin to enclose shouting with all their might, but still in regular time. The kangaroos and other animals become alarmed and make towards the entrance of the valley, where a shower of spears transfix them in their endeavour to escape. . . A fire is kindled on the spot and the animals are grilled . . .'

By Dawson's (1830:67) standards, Aboriginal women were treated poorly: 'They carry the wood for fires, make fishing nets and carry most other items when in transit. They make string out of bark. Items such as fish hooks made from oyster or pearl shells, broken shells, pieces of glass to scrape spears to a thin and sharp point, gum for glue and sometimes oysters and fish when moving from the coast to interior, are carried by the women'.

Dawson (1830:68) observed spears being thrown over distances of forty yards with accuracy and force. He saw birds killed by stones thrown by hand or by spears. Fish and animals were roasted on fire ashes and torn apart with teeth and fingers when cooked. People sleep 'before their fires' frequently in a circle, with covers of bark sheets in winter or rain.

Dawson (1830) referred to communication between Aborigines of the coast and interior in which European hatchets, shells and glass were exchanged for opossum skins, belts of yarn and headbands. Grant (1803:156-7) met a 'bush native' 'who are considered as an inferior tribe by the inhabitants of the sea'.

3.3.5 Population

Early non-indigenous settlers and visitors made several observations on the nature and size of the local Aboriginal population. In the returns of Aborigines from selected blanket distributions, the following populations were recorded (Brayshaw 1986a:58, Threlkeld in Gunson 1974:360-361, Turner and Blyton 1995):

1821: Lake Macquarie area; over 100 people observed by Reverend Middleton;
1828: Lake Macquarie/Newcastle; 24 male adults, 26 female adults, 10 male and 4 female children;
1833: Lake Macquarie; 62 male adults, 38 female adults, 6 male and 11 female children;
1838: Lake Macquarie; 15 male adults, 8 female adults, 2 male and 1 female children;
1840: Lake Macquarie; 15 male adults, 7 female adults, 3 male and 1 female children.

In a reply to the circular issued by the NSW Select Committee on the Condition of the Aborigines (NSW Legislative Council 1846) the following populations were documented:

1846: Newcastle; 20 male adults, 5 female adults, 2 male and 2 female children (Rev. Wilton);
1846: Morpeth; 15 adult males, 5 adult females and 3 male children (Rev. Middleton);
1846: Paterson; 20-30 people including 7-8 children (Rev. Smith).

A dramatic decline in Aboriginal numbers over the preceding ten year period was noted by Reverends Wilton, Middleton and Smith (NSW Legislative Council 1846).

Due to the probable effects of the first smallpox epidemic in 1789, it is unlikely that the Europeans ever gained an accurate understanding of traditional population sizes. What is clear, is that from the time of early settlement the number of Aborigines declined rapidly (*cf* Brayshaw 1986a, Hartley 1986:48, NSW Legislative Council 1846).

3.3.6 Relationship with Settlers

Observations have been recorded of encounters between Aborigines and the early settlers and on the relationship between these groups. A number of initial encounters were relatively friendly (*cf*. Needham 1981, NSW Legislative Council 1846, Threlkeld in Gunson 1974:44). These were often between Aboriginals and escaped convicts and timber getters, but also free settlers.

In September 1790, four convicts seized a small boat at Port Jackson and landed at Port Stephens, where they lived with Aborigines for five years (Goold 1981:4). Fifteen convicts seized the 'Norfolk' in 1800 and sailed north. Off Coal Harbour heavy gales forced them to Stockton where the vessel was wrecked. Six men chose to stay and joined a camp of Aboriginals on Throsby Creek, living for several months until three men chose to make their way back to Sydney. Assisted by Aboriginals, two reached Broken Bay where they were taken by Lieutenant Grant to Sydney (Goold 1981:7).

The Aborigines were used as guides and trackers (Hartley 1995). Bo-win-bah (Gorman, chief of the Pambalong) and Biraban (Johnny M'Gill) guided F. W. Ludwig Leichhardt from Ash Island to Minmi cattle station, on the first stage of Leichhardt's journey north in 1842. The party travelled around the margins of Hexham Swamp and ascended Mount Sugarloaf, however the Aboriginal guides refused to accompany Leichhardt's party to the latter (Hartley 1995:90-91).

When Governor Macquarie visited Maitland on 15th November 1821 he found Bungaree, chief of the 'Boan Native Tribe', with his family and thirty other tribal members, waiting. Bungaree and his tribe entertained Macquarie's party with a corroboree after dinner (Brayshaw 1986a).

However, serious conflict quickly arose over the mis-treatment of Aboriginal women by the settlers. Misunderstandings with pastoral settlers also became more common. Convicts were often brutal to the Aborigines (Dawson 1830, Gunson 1974:4-5). The behaviour of timber getters in cutting down trees (believed to house the souls of Aboriginals awaiting rebirth) and shooting fauna (totem animals to the local Aboriginals) were also causes of conflict (Needham 1981).

For example, in March 1799, while two vessels were loading cedar at the Hunter River, there was a fight with Aboriginal people who drove the Europeans away. The Aborigines 'gathered in great numbers on the foreshores' and were 'greatly incensed' at something these men had done. When one boat returned to Sydney the Governor sent an armed party to rescue the remaining men. The Aborigines indicated the men had walked overland towards Sydney, where they arrived some time later. The rescue party refused to believe this and attacked the Aborigines, wounding several (Goold 1981:6).

From the early 1800s convicts continually escaped from Newcastle, with the aim of making their way overland to settlements on the Hawkesbury River. Escapees were reportedly attacked by Aboriginals. In 1804 John Hughes, John Coleman and Edward Mundy escaped. Two days later they were involved in conflict with Aboriginals who wounded Coleman and took their clothing and food (Goold 1981:12).

From the 1830s groups of Aborigines raided settlers' properties and stole food and attacked people. Many offenders were captured and tried before the Supreme Court in Sydney. Some were acquitted and others were sentenced to death (Turner and Blyton 1995).

Opinions of the settlers varied, with some viewing the Aborigines as 'savages . . . with no homes, no occupation beyond procuring food for the day, and think nothing of to-morrow . . . they resist labour' and wander 'from place to place as the game grows scarce' (Davidson 1846:144-6). However, other settlers viewed the Aborigines from a different perspective. Missionaries such as the Reverend Threlkeld sought to convert the Aborigines to Christianity. He was genuinely interested in and spent considerable time and effort observing and recording Aboriginal life.

3.3.7 Recent Aboriginal History

The arrival of non-indigenous people had disastrous effects for the local Aborigines. The observations of early settlers give pertinent insights into the main causes of this event.

The rapid spread of European diseases, which the Aboriginal population had not hitherto been exposed to or developed immunity to, was a major factor. Smallpox, typhoid, influenza, scarlet fever, measles, diphtheria, whooping cough and croup contributed to the deaths of many Aboriginal people (Wood 1972). Major smallpox epidemics occurred between April and May 1789 and again from 1829 to 1831 (Butlin 1983). The first epidemic was reported to have decimated half of the Aboriginal population between Botany Bay and the Hawkesbury (Butlin 1983).

Reverend Threlkeld noted in 1828 the effects of influenza and in 1837 the effects of measles, hooping cough and influenza (Turner and Blyton 1995). In a reply by various Ministers of the Church of England in the lower Hunter Valley, to a circular issued in 1846 by the NSW Select Committee on the Condition of the Aborigines requesting information on the state of the local Aborigines, responses highlighted the effects of diseases and a rapid recent decrease in the Aboriginal population. Reverend C. P. N. Wilton, Minister of the Church of England in Newcastle, reported smallpox and measles to be factors in the rapid decrease in the local population (by half in the previous ten years) (Wilton in NSW Legislative Council 1846). Reverend George Augustus Middleton, Minister of the Church of England at Morpeth, partially attributed the population decline to native pock and influenza (Middleton in NSW Legislative Council 1846).

Factors other than disease contributed to the rapid decimation of the Aboriginal population and traditional life, including the loss of traditional hunting grounds and a decrease in abundance of the game that populated them. Again, the Church of England Ministers highlighted this factor. Reverend Wilton observed that the ordinary means of subsistence for the Aboriginal people was greatly diminished: 'Emu, kangaroo, wallibi and opossum almost disappeared from their hunting grounds', fish and 'Kon-je-voi' were the only abundant foods left' (Wilton in NSW Legislative Council 1846). Reverend Middleton also observed that the ordinary means of subsistence were seriously diminished, due to clearance of brushes and draining of lagoons. No kangaroos were present, but rivers, lagoons and forests continued to supply some food (Middleton in NSW Legislative Council 1846).

Turner and Blyton (1995) argue that the decline in hunting grounds was not a major factor in the population decline around Lake Macquarie, as vast areas were not occupied by the Europeans until after the 1850s. They argue that violence by non-Aboriginal men against Aboriginal women was a major cause of the decline in population. To an extent this may hold true for the Hexham Swamp area. However, the rapid decrease in hunting grounds (as non-Aboriginal settlers developed pastures, villages and mines) and a reduction in the abundance of food sources as native animal and plant habitats were destroyed, is evidenced by ethnohistorical accounts as to the negative effects on the Aboriginal population.

The theory that violence was a factor in population decline is also plausible. The violent offences perpetrated against Aboriginal women are reported by Threlkeld (Gunson 1974:49) and Dawson (1830). The effects of rape on Aboriginal women, include the transmission of diseases, some of which may have led to infertility, and the production of offspring of mixed Aboriginal and non-indigenous blood that may have been very undesirable for the Aboriginal parent. Reverend Middleton reported that infanticide 'was common, with half caste males killed' (Middleton in NSW Legislative Council 1846). This may have been a factor in the decline of the Aboriginal population.

The rapid deaths of many Aboriginal people through disease also acted to destroy the complex structure of their traditional society. Systems of kinship, marriage, order and subsistence were thrown into disarray.

By the 1840s, many of the remaining local Aborigines were dependent upon the settlers for old clothing, money and rations (Wilton in NSW Legislative Council 1846). Aboriginal people were employed by settlers as hewers of wood, drawers of water (Backhouse 1843:389), about the house, to run errands, or on farms to gather maize or burn off (NSW Legislative Council 1846).

The annual distribution of blankets conducted by the Government was ended in 1844, to the anger of the local Aborigines who could no longer obtain traditional possum skin cloaks due to the reduction in animal numbers and possible loss of knowledge and trading networks.

The destruction of their traditional society and the increasing reliance on the settlers led many Aboriginals into a life of alcohol abuse. Increased hostility among Aboriginal people resulted from these pressures on their society, the integration of groups which historically had hostile relationships, and the effects of alcohol (*cf.* Hartley 1995). Reports in the *Hunter Valley Gazette* (18/12/1841) and *Maitland Mercury* (1/4/1843) identified the mixing of tribes congregated around the urban areas of Maitland and Newcastle, and fighting resulting from alcohol abuse.

In the latter part of the 1800s there was growing concern in NSW about the plight of the Aborigines. The Aborigines Protection Association was formed and in 1881 a Protector of Aboriginals appointed. In 1883 the Government established a Board for the Protection of Aborigines to achieve a 'more systematic and enlightened treatment of Aborigines'. Rural stations were created so that Aborigines could remain on tribal territory. One station was established at Pelican Flat (Swansea) in 1887 (Turner and Blyton 1995).

By the 1940s people moved to Newcastle and Lake Macquarie to escape the oppression of the Aboriginal Protection Board and to find employment. Around 5,300 Aboriginal children were removed from their families between 1909 and 1967 and placed in institutions. Broken Hill Proprietary Limited (BHP) and the Department of Railways were the main sources of employment. Oral accounts suggest racism was less overt in the working class city of Newcastle (Turner and Blyton 1995). Aboriginal people outside of the missions lived in shanty settlements on the fringes of non-indigenous communities or in tent villages alongside railway lines. Between 1900 and 1960 such communities were at Swansea, Catherine Hill Bay, Dora Creek, Toronto, Fennell Bay, Teralba, Cardiff, Eleebana, Wallsend and Waratah (Turner and Blyton 1995).

A number of people were important in initiating a recovery for the Awabakal people, including Dorothy Wotherspoon, Victoria Mathews, Marie Griffiths, Robert Smith, William Smith, George Griffiths, Colleen Perry, Gwen Wright, Gloria Smith, Shirley Smith and their families. A large Aboriginal population remains in the region today, particularly focused on urban areas such as Newcastle and Maitland, and takes an active interest in their cultural heritage.

3.3.8 Ethnohistorical References to Aboriginal Sites

A number of references are contained in the local ethnohistorical literature to Aboriginal sites in the region and cultural associations with the land. Mostly these are ceremonial sites or sites of spiritual significance documented by Reverend Threlkeld. Threlkeld had established his Ebenezer Mission on Lake Macquarie at the present site of Belmont in 1825, relocating it to Deranbambah (Toronto) on the western side of the lake in 1829.

Threlkeld (in Gunson 1974:63-65) noted a number of important sites, including:

- ‘Kin-ti-ir-ra-bin’, a small volcano on the coast near Red Head;
- ‘Pòr-ro-bung’, a mystic sacred ring (bora);
- ‘Yu-lung’, a ring in which a tooth evulsion ceremony occurs;
- Another volcano up the Hunter River, ‘Ko-pur-ra-ba’, from where ‘Ko-pur-ra’, red ochre was obtained;
- ‘Pit-to-ba’, a place of pipe-clay (‘Pit-to’);
- ‘Ko-na-ko-na-ba’, a large mountain on the northern end of Lake Macquarie where yellow ochre (‘Ko-na-ko-na’) was obtained;
- ‘Pu-r-ri-bang-ba’, the Ants’ nest place, another location from which a yellow ochre known as ‘Pur-ro-bàng’ was obtained;
- ‘Nir-rit-ti-ba’ island (Moon Island), where muttonbirds and their eggs were feasted on;
- ‘Nul-ka-nul-ka’, or hard stone, a vein/dyke of volcanic rock (silicified tuff) at Reid’s Mistake;
- A freshwater hole between Lake Macquarie and the Sugarloaf mountains named ‘Wau-wa-rùn’ that was said to be bottomless (Freemans Waterhole); and
- ‘Yi-ran-na-li’, a high cliff at Newcastle, where it is said that if a person speaks, stones will fall down on them (Threlkeld in Gunson 1974:63-65).

Threlkeld (in Gunson 1974:66) also noted that on a range of hills near Lake Macquarie (Sugarloaf Range) were circular erections of stone, 5-6 feet in diameter and 2-3 feet high. M’Gill (Biraban) informed him that tradition was that Eagle-Hawks had brought the stones there. Threlkeld (in Gunson 1974:66) had at first dug into several mounds at these sites, expecting to find evidence of burials, but to no avail. This may well represent one of the first "archaeological" excavations in Australia.

Threlkeld (in Gunson 1974) notes that Mount Sugarloaf was used for special ceremonies and that a cave on its side was used for the burial of important people and some small children.

Threlkeld (in Gunson 1974:194) reports being informed about "Puttikan", a powerful supernatural spirit being that inhabited the Sugarloaf area:

> . . . there is a being in Sugar-loaf Mountains, resembling a man but taller in stature; with arms, legs, face, and hair, very long on the head, but the feet are placed contrarily to the face being behind; and the body hairy, like an animal. The flesh is so hard in all parts of the body that it is imprenetrable (*sic*), except just between the legs, where a spear may penetrate, but at no other part. He is fierce, devouring men, and often pursuing the Aborigines in the mountains. There are females, but not many of the species. Their cry is often heard uttering Perrelorl-o, dwelling very long on the O, in the summer time.

Threlkeld (in Gunson 1974:61) reports that the name "Puttikan" literally means "the being who bites". "The favourite haunt of this supernatural person was said to be in the Sugar-loaf Mountain, west of Newcastle". Hence, access to Mount Sugarloaf may have been restricted to the initiated men.

Threlkeld (in Gunson 1974:50) further describes "Puttikan":

> It was in November 1825, when, just as the sun was sinking behind the Sugar-loaf Mountain near Newcastle, some natives came to guide me to the place where a ceremony was to be performed preparatory to the rapping out of a tooth from the mouth of certain youths, who by such a process were declared capable of marrying a wife. Besides this they were supposed to be protected from the anger of an imaginary being, that travelled the bush who whenever he meets a black, looks to see if the upper front tooth be removed if so, the person escapes unhurt, if the tooth has not been extracted the unfortunate man becomes a victim to the anger of this terrible being. The name of this fancied supernatural person is "Put-ti-kan", in shape he is like a horse, having a large mane, and tail sharp like a cutlass: whenever he meets the blacks they go towards him and draw up their lips to shew that the tooth is rapped out, when he will not injure them; but should the tooth be left in, he runs after, kills, and eats them. He does not walk, but bounds like a kangaroo, the noise of which on the ground is as the report of a gun, calling out as he advances *Pi-ro-long*! *Pi-ro-long*!

More sites in the locality are documented within a series on the local Aborigines published in the *Wallsend & Plattsburg Sun* in 1890 and 1891. The accounts are based partly on information from early settlers, often recollections of forty to fifty years previous. The aim of the series was to generate public interest with the hope of revealing more information on the local Aboriginals 'for the education and benefit of future generations'. In a prophetic statement the writer is aware of the rapid changes to the countryside and suggested that 'the residents of today may hardly recognise the town and country in forty years hence' (*Wallsend & Plattsburg Sun 13/12/1890*).

The 'Great Corroboree Ground' is described as being located on level ground, in the vicinity of a canal, between Nelson and John Streets at Wallsend (*Wallsend & Plattsburg Sun 13/12/1890*). The 'Pambalong clan' were reported to be visited every six months by neighbouring clans (Lake Macquarie, Sugarloaf, Ash Island) for corroborees lasting one week (*Wallsend & Plattsburg Sun 13/12/1890*). A site called 'The Doghole', near Minmi, is reportedly where 'marriages' were celebrated. It is located 'a couple of miles from Minmi and is at the head of the Big (Hexham) Swamp' (*Wallsend & Plattsburg Sun 3/1/1891, 7/1/1891*). This corresponds to Stockrington, near Blue Gum Creek.

Austin *et al* (1995) report on the "Koe-Inba Project" that the Awabakal people undertook for Lake Macquarie City Council in 1984, involving recording of site types for which evidence remains (eg. scarred trees, grinding grooves, rock shelters, wells, stone arrangements and artefact scatters) and cultural sites for which physical evidence does not necessarily exist (eg. Aboriginal pathways). Austin *et al* (1995) note that the Sugarloaf Range and nearby swamps were recognised as key parts of the cultural landscape due to their spiritual associations and resources. 'Koe-in' ('Koin', 'Koun', 'Kon', 'Coen' or 'Coo-in') is reported as the supreme being of the Sugarloaf area (Threlkeld in Gunson 1974:62). Awabakal LALC Coordinator, Mr Ron Gordon (quoted in Umwelt 2005a:4.4), describes him as a being with half a mouth, that speaks with humans and animals, and touches heaven and earth.

Umwelt (2005a:4.4) report that the pathway linking Mount Sugarloaf, where ceremonial/spiritual activities occurred, with the Hexham and Pambalong swamps, where resources were procured and camp sites located, generally follows the Mt Sugarloaf Road from the peak to Seahampton and then Stockrington Road along a ridge crest, before splitting into two routes. One route leads to Hexham Swamp and the second continues down the ridge crest to Pambalong Swamp. Umwelt (2005a:4.4) report that this pathway is of high cultural significance to the Awabakal people.

Hence, the SMP study area and the general locality of Mount Sugarloaf holds strong cultural associations for the Awabakal and Wonnarua people, both traditional, historic and contemporary[7]. Mount Sugarloaf is documented for its association with male initiation ceremonies and the presence of the supernatural spirit being "Puttikan" and the supreme being "Koe-in", and is inferred to be an important connection between the secular and the sky-world, or 'heirophany', for example for the ascension of people to the sky-world after death (cf. Threlkeld in Gunson 1974, Boot 2002, Knight 2001).

A vibrant Aboriginal population remains in the region today, and takes an active interest in their heritage. Consultation with the local Aboriginal community has formed an integral part of the assessment (refer to Section 6). As discussed in Section 3.5, consultation with the Aboriginal community is essential to identify certain site types and cultural values.

3.4 Occupation Model

In order for any investigation to contribute effectively to the management of the heritage resource, the following key elements of a research design (*cf*. Boismier 1991) are essential:

1) Identification of the specific environmental and cultural characteristics of the area;

2) Construction of a model of Aboriginal occupation for the locality;

3) Definition of the expected nature and distribution of evidence;

4) Formation of a methodology to test the predictive model and relevant research questions, in consideration of the expected nature and distribution of evidence; and

5) Analytical techniques for the evidence recovered that are appropriate to address the research questions and project objectives.

[7] Creamer (1984) defines three categories of cultural significance: *Traditional* - significance of sites and associated beliefs date from the pre-contact period and have persisted until the present time; *Historic* - significance of site and associated knowledge dates from the post-contact period and is remembered by many today; and *Contemporary* - significance of site acquired in very recent times, as with art, scarred trees or shell middens that are now considered important.

The environmental context of the investigation area has been outlined in Section 2, and the proposed methodology and analytical techniques are discussed in Section 4. The model of Aboriginal occupation for the locality and expected nature and distribution of evidence are discussed below and in Section 3.5.

Broader models of occupation for the Hunter Valley region have been proposed by Kuskie and Kamminga (2000) for the lower valley and Kuskie and Clarke (2004) for the central to upper valley, based on ethnographic, ethnohistorical, oral historical and archaeological evidence. These models have been refined through subsequent excavations and analysis (eg. Kuskie 2009, Kuskie and Clarke 2006, Kuskie and Ingram 2008). Elements of the regional models that are of particular relevance to the investigation area are outlined below, with the nature of expected *archaeological* evidence to test the individual elements specified in *italics*:

- Occupation predominantly focused on the relatively more abundant and diverse resource rich zones within the tribal territory (for example, the junction of multiple resource zones) particularly along the Hunter River and its former estuarine margins and around wetlands, swamps and lakes. Within the *primary resource zones*, such occupation could include nuclear/extended family base camps, community base camps and occasional larger congregations of groups where resources permitted. Encampments in more favourable locations (for example, abundant resources and water) may have been the subject of stays of longer duration and more frequent episodes of occupation than in other areas (for example, secondary resource zones, refer below);

    - *Substantially higher counts and densities of artefacts and numbers of activity areas, along with a greater range of stone material and artefact types may occur in the primary resource zones than in other areas.*
    - *Encampments in more favourable locations used for longer durations and more often may exhibit greater superimpositioning of activity areas, greater quantity and density of evidence, and evidence of different episodes in the form of in situ deposits with stratified or vertically separated evidence of activity events and datable material.*
    - *Refer below for discussion of expected evidence for different occupation types.*

- Outside of the primary resource zones sporadic occupation of *secondary resource zones*, focused on the watercourses, particularly within close proximity (for example, 50 metres) of higher order watercourses and associated level to very gently inclined valley flats. These zones were utilised for encampments by small parties of hunters/gatherers and nuclear/extended family groups during the course of the seasonal round. There was a strong preference for camping on level ground, adjacent to reliable water sources and more abundant subsistence resources. A greater range and frequency of activities were undertaken at the encampments, rather than in the surrounding landscape. Camp sites along the watercourses were occupied by these small groups of people for varying lengths of time (but of typically short duration), during both the course of the seasonal round and in different years. Occupation of these camp sites was predominantly sporadic, rather than continuous;

    - *Moderately higher counts and densities of artefacts and numbers of activity areas, along with a relatively broad range of stone material and artefact types may occur in the secondary resource zones than in other areas, but to a much lesser degree than in the primary resource zones.*
    - *Refer below for discussion of expected evidence for different occupation types and identifying whether occupation is sporadic or continuous.*

- Not withstanding the points above, widespread, generally low intensity, usage of the entire tribal territory. Occupation outside of the primary resource zones and secondary resource zones tended to involve hunting and gathering activities by small parties of men and/or women and children, along with transitory movement between locations and procurement of stone materials. However, the utilisation of these areas (for example, simple slopes, ridge crests, spur crests and lower order watercourses) was far less intense than areas such as valley flats and higher order watercourses where encampments were situated and potable water and more abundant resources were present. These areas were probably typically exploited during the course of the normal daily round by inhabitants of encampments located in the primary or secondary resource zones that foraged within an area of up to ten kilometres radius from their campsites;

    - *Evidence of low intensity occupation that may include low to very low artefact counts and densities and low numbers of activity areas, along with dates/stratigraphy indicating sporadic occupation over time, not continuous occupation.*
    - *Refer below for discussion of expected evidence for different occupation types.*

- Occupation outside of the primary and secondary resource zones also involved special purpose journeys (for example, to procure stone from a known source or to access an area for ceremonial/spiritual purposes) and non-secular activities (for example, ceremonial activities);

    - *Evidence of lithic or quarry sites may occur at stone/ochre sources. More abundant evidence at a particular location may indicate repeated and special-purpose visits, as may the absence of evidence associated with other occupation types.*
    - *Refer below for discussion of expected evidence associated with ceremonial activities.*

- Thus, occupation extended over the entire tribal territory, with varying intensities and involving different activities, and occurring at different times of the year and different periods within the overall time-span of occupation;

    - *Evidence of occupation at different times of year may be tested only if specific seasonal plant/food evidence and/or associated tool types involved in their processing can be identified in association with occupation.*
    - *Identification of different episodes of occupation over time would require in situ deposits with stratified or vertically separated evidence of activity events and datable material.*

- Occupation (or at least the evidence that survives of that occupation) predominantly occurred within the mid to late Holocene (past 5,000 years), after climatic change and rising sea-levels transformed the environment of the region, although sporadic occupation of the Hunter Valley may have extended as far back as 30,000 to 40,000 years;

    - *Charcoal in a cultural context may be radiocarbon dated or other forms of dating may be used to establish the age of occupation.*
    - *Specific artefact types may also provide evidence on the age of occupation.*

- Activities such as food procurement (hunting, gathering and land management practices such as burning-off), food processing, food consumption, maintenance of wooden and stone tools, production of stone tools (including systematic production of types such as backed artefacts, as well as hafting of implements and casual, opportunistic production of other items on an as needed basis), production of wooden tools and other implements, procurement of stone, erection of shelters, children's play, ceremonial activity, spiritual activity, human burials and social and political activity are among the types of pursuits engaged in by the local Aboriginal people across the tribal territory;

- *Food procurement (including hunting, gathering and land management): minimal evidence expected for most types of food procurement, apart from the presence of stone artefacts such as eloueras, wooden implements where preserved, such as digging sticks, or food refuse (eg. shell and bone) in sites.*
- *Food processing and consumption: evidence expected includes tools with specific use-wear/residues on cutting/chopping/pounding edges, specific tools that are related to processing certain foods (eg. eloueras, seed grinding slabs), evidence associated with hearths or ovens, and food refuse (eg. shell and bone) in sites.*
- *Production and maintenance of wooden implements: expected evidence includes stone and shell tools with design and/or use-wear/residues consistent with working wood, and the presence of wooden implements in sites.*
- *Production of stone tools: evidence expected includes hammerstones, anvils and most abundantly knapping debitage (eg. cores, flakes, flake portions, microblades, etc), along with some of the finished tools themselves.*
- *Production of backed artefacts: evidence expected includes finished microliths (unused), bondi point preforms, backing flakes, chimblers/hammerstones, high quantities of debitage including a high frequency of elongated flakes (microblades);*
- *Maintenance of stone tools: expected evidence includes cutting-edge rejuvenation flakes (eg. flakes from utilised edges of eloueras or other tools), portable whetstones, and axe-grinding grooves in sandstone.*
- *Procurement of stone: presence of stone sources and evidence for procurement at those sources (lithic quarry sites).*
- *Ceremonial activity: presence of ochre in sites, and evidence of ceremonial sites (bora grounds, stone arrangements, carved trees, rock engravings, etc).*
- *Spiritual, social and other activity: presence of ochre in sites, evidence of ceremonial sites (bora grounds, stone arrangements, carved trees, etc) and rock art and engravings.*

- Activities varied in frequency and occurrence within the landscape (and between the different occupation site types - refer below), probably in relation to numerous variables such as topography, distance to resource zones, distance to water, aspect, slope and cultural choice. However, few activities are evident within the archaeological record other than those involving the use of stone, or where preservation conditions permit, other materials such as bone, shell and wood. The majority of evidence within an archaeological context will relate to reduction of stone, but some evidence will exist of encampments, food processing, food procurement and ceremonial and other activities;

  - *Predominance of stone artefacts as the surviving physical evidence of occupation.*
  - *Occasional evidence of hearths and other activities (refer elsewhere in this section).*

- The stone materials silcrete and tuff were favoured for stone working activities, with the relatively intensity of use of each material dependent upon the proximity of local sources. Tuff was primarily procured from exposed bedrock in hills, along drainage depressions and along the coastline where this rock type exists. It is available in many locations due to its abundance in the local coal measures. Silcrete was also procured from local sources (alluvial and terrace gravels). Other stone materials such as porcellanite and petrified wood were also preferentially employed for manufacturing small implements such as backed artefacts. Again, selection and use of these materials also related to their relative availability from local sources in various locations within the landscape;

  - *Dominance of these stone types within most archaeological assemblages. Evidence of nature and location of stone sources and attributes on individual artefacts that can potentially be linked to sources (eg. cortex, size, extent of reduction).*

- Stone was typically procured during the course of normal daily and seasonal movements, without the need for special purpose trips. The conservation of the most commonly used stone materials such as silcrete and tuff was not a priority. However, high quality less commonly utilised materials may have been procured from more distant sources by special purpose journeys and/or trade;

    - *Presence of stone sources and evidence for procurement at those sources (lithic quarry sites). More abundant evidence at a particular location may indicate repeated and special-purpose visits, as may the absence of evidence associated with other occupation types. Particular stone materials may be traced by chemical/physical tests.*

- Minimal use was made of other stone materials. Several of those that were utilised (quartz, quartzite, acidic volcanics, chalcedony and chert) were probably obtained from local sources such as alluvial and terrace gravels, terrestrial outcrops and weathered conglomerate rock. However, other types such as dacite and rhyodacite (used for grindstones) may have been obtained from sources on the coast north of Newcastle (around Birubi Point) by either trade or special exchange with another cultural group (in recent times the Worimi people), special purpose trips, or visits during the normal seasonal round;

    - *Relatively low frequencies of these types within archaeological assemblages.*

- Heat treatment of silcrete was undertaken to improve flaking qualities and possibly to obtain desired colours. Heat treatment involved both cobbles and large primary flakes of silcrete. Tuff was not deliberately heat treated. A reasonably high proportion of silcrete used in knapping was treated, and some of the products include bondi points that were hafted to spear heads. Kuskie and Kamminga (2000) speculate that colours had important symbolic meaning in Aboriginal society, and part of the reason for heat treatment may have been to obtain a desired colour as well as to improve the flaking properties of the stone. This may have been especially important for armatures of fighting and hunting spears;

    - *Presence of stone in an archaeological context that has been thermally altered (and deliberate heating is inferred), along with heat treatment pits.*

- Ochre was used for ceremonial purposes and is likely to have been procured from relatively local sources;

    - *Presence of ochre in association with areas where preparation occurred for ceremonial activities and evidence of ochre procurement (quarries) at local sources.*

- Backed artefact production occurred widely, with the primary goal of producing microliths (such as Bondi points) that could be hafted onto hunting or fighting spears made of grass tree stems or other wood, with the use of resin. It was more likely to be a planned and organised activity, but it did not necessarily occur only at nuclear family base camps or hunting party camps. Microblade production may also have occurred in places traversed during the course of hunting expeditions, such as resting places along travel corridors. When the production of microblades occurred away from camps, it may have involved more casual or opportunistic behaviour, such as backing a microblade to replace a spear barb when needed;

- *Evidence expected includes microblades, microblade cores, microblade portions, microlith backing flakes, bondi point preforms and preform portions, complete and broken microliths and other debitage associated with their production, in association with sites interpreted as being nuclear family base camps or hunting-party camps. Also, some evidence (including microlith backing flakes and broken and utilised bondi points) would be expected away from these locations.*

- Production of backed artefacts was time-consuming and resulted in a considerable quantity of stone debitage at localities where it was undertaken. It is speculated that the end purpose (hunting or fighting spears armed with stone barbs) must have been highly desirable and socially valuable (Kuskie and Kamminga 2000). Hunting larger animals with spears was also a high-risk subsistence activity (in terms of invested time, energy and the price of failure), whereas most dietary requirements could be adequately met through low-risk means (ie. more reliable in terms of time, energy and return). Global scale analyses have demonstrated that in lower latitudes (in which the Hunter Valley is situated), with longer plant-growing seasons, plants and small land fauna are prominent in the economy of hunter-gatherer people *(cf.* Binford 1980, Torrence 1983). The investment of considerable time and energy in the production and hafting of backed artefacts to hunting and fighting spears may well have been undertaken as much in relation to the social value of these items and tasks as strictly utilitarian need (Kuskie and Kamminga 2000);

  - *Problematic to identify through archaeological evidence.*

- Casual and opportunistic reduction of stone or selection of flakes to meet requirements on an 'as needed' basis was a widespread occurrence. Suitable flakes (sometimes after being retouched) were used in domestic tasks such as fashioning or repairing a wooden implement, while a higher proportion of flaked products were simply discarded at the site of their manufacture, without use;

  - *Presence of artefacts relating to non-specific knapping in a wide variety of contexts in the landscape, with only a low proportion of items possessing retouch or use-wear.*

- A low frequency of items was knapped using bipolar technology. This technology is largely, although not entirely, restricted to the reduction of quartz. It is likely that this technology was employed to reduce small pebbles rather than as strategy to prolong the life-use of an existing core;

  - *Presence of artefacts associated with bipolar knapping in relatively low frequencies. and mostly on quartz.*

- Exposed sandstone bedrock was used for the shaping and/or maintenance of ground-edge hatchets. This activity may have been occasional and incidental to transitory movement or short-term occupation during the course of the normal daily hunting/gathering round, rather than a result of special purpose visits;

  - *Sites with grinding grooves may exhibit evidence consistent with transitory movement or hunting/gathering without camping. Sites with extensive evidence of grinding and limited evidence of other activities will not occur.*

- Special tools such as worimi cleavers and grindstones were large and heavy and may have been deliberately cached at base camps in readiness for return visits;

  - *Presence of specific tools (such as grindstones) at sites where evidence is present for repeated episodes of occupation. These tools and other types may be present in multiple numbers.*

- Plant foods were processed and consumed at temporary hunter/gatherer encampments, at family base camps, and where larger groups of people congregated, as well as at the sites of procurement. A range of plant resources was available in the locality. Women played a much larger role than men in obtaining and processing plant foods. Macrozamia kernels were collected and prepared by a special process to remove toxins, involving soaking the kernels for up to two weeks, then pounding and roasting them (*cf.* David 1890, Backhouse in Gunson 1974);

    - *Evidence relating to food processing and consumption occurring in association with evidence representative of these site types.*
    - *A suitable environmental context for the plants to exist, implements for pounding and a possible focus of this evidence around freshwater sources where the Macrozamia toxins could be extracted.*

- Ferns may have been a staple of the local diet, along with the bulbs and roots of other wetland plants. It is uncertain if swamp fern (*Blechnum* spp.) and/or bracken fern (*Pteridum esculentum*) was consumed. Notwithstanding its importance in the Maori diet, bracken fern, which grows in wet sclerophyll forest, is less likely since it is not reported ethnohistorically as being a preferred food (Beth Gott, *pers. comm*.). Worimi cleavers were used to pound the starch-rich rhizomes of bracken fern and/or swamp fern and possibly the roots of other plants obtained from the wetlands (*cf.* Kamminga 1974). Eloueras may have been used for extracting the perennial herb cumbungi (*Typha australis*), abundant in the freshwater parts of wetlands, or less likely tall spike rush (*Eleocharis sphacelata*). Fibre from the cumbungi rhizome and leaf was used for string, baskets and nets (Beth Gott, *pers. comm*.);

    - *Suitable environmental context for the presence of such plants, presence of tools used in cutting and pounding them (eg. worimi cleavers, eloueras, pebble choppers) and presence of products made from plants (eg. string, baskets and nets).*

- Animal foods were processed and consumed at temporary hunter/gatherer encampments, at family base camps, and where larger groups of people congregated, as well as at the sites of procurement. Men hunted for larger game, while women played a key role in obtaining smaller game. Hunting was a planned and coordinated event, as evidenced by the capture of kangaroos 'enclosed in a nook or bend in the river or some other obstacle' (Dawson 1830:119) and the use of fire to burn-off and promote fresh grass growth (Sokoloff 1978a-b). Birds, such as swans and ducks, were caught around the swamps and lakes (*cf.* Threlkeld in Gunson 1974); and

    - *Evidence for consumption and processing of animal food located in association with evidence interpreted as representing these occupation types.*

- Fish were obtained by several methods. People used bark canoes on lakes, wetlands and rivers, and angled with shell fish-hooks and line. Fish were also obtained directly by spearing, while standing in a canoe or on a bank, or by the use of hand nets to form a circle in shallow waters and enclose the fish. Another group activity was the planting of sprigs of bushes in streams, with some men frightening the fish towards an opening, at which point others stood ready with nets to catch them (*cf.* Threlkeld in Gunson 1974). Eels were also caught in an organised manner, with small trenches being dug in the swamps, particularly near the narrower outlet (*cf.* David and Etheridge 1890:46). Managing resources by the use of facilities (eg. fish and eel traps) and fire (encourages new grass to attract kangaroos or manage macrozamias) were additional strategies aimed at increasing the reliability and productivity of food resources (Rich 1995:4).

- *Presence of fish remains in deposits, shell fish-hooks and fish-hook files, fishing line, fishing spears and hand nets. Fish traps would be expected in suitable watercourses (although only stone arrangements would survive), however evidence for procurement of eels is not expected within an archaeological context.*

Notwithstanding arguments largely underpinned by material culture, environmental factors and resource variation, in relation to comparable areas on the South Coast, Boot (2002:334) observes that *"the economy was secondary to the sacred and that, ultimately, the primary purpose of economic life was to sustain the sacred worlds of the Yuin"*.

The investigation area is located in contexts that do not conform to primary or secondary resource zones. According to the modelling above, occupation of the investigation area is therefore more likely to have related to hunting and gathering activities, along with transitory movement between locations and procurement of stone materials, and have been of a generally low intensity. The spiritual/ceremonial use of Mt Sugarloaf may have been a significant cultural factor in the occupation of the locality, and potentially contributed to limited utilitarian activities having been undertaken within the area (or portions of it).

In general terms, the nature of occupation at each site identified within the investigation area could represent a variety of circumstances (Kuskie and Kamminga 2000), for example:

- Transitory movement;
- Hunting and/or gathering (without camping);
- Camping by small hunting and/or gathering parties;
- Nuclear/extended family base camp;
- Community base camp;
- Larger congregation of groups; or
- Ceremonial activity.

The evidence could represent a single episode or multiple episodes of one or more of the above types of occupations. The episodes of occupations could have occurred at different times over the entire time-span of occupation in the region. Each episode of occupation could also have been for a different duration of time.

Unless the archaeological evidence for individual activity events is readily identifiable, it can be highly problematic to determine the types of occupation, number of episodes, and times and duration represented by evidence at a particular site. Suitable circumstances are rarely present in open sites, due to mixing of evidence by post-depositional processes and the superimpositioning of evidence caused by repeated episodes of occupation.

Listed below is a brief description of the nature of each type of occupation and the material circumstances or evidence that may relate to such occupation types within the present investigation area and surrounding locality (*cf*. Kuskie and Kamminga 2000):

Transitory movement:

- May occur when an individual or group of people are moving between base camps, or from a campsite to resources or a ceremonial or other special purpose site;
- Duration would be less than a day and probably less than a few hours;
- Total numbers of people would generally be relatively low;

- Could occur on most topographical units and classes of slope, but possibly more frequently on ridge and spur crests and along watercourses and valley flats;
- Could occur in any type of rock shelter (ie. any size, topographic location, or distance from water source) where shelter may be sought from inclement weather;
- Proximity to potable water was probably not important;
- Proximity to food resources was probably not important;
- Evidence may represent accidental discard, repair of hunting or gathering equipment, children's play or knapping activity;
- Quantity and density of evidence and range of artefact and stone types are expected to be low, consistent with 'background discard', with few discrete activity areas unless repeated episodes have occurred causing superimpositioning;

Hunting and/or gathering (without camping):

- May occur when an individual, or more likely a small group of closely related people, engage in hunting activities (more likely to be a party of men) or gathering activities (more likely to be women and children);
- Duration would be less than a day, with people returning to a base to sleep;
- Total numbers of people would be relatively small;
- Would be expected to occur where food resources were available, which for different foods may be a seasonal or annual occurrence;
- Could occur in any type of rock shelter (ie. any size, topographic location, or distance from water source) particularly where shelter may be sought from inclement weather;
- Proximity to potable water was probably not important;
- Evidence may represent accidental discard, loss during use, repair of hunting or gathering equipment, children's play or knapping activity;
- Quantity and density of evidence and range of artefact and stone types are expected to be low, consistent with 'background discard', possibly with a few discrete activity areas. Loss or discard of specific tool types may be a useful indicator (particularly items with use-wear/residue that are not in association with evidence of their manufacture or maintenance). Repeated visits to particularly food sources may cause a build up of unrelated evidence over a period of time in a specific location. Small shell middens, representing single meal events, would be expected close to shellfish sources, with potentially a build up of temporally unrelated meal events from repeated visits over time.

Camping by small hunting and/or gathering parties:

- May occur when an individual, or more likely a small group of closely related people, that are engaged in hunting activities (more likely to be a party of men) or gathering activities (more likely to involve women and children) camp overnight near the resource being procured;
- Duration would be one or several days;
- Total numbers of people would be relatively small;
- Would be expected to occur close to where food resources were available, which for different foods may be a seasonal or annual occurrence;

- Would be expected to occur in open contexts and also in rock shelters, particularly relatively larger rock shelters with sufficient habitable floor areas for activities and sleeping. Aspect of the rock shelter towards the rising or setting sun may have been important;
- Proximity to potable water probably was important, although temporary sources may have been sufficient;
- Evidence may represent accidental discard, repair of hunting or gathering equipment, children's play, stone knapping activity, food processing or temporary camp fires;
- Quantity and density of evidence and range of artefact and stone types are expected to be low to moderate, and distinguishable from 'background discard', with at least several activity areas. A reasonably broad range of artefact and stone types may be discarded (although not as diverse as expected at a base camp). Shell middens representing single or multiple meal events would be expected close to shellfish sources. Items likely to be cached for future use at a base camp, or unlikely to be carried around on a hunting or gathering journey (eg. grindstones) are not expected to occur. Time-consuming activities like construction and use of ovens or heat treatment pits are also unlikely to have occurred

Nuclear/extended family base camp:

- May occur when a single nuclear family or extended family camps together;
- Duration uncertain but probably dependent on availability of food resources and potable water in the locality;
- Total numbers of people would be relatively small;
- In open sites, probably situated on level or very gently inclined ground, close to potable water and close to food resources;
- In rock shelters, probably occurred in shelters close to potable water (with greater potential near higher order sources), close to food resources and only in large rock shelters with sufficient habitable floor area for activities and sleeping. Aspect of the rock shelter towards the rising or setting sun may have been important;
- The encampment area in open contexts may consist of a several small huts, dispersed in a spatial patterning depending on the social mix of the people;
- Evidence may represent accidental discard, repair of equipment, children's play, stone knapping activity, food processing, campfires, heat treatment of silcrete and manufacturing of tools;
- Quantity and density of evidence and range of artefact and stone types discarded are expected to be high. Shell middens representing multiple meal events would be expected close to shellfish sources, including middens of larger size. Repeated visits to a camp site or stays of long duration may cause a build-up of evidence over a period of time in a specific location. Items are likely to have been cached for future use at a base camp. Specific artefact indicators include grindstones. Evidence of casual knapping and production of tools is expected to be common. The significant differences with a temporary hunter/gatherer's camp include the possible presence of features such as heat treatment pits and ovens, broader range of artefact and stone types, presence of specific artefact indicators, higher density of evidence (reflecting more activity and longer duration of use) and relatively common evidence for the production of tools.

Community base camp:

- May occur when a number of nuclear families camp together;
- Duration uncertain but probably dependent on availability of food resources;
- Total numbers of people could be relatively large (30+);
- Probably situated on level or very gently inclined ground in open contexts;
- Probably situated close to potable water;
- Probably situated close to food resources (eg. conjunction of wetlands and forest zones);
- The encampment area may exceed 100 m^2 and consist of a number of individual groups and huts, dispersed in a spatial patterning depending on the social mix of the groups;
- Quantity and density of evidence and range of artefact and stone types discarded are expected to be high. Large shell middens representing multiple meal events would be expected close to shellfish sources. Spatially discrete evidence of individual camp sites would be expected (if the resulting evidence has not been affected by disturbance or superimpositioning). Items may not have been cached for future use. Specific artefact indicators include grindstones, relatively more common evidence of food processing and possibly ochre. Evidence of casual knapping and production of tools is expected to be common. However, features such as heat treatment pits may not occur.

Larger congregation of groups:

- May occur in relation to special events (eg. major ceremonies) or when a particularly desirable food was most abundant;
- Probably of short duration (eg. less than two weeks) but potentially for longer duration (eg. up to several months);
- Total numbers of people could vary widely, but possibly exceed 100;
- Probably situated on level or very gently inclined ground in open contexts;
- Probably situated close to potable water;
- Probably situated close to food resources;
- A large area or areas of encampments would be expected, possibly covering hundreds of square metres or more;
- Spatially discrete evidence of individual camp sites would be expected (if the resulting evidence has not been affected by disturbance or superimpositioning);
- Quantity and density of evidence and range of artefact and stone types discarded are expected to be high (similar to community base camp). Substantial shell middens representing multiple, contemporaneous meal events would be expected close to shellfish sources. Items may not have been cached for future use. Specific artefact indicators include grindstones, relatively more common evidence of food processing and possibly ochre, and possibly evidence of processing uncommon foods for which the gathering may be related (eg. whale). Evidence of casual knapping and production of tools is expected to be common. However, features such as heat treatment pits may not occur.

Ceremonial activity:

- May occur when a group of people gathers at a particular location to perform a ceremony;
- Evidence may be present of ceremonial site features such as earthen rings or stone arrangements, or ochre;

- Evidence of large encampments (similar to that expected for the 'larger congregation of groups' listed below) may be present nearby, including in locations with an aspect towards the ceremonial site.

To distinguish whether single or multiple episodes of occupation occurred, several factors can be examined. Multiple episodes of occupation would tend to exhibit superimpositioning of artefact evidence (eg. mix of unrelated stone materials and artefact types and activity areas). However, identifying which items belong to which activity events can be problematical. Also, distinguishing the effects of post-depositional disturbance from cultural superimpositioning is problematical (Koettig 1994). The analysis of distributions of stone material and artefact types is of benefit in some circumstances. In a stratified deposit, multiple episodes of occupation would be indicated by evidence in different stratigraphic layers, particularly discrete activity areas to exclude the possibility that items have moved vertically through the deposit by bioturbation.

Another indicator of multiple occupation is an expectation of a relatively higher density of artefacts within a locality (combined with superimpositioning as discussed above). Larger areas of occupation may also result, when occupations only partially overlap (eg. Camilli 1989).

Identification of different episodes of occupation over time would require *in situ* deposits with stratified or vertically separated evidence of activity events and datable material (eg. charcoal or midden deposits).

Identification of the duration of individual episodes of occupation may prove very difficult. Where a single episode of occupation has occurred, a greater quantity of items, frequency of discrete activity events and size of contemporaneous shell midden deposit may be indicative of a longer stay.

Identification of the types of occupations when multiple episodes have occurred may prove highly problematical. Unless specific artefact indicators for different types of occupation are present, the superimpositioning of evidence from unrelated occupations (eg. transitory movement over a nuclear family base camp) may not be possible to determine.

3.5 Predictive Model of Site Location

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

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

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

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

In certain circumstances, such as where low surface visibility or recent sediment deposition precludes effective assessment of the potential archaeological resource, sub-surface testing may be a viable alternative for further testing the predictive model and assessing the investigation area.

The following is a brief description of the site types that may occur within the investigation area.

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

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

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

Artefact scatters may represent the evidence of:

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

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

Within the investigation area, there is potential for stone artefacts to occur in a widespread distribution of variable density across virtually all landform units, apart from in areas which have been substantially impacted by recent land-use. Typically, a higher density of evidence is expected to occur where more focused and/or repeated Aboriginal occupation has occurred (ie., in primary or secondary resource zones). However, none of the present investigation area can be characterised as being located within a primary or secondary resource zone, and therefore evidence of focused occupation is not expected to be present.

Occupation of the investigation area may have involved hunting and gathering and transitory movement (particularly along the ridge and spur lines), resulting in a low-density distribution of artefacts typically consistent with background discard. Superimpositioning of evidence along the crests from repeated movement may result in relatively higher artefact density in these areas. In general, the use of the moderate to steeply inclined slopes is anticipated to have been very low, with consequently a very low density of evidence expected. The spiritual/ceremonial use of Mt Sugarloaf may also have contributed to minimal utilitarian activity in the locality (or portions of it), and a consequent very low density of artefacts.

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

Mount Sugarloaf is a prominent natural feature in the landscape. It is a regionally dominant point that overlooks a substantial area along the coastal lowlands to the east, including Lake Macquarie, Newcastle Bight and the lower Hunter River valley, along with the Central Lowlands of the Hunter Valley to the north and west. Strong cultural ties have been identified by the Awabakal people with this landscape and ceremonial sites have been reported in the locality (refer to Sections 3.3 and 6 and Kuskie 2008a). As such, the potential for evidence of ceremonial sites within the investigation area is assessed as moderate to high.

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

The potential for burial sites to occur within the investigation area is considered to be low to moderate, given the historical reports of burials in caves (Threlkeld in Gunson 1974).

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

Both vegetation removal and the long passage of time since the practice of tree carving was prevalent have rendered this site type extremely rare. However, the investigation area is largely forested with regenerating vegetation and mature remnant native forest. Where mature native trees are present, there is some potential, albeit generally low, for carved trees to occur.

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

Grinding grooves are typically located in sedimentary bedrock along watercourses. The investigation area hosts suitable geology (extensive conglomerate and sandstone) and drainage depressions, and a number of grinding groove sites have previously been recorded there (Table 2). The potential for further grinding groove sites to occur within the investigation area is considered to be high.

LITHIC QUARRIES: A lithic quarry is the location of an exploited stone source (Hiscock and Mitchell 1993:32). Sites will only be located where exposures of a stone type suitable for use in artefact manufacture occurs. Reduction sites, where the early stages of stone artefact manufacture occur, are often associated with quarries.

Geological mapping of the study area indicates that the primary potential for lithic quarry evidence relates to the exploitation of tuff, if outcrops occur, and pebbles derived from conglomerate. This potential is assessed as moderate in areas of lower gradient and low in areas of higher gradient. Klauss Diessel and Murray Little (*pers. comm.*, 1996) have identified such outcrops of tuff on the foothills of Sugarloaf Range immediately north of the investigation area.

MIDDENS: Shell middens are a common site type in the coastal region. Middens are deposits of shell, the remains of what formed part of the Aboriginal diet. Middens may also include stone, bone or shell artefacts, charcoal, or the remains of small terrestrial or aquatic fauna, which were also a part of the diet. Middens exhibit wide variation in terms of their size, preservation and contents, and can provide significant information on land-use patterns, diet, chronology of occupation and environmental conditions.

The distance the investigation area is located from higher order watercourses and estuarine/lake contexts in which shellfish sources are present renders the potential for shell midden sites as very low.

MYTHOLOGICAL/TRADITIONAL SITES: Mythological sites, or sites of traditional significance to Aboriginal people, may occur in any location. Often natural landscape features are the locations of mythological sites. Other sites of contemporary significance include massacre sites (the location of violent clashes between early settlers and local Aboriginals), traditional camp sites and contact sites.

Consultation with the local Aboriginal community is essential to identify these site types. As outlined in Section 3.3, the general locality of Mount Sugarloaf holds strong cultural associations for the Awabakal people, both traditional, historic and contemporary. The potential for significant sites of cultural value to occur within the investigation area is assessed on a preliminary basis as high, given its prominence as a natural feature in the landscape and known associations with male initiation, the supernatural spirit being "Puttikan" and the supreme being "Koe-in".

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

The study area is generally characterised by concave slopes ranging from less than 20 degrees to vertical cliffs, and has discontinuous cliff line sedimentary outcrops at various elevations. As such, the potential for rock shelter sites is assessed as high.

SCARRED TREES: Scarred trees contain scars caused by the removal of bark for use in manufacturing canoes, containers, shields or shelters.

Mature trees, remnants of stands of the original vegetation, have the potential to contain scars. Both vegetation removal and the long passage of time since these practices were prevalent have generally rendered this site type rare. However, the investigation area is largely forested with regenerating vegetation and mature remnant native forest. Where mature native trees are present, there is a low to moderate potential for scarred trees to occur.

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

Hill tops and ridge crests which contain stone outcrops or surface stone, and have been subject to minimal impacts from recent land use practices, are potential locations for stone arrangements. Stone arrangement sites have been recorded in the locality and the present investigation area is located in a suitable topographic context, with suitable geological conditions. As such, the potential for stone arrangement sites to occur can be assessed as moderate.

4. METHODOLOGY

During the initial stages of the investigation, research was conducted into the environmental, cultural and archaeological background of the investigation area, and searches were undertaken of the OEH Aboriginal Heritage Information Management System and other relevant heritage registers and planning instruments (refer to Section 3.1).

The Project has been undertaken within a period of regulatory and policy change, particularly with the cessation of Part 3A Major Projects under the EP&A Act and introduction of Division 4.1 of Part 4 ('State Significant Development'). The Director-General's requirements for the Project were not obtained until a long period into the investigation. In order to address the anticipated requirements (refer to Section 1.2), the investigation involved:

- Consultation with the Aboriginal community in accordance with the OEH policy entitled *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*; and
- A cultural heritage assessment conducted in accordance with the *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (DEC 2005), *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b) and the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011a).

Notwithstanding that the *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005) reference the *Interim Community Consultation Requirements for Applicants* (DEC 2004) and *Aboriginal Cultural Heritage Standards and Guidelines Kit* (DEC 1997), the latter policies have effectively been superseded by the DECCW (2010c) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* and DECCW (2010b) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* and OEH (2011a) *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (refer to Section 8.2). The 2010 consultation requirements were introduced on 12 April 2010 and supersede the 2004 policy, but effectively incorporate the same procedures.

Field inspection of the investigation area was undertaken over 24 days between 12 September and 27 October 2011, by Stephen Free and Leigh Bate of South East Archaeology, assisted by representatives of the registered Aboriginal parties (refer to Section 6). Full details of the registered parties involvement in the survey are presented in the consultation database in Appendix 6. During the course of the survey, assistance was provided by the following individuals:

- Lower Hunter Wonnarua Council - Dean Miller and Daniel Scott;
- Awabakal Traditional Owners Aboriginal Corporation - Jodie Wilson;
- Awabakal Descendants Traditional Owners Aboriginal Corporation - Shane Frost;
- Yarrawalk - Jason Blair and Danny Franks;
- Awabakal LALC - Darren Carney;
- Wonn 1 Contracting - Adam Clarke;
- Yinarr Cultural Services - Norm Archibald and Kiah Archibald;
- Cacatua Culture Consultants - Jason Brown;
- Gimbay Gatigaan Aboriginal Corporation - Lenny Quinlan and Ben Quinlan;
- Gidawaa Walang - Jake Dacey and Nikita Butt.

All registered parties were invited to attend (and many participated in) a site inspection and meeting on 27 January 2012 to discuss the survey results, cultural values and impact assessment (Plate 7, Appendix 5; refer to Section 6 and Appendix 6).

A second meeting was held on 22 March 2012 to discuss the draft heritage report and to seek further input from the registered parties on cultural values, significance and management strategies. All registered parties were invited to attend this meeting and many did (refer to Section 6 and Appendix 6).

The investigation occurred in accordance with the draft methodology dated 25 July 2011 that was provided to the registered Aboriginal parties and finalised on 30 August 2011 with minor modifications to address several issues raised by the parties. Eleven of the 15 registered Aboriginal parties responded to the methodology and/or selection criteria for those registered parties wishing to be considered for paid participation in the investigation (refer to Section 6). No objections were raised to the methodology, however several minor amendments were made to address issues raised by two parties:

- Awabakal Descendants Traditional Owners Aboriginal Corporation agreed with the proposed methodology, but requested that inspection for scarred trees also be made widely within the underground investigation area on the basis that they may be subject to impacts from changes to underground aquifers, and that much of their response be kept confidential. These requests were addressed through clarification via email and a minor amendment to methodology, and non-inclusion of relevant sections within Appendix 6; and

- Awabakal Traditional Owners Aboriginal Corporation agreed with the proposed methodology, but requested some further information such as previously recorded sites and an estimate of the number of days for the survey, and that much of their response be kept confidential. These requests were addressed by providing clarification on the methodology, a copy of the final methodology and a copy of all OEH records for previously recorded sites within the investigation area, and non-inclusion of relevant sections within Appendix 6.

For the purposes of this Aboriginal cultural heritage assessment, the investigation area totals 1,260 hectares and is subdivided into:

1) *Underground investigation area* - in which the primary impacts will potentially occur from underground mining related subsidence, with minimal direct surface impacts (primarily limited to small areas from continued use of existing access tracks, exploratory drilling, subsidence monitoring, environmental monitoring and subsidence remediation). This area measures approximately 1,242.7 hectares; and

2) *Surface investigation area* - in which the primary impacts will occur from surface works. This area measures 21.7 hectares (of which 2.4 hectares overlaps with the underground investigation area).

It is noted that the *Project area* shown on Figures 1 - 3 is marginally smaller than the *investigation area* (ie. refer to Figure 4), as the latter encompasses a buffer zone based on the angle of draw.

Property access was not available to a 130 hectare portion of the underground investigation area on privately owned land in the central-west (refer to Figure 9). As a consequence, although a large proportion of the overall investigation area of 1,260 hectares was subject to archaeological survey (approximately 1,132 hectares or 90%), a small portion (10%) of the investigation area was not directly surveyed during the present assessment. Recommendations are presented to address this issue (refer to Section 11).

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

Detailed recording of the archaeological *survey areas* was made on survey recording forms, including environmental variables and heritage resources identified or potentially present. Each *survey area* was assigned a unique reference code after the Tasman Extension 'TE' initials (refer to survey coverage database in Appendix 3).

Within each *survey area*, the areas inspected on foot correspond to the DECCW (2010b) definition of *survey units*. The *survey units* typically comprised general transects through vegetated terrain, or coverage of and separate recording of specific exposure types, such as vehicle tracks. Data for each *survey unit* was recorded separately on the survey area recording forms and representative photographs of survey units and survey areas were taken and are included in Appendix 5 where relevant and informative.

For the purposes of the analysis, *survey unit* data from each *survey area* are combined (refer to Appendix 3), and data from each survey area can be combined with comparable survey areas to analyse coverage and artefact density with respect to environmental variables such as landform element and slope (refer to Table 3). For a thorough discussion of the rationale for use of the individual artefact as the basic unit of analysis, including the problems with open artefact site definitions due to exposure/obscurement issues, and the margins of error, variables and constraints associated with the data collection procedures and analysis, refer to the comprehensive discussion in Kuskie (2000) and Sections 3.5 and 5.3 of this report.

The general survey procedure involved separation of the crew into two teams, each comprising an archaeologist and several Aboriginal community representatives. The team members worked together surveying each survey area, or in separate survey areas. Time was utilised at the onset of the survey for Occupational Health and Safety procedures and training/familiarisation and several days were lost due to inclement weather, which represented a safety risk in the rugged terrain.

The survey team was equipped with high resolution 1:3,000 scale mapping of the investigation area, with two metre contours, a 100 metre MGA grid and an aerial photograph underlay. The contours were interpolated, and not derived from laser scanning, and as such were of variable accuracy. However, along with the use of hand-held Global Positioning System (GPS) units (generally accurate to within five metres), these features assisted with defining survey areas and survey units and accurately establishing the location of Aboriginal sites and marking the above onto the detailed base mapping (refer to Figures 10 and 11 and Appendix 4).

Hence, the survey sampled the entire geographic extent of the investigation area (excluding the 10% where property access was not available), within individual survey areas based on specific combinations of landform element and class of slope. The extent of the sample and nature of survey coverage is discussed in Section 5.1. As the investigation area encompassed the proposed impact areas, the coverage sampled much of the potential impact areas of the Project. Minor areas immediately adjacent to the investigation area were also sampled in some instances, but this coverage is not included within the Project survey coverage database.

Within each survey area in the *underground investigation area*:

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

Within each survey area in the *surface investigation area*:

- Inspection was made widely for the obtrusive site types, such as rock shelters with deposit and/or art, grinding grooves and scarred trees; and
- Inspection was also made widely for stone artefacts and other cultural evidence, focusing on areas with ground surface visibility.

Aboriginal heritage site recording forms for each identified site were also completed. Spatially separate locations of heritage evidence were recorded as separate site loci named after "Tasman Extension" for the project, followed by the survey area number and a sequential letter (refer to Section 3.5 for further discussion of site definitions and delineation of site boundaries). For example, the site loci identified within survey area TE152 were named "Tasman Extension 152/A" and "Tasman Extension 152/B" (refer to detailed site descriptions in Appendix 4).

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

Stone artefacts were recorded on a lithic item recording form, including details about provenance, stone material type, artefact type, size class, cortex and other relevant attributes (refer to Table 8).

During the survey and throughout the consultation process registered Aboriginal parties were also asked of their knowledge of any areas of cultural significance within the investigation area (refer to Figure 12), for example:

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

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

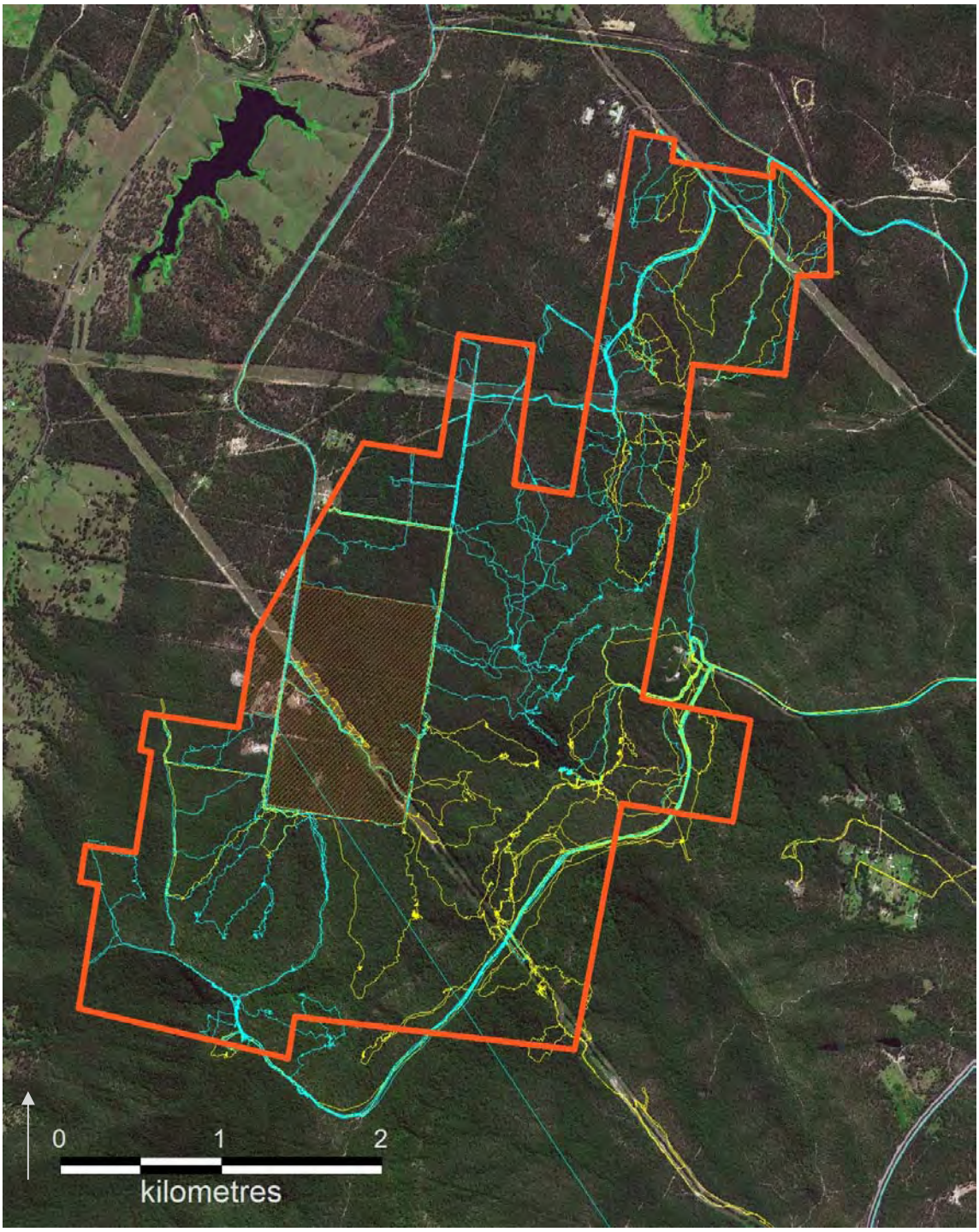


Figure 9: Approximate location of GPS recorded transects (yellow and blue lines) within the investigation area (orange border) (noting that dense vegetation cover limited the effectiveness and accuracy of the hand-held GPS units at times; that the field teams involved a number of participants, only one of which in each team carried a GPS unit; and that some coverage outside of the investigation area relates to access, not direct survey coverage) (area of limited property access cross-hatched orange) (aerial photograph courtesy Resource Strategies).

5. RESULTS AND DISCUSSION

5.1 Survey Coverage

For the purposes of this Aboriginal cultural heritage assessment, the investigation area measures 1,260 hectares and is larger than the Project area because it includes a buffer zone based on the angle of draw.

Comprehensive archaeological survey coverage was obtained across the geographic extent of the investigation area (potential impact area), apart from an approximately 130 hectare portion that could not be sampled due to property access constraints at the time of the survey[8] (refer to Figure 10). This *heritage study area* of approximately 1,132 hectares, or 90% of the overall investigation area, was subdivided into a total of 209 archaeological survey areas, each representing a specific combination of landform unit and class of slope (definitions as per McDonald *et al* 1984). Each archaeological survey area was inspected for Aboriginal heritage evidence. The environmental contexts surveyed included the six landform elements and four classes of slope present (Table 3).

The locations of the individual survey areas are marked on Figure 10 and descriptions are presented in Appendix 3. A summary of the survey coverage is presented in Table 3 for the combined environmental contexts and individual classes of slope and landform elements.

The total survey coverage (ground physically inspected for heritage evidence) equated to approximately 605,404 m^2, or 5.3% of the heritage study area or 4.8% of the overall investigation area. As this coverage only refers to an area of several metres width directly inspected by each member of the survey team, the actual coverage for obtrusive site types (for example, scarred trees and rock shelters) was significantly greater than this. The total effective survey coverage (*visible* ground surface physically inspected with potential to host heritage evidence) equated to around 39,666 m^2, or 0.35% of the heritage study area or 0.3% of the overall investigation area.

Conditions of surface visibility were generally very low across the investigation area, due to the dense cover of vegetation (Appendix 3). Archaeological visibility, the actual visible ground surface with potential for heritage evidence (accounts for factors such as ground disturbance and sediment deposition), was generally similar to surface visibility. Mean archaeological visibility across the entire survey sample was approximately 6.6%. Exposures tended to be present along the vehicle tracks and power easements and other areas of recent ground disturbance, but much of the investigation area comprised dense vegetation.

A number of mature native trees exist within the investigation area and where identified, these were inspected for evidence of Aboriginal scarring. Rock formations, both open surfaces and raised features such as boulders and scarps, are relatively common within the investigation area. These were targeted for inspection during the survey.

Notwithstanding the low surface visibility and resulting low proportion of effective survey coverage as a percentage of the entire investigation area, the level and nature of effective survey coverage is considered satisfactory enough to present an effective assessment of the Aboriginal heritage resources identified and potentially present within the investigation area. The coverage was relatively comprehensive for obtrusive site types (for example, scarred trees, grinding grooves and rock shelters) but limited for the less obtrusive stone artefacts.

[8] Recommendations are presented to address this issue (refer to Section 11).

Nevertheless, in view of the potential impacts of the proposal (primarily related to subsidence and rock formations), predictive modelling and results obtained from the sample of effective coverage, it is concluded that the survey provides a valid basis for formulating recommendations for the management of the identified and potential Aboriginal heritage resources.

Table 3: Environmental contexts, class of slope and landform elements - summary of survey coverage and artefact density for investigation area.

Environmental Context	Total Area of Context (m^2)	% Context Comprises of Investigation Area	Total Area Surveyed (m^2)	% Surveyed of Context	Effective Survey Coverage Total (m^2)	% Effective Survey Coverage of Context	Total # Artefacts (open sites)	Artefact Density (# artefacts per m^2 effective survey coverage)
level-very gentle drainage depression	234,246	2.07%	10,500	4.48%	615	0.26%	0	-
gentle drainage depression	576,896	5.10%	48,500	8.41%	2191	0.38%	1	0.0004
moderate drainage depression	1,160,489	10.25%	74,620	6.43%	2305	0.20%	1	0.0004
steep drainage depression	323,518	2.86%	25,150	7.77%	618	0.19%	0	-
level-very gentle flat	488,496	4.32%	39,900	8.17%	7535	1.54%	20	0.0026
level-very gentle simple slope	1,313,582	11.60%	52,684	4.01%	4953	0.38%	16	0.0032
gentle simple slope	1,213,583	10.72%	103,590	8.54%	5234	0.43%	34	0.0065
moderate simple slope	2,261,627	19.98%	89,890	3.97%	3550	0.16%	4	0.0011
steep simple slope	2,026,207	17.90%	66,060	3.26%	3928	0.19%	2	0.0005
level-very gentle spur crest	6,707	0.06%	1,500	22.36%	30	0.45%	0	-
gentle spur crest	55,252	0.49%	7,420	13.43%	544	0.98%	0	-
moderate spur crest	31,267	0.28%	1,600	5.12%	32	0.10%	0	-
steep spur crest	11,562	0.10%	1,500	12.97%	30	0.26%	0	-
level-very gentle ridge crest	81,677	0.72%	8,660	10.60%	1474	1.80%	65	0.0441
gentle ridge crest	460,423	4.07%	26,350	5.72%	3240	0.70%	9	0.0028
moderate ridge crest	272,609	2.41%	23,010	8.44%	2141	0.79%	8	0.0037
steep ridge crest	69,154	0.61%	2,800	4.05%	92	0.13%	0	-
gentle scarp	19,441	0.17%	2,800	14.40%	56	0.29%	0	-
moderate scarp	597,638	5.28%	16,600	2.78%	1030	0.17%	0	-
steep scarp	116,434	1.03%	2,270	1.95%	68	0.06%	0	-
Totals/Means	**11,320,808**	**100%**	**605,404**	**5.35%**	**39,666**	**0.35%**	**160**	**0.0040**
Class of Slope								
level-very gentle	2,124,708	18.77%	113,244	5.33%	14,607	0.69%	101	0.0069
gentle	2,325,595	20.54%	188,660	8.11%	11,265	0.48%	44	0.0039
moderate	4,323,630	38.19%	205,720	4.76%	9,059	0.21%	13	0.0014
steep	2,546,875	22.50%	97,780	3.84%	4,736	0.19%	2	0.0004
Totals/Means	**11,320,808**	**100%**	**605,404**	**5.35%**	**39,666**	**0.35%**	**160**	**0.0040**
Landform Element								
drainage depression	2,295,149	20.27%	158,770	6.92%	5,729	0.25%	2	0.0003
flat	488,496	4.32%	39,900	8.17%	7,535	1.54%	20	0.0027
simple slope	6,814,999	60.20%	312,224	4.58%	17,666	0.26%	56	0.0032
spur crest	104,788	0.93%	12,020	11.47%	636	0.61%	0	-
ridge crest	883,863	7.81%	60,820	6.88%	6,947	0.79%	82	0.0118
scarp	733,513	6.48%	21,670	2.95%	1,154	0.16%	0	-
Totals/Means	**11,320,808**	**100%**	**605,404**	**5.35%**	**39,666**	**0.35%**	**160**	**0.0040**

*Totals and coverage exclude approximately 130 hectares of land for which property access was not available.

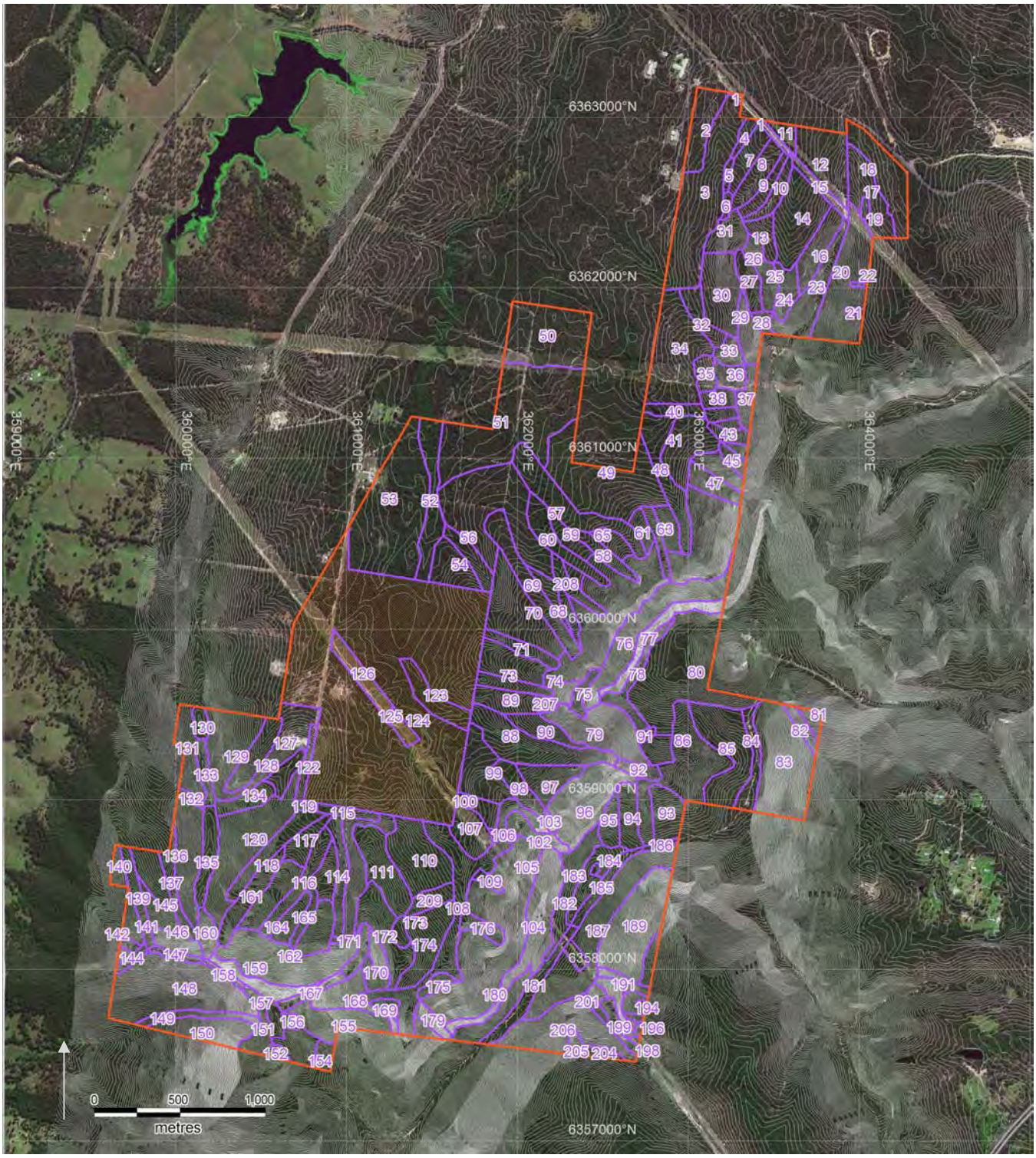
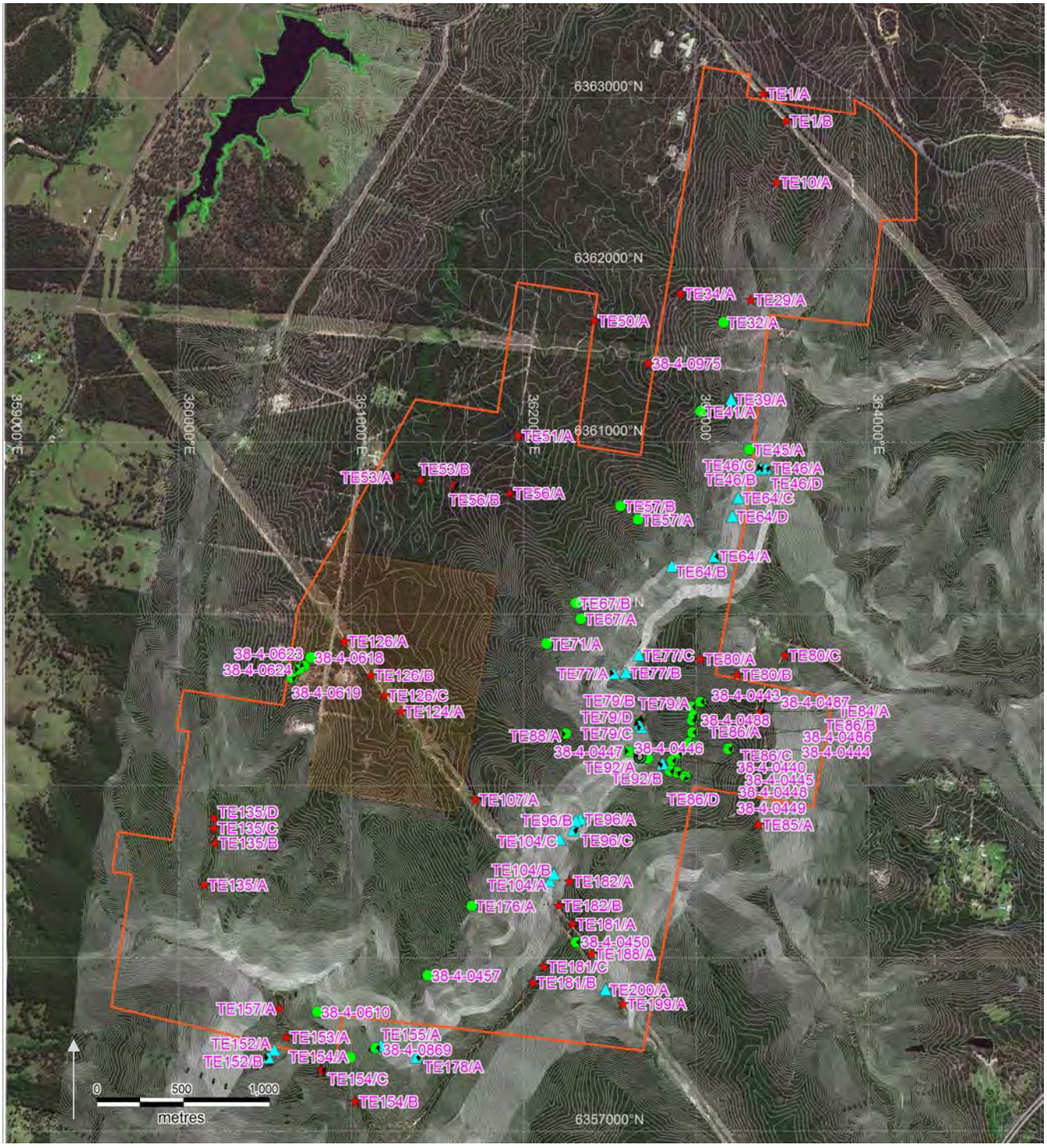


Figure 10: Location of archaeological survey areas (purple shapes) (aerial photograph and two metre contours courtesy Resource Strategies; 1000 metre MGA grid; investigation area border - orange; limited access area cross-hatched orange) (refer to Appendix 3 for full details of coverage).



Open artefact site
Open grinding groove
Open grinding groove and open artefact
Rockshelter with PAD

Figure 11: Location of Aboriginal heritage sites within or immediately adjacent to the investigation area (aerial photograph and two metre contours courtesy Resource Strategies; 1000 metre MGA grid; investigation area border - orange; limited access area cross-hatched orange) (refer to Appendices 2 and 4 for full details of sites and higher-resolution mapping).

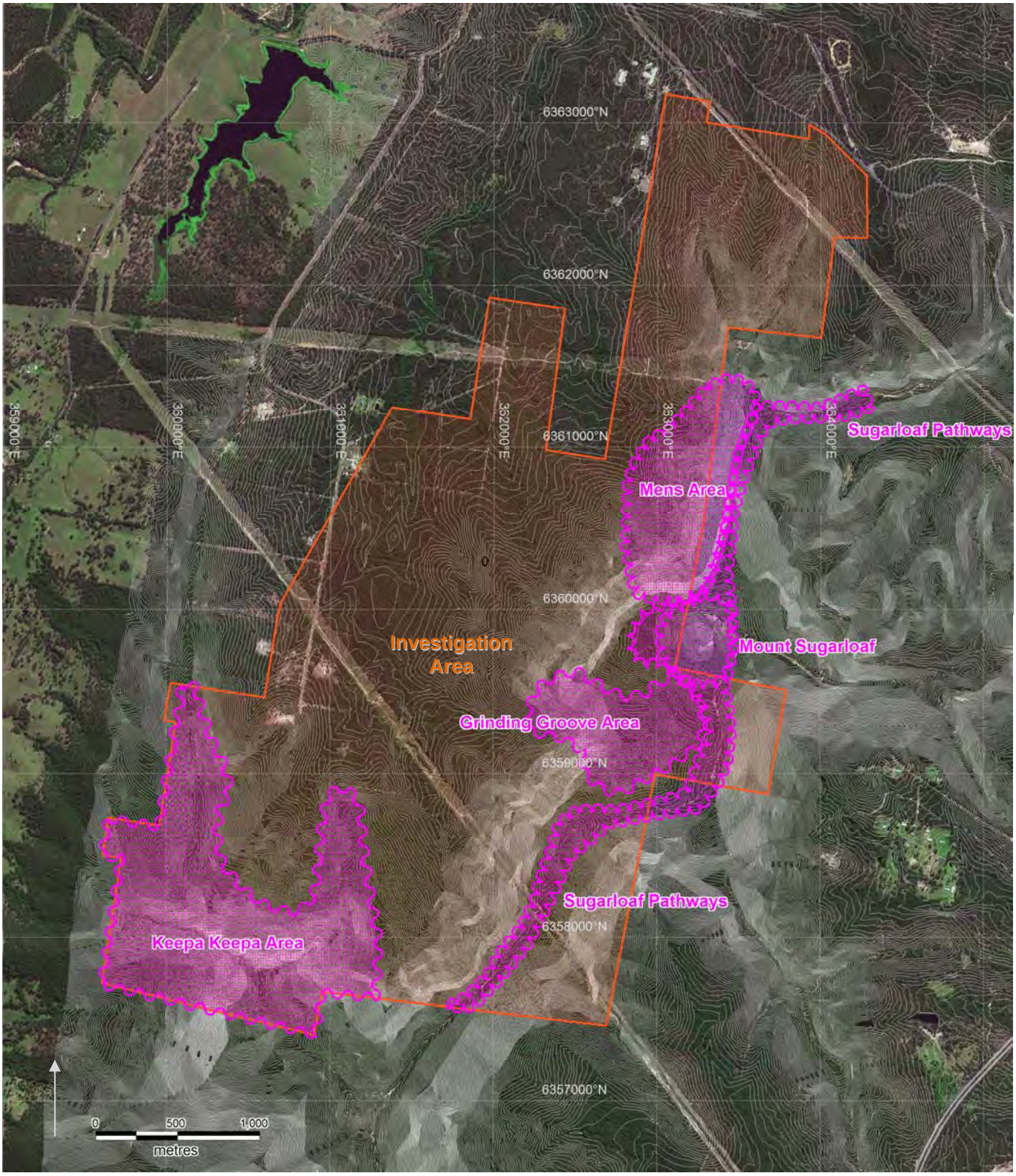


Figure 12: Approximate location of several areas of high Aboriginal cultural sensitivity within the investigation area (pink shading and orange shading) (aerial photograph and two metre contours courtesy Resource Strategies; 1000 metre MGA grid; investigation area border - orange).

5.2 Aboriginal Heritage Evidence

5.2.0 Overview

The conduct of the present survey has resulted in a substantial increase in the known heritage resource within the Tasman Extension investigation area. Prior to this comprehensive survey, approximately 22 Aboriginal sites were listed on the OEH AHIMS within this area[9] (refer to Section 3.1 and Figure 5).

The present survey has resulted in the identification of another 54 Aboriginal heritage sites, as summarised below, along with an additional 26 rock shelters with PADs[10]:

- 37 open artefact sites[11];
- 16 open grinding groove sites;
- 26 rock shelters with PADs; and
- One open grinding groove and open artefact site.

In addition, during the course of the present survey, 11 of the previously recorded sites within the investigation area were relocated and re-recorded (refer to Table 4). In most situations, the grid references and descriptions of these sites were revised (updated mapping of all site locations within the investigation area is presented in Figure 11).

During the course of the present survey, nine of the previously recorded sites within the investigation area could not be relocated, either due to property access restrictions (four sites) or an inability to relocate the evidence (four sites) or the site being located marginally outside of the investigation area (one site). Inaccuracies in previous grid reference reporting and changing conditions of vegetation and surface visibility may have contributed to this result.

Hence, a total of 74 sites and 26 rock shelters with PADs are known to occur directly within or immediately adjacent to the Tasman Extension investigation area, comprising:

- 38 open artefact sites;
- 35 open grinding groove sites;
- 26 rock shelters with PADs; and
- One open grinding groove and open artefact site.

Of the sites identified during the present investigation, 15 are located marginally outside of the investigation area boundary, although several occur under an area of currently proposed mine workings. Two of the previously recorded sites are also located marginally outside of the investigation area boundary. Excluding those sites immediately adjacent to the investigation area, a total of 65 sites and 18 rock shelters with PADs occur directly within the investigation area, including:

[9] Albeit subsequent examination of the site record for #38-4-0001 indicates that it is probably located 500 metres outside of the investigation area.

[10] Rock shelters with PADs are not technically "Aboriginal objects" as defined under the NPW Act;

[11] For the purposes of this assessment, "artefact scatters" and "isolated finds" are typically assessed together in recognition that the occurrence of a single artefact often represents the only visible portion of a larger artefact resource within a broader site/survey area.

- 31 open artefact sites;
- 33 open grinding groove sites;
- 18 rock shelters with PADs; and
- One open grinding groove and open artefact site.

Full descriptions of the previously recorded sites are presented in Appendix 2. Where these sites were relocated and re-recorded, updated descriptions are also presented in Appendix 4. Full descriptions of all newly identified sites recorded during the current survey are presented in Appendix 4.

For the purposes of the significance assessment and impact assessment (refer to Sections 7 and 9), all sites directly within or immediately adjacent to the Tasman Extension investigation area (as listed in Table 4) have been subject to consideration.

All of the recorded Aboriginal sites are currently listed or in the process of being listed on the OEH AHIMS register. By virtue of their listing on the OEH AHIMS register, all Aboriginal sites within the Lake Macquarie local government area are also listed on the *Lake Macquarie Local Environmental Plan 2004*. No Aboriginal heritage sites within the investigation area are listed on any other heritage registers or planning instruments (refer to Section 3.1).

While the above discussion focuses on Aboriginal objects and physical evidence of Aboriginal occupation, significant and widespread traditional, historical and contemporary cultural values and associations with the investigation area have been identified by the registered Aboriginal parties (and are also known through ethnohistorical evidence - refer to Section 3.3.8).

The associations and cultural values identified by the registered parties and/or through ethnohistorical evidence are outlined in Section 5.2.4 (refer also to Figure 12), and include:

- The entire Mount Sugarloaf area (including the investigation area) being a cultural landscape of high traditional, historical and contemporary cultural significance to the Aboriginal community;
- The Men's Area in the north-east of the investigation area and extending into the existing Tasman Mine, associated with male initiation ceremonies and protected by significant naturally formed keeper warrior sandstone formations and with a large centrally located phallic sandstone pillar;
- The Keepa Keepa Pathways Area in the south-west of the investigation area, comprising the southern access route from the Central Lowlands to Sugarloaf Ridge and the Watagan Mountains and Mount Vincent (also an area of high cultural significance);
- The Grinding Groove Area in the central-eastern portion of the investigation area, with strong associations with men's business, maintenances of hatchets and axes, preparation of medicine and other uses;
- Other pathways from Mount Sugarloaf, including to the north-east of the investigation area, linking with the Black Hill Spur and Hexham Swamp (Kuskie and Kamminga 2000, Kuskie 2006, Umwelt 2005a) and along Sugarloaf Ridge to the south;
- The association of Mount Sugarloaf with the supreme being 'Koe-in' (Threlkeld in Gunson 1974);

- The presence of the supernatural spirit being 'Puttikan', which inhabited the Sugarloaf area (Threlkeld in Gunson 1974);
- The use of a cave on the side of Mount Sugarloaf for the burial of important people and some small children (Threlkeld in Gunson 1974);
- The important connection, or 'heirophany', Mount Sugarloaf represents between the secular and the sky-world, for example for the ascension of people to the sky-world after death (*cf*. Threlkeld in Gunson 1974, Boot 2002, Knight 2001);
- The presence of quartz in the investigation area, and its associations with the clever man (karadji man);
- In general terms, the use of subsistence and other resources from within the investigation area;
- In general terms, the traditional use of the area by Awabakal and Wonnarua people, and an ongoing cultural and spiritual connection to the land by the descendants of these people; and
- In relation to the Aboriginal objects identified within the investigation area (for example, stone artefact sites, grinding grooves and rock shelters), the contemporary significance of these to the Aboriginal community, as they represent a tangible link with the traditional past and with the lifestyle and values of community ancestors.

Information pertaining to certain cultural values and places (for example, the men's area) are subject to gender restrictions, and registered parties have requested that this information (including photographs and specific locations) is not made available to women or the general public. Registered parties have also requested that other information pertaining to certain cultural values and places, due to their secret/sacred nature, are not divulged to other persons or the general public.

This report seeks to respect the confidential nature of the information disclosed by the Aboriginal informants and to respect the special significance of these values to the Aboriginal community, while balancing the needs to assess the potential impacts of the Project on these values and ensure that management measures are implemented to ensure that these values/places of high significance are not adversely affected. Hence, photographs, locations and detailed information of sensitive areas/features have been excluded from this report.

The possibility cannot be excluded that further Aboriginal values or associations may exist with the locality of the investigation area that were not divulged to South East Archaeology by the persons consulted.

Table 4: Summary of Aboriginal sites located within or immediately adjacent to the Tasman Extension investigation area.

Site Name	Survey Area	OEH AHIMS #	Site Type	MGA Grid Reference Eastings	MGA Grid Reference Northings	Date Recorded	Recorder	Comments
Mt Sugarloaf (38-4-0440)	86	38-4-0440	Open grinding groove	362862	6359147	2011	SEA	Originally recorded by Bluff, 1997. Grid references updated here.
Mt Sugarloaf (38-4-0443)	85	38-4-0443	Open grinding groove	363025	6359489	1997	Bluff	Originally recorded by Bluff, 1997. Not relocated during current survey. Grid reference accuracy uncertain, possibly 35 metres west of reported location.
Mt Sugarloaf (38-4-0444)	86	38-4-0444	Open grinding groove	363006	6359236	2011	SEA	Originally recorded by Bluff, 1997. Grid references updated here.
Mt Sugarloaf (38-4-0445)	86	38-4-0445	Open grinding groove	362899	6359189	2011	SEA	Originally recorded by Bluff, 1997. Grid references updated here.
Mt Sugarloaf (38-4-0446)	92	38-4-0446	Open grinding groove	362720	6359160	2011	SEA	Originally recorded by Bluff, 1997. Grid references updated here.
Mt Sugarloaf (38-4-0447)	92	38-4-0447	Open grinding groove	362609	6359202	2011	SEA	Originally recorded by Bluff, 1997. Grid references updated here.
Mt Sugarloaf (38-4-0448)	86	38-4-0448	Open grinding groove	362849	6359087	2011	SEA	Originally recorded by Bluff, 1997. Grid references updated here.
Mt Sugarloaf (38-4-0449)	86	38-4-0449	Open grinding groove	362888	6359078	2011	SEA	Originally recorded by Bluff, 1997. Grid references updated here.
Mt Sugarloaf (38-4-0450)	188	38-4-0450	Open grinding groove	362305	6358089	1997	Bluff	Originally recorded by Bluff, 1997. Not relocated during current survey. Grid reference accuracy uncertain, may be located at least 200 metres south-east of this grid reference.
Heaton State Forest (38-4-0457)	108	38-4-0457	Open grinding groove	361445	6357899	1997	Bluff	Originally recorded by Bluff, 1997. Not relocated during current survey. Grid reference accuracy uncertain.
Heaton State Forest (38-4-0486)	86	38-4-0486	Open grinding groove	362977	6359383	2011	SEA	Originally recorded by Bluff, 1998. Grid references updated here.
Heaton State Forest (38-4-0487)	86	38-4-0487	Open grinding groove	362975	6359459	1998	Bluff	Originally recorded by Bluff, 1998. Not relocated during current survey. Grid reference accuracy uncertain.
Heaton State Forest (38-4-0488)	86	38-4-0488	Open grinding groove	362985	6359406	2011	SEA	Originally recorded by Bluff, 1998. Grid references updated here.
Sugarloaf Range 1 (38-4-0610)	155	38-4-0610	Open grinding groove	360803	6357686	2011	SEA	Originally recorded by Bluff, 2000. Grid references updated here. Site type 'grinding grooves' not 'artefacts' as reported on AHIMS.
Mt Sugarloaf (38-4-0618)	-	38-4-0618	Open grinding groove	360765	6359749	2000	Bluff	Originally recorded by Bluff, 2000. Not reinspected during present survey due to property access restrictions.
Mt Sugarloaf (38-4-0619)	-	38-4-0619	Open grinding groove	360655	6359629	2000	Bluff	Originally recorded by Bluff, 2000. Not reinspected during present survey due to property access restrictions.

Site Name	Survey Area	OEH AHIMS #	Site Type	MGA Grid Reference Eastings	MGA Grid Reference Northings	Date Recorded	Recorder	Comments
Mt Sugarloaf (38-4-0623)	-	38-4-0623	Open grinding groove	360725	6359699	2000	Bluff	Originally recorded by Bluff, 2000. Not reinspected during present survey due to property access restrictions.
Mt Sugarloaf 2 (38-4-0624)	-	38-4-0624	Open grinding groove	360695	6359679	2000	Bluff	Originally recorded by Bluff, 2000. Not reinspected during present survey due to property access restrictions.
Heaton SF (38-4-0869)	-	38-4-0869	Open grinding groove	361143	6357474	2011	SEA	Originally recorded by Bluff, 2000. Grid references updated here. Outside investigation area.
Wallis Creek 1 (38-4-0975)	-	38-4-0975	Open artefact site	362729	6361454	2004	ERM	Originally recorded by Davies of ERM, 2004. Not reinspected during present survey as outside investigation area by 35 metres.
Tasman Extension 1/A	1	38-4-1386	Open artefact site	363395	6363025	2011	SEA	35 metres outside investigation area
Tasman Extension 1/B	1	38-4-1387	Open artefact site	363529	6362864	2011	SEA	
Tasman Extension 10/A	10	38-4-1388	Open artefact site	363472	6362509	2011	SEA	
Tasman Extension 29/A	29		Open artefact site	363324	6361824	2011	SEA	
Tasman Extension 32/A	32	38-4-1390	Open grinding groove	363165	6361691	2011	SEA	
Tasman Extension 34/A	34	38-4-1391	Open artefact site	362916	6361861	2011	SEA	
Tasman Extension 39/A	39	38-4-1392	Rockshelter with PAD	363211	6361246	2011	SEA	
Tasman Extension 41/A	41	38-4-1393	Open grinding groove	363034	6361176	2011	SEA	
Tasman Extension 45/A	45	38-4-1394	Open grinding groove	363308	6360957	2011	SEA	
Tasman Extension 46/A	-	38-4-1395	Rockshelter with PAD	363366	6360845	2011	SEA	40-80 metres outside investigation area but under current proposed mine workings
Tasman Extension 46/B	-	38-4-1396	Rockshelter with PAD	363372	6360844	2011	SEA	40-80 metres outside investigation area but under current proposed mine workings
Tasman Extension 46/C	-	38-4-1397	Rockshelter with PAD	363377	6360851	2011	SEA	40-80 metres outside investigation area but under current proposed mine workings
Tasman Extension 46/D	-	38-4-1398	Rockshelter with PAD	363405	6360851	2011	SEA	40-80 metres outside investigation area but under current proposed mine workings
Tasman Extension 50/A	50	38-4-1399	Open artefact site	362415	6361701	2011	SEA	
Tasman Extension 51/A	51	38-4-1400	Open artefact site	361975	6361038	2011	SEA	
Tasman Extension 53/A	53	38-4-1401	Open artefact site	361260	6360803	2011	SEA	
Tasman Extension 53/B	53	38-4-1402	Open artefact site	361402	6360782	2011	SEA	
Tasman Extension 56/A	56	38-4-1403	Open artefact site	361918	6360705	2011	SEA	
Tasman Extension 56/B	56	38-4-1404	Open artefact site	361596	6360752	2011	SEA	
Tasman Extension 57/A	57	38-4-1405	Open grinding groove	362663	6360550	2011	SEA	
Tasman Extension 57/B	57	38-4-1406	Open grinding groove	362562	6360628	2011	SEA	
Tasman Extension 64/A	64	38-4-1407	Rockshelter with PAD	363105	6360333	2011	SEA	
Tasman Extension 64/B	64	38-4-1408	Rockshelter with PAD	362860	6360279	2011	SEA	
Tasman Extension 64/C	64		Rockshelter with PAD	363245	6360677	2011	SEA	
Tasman Extension 64/D	64	38-4-1410	Rockshelter with PAD	363212	6360571	2011	SEA	
Tasman Extension 67/A	67	38-4-1411	Open grinding groove	362331	6359973	2011	SEA	
Tasman Extension 67/B	67	38-4-1412	Open grinding groove	362303	6360063	2011	SEA	
Tasman Extension 71/A	71	38-4-1413	Open grinding groove	362133	6359830	2011	SEA	
Tasman Extension 77/A	77	38-4-1414	Rockshelter with PAD	362524	6359657	2011	SEA	
Tasman Extension 77/B	77	38-4-1415	Rockshelter with PAD	362593	6359662	2011	SEA	
Tasman Extension 77/C	77	38-4-1416	Rockshelter with PAD	362667	6359764	2011	SEA	

Site Name	Survey Area	OEH AHIMS #	Site Type	MGA Grid Reference Eastings	MGA Grid Reference Northings	Date Recorded	Recorder	Comments
Tasman Extension 79/A	79	38-4-1417	Open grinding groove	362675	6359376	2011	SEA	
Tasman Extension 79/B	79	38-4-1418	Open artefact site	362685	6359382	2011	SEA	
Tasman Extension 79/C	79	38-4-1419	Rockshelter with PAD	362683	6359343	2011	SEA	
Tasman Extension 79/D	79	38-4-1420	Rockshelter with PAD	362667	6359361	2011	SEA	
Tasman Extension 80/A	80	38-4-1421	Open artefact site	363024	6359742	2011	SEA	
Tasman Extension 80/B	-	38-4-1422	Open artefact site	363236	6359651	2011	SEA	c.25 metres outside investigation area
Tasman Extension 80/C	-	38-4-1423	Open artefact site	363516	6359765	2011	SEA	outside investigation area
Tasman Extension 84/A	84	38-4-1424	Open artefact site	363374	6359433	2011	SEA	
Tasman Extension 85/A	-	38-4-1425	Open artefact site	363360	6358775	2011	SEA	outside investigation area
Tasman Extension 86/A	86	38-4-1426	Open grinding groove	362980	6359311	2011	SEA	
Tasman Extension 86/B	86	38-4-1427	Open grinding groove	362961	6359249	2011	SEA	
Tasman Extension 86/C	86	38-4-1428	Open grinding groove	363189	6359216	2011	SEA	
Tasman Extension 86/D	86	38-4-1429	Open grinding groove	362937	6359054	2011	SEA	
Tasman Extension 88/A	88	38-4-1430	Open grinding groove	362244	6359305	2011	SEA	
Tasman Extension 92/A	92	38-4-1431	Open grinding groove and open artefact site	362665	6359180	2011	SEA	
Tasman Extension 92/B	92	38-4-1432	Rockshelter with PAD	362807	6359130	2011	SEA	
Tasman Extension 96/A	96	38-4-1433	Rockshelter with PAD	362329	6358806	2011	SEA	
Tasman Extension 96/B	96	38-4-1434	Rockshelter with PAD	362303	6358796	2011	SEA	
Tasman Extension 96/C	96	38-4-1435	Rockshelter with PAD	362287	6358743	2011	SEA	
Tasman Extension 104/A	104	38-4-1436	Rockshelter with PAD	362151	6358448	2011	SEA	
Tasman Extension 104/B	104	38-4-1437	Rockshelter with PAD	362176	6358488	2011	SEA	
Tasman Extension 104/C	104	38-4-1438	Rockshelter with PAD	362209	6358690	2011	SEA	
Tasman Extension 107/A	107	38-4-1439	Open artefact site	361718	6358921	2011	SEA	
Tasman Extension 124/A	124	38-4-1440	Open artefact site	361285	6359435	2011	SEA	
Tasman Extension 126/A	126	38-4-1441	Open artefact site	360959	6359845	2011	SEA	
Tasman Extension 126/B	126	38-4-1442	Open artefact site	361114	6359646	2011	SEA	
Tasman Extension 126/C	126	38-4-1443	Open artefact site	361192	6359529	2011	SEA	
Tasman Extension 135/A	135	38-4-1444	Open artefact site	360148	6358428	2011	SEA	
Tasman Extension 135/B	135	38-4-1445	Open artefact site	360208	6358669	2011	SEA	
Tasman Extension 135/C	135	38-4-1446	Open artefact site	360203	6358757	2011	SEA	
Tasman Extension 135/D	135	38-4-1447	Open artefact site	360205	6358813	2011	SEA	
Tasman Extension 152/A	-	38-4-1448	Rockshelter with PAD	360554	6357465	2011	SEA	c.20 metres outside investigation area
Tasman Extension 152/B	-	38-4-1449	Rockshelter with PAD	360521	6357421	2011	SEA	c.70 metres outside investigation area
Tasman Extension 153/A	153	38-4-1450	Open artefact site	360621	6357539	2011	SEA	
Tasman Extension 154/A	-	38-4-1451	Open grinding groove	360995	6357422	2011	SEA	outside investigation area
Tasman Extension 154/B	-	38-4-1452	Open artefact site	361022	6357171	2011	SEA	outside investigation area
Tasman Extension 154/C	-	38-4-1453	Open artefact site	360826	6357349	2011	SEA	outside investigation area
Tasman Extension 155/A	-	38-4-1454	Rockshelter with PAD	361172	6357492	2011	SEA	outside investigation area
Tasman Extension 157/A	157	38-4-1455	Open artefact site	360581	6357706	2011	SEA	
Tasman Extension 176/A	176	38-4-1456	Open grinding groove	361700	6358302	2011	SEA	
Tasman Extension 178/A	-	38-4-1457	Rockshelter with PAD	361377	6357423	2011	SEA	outside investigation area
Tasman Extension 181/A	181	38-4-1458	Open artefact site	362283	6358198	2011	SEA	
Tasman Extension 181/B	181	38-4-1459	Open artefact site	362054	6357857	2011	SEA	
Tasman Extension 181/C	181	38-4-1460	Open artefact site	362116	6357951	2011	SEA	
Tasman Extension 182/A	182	38-4-1461	Open artefact site	362265	6358449	2011	SEA	
Tasman Extension 182/B	182	38-4-1462	Open artefact site	362203	6358308	2011	SEA	
Tasman Extension 188/A	188	38-4-1463	Open artefact site	362394	6358025	2011	SEA	
Tasman Extension 199/A	199	38-4-1464	Open artefact site	362577	6357734	2011	SEA	
Tasman Extension 200/A	200	38-4-1465	Rockshelter with PAD	362476	6357815	2011	SEA	

Includes all sites in the investigation area, OEH sites within up to c.100 metres outside of the investigation area and several new sites marginally outside of the investigation area;

Site #38-4-0001 is probably located around MGA reference 361500:6375000, 500 metres outside of the investigation area, according to the description and latitude/longitude on the site record, contrary to the OEH provided grid reference which places it within the investigation area. It is excluded from the above table.

5.2.1 Open Artefact Sites

A total of 38 open artefact sites are known to occur directly within or immediately adjacent to the Tasman Extension investigation area, along with an additional open grinding groove and artefact site (Table 5). One previously recorded site was not reinspected as it is located marginally outside of the investigation area.

Almost all of these sites were identified in exposures created by ground disturbance, such as vehicle tracks and powerline easements (Figure 11). Twenty of the sites occur on simple slopes, 12 on ridge crests, five on flats and two on drainage depressions.

Eighteen of the open artefact sites comprise a single recorded artefact. Typically "isolated finds" or "isolated artefacts" represent the only visible evidence of larger artefact scatters, in which low conditions of visibility have prevented the detection of further items. The terms "isolated artefact" and "artefact scatter" have been used interchangeably in previous studies. The term "open artefact site" encompasses those spatially discrete locations of visible artefact evidence in open contexts, that have been or can be referred to as "isolated artefacts" or "artefact scatters".

Seventeen of the open artefact sites contain between two and ten artefacts, and only three sites contain greater than ten artefacts, TE135/A with 19 artefacts, TE85/A with 24 artefacts and TE157/A with 43 artefacts.

The identified artefacts probably only represent a small fraction of the entire artefact resource that is present within the investigation area, because the vast majority of evidence is likely to be currently obscured by vegetation and soil. Substantial portions of the investigation area were not directly sampled for artefacts, and where the sample was obtained, conditions of surface visibility were typically low (mean archaeological visibility across the entire survey sample was 6.6%). The survey sample has, however, served to refine the predictive model with respect to artefact distribution (refer to Section 5.3.6).

During the present survey, a total of 174 stone artefacts were recorded in detail (refer to Table 8).

5.2.2 Open Grinding Groove Sites

A total of 36 open grinding groove sites occur within or immediately adjacent to the Tasman Extension investigation area (including one site with associated stone artefacts; refer to Table 6). Four previously recorded grinding groove sites could not be reinspected due to property access restrictions and four previously recorded sites could not be relocated.

A total of 385 grooves were recorded at the sites during the current survey. Only three of the 28 grinding groove sites recorded during the current survey comprise single grooves, 14 sites comprise between 2 and 10 grooves, six sites comprise between 11 and 20 grooves, and five sites host over 20 grooves. The largest site, #38-4-440, hosts 92 grooves, with TE 92/A and #38-4-447 each having 35 grooves, #38-4-445 28 grooves and #38-4-446 22 grooves. All of these sites are located in the Grinding Groove Area in the central-eastern portion of the investigation area, which is of high cultural value to the Aboriginal community (refer to Section 5.2.4). Eighteen recorded open grinding groove sites are clustered in this area, on first and second order unnamed headwater tributaries (Figure 11). Three rock shelters are also present. The locality comprises the upper slopes of Sugarloaf Range, on the western side of the crest, and is situated directly south of Mount Sugarloaf.

The grooves are typically narrow, elongated and u-shaped, the result of shaping and sharpening of ground-edge hatchets and/or axes. Several grooves comprise broader, shallow bowls that may have been used for seed-grinding or other purposes, such as the preparation of medicine or processing of animal foods or ochre. Recently developed residue and use-wear analysis techniques (Stephenson 2011) may enable resolution of this issue. Other naturally formed holes occur in the sandstone rock formations and the possible use of these by Aboriginal people, for example for heating water, cannot be discounted.

Thirty-one of the grinding groove sites occur on drainage depressions and five on simple slopes. All of the sites are located on the western fall of Sugarloaf Range, typically in the headwaters or moderate to steep side-slopes of the range. However, four previously recorded sites occur on drainage depressions lower down (in the Central Lowlands portion of the investigation area) in the area in which property access was restricted. There is a high potential for further grinding groove sites to occur along the drainage lines in this area.

Table 5: Summary of open artefact sites recorded during the present survey.

Site Name	Landform Element	Slope	Distance to Water	Vegetation	Land Surface	Exposure Type	Ground Disturbance	Visible Extent of Surface Exposures: Length (m)	Visible Extent of Surface Exposures: Width (m)	Visible Extent of Evidence: Length (m)	Visible Extent of Evidence: Width (m)	Visible Locus Area (m^2)	Mean Surface Visibility of Locus (%)	Mean Archaeological Visibility of Locus (%)	Effective Locus Area (m^2)	# of Artefacts	# of Artefacts/m^2 of Effective Locus Area	Sub-Surface Deposit	Comments
TE1/A	simple	gentle	>50	1	5	A	high	varies	varies	15	5	75	60	60	45	3	0.067	unlikely	transmission line access track
TE1/B	simple	gentle	>50	1	5	A	mod	varies	varies	17	3	51	60	60	30.6	3	0.098	unlikely	access track for transmission line easement
TE10/A	drainage depression	gentle	<50	1	5	A	mod	1	1	1	1	1	90	90	0.9	1	1.111	unlikely	access track
TE29/A	simple	steep	>50	2	4	A	low	1	1	1	1	1	10	10	0.1	1	10	unlikely	
TE34/A	simple slope	level - very gentle	>50	2	4	A	high	varies	varies	1	1	1	90	20	0.2	1	5	possible	site located on access track; exposure of artefact likely caused by recent grading of road
TE50/A	simple slope	level - very gentle	>50	2	4	A	high	varies	varies	16	4	64	80	80	51.4	3	0.058	possible	found on access track
TE51/A	flat	level - very gentle	>50	2	4	A	mod	varies	varies	15	3	45	90	30	13.5	5	0.37	unlikely	access track
TE53/A	simple slope	level - very gentle	>50	2	4	A	mod	5	2	5	2	10	75	75	7.5	8	1.067	unlikely	access track
TE53/B	simple slope	level - very gentle	>50	2	4	A	mod	2	1	1	1	1	60	60	0.6	1	1.667	unlikely	access track
TE56/A	simple slope	level - very gentle	>50	2	4	A	mod	varies	varies	1	1	1	90	30	0.3	1	3.333	unlikely	access track
TE56/B	simple slope	level - very gentle	>50	2	4	A	mod	2	1	2	1	2	75	75	1.5	2	1.333	unlikely	access track
TE79/B	simple	steep	<50	2	4	A	low	varies	varies	1	1	1	20	20	0.2	1	5	unlikely	
TE80/A	simple	gentle	>50	2	4	A	mod	2	2	1	1	1	80	80	0.8	1	1.25	unlikely	located on walking track
TE80/B	simple	gentle	>50	2	4	A	mod	2	1	1	1	1	80	80	0.8	1	1.25	unlikely	located on walking track
TE80/C	simple slope	gentle	>50	1	5	A	high	varies	varies	1	1	1	90	30	0.3	1	3.333	unlikely	acces track; site located outside study area (Sugarloaf Range Road)
TE84/A	ridge crest	moderate	>50	2	4	A	low	2	2	2	2	4	70	70	2.8	5	1.786	unlikely	located on drainage scarp
TE85/A	simple	gentle	>50	1	5	A	high	25	15	6	3	18	50	50	9	24	2.667	unlikely	located on access track
TE92/A	drainage depression	moderate	<50	2	4	A	mod	varies	varies	1	1	1	100	100	1.0	1	1	unlikely	located among sandstone boulders on grinding groove platform, 10m from groove complex; recorded as grinding groove and open artefact site
TE107/A	simple slope	gentle	>50	1	5	A	high	1	1	1	1	1	10	10	0.1	1	10	unlikely	located under transmission line on unused walking track
TE124/A	flat	level - very gentle	<50	1	5	A	high	varies	varies	110	10	1100	30	30	330	6	0.018	possible	transmission line

Site Name	Landform Element	Slope	Distance to Water	Vegetation	Land Surface	Exposure Type	Ground Disturbance	Visible Extent of Surface Exposures: Length (m)	Visible Extent of Surface Exposures: Width (m)	Visible Extent of Evidence: Length (m)	Visible Extent of Evidence: Width (m)	Visible Locus Area (m²)	Mean Surface Visibility of Locus (%)	Mean Archaeological Visibility of Locus (%)	Effective Locus Area (m²)	# of Artefacts	# of Artefacts/m² of Effective Locus Area	Sub-Surface Deposit	Comments
TE126/A	flat	level - very gentle	>50	1	5	A	high	varies	varies	100	30	3000	40	10	300	5	0.017	unlikely	within powerline easement
TE126/B	flat	level - very gentle	>50	1	5	A	high	varies	varies	40	5	200	40	10	20	2	0.1	possible	transmission line
TE126/C	flat	level - very gentle	>50	1	5	A	high	varies	varies	4	2	8	80	30	2.4	2	0.833	possible	transmission line
TE135/A	ridge crest	level - very gentle	<50	1, 2	5	A	mod	varies	varies	10	4	40	70	20	8	19	2.375	possible	drill pad/ access track
TE135/B	ridge crest	level - very gentle	<50	1, 2	5	A	mod	varies	varies	1	1	1	70	20	0.2	1	5	unlikely	access track
TE135/C	ridge crest	level - very gentle	<50	1, 2	5	A	mod	varies	varies	1	1	1	70	20	0.2	1	5	unlikely	access track
TE135/D	ridge crest	level - very gentle	<50	1, 2	5	A	mod	varies	varies	1	1	1	70	20	0.2	1	5	unlikely	access track
TE153/A	simple	gentle	>50	2	4	A	high	1	1	1	1	1	80	80	0.8	1	1.25	unlikely	recent engravings on nearby outcrop
TE154/B	ridge crest	gentle	>50	1	5	A	high	varies	varies	30	30	900	80	30	270	10	0.037	unlikely	access track; site located outside study area
TE154/C	ridge crest	gentle	>50	1	5	A	high	varies	varies	10	3	30	80	30	9	3	0.333	unlikely	access track; site located outside study area
TE157/A	ridge crest	level - very gentle	>50	1	4, 5	A	mod	varies	varies	180	5	900	90	40	360	43	0.119	possible	access track; 360549:6357784 to 360584:6357627
TE181/A	ridge crest	gentle	>50	1	5	A	mod	60	15	60	15	900	80	40	360	6	0.017	unlikely	access track to power line easement
TE181/B	ridge crest	gentle	>50	1	5	A	mod	50+	4	1	1	1	80	20	0.2	1	5	unlikely	access track
TE181/C	ridge crest	gentle	>50	1	5	A	mod	varies	varies	4	2	8	90	20	1.6	2	1.25	unlikely	access track
TE182/A	simple	moderate	>50	1	5	A	mod	20	10	1	1	1	85	85	0.85	1	1.176	unlikely	
TE182/B	simple	moderate	>50	1	5	A	high	2	1	1	1	1	25	25	0.25	1	4	unlikely	transmission line access track
TE188/A	simple	moderate	>50	2	4	A	mod	5	5	2	2	4	70	30	1.2	2	1.667	unlikely	access track for transmission line easement
TE199/A	ridge crest	moderate	>50	1, 2	4, 5	A	high	4	2	4	2	8	95	95	7.6	3	0.395	unlikely	access track under transmission line

Vegetation - 1 = cleared/grass/crop; 2 = forest/bush/regrowth

Land Surface - 1 = sheet erosion; 2 = gully erosion; 3 = stream bank erosion; 4 = vegetated; 5 = modified

Table 6: Summary of open grinding groove sites recorded during the present survey.

Site Name	Extent of Exposed Rock (metres)	Extent of Grooves (metres)	Rock Type	Surface Condition	Disturbance	Type of Disturbance	# of Grooves	Comments
TE32/A	1.6x0.7	0.19x0.18	sandstone	stable	low		3	
	5x4	0.7x0.5	sandstone	stable	low		7	
	3.5x2.5	0.6x0.2	sandstone	stable	low		2	
TE41/A	4x3	0.5x0.5	sandstone	stable	low	weathering	1	
TE45/A	5x3	0.5x0.5	sandstone	stable	low		1	
TE57/A	8x3	2x2	sandstone	stable	low	weathering, vegetation	11	
TE57/B	4x3	1x1	sandstone	weathered	low	vegetation	17	
TE67/A	10x2	5x2	sandstone	weathered	low	weathering, vegetation	17	
TE67/B	1x1	1x1	sandstone	exfoliating, weathered	low		7	
TE71/A	2x2	2x2	sandstone	stable	low	erosion, weathering	2	
TE79/A	4x2	0.5x0.5	sandstone	stable	low	erosion	5	
TE86/A	15x6	0.7x0.5	sandstone	stable	low	erosion	6	
TE86/B	12x6	1.3x0.4	sandstone	stable	low	erosion	4	
TE86/C	3x2	0.4x0.3	sandstone	stable	low	erosion, weathering	2	
TE86/D	5x4	0.3x0.2	sandstone	stable	low	erosion, weathering	1	
TE88/A	2x0.7	0.8x0.3	sandstone	stable	low	weathering	4	sub-locus A
	1x0.7	0.5x0.3					2	sub-locus B
TE92/A	5x4	5x4	sandstone	stable	low	erosion, weathering	35	part of grinding groove and open artefact site
TE154/A	2x2	1x1	sandstone	weathered	low	weathering	4	located outside investigation area
TE176/A	20x4	2x2	sandstone	stable	low	erosion, weathering	6	
38-4-0440	5x4.5	5x1	sandstone	stable	low	erosion	18	probably more grooves beneath moss cover
	6x5	5x4	sandstone	stable	low	erosion	20	
	15x3	1x1	sandstone	stable	low	erosion	8	
	10x7	6x2	sandstone	stable	low	erosion	27	
	10x8	2x1	sandstone	stable	low	erosion	19	
38-4-0444	15x3	5x3	sandstone	stable	low	erosion, weathering	17	
38-4-0445	15x8	5x5	sandstone	stable	low	erosion	28	
38-4-0446	15x6	10x2	sandstone	stable	low	erosion, weathering	22	
38-4-0447	25x20	12x6	sandstone	stable	low	erosion, weathering	35	35 grooves in five sub-loci
38-4-0448	15x8	2x1	sandstone	stable	low	erosion, weathering	9	
38-4-0449	15x10	7x3	sandstone	stable	low	erosion, weathering	14	
38-4-0486	8x6	1x0.5	sandstone	stable	low	erosion	6	
38-4-0488	10x5	0.8x0.7	sandstone	stable	low	erosion	7	
38-4-0610	50x3	12x2	sandstone	weathered	low	weathering, vegetation	9	
38-4-0869	7x5	2x5	sandstone	weathered	low	weathering	9	located outside investigation area

5.2.3 Rock Shelters with Potential Archaeological Deposits

A total of 26 rock shelters with PADs are known to occur directly within or immediately adjacent to the Tasman Extension investigation area (Table 7). These are not technically "Aboriginal objects" as defined under the NPW Act, however excavation of any of these shelters may reveal stone artefacts and other cultural deposits (eg. charcoal from camp fires). One shelter, TE200/A, on the eastern fall of the Sugarloaf Range with an aspect over the Coastal Lowlands, may host highly weathered Aboriginal art, although this could not be conclusively determined during the survey.

It is also possible that human remains were interred or re-interred in any of these rock shelters. The use of a cave on the side of Mount Sugarloaf for the burial of important people and some small children was noted by Threlkeld (in Gunson 1974).

The research potential of these deposits can be assessed in relation to various criteria (refer to Section 7.2).

Some of the PADs recorded are very small, but the general threshold for inclusion was that there had to be sufficient room and shelter for at least one adult to sit and some deposit (ie. shelters with only bare rock floors and no deposit were not recorded, although it is highly probable such shelters would have been utilised by Aboriginal people on occasions).

The reasons for the absence of visible evidence in these shelters probably varies, but in many cases may relate to limited archaeological visibility. A number of shelters had a covering on the surface of recent sediment deposition, or for other reasons such as leaf litter, visibility was low. However, a genuine absence of occupation (specifically, the resulting evidence thereof) may also be the situation for several of the shelters. The use of Mount Sugarloaf for predominantly spiritual, rather than secular, activities may form part of the explanation. Nevertheless, test excavation would be required to identify whether evidence of occupation is present.

In terms of the shelter floor area, most of the shelters are relatively small (typically less than 50 m^2). Sites TE 64/C at approximately 91 m^2 and 46/B at 80 m^2 are the largest shelters. However, the floor in 46/B is sloping and only a shallow deposit may be present. These calculations refer to the gross floor area, not the *habitable floor area* where the roof is higher than one metre above the floor.

Most of the PADs have a potential depth of deposit of 0.4 metres or less (relatively shallow). This was estimated using a stake flag, a method that can be unreliable in compact soil (Kuskie, pers. obs.). Deeper deposits significantly enhance the potential for stratigraphy and identifying chronological changes in occupational evidence.

In general, the shelters tend to be small in size, have low roof heights, limited habitable floor areas, sloping floors and/or shallow potential deposits, which tends to limit their potential research value.

Table 7: Summary of rock shelters with potential archaeological deposits recorded during the present survey.

Site Name	Landform Element	Distance to Water (m)	Rock Material	Outcrop Type	Outcrop Form	Aspect	Erosion	Surface Condition	Soils	DisturbancetoDeposit	Causes of Disturbance	# of Artefacts	# of Grinding Grooves	Shelter Floor Area (m^2)	Potential Depth of PAD (mm)	Comments
TE39/A	drainage depression	<50	sandstone	rock shelter	boulder, outcrop		exfoliation	stable	silt, sand	low	erosion	0	0	35	400	extent of PAD 7x5m; shelter height 1.5m
TE46/A	simple slope	>50	sandstone	rock shelter	cliff		cavernous	stable	silt, sand	low	erosion	0	0	28	200	extent of PAD 7x4m; 4 adjacent shelters; this shelter 40m outside present study area
TE46/B	simple slope	>50	sandstone	rock shelter	scarp		cavernous	stable	silt, sand	low	erosion	0	0	80	200	extent of PAD 10x8m; 50m outside present study area
TE46/C	simple slope	>50	sandstone	rock shelter	scarp		cavernous	stable	silt, sand	low	erosion	0	0	30	500	extent of PAD 5x6m; about 50m outside study area
TE46/D	simple slope	>50	sandstone	rock shelter	scarp		cavernous	stable	silt, sand	low	erosion	0	0	42	400	extent of PAD 14x3m; about 80m outside study area
TE64/A	simple slope	>50	sandstone	rock shelter	scarp	north east	honeycomb	exfoliating, exposed/ weathered	silt, sand, gravel	low	erosion	0	0	20	15	floor area 4x5m, shelter height 1.2m
TE64/B	simple slope	>50	sandstone	rock shelter	scarp	north east	exfoliation	exfoliating	silt, sand, gravel	low	vegetation	0	0	6	10	floor area 2.2x2.6m, shelter height 1.1m
TE64/C	simple slope	>50	sandstone	rock shelter	cliff	south west	cavernous	stable	silt, sand	low	erosion	0	0	91	200	extent of PAD 13x7m
TE64/D	simple slope	>50	sandstone	rock shelter	cliff	south west	cavernous	stable	silt, sand	low	erosion	0	0	15	200	extent of PAD 3x5m
TE77/A	simple slope	>50	sandstone	rock shelter, overhang	cliff, scarp, boulder	north west	exfoliation, honeycomb	exfoliating	sand	low	erosion	0	0	6	200	extent of PAD 2.5x1.5
TE77/B	simple slope	>50	sandstone	rock shelter	cliff, scarp, boulder	north	exfoliation, honeycomb	stable	sand	low	erosion	0	0	12	150	extent of PAD 4.8x2
TE77/C	simple slope	>50	sandstone	rock shelter	cliff, scarp	north west	exfoliation	stable	sand	moderate	erosion	0	0	59	200	extent of PAD 8x3m
TE79/C	simple slope	>50	sandstone	over hang	cliff, scarp, boulder, outcrop	south west	exfoliation, cavernous, honeycomb	stable	silt, sand	low	erosion	0	0	0.5	200	extent of PAD 0.5x1m
TE79/D	simple slope	>50	sandstone	rock shelter	cliff, scarp, boulder, outcrop	south west	exfoliation, cavernous, honeycomb	stable	silt, sand	low	erosion	0	0	9	300	extent of PAD 6x1.5m
TE92/B	drainage depression	<50	sandstone	rock shelter	scarp	north	exfoliation, cavernous	stable	silt, sand	low	erosion	0	0	7	300	extent of PAD 3.7x1.8; rock shelter dimensions 3.7x2x1m

Site Name	Landform Element	Distance to Water (m)	Rock Material	Outcrop Type	Outcrop Form	Aspect	Erosion	Surface Condition	Soils	DisturbancetoDeposit	Causes of Disturbance	# of Artefacts	# of Grinding Grooves	Shelter Floor Area (m^2)	Potential Depth of PAD (mm)	Comments
TE96/A	simple slope	<50	sandstone	rock shelter	scarp, boulder, outcrop	south west	exfoliation, cavernous	stable	silt, sand	low	erosion	0	0	12	500	extent of PAD 4x3; nearby shelters up cliff wall inaccessible
TE96/B	simple slope	>50	sandstone	rock shelter	scarp, boulder	west	exfoliation, cavernous, honeycomb	stable	silt, sand	low	erosion	0	0	(a)30; (b)6.3	150	extensive build up of eroded sandstone; (a) & (b) adjoining rockshelters
TE96/C	simple slope	>50	sandstone	rock shelter	scarp	west	exfoliation, cavernous, honeycomb	stable	silt, sand	low	erosion	0	0	20	700	PAD dimensions 5x4m
TE104/A	simple slope	>50	sandstone	rock shelter	cliff, scarp, boulder, outcrop	north west	exfoliation, cavernous, honeycomb	stable	silt, sand	low	erosion	0	0	10	500	extent of PAD 4x2.5m
TE104/B	simple slope	>50	sandstone	rock shelter	cliff, boulder, outcrop	north west	exfoliation, cavernous	stable	silt, sand	low	erosion	0	0	6	400	extent of PAD 4x1.5m
TE104/C	simple slope	>50	sandstone	rock shelter	cliff, scarp, boulder, outcrop	north west	exfoliation, cavernous	stable	silt, sand	low	erosion	0	0	20	300	extent of PAD 5x4m
TE152/A	simple slope	>50	sandstone	rock shelter	scarp, boulder, outcrop	west	exfoliation, cavernous, honeycomb	stable	silt, sand	low	erosion	0	0	11	50	extent of PAD 4.4x2.5m
TE152/B	simple slope	>50	sandstone	rock shelter	scarp, boulder, outcrop	west	exfoliation, cavernous, honeycomb	stable	silt, sand	low	erosion	0	0	12	400	extent of PAD 4x3m; goat seats and human footprints
TE155/A	simple slope	>50	sandstone	rock shelter	scarp	north	exfoliation	exfoliating, exposed/ weathered	silt, sand	low	vegetation	0	0	8	100	grinding groove site located 20m to west; within drainage line; located outside study area
TE178/A	simple slope	>50	sandstone	rock shelter	scarp, boulder	west	exfoliation, cavernous, honeycomb	stable	silt, sand	low	erosion	0	0	35	400	extent of PAD 7x5m
TE200/A	ridge crest	<50	sandstone	rock shelter	cliff, boulder, outcrop	east	exfoliation	stable	sand	low	erosion	0	0	55	400	extent of PAD 11X2; engravings likely date to the transmission line construction; dark staining, perhaps Aboriginal art

5.2.4 Cultural Values

Significant and widespread traditional, historical and contemporary cultural values and associations with the investigation area have been identified by the registered Aboriginal parties (and are also known through ethnohistorical evidence - refer to Section 3.3.8). Some of these relate to physical objects, including items that qualify as *Aboriginal objects* as defined under the *National Parks and Wildlife Act 1974*. However, many relate to intangible values, associations or landscape features that do not qualify as *Aboriginal objects.*

These associations and cultural values are discussed below. However, it is noted that certain places and values are the subject of gender restrictions and/or are of a secret/sacred nature. Consistent with the requests of the Aboriginal informants, photographs, locations and detailed information of sensitive areas/features have been excluded from this report.

The possibility cannot be excluded that other Aboriginal values or associations to those described below may exist with the locality of the investigation area, and were not divulged to South East Archaeology by the persons consulted.

Tasman Extension Investigation Area:

The entire Mount Sugarloaf area (including the investigation area) is a cultural landscape that is of high traditional, historical and contemporary cultural significance to the Aboriginal community. Specific connections with particular places or values are outlined below. However, it is the inter-relationship of these places and values and their context that combine to create a cultural landscape of significance. As such, any assessment of significance warrants a more holistic approach than can be provided by focusing on individual sites or values, without consideration of their overall context (refer to Section 7).

It is noted that the cultural landscape extends well beyond the investigation area (for example, refer to Umwelt 2010). However, this report focuses on the Project investigation area due to the nature of the objectives of the assessment.

Men's Area:

The Men's Area in the north-east of the investigation area and extending into the existing Tasman Mine, is associated with male initiation ceremonies. The area is located north of Mount Sugarloaf and contains a section of cliffline along the upper slopes of the range, which host a number of identified rock shelters (Figure 12). It is protected by significant naturally formed keeper warrior sandstone formations located at the north and south sections. It also hosts a large, centrally located phallic sandstone pillar. Other large rock formations in this locality may represent anthropomorphic figures. At the request of Aboriginal parties, photographs of these rock formations have not been included within this report.

The conduct of initiation ceremonies in the Mount Sugarloaf locality is documented by Threlkeld (in Gunson 1974). For example, in November 1825 several Aboriginal people guided Threlkeld to a ceremony, where tooth evulsion would take place. By having a tooth removed the male was able to take a wife and it also offered protection against the anger of the spirit 'Puttikan'. At the ceremony were 20 males, who stood at the edge of a circle formed on grass, 38 feet in diameter. All vegetation was removed from within the ring and a small hillock was raised in the centre (Threlkeld in Gunson 1974:50).

Grinding Groove Area:

The Grinding Groove Area in the central-eastern portion of the investigation area (Figure 12) has strong associations with men's business, maintenances of hatchets and axes, preparation of medicine and other uses. Eighteen recorded open grinding groove sites are clustered in this area, on first and second order unnamed headwater tributaries (Figure 11). Three rock shelters are also present. The locality comprises the upper slopes of Sugarloaf Range, on the western side of the crest, and is situated directly south of Mount Sugarloaf.

The grinding groove sites and rock shelters are outlined in Sections 5.2.2 and 5.2.3. Aboriginal representatives viewed the grooves as being related to the grinding of hatchets and axes by men, prized possessions in the male tool-kit, and potentially associated with the participation of men in the conduct of ceremonies in the nearby men's area, and Mount Sugarloaf and Mount Vincent. Several broader, shallow basins were viewed as potentially relating to the preparation of medicine. Recently developed residue and use-wear analysis techniques (Stephenson 2011) may enable resolution of this issue. Other naturally occurring holes in the sandstone rock formations were viewed as being related to the use of water.

Keepa Keepa Pathways Area:

The Keepa Keepa Pathways Area is located in the south-west of the investigation area (Figure 12), and comprises the southern access route from the Central Lowlands to Sugarloaf Ridge and the Watagan Mountains and Mount Vincent (also an area of high cultural significance). Culturally significant sites and burials are known to Aboriginal representatives around Mount Vincent, immediately south of the investigation area.

Keepa Keepa representatives have carved engravings on large boulders in this area, and several shipping containers have been placed there (Plate 8, Appendix 5).

Sugarloaf Pathways:

Other pathways from Mount Sugarloaf, including to the north-east of the investigation area, linking with the Black Hill Spur and Hexham Swamp (Kuskie and Kamminga 2000, Kuskie 2006, Umwelt 2005a) and along Sugarloaf Ridge to the south.

Kuskie (2006) identified that the Black Hill Spur was a pathway used by Aboriginal people. This information derived from interviews with long-time Black Hill residents Mrs Beryl Hardes and Mrs Judith Crockett (Kuskie and Kamminga 2000). It is likely that this route or pathway extended west then south across George Booth Drive and up to Mount Sugarloaf, immediately to the east of the present investigation area, but traversing an area of the existing Tasman Mine workings.

Umwelt (2005a:4.4) report that the pathway linking Mount Sugarloaf, where ceremonial/spiritual activities occurred, with the Hexham and Pambalong swamps, where resources were procured and camp sites located, generally follows the Mt Sugarloaf Road from the peak to Seahampton and then Stockrington Road along a ridge crest, before splitting into two routes. One route leads to Hexham Swamp and the second continues down the ridge crest to Pambalong Swamp. Umwelt (2005a:4.4) report that this pathway is of high cultural significance to the Awabakal people. This pathway fringes the eastern boundary of the investigation area, north of Mount Sugarloaf, and traverses an area of the existing Tasman Mine workings.

South of Mount Sugarloaf, the Sugarloaf Range ridge extends south to Mount Vincent and further south and west. The ridge traverses the south-eastern portion of the investigation area, and forms a pathway between these locations.

The Aboriginal representatives noted the importance of Mount Sugarloaf and the range and elevated areas for the extensive views provided over the surrounding landscape (refer to Plates 1-6 in Appendix 5). Mt Sugarloaf, at 412 metres elevation, is a regionally dominant point that overlooks a substantial area along the Coastal Lowlands to the east, including Lake Macquarie, Newcastle Bight and the lower Hunter Valley, along with the Central Lowlands of the Hunter Valley to the north and west. Significantly, Mount Sugarloaf is also a prominent landmark visual from many other locations in the surrounding region.

Sugarloaf and the Supreme Being, 'Koe-in':

'Koe-in' ('Koin', 'Koun', 'Kon', 'Coen' or 'Coo-in') is reported as the supreme being of the Sugarloaf area (Threlkeld in Gunson 1974:62).

Threlkeld (in Gunson 1974:62) reports on discussions with John M'Gill (Biraban), chief of the Lake Macquarie 'tribe' (Awabakal). 'Koe-in' is a male being, in appearance like an Aboriginal man, who lives in the thick bushes or jungle. He has three names, 'Koun', 'Tippakal' and 'Por-rang'. He occasionally appears by day, but mostly by night, generally during assemblages of people for ceremonies. He appears painted with pipeclay and with a fire-stick in hand, but generally it was the Doctors of the tribe (karadji men) who perceived him, and to whom he would say "fear not, come and talk". At other times, 'Koe-in' would appear when a person was asleep, take them up, as an eagle does his prey, and carry them away, returning them later to their fireside. Threlkeld reports that 'Koe-in' has a wife, 'Tippakalleen' (also known as 'Mailkan' or 'Bimpoin') who was feared, for carrying people off in a large bag-net underneath the earth (never to return), and spearing children dead through the temple.

M'Gill (Biraban) informed Threlkeld (in Gunson 1974:66) of the significance of the Eagle-Hawks with Sugarloaf Range and that they had made the circular erections of stone, 5-6 feet in diameter and 2-3 feet high, noted by Threlkeld on the range.

Gunson (1974) identifies that 'Koe-in' resembles 'Baiame' of the Kamilaroi and the Yuin people's 'Daramulun' as a powerful sky-hero figure. He was less powerful than his evil female counterpart. In flight he resembled an eaglehawk, similar to beliefs of other south-eastern Australian cultural groups. Eaglehawks were seen as ancestors of the Awabakal people.

Sugarloaf and the Supernatural Spirit 'Puttikan':

Threlkeld (in Gunson 1974:194) reports being informed about "Puttikan", a powerful supernatural spirit being that inhabited the Sugarloaf area:

> . . . there is a being in Sugar-loaf Mountains, resembling a man but taller in stature; with arms, legs, face, and hair, very long on the head, but the feet are placed contrarily to the face being behind; and the body hairy, like an animal. The flesh is so hard in all parts of the body that it is imprenetrable (*sic*), except just between the legs, where a spear may penetrate, but at no other part. He is fierce, devouring men, and often pursuing the Aborigines in the mountains. There are females, but not many of the species. Their cry is often heard uttering Perrelorl-o, dwelling very long on the O, in the summer time.

Threlkeld (in Gunson 1974:61) reports that the name "Puttikan" literally means "the being who bites". "The favourite haunt of this supernatural person was said to be in the Sugar-loaf Mountain, west of Newcastle".

Threlkeld (in Gunson 1974:50) further describes "Puttikan":

> It was in November 1825, when, just as the sun was sinking behind the Sugar-loaf Mountain near Newcastle, some natives came to guide me to the place where a ceremony was to be performed preparatory to the rapping out of a tooth from the mouth of certain youths, who by such a process were declared capable of marrying a wife. Besides this they were supposed to be protected from the anger of an imaginary being, that travelled the bush who whenever he meets a black, looks to see if the upper front tooth be removed if so, the person escapes unhurt, if the tooth has not been extracted the unfortunate man becomes a victim to the anger of this terrible being. The name of this fancied supernatural person is "Put-ti-kan", in shape he is like a horse, having a large mane, and tail sharp like a cutlass: whenever he meets the blacks they go towards him and draw up their lips to shew that the tooth is rapped out, when he will not injure them; but should the tooth be left in, he runs after, kills, and eats them. He does not walk, but bounds like a kangaroo, the noise of which on the ground is as the report of a gun, calling out as he advances *Pi-ro-long*! *Pi-ro-long*!

Hence, access to Mount Sugarloaf or portions of it may have been restricted to the initiated men.

Burials in a cave on the side of Mount Sugarloaf:

The use of a cave on the side of Mount Sugarloaf for the burial of important people and some small children was noted by Threlkeld (in Gunson 1974). It is uncertain if this relates to one of the rock shelters identified during the present investigation, but that possibility cannot be excluded.

Mount Sugarloaf as a heirophany between the secular world and the sky-world:

The importance of the connection, or 'heirophany', Mount Sugarloaf represents between the secular and the sky-world is evident from the writings of Threlkeld (in Gunson 1974). A number of similar cultural places have been identified in south-eastern Australia (Boot 2002, Knight 2001).

Mount Sugarloaf was associated with the supreme being 'Koe-in', his evil wife 'Tippakalleen' and the eaglehawk ancestors of the Awabakal people. It is highly probable that prominent natural rock formations, particularly large boulders, on and around Mount Sugarloaf, were 'jump-off' places associated with the ascension of spirits to the sky-world after death.

Presence of quartz and associations with the Clever Man:

The presence of quartz in the investigation area, and its associations with the clever man (karadji man), have been identified by the Aboriginal representatives involved in the survey. Elkin (1933) reports that the 'Doctors' or 'men of high degree' (karadji or koradji men) were of supreme importance within Aboriginal cultural groups. Threlkeld (in Gunson 1974) observed that it was generally only the karadji men of the Awabakal who could communicate with 'Koe-in', the supreme being.

Use of subsistence and other resources:

In general terms, the use of subsistence and other resources from within the investigation area has been highlighted by several of the Aboriginal participants in the survey. The use of native tobacco, geebung, macrozamia, grass trees, native figs and other plant resources has been noted.

Threlkeld (in Gunson 1974) also documents extensive observations about the use of plants and other resources (which would have been available from the investigation area), for example bracken fern and macrozamia (refer to Sections 3.3.2 and 3.3.3).

Ongoing cultural and spiritual connection:

In general terms, the traditional use of the area by Awabakal and Wonnarua people, and an ongoing cultural and spiritual connection to the land by the descendants of these people, has been highlighted by Aboriginal participants in the survey.

Contemporary significance of Aboriginal objects:

In relation to the Aboriginal objects identified within the investigation area (for example, stone artefact sites, grinding grooves and rock shelters), the contemporary significance of these to the Aboriginal community, as they represent a tangible link with the traditional past and with the lifestyle and values of community ancestors, has been highlighted by Aboriginal participants in the survey.

5.3 Discussion

The results of the investigation are discussed below, including the potential integrity of the evidence, nature of the evidence and interpretations of the evidence.

5.3.1 Integrity of Evidence

The integrity of the identified sites and the remainder of the investigation area can primarily be assessed for surface evidence only through examination of land use impacts. Controlled excavation enables integrity to be assessed through the horizontal and vertical distribution of artefacts and by conjoining items.

As discussed in Section 2, recent non-Aboriginal land-use practices have had generally minimal impacts on the investigation area. Some impacts have been caused by:

- Vegetation removal, particularly for timber harvesting;
- Construction, maintenance and use of vehicle tracks, including Mt Sugarloaf Road and various unsealed tracks;
- Essential services, including electricity transmission line easements and Telstra cables; and
- Mineral exploration.

Levels of ground disturbance were recorded during the survey, after McDonald *et al* (1984) (Appendix 3). The survey areas typically exhibited low levels of ground disturbance.

By virtue of their identification in exposures created by ground disturbance (particularly vehicle tracks and power easements), many of the identified open artefact sites exhibit moderate to high levels of disturbance (refer to Table 5). However, the open grinding groove sites are all situated in areas where minimal impacts have arisen from recent land use, and therefore exhibit low levels of ground disturbance, notwithstanding that they are subject to natural weathering processes (refer to Table 6). Similarly, almost all of the rock shelter PADs exhibit low levels of disturbance, although again natural weathering processes are constantly in action.

As identified in Section 2, previous timber harvesting may have resulted in the removal of scarred or carved trees, had they once been present. However, in general, disturbance levels are low across the investigation area and should sub-surface deposits of artefacts occur, they may exhibit reasonable integrity.

5.3.2 Lithic Assemblage

A total of 174 lithic items were recorded during the survey, within the 38 open artefact sites (including one open artefact and grinding groove site). These items are listed in Table 8 and summarised in Table 9.

The combined artefact assemblage is dominated by items that may represent the fragmented debris of on-site knapping of primary flakes and/or microblades or other on-site fracture, such as accidental breakage, or accidental discard. These items represent 95.4% of the combined assemblage and include flakes (17.2% of the combined assemblage), flake portions (distal, medial, proximal and longitudinal) which represent 29.3% of the combined assemblage, lithic fragments (synonymous with "flaked pieces", 37.4%) and cores (10.3%).

Five retouched and/or utilised items were identified, along with a geometric microlith, hammerstone and a hatchet blank. Significantly, the hatchet blank was located at the grinding groove site TE92/A.

One distinct microblade core was identified, along with several microblades, and a complete geometric microlith. Microblade cores represent on-site manufacture of microblades and flakes, with the elongated flakes possibly then selected for use as preforms for making bondi points and other microliths. Microliths are found in artefact scatter sites dating to the mid-late Holocene. While their function is not known with certainty, most archaeologists consider that they were used in armatures of hunting and fighting spears (Mulvaney and Kamminga 1999:235-36). Microliths may have served as barbs, or else as lacerators intended to disable an enemy or prey by causing haemorrhage.

The combined artefact assemblage is dominated by the stone materials silcrete (55.7% of the assemblage) and tuff (37.4%). Four basic volcanic items were identified, along with two items each of chert, quartz, quartzite and other volcanics.

Silcrete is a brittle, intensely indurate rock composed mainly of quartz clasts cemented by a matrix which may be well-crystallized quartz, cryptocrystalline quartz or amorphous (opaline) silica (Langford-Smith 1978:3). The texture of silcrete reflects that of the host rock and clasts may range in size from very fine grains to boulders.

Silcrete is produced by an absolute accumulation of silica, which can be precipitated from solution by evaporation, cooling, the neutralisation of strongly alkaline solutions, reaction with cations, adsorption by solids and the life-processes of organisms (Summerfield 1983:76). In weathered profiles, downward percolation of silica released through bedrock weathering and clay mineral authigenesis, together with water-table fluctuations, are suitable conditions for formation (Summerfield 1983:80).

Silcrete is normally grey in colour, but can be whitish, red, brown or yellow. It shatters readily into sharp, angular pieces with a conchoidal fracture and newly broken rocks have a semi-vitreous sheen (Langford-Smith 1978:4). Silcrete was an attractive material to the local Aboriginal people because of its flaking properties and availability. Flakes have sharp, reasonably durable edges and implements made from the stone were used for a variety of tasks, including woodworking and spear barbs.

Table 8: Description of stone artefacts recorded during the heritage survey.

Site Name	Artefact #	Colour	Stone Material	Lithic Item Type	Length (mm)	Width (mm)	Thickness (mm)	Cortex (%)	Cortex Type	Comments
TE1/A	1	cream	chert	lithic fragment	28	18	10			
TE1/A	2	cream	chert	lithic fragment	21	10	9			
TE1/A	3	grey	silcrete	lithic fragment	20	18	8			
TE1/B	1	grey	tuff	flake - proximal	19	12	3			
TE1/B	2	orange	tuff	core	50	30	24	10	terr	3 platforms; 9 scars
TE1/B	3	grey	tuff	core	41	26	14	5	tab	2 platforms; 3 scars
TE10/A	1	red	tuff	flake	21	19	3			
TE29/A	1	grey	quartzite	flake	50	39	12			located on steep slope
TE34/A	1	pink	silcrete	flake - medial	20	18	6			
TE50/A	1	yellow	silcrete	flake - proximal	11	20	4			
TE50/A	2	yellow	silcrete	flake - proximal	22	16	2			
TE50/A	3	pink	silcrete	core	30	26	12			2 platforms; 3 scars
TE51/A	1	white	tuff	flake - proximal	28	22	8			
TE51/A	2	white	tuff	lithic fragment	34	24	10			
TE51/A	3	orange	silcrete	core	34	36	20			
TE51/A	4	grey	silcrete	lithic fragment	16	12	4			
TE51/A	5	grey	silcrete	lithic fragment	24	14	8			
TE53/A	1	brown	tuff	flake	18	15	6			
TE53/A	2	pink	silcrete	lithic fragment	19	12	3			
TE53/A	3	pink	silcrete	flake	31	26	16			
TE53/A	4	pink	silcrete	lithic fragment	22	14	8			
TE53/A	5	pink	silcrete	lithic fragment	19	16	6			
TE53/A	6	pink	silcrete	lithic fragment	17	12	4			
TE53/A	7	pink	silcrete	lithic fragment	34	14	8			
TE53/A	8	grey	tuff	flake - medial	17	16	4			
TE53/B	1	pink	silcrete	flake	11	9	3			
TE56/A	1	red	silcrete	lithic fragment	40	28	14			heat affected
TE56/B	1	red/yellow	tuff	core	48	38	28	40	peb	3 scars; conjoined core; heat affected
TE56/B	2	red/yellow	tuff	flake	32	26	16			
TE79/B	1	grey	tuff	core	38	32	16			5 scars
TE80/A	1	brown	tuff	retouched/utilised flake	52	39	10			retouch/use damage along right lateral margin
TE80/B	1	red	tuff	flake	50	35	12			
TE80/C	1	grey	tuff	lithic fragment	26	20	6			
TE84/A	1	red	silcrete	core	28	26	14			2 platforms; 4 scars
TE84/A	2	red	silcrete	lithic fragment	30	18	6			heat affected
TE84/A	3	red	silcrete	lithic fragment	18	12	4			heat affected
TE84/A	4	cream	tuff	flake - proximal	20	18	10			
TE84/A	5	cream	tuff	flake						*in situ;* embedded in access track
TE85/A	1	yellow	tuff	flake - medial	35	21	7			
TE85/A	2	yellow	tuff	flake - proximal	26	22	11			
TE85/A	3	yellow	tuff	flake - medial	22	33	8			
TE85/A	4	yellow	tuff	flake - medial	14	22	6			
TE85/A	5	yellow	tuff	flake - proximal	24	12	4			
TE85/A	6	yellow	silcrete	lithic fragment	27	20	8			
TE85/A	7	yellow	tuff	lithic fragment	16	12	8			
TE85/A	8	yellow	tuff	flake	22	18	4			
TE85/A	9	red	silcrete	lithic fragment	22	17	14			
TE85/A	10	white	quartz	lithic fragment	12	8	6			
TE85/A	11	red	silcrete	flake	21	20	8			
TE85/A	12	red/yellow	tuff	flake	48	23	18			vehicle damage
TE85/A	13	red/yellow	tuff	flake - distal	28	18	8			vehicle damage
TE85/A	14	red	silcrete	flake	28	14	5			
TE85/A	15	red	silcrete	lithic fragment	14	9	3			
TE85/A	16	pink	silcrete	flake - medial	20	18	5			
TE85/A	17	yellow	tuff	flake - proximal	21	26	6			
TE85/A	18	red	silcrete	flake - medial	16	14	5			
TE85/A	19	yellow	silcrete	lithic fragment	<2	<1	<1			4 chips; vehicle damage
TE85/A	20	brown	tuff	flake - proximal	21	12	4			

Site Name	Artefact #	Colour	Stone Material	Lithic Item Type	Length (mm)	Width (mm)	Thickness (mm)	Cortex (%)	Cortex Type	Comments
TE85/A	21	pink	silcrete	core	28	26	21			3 scars; coarse silcrete
TE85/A	22	brown	tuff	flake	68	18	14			vehicle damage
TE85/A	23	red	silcrete	flake	21	16	4			
TE85/A	24	red/yellow	silcrete	flake	26	16	4			
TE92/A	1	grey	volcanic	hatchet blank	130	60	20			blank; at grinding groove site
TE107/A	1	red	silcrete	flake	32	28	8			
TE124/A	1	white/grey	tuff	flake - proximal	46	40	16	10	tab	
TE124/A	2	grey	tuff	flake - proximal	28	16	6	30	tab	
TE124/A	3	pink	silcrete	flake	36	26	4			
TE124/A	4	yellow	silcrete	flake - proximal	28	16	6			
TE124/A	5	red	silcrete	flake	22	20	4			
TE124/A	6	white	tuff	retouched flake	26	24	12			steep retouch; edge damage
TE126/A	1	red	silcrete	flake - medial	22	16	8			
TE126/A	2	grey	tuff	flake	40	32	6			
TE126/A	3	white	silcrete	lithic fragment	20	14	4			
TE126/A	4	yellow	tuff	flake	30	32	10	15	tab	
TE126/A	5	white	tuff	core	30	22	14	30	tab	2 platforms; 6 scars
TE126/B	1	yellow	silcrete	core						conjoin to #2; vehicle damage
TE126/B	2	red	silcrete	flake						conjoin to #1; broken by vehicle
TE126/C	1	orange	tuff	flake	50	40	6			
TE126/C	2	orange	tuff	flake	26	28	4			
TE135/A	1	pink	silcrete	flake - medial	26	18	8			
TE135/A	2	pink	silcrete	flake - medial	16	12	6			conjoins to #3; heat affected
TE135/A	3	pink	silcrete	flake - distal	18	8	4			conjoins to #2; heat affected
TE135/A	4	grey	silcrete	lithic fragment	20	14	6			
TE135/A	5	white	tuff	lithic fragment	12	8	4			
TE135/A	6	pink	silcrete	flake - distal	20	14	4			
TE135/A	7	red	silcrete	blade core	38	34	26			1 platform; 8 scars; unidirectional; heat affected
TE135/A	8	white	tuff	lithic fragment	20	18	10			
TE135/A	9	grey	silcrete	flake	26	24	4			
TE135/A	10	pink	silcrete	flake	20	14	4			
TE135/A	11	grey	silcrete	lithic fragment	16	12	6			
TE135/A	12	red	silcrete	flake	16	12	4			
TE135/A	13	pink	silcrete	lithic fragment	22	14	8			
TE135/A	14	pink	silcrete	lithic fragment	16	12	4			
TE135/A	15	pink	silcrete	flake	12	6	2			
TE135/A	16	pink	silcrete	lithic fragment	26	12	8			
TE135/A	17	pink	silcrete	lithic fragment	16	10	2			
TE135/A	18	pink	silcrete	lithic fragment	20	10	4			
TE135/A	19	pink	silcrete	lithic fragment	12	10	4			
TE135/B	1	grey	tuff	flake	28	18	14			
TE135/C	1	grey	tuff	core	30	20	14			1 platform
TE135/D	1	grey	tuff	lithic fragment	28	28	6			
TE153/A	1	white	tuff	flake	40	30	12	30	tab	edge damage
TE154/B	1	pink	silcrete	lithic fragment	14	14	4			
TE154/B	2	pink	silcrete	utilised blade - proximal	16	12	2			utilised
TE154/B	3	pink	silcrete	flake - proximal	14	10	2			
TE154/B	4	pink	silcrete	lithic fragment	20	14	6			
TE154/B	5	grey	silcrete	lithic fragment	14	10	4			
TE154/B	6	white	silcrete	flake - longitudinal	30	26	6			
TE154/B	7	pink	silcrete	flake - distal	18	12	4			
TE154/B	8	pink	silcrete	lithic fragment	22	18	4			
TE154/B	9	white	silcrete	lithic fragment	30	22	10			
TE154/B	10	white	quartz	lithic fragment	8	6	2			
TE154/C	1	yellow	tuff	lithic fragment	30	32	16	70	tab	
TE154/C	2	orange	tuff	lithic fragment	30	22	8	40	tab	
TE154/C	3	red	silcrete	lithic fragment	24	20	10			heat affected
TE157/A	1	white	tuff	flake - proximal	14	16	6			
TE157/A	2	grey	tuff	core	60	48	34	25	tab	3 platforms; 8 scars; multidirectional

Site Name	Artefact #	Colour	Stone Material	Lithic Item Type	Length (mm)	Width (mm)	Thickness (mm)	Cortex (%)	Cortex Type	Comments
TE157/A	3	white	silcrete	flake - proximal	24	20	4			
TE157/A	4	pink	silcrete	lithic fragment	36	22	6			heat affected
TE157/A	5	pink	silcrete	flake - medial	22	22	4			heat affected
TE157/A	6	grey	tuff	core	24	22	12	15	tab	2 platforms; 6 scars; multidirectional
TE157/A	7	pink	silcrete	utilised blade - proximal	16	8	4			utilised
TE157/A	8	white	silcrete	lithic fragment	14	10	2			heat affected
TE157/A	9	pink	silcrete	blade - medial	12	6	2			
TE157/A	10	black	tuff	flake - longitudinal	36	30	8			
TE157/A	11	cream	volcanic	hammerstone	130	90	40			broken
TE157/A	12	black	basic volcanic	lithic fragment	30	24	10			
TE157/A	13	black/white	tuff	lithic fragment	16	10	8			
TE157/A	14	pink	silcrete	flake - distal	22	12	6			heat affected
TE157/A	15	red	tuff	flake - medial	24	20	6			
TE157/A	16	red	tuff	core	22	20	6			2 platforms; 7 scars
TE157/A	17	black	basic volcanic	lithic fragment	24	24	12			
TE157/A	18	pink	silcrete	lithic fragment	22	10	6			heat affected
TE157/A	19	pink	silcrete	flake	28	22	10			
TE157/A	20	black	basic volcanic	lithic fragment	34	22	12			
TE157/A	21	yellow	tuff	lithic fragment	10	10	4			
TE157/A	22	black	basic volcanic	lithic fragment	16	14	6			
TE157/A	23	pink	silcrete	lithic fragment	14	10	8			heat affected
TE157/A	24	pink	silcrete	flake - medial	14	12	4			heat affected
TE157/A	25	pink	silcrete	flake - longitudinal	14	10	2			heat affected
TE157/A	26	red	silcrete	lithic fragment	12	10	8			heat affected
TE157/A	27	pink	silcrete	lithic fragment	22	14	10			
TE157/A	28	pink	silcrete	flake - proximal	24	12	6			pot lid fracture
TE157/A	29	pink	silcrete	lithic fragment	22	14	4			
TE157/A	30	pink	silcrete	lithic fragment	24	10	6			heat affected
TE157/A	31	pink	silcrete	lithic fragment	36	30	16			
TE157/A	32	pink	silcrete	flake - distal	12	12	4			
TE157/A	33	pink	silcrete	flake - proximal	12	10	2			
TE157/A	34	pink	silcrete	lithic fragment	14	12	6			
TE157/A	35	pink	silcrete	flake - distal	10	12	2			
TE157/A	36	pink	silcrete	lithic fragment	10	8	2			
TE157/A	37	grey	tuff	flake - medial	22	24	10			
TE157/A	38	black	tuff	lithic fragment	30	22	10			
TE157/A	39	pink	silcrete	geometric microlith	12	8	4			steep backing on dorsal
TE157/A	40	grey	silcrete	lithic fragment	10	4	4			
TE157/A	41	white	tuff	flake - proximal	20	12	6			
TE157/A	42	grey	tuff	lithic fragment	30	18	12			
TE157/A	43	black	tuff	flake - proximal	30	20	8			
TE181/A	1	red	silcrete	lithic fragment	18	8	4			
TE181/A	2	yellow	tuff	flake - proximal	22	24	6			
TE181/A	3	grey	tuff	lithic fragment	16	14	8			
TE181/A	4	yellow	tuff	flake - medial	12	14	4			
TE181/A	5	red	silcrete	lithic fragment	26	26	14			
TE181/A	6	yellow	tuff	core	36	24	12			3 platforms; 6 scars
TE181/B	1	red	silcrete	core	36	26	20	15	peb	2 platforms; 7 scars
TE181/C	1	pink	silcrete	flake - medial	18	16	6			heat affected
TE181/C	2	red	tuff	flake - medial	24	20	6			edge damage
TE182/A	1	red	silcrete	flake - medial	16	15	6			
TE182/B	1	pink	silcrete	flake - medial	18	16	7			
TE188/A	1	grey	tuff	core	34	34	16			3 platforms; 9 scars
TE188/A	2	red	silcrete	flake - longitudinal	30	24	10			
TE199/A	1	grey/brown	tuff	core	32	31	30	5	peb	7 scars
TE199/A	2	grey	tuff	retouched flake	28	20	8			retouch along margin
TE199/A	3	grey	quartzite	flake - distal	25	18	7			

Table 9: Summary of stone artefacts recorded during the heritage survey.

	Stone Material							
Lithic Item Type	basic volcanic	chert	quartz	quartzite	silcrete	tuff	volcanic	Total
blade - medial					1			1
blade core					1			1
core					6	12		18
flake				1	15	14		30
flake - distal				1	6	1		8
flake - longitudinal					3	1		4
flake - medial					11	8		19
flake - proximal					7	13		20
geometric microlith					1			1
hammerstone							1	1
hatchet blank							1	1
lithic fragment	4	2	2		44	13		65
retouched flake						2		2
retouched/utilised flake						1		1
utilised blade - proximal					2			2
Total	4	2	2	2	97	65	2	174

Archaeological and geological studies in the Central Lowlands have identified various terrestrial and alluvial sources of silcrete, including nearby at the Freeway Business Park (Kuskie 2004), Thornton (Kuskie 1994) and Bolwarra Heights (Baker 1997). Silcrete cobbles were not identified within the study area during the present investigation and the minor silcrete gravel is too small to have represented a suitable source for the material. Minimal cortex was noted on the silcrete items (only one item, with pebble cortex). Given the availability of silcrete in the region, relatively local colluvial and/or alluvial gravel sources are inferred for the items within the investigation area.

Tuff items comprise 37.4% of the assemblage. Tuff is a fine grained, isotropic stone formed after a cloud of ash was ejected in an explosive volcanic eruption. The ash settled to the ground or through ponded water. After burial, some tuff beds became indurated, through a low-grade metamorphic process (probably involving pressure) in which the stone recrystallised to a more stable structure. Tuff samples examined from the lower and upper Hunter are rhyolitic in chemical composition (quartz and potassium-feldspar, occasionally with layer silicate or goethite) (Kuskie and Kamminga 2000).

Tuff is typically grey in colour in the lower Hunter Valley (a function of grain size, not a reference to individual grains, which can be of a variety of colours). However, tuff is porous enough for the diffusion of iron bearing solution, with iron precipitating out to give a yellow, brown, red or orange colour. Variations to the surface colouration can also result from weathering processes.

Volcanic tuffs occur in widespread seams throughout the Hunter Valley and are occasionally exposed in drainage lines or in cliff faces, or the cobbles become worked into river gravels (eg. Hunter River and its tributaries) where they represent a readily available source of the material. Tuff is present within the underlying bedrock of the investigation area and Klauss Diessel and Murray Little (*pers. comm.*, 1996; *cf.* Diessel 1983, Little 1995) have identified outcrops of tuff on the foothills of Sugarloaf Range immediately north of the investigation area and in a tributary of Surveyors Creek immediately east of the northern portion of the investigation area.

Tabular cortex was identified on ten tuff items, with terrestrial cortex on one and other waterworn cortex on two. Hence, it is inferred that the tuff items within the investigation area were procured from relatively local sources.

5.3.3 Grinding Grooves

The general morphology of the 385 grinding grooves identified within the 28 open groove sites recorded during the current survey was documented (refer to site descriptions in Appendix 4 and Table 6).

Experimental studies by Dickson (1981) and Wilson (1994) provide data that is of use in interpreting the grooves identified within the investigation area. The experimental data indicates that (*cf.* Umwelt 2010):

- Coarse, quartz rich sandstone with a relatively unconsolidated clay matrix will sharpen more effectively than a more consolidated or lithic sandstone with a finer grain size;
- The use of water to rinse the groove clean and prevent a build-up of ground material during grinding was important;
- Generally only one or perhaps at most two or three hatchet/axe[12] heads (if of a similar breadth or cross-section) would tend to result in the formation of a single groove;
- Thickness, and to a lesser extent width, remained fairly constant during the life of the implement, whereas length and weight would decrease due to resharpening episodes;
- Due to the rocking action employed when grinding, the grooves tend to become shallower and narrower at each end;
- Grinding for three hours to produce a new cutting edge on a stone implement would create a groove with an average depth of 15-18 millimetres;
- Deeper grooves could be formed from resharpening the hatchet/axe. If a new area of sandstone was used for resharpening, the groove was generally shallower (<10 millimetres depth) and sometimes shorter (<20 centimetres); and
- Wilson's (1994) grooves were generally 30 - 35 cm in length, but groove length is largely a function of the length of the arm of the person responsible for the grinding.

Umwelt (2010) concluded in relation to the grooves at West Wallsend, south of the present investigation area, that very narrow and elongated grooves were more likely to have arisen from grinding fire-hardened wooden points, and short rounder grooves (bowl-like) from grinding plant foods.

The study of Stephenson (2011) indicates that processing of animal foods and preparation of medicine or processing of ochre may also be functions of these bowl-like grooves. Recently developed residue and use-wear analysis techniques, involving non-destructive biochemical analysis (Stephenson 2011), may enable resolution of this issue. The methods developed by Stephenson (2011) are highly suitable to *in-situ* features such as non-portable grooves, as samples can be lifted on-site without causing impacts to the item, with subsequent analysis conducted in laboratory conditions.

[12] Umwelt (2010) define hatchets as hafted chopping tools generally between 4 and 8 centimetres width at the cutting edge, compared with axes as hand-held or hafted chopping tools generally greater than 8 centimetres width.

Preliminary comparison of the grooves recorded during the present assessment with the experimental data of Dickson (1981) and Wilson (1994) indicate that many of the narrow, elongated and u-shaped grooves may be the result of shaping and sharpening of ground-edge hatchets and/or axes. However, a number of broad grooves or basin-like ground depressions are also present, which potentially could have arisen from seed-grinding, or other plant food, animal food or ochre processing, or preparation of medicine. Other naturally formed holes occur in the sandstone rock formations, often at the grinding groove sites, and the possible use of these by Aboriginal people, for example for heating or storing water, cannot be discounted. Site #38-4-447 contains markings that may represent engravings with symbolic or other meaning. More detailed analysis of individual grooves with reference to the experimental data is warranted, and would facilitate comparison of grooves between areas hypothesised to be primarily associated with non-secular use, and areas inferred to be associated with secular use.

Stone hatchets were an essential part of a male's tool-kit. They were used to cut saplings for building gunyahs, for stripping bark from trees, cutting notches in trees for climbing, and cutting toe-holds in trees to procure animals or honey from bee nests (Mathews 1894). These items tended to be made of tough volcanic stone.

The association of axes/hatchets as key elements of the male tool-kit, and the male initiation area and gender-specific connections with Mount Sugarloaf identified by the registered Aboriginal parties, are potentially key factors in the Aboriginal occupation of this locality. The occupation of portions of the investigation area, particularly the elevated terrain around Mount Sugarloaf and the men's area and main grinding groove area, may have been limited to men (and boys progressing through to their initiation). It is speculated that creation of many of the grinding grooves may have occurred during that progression towards initiation, rather than for simply utilitarian purposes during the course of the normal daily round. The remote location of many of the grooves, their relatively close physical relationship with the men's area, the presence of only a single resource zone (as opposed to multiple resource zones where more hunting/gathering activity would be expected to occur, and were readily available in the adjacent Coastal Lowlands and Central Lowlands), and the considerable effort required to access these areas (compared with other lower elevation exposures of sandstone bedrock in watercourses in nearby areas, which could more readily have been accessed and used for shaping or sharpening hatchets) support this inference. Some grooves are potentially arranged in radiating type patterns, which also warrant further detailed recording and investigation to assess possible spiritual connections.

5.3.4 Rock Shelters

As for the grinding groove sites, any inference that the use of the rock shelters in the investigation area was for purely utilitarian purposes (for example, temporary shelter during the course of the daily hunting/gathering round and/or encampments) is not supported by:

- Their relatively remote and difficult to access nature;
- Their relatively close physical relationship with the men's area and other culturally significant areas;
- The absence of identified artefacts (albeit recent sedimentation may have obscured any evidence);
- The presence of only a single resource zone; and
- The location of the shelters some distance away from higher order watercourses (decreasing their attractiveness for overnight stays or occupation by family groups).

Rather, these factors also support an inference that any use of the shelters was associated with the non-secular (spiritual) uses of Mount Sugarloaf, such as the male initiation practices. In addition, most of the shelters have relatively small habitable floor areas, small/low entrances (although which in a number of shelters open to broader, higher cavernous areas inside), sloping floors and/or low roof heights, which tend to limit their prospective use for overnight encampments, particularly by family groups.

Further investigation of the shelters may be warranted to establish whether any evidence of occupation is present, the nature of that evidence and the relationship of these shelters with the non-secular uses of the locality and occupation model. Further investigation of the potential use of any of the shelters within the investigation area for human burial practices, as referred to by Threlkeld (in Gunson 1974), may also be warranted.

5.3.5 Spatial Distribution

The identified open artefact evidence may only represent a fraction of the entire artefact resource that is present within the heritage study area, because the vast majority of evidence is likely to be currently obscured by vegetation and soil.

Comprehensive studies (for example, Kuskie 2000, 2005b, 2005c, Kuskie and Clarke 2004, Kuskie and Kamminga 2000) demonstrate that artefacts occur in a widespread distribution across the landscape, with higher artefact densities, representing a greater focus of Aboriginal activity, tending to occur in primary and secondary resource zones (refer to Section 3.4) than in other contexts. Many major surveys in eastern Australia have identified a virtually continual distribution of artefacts across the landscape, but at varying densities (for example, Hall 1991, 1992, Hall and Lomax 1993, Kuskie 2000, Packard 1991, 1992). The results of large area surveys and major excavation projects (for example, Kuskie and Kamminga 2000, Kuskie and Clarke 2004, Kuskie 2005b, 2005c and 2009) lend support to arguments that the landscape should be viewed as an archaeological continuum, in which 'sites' represent points where higher frequencies of activities have occurred (Foley 1981).

However, defining a 'site' is problematical, due to the manner in which the evidence is exposed and the nature of the underlying human behaviour that has created the evidence. Most evidence is exposed within areas of erosion or ground disturbance. Therefore, delineating the extent of an open artefact site is not realistically possible without extensive sub-surface testing. The recorded evidence has typically been affected by post-depositional processes to such an extent that definition of a *cultural site* may not be possible (a discrete, culturally defined unit beyond which cultural material is absent). At such locations where artefacts have been identified, unless the items can be demonstrated to be culturally and temporally associated, the evidence cannot be said to represent a *cultural site*. Instead, the evidence may reflect a number of different occupational events that are spatially superimposed or mixed by post-depositional processes, but are not temporally or culturally related. In addition, the 'site' locations and boundaries would simply reflect the distribution and size of surface exposures. The definition of a 'site' is therefore an arbitrary one, which offers benefits in terms of planning and management, but does not necessarily reflect the underlying human behaviour that created the evidence (*cf.* Dunnell and Dancey 1983).

Many survey assessments have used arbitrary site definitions such as 'two or more artefacts within 50 or 100 metres of each other' or 'concentrations of artefacts at a higher density than *background scatter*'. Neither concept is appropriate in a 'cultural landscape' approach. In recognition of the problems of 'site' definition as discussed above, the definition of an open artefact site 'as the presence of one or more stone artefacts within a *survey area*' is more appropriate (Kuskie 2000). The *survey area* will always equate to a discrete *environmental context* (a particular combination of landform element and class of slope), bounded by different environmental contexts. While the visible site locus boundaries may be defined by the extent of visible evidence, across the entire *survey area* in which a site is identified, there exists a *potential resource* of comparable evidence. This recognition of the potential resource overcomes the problem of the nature of exposure of evidence (ie. 'sites' simply equate to 'surface exposures').

The 'broad-area' approach is based on the assumption that different environmental contexts provided different sets of constraints to Aboriginal occupation, which resulted in different patterns of land use. Following from this is the expectation that land use patterns may differ between environmental contexts and that this may result in the physical manifestation of different spatial distributions and forms of archaeological evidence. It is assumed that if the specific environmental context is repeated elsewhere within the investigation area, that similar evidence would exist in both locations, reflecting the similar underlying behaviour.

Following from these issues, it is apparent that concentrations of artefacts may represent many different and unrelated episodes of occupation. Therefore, by focusing the analysis on individual artefacts, issues of 'intra-site' spatial context become less critical. It is possible to compare the frequency of individual artefact and stone material types (measured against a constant unit of area, such as a square metre of effective survey coverage or a cubic metre of excavated soil sieved) with environmental variables, in order to test and refine a predictive model.

The *heritage study area* has been subdivided into 20 *environmental contexts* (Table 3). These are discrete, recurring areas of land for which it is assumed that the Aboriginal land use and resultant heritage evidence in one location (for example, one *survey area*) may be extrapolated to other similar locations (for example, another *survey area* within the same environmental context). *Environmental contexts* are defined on the basis of two environmental variables:

- Firstly, *landform element* (following the definitions of McDonald *et al* 1984) (for example, ridge crest, spur crest, simple slope, drainage depression and flat); and
- Secondly, *class of slope* (following McDonald *et al* 1984) (for example, level to very gently inclined slopes of less than 1°45´; gently inclined slopes greater than 1°45´ and less than 5°45´, etc.).

Environmental contexts consist of all of the *survey areas* with a particular combination of landform element and slope (for example, ten separate *survey areas* may be combined to form the 'gentle simple slope' context). As each *survey area* is by definition part of a single *environmental context* (although a number of similar 'survey areas' can make up the total), it is possible to compare and analyse other environmental variables on a fine-scale between each survey area and on a broader-scale between each context.

However, in relation to the present investigation area, the inferences that can be made from this comparison are limited by the small nature of the effective survey coverage and artefact sample size, along with the fact that only three sites contain greater than ten artefacts.

The artefact densities are very low across the investigation area (mean of 0.004 artefacts per square metre of effective survey coverage). Nevertheless, in relation to inferred spiritual/ceremonial use of portions of the investigation area, and the perhaps associated limitations on secular use of these areas, this result in itself is relevant.

Artefact densities are highest in the ridge crest landform unit (0.0118/m^2), compared with the simple slopes (0.0032/m^2), flats (0.0027/m^2) and drainage depressions (0.0003/m^2). Ridge crests only comprise 7.8% of the heritage study area. This indicates a trend for higher artefact discard on ridge crests than on the other landform units, which may be related to the use of these units for transitory movement (Aboriginal pathways), and the generally limited presence of higher order watercourses in the study area. However, these results must be treated with caution due to the nature of the artefact and effective survey coverage samples.

Site TE135/A (19 artefacts) on the level-very gentle ridge crest leading from Summit Point and Sugarloaf Range to the Central Lowlands around Wallis Creek is one of only three sites identified during the survey with greater than ten artefacts. The largest site, TE157/A with 43 artefacts, is located further up the ridge crest close to Summit Point. These sites are located in an area inferred to have represented a key corridor for transitory movement between these localities (Aboriginal pathway), and are some distance from the key spiritual/ceremonial areas. The other site with more than ten artefacts, TE85/A (with 24), is located on a gentle simple slope on the eastern side of the crest of Sugarloaf Range, overlooking the Coastal Zone. Again, this site is located adjacent to an inferred important corridor for transitory movement, at a place where people had extensive views of the adjacent coastal territory.

Examination of artefact density with respect to gradient reveals that a mean of 0.0069 artefacts per square metre of effective survey coverage occurs on level-very gentle gradients, compared with 0.0039/m^2 on gentle gradients, 0.0014/m^2 on moderate gradients and 0.0004/m^2 on steep gradients (Table 3). These results are highly consistent with the results of other extensive surveys throughout eastern Australia. Level to very gently inclined gradients comprise 18.8% of the total heritage study area, gently inclined slopes 20.5% and moderately and steeply inclined slopes 60.7% (Table 3).

In terms of environmental contexts (combinations of landform element and class of slope; refer to Table 3), the highest mean density of 0.0441 artefacts per square metre of effective survey coverage occurs on the level-very gentle ridge crests, consistent with the results above. Very low densities occur in other contexts. Again, these results reflect the general absence of low gradient contexts around higher order watercourses from the heritage study area, and the steep mountainous nature of much of the area. More focused occupation (and resulting higher artefact discard) would be expected in areas of low gradient around higher-order watercourses, wetlands/swamps, lakes and the former Hunter River estuary.

Hence, the density results (based on *archaeological visibility* and *effective survey coverage*) indicate trends for relatively higher artefact discard to occur in the level-very gentle ridge crest environmental context, and in terms of landform units on ridge crests, and in terms of gradient, on level to very gentle gradients and to a lesser extent gentle gradients. Nevertheless, in overall terms, the artefact densities are very low across the investigation area (mean of 0.004 artefacts per square metre of effective survey coverage).

Much of the investigation area comprises moderate to steep gradients with limited potential for evidence of focused occupation. In these areas, a very low density of artefacts and potentially shallow very low-density sub-surface deposit of artefacts may occur. The lower elevation and lower gradient north-western portion of the investigation area, much of which could not be surveyed due to property access restrictions, generally has a higher potential for deeper soils and therefore may host sub-surface deposits of artefacts. However, the predictive modelling (refer to Sections 3.4 and 3.5) indicates that focused occupation is unlikely to have occurred in these areas due to the absence of higher-order watercourses. In this lower elevation area, a low to very low density of artefacts (in a sub-surface context) may occur that is generally consistent with background discard, and although a low frequency of activity areas (with consequent higher artefact density) may be present, will not represent focused occupation. The potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value to occur within these portions of the investigation area is generally low.

5.3.6 Site Interpretation and Reassessment of Occupation Model

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

The evidence identified at the open artefact sites is consistent with background discard, manuport and artefact material which is insufficient either in number or in association with other material to suggest focused activity in a particular location (Rich 1993, Kuskie and Kamminga 2000). The only higher artefact counts and densities (sites TE85/A, TE135/A and TE157/A) occur in areas where superimpositioning of evidence from repeated visits (for example, during the course of transitory movement) is likely to have occurred.

The assemblage is overwhelmingly dominated by items that represent non-specific stone flaking, with only a few items representing possible evidence of microblade production, loss or intentional discard of microliths and loss or discard of non-microlith tools. The discard of a hatchet blank at a grinding groove site (TE92/A) is of note for its association with the grooves. However, the open artefact sites are generally lacking in clear evidence of distinct activity areas (eg. knapping areas associated with microlith production), although partly this may be a result of the nature of the sample, and further investigation could identify activity areas at several sites (in particular, relating to the knapping of pink silcrete at TE135/A and TE157/A).

The latter is of interest as the pink colouration is indicative of deliberate thermal alteration. Kuskie and Kamminga (2000) speculate that colours had important symbolic meaning in Aboriginal society, and part of the reason for heat treatment may have been to obtain a desired colour as well as to improve the flaking properties of the stone. This may have been especially important for armatures of fighting and hunting spears, part of the male tool-kit.

Hence, any knapping activity associated with the pink silcrete (particularly if it relates to microlith production), may be associated with the male initiation area and gender-specific connections with Mount Sugarloaf identified by the registered Aboriginal parties, and the subsequent inference that the occupation of portions of the investigation area, particularly the elevated terrain around Mount Sugarloaf and the men's area and main grinding groove area, may have been limited to men (and boys progressing through to their initiation).

The grinding groove sites provides evidence of the production and maintenance of stone hatchets/axes, and potentially other activities such as seed-grinding, or processing of other plant food, animal food or ochre, or preparation of medicine. Other naturally formed holes occur in the sandstone rock formations, often at the grinding groove sites, and the possible use of these by Aboriginal people, for example for heating or storing water, cannot be discounted. One site contains markings that may represent engravings with symbolic or other meaning.

As discussed in Section 5.3.3, many of the grinding groove sites may be associated with the use of Mount Sugarloaf for male initiation ceremonies, rather than for simply utilitarian purposes during the course of the normal daily round. Factors supporting this inference include:

- Axes/hatchets being key elements of the male tool-kit;
- The location of the vast majority of the grinding groove sites adjacent to the men's area and peak of Mount Sugarloaf, and the Sugarloaf Ridge (access corridor), including a substantial cluster of sites immediately south of Mount Sugarloaf;
- Gender-specific connections with Mount Sugarloaf identified by the registered Aboriginal parties. Aboriginal representatives viewed the grooves as being related to the grinding of hatchets and axes by men, prized possessions in the male tool-kit, and potentially associated with the participation of men in the conduct of ceremonies in the nearby men's area, and Mount Sugarloaf and Mount Vincent. Several broader, shallow basins were viewed as potentially relating to the preparation of medicine;
- The remote location of many of the grooves (limiting the potential that their use would arise during the course of the normal daily round);
- The considerable effort required to access these areas (compared with other lower elevation exposures of sandstone bedrock in watercourses in nearby areas, which could more readily have been accessed and used for grinding);
- The presence of only a single resource zone (as opposed to multiple resource zones where more hunting/gathering activity would be expected to occur, and were readily available in the adjacent Coastal Lowlands and Central Lowlands); and
- The possible arrangement of some grooves in radiating type patterns.

The use of the rock shelters is uncertain. Direct evidence of human occupation was not located within them, however the absence of artefacts may be a result of recent sedimentation, and the absence of art may relate to weathering processes. As discussed in Section 5.3.4, many of the rock shelters may also be associated with the use of Mount Sugarloaf for male initiation ceremonies, rather than for simply utilitarian purposes, such as temporary shelter or overnight camps during the course of the daily hunting/gathering round. Factors supporting this inference include:

- The relatively remote and difficult to access nature of the shelters;
- The relatively close physical relationship of the shelters with the men's area and other culturally significant areas;
- The relatively small habitable floor areas, small/low entrances, sloping floors and/or low roof heights, which tend to limit the prospective use of the shelters for overnight camps, particularly by family groups;
- The absence of identified artefacts (albeit recent sedimentation may have obscured any evidence), consistent with non-secular use (if any use at all occurred);

- The presence of only a single resource zone (limiting the attractiveness of the shelters for focused occupation); and
- The location of the shelters some distance away from higher order watercourses (also decreasing their attractiveness for overnight stays or occupation by family groups).

Any of the shelters within the investigation area may have been used for human burial practices, as referred to by Threlkeld (in Gunson 1974).

Broader models of occupation for the Hunter Valley region have been proposed by Kuskie and Kamminga (2000) for the lower valley and Kuskie and Clarke (2004) for the central to upper valley, based on ethnographic, ethnohistorical, oral historical and archaeological evidence (refer to Section 3.4).

No portions of the investigation area comprise areas that can be characterised as being *primary resource zones* or *secondary resource zones* under this model.

A large part of the investigation area (the elevated mountainous terrain) is consistent with occupation involving special purpose journeys (access for ceremonial/spiritual purposes) and non-secular activities (ceremonial activities). Within this area, evidence is present of usage of a generally low intensity, involving transitory movement between locations and production and maintenance of stone hatchets/axes, and potentially other activities such as seed-grinding, or processing of other plant food, animal food or ochre, or preparation of medicine.

The lower elevation portion of the investigation area (north-western area, which can be characterised as being part of the 'Central Lowlands') may best be characterised by occupation of a generally low intensity that involved hunting and gathering activities by small parties of men and/or women and children, along with transitory movement between locations. This area may generally have been exploited during the course of the normal daily round by inhabitants of encampments located in the primary or secondary resource zones (eg. along Wallis Creek) that foraged within an area of up to ten kilometres radius from their campsites.

The key element for which evidence was available to suggest a modification would be appropriate to the occupation model proposed in Section 3.4 relates to the hypothesis that the shaping and/or maintenance of ground-edge hatchets was "occasional and incidental to transitory movement or short-term occupation during the course of the normal daily hunting/gathering round, rather than a result of special purpose visits". On the basis of the results of the investigation, this element of the model can be revised as such:

- Exposed sandstone bedrock was used for the shaping and/or maintenance of ground-edge hatchets and axes, and potentially for seed-grinding, processing of other plant foods, animal foods and/or ochre, or preparation of medicines. These activities may have been occasional and incidental to transitory movement or short-term occupation during the course of the normal daily hunting/gathering round, or as a result of special purpose visits;
    - *Sites with grinding grooves may exhibit evidence consistent with transitory movement or hunting/gathering without camping, particularly where this activity occurred during the course of the normal daily round;*
    - *Sites with moderate to extensive evidence of grinding and limited evidence of other activities may occur, in association with ceremonial sites, where this activity occurred as a result of special purpose visits;*
    - *Residue and use-wear analysis may enable identification of the uses of individual grooves.*

The remaining elements of the occupation model (refer to Section 3.4) either could not be tested or were not disputed by the results of the investigation.

Consistent with the conclusions of Boot (2002), *the economy was secondary to the sacred and that, ultimately, the primary purpose of economic life was to sustain the sacred worlds of the Aboriginal people.* The spiritual/ceremonial use of Mt Sugarloaf was a significant cultural factor in the occupation of the locality of the investigation area, and potentially contributed to limited utilitarian activities having been undertaken within the area (or portions of it, particularly the elevated terrain).

5.3.7 Regional Context

The nature of the evidence from the heritage study area can be compared with other studies and sites in the region (refer to Section 3.2). The primary purpose is to identify similarities and differences with other reported evidence, in order to provide a framework for interpreting representativeness and assessing potential cumulative impacts.

However, it is noted that the environment of much of the investigation area ('Southern Mountains') contrasts significantly with the adjacent Coastal Lowlands and Central Lowlands (which forms the north-western portion of the investigation area), where most of the archaeological investigations have occurred.

The results from the mountainous terrain of the investigation area contrast markedly with many other studies in the region undertaken within the lower elevation Coastal Lowlands or Central Lowlands (refer to Section 3.2). Specifically, the known ceremonial/spiritual associations with Mount Sugarloaf and the investigation area, and nature of physical evidence (numerous grinding grooves, a number of rock shelters with PADs, but limited stone artefact evidence, particularly of more focused occupation), contrasts with the adjacent terrain, particularly areas that correspond to primary or secondary resource zones. In these other areas, evidence of Aboriginal occupation primarily pertains to the secular world. In the mountainous terrain of the study area, occupation primarily pertained to the non-secular world.

However, there are similarities with the study by Umwelt (2010) of the West Wallsend Colliery, in similar mountainous terrain several kilometres south of the present investigation area. Key similarities include the nature of site types recorded, types of grinding grooves, types and frequencies of stone materials, low numbers of artefacts in open sites and location of open artefact sites predominantly on low-gradient crests. Strong traditional, historical and contemporary cultural values have been identified in both investigation areas by the Aboriginal stakeholders.

Notwithstanding some similarities with the West Wallsend study area of Umwelt (2010), the Tasman Extension investigation area (and immediate surrounds) hosts Aboriginal heritage evidence (including cultural sites and values) in the form of a cultural landscape that is not replicated elsewhere locally and is of representative value within both local and regional contexts.

5.3.8 Reassessment of Predictive Model

In view of the survey results, the predictive model of site location for the investigation area (refer to Section 3.5) can be reassessed. Although about 90% of the investigation area has been sampled during this study, the model can be reassessed in relation to the 10% that has not been sampled yet, along with areas within the sampled zone that were not directly inspected.

Artefact Scatters:

Open artefact sites had previously been recorded within the investigation area and as predicted, a number of additional sites were identified during the survey.

The potential for further artefact evidence to occur within the portions of the investigation area that were sampled (but not directly inspected) can be reassessed as high, given that additional evidence may be obscured by sediment or vegetation/leaf litter or occur in areas not directly inspected. There remains a high potential for additional open artefact sites to occur within the portion of the investigation area that could not be sampled due to access constraints.

There is potential for stone artefacts to occur in a widespread distribution of variable density across virtually all landform units of the investigation area, apart from in areas which have been substantially impacted by recent land-use. However, none of the investigation area can be characterised as being located within a primary or secondary resource zone, and therefore evidence will typically be of a very low density, as demonstrated by the survey results. Trends for relatively higher artefact discard to occur in the level-very gentle ridge crest environmental context, and in terms of landform units on ridge crests, and in terms of gradient, on level to very gentle gradients and to a lesser extent gentle gradients, have been identified by the survey. However, in general, the use of the moderate to steeply inclined slopes is anticipated to have been very low, with consequently a very low density of artefacts and potentially a shallow very low-density sub-surface deposit of artefacts expected. The spiritual/ceremonial use of Mt Sugarloaf may have contributed to minimal utilitarian activity in the locality (or portions of it), and a consequent very low density of artefacts.

The lower elevation and lower gradient north-western portion of the investigation area, much of which could not be surveyed due to property access restrictions, generally has a higher potential for deeper soils and therefore may host sub-surface deposits of artefacts. However, focused occupation is unlikely to have occurred in these areas due to the absence of higher-order watercourses. In this lower elevation area, a low to very low density of artefacts (in a sub-surface context) may occur that is generally consistent with background discard, and although a low frequency of activity areas (with consequent higher artefact density) may be present, will not represent focused occupation. The potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value to occur within these portions of the investigation area is generally low.

Bora/Ceremonial Sites:

Registered Aboriginal parties have identified a men's area within the investigation area, that is connected with initiation ceremonies. Although direct physical evidence of bora/ceremonial sites were not located, the potential for such evidence to occur within this area cannot be discounted. The potential for other physical evidence of bora/ceremonial sites to occur within the portions of the investigation area that were sampled (but not directly inspected) can be reassessed as low, given the comprehensive nature of the survey and the obtrusive nature of this site type and its general rarity.

There is low potential for bora/ceremonial sites to occur within the portion of the investigation area that could not be sampled due to access constraints.

Burials:

The potential for burial sites to occur within the investigation area was initially assessed as low to moderate, given the historical reports of burials in caves (Threlkeld in Gunson 1974). This assessment remains valid for the rock shelters within the area, given the limited potential of identifying this form of evidence through surface survey techniques alone. The potential for burial sites to occur outside of the rock shelters is reassessed as very low, but cannot be discounted.

Carved Trees:

No carved trees were identified within the heritage study area. The potential for carved trees to occur within the portions of the investigation area that were sampled (but not directly inspected) can be reassessed as very low, given the comprehensive nature of the survey and the obtrusive nature of this site type and its general rarity. There remains a low potential for carved tree sites to occur within the portion of the investigation area that could not be sampled due to access constraints, particularly where mature native trees exist.

Grinding Grooves:

Grinding groove sites had previously been recorded within the investigation area and as predicted, a number of additional sites were identified during the survey. The potential for further grinding groove evidence to occur within the portions of the investigation area that were sampled (but not directly inspected) can be reassessed as moderate to high, given that additional evidence may be obscured by sediment or vegetation/leaf litter. Similarly, additional grooves may be present at the recorded sites, which are currently obscured by sediment or vegetation/leaf litter. There remains a high potential for additional grinding groove sites to occur within the portion of the investigation area that could not be sampled due to access constraints, where suitable rock formations are present (particularly open sandstone bedrock in drainage depressions).

Lithic Quarry Sites:

No quarry sites were identified within the heritage study area. The potential for quarry sites to occur within the portions of the investigation area that were sampled (but not directly inspected) can be reassessed as low, given the comprehensive nature of the survey and results to date. There remains a low to moderate potential for quarry sites to occur within the portion of the investigation area that could not be sampled due to access constraints, where outcrops of tuff are present. The exploitation of pebbles derived from conglomerate within the investigation area cannot be discounted in any location, but minimal direct evidence may remain.

Middens:

No midden sites were identified within the heritage study area, consistent with initial predictions for a very low potential. The potential for midden sites to occur within the portions of the investigation area that were sampled (but not directly inspected) or within the area that could not be sampled due to access constraints can be reassessed as negligible, given the survey results and distance of the area from shellfish sources.

Mythological/Traditional Sites:

Consistent with initial predictions, specific knowledge of sites and places associated with ceremonies, spiritual/mythological beliefs or traditional knowledge, which date from the pre-contact period and have persisted until the present time within the heritage study area, have been disclosed by registered Aboriginal parties and supported by ethnohistorical evidence. The possibility cannot be excluded that other traditional or historical Aboriginal values or associations may exist that were not divulged to South East Archaeology by the persons consulted. It was not feasible to contact every single knowledge holder in the community. Registered Aboriginal parties also disclosed numerous associations with the study area of contemporary significance and cultural value.

Rock Shelters With Art, Deposits and/or Grinding Grooves:

No rock shelters with confirmed art, artefacts or grinding grooves were identified within the heritage study area, however 26 rock shelters with PADs were identified. Excavation of any of the identified PADs may reveal artefact deposits, which are presently obscured by sediment. The potential for additional rock shelters to occur within the portions of the investigation area that were sampled (but not directly inspected) can be reassessed as low, given the comprehensive nature of the survey and the obtrusive nature of this site type. The potential for rock shelters to occur within the portion of the investigation area that could not be sampled due to access constraints is very low, as this comprises low elevation terrain with limited potential for major rock formations.

Scarred Trees:

No scarred trees were identified within the heritage study area. The potential for scarred trees to occur within the portions of the investigation area that were sampled (but not directly inspected) can be reassessed as low, given the comprehensive nature of the survey and the obtrusive nature of this site type. There remains a low to moderate potential for scarred tree sites to occur within the portion of the investigation area that could not be sampled due to access constraints, particularly where mature native trees exist.

Stone Arrangements:

No stone arrangements were identified within the heritage study area, however Umwelt (2010) recorded stone arrangements along Sugarloaf Range to the south, and Threlkeld (in Gunson 1974) reports on the presence of stone arrangements around Mount Sugarloaf. There remains some potential for stone arrangements to occur within the portions of the investigation area that were sampled (but not directly inspected), although this potential can be reassessed as low. There remains a moderate potential for stone arrangement sites to occur within the portion of the investigation area that could not be sampled due to access constraints, particularly on crests.

6. ABORIGINAL CONSULTATION

The investigation area lies within the boundaries of the Awabakal Local Aboriginal Land Council (LALC) and within an area of interest to other Aboriginal persons and organisations.

The Aboriginal heritage impact assessment has involved a comprehensive program of consultation with the Aboriginal community that complies with the policy requirements of the OEH (refer to consultation database and relevant correspondence in Appendix 6). These requirements are specified in the OEH policy entitled *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010c).

Notwithstanding that the *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005) and the Director-General's Environmental Assessment Requirements for the Project reference the now outdated *Interim Community Consultation Requirements for Applicants* policy (DEC 2004), the assessment has proceeded in accordance with the 2010 guidelines. These were introduced on 12 April 2010 and supercede the 2004 policy, but effectively incorporate the same procedures.

The consultation requirements specified in the OEH *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010c) involve the following procedures (numbering follows the OEH guidelines):

4.1.2) In order to identify Aboriginal people who may have an interest in the investigation area and hold knowledge relevant to determining the cultural significance of Aboriginal objects or places, providing written notification of the project to the relevant DECCW Environment, Protection and Regulation Group (EPRG) regional office, LALC, Local Council and Catchment Management Authority (CMA), along with the Registrar of Aboriginal Owners under the *Aboriginal Land Rights Act 1983* (Department of Aboriginal Affairs), National Native Title Tribunal and Native Title Services Corporation Ltd (NTSCORP)[13] including the name and contact details of the proponent, the location and a brief overview of the proposed project, and a request for advice on the contact details of such Aboriginal people;

4.1.3) Providing written notification of the project directly to those Aboriginal persons/organisations that were identified in Procedure 4.1.2, along with the LALC, and placing an advertisement in a local newspaper circulated in the general location of the investigation area, explaining the project and its location. The notification includes the name and contact details of the proponent, the location and a brief overview of the proposal, a statement about the purpose of the consultation, an invitation for Aboriginal people with cultural knowledge relevant to the investigation area to register an interest and advice on privacy matters[14], with a minimum 14 day response period[15];

4.1.6) Providing a record of the names of each Aboriginal person who registered an interest along with a copy of that registration and the notification letter in Procedure 4.1.3 to the relevant DECCW EPRG regional office and LALC within 28 days of the closing date for registrations of interest;

[13] Procedures 4.1.2 - 4.1.7 are not required where an approved native title determination exists over the entire investigation area. In this event, consultation is only required with the native title holders.

[14] Procedure 4.1.5.

[15] Procedure 4.1.4.

4.2 & 4.3) Providing detailed information about the project, heritage impact assessment process and proposed heritage assessment methodology to all registered Aboriginal parties identified in Procedure 4.1, with a minimum 28 day response period for comments;

4.2 & 4.3) Considering any input received from the registered parties in finalising the heritage assessment methodology and process, and implementing the methodology in consultation with the registered Aboriginal parties. This included seeking input on knowledge of Aboriginal objects and places of cultural value to Aboriginal people within the investigation area and views on potential management strategies, and incorporated a field inspection of the investigation area;

4.3 & 4.4) Preparation of a draft Aboriginal heritage impact assessment report and seeking the views of registered Aboriginal parties on cultural values and potential management strategies through provision of a copy of the draft report to the registered parties, with a minimum 28 day response period for comments; and

4.3 & 4.4) Preparation of a final Aboriginal heritage impact assessment report that incorporates the input of the registered Aboriginal parties and the proponent's response to each submission made on the draft report, and making the final report available to the registered Aboriginal parties and the relevant LALC.

All consultation with the Aboriginal community is documented in Appendix 6 of this report.

Compliance with Procedure #4.1.2 of the OEH policy was achieved through correspondence forwarded to the relevant organisations by Phil Brown of Donaldson Coal on 15 June 2011. The following responses were received:

- The Registrar of Aboriginal Owners responded on 20 June 2011 advising that there are no Registered Aboriginal Owners for this area but that the Awabakal LALC may be able to assist further;
- The OEH responded on 20 June 2011 advising that 37 Aboriginal organisations or individuals should be contacted;
- Lake Macquarie City Council responded on 21 June 2011 advising that four Aboriginal organisations should be contacted (Awabakal LALC, Awabakal Traditional Owners Aboriginal Corporation, Bahtahbah LALC and Descendents of Awabakal Aboriginal Corporation) with Koompahtoo LALC heritage matters being addressed by the Awabakal LALC;
- Cessnock City Council responded on 30 June 2011 advising that Barkuma Neighbourhood Centre, Awabakal LALC and Mindaribba LALC should be contacted; and
- The Hunter - Central Rivers Catchment Management Authority responded on 18 July 2011 advising that it is not the CMAs role to address such a request, and that the OEH should be contacted.

The Native Title Tribunal was contacted and the registers searched. No Determinations of Native Title or registered Native Title Determination applications (Claimants) or Indigenous Land Use Agreements apply to the investigation area.

As a result of the OEH and Lake Macquarie City Council, Procedure #4.1.3 of the OEH consultation policy was then implemented by Tony Sutherland of Donaldson Coal writing on 28 June 2011 to the organisations named by the parties above, with an invitation to register an interest.

Advertisements were also placed in the Public Notices sections of the Maitland Mercury and Cessnock Advertiser on 29 June 2011 and The Post (Newcastle) on 2 July 2011 (refer to Appendix 6).

At the conclusion of these registration of interest procedures, 15 Aboriginal parties had registered an interest in the assessment, as listed in Table 10.

Table 10: Summary of registered Aboriginal parties involvement.

Registered Party	Date Registered	Sent Project Information, Methods and Selection Criteria	Responded to Methods and Selection Criteria	Engaged for Participation in Field Survey
Lower Hunter Wonnarua Council	24/6/11	25/7/11	22/8/11	5 weeks
Awabakal Traditional Owners Aboriginal Corporation	27/6/11	25/7/11	24/8/11	5 weeks
Awabakal Descendants Traditional Owners Aboriginal Corporation	27/6/11	25/7/11	21/8/11	5 weeks
Yarrawalk (a division of Tocomwall Pty Ltd)	27/6/11	25/7/11	20/8/11	5 weeks
Awabakal LALC	29/6/11	25/7/11	24/8/11	5 weeks
Mindaribba LALC	1/7/11	25/7/11	-	-
Wonn 1 Contracting	3/7/11	25/7/11	24/8/11	1 week
Yinarr Cultural Services	3/7/11	25/7/11	22/8/11	1 week
Cacatua Culture Consultants	5/7/11	25/7/11	24/8/11	1 week
Wonnarua Nation Aboriginal Corporation	6/7/11	25/7/11	-	-
Keepa Keepa Elders Group	6/7/11	25/7/11	-	-
Wonnarua Culture Heritage	7/7/11	25/7/11	24/8/11	1 week
Gimbay Gatigaan Aboriginal Corporation	8/7/11	25/7/11	17/8/11	1 week
Widescope Indigenous Group Pty Ltd	10/7/11	25/7/11	-	-
Gidawaa Walang	11/7/11	25/7/11	24/8/11	1 week

Compliance with procedure #4.1.6 of the OEH consultation policy was achieved on 11 August 2011 by providing copies of the required information to the OEH and Awabakal and Mindaribba LALCs. Several parties had requested that their responses be kept confidential, and therefore these details were not forwarded to the OEH or LALCs.

As per procedures 4.2 and 4.3 of the OEH consultation policy, detailed information about the Project and the proposed (draft) methodology were forwarded to all registered parties on 25 July 2011 with a request for comment by 24 August 2011. Verbal confirmation of receipt of this information was obtained from every party. The proponent's selection criteria for completion with supporting documentation (eg. insurance), for those registered parties wishing to be considered for paid participation in field inspections, was also forwarded to every party with the Project information and methodology.

Responses to the methodology and/or selection criteria for those registered parties wishing to be considered for paid participation in the investigation were received from 11 of the 15 registered parties, as listed in Table 10 and below:

- Gimbay Gatigaan Aboriginal Corporation, Yinarr Cultural Services, Lower Hunter Wonnarua Council, Wonn 1 Contracting, Gidawaa Walang, Awabakal LALC and Wonnarua Culture Heritage sent a response to the selection criteria, but made no comment on the proposed methodology;

- Cacatua Culture Consultants sent a response to the selection criteria and agreed with the proposed methodology;

- Yarrawalk (a division of Tocomwall Pty Ltd) sent a response to the selection criteria and agreed with the proposed methodology, and requested that their response be kept confidential (as such, relevant sections have not been included within Appendix 6);

- Awabakal Descendants Traditional Owners Aboriginal Corporation (ADTOAC) sent a response to the selection criteria and agreed with the proposed methodology, but requested that inspection for scarred trees also be made widely within the underground investigation area on the basis that they may be subject to impacts from changes to underground aquifers, and that much of their response be kept confidential. These requests were addressed through clarification via email and a minor amendment to methodology, and non-inclusion of relevant sections within Appendix 6; and

- Awabakal Traditional Owners Aboriginal Corporation (ATOAC) sent a response to the selection criteria and agreed with the proposed methodology, but requested some further information such as previously recorded sites and an estimate of the number of days for the survey, and that much of their response be kept confidential. These requests were addressed by providing clarification on the methodology, a copy of the final methodology and a copy of all OEH records for previously recorded sites within the investigation area, and non-inclusion of relevant sections within Appendix 6.

Based on the responses to the selection criteria and in consideration of the OEH consultation requirements, Donaldson Coal engaged representatives from every registered party that responded to the selection criteria and provided evidence of insurance, for paid participation in the field survey. Due to safety and logistical issues, with the rugged terrain and limited number of heritage survey teams (two), the registered parties involvement was coordinated through a roster system. The roster system was also based on the responses to the selection criteria, and involved extending an invitation to five groups (Awabakal Descendants Traditional Owners Aboriginal Corporation, Awabakal Traditional Owners Aboriginal Corporation, Awabakal LALC, Lower Hunter Wonnarua Council and Yarrawalk) for participation in the duration of the field survey, and the remaining six groups for participation in one week each of the survey (refer to Table 10 and Appendix 6).

The field survey was conducted over 24 days between 12 September and 27 October 2011 by archaeologists from South East Archaeology (Stephen Free and Leigh Bate), accompanied on every day by representatives of the registered parties. Full details of the registered parties involvement in the survey are presented in the consultation database in Appendix 6. Through the course of the survey, assistance was provided by the following individuals:

- Lower Hunter Wonnarua Council (LHWC) - Dean Miller and Daniel Scott;

- Awabakal Traditional Owners Aboriginal Corporation - Jodie Wilson;

- Awabakal Descendants Traditional Owners Aboriginal Corporation - Shane Frost;

- Yarrawalk - Jason Blair and Danny Franks;

- Awabakal LALC - Darren Carney;
- Wonn 1 Contracting - Adam Clarke;
- Yinarr Cultural Services - Norm Archibald and Kiah Archibald;
- Cacatua Culture Consultants - Jason Brown;
- Gimbay Gatigaan Aboriginal Corporation - Lenny Quinlan and Ben Quinlan;
- Gidawaa Walang - Jake Dacey and Nikita Butt.

On several days, representatives of organisations that had been invited to send a representative were unable to attend. Despite being invited, Wonnarua Culture Heritage did not provide a representative at all for the week in which they had been engaged for. On other days, progress was limited due to adverse weather conditions, which created unacceptable safety risks in the rugged terrain.

Several organisations (Yinarr Cultural Services and Yarrawalk) requested that a second, junior representative attend in a voluntary capacity. Notwithstanding logistical and safety issues, both requests were accommodated by the Project team.

Subsequent to the completion of the field survey and preliminary draft report, all registered Aboriginal parties were invited to attend a site inspection and meeting to discuss the survey results, cultural values and impact assessment. The inspection and meeting occurred on 27 January 2012, with many registered parties in attendance (refer to consultation database and minutes in Appendix 6, and Plate 7, Appendix 5).

Representatives of nine of the 15 registered parties attended the meeting and site inspection. Awabakal Descendants Traditional Owners Aboriginal Corporation and Gimbay Gatigaan Aboriginal Corporation sent apologies advising that they were unable to attend on the day, but were very interested in participating further. A second meeting has been arranged to address their request (refer to Table 11). Wonnarua Nation did not attend and requested a separate meeting, which was also arranged. Despite being invited, the Awabakal LALC, Mindaribba LALC and Widescope Indigenous Group Pty Ltd did not attend.

Significant and widespread traditional, historical and contemporary cultural values and associations with the investigation area have been identified by the registered Aboriginal parties (and are also known through ethnohistorical evidence - refer to Section 3.3.8). Some of these relate to physical objects, including items that qualify as *Aboriginal objects* as defined under the *National Parks and Wildlife Act 1974*. However, many relate to intangible values, associations or landscape features that do not qualify as *Aboriginal objects.*

These associations and cultural values are discussed in Section 5.2.4 and relate to:

- Tasman Extension Investigation Area;
- Men's Area;
- Grinding Groove Area;
- Keepa Keepa Pathways Area;
- Sugarloaf Pathways;
- Sugarloaf and the Supreme Being, 'Koe-in';
- Sugarloaf and the Supernatural Spirit 'Puttikan';

- Burials in a cave on the side of Mount Sugarloaf;
- Mount Sugarloaf as a heirophany between the secular world and the sky-world;
- Presence of quartz and associations with the Clever Man;
- Use of subsistence and other resources;
- Ongoing cultural and spiritual connection;
- Contemporary significance of Aboriginal objects.

It is noted that certain places and values are the subject of gender restrictions and/or are of a secret/sacred nature. Consistent with the requests of the Aboriginal informants, photographs, locations and detailed information of sensitive areas/features have been excluded from this report.

The possibility cannot be excluded that other Aboriginal values or associations to those described may exist with the locality of the investigation area, and were not divulged to South East Archaeology by the persons consulted.

A number of issues have been raised by the registered Aboriginal parties during the course of the assessment and subsequent consultation. The key issues raised and how they have been addressed are outlined in Table 11.

Compliance with procedures 4.3 and 4.4 of the OEH consultation policy was achieved by providing copies of the draft heritage assessment report to each of the registered Aboriginal parties, with a request for their comment, followed by preparation of a final report incorporating and addressing any input received.

Further meetings were arranged with the registered Aboriginal parties to discuss the assessment and draft report and to seek their further input on the cultural values and management of the heritage evidence.

At the request of the Wonnarua Nation, a separate meeting was held with Mr Laurie Perry of this organisation on 21 March 2012. Meeting notes from this meeting and correspondence tabled by Mr Perry are presented in Appendix 6. The key issues raised by Mr Perry are addressed in Table 11 (issue #47 - 48). The key issue raised by Mr Perry was his proposal to develop an "Aboriginal Cultural Heritage Assessment" for the Project. A recommendation has been presented to address this and similar requests from other registered parties (refer below and to Section 11).

A second meeting was held on 22 March 2012 to discuss the draft heritage report and to seek further input from the registered parties on cultural values, significance and management strategies. All registered parties were invited to attend this meeting and many did. Meeting notes from this meeting and the attendance list are presented in Appendix 6. The key issues raised during the meeting are addressed in Table 11 where they were not addressed as documented in the meeting notes (issue #49 - 51; where feasible the issue number is also noted on the meeting notes in Appendix 6).

The meeting of 22 March 2012 was dominated by three key issues:

a) Anxiety about the potential subsidence impacts on the grinding groove sites, rock shelters and areas of cultural value ('Issue #49');

b) A desire for greater inclusion and expression of cultural values within the heritage assessment ('Issue #50'); and

c) Concern about the issue of Native Title, eminating from the newspaper advertisement for the Mining Lease that appeared in the previous day's media, and the effect of that on the cultural heritage assessment process ('Issue #51').

A number of measures are being implemented to minimise and mitigate the potential impacts of subsidence on the Aboriginal sites and cultural values ('Issue #49') (refer to Section 11). The key measures include implementation of Subsidence Control Zones and monitoring, along with alteration to the mine plan to avoid impacts to certain sites/cultural areas. Provisions are also to be included in an AHMP for further alterations to the mine plan to protect sites and cultural areas should monitoring indicate that impacts are in excess of predictive levels. Notwithstanding these measures, the anxiety of the registered Aboriginal parties with respect to the potential for subsidence is acknowledged.

Every effort has been made during the ten month consultation process for this Project to involve the Aboriginal community in the Project, identify cultural values and cultural significance, and seek input into the heritage assessment and heritage management strategies ('Issue #50'). This has been acknowledged by a number of the registered parties. Consultation and cultural values are documented throughout this report, particularly in Sections 3.2, 3.3, 4, 5.2, 6, 7, 10.2 and 11, and Appendix 6. Notwithstanding these efforts, in order to further address this issue, Donaldson Coal has agreed to facilitate and fund further documentation of the cultural values of the Project area by the registered parties. A recommendation to this effect is included in Section 11. In addition, a further week was allowed for the provision of comments on the draft report.

A newspaper advertisement for the Mining Lease Application 416 concerning the issue of Native Title (Section 29 notice) appeared in local media on 21 March 2012 ('Issue #51'). The Native Title issue raised considerable consternation among many registered parties, largely on the grounds that under Section 4.1.1 of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010c), proponents are not required to comply with the remainder of Section 4.1 of the consultation policy for areas where there is an approved determination of Native Title (and consult only with the Native Title holders). At the meeting on 22 March it was explained to the registered parties that:

- The timing of the media advertisement was outside of the control of Donaldson Coal (it was determined by the Department of Resources and Energy);
- Part of the Project area will not be affected by Native Title (areas outside of Sugarloaf SCA and Heaton SF) and therefore the OEH consultation process as conducted is unaffected;
- Irrespective of any Native Title claims over other portions of the Project area (Sugarloaf SCA and Heaton SF) these may take years to resolve and are independent of the NSW planning approvals process and consultation process for the Project application; and
- The potential that a party may successfully claim Native Title in those specific areas (Sugarloaf SCA and Heaton SF) is a risk that Donaldson Coal must accept and manage in the future in accordance with relevant guidelines, policies and statutory processes at that time.

A recommendation is included in Section 11 to include provisions in the AHMP to enable a review of strategies in any areas to which a successful Native Title Claim may subsequently arise.

At the conclusion of the period for comments on the draft report, responses had been received from eight registered parties (ATOAC stated that they also responded on behalf of ADTOAC although no correspondence/confirmation from ADTOAC was provided). These are included in Appendix 6, and key issues relating to Aboriginal heritage are addressed below in Table 11 (issue #53 - 67; where feasible the issue number is noted on the correspondence provided by the registered party in Appendix 6).

Gimbay Gatigaan Aboriginal Corporation responded to the draft report on 4 April 2012 and provided additional information about their cultural connections with the area. Gimbay Gatigaan endorsed the recommendation for a cultural values study with an educational focus.

Keepa Keepa Elders responded to the draft report on 4 April 2012 and generally agreed with the recommendations presented. Keepa Keepa Elders stressed the high cultural significance of the sites and Project area, and sought continued involvement in the Project.

Wonn 1 Contracting (Mr Arthur Fletcher) responded to the draft report on 4 April 2012 and generally agreed with the recommendations presented. Mr Fletcher also stressed the high cultural significance of the sites and Project area, and sought continued involvement in the Project.

Tocomwall Pty Ltd responded to the draft report on 5 April 2012 supporting the use of SCZs and monitoring and requesting continued involvement in the consultation process and mitigation and management works. Tocomwall highlighted the need for inclusion of a commitment to an Aboriginal cultural values assessment of the investigation area within the AHMP prepared for the Project ('Issue #50'). Donaldson Coal has agreed to facilitate and fund further documentation of the cultural values of the Project area by those registered Aboriginal parties with cultural knowledge and traditional connections with the Project area and a recommendation to this effect is now included in Section 11.

ATOAC responded to the draft report on 5 April 2012 (including a statement that their comments were also on behalf of ADTOAC, although no correspondence/confirmation from ADTOAC was provided) expressing concern at their perceptions of a lack of consultation, the consultation process not being undertaken in accordance with the guidelines, the report not being prepared in accordance with the guidelines or Director-General's requirements, their not having been provided with relevant documentation and social impacts and cultural values generally not being considered. A second version of this response with some grammatical errors amended was provided by ATOAC on 10 April 2012. The statements made by the ATOAC are disputed (refer to Table 11, issue #61 - 63). ATOAC provided further comments on the draft report on 11 April 2012, after the closing date for submissions. ATOAC requested that this correspondence remain confidential. As a result, this response has not been included in Appendix 6.

The Lower Hunter Wonnarua Council responded to the draft report on 5 April 2012 and stressed the high cultural significance of the sites and Project area, and sought continued involvement in the Project. The Lower Hunter Wonnarua Council were satisfied with the recommendations of the report, inclusive of the cultural values study, however stated that this study should be limited to those parties with cultural knowledge of the area. An existing ILUA between the Wonnarua People and Wonnarua Nation and Tasman Mine was noted.

Copies of the final report will be made available to the registered Aboriginal parties.

Table 11: Summary of registered Aboriginal parties key comments and how they have been addressed by the Project.

Issue #	Issue	Raised by	Project Team Response
1	In response to draft methodology, requested that inspection for scarred trees also be made widely within the underground investigation area on the basis that they may be subject to impacts from changes to underground aquifers, and that much of their response be kept confidential	Shane Frost (ADTOAC)	SEA clarified the methodology, made a minor amendment to the methodology, and certain confidential information was excluded from this report.
2	In response to draft methodology, requested further information such as about previously recorded sites, and an estimate of the number of days for the survey, and that much of their response be kept confidential	Kerrie Brauer (ATOAC)	SEA clarified the methodology, a copy of the final methodology and a copy of all OEH records for previously recorded sites within the investigation area was provided, and certain confidential information was excluded from this report.
3	Enquiry as to why organisation wasn't engaged for paid participation for the whole duration of the survey.	Kathy Steward Kinchela (Yinarr Cultural Services)	Explained that the assessment process for the selection of groups for paid involvement was based on their responses against the selection criteria.
4	Request that Elders and others be allowed to inspect sites found within the Project area.	Scott Franks (Yarrawalk)	Agreed to facilitate/arrange this after completion of the survey. Inspection occurred on 27 January 2012.
5	Request that a second, unpaid junior representative be allowed to participate in the survey.	Scott Franks (Yarrawalk), Kathy Steward Kinchela (Yinarr Cultural Services)	Agreed and provisions were made to facilitate this occurring during the survey.
6	Concern about impacts to an artefact site within an existing road that occurred from road works associated with a drilling program, after the site had been recorded.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Donaldson hosted a meeting with the stakeholders to discuss. Works immediately halted and further investigation of drilling to be conducted, including another inspection of areas of concern. OEH notified.
7	Concern about new sites that are located outside of present project area but within the current mining area, including possible subsidence impacts, along with minor impacts from stakes driven into the rock in several places (used for subsidence monitoring).	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Donaldson will allow interested groups to inspect recorded sites at existing mine to check on subsidence impacts. Further consideration of management of new sites identified within existing mine area to occur. Arrangements made for inspection in February, delayed to mid-March at request of one stakeholder.
8	Significance of quartz material in the investigation area (relationship to clever man) and dissatisfaction that materials were not recorded.	Dean Miller (LHWC) during survey.	The cultural values relating to the clever man (karadji man) and quartz has been documented (refer to Section 5.2.4).
9	Subsistence resources ('bush tucker) - Darren Carney willing to provide additional information for the Project report.	Darren Carney (Awabakal LALC) during survey.	Darren will be invited to submit further information in response to the draft report.
10	Copy of mine plan (including current approved areas) requested as concern about possible impacts to areas not assessed.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Project team to provide copy of mine plan to stakeholders. Recommendations presented to address potential impacts in extension area and existing approved mining area (refer to Sections 10 and 11).

Issue #	Issue	Raised by	Project Team Response
11	Men's area – all stakeholders requested a visit to the area as some had not been part of the recording team.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Project team facilitated this after completion of the survey. Inspection occurred on 27 January 2012. A further inspection will be arranged for March 2012 for Shane Frost if required.
12	All stakeholders requested future recording of the rock shelters that are located along the north east escarpment outside the study area and which relate to the men's area.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Project team to facilitate/arrange this after completion of the survey. Recommendations presented to address this issue (refer to Sections 10 and 11).
13	Report photographs – stakeholders stressed that photographs of certain areas should not be viewed by women.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Consistent with the requests of the Aboriginal informants, photographs, locations and detailed information of sensitive areas/features have been excluded from this report.
14	Dissatisfaction with involvement of female stakeholders. Concerns that registered parties sent out female participants and that they went into areas they shouldn't.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Cultural issue to be resolved between Aboriginal parties.
15	Confidential information for the report - stakeholders requested further discussion on restrictions to sensitive information.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Consistent with the requests of the Aboriginal informants, photographs, locations and detailed information of sensitive areas/features have been excluded from this report. Issue to be discussed further at draft report stage.
16	Requested an update on the drilling investigations and expressed concern that Awabakal LALC personnel previously inspecting these locations under due diligence had failed to identify artefact evidence.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Project team to review procedures for due diligence of drilling. New procedures to be developed for Project approval and implemented post approval (refer to Section 11).
17	Concerns expressed about lack of cultural knowledge and participation of some registered Aboriginal parties.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Noted.
18	Concerns expressed about lack of fitness and health and safety relating to participation of some registered Aboriginal parties.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Noted.

Issue #	Issue	Raised by	Project Team Response
19	Concerns expressed about lack of access to portion of investigation area.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Recommendation presented to address this issue by conducting detailed survey of area with restricted property access post-approval (refer to Sections 10 and 11).
20	Discussion and agreement of recommendation for Aboriginal Place for the Sugarloaf Conservation Area portion of the study area. Interpretive information, cultural tourism options, bush tucker trail discussed.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Project team to facilitate further discussion on these issues. Additional meeting arranged for March 2012.
21	Request for Aboriginal cultural awareness training for staff.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Recommendation presented for cultural awareness training to address this issue (refer to Sections 10 and 11).
22	Dissatisfaction with the survey being conducted by two teams and request for all stakeholders to visit all sites.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Project team facilitated this after completion of the survey. Inspection occurred on 27 January 2012. Further inspection will occur in March 2012 if required. No stakeholders expressed dissatisfaction with this aspect of the draft methodology.
23	Discussion on non-recording of sandstone bowls near grinding grooves that were utilised for making medicine and boiling water.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	The presence of natural hollows/basins in the sandstone bedrock, particularly around grinding groove sites, has been documented (refer to Section 5).
24	Discussion on employment/scholarship opportunities.	Shane Frost (ADTOAC), Dean Miller (LHWC), Jason Blair, Danny Franks (Yarrawalk), Darren Carney (Awabakal LALC) during survey.	Donaldson advised that there are some programs already in place. Project team to facilitate further discussion on these issues.
25	Advised of Keepa Keepa's agreement with Forests NSW and and concerns this not being taken into consideration and lack of feedback after earlier consultation with Donaldson staff.	Allan Smith (Keepa Keepa Elders Group)	Donaldson Coal representatives met with Keepa Keepa representatives on 3 February 2012 to discuss these issues.
26	Request to meet separately rather than at meeting of all stakeholders planned for 27 January 2012.	Laurie Perry (Wonnarua Nation)	Project team agreed to meet separately, but also encouraged participation in meeting of 27 January 2012. Meeting to be arranged for March 2012.
27	Request for further involvement/input, as unable to attend meeting of 27 January 2012.	Jaye Quinlan (Gimbay Gatigaan)	Project team explained opportunties for further involvement, including in response to draft report, and will be invited along with all registered parties to further meeting in March 2012.
28	Request for further involvement/input, as unable to attend meeting of 27 January 2012 and not available until 10 March.	Shane Frost (ADTOAC)	Project team arranging further meeting for mid-late March 2012.

Issue #	Issue	Raised by	Project Team Response
29	Request for further information on subsidence monitoring stakes.	Dean Miller (LHWC) during meeting 27/1/12	Project team undertook to investigate and provide further information. Arrangements made with Mr Dean Miller for an inspection in February, subsequently delayed to mid-March at Mr Miller's request.
30	Request for copy of mine plan and LIDAR data.	Scott Franks (Yarrawalk) during meeting 27/1/12	Project team undertook to provide requested information.
31	Concern that previous agreement that mining would not occur under Mt Sugarloaf was now proposed to be broken.	Dean Miller (LHWC) during meeting 27/1/12	Project team advised that mining would not occur under Mt Sugarloaf as per previous agreement/understanding, and that adjacent areas along the Sugarloaf Range would be protected in Subsidence Control Zones.
32	Concern that relevant approvals had not been obtained for the existing mine.	Dean Miller (LHWC) during meeting 27/1/12	Project team advised that all relevant approvals had been obtained.
33	Concern about how the proposed merger of Gloucester Coal and Yancoal would affect Gloucester's management of Aboriginal heritage, as considerable dissatisfaction with Yancoal's approach.	Scott Franks (Yarrawalk) during meeting 27/1/12	Noted.
34	Request for copy of powerpoint presentation at meeting.	Kerrie Brauer (ATOAC)	Copy provided by Project team to all registered parties.
35	Concern about request by some stakeholders for separate meetings. View expressed that future meetings should involve all stakeholders.	Dean Miller (LHWC) during meeting 27/1/12	Noted.
36	Concern about potential for gas emissions during mining.	Dean Miller (LHWC) during meeting 27/1/12	Project team explained that assessments indicate that gas emissions will be minimal.
37	Enquiry as to why some organisations weren't engaged for paid participation for the whole duration of the survey.	Kathy Steward Kinchela (Yinarr) during meeting 27/1/12	Explained that the assessment process for the selection of groups for paid involvement was based on their responses against the selection criteria, that all groups that responded were involved in the survey to some extent, and that additional site inspections were organised for those that weren't (such as on 27/1/12).
38	Concern about potential subsidence impacts on Aboriginal heritage sites and values.	Various parties during meeting 27/1/12	Project team advised that subsidence assessment was being completed (Mr Steve Ditton was present at the meeting to explain the assessment). Recommendations presented to address this issue through implementation of Subsidence Control Zones and monitoring (refer to Sections 10 and 11).
39	Further meeting/workshop requested to discuss draft report and conduct additional site inspection.	Dean Miller (LHWC) and other parties during meeting 27/1/12	Project team agreed to facilitate another meeting/inspection after draft report made available to registered parties. Arrangements made for meeting in March 2012.
40	Need to respect and manage traditional protocols/confidentiality issues in the report.	Scott Franks (Yarrawalk) during meeting 27/1/12	Consistent with the requests of the Aboriginal informants, photographs, locations and detailed information of sensitive areas/features have been excluded from this report.
41	Issue of cultural use of springs.	Dean Miller (LHWC) during meeting 27/1/12	Natural features, apart from one recently modified by historical (non-indigenous) activity. Impacts to be assessed in groundwater report.

Issue #	Issue	Raised by	Project Team Response
42	Request for access to all site project plans and reports.	Dean Miller (LHWC) during meeting 27/1/12	Will be made available through Environmental Assessment lodgement process.
43	Inquiry as to whether Aboriginal monitoring of construction would occur within the surface facilities area. Concern expressed about existing protocols due to perceived inadequacy of Awabakal LALC inspections.	Kerrie Brauer (ATOAC) during meeting 27/1/12	Recommendations presented to address this issue (refer to Sections 10 and 11).
44	Concern about Keepa Keepa area and location of burial.	Arthur Fletcher (Wonn1) during meeting 27/1/12	Location inspected and determined to be marginally outside of investigation area. Further assessment to be undertaken by historical heritage team.
45	Request for copy of historical heritage report when complete.	Kerrie Brauer (ATOAC) during meeting 27/1/12	Project team agreed to make available.
46	Concern about Lucas Drilling activities observed on eastern side of Sugarloaf Range Road.	Dean Miller (LHWC) and other parties during meeting 27/1/12	Area inspected by Awabakal LALC under existing Donaldson protocal, and also subject to sampling under current survey. No heritage evidence present, visibility conditions very low, impacts confined to small area and further action not warranted.
47	Request for study on Aboriginal cultural values to be conducted by Wonnarua Nation.	Laurie Perry (Wonnarua Nation) at meeting 21/3/12.	Recommendation presented to address this and similar requests from other registered parties (refer to Section 11).
48	Not acceptable to consult Aboriginal people from other areas who have little or no cultural knowledge and/or are not the Traditional Owners.	Laurie Perry (Wonnarua Nation) at meeting 21/3/12.	Noted. Project team explained the OEH and DP&I consultation process.
49	Concern about potential subsidence impacts on Aboriginal heritage sites and values.	Dean Miller (LHWC) and most other parties during meeting 22/3/12 and in responses to draft report.	Subsidence assessment has been completed (refer to Section 9 and Appendix 7). Rock formations in men's area reassessed. Recommendations presented to address subsidence impacts through implementation of Subsidence Control Zones and monitoring, along with alteration to mine plan to avoid impacts to certain sites/cultural areas (refer to Sections 10 and 11). Provisions to be included in AHMP for further alterations to mine plan to protect sites/cultural areas should subsidence predictions prove to be inaccurate.
50	A desire for greater inclusion and expression of cultural values within the heritage assessment.	Most parties during meeting 22/3/12 and in responses to draft report.	Every effort has been made during the ten month consultation process for this Project to involve the Aboriginal community in the Project, identify cultural values and cultural significance, and seek input into the heritage assessment and heritage management strategies. This has been acknowledged by a number of the registered parties. Consultation and cultural values are documented throughout this report, particularly in Sections 3.2, 3.3, 4, 5.2, 6, 7, 10.2 and 11, and Appendix 6. Notwithstanding, in order to further address this issue, Donaldson Coal has agreed to facilitate and fund further documentation of the cultural values of the Project area by the registered parties. A recommendation to this effect is included in Section 11.

Issue #	Issue	Raised by	Project Team Response
51	Concern about the issue of Native Title, eminating from the newspaper advertisement for the Mining Lease that appeared in the previous day's media, and the effect of that on the cultural heritage assessment process.	Most parties during meeting 22/3/12.	Explained that the timing of the media advertisement was outside of the control of Donaldson Coal, part of the Project area will not be affected by Native Title (areas outside of Sugarloaf SCA and Heaton SF) and therefore the OEH consultation process as conducted is unaffected, irrespective of any Native Title claims these may take years to resolve and are independent of the planning approvals process and consultation process, and the potential that a party may successfully claim Native Title is a risk that Donaldson Coal must accept and manage in the future. Notwithstanding, a recommendation is included in Section 11 to include provisions in the AHMP to enable a review of strategies in any areas to which a successful Native Title Claim may subsequently arise.
52	Query about the impact of subsidence on the water flow over grinding groove sites.	Dean Miller (LHWC) during meeting 22/3/12. Wonn 1 in response to draft report 4/4/12.	The surface water and geomorphology assessments for the Project have concluded that there will be no more than negligible impacts to stream baseflow and no more than negligible changes to stream geomorphology within third order streams or within first or second order streams associated with groundwater dependant ecosystems, steep slopes or cliff lines.
53	Keepa Keepa Indigenous Reserve is present within Heaton SF and covers a larger area than shown in Figure 12.	Keepa Keepa Elders in response to draft report 4/4/12.	The area shown in Figure 12 is not intended to represent any formal boundary of the Reserve. Enquiries made by the Project team with Forests NSW indicate that the agreement between Keepa Keepa Elders and Forests NSW has expired.
54	All sites within the investigation area are of high cultural significance, with particular concern for sites within the Keepa Keepa Reserve.	Keepa Keepa Elders in response to draft report 4/4/12.	Acknowledged in significance assessment (refer to Section 7.2). Recommendations to mitigate and minimise Project impacts presented in Section 11.
55	Consider that insufficient survey was conducted over the investigation area and that hundreds more sites will be present.	Keepa Keepa Elders in response to draft report 4/4/12. Wonn 1 in response to draft report 4/4/12.	The survey sampled the geographic extent of the investigation area, apart from the 10% area in which property access was not available - recommendations are presented to address this issue in Section 11. The survey coverage directly sampled 5% of the investigation area (not 0.35%), and the coverage for obtrusive site types such as rock shelters was significantly greater than this (refer to Sections 4 and 5.1). No survey ever samples 100% of an investigation area and it is argued here that the coverage represents a sufficient sample to test the predictive model and identify with a reasonable degree of confidence the nature and distribution of heritage evidence present. The potential for further evidence to occur is addressed in Section 5.3.8.
56	Generally agreed with all recommendations and requested continued involvement in consultation process and mitigation and management works.	Keepa Keepa Elders in response to draft report 4/4/12. Wonn 1 in response to draft report 4/4/12.	Acknowledged, recommendations incorporated to address this issue in Section 11.

Issue #	Issue	Raised by	Project Team Response
57	Entire Mt Sugarloaf area is sacred to Aboriginal people.	Wonn 1 in response to draft report 4/4/12.	Acknowledged, refer to Section 7.2.
58	All sites within the investigation area are of high cultural significance.	Wonn 1 in response to draft report 4/4/12. LHWC in response to draft report 5/4/12.	Acknowledged in significance assessment (refer to Section 7.2).
59	The sites and places within the investigation area are of high cultural significance to Wonnarua People.	Tocomwall in response to draft report 5/4/12.	Acknowledged, refer to Section 7.2.
60	Support the use of SCZs and monitoring and requested continued involvement in consultation process and mitigation and management works.	Tocomwall in response to draft report 5/4/12.	Acknowledged, refer to Section 11.
61	Perception that ATOAC has been excluded from the consultation process and the process is not consistent with the OEH consultation guidelines.	ATOAC in response to draft report 5/4/12.	Not accepted. ATOAC has been openly consulted in accordance with the OEH guidelines for the 10 months of the Project investigation, with numerous invitations and efforts made to involve ATOAC and provide an opportunity for them to identify cultural values and cultural knowledge relevant to the investigation. The consultation process is documented in Section 6 and Appendix 6.
62	Perception that the draft report is not compliant with relevant Director-General's requirements or OEH or DP&I policies and guidelines.	ATOAC in response to draft report 5/4/12.	Not accepted. This report has been prepared in accordance with the Director-Generals requirements and relevant policies and guidelines as outlined in Sections 1.2 and 4 and throughout the report.
63	Complaint that not provided with copies of Director-General's requirements or subsidence assessment.	ATOAC in response to draft report 5/4/12.	Not accepted. These documents were provided as Appendices 1 and 7 of the draft report.
64	Women should never have been involved in the survey. Very wrong for ATOAC to have sent a women sites officer there during the survey.	LHWC in response to draft report 5/4/12.	Noted.
65	Project area was Wonnarua territory, and Awabakal were a sub-group of the Wonnarua People.	LHWC in response to draft report 5/4/12.	Noted.
66	Wonnarua People and Wonnarua Nation have an ILUA with Tasman Mine.	LHWC in response to draft report 5/4/12.	Noted.
67	Satisfied with recommendations of report including with the cultural values study, however this study should be limited to those with cultural knowledge of the area, not stakeholders who do not have such knowledge.	LHWC in response to draft report 5/4/12.	Acknowledged, recommendations incorporated to address this issue in Section 11.
68	Request for a detailed assessment of the food resources of the area.	Most parties during meeting 22/3/12.	The food resources in the Project area are documented in Sections 2.4 and 3.3 of the report. In order to address this issue further, a list of the flora species recorded in the Project area by Driscoll (2012) is provided in Appendix 8.

7. SIGNIFICANCE ASSESSMENT

7.1 Criteria

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

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

I. Scientific (Archaeological) value;

II. Importance to Aboriginal people (Cultural value);

III. Educational value;

IV. Historic value; and

V. Aesthetic value.

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

Scientific (Archaeological) Value:

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

Research Potential:

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

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

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

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

a) Potential to address locally specific research questions;

b) Potential to address regional research questions;

c) Potential to address general methodological or theoretical questions;

d) Potential deposits; and

e) Potential to address future research questions.

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

Representativeness:

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

The main criteria used for assessing representativeness include:

a) The extent to which the evidence occurs elsewhere in the region;

b) The extent to which this type of evidence is subject to existing or potential future impacts in the region;

c) The integrity of the evidence compared to that at other localities in the region;

d) Whether the evidence represents a prime example of its type within the region; and

e) Whether the evidence has greater potential for educational or demonstrative purposes than at other similar localities in the region.

Nature of Evidence:

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

a) Presence, range and frequency of stone materials;

b) Presence, range and frequency of artefact types; and

c) Presence and types of other features.

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

Integrity:

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

The criteria used in assessing integrity include:

a) Horizontal and vertical spatial distribution of artefacts;

b) Preservation of intact features such as midden deposits, hearths or knapping floors;

c) Preservation of site contents such as charcoal and shell which may enable accurate direct dating or other analysis; and

d) Preservation of artefacts which may enable use-wear/residue analysis.

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

Aboriginal (Cultural) Significance:

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

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

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

Educational Value:

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

Historic Value:

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

Aesthetic Value:

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

7.2 Significance of Heritage Evidence Within the Investigation Area

The significance of the Aboriginal heritage sites, cultural areas/values and potential deposits within or immediately adjacent to the investigation area has been assessed in relation to the criteria presented in Section 7.1. The significance assessment is summarised in Table 12 and presented for each site in Table 13. The significance assessment involves ratings of 'low', 'low-moderate', 'moderate', 'moderate-high' and 'high'. Key criteria are included in Table 13 where relevant. The assessment has been conducted within both local (abbreviated as 'L') and regional ('R') contexts.

It is noted that all Aboriginal heritage is of interest and contemporary value to the Aboriginal community. Aboriginal heritage evidence represents a tangible link with the traditional past and with the lifestyle and values of community ancestors. The Aboriginal community themselves are in the best position to identify the levels of cultural significance and the stakeholders have been invited throughout the course of the Project, the field investigation and two stakeholder meetings to provide input into the cultural significance of the specific sites and areas.

The response of many registered parties is that all identified sites and cultural values, along with the Project area itself, are of high cultural significance (refer to Table 13 and Appendix 6). Registered parties were generally reluctant to engage in any comparative or ranking process (as is inherent within any system of significance assessment) and preferred to identify all sites and the Project area as being of high cultural significance (for example, refer to Tocomwall, Keepa Keepa Elders, Lower Hunter Wonnarua Council and Wonn 1 correspondence in Appendix 6). Mr Arthur Fletcher (Wonn 1) identified in his response to the draft report that "the whole Mt Sugarloaf area is considered to be sacred to the Aboriginal people". Mr Thomas Miller (Lower Hunter Wonnarua Council) identified that all the sites within the Project area are interconnected and also connected to sites at Lake Macquarie and Minmi and Stockrington and elsewhere, and that the cultural significance of these sites and the whole project area is very high. Notwithstanding the above, several parties identified three rock formations within the Men's Area as being the most culturally significant individual features in the Project area.

Table 12: Summary of significance assessment of Aboriginal sites, cultural areas/values and potential deposits within or immediately adjacent to the investigation area.

	Site Type					
Overall Significance	Cultural area/value	Open artefact site	Open grinding groove	Open grinding groove and open artefact site	Rockshelter with PAD	**Total**
high local, high regional	6		1			7
high local, low-moderate regional	2		1	1		4
moderate-high local, low regional		1	1		2	4
moderate local, low regional	2	1	3		5	11
low-moderate local, low regional		1	18		2	21
low local, low regional	1	35	11		17	64
uncertain	1					1
not assessable	1					1
Total	13	38	35	1	26	113

The key conclusions of the significance assessment are presented below for each site type. In overall terms for the sites that comprise physical objects under the NP&W Act or potential deposits (ie. the grinding grooves, artefact scatters and rock shelters with PADs), three (3%) are assessed as being of high significance within a local context, four (4%) of moderate to high significance within a local context, nine (9%) of moderate significance within a local context, 21 (21%) of low-moderate significance within a local context, and 63 (63% of low significance within a local context. One of these sites is assessed as being of high significance within a regional context, and two sites of low-moderate significance within a regional context. All of these sites were considered to be of high cultural value by registered Aboriginal parties.

Open Artefact Sites

One of the open artefact occurrences is assessed as being of moderate to high significance within a local context (TE157/A), one as being of moderate significance (TE85/A), one of low to moderate significance (TE135/A), and 35 of low significance (refer to Tables 12 and 13).

Artefact scatters and isolated artefacts are common occurrences throughout the region and are therefore generally of low representative value. The sites tended to be of lower significance if levels of ground disturbance were high (and therefore the integrity of any evidence low), there was a limited range and nature of artefact evidence, and/or the potential for deposits of research value was low. Almost every open artefact site was located in areas of ground disturbance associated with vehicle tracks and/or powerline easements, and only three sites contain greater than ten artefacts.

The artefact sites tended to be of higher significance where there was a broader range and nature of evidence present, a higher potential for deposits of research value and/or a strong association with the cultural pathways (corridors for movement).

Research potential relates to the probability that the sites contain sub-surface deposits that may yield evidence useful in addressing locally relevant research questions, such as those relating to occupation patterns. Apart from questions of interest associated with the cultural pathways, much of the investigation area comprises moderate to steep gradients with limited potential for evidence of focused occupation. The lower elevation and lower gradient north-western portion investigation area, much of which could not be surveyed due to access restrictions, generally has a higher potential for deeper soils and therefore may host sub-surface deposits of artefacts. However, the predictive modelling indicates that focused occupation is unlikely and therefore deposits of significance are generally not expected.

Grinding Groove Sites

Two of the grinding groove sites are assessed as being of high significance within a local context (#38-4-440 and #38-4-447), one as being of moderate to high significance (#38-4-445), three of moderate significance (#38-4-444, 38-4-446 and 38-4-449), 18 of low to moderate significance, and 11 of low significance (refer to Tables 12 and 13). The open grinding groove and open artefact site (TE92/A) is also assessed as being of high significance within a local context.

Eighteen of the grinding groove sites form a site complex in the central-eastern portion of the investigation area, which is of high cultural value to the Aboriginal community (refer to Section 5.2.4). This 'Grinding Groove Area ' hosts all of the sites of moderate or higher levels of significance.

The grinding groove sites tended to be of higher significance where there is high integrity, high complexity (numerous grooves, different types and shapes of grooves), research potential (pertaining to residue analysis and occupation models) and representative value. The clustering of sites and their potential inter-relationship (for example, the Grinding Groove Area) also added to the level of significance, compared with spatially isolated sites. Aesthetic values also apply to these sites, given the natural forested mountainous landscape with limited recent human impacts. Educational values also apply, with more complex and larger sites having potential use as an educational resource.

Site #38-4-440 is assessed as being of a high level of significance at a regional level, due to the characteristics noted above, including its excellent representative value. Site #38-4-447 is assessed as being of low to moderate significance at a regional level.

The grinding groove sites tended to be of lower significance where they were spatially isolated from other sites, contained single or few grooves, and were of limited representative value.

Rock Shelters with PADs

Two of the rock shelters with PADs are assessed as being of potentially moderate to high significance within a local context (TE64/C and TE200/A), five as being of potentially moderate significance (TE46/A - D and TE104/C), two of low to moderate significance (TE39/A and TE64/D), and 17 of low significance (refer to Tables 12 and 13).

The research potential of rock shelters was one of the primary criteria used in assessing their significance, as there can be stratified deposits with datable cultural evidence (potentially extending back many thousands or even tens of thousands of years) and typically, due to sedimentation processes or other visibility constraints, any evidence visible on the surface of the shelter floor does not necessarily provide an accurate indication of the nature of the buried deposits.

The research potential and significance of the rock shelter PADs was assessed with reference to various criteria, including:

1) Size of the habitable floor area: A larger habitable floor area (the floor area of a rock shelter where the ceiling height is about one metre or more) equates to higher potential, as family groups may have been accommodated, a broader range of activities performed, and overnight camps and stays of longer duration been more feasible. Conversely, a small floor area limits the potential to short-duration/low-intensity activities such as people having sought temporary shelter from adverse weather;

2) Internal roof height: A low internal roof height (eg. less than standing height) is inferred to have reduced the attractiveness of a shelter for occupation of any more intensity than temporary shelter from adverse weather;

3) Depth of deposit: The deeper the deposit within a rock shelter, the higher the potential for stratification and spatially (vertically) separate evidence of discrete episodes of occupation from different time periods. Hence, a deeper deposit equates to higher potential and a shallower deposit equates to lower potential;

4) Extent of potential deposit: A larger PAD, including often in areas marginally forward of the dripline, equates to higher potential, whereas a smaller PAD equates to lower potential;

5) Complexity (presence of grooves and/or art, association with other sites): The presence of grooves and/or art adds to the range of activities performed in a shelter and equates to higher significance and possibly research potential;

6) Proximity to potable water: The topographic context of each shelter was considered, particularly proximity to potable water, especially higher order watercourses (refer to the detailed model of occupation presented in Section 5.1, which assumes that deposits of higher research potential will generally be located where more focused occupation has occurred, such as in the primary and secondary resource zones); and

7) Potential integrity: Although problematic to assess in the absence of controlled hand excavation, where low integrity was inferred (typically due to shallow deposits and clear evidence of extensive animal activity, such as animal burrows, and/or erosion) this typically negates most other criteria and equates to low research potential and low significance.

Rock shelter sites of low significance typically had small habitable floor areas and potential deposits, and often shallow deposits and/or low internal roof heights. Consequently they had low research potential. Such shelters may not even have been used by Aboriginal people, or if occupied, may only have been for short-duration/low-intensity activities, such as the seeking of temporary shelter from adverse weather. However, without excavation of a sample from a shelter, where artefacts are not visible it cannot be stated that the shelter was not occupied by Aboriginal people, nor can the nature and resulting evidence of any occupation be known.

Rock shelter sites of moderate or high potential often had moderately sized habitable floor areas and moderately deep potential deposits. Often low internal roof heights were not a constraint. The presence of other features such as potential art or extensive views added to the level of significance, as did the relationship with areas of cultural significance such as the men's area. Aesthetic values also apply to these sites, given the natural forested mountainous landscape with limited recent human impacts.

Nevertheless, as noted above, in any shelter irrespective of the assessed level of potential, this factor can only be adequately assessed through controlled excavation. Without excavation, the nature of any evidence present in sub-surface deposits cannot be adequately identified. Controlled excavation of any shelter may lead to a revision of the assessment of significance, either upward (in the case of a shelter where deposits of higher research value than anticipated are revealed) or downward (in the case of a shelter where anticipated deposits of research value do not exist or are in a state of low integrity).

Cultural Places/Values

Six of the cultural places/values are assessed as being of high significance within both local and regional contexts, two of high significance within a local context and low to moderate significance within a regional context, two of moderate significance within a local context and the remainder of low or uncertain value (refer to Tables 12 and 13). All of these sites were considered to be of high cultural value by registered Aboriginal parties.

The entire Mount Sugarloaf area (including the investigation area) is a cultural landscape that is of high traditional, historical and contemporary cultural significance to the Aboriginal community. Specific connections with particular places or values are outlined in Section 5.2.4 and Table 13. However, it is the inter-relationship of these places and values and their context that combine to create a cultural landscape of regional significance.

Aesthetic values also apply to these sites, given the natural forested mountainous landscape with limited recent human impacts. Educational values also apply, with more complex and larger sites having potential use as an educational resource. Historical values apply, where there is an association with Reverend Threlkeld and Biraban (refer to Sections 3.3 and 5.2.4). Scientific values apply to the Grinding Groove Area, Keepa Keepa Pathways, and Sugarloaf Pathways, where the cultural values can manifest as physical evidence, with research value.

Table 13: Significance assessment of Aboriginal sites, cultural areas/values and potential deposits within or immediately adjacent to the investigation area.

Site Name	OEH AHIMS #	Site Type	Comments	Significance					
				Overall[16]	Archaeological / Scientific	Aboriginal / Cultural	Aesthetic	Educational	Historic
Mt Sugarloaf (38-4-0440)	38-4-0440	Open grinding groove		high L, high R	high (high integrity, high complexity, high representative value, research potential, part of grinding groove cultural area)	high	high (natural landscape, limited recent impact)	high (potential use as educational resource)	low
Mt Sugarloaf (38-4-0443)	38-4-0443	Open grinding groove	Not relocated during current survey.	low L, low R	low (few grooves, low representative value, but part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	low	low
Mt Sugarloaf (38-4-0444)	38-4-0444	Open grinding groove		mod L, low R	mod (high integrity, moderate complexity, moderate representative value, part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	mod (potential use as educational resource)	low
Mt Sugarloaf (38-4-0445)	38-4-0445	Open grinding groove		mod-high L, low R	mod-high (high integrity, moderate-high complexity, moderate representative value, part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	mod (potential use as educational resource)	low
Mt Sugarloaf (38-4-0446)	38-4-0446	Open grinding groove		mod L, low R	mod (high integrity, moderate complexity, moderate representative value, part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	mod (potential use as educational resource)	low
Mt Sugarloaf (38-4-0447)	38-4-0447	Open grinding groove		high L, low-mod R	high (high integrity, high complexity, moderate representative value, possible engravings, part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	mod (potential use as educational resource)	low
Mt Sugarloaf (38-4-0448)	38-4-0448	Open grinding groove		low-mod L, low R	low-mod (low-moderate complexity, low-moderate representative value, part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low

[16] A number of registered Aboriginal parties have expressed the view that all of the sites/places are of high cultural significance (ie. high importance) and make no differentiation on the comparative level of value between any site or place. This is acknowledged and respected.

Site Name	OEH AHIMS #	Site Type	Comments	Significance					
				Overall[16]	Archaeological / Scientific	Aboriginal / Cultural	Aesthetic	Educational	Historic
Mt Sugarloaf (38-4-0449)	38-4-0449	Open grinding groove		mod L, low R	mod (high integrity, moderate complexity, moderate representative value, part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	mod (potential use as educational resource)	low
Mt Sugarloaf (38-4-0450)	38-4-0450	Open grinding groove	Not relocated during current survey.	low-mod L, low R	low-mod (low-moderate complexity, low-moderate representative value)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low
Heaton State Forest (38-4-0457)	38-4-0457	Open grinding groove	Not relocated during current survey.	low-mod L, low R	low-mod (low-moderate complexity, low-moderate representative value)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low
Heaton State Forest (38-4-0486)	38-4-0486	Open grinding groove		low-mod L, low R	low (low-mod complexity, part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low
Heaton State Forest (38-4-0487)	38-4-0487	Open grinding groove	Not relocated during current survey.	low L, low R	low (single groove, low representative value)	high	mod (natural landscape, limited recent impact)	low	low
Heaton State Forest (38-4-0488)	38-4-0488	Open grinding groove		low-mod L, low R	low (low-mod complexity, part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low
Sugarloaf Range 1 (38-4-0610)	38-4-0610	Open grinding groove		low-mod L, low R	low-mod (low-moderate complexity, low-moderate representative value, in Keepa Keepa cultural area)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low
Mt Sugarloaf (38-4-0618)	38-4-0618	Open grinding groove	Not reinspected during present survey due to property access restrictions.	low L, low R	low (few grooves, low representative value)	high	mod (natural landscape, limited recent impact)	low	low
Mt Sugarloaf (38-4-0619)	38-4-0619	Open grinding groove	Not reinspected during present survey due to property access restrictions.	low-mod L, low R	low-mod (low-moderate complexity, low-moderate representative value)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low
Mt Sugarloaf (38-4-0623)	38-4-0623	Open grinding groove	Not reinspected during present survey due to property access restrictions.	low L, low R	low (two grooves, low representative value)	high	mod (natural landscape, limited recent impact)	low	low

Site Name	OEH AHIMS #	Site Type	Comments	Significance					
				Overall[16]	Archaeological / Scientific	Aboriginal / Cultural	Aesthetic	Educational	Historic
Mt Sugarloaf 2 (38-4-0624)	38-4-0624	Open grinding groove	Not reinspected during present survey due to property access restrictions.	low L, low R	low (single groove, low representative value)	high	mod (natural landscape, limited recent impact)	low	low
Heaton SF (38-4-0869)	38-4-0869	Open grinding groove	Outside investigation area.	low-mod L, low R	low-mod (high integrity, low-moderate complexity, low-moderate representative value)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low
Wallis Creek 1 (38-4-0975)	38-4-0975	Open artefact site	Not reinspected during present survey as outside investigation area by 35 metres.	low L, low R	low (common, low research potential)	high	low	low	low
Tasman Extension 1/A	38-4-1386	Open artefact site	35 metres outside investigation area	low L, low R	low (common, low research potential, low integrity)	high	low	low	low
Tasman Extension 1/B	38-4-1387	Open artefact site		low L, low R	low (common, low research potential)	high	low	low	low
Tasman Extension 10/A	38-4-1388	Open artefact site		low L, low R	low (common, low research potential)	high	low	low	low
Tasman Extension 29/A		Open artefact site		low L, low R	low (low research potential)	high	low	low	low
Tasman Extension 32/A	38-4-1390	Open grinding groove		low-mod L, low R	low-mod (high integrity, low-moderate complexity, low-moderate representative value)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low
Tasman Extension 34/A	38-4-1391	Open artefact site		low L, low R	low (common, low research potential)	high	low	low	low
Tasman Extension 39/A	38-4-1392	Rockshelter with PAD		low-mod L, low R	low-mod (small to moderate habitable floor area and PAD but low roof, low to moderate research potential, association with mens area)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 41/A	38-4-1393	Open grinding groove		low L, low R	low (single groove, isolated)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 45/A	38-4-1394	Open grinding groove		low L, low R	low (single groove, isolated, associated with mens area)	high	mod (natural landscape, limited recent impact)	low	low

Site Name	OEH AHIMS #	Site Type	Comments	Significance					
				Overall[16]	Archaeological / Scientific	Aboriginal / Cultural	Aesthetic	Educational	Historic
Tasman Extension 46/A	38-4-1395	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	mod L, low R	low-mod (small to moderate habitable floor area and PAD but shallow deposit, low to moderate research potential, strong association with mens area)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 46/B	38-4-1396	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	mod L, low R	low-mod (large habitable floor area but shallow deposit and sloping floor, low to moderate research potential, strong association with mens area)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 46/C	38-4-1397	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	mod L, low R	low-mod (small to moderate habitable floor area and PAD but sloping floor, low to moderate research potential, strong association with mens area)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 46/D	38-4-1398	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	mod L, low R	low-mod (moderate to large shelter but sloping floor, low to moderate research potential, strong association with mens area)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 50/A	38-4-1399	Open artefact site		low L, low R	low (common, low research potential, low integrity)	high	low	low	low
Tasman Extension 51/A	38-4-1400	Open artefact site		low L, low R	low (common)	high	low	low	low
Tasman Extension 53/A	38-4-1401	Open artefact site		low L, low R	low (common)	high	low	low	low
Tasman Extension 53/B	38-4-1402	Open artefact site		low L, low R	low (common)	high	low	low	low
Tasman Extension 56/A	38-4-1403	Open artefact site		low L, low R	low (common)	high	low	low	low
Tasman Extension 56/B	38-4-1404	Open artefact site		low L, low R	low (common)	high	low	low	low
Tasman Extension 57/A	38-4-1405	Open grinding groove		low-mod L, low R	low-mod (high integrity, low-moderate complexity, low-moderate representative value)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low
Tasman Extension 57/B	38-4-1406	Open grinding groove		low-mod L, low R	low-mod (high integrity, low-moderate complexity, low-moderate representative value)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low

Site Name	OEH AHIMS #	Site Type	Comments	Significance					
				Overall[16]	Archaeological / Scientific	Aboriginal / Cultural	Aesthetic	Educational	Historic
Tasman Extension 64/A	38-4-1407	Rockshelter with PAD		low L, low R	low (small habitable floor area and PAD, shallow deposit, low roof, low research potential, association with mens area)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 64/B	38-4-1408	Rockshelter with PAD		low L, low R	low (small habitable floor area and PAD, shallow deposit, low roof, low research potential, association with mens area)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 64/C		Rockshelter with PAD		mod-high L, low R	mod-high (large habitable floor area but shallow deposit, moderate research potential, strong association with mens area)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 64/D	38-4-1410	Rockshelter with PAD		low-mod L, low R	low (small habitable floor area and PAD, shallow deposit, low research potential, association with mens area)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 67/A	38-4-1411	Open grinding groove		low-mod L, low R	low-mod (high integrity, low-moderate complexity, low-moderate representative value)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low
Tasman Extension 67/B	38-4-1412	Open grinding groove		low-mod L, low R	low-mod (high integrity, low-moderate complexity, low-moderate representative value)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low
Tasman Extension 71/A	38-4-1413	Open grinding groove		low L, low R	low (two grooves, isolated)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 77/A	38-4-1414	Rockshelter with PAD		low L, low R	low (small habitable floor area and PAD, shallow deposit, low roof, low research potential)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 77/B	38-4-1415	Rockshelter with PAD		low L, low R	low (small habitable floor area and PAD, shallow deposit, low roof, low research potential)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 77/C	38-4-1416	Rockshelter with PAD		low L, low R	low (small to moderate habitable floor area and PAD, but shallow sloping deposit, low research potential)	high	mod (natural landscape, limited recent impact)	low	low

Site Name	OEH AHIMS #	Site Type	Comments	Significance					
				Overall[16]	Archaeological / Scientific	Aboriginal / Cultural	Aesthetic	Educational	Historic
Tasman Extension 79/A	38-4-1417	Open grinding groove		low-mod L, low R	low (low complexity, but part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low
Tasman Extension 79/B	38-4-1418	Open artefact site		low L, low R	low (low research potential)	high	low	low	low
Tasman Extension 79/C	38-4-1419	Rockshelter with PAD		low L, low R	low (small habitable floor area and PAD, shallow deposit, low roof, low research potential, association with grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 79/D	38-4-1420	Rockshelter with PAD		low L, low R	low (small habitable floor area and PAD, shallow deposit, sloping floor, low roof, low research potential, association with grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 80/A	38-4-1421	Open artefact site		low L, low R	low (common, low research potential)	high	low	low	low
Tasman Extension 80/B	38-4-1422	Open artefact site	25 metres outside investigation area	low L, low R	low (common, low research potential)	high	low	low	low
Tasman Extension 80/C	38-4-1423	Open artefact site	outside investigation area	low L, low R	low (common, low research potential, low integrity)	high	low	low	low
Tasman Extension 84/A	38-4-1424	Open artefact site		low L, low R	low (common, low research potential)	high	low	low	low
Tasman Extension 85/A	38-4-1425	Open artefact site	outside investigation area	mod L, low R	mod (range of contents, research potential, association with cultural pathways)	high	low	low	low
Tasman Extension 86/A	38-4-1426	Open grinding groove		low-mod L, low R	low (low complexity, but part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low
Tasman Extension 86/B	38-4-1427	Open grinding groove		low-mod L, low R	low (low complexity, but part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 86/C	38-4-1428	Open grinding groove		low L, low R	low (only two grooves, part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 86/D	38-4-1429	Open grinding groove		low L, low R	low (single groove, part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 88/A	38-4-1430	Open grinding groove		low-mod L, low R	low (low to moderate complexity, part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	low-mod (potential use as educational resource)	low

Site Name	OEH AHIMS #	Site Type	Comments	Significance					
				Overall[16]	Archaeological / Scientific	Aboriginal / Cultural	Aesthetic	Educational	Historic
Tasman Extension 92/A	38-4-1431	Open grinding groove and open artefact site		high L, low-mod R	high (high integrity, high complexity, moderate representative value, part of grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	mod (potential use as educational resource)	low
Tasman Extension 92/B	38-4-1432	Rockshelter with PAD		low L, low R	low (small habitable floor area and PAD, shallow deposit, low roof, low research potential, association with grinding groove cultural area)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 96/A	38-4-1433	Rockshelter with PAD		low L, low R	low (small habitable floor area and PAD, deep deposit, low roof, low research potential)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 96/B	38-4-1434	Rockshelter with PAD		low L, low R	low (small habitable floor area and PAD, low research potential)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 96/C	38-4-1435	Rockshelter with PAD		low L, low R	low (small habitable floor area and PAD, deep deposit, low roof, low research potential)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 104/A	38-4-1436	Rockshelter with PAD		low L, low R	low (small habitable floor area and PAD, moderately deep deposit, low roof, low research potential)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 104/B	38-4-1437	Rockshelter with PAD		low L, low R	low (small habitable floor area and PAD, low roof, low research potential)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 104/C	38-4-1438	Rockshelter with PAD		mod L, low R	mod (moderate habitable floor area in relatively large shelter, but shallow deposit, moderate research potential)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 107/A	38-4-1439	Open artefact site		low L, low R	low (common, low research potential)	high	low	low	low
Tasman Extension 124/A	38-4-1440	Open artefact site		low L, low R	low (common)	high	low	low	low
Tasman Extension 126/A	38-4-1441	Open artefact site		low L, low R	low (common, low integrity)	high	low	low	low
Tasman Extension 126/B	38-4-1442	Open artefact site		low L, low R	low (common, low integrity)	high	low	low	low
Tasman Extension 126/C	38-4-1443	Open artefact site		low L, low R	low (common, low integrity)	high	low	low	low

Site Name	OEH AHIMS #	Site Type	Comments	Significance					
				Overall[16]	Archaeological / Scientific	Aboriginal / Cultural	Aesthetic	Educational	Historic
Tasman Extension 135/A	38-4-1444	Open artefact site		low-mod L, low R	low-mod (range of contents, research potential, association with cultural pathways)	high	low	low	low
Tasman Extension 135/B	38-4-1445	Open artefact site		low L, low R	low (common, low integrity)	high	low	low	low
Tasman Extension 135/C	38-4-1446	Open artefact site		low L, low R	low (common, low integrity)	high	low	low	low
Tasman Extension 135/D	38-4-1447	Open artefact site		low L, low R	low (common, low integrity)	high	low	low	low
Tasman Extension 152/A	38-4-1448	Rockshelter with PAD	20 metres outside investigation area	low L, low R	low (small habitable floor area and PAD, shallow deposit, low roof, low research potential)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 152/B	38-4-1449	Rockshelter with PAD	70 metres outside investigation area	low L, low R	low (small habitable floor area and PAD, shallow deposit, low roof, low research potential)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 153/A	38-4-1450	Open artefact site		low L, low R	low (common)	high	low	low	low
Tasman Extension 154/A	38-4-1451	Open grinding groove	outside investigation area	low L, low R	low (low complexity, low representative value)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 154/B	38-4-1452	Open artefact site	outside investigation area	low L, low R	low (common)	high	low	low	low
Tasman Extension 154/C	38-4-1453	Open artefact site	outside investigation area	low L, low R	low (common, low integrity)	high	low	low	low
Tasman Extension 155/A	38-4-1454	Rockshelter with PAD	outside investigation area	low L, low R	low (small habitable floor area and PAD, low research potential)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 157/A	38-4-1455	Open artefact site		mod-high L, low R	mod-high (range of contents, research potential, association with cultural pathways)	high	low	low	low
Tasman Extension 176/A	38-4-1456	Open grinding groove		low-mod L, low R	low-mod (high integrity, low-moderate complexity, low representative value)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 178/A	38-4-1457	Rockshelter with PAD	outside investigation area	low L, low R	low (small habitable floor area and PAD, sloping floor, low research potential)	high	mod (natural landscape, limited recent impact)	low	low
Tasman Extension 181/A	38-4-1458	Open artefact site		low L, low R	low (common, low integrity)	high	low	low	low
Tasman Extension 181/B	38-4-1459	Open artefact site		low L, low R	low (common, low integrity)	high	low	low	low
Tasman Extension 181/C	38-4-1460	Open artefact site		low L, low R	low (common, low integrity)	high	low	low	low

Site Name	OEH AHIMS #	Site Type	Comments	Significance					
				Overall[16]	Archaeological / Scientific	Aboriginal / Cultural	Aesthetic	Educational	Historic
Tasman Extension 182/A	38-4-1461	Open artefact site		low L, low R	low (common, low integrity)	high	low	low	low
Tasman Extension 182/B	38-4-1462	Open artefact site		low L, low R	low (common, low integrity)	high	low	low	low
Tasman Extension 188/A	38-4-1463	Open artefact site		low L, low R	low (common)	high	low	low	low
Tasman Extension 199/A	38-4-1464	Open artefact site		low L, low R	low (common, low integrity)	high	low	low	low
Tasman Extension 200/A	38-4-1465	Rockshelter with PAD		mod-high L, low R	mod-high (moderate habitable floor area in relatively large shelter, moderately deep deposit, complex-potential art and extensive views, moderate to high research potential)	high	high (natural landscape, limited recent impact, extensive visual aspect)	low	low
Tasman Extension Investigation Area	n/a	Cultural area/value		high L, high R	n/a	high	mod-high (prominent natural landscape, limited recent impact)	mod-high (potential use as educational resource)	mod-high (association with Reverend Threlkeld and Biraban)
Men's Area	n/a	Cultural area/value		high L, high R	n/a	high	mod-high (prominent natural landscape, limited recent impact)	mod-high (potential use as educational resource)	mod-high (association with Reverend Threlkeld and Biraban)
Grinding Groove Area	n/a	Cultural area/value		high L, high R	high (range of contents, integrity, research potential, association with cultural areas)	high	mod-high (natural landscape, limited recent impact)	mod-high (potential use as educational resource)	low
Keepa Keepa Pathways Area	n/a	Cultural area/value		high L, low-mod R	mod-high for artefact sites (range of contents, research potential, association with cultural pathways)	high	mod (natural landscape, but some recent impact)	mod (potential use as educational resource)	low
Sugarloaf Pathways	n/a	Cultural area/value		high L, low-mod R	mod-high for artefact sites (range of contents, research potential, association with cultural pathways)	high	mod (natural landscape, but some recent impact)	mod (potential use as educational resource)	low
Sugarloaf and the Supreme Being, 'Koe-in'	n/a	Cultural area/value		high L, high R	n/a	high	mod (prominent natural landscape, some recent impacts)	mod (potential use as educational resource)	high (association with Reverend Threlkeld and Biraban)
Sugarloaf and the Supernatural Spirit 'Puttikan'	n/a	Cultural area/value		high L, high R	n/a	high	mod (prominent natural landscape, some recent impacts)	mod (potential use as educational resource)	high (association with Reverend Threlkeld and Biraban)

Site Name	OEH AHIMS #	Site Type	Comments	Significance					
				Overall[16]	Archaeological / Scientific	Aboriginal / Cultural	Aesthetic	Educational	Historic
Burials in a cave on the side of Mount Sugarloaf	n/a	Cultural area/value		uncertain	uncertain	high	low	low	high (association with Reverend Threlkeld)
Mount Sugarloaf as a heirophany between the secular world and the sky-world	n/a	Cultural area/value		high L, high R	n/a	high	mod (prominent natural landscape, some recent impacts)	mod (potential use as educational resource)	high (association with Reverend Threlkeld and Biraban)
Presence of quartz and associations with the Clever Man	n/a	Cultural area/value		low L, low R	n/a	high	low	low	low
Use of subsistence and other resources	n/a	Cultural area/value		mod L, low R	n/a	high	low	mod (potential use as educational resource)	low
Ongoing cultural and spiritual connection	n/a	Cultural area/value		mod L, low R	n/a	high	low	mod (potential use as educational resource)	low
Contemporary significance of Aboriginal objects	n/a	Cultural area/value	Refer above for each recorded Aboriginal site						

L = Local context, R = Regional context. 'mod' = moderate.

8. STATUTORY OBLIGATIONS

Commonwealth, State and local legislation relevant to the protection and management of Aboriginal heritage is outlined in the sections below. The investigation area does not contain any heritage items listed for indigenous values under the *Environment Protection and Biodiversity Conservation Act 1999, Australian Heritage Council Act 2003, Aboriginal and Torres Strait Islander Heritage Protection Act 1984* or NSW *Heritage Act 1977*, but it does contain Aboriginal objects protected under the NSW *National Parks and Wildlife Act 1974*.

8.1 Commonwealth

While the primary legislation offering protection to Aboriginal heritage in NSW is enacted by the State (refer to Section 8.2), several Acts administered by the Commonwealth may also be relevant.

Environment Protection and Biodiversity Conservation Act 1999:

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary Commonwealth legislation for the protection and management of matters of national environmental significance, which includes heritage places. The primary features of the EPBC Act relating to heritage include:

- A National Heritage List of natural, indigenous and historic places of national heritage significance;
- A Commonwealth Heritage List of heritage places owned or managed by the Commonwealth; and
- Consideration of heritage in the planning and development approvals process.

Commonwealth Heritage places are protected in that:

- Actions taken on Commonwealth land which are likely to have a significant impact on the environment will require the approval of the Minister;
- Actions taken outside Commonwealth land which are likely to have a significant impact on the environment on Commonwealth land, will require the approval of the Minister; and
- Actions taken by the Commonwealth Government or its agencies that are likely to have a significant impact on the environment anywhere will require approval by the Minister.

Australian Government agencies that own or lease heritage places are required to assist the Minister and the Australian Heritage Council to identify and assess the heritage values of these places. They are required to:

- Develop heritage strategies;
- Produce a register of the heritage places under their control;
- Develop a management plan to manage these places consistent with the Commonwealth Heritage Management Principles prescribed in regulations to the Act;
- Ensure the ongoing protection of the Commonwealth heritage values of the place when selling or leasing a Commonwealth heritage place; and

- Ask the Minister for advice about taking an action, if the action has, will have, or is likely to have, a significant impact on a Commonwealth heritage place.

The environmental assessment process of the EPBC Act protects matters of national environmental significance (including national heritage places), along with the environment where actions proposed are on, or will affect, Commonwealth land and/or where Commonwealth agencies are proposing to take an action. When a proposal is identified as having the potential to have a significant impact on a matter of national environmental significance, the proponent must refer the project to the Department of Sustainability, Environment, Water, Population and Communities. The matter is made public and referred to the relevant state, territory and Commonwealth ministers for comment. The Minister then decides whether the likely environmental impacts of the project are such that it should be assessed under the EPBC Act. State governments may, under agreement with the Commonwealth, assess actions that may have an impact on matters of national environmental significance. Following assessment, the Minister or their delegate may approve the action (with or without conditions) or not approve the action.

Australian Heritage Council Act 2003:

The *Australian Heritage Council Act 2003* established the Australian Heritage Council, an independent expert body to advise the Minister on the listing and protection of heritage places and other matters relating to heritage. This Act also enables the continued management of the Register of the National Estate, a list of more than 13,000 heritage places around Australia that has been compiled by the former Australian Heritage Commission since 1976. Places on the Register are protected under the EPBC Act by the same provisions that protect Commonwealth Heritage places.

Aboriginal and Torres Strait Islander Heritage Protection Act 1984:

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* provides for the protection of areas and objects which are of significance to Aboriginal people in accordance with Aboriginal tradition. The Act allows Aboriginal people to apply to the Minister to seek protection for significant Aboriginal areas and objects. The Minister has broad powers to make such a declaration should the Minister be satisfied that the area or object is a significant Aboriginal area or object and is under immediate threat of injury or desecration. An 'emergency declaration' can remain in force for up to 30 days.

8.2 State

National Parks and Wildlife Act 1974:

The *National Parks and Wildlife Act 1974* (NP&W Act) provides the primary basis for the legal protection and management of Aboriginal heritage in NSW. With respect to development proposals and planning approvals, the *Environmental Planning and Assessment Act 1979* (EP&A Act) is the primary legislation.

Implementation of the Aboriginal heritage provisions of the NP&W Act is the responsibility of the Office of Environment and Heritage (OEH). The rationale behind the NP&W Act is to prevent the unnecessary or unwarranted destruction of Aboriginal objects and to protect and conserve objects where such action is considered warranted (DECCW 2009a, 2009b).

Section 2A of the Act, defines its objects to include 'the conservation of nature, including …

(b) the conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including, but not limited to:

(i) places, objects and features of significance to Aboriginal people, and
(ii) places of social value to the people of New South Wales.

Section 2A also identifies that the objects of the Act are to be achieved by applying the principles of ecologically sustainable development, defined in Section 6 of the *Protection of the Environment Administration Act 1991* as requiring the integration of *economic* and *environmental* considerations (including cultural heritage) in the decision-making process.

In regard to Aboriginal cultural heritage, ecologically sustainable development can be achieved by applying the principle of intergenerational equity and the precautionary principle (DECCW 2009b).

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. In terms of Aboriginal heritage, intergenerational equity can be considered in terms of the cumulative impacts to Aboriginal objects and places in a region. If few Aboriginal objects and places remain in a region, fewer opportunities remain for future generations of Aboriginal people to enjoy the cultural benefits of those Aboriginal objects and places. Information about the integrity, rarity or representativeness of the Aboriginal objects and places proposed to be impacted, and how they illustrate the occupation and use of land by Aboriginal people across the region, are therefore relevant to the consideration of intergenerational equity and the understanding of the cumulative impacts of a proposal (DECCW 2009b:26).

The precautionary principle states 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 applying the precautionary principle, decisions should be guided by (DECCW 2009b:26):

- A careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and
- An assessment of the risk-weighted consequences of various options.

The precautionary principle is relevant to the OEH's consideration of potential impacts to Aboriginal cultural heritage where:

- The proposal 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 (DECCW 2009b:26).

Where this is the case, the OEH instructs that a precautionary approach should be taken and all cost-effective measures implemented to prevent or reduce damage to the objects/place (DECCW 2009b).

With the exception of some artefacts in collections, the NP&W Act generally defines all Aboriginal objects to be the property of the Crown. The Act then provides various controls for the protection, management of and impacts to these objects. An 'Aboriginal object' is defined under Section 5(1) as:

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

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

Under s89A of the NP&W Act, a person who is aware of the location of an Aboriginal object that is the property of the Crown or, not being the property of the Crown, is real property, and does not, in the prescribed manner, notify the Director-General thereof within a reasonable time after the person first becomes aware of that location is guilty of an offence against the Act unless the person believes on reasonable grounds that the Director-General is aware of the location of that Aboriginal object. The 'prescribed manner' is currently taken to be written notice in a form approved by the Director-General, being the Aboriginal Site Recording Forms available on the OEH website. Failure to comply with the requirements may result in a maximum penalty of 100 penalty units and, in the case of a continuing offence, a further 10 penalty units for each day the offence continues, for an individual, with double the fines for a corporation.

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

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

1) A person must not harm or desecrate an object that the person knows is an Aboriginal object.

Maximum Penalty:
(a) in the case of an individual - 2,500 penalty units or imprisonment for one year, or both, or (in circumstances of aggravation) 5,000 penalty units or imprisonment for two years, or both, or
(b) in the case of a corporation - 10,000 penalty units (currently $1,100,000).

2) A person must not harm an Aboriginal object ('strict liability offence').

Maximum Penalty:
(a) in the case of an individual - 500 penalty units or (in circumstances of aggravation) 1,000 penalty units, or
(b) in the case of a corporation - 2,000 penalty units (currently $220,000).

Under Section 86(4) it is an offence for a person to harm or desecrate an Aboriginal place, with maximum penalties of 5,000 penalty units or imprisonment for two years, or both, for individuals and 10,000 penalty units for corporations.

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

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

There are various exemptions and defences to offences under Section 86 of the Act, including:

- Of most relevance to development proposals generally, the offences under Section 86(1), (2) and (4) have a defence to prosecution under Section 87(1) if the harm or desecration was authorised by an Aboriginal Heritage Impact Permit (AHIP) and the conditions to which that AHIP were subject have not been contravened;

- The strict liability offence under Section 86(2) has a defence to prosecution under Section 87(2) if the person exercised *due diligence* to determine whether the act or omission constituting the alleged offence would harm an Aboriginal object and reasonably determined that no Aboriginal object would be harmed. Section 87(3) and the regulations associated with the Act (National Parks and Wildlife Regulation 2009) enable due diligence to be achieved through compliance with industry-specific Codes of Practice approved by the Minister. These include the DECCW (2010a) *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* and other approved codes such as the *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects* (NSW Minerals Council 2010).

  The 'due diligence' process is essentially intended to provide a defence to the strict liability offence under Section 86(2) of the NP&W Act, if an activity were subsequently to unknowingly harm an Aboriginal object in the absence of an AHIP. If Aboriginal objects are present or are likely to be present and an activity will harm those objects, then an AHIP application is required (excluding Part 3A projects). While the DECCW (2010a) *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* sets out procedures to determine whether or not Aboriginal objects are, or are likely to be present, identify whether the activity may harm objects and whether an AHIP is necessary, it does not constitute a level of Aboriginal heritage impact assessment that is typically required to satisfy the assessment requirements for projects under Part 4 and Part 5 of the EP&A Act. However, the conduct of an environmental impact assessment for a Part 4 or Part 5 project that satisfies the requirements of the Code of Practice will satisfy the 'due diligence' defence to Section 86(2) of the NP&W Act;

- The strict liability offence under Section 86(2) has a defence to prosecution under Section 87(4) if the person shows that the act or omission constituting the alleged offence is prescribed by the regulations as a low impact act or omission.

  Clause 80B of the National Parks and Wildlife Regulation 2009 describes low impact acts or omissions as including:

  - Maintenance work on land already disturbed (such as maintenance of existing roads, tracks or utilities);

- Farming and land management works on land already disturbed (such as cropping or leaving paddocks fallow, or construction of farm dams, fences, irrigation infrastructure, ground water bores, flood mitigation works, erosion control or soil conservation works, or maintenance of various existing infrastructure);
- Grazing of animals;
- Activity on already disturbed land that comprises exempt development or was the subject of a complying development certificate issued under the EP&A Act;
- Mining exploration work (such as costeaning, bulk sampling or drilling) on land already disturbed;
- Geological mapping, surface geophysical surveys and sub-surface surveys involving downhole logging, sampling or coring using hand-held equipment except where conducted as part of an archaeological investigation (exempted where the DECCW 2010 *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* is followed);
- Removal of isolated dead or dying vegetation if there is minimal ground disturbance;
- On already disturbed land seismic surveying or groundwater monitoring bores;
- Environmental rehabilitation work (such as silt fencing, tree planting, bush regeneration and weed removal, but not erosion control or soil conservation works).

For the purposes of Clause 80B, land is considered to be 'already disturbed' if it 'has been the subject of a human activity that has changed the land's surface, being changes that remain clear and observable' (for example, soil ploughing, construction of rural infrastructure such as dams and fences, construction of roads, tracks and trails, clearing of vegetation, construction of buildings, installation of utilities, substantial grazing involving the construction of rural infrastructure, or construction of earthworks related to the above);

- The defence of honest and reasonable mistake of fact applies under Section 86(5) to the strict liability offence of Section 86(2) and to offences against Aboriginal places under Section 86(4);

- The offences under Section 86(1) and (2) do not apply under Section 86(6), with respect to an Aboriginal object that is dealt with in accordance with section 85A (refer below);

- Exemptions are available under Section 87A to Section 86(1)-(4) for various emergency situations, conservation works and conservation agreements; and

- Exemptions are available under Section 87B to Section 86(1), (2) and (4) for Aboriginal people in relation to the carrying out of traditional cultural activities.

Consents regarding impacts to Aboriginal objects or areas with potential for Aboriginal objects are managed through the OEH Aboriginal Heritage Impact Permit system, as outlined in Section 90 of the NP&W Act and clauses 80D and 80E of the Regulations. The issuing of an AHIP is dependent upon adequate archaeological assessment and review (cultural heritage assessment report), together with an appropriate level of Aboriginal community liaison and involvement.

Typically, to support an AHIP, an Aboriginal cultural heritage assessment must be undertaken in accordance with the OEH (2011a) *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*, which effectively involves an assessment following the DECCW (2010b) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* and Aboriginal community consultation in accordance with the DECCW (2010c) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* policy (refer to Section 6).

The DECCW (2010b) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* contains detailed requirements for heritage assessments. Key features include:

- Investigations must be undertaken by people with appropriate skills and experience, specified in Section 1.6 as:

    1) A minimum of a Bachelor's degree with honours in archaeology or relevant experience in the field of Aboriginal cultural heritage management, and

    2) The equivalent of two years full-time experience in Aboriginal archaeological investigation, including involvement in a project of similar scope, and

    3) A demonstrated ability to conduct a project of the scope required through inclusion as an attributed author on a report of similar scope.

- Archaeological test excavation will be necessary when (regardless of whether or not there are objects present on the ground surface) it can be demonstrated through Requirements 1, 2, 3, 4, and 5 of the Code that sub-surface Aboriginal objects with potential conservation value have a high probability of being present in an area, and the area cannot be substantially avoided by the proposed activity; and

- A Section 90 AHIP is not required for test excavations undertaken in compliance with the Code (implementation of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* policy is required however).

Under clause 80D of the National Parks and Wildlife Regulation 2009, the cultural heritage assessment report that accompanies the AHIP application must address:

- The significance of the Aboriginal objects or Aboriginal places that are the subject of the application;

- The actual or likely harm to those Aboriginal objects or Aboriginal places from the proposed activity that is the subject of the application;

- Any practical measures that may be taken to protect and conserve those Aboriginal objects or Aboriginal places;

- Any practical measures that may be taken to avoid or mitigate any actual or likely harm to those Aboriginal objects or Aboriginal places; and

- Include any submission received from a registered Aboriginal party under clause 80C and the applicant's response to that submission.

The OEH determination of AHIP applications is guided by the OEH (2011a) *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*, OEH (2011b) *Applying for an Aboriginal Heritage Impact Permit: Guide for Applicants*, and OEH (2011c) *Guide to Aboriginal Heritage Impact Permit Processes and Decision-Making* policy.

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. AHIPs may be transferred or varied (subject to conditions and approval of the Director-General). AHIPs may be refused. An application is taken to be refused (unless otherwise granted or refused earlier), 60 days after the date on which the application was received by the Director-General (not including any period during which an applicant is required to supply to the Director-General further information under Section 90F).

The Director-General may attach any conditions seen fit to any AHIP granted. Failure to comply with a condition is deemed under Section 90J to be a contravention of the Act. Such offences may result in a maximum penalty of 1,000 penalty units and/or imprisonment for six months, and, in the case of a continuing offence, a further 100 penalty units for each day the offence continues, for an individual, with double the fines for a corporation.

Under Section 90K of the NP&W Act, in making a decision in relation to an AHIP, the Director-General must consider the following matters (but only these matters):

a) The objects of the Act;

b) Actual or likely harm to the Aboriginal objects or Aboriginal place that are the subject of the permit;

c) Practical measures that may be taken to protect and conserve the Aboriginal objects or Aboriginal place that are the subject of the permit;

d) Practical measures that may be taken to avoid or mitigate any actual or likely harm to the Aboriginal objects or Aboriginal place that are the subject of the permit;

e) The significance of the Aboriginal objects or Aboriginal place that are the subject of the permit;

f) The results of any consultation by the applicant with Aboriginal people regarding the Aboriginal objects or Aboriginal place that are the subject of the permit (including any submissions made by Aboriginal people as part of a consultation required by the regulations);

g) Whether any such consultation substantially complied with any requirements for consultation set out in the regulations (specified in Section 90N of the NP&W Act and clause 80C of the National Parks and Wildlife Regulation 2009 and in the DECCW *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*);

h) The social and economic consequences of making the decision;

i) Any documents accompanying the application and any public submission that has been made under the EP&A Act in connection with the activity to which the permit application relates and that has been received by the Director-General; and

j) Any other matter prescribed by the regulations.

An appeals process is available under Section 90L of the NP&W Act whereby an applicant, dissatisfied with the refusal of the Director-General to grant a Section 90 AHIP, or with any conditions attached to the AHIP, may appeal to the Land and Environment Court. The appeal must be made within 21 days after notice of the decision that is being appealed. The decision of the Land and Environment Court on the appeal is final and is binding on the Director-General and the appellant.

Under Section 85A of the NP&W Act, the Director-General may 'dispose' of Aboriginal objects that are the property of the crown:

a) By returning the Aboriginal objects to an Aboriginal owner or Aboriginal owners entitled to, and willing to accept possession, custody or control of the Aboriginal objects in accordance with Aboriginal tradition, or

b) By otherwise dealing with the Aboriginal objects in accordance with any reasonable directions of an Aboriginal owner or Aboriginal owners referred to in paragraph (a), or

c) If there is or are no such Aboriginal owner or Aboriginal owners - by transferring the Aboriginal objects to a person, or a person of a class, prescribed by the regulations for safekeeping (typically implemented by way of a Care Agreement between the OEH and the Aboriginal person or organisation).

Under Section 85A(3) of the NP&W Act, the regulations may make provision as to the manner in which any dispute concerning the entitlement of an Aboriginal owner or Aboriginal owners to possession, custody or control of Aboriginal objects for the purposes of this section is to be resolved.

Under Section 91AA of the NP&W Act, if the Director-General is of the opinion that any action is being, or is about to be carried out that is likely to significantly affect an Aboriginal object or Aboriginal place or any other item of cultural heritage situated on land reserved under the Act, the Director-General may make a stop-work order for a period of 40 days. Various exemptions exist, such as for emergency situations and for approved developments under the EP&A Act. A person that contravenes a stop-work order may be penalised up to 1,000 penalty units and an additional 100 units for every day the offence continues (10,000 units and 1,000 units respectively in the case of a corporation). Under Section 91A, the Director-General may also make recommendations to the Minister for an Interim Protection Order in respect of land which has cultural significance, including Aboriginal objects, for a duration of up to two years. The existence of an AHIP does not prevent the making of a stop-work order or an interim protection order (Section 90O).

Under Section 91L of the NP&W Act the Director-General may direct a person to carry out remediation work to Aboriginal objects or places, if they have been harmed as a result of an offence under the Act. The remediation work may involve protection, conservation, maintenance, remediation or restoration of the harmed Aboriginal object or place. The maximum penalties under Section 91Q for contravening a remediation direction are 2,000 penalty units and 200 penalty units for each day the offence continues for a corporation.

Environmental Planning and Assessment Act 1979:

The EP&A Act requires that environmental impacts (including those to cultural heritage) be considered in land use planning and decision-making. The Minister administering the EP&A Act may make various planning instruments such as Local Environmental Plans (LEPs) or Development Control Plans (DCPs). These planning instruments may identify places and features of cultural heritage significance and define statutory requirements regarding the potential development, modification and conservation of these items. In general, places of identified significance, or places requiring further assessment, are listed in heritage schedules that form part of an LEP. Listed heritage items are then protected from certain defined activities, unless consent has been gained from an identified consent authority (typically the local government authority).

In determining a Development Application (DA) under Part 4 of the EP&A Act, a consent authority, such as a local government authority, must take into consideration matters such as the provisions of environmental planning instruments (for example, LEPs), DCPs, the likely impacts of that development, including environmental impacts on the natural and built environments, and social and economic impacts on the locality (Section 79C{1}).

If Aboriginal objects are known to exist on the land to which the development application applies prior to the application being made, under Part 4 of the EP&A Act an 'Integrated Development Application' (IDA) must be submitted to the consent authority. Any Development Approval issued for development of this kind must be consistent with the General Terms of Approval (GTA's) or requirements provided by the relevant State Government agency (for example, the OEH).

Under Part 5 of the EP&A Act, public authorities and government agencies that carry out activities have a duty to take into account to the fullest extent possible all matters affecting or likely to affect the environment (including cultural heritage) by reason of that activity. This typically takes the form of a Review of Environmental Factors (REF) or Environmental Impact Statement (EIS), with the agency (proponent) acting as the determining authority.

Part 3A of the EP&A Act has been repealed, but under Division 4.1 of Part 4, 'State Significant Development' is treated in a similar manner to the former Part 3A. The current Project is being assessed as a State Significant Development under Part 4 of the EP&A Act. The Minister is the Consent authority for State Significant Development applications, although for staged developments, the Minister may determine the local Council as the Consent authority for subsequent stages. As for other development applications under Part 4, the environmental impacts of the proposal need to be considered, including those on heritage.

Similar to the previous Part 3A legislation, under Section 89J of Part 4 of the EP&A Act, a Section 90 AHIP to impact Aboriginal objects is not required for an approved State Significant Development or for any investigative or other activities required to be carried out for the purpose of complying with environmental assessment requirements issued in connection with a development application for any such development. Presumably, *in lieu* of a Section 90 AHIP, Aboriginal heritage would need to be managed post-approval under an Aboriginal Heritage Management Plan subject to the approval of the DP&I.

The interplay of the NP&W Act and Regulation and the planning system is complex. For proposed developments, the specific level of Aboriginal heritage impact assessment and Aboriginal community consultation required, and any requirement for an AHIP, is highly dependent upon not just the NP&W Act and Regulation, but the nature of the proposal, the Part and Division of the EP&A Act under which planning approval is required, any specific project approval requirements issued by DP&I and/or the OEH, the presence or otherwise of Aboriginal objects, and the potential for Aboriginal objects to occur.

8.3 Local

Under the *Environmental Planning and Assessment Act 1979* the Minister may make various planning instruments such as Local Environment Plans (LEPs), that are administered at a local government level. These plans set out objectives and controls for the development of land in the local government areas.

The *Cessnock Local Environmental Plan 1989* and *Lake Macquarie Local Environmental Plan 2004* and *Hunter Regional Environmental Plan 1989 (Heritage)* (REP) apply to portions of the investigation area, although may not be relevant to this specific project as it is defined as an activity under Part 4 Division 4.1 of the EP&A Act. The LEPs and REP contains several provisions relating to heritage and list heritage items within various schedules.

No indigenous heritage items are listed on the Cessnock LEP or Hunter REP within the investigation area. All Aboriginal sites listed on the OEH AHIMS are also listed on Schedule 6 of the Lake Macquarie LEP.

Part 6, Clause 50 of the *Lake Macquarie Local Environment Plan 2004* relates to development affecting places or sites of known or potential Aboriginal heritage significance, and states that:

(1) Consent must not be granted for development that is likely to have an impact on a place of Aboriginal heritage significance or a potential place of Aboriginal heritage significance, or that will be carried out on an archaeological site of a relic that has Aboriginal heritage significance, unless the consent authority has considered a heritage impact statement explaining how the proposed development would affect the conservation of the place or site and any relic known or reasonably likely to be located at the place or site.

(2) Except where the proposed development is integrated development, the consent authority must provide a copy of the development application and heritage impact statement to a member or representative of the appropriate local Aboriginal community and the Director-General of the Department of Environment and Conservation within 14 days of receipt of the application.

(3) Consent must not be granted to any such development unless the consent authority has taken into consideration any comments received by it from any member or representative of that Aboriginal community or that Director-General within 28 days after the application and statement are sent in accordance with subclause (2).

(4) In the instance of development in proximity to items or places identified in Schedule 6 or recorded or held by a Local Aboriginal Land Council, consultation with the relevant Local Aboriginal Land Council is required before consent may be granted. Consultation is sufficient for the purposes of this requirement if the consent authority has taken into consideration all comments received from the Local Aboriginal Land Council within 28 days after a copy of the application and statement are sent to it by the consent authority.

Schedule 6 (places or potential places of Aboriginal heritage significance) is identified as:

- Part 1: Places of Aboriginal heritage significance - all sites identified in the last edition of the OEH AHIMS register; and
- Part 2: Potential places of Aboriginal heritage significance - all sites, localities and landscapes identified in the *Lake Macquarie Aboriginal Heritage Study Report.*

9. POTENTIAL IMPACTS

The proposed works associated with the Tasman Extension Project have been outlined in Section 1.1 and are shown on Figure 2. Principally they comprise an extension of the underground mining operations and development of surface infrastructure, including a new pit top (and associated run-of-mine coal handling infrastructure) and ventilation surface infrastructure.

The impacts of the Project on Aboriginal heritage (comprising both the identified Aboriginal objects, the potential resource and cultural areas/values) can potentially manifest itself in two distinct ways:

- Direct impacts from surface works (refer to Section 9.1); and
- Indirect impacts to the ground surface through underground mining induced subsidence (refer to Section 9.2).

In addition, a key component of the Project requirements is consideration of these impacts within a regional context (ie. cumulative impacts - refer to Section 9.3).

The potential impacts of the Project on each of the Aboriginal sites and cultural areas/values within or immediately adjacent to the investigation area are presented in Tables 14 and 15. These summaries in Tables 14 and 15 refer to the potential impacts *prior to* the implementation of any mitigation measures, such as additional Subsidence Control Zones (over and above those already in place for the approved Tasman Mine). The level of impacts will be reduced by the implementation of various mitigation measures and management strategies, as outlined in Sections 10 and 11 and demonstrated in Table 16 (refer also to Figure 13). The 'type of harm', 'degree of harm' and 'consequence of harm' are as specified in the DECCW (2010b) requirements.

In the absence of appropriate management and mitigation measures (including the existing Subsidence Control Zones), it is concluded that the impacts of the Project on Aboriginal heritage would be high within a local context and moderate within a regional context. However, with the implementation of mitigation measures, particularly the Subsidence Control Zones, the impacts of the Project on Aboriginal heritage will be reduced to low within a local context and very low within a regional context.

9.1 Potential Surface Impacts

The nature and level of potential direct surface impacts of relevance to Aboriginal heritage can be categorised as follows:

- Broad-scale high level impacts, comprising the area of the new pit top, including new roads, ventilation shafts and stockpiles (surface investigation area, adjacent to George Booth Drive);
- Small-scale low-high level impacts, comprising areas with potentially some flexibility in location (eg. small area impacts such as exploratory drilling, subsidence monitoring, environmental monitoring and subsidence remediation); and
- Low-high level continuing land-use impacts, comprising areas such as existing vehicle tracks or power easements, that will be subject to use and potentially maintenance.

Broad-scale high level impacts

Development of a new pit top and associated ROM coal handling infrastructure adjacent to George Booth Drive will affect a maximum area of approximately 11.3 hectares, within a surface investigation area of 21.7 hectares (refer to Figures 2 and 4). No Aboriginal heritage evidence has been identified in this location.

As discussed in Section 5.3.8, there remains a potential for stone artefacts to occur across this area. Given the absence of primary or secondary resource zones, this evidence is expected to comprise a very low density of artefacts and potentially a shallow very low-density sub-surface deposit of artefacts. Consistent with the results of the investigation, relatively higher artefact discard may occur on the level to gentle crests within this area. Nevertheless, the potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value to occur is low.

Of the cultural areas/values identified by the Aboriginal parties, the overall Tasman Extension Investigation Area Cultural Landscape, the use of subsistence and other resources, and the ongoing cultural and spiritual connection, may be affected. The proposed works may result in some loss of these values, albeit the focus of the works on the lower foothills north of Mount Sugarloaf is not directly within any of the more significant areas.

Small-scale low-high level impacts

Mine infrastructure (such as ventilation shafts) will all be located within the surface investigation area adjacent to George Booth Drive (refer above).

Other minor impacts may occur throughout the Project area in relation to exploratory drilling (including new vehicle access where required) and subsidence and environmental monitoring, and subsidence remediation. The locations of such areas are currently unknown, and as such they cannot be predicted in the 'surface impacts' column of Table 14. Nevertheless, any potential impacts would be limited to small discrete areas, and it would be highly feasible to avoid impacts to identified heritage sites. Measures are proposed in Sections 10 and 11 to address and minimise these potential impacts.

Low-high level continuing land-use impacts

Continuation of existing land-use practices, mostly relating to the maintenance and use of the vehicle tracks and power easements, for both mining and non-Project related purposes, may also result in impacts to Aboriginal heritage evidence within the Project area and therefore requires management consideration.

Almost all of the open artefact sites within the Project area are located on vehicle tracks, including within power easements. Use of these tracks by Donaldson Coal (for example, during exploratory drilling or subsidence or environmental monitoring or remediation works), or other users of the power easements, State Forest, Conservation Area, or private land on which they are situated, may result in impacts to these sites. A higher level of impact would be expected to arise when maintenance works are conducted along vehicle tracks, compared with the very low level of impacts that would be expected from the passage of vehicles and machinery. Potential impacts from the Project only (not from other land users) are assessed in Table 14.

Measures are proposed in Sections 10 and 11 to address and minimise these potential impacts.

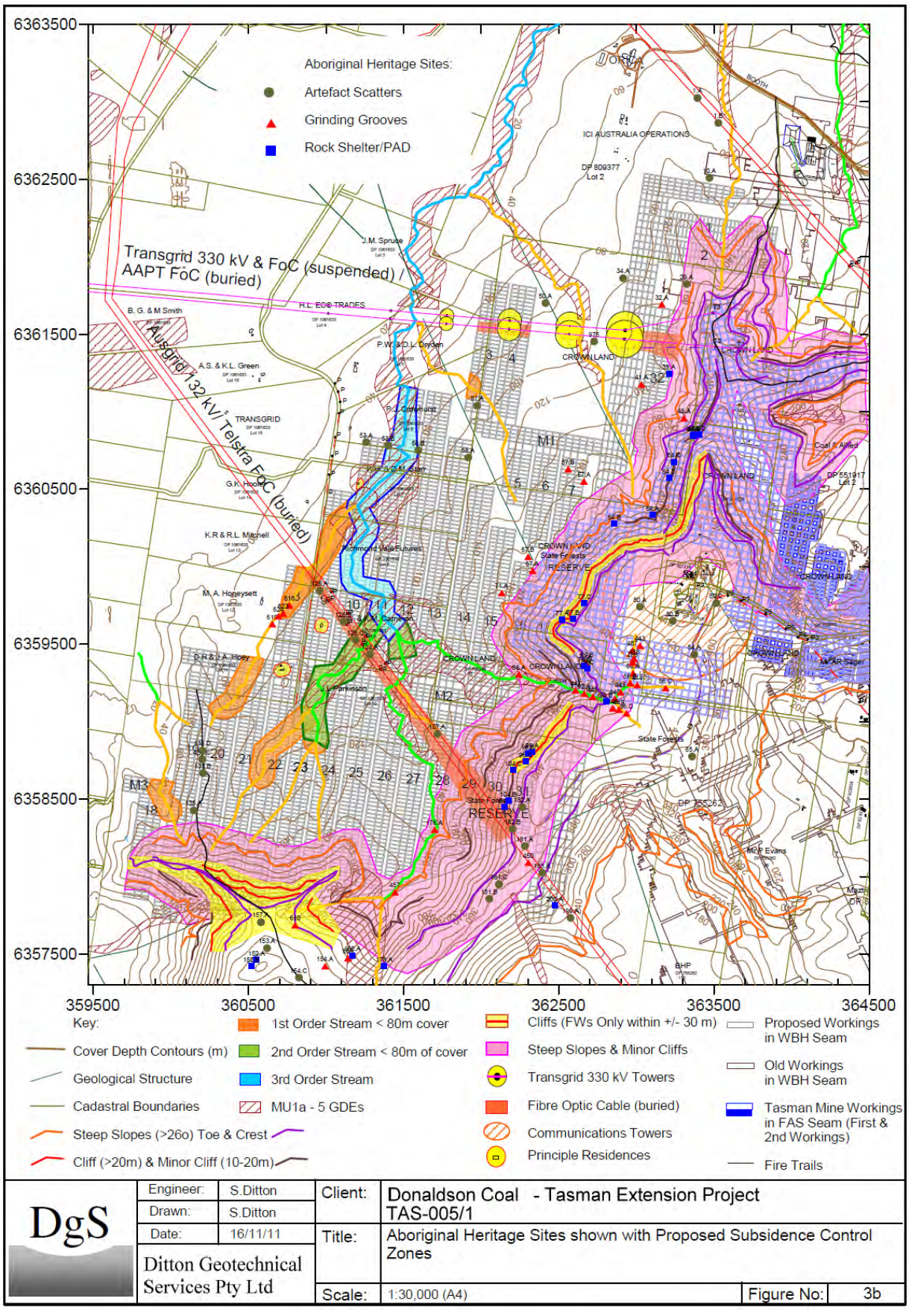


Figure 13: Proposed Subsidence Control Zones and locations of Aboriginal sites and cultural areas/values (courtesy Resource Strategies and DGS 2012).

Table 14: Potential surface impacts to Aboriginal sites, cultural areas/values and potential deposits within or immediately adjacent to the investigation area from the Project prior to the implementation of mitigation measures.

Site Name	Site Type	Comments	Surface	Potential Impacts		
				Type of Harm	Degree of Harm	Consequence of Harm
Mt Sugarloaf (38-4-0440)	Open grinding groove		nil proposed by Project	none	none	no loss of value
Mt Sugarloaf (38-4-0443)	Open grinding groove	Not relocated during current survey.	nil proposed by Project	none	none	no loss of value
Mt Sugarloaf (38-4-0444)	Open grinding groove		nil proposed by Project	none	none	no loss of value
Mt Sugarloaf (38-4-0445)	Open grinding groove		nil proposed by Project	none	none	no loss of value
Mt Sugarloaf (38-4-0446)	Open grinding groove		nil proposed by Project	none	none	no loss of value
Mt Sugarloaf (38-4-0447)	Open grinding groove		nil proposed by Project	none	none	no loss of value
Mt Sugarloaf (38-4-0448)	Open grinding groove		nil proposed by Project	none	none	no loss of value
Mt Sugarloaf (38-4-0449)	Open grinding groove		nil proposed by Project	none	none	no loss of value
Mt Sugarloaf (38-4-0450)	Open grinding groove	Not relocated during current survey.	nil proposed by Project	none	none	no loss of value
Heaton State Forest (38-4-0457)	Open grinding groove	Not relocated during current survey.	nil proposed by Project	none	none	no loss of value
Heaton State Forest (38-4-0486)	Open grinding groove		nil proposed by Project	none	none	no loss of value
Heaton State Forest (38-4-0487)	Open grinding groove	Not relocated during current survey.	nil proposed by Project	none	none	no loss of value
Heaton State Forest (38-4-0488)	Open grinding groove		nil proposed by Project	none	none	no loss of value
Sugarloaf Range 1 (38-4-0610)	Open grinding groove		nil proposed by Project	none	none	no loss of value
Mt Sugarloaf (38-4-0618)	Open grinding groove	Not reinspected during present survey due to property access restrictions.	nil proposed by Project	none	none	no loss of value
Mt Sugarloaf (38-4-0619)	Open grinding groove	Not reinspected during present survey due to property access restrictions.	nil proposed by Project	none	none	no loss of value
Mt Sugarloaf (38-4-0623)	Open grinding groove	Not reinspected during present survey due to property access restrictions.	nil proposed by Project	none	none	no loss of value
Mt Sugarloaf 2 (38-4-0624)	Open grinding groove	Not reinspected during present survey due to property access restrictions.	nil proposed by Project	none	none	no loss of value
Heaton SF (38-4-0869)	Open grinding groove	Outside investigation area.	nil (outside Project area)	none	none	no loss of value
Wallis Creek 1 (38-4-0975)	Open artefact site	Not reinspected during present survey as outside investigation area by 35 metres.	low-high level continuing land use (vehicle track, power easement); nil proposed by Project	none	none	no loss of value
Tasman Extension 1/A	Open artefact site	35 metres outside investigation area	low-high level continuing land use (vehicle track, power easement); nil proposed by Project	none	none	no loss of value

Site Name	Site Type	Comments	Surface	Potential Impacts		
				Type of Harm	Degree of Harm	Consequence of Harm
Tasman Extension 1/B	Open artefact site		low-high level continuing land use (vehicle track, power easement)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 10/A	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 29/A	Open artefact site		nil proposed by Project	none	none	no loss of value
Tasman Extension 32/A	Open grinding groove		nil proposed by Project	none	none	no loss of value
Tasman Extension 34/A	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 39/A	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 41/A	Open grinding groove		nil proposed by Project	none	none	no loss of value
Tasman Extension 45/A	Open grinding groove		nil proposed by Project	none	none	no loss of value
Tasman Extension 46/A	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	nil proposed by Project	none	none	no loss of value
Tasman Extension 46/B	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	nil proposed by Project	none	none	no loss of value
Tasman Extension 46/C	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	nil proposed by Project	none	none	no loss of value
Tasman Extension 46/D	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	nil proposed by Project	none	none	no loss of value
Tasman Extension 50/A	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 51/A	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 53/A	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 53/B	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 56/A	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 56/B	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 57/A	Open grinding groove		nil proposed by Project	none	none	no loss of value
Tasman Extension 57/B	Open grinding groove		nil proposed by Project	none	none	no loss of value
Tasman Extension 64/A	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 64/B	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 64/C	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value

Site Name	Site Type	Comments	Surface	Potential Impacts		
				Type of Harm	Degree of Harm	Consequence of Harm
Tasman Extension 64/D	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 67/A	Open grinding groove		nil proposed by Project	none	none	no loss of value
Tasman Extension 67/B	Open grinding groove		nil proposed by Project	none	none	no loss of value
Tasman Extension 71/A	Open grinding groove		nil proposed by Project	none	none	no loss of value
Tasman Extension 77/A	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 77/B	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 77/C	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 79/A	Open grinding groove		nil proposed by Project	none	none	no loss of value
Tasman Extension 79/B	Open artefact site		nil proposed by Project	none	none	no loss of value
Tasman Extension 79/C	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 79/D	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 80/A	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 80/B	Open artefact site	25 metres outside investigation area	nil proposed by Project	none	none	no loss of value
Tasman Extension 80/C	Open artefact site	outside investigation area	nil proposed by Project	none	none	no loss of value
Tasman Extension 84/A	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 85/A	Open artefact site	outside investigation area	nil proposed by Project	none	none	no loss of value
Tasman Extension 86/A	Open grinding groove		nil proposed by Project	none	none	no loss of value
Tasman Extension 86/B	Open grinding groove		nil proposed by Project	none	none	no loss of value
Tasman Extension 86/C	Open grinding groove		nil proposed by Project	none	none	no loss of value
Tasman Extension 86/D	Open grinding groove		nil proposed by Project	none	none	no loss of value
Tasman Extension 88/A	Open grinding groove		nil proposed by Project	none	none	no loss of value
Tasman Extension 92/A	Open grinding groove and open artefact site		nil proposed by Project	none	none	no loss of value
Tasman Extension 92/B	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 96/A	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 96/B	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 96/C	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 104/A	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 104/B	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 104/C	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension 107/A	Open artefact site		low-high level continuing land use (vehicle track, power easement)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 124/A	Open artefact site		low-high level continuing land use (vehicle track, power easement)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value

Site Name	Site Type	Comments	Surface	Potential Impacts		
				Type of Harm	Degree of Harm	Consequence of Harm
Tasman Extension 126/A	Open artefact site		low-high level continuing land use (vehicle track, power easement)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 126/B	Open artefact site		low-high level continuing land use (vehicle track, power easement)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 126/C	Open artefact site		low-high level continuing land use (vehicle track, power easement)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 135/A	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 135/B	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 135/C	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 135/D	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 152/A	Rockshelter with PAD	20 metres outside investigation area	nil proposed by Project	none	none	no loss of value
Tasman Extension 152/B	Rockshelter with PAD	70 metres outside investigation area	nil proposed by Project	none	none	no loss of value
Tasman Extension 153/A	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 154/A	Open grinding groove	outside investigation area	nil proposed by Project	none	none	no loss of value
Tasman Extension 154/B	Open artefact site	outside investigation area	low-high level continuing land use (outside Project area, but key access vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 154/C	Open artefact site	outside investigation area	low-high level continuing land use (outside Project area, but key access vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 155/A	Rockshelter with PAD	outside investigation area	nil proposed by Project	none	none	no loss of value
Tasman Extension 157/A	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 176/A	Open grinding groove		nil proposed by Project	none	none	no loss of value
Tasman Extension 178/A	Rockshelter with PAD	outside investigation area	nil proposed by Project	none	none	no loss of value
Tasman Extension 181/A	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 181/B	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 181/C	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 182/A	Open artefact site		low-high level continuing land use (vehicle track)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 182/B	Open artefact site		low-high level continuing land use (vehicle track, power easement)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 188/A	Open artefact site		low-high level continuing land use (vehicle track, power easement)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value

Site Name	Site Type	Comments	Surface	Potential Impacts		
				Type of Harm	Degree of Harm	Consequence of Harm
Tasman Extension 199/A	Open artefact site		low-high level continuing land use (vehicle track, power easement)	possibly direct or none	possibly total or partial or none	possibly total or partial or no loss of value
Tasman Extension 200/A	Rockshelter with PAD		nil proposed by Project	none	none	no loss of value
Tasman Extension Investigation Area	Cultural area/value		broad-scale high level (small portion), small-scale low-high level (very small portions), low-high level continuing land use (very small portions)	probably direct	probably partial	probably partial loss of value
Men's Area	Cultural area/value		small-scale low-high level (if drilling, monitoring or remediation works)	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Grinding Groove Area	Cultural area/value		small-scale low-high level (if drilling, monitoring or remediation works)	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Keepa Keepa Pathways Area	Cultural area/value		low-high level continuing land use (vehicle track)	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Sugarloaf Pathways	Cultural area/value		low-high level continuing land use (vehicle track)	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Sugarloaf and the Supreme Being, 'Koe-in'	Cultural area/value		small-scale low-high level (if drilling, monitoring or remediation works), low-high level continuing land use	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Sugarloaf and the Supernatural Spirit 'Puttikan'	Cultural area/value		small-scale low-high level (if drilling, monitoring or remediation works), low-high level continuing land use	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Burials in a cave on the side of Mount Sugarloaf	Cultural area/value		uncertain	uncertain	uncertain	uncertain
Mount Sugarloaf as a heirophany between the secular world and the sky-world	Cultural area/value		probably nil from Project (peak outside of Project area)	probably none	probably none	probably no loss of value
Presence of quartz and associations with the Clever Man	Cultural area/value		small-scale low-high level (if drilling, monitoring or remediation works), low-high level continuing land use	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Use of subsistence and other resources	Cultural area/value		broad-scale high level (small portion), small-scale low-high level (very small portions), low-high level continuing land use (very small portions)	probably direct	probably partial	probably partial loss of value
Ongoing cultural and spiritual connection	Cultural area/value		broad-scale high level (small portion), small-scale low-high level (very small portions), low-high level continuing land use (very small portions)	probably direct	probably partial	probably partial loss of value
Contemporary significance of Aboriginal objects	Cultural area/value	Refer above for each recorded Aboriginal site				

Table 15: Potential subsidence impacts to Aboriginal sites, cultural areas/values and potential deposits within or immediately adjacent to the investigation area from the Project prior to the implementation of mitigation measures, including Subsidence Control Zones (after Ditton 2012; refer to Appendix 7).

Site Name	Site Type	Comments	Potential Impacts			
			Subsidence	Type of Harm	Degree of Harm	Consequence of Harm
Mt Sugarloaf (38-4-0440)	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Mt Sugarloaf (38-4-0443)	Open grinding groove	Not relocated during current survey.	very unlikely	probably none	probably none	probably no loss of value
Mt Sugarloaf (38-4-0444)	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Mt Sugarloaf (38-4-0445)	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Mt Sugarloaf (38-4-0446)	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Mt Sugarloaf (38-4-0447)	Open grinding groove		unlikely (before and after SCZ)	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Mt Sugarloaf (38-4-0448)	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Mt Sugarloaf (38-4-0449)	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Mt Sugarloaf (38-4-0450)	Open grinding groove	Not relocated during current survey.	very unlikely	probably none	probably none	probably no loss of value
Heaton State Forest (38-4-0457)	Open grinding groove	Not relocated during current survey.	very unlikely	probably none	probably none	probably no loss of value
Heaton State Forest (38-4-0486)	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Heaton State Forest (38-4-0487)	Open grinding groove	Not relocated during current survey.	very unlikely	probably none	probably none	probably no loss of value
Heaton State Forest (38-4-0488)	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Sugarloaf Range 1 (38-4-0610)	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Mt Sugarloaf (38-4-0618)	Open grinding groove	Not reinspected during present survey due to property access restrictions.	unlikely (before SCZ); very unlikely (after SCZ)	possibly direct or none (before SCZ); probably none (after SCZ)	possibly partial or none (before SCZ); probably none (after SCZ)	possibly partial or no loss of value (before SCZ); probably no loss of value (after SCZ)
Mt Sugarloaf (38-4-0619)	Open grinding groove	Not reinspected during present survey due to property access restrictions.	very unlikely	probably none	probably none	probably no loss of value
Mt Sugarloaf (38-4-0623)	Open grinding groove	Not reinspected during present survey due to property access restrictions.	moderate (before and after SCZ)	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Mt Sugarloaf 2 (38-4-0624)	Open grinding groove	Not reinspected during present survey due to property access restrictions.	moderate (before and after SCZ)	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Heaton SF (38-4-0869)	Open grinding groove	Outside investigation area.	very unlikely	probably none	probably none	probably no loss of value
Wallis Creek 1 (38-4-0975)	Open artefact site	Not reinspected during present survey as outside investigation area by 35 metres.	very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 1/A	Open artefact site	35 metres outside investigation area	very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 1/B	Open artefact site		very unlikely	probably none	probably none	probably no loss of value

Site Name	Site Type	Comments	Potential Impacts			
			Subsidence	Type of Harm	Degree of Harm	Consequence of Harm
Tasman Extension 10/A	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 29/A	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 32/A	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 34/A	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 39/A	Rockshelter with PAD		moderate (before and after SCZ)	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Tasman Extension 41/A	Open grinding groove		moderate (before and after SCZ)	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Tasman Extension 45/A	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 46/A	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	unlikely (before and after SCZ)	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Tasman Extension 46/B	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	unlikely (before and after SCZ)	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Tasman Extension 46/C	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 46/D	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 50/A	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 51/A	Open artefact site		unlikely	probably none	probably none	probably no loss of value
Tasman Extension 53/A	Open artefact site		unlikely	probably none	probably none	probably no loss of value
Tasman Extension 53/B	Open artefact site		unlikely	probably none	probably none	probably no loss of value
Tasman Extension 56/A	Open artefact site		unlikely	probably none	probably none	probably no loss of value
Tasman Extension 56/B	Open artefact site		unlikely	probably none	probably none	probably no loss of value
Tasman Extension 57/A	Open grinding groove		moderate (before and after SCZ)	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Tasman Extension 57/B	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 64/A	Rockshelter with PAD		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 64/B	Rockshelter with PAD		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 64/C	Rockshelter with PAD		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 64/D	Rockshelter with PAD		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 67/A	Open grinding groove		unlikely (before and after SCZ)	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Tasman Extension 67/B	Open grinding groove		unlikely (before and after SCZ)	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Tasman Extension 71/A	Open grinding groove		moderate (before SCZ); possible (after SCZ)	possibly direct or none	possibly partial or none	possibly partial or no loss of value

Site Name	Site Type	Comments	Potential Impacts			
			Subsidence	Type of Harm	Degree of Harm	Consequence of Harm
Tasman Extension 77/A	Rockshelter with PAD		unlikely (before SCZ); very unlikely (after SCZ)	possibly direct or none (before SCZ); probably none (after SCZ)	possibly partial or none (before SCZ); probably none (after SCZ)	possibly partial or no loss of value (before SCZ); probably no loss of value (after SCZ)
Tasman Extension 77/B	Rockshelter with PAD		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 77/C	Rockshelter with PAD		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 79/A	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 79/B	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 79/C	Rockshelter with PAD		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 79/D	Rockshelter with PAD		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 80/A	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 80/B	Open artefact site	25 metres outside investigation area	very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 80/C	Open artefact site	outside investigation area	very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 84/A	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 85/A	Open artefact site	outside investigation area	very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 86/A	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 86/B	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 86/C	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 86/D	Open grinding groove		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 88/A	Open grinding groove		moderate (before SCZ); unlikely (after SCZ)	possibly direct or none	possibly partial or none	possibly partial or no loss of value
Tasman Extension 92/A	Open grinding groove and open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 92/B	Rockshelter with PAD		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 96/A	Rockshelter with PAD		unlikely (before SCZ); very unlikely (after SCZ)	possibly direct or none (before SCZ); probably none (after SCZ)	possibly partial or none (before SCZ); probably none (after SCZ)	possibly partial or no loss of value (before SCZ); probably no loss of value (after SCZ)
Tasman Extension 96/B	Rockshelter with PAD		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 96/C	Rockshelter with PAD		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 104/A	Rockshelter with PAD		unlikely (before SCZ); very unlikely (after SCZ)	possibly direct or none (before SCZ); probably none (after SCZ)	possibly partial or none (before SCZ); probably none (after SCZ)	possibly partial or no loss of value (before SCZ); probably no loss of value (after SCZ)
Tasman Extension 104/B	Rockshelter with PAD		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 104/C	Rockshelter with PAD		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 107/A	Open artefact site		unlikely	probably none	probably none	probably no loss of value
Tasman Extension 124/A	Open artefact site		unlikely	probably none	probably none	probably no loss of value
Tasman Extension 126/A	Open artefact site		unlikely	probably none	probably none	probably no loss of value
Tasman Extension 126/B	Open artefact site		unlikely	probably none	probably none	probably no loss of value
Tasman Extension 126/C	Open artefact site		unlikely	probably none	probably none	probably no loss of value

Site Name	Site Type	Comments	Potential Impacts			
			Subsidence	Type of Harm	Degree of Harm	Consequence of Harm
Tasman Extension 135/A	Open artefact site		unlikely	probably none	probably none	probably no loss of value
Tasman Extension 135/B	Open artefact site		unlikely	probably none	probably none	probably no loss of value
Tasman Extension 135/C	Open artefact site		unlikely	probably none	probably none	probably no loss of value
Tasman Extension 135/D	Open artefact site		unlikely	probably none	probably none	probably no loss of value
Tasman Extension 152/A	Rockshelter with PAD	20 metres outside investigation area	very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 152/B	Rockshelter with PAD	70 metres outside investigation area	very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 153/A	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 154/A	Open grinding groove	outside investigation area	very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 154/B	Open artefact site	outside investigation area	very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 154/C	Open artefact site	outside investigation area	very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 155/A	Rockshelter with PAD	outside investigation area	very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 157/A	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 176/A	Open grinding groove		moderate (before SCZ); very unlikely (after SCZ)	possibly direct or none (before SCZ); probably none (after SCZ)	possibly partial or none (before SCZ); probably none (after SCZ)	possibly partial or no loss of value (before SCZ); probably no loss of value (after SCZ)
Tasman Extension 178/A	Rockshelter with PAD	outside investigation area	very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 181/A	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 181/B	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 181/C	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 182/A	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 182/B	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 188/A	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 199/A	Open artefact site		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension 200/A	Rockshelter with PAD		very unlikely	probably none	probably none	probably no loss of value
Tasman Extension Investigation Area	Cultural area/value		varies	possibly indirect or none	possibly partial or none	possibly partial or no loss of value
Men's Area	Cultural area/value		very unlikely	probably none	probably none	probably no loss of value
Grinding Groove Area	Cultural area/value		very unlikely	probably none	probably none	probably no loss of value
Keepa Keepa Pathways Area	Cultural area/value		varies	possibly indirect or none	possibly partial or none	possibly partial or no loss of value
Sugarloaf Pathways	Cultural area/value		very unlikely	probably none	probably none	probably no loss of value
Sugarloaf and the Supreme Being, 'Koe-in'	Cultural area/value		very unlikely	probably none	probably none	probably no loss of value
Sugarloaf and the Supernatural Spirit 'Puttikan'	Cultural area/value		varies	possibly indirect or none	possibly partial or none	possibly partial or no loss of value
Burials in a cave on the side of Mount Sugarloaf	Cultural area/value		varies	probably none	probably none	probably no loss of value
Mount Sugarloaf as a heirophany between the secular world and the sky-world	Cultural area/value		very unlikely	probably none	probably none	probably no loss of value

Site Name	Site Type	Comments	Potential Impacts			
			Subsidence	Type of Harm	Degree of Harm	Consequence of Harm
Presence of quartz and associations with the Clever Man	Cultural area/value		very unlikely	probably none	probably none	probably no loss of value
Use of subsistence and other resources	Cultural area/value		varies	possibly indirect or none	possibly partial or none	possibly partial or no loss of value
Ongoing cultural and spiritual connection	Cultural area/value		varies	possibly indirect or none	possibly partial or none	possibly partial or no loss of value
Contemporary significance of Aboriginal objects	Cultural area/value	Refer above for each recorded Aboriginal site	Refer above for each recorded Aboriginal site	Refer above for each recorded Aboriginal site	Refer above for each recorded Aboriginal site	Refer above for each recorded Aboriginal site

Note: The potential subsidence impacts for several open artefact sites have been revised downward from 'moderate' in Ditton's (2012: Table 23C) to 'unlikely' (refer to Section 9.2 for discussion).
For rock shelters, the potential for subsidence impacts is assumed as the highest risk (if the risks for cracking damage and toppling damage are not the same).

9.2 Potential Subsidence Impacts

The impacts of underground mining on the ground surface occur through subsidence and have the potential to affect Aboriginal heritage evidence, particularly rock shelter and grinding groove sites. The potential subsidence impacts of the project on Aboriginal heritage have been assessed by Ditton (2012) and are summarised in Appendix 7 and Table 15.

Ditton (2012) has prepared a generic assessment of the predicted subsidence, tilt and horizontal strain[17] for each Aboriginal site (and the major rock formations associated with specific cultural areas, such as the men's area), including the cumulative effect from the existing approved Tasman Mine workings in the Fassifern Seam (refer to Table 23A in Appendix 7). It is noted that the areas of Fassifern Seam workings included in the present investigation area have not previously been subject to heritage assessment or subsidence impact assessment during the Tasman Mine approval process (Umwelt 2002a) or SMP assessment of Panels 1-17 (Kuskie 2008a).

The predictions of Ditton (2012) are made for two scenarios, one prior to the implementation of Subsidence Control Zones (SCZs) for the Extension Project and secondly, after implementations of the SCZs. The SCZs are a significant mitigation measure which will substantially reduce the potential impacts of the Project on Aboriginal heritage (refer to Section 10 and Table 16). However, substantial SCZs already exist as a condition of the current Tasman Mine Project Approval. Where the assessment of Ditton (2012: Tables 23A and 23C) references 'no SCZ', this is taken to mean 'no additional SCZ as proposed for the present Extension Project', but assumes that SCZs forming part of the Approved Project are already applied. In other words, Ditton's (2012) assessment does not measure the base case scenario, were bord and pillar mining to occur in the Fassifern Seam (Approved Project) or West Borehole Seam (current application), and no SCZs at all were to be applied (including the Approved Mine SCZs). In this scenario, it is assumed that the impacts on Aboriginal heritage would be substantially higher than what is presented in the 'no SCZ' assessment of Ditton (2012: Tables 23A and 23C).

[17] For a discussion of the nature of subsidence effects, refer to Ditton (2012).

Ditton (2012) has also assessed the probability that the predicted levels of subsidence, tilt and strain will result in perceptible impacts for each Aboriginal site. 'Perceptible impact' can be taken to refer to any changes in the rock formations that are associated with mining activity and subsidence movements. Such impacts may include tensile cracking, ranging from fine cracks to major fractures, shear movements on bedding planes and through intact strata, perceptible disturbance of any formations, and rock falls, ranging from minor dislocation of material through to major falls.

Ditton (2012) defines perceptible impacts in terms of 'cracking potential' and 'toppling damage'. The probability of perceptible impacts is a generic estimate based on the stratigraphic horizon in which the rock shelters are formed, rather than the specific geometries of individual sites. Large, continuous, overhanging formations are likely to be more susceptible to rock falls than pagoda features and isolated rocks, so there may be significant differences in potential impacts at individual sites that cannot be captured without a specific site assessment (*cf.* Mills 2009). Further assessment of individual sites of significance may be undertaken where required for future Subsidence Management Plans (for example, will lead to a refinement of the recommended mitigation/management strategy).

Ditton (2012) considers 'cracking potential' to be the primary indicator, with 'toppling potential' an additional and highly relevant criteria for rock formations hosting shelters. Ditton (2012; refer to Appendix 7, Table 23B) describes the probability for 'cracking potential' in various categories:

- Moderate: >25% probability (tensile strain >2.5 mm/m, compressive strain >5 mm/m);
- Possible: 10-25% probability (tensile strain 1.5 - 2.5 mm/m, compressive strain 3 - 5 mm/m);
- Unlikely: 5-10% probability (tensile strain 0.5 - 1.5 mm/m, compressive strain 2 - 3 mm/m); and
- Very Unlikely: <5% probability (tensile strain <0.5 mm/m, compressive strain <2 mm/m).

Ditton (2012; refer to Appendix 7, Table 23B) describes the probability for 'toppling potential' in the following categories:

- Moderate: >25% probability (>30 mm/m tilt increase);
- Possible: 10-25% probability (10 - 30 mm/m tilt increase);
- Unlikely: 5-10% probability (3 - 10 mm/m tilt increase); and
- Very Unlikely: <5% probability (<3 mm/m tilt increase).

Ditton's (2012: Table 23C) assessment of potential subsidence impacts for open artefact sites is based on a generic assessment of the predicted subsidence, tilt and horizontal strain. As outlined below, notwithstanding a 'moderate' rating for potential cracking of the soil at several open artefact sites, this does not necessarily translate to a 'moderate' potential for impacts to the artefacts themselves or any sub-surface deposits. In all cases, the potential for direct impacts to these open artefact sites can be reassessed as 'unlikely', notwithstanding that minor cracking of the soil may occur in the general locality.

Potential Subsidence Impacts on Rock Shelters with PADs

As identified in Table 15, prior to the implementation of mitigation measures such as the additional Subsidence Control Zones proposed for the Extension Project, subsidence impacts (assumed to be a greater than 10% probability of perceptible impacts, or the 'possible' or 'moderate' categories of Ditton {2012} with respect to cracking and/or toppling potential) are anticipated to occur to only one rock shelter with PAD identified within the investigation area, TE39/A. Another five PADs, TE46/A, TE46/B, TE77/A, TE96/A and TE104/A, are assessed as having an 'unlikely' (5-10% probability) of perceptible impacts, with the remaining rock shelters assessed as being 'very unlikely' (<5% probability) of exhibiting perceptible impacts.

Without the implementation of any SCZs, either for the Extension Project or the existing Approved Project, the impacts of subsidence on the identified rock shelters with PADs would be substantially higher.

After the implementation of the additional SCZs for the Extension Project (above those already in place for the Tasman Mine/Approved Project):

- Only one rock shelter with PAD (TE39/A of low-moderate significance within a local context and low significance within a regional context) has a greater than 10% probability of perceptible impacts;
- Only two rock shelters with PADs, TE46/A and TE46/B (moderate significance within a local context and low significance within a regional context), are assessed as having an 'unlikely' (5-10% probability) of perceptible impacts; and
- The 23 remaining rock shelters with PADs have a 'very unlikely' (<5% probability) of exhibiting perceptible impacts. These comprise two of moderate-high local and low regional significance, three of moderate local and low regional significance, one of low-moderate local and low regional significance, and 17 of low local and regional significance.

Where subsidence impacts do occur to rock shelters (eg. shelter TE39/A), it is anticipated that any rock falls would affect the integrity of the shelter and potentially sterilise a portion of the archaeological deposit, however in the absence of rock art, unless major rock fall occurs the effects on the deposits may not be substantial. Nevertheless, rock fall may reduce the visual integrity of a site and aspects of its heritage significance. Cracking is a potential cause of more substantive impacts to heritage. Although cracking may not directly affect archaeological deposits, major cracking has the effect of rendering a shelter susceptible to collapse or rock fall, and effectively unsafe. Such cracking may effectively sterilise the Aboriginal heritage resource within the shelter, as it is not available for Aboriginal community members to safely visit or for any future scientific research (eg. excavation) to be safely conducted. Cracking may also reduce the visual integrity of a site and aspects of its heritage significance.

Potential Subsidence Impacts on Open Grinding Groove Sites

Grinding groove sites are by their nature located on rock outcrops. Such outcrops tend to be sensitive to subsidence induced surface cracking.

As identified in Table 15, prior to the implementation of mitigation measures such as the additional Subsidence Control Zones proposed for the Extension Project, subsidence impacts (assumed to be a greater than 10% probability of perceptible impacts, or the 'possible' or 'moderate' categories of Ditton {2012} with respect to cracking potential) are anticipated to occur to seven open grinding groove sites identified within the investigation area (TE41/A, TE57/A, TE71/A, TE88/A, TE176/A, 38-4-623 and 38-4-624). Another four sites (TE67/A, TE67/B, 38-4-447 and 38-4-618) are assessed as having an 'unlikely' (5-10% probability) of perceptible impacts, with the remaining open grinding groove sites assessed as being 'very unlikely' (<5% probability) of exhibiting perceptible impacts.

Without the implementation of any SCZs, either for the Extension Project or the existing Approved Project, the impacts of subsidence on the identified open grinding groove sites would be substantially higher.

After the implementation of the additional SCZs for the Extension Project (above those already in place for the Tasman Mine/Approved Project):

- Five open grinding groove sites have a greater than 10% probability of perceptible impacts, comprising TE41/A, TE71/A, 38-4-623 and 38-4-624 (low local significance) and TE57/A (low-moderate significance within a local context and low significance within a regional context);
- Four open grinding groove sites have an 'unlikely' (5-10% probability) of perceptible impacts, comprising TE67/A, TE67/B and TE88/A (low-moderate significance within a local context and low significance within a regional context) and 38-4-447 (high significance within a local context and low-moderate significance within a regional context); and
- The 27 remaining open grinding groove sites have a 'very unlikely' (<5% probability) of exhibiting perceptible impacts. These comprise one of high local and regional significance, one of moderate-high local and low regional significance, three of moderate local and low regional significance, 14 of low-moderate local and low regional significance, and seven of low local and regional significance.

Subsidence can potentially result in changes to stream baseflow which may affect the context of grinding groove sites. Due to the implementation of the SCZs, the Project will have no more than negligible impacts on stream baseflow and no more than negligible changes to stream geomorphology within third order streams or within first or second order streams associated with groundwater dependant ecosystems, steep slopes or cliff lines.

Potential Subsidence Impacts on Open Artefact Sites

Although Ditton (2012: Table 23C) provides an assessment of potential subsidence impacts for open artefact sites, this is based on a generic assessment of the predicted subsidence, tilt and horizontal strain in particular localities, not on the potential for impacts to the specific artefacts. Notwithstanding a 'moderate' rating ascribed by Ditton (2012) for the potential cracking of the soil at several of the open artefact sites, the actual potential for perceptible impacts is inferred to be lower than this. In these cases, the potential for direct impacts to the open artefact sites has been reassessed as 'unlikely', notwithstanding that minor cracking of the soil may occur in the general locality.

Elsewhere, Mills (2005, 2007, 2009) reports that no significant impacts have been noted at previously undermined open sites (Mills 2007). Although temporary cracking during the period of active mining can affect the ground surface in the locality of sites situated directly over longwall panels, and there is potential for more permanent tension cracks within about 50 to 90 metres of chain pillar edges and close to the ends of the longwall panels, previous experience at Ulan indicates that these tension cracks are not commonly evident and gradually fill in over a period of years (Mills 2005, 2007).

As such, the potential impacts of subsidence on any of the open artefact sites within the Tasman Extension underground (bord and pillar) mining area is assessed as very low or negligible. Any effects are likely to be short-term in duration, minimal in extent and confined to the context of the sites (sediments in which the artefacts are located) rather than direct impacts or damage to the artefacts themselves.

Potential Subsidence Impacts on Cultural Values

Ditton (2012) has directly assessed the potential for subsidence impacts on three key rock formations/features in the men's area, and indirectly (via the overall subsidence assessment and specific assessments for various other Aboriginal sites) assessed the wider potential for subsidence impacts that may affect cultural values associated with the investigation area (refer to Section 5.2.4 and Table 15).

In relation to the cultural values, based on the assessment of Ditton (2012), the following conclusions are made about the potential for subsidence impacts:

- The entire Mount Sugarloaf area (including the investigation area): the implementation of SCZs will significantly reduce the potential for subsidence impacts in the areas of highest cultural significance (refer below) although elsewhere in the investigation area subsidence impacts are expected to occur as documented by Ditton (2012). This may include outside of the SCZs surface cracking and subsidence of up to 1.27 metres, which may have some adverse effect on the overall level of cultural value of the entire investigation area, however this decrease in value is inferred to be minimal;
- The Men's Area: Almost all of the Men's Area, including all major rock formations and culturally significant features, is located within a SCZ for 'Steep Slopes and Minor Cliffs'. Ditton (2012) assessed the potential for perceptible impacts to the main warrior rocks and phallic stone as 'very unlikely'. Similar assessments were made for all grinding groove and rock shelter sites within the Men's Area. As such, it is concluded that the potential impacts of subsidence on this cultural value/area will be very unlikely;
- The Keepa Keepa Pathways Area: Much of this area is in the SCZs for 'Cliffs' and 'Steep Slopes and Minor Cliffs' (Figure 13) and as such, minimal subsidence impacts are likely. Subsidence impacts were assessed as being very unlikely for the only grinding groove and rock shelter sites in this area. However, portions of the Keepa Keepa Pathways Area are located outside of the SCZs and may experience cracking. As such, it is concluded that there may be some adverse effect on the overall level of cultural value of this area, however this decrease in value is inferred to be relatively low (given that most of it is within the SCZs);
- The Grinding Groove Area: A large proportion of the Grinding Groove Area is located within the SCZs for 'Cliffs', 'Steep Slopes and Minor Cliffs' and '1st order streams' (Figure 13). Ditton (2012) has assessed the potential for subsidence impacts for all the grinding groove and rock shelter sites within this area of cultural significance (refer to Table 15 and Appendix 7). Based on assessments of the potential for perceptible impacts at these sites being almost entirely 'very unlikely', it is concluded that the potential impacts of subsidence on this cultural value/area will be very unlikely;

- Other pathways from Mount Sugarloaf, including to the north-east and along Sugarloaf Ridge to the south: Much of this area is in the SCZs for 'Steep Slopes and Minor Cliffs' and 'Communications Towers' (Figure 13) and as such, minimal subsidence impacts are likely. As such, it is concluded that the potential impacts of subsidence on this cultural value/area will be very unlikely;

- The association of Mount Sugarloaf with the supreme being 'Koe-in': Mount Sugarloaf itself is located marginally outside the Project area and the entire area surrounding the peak will be protected by an SCZ for 'Communications Towers' (Figure 13). As such, it is concluded that the potential impacts of subsidence on this cultural value/area will be very unlikely;

- The presence of the supernatural spirit being 'Puttikan', which inhabited the Sugarloaf area: As for the overall investigation area, while the implementation of the SCZs will significantly reduce the potential for subsidence impacts in many areas of high cultural significance, elsewhere subsidence impacts are expected to occur as documented by Ditton (2012). This may have some adverse effect on this cultural value, however this decrease in value is inferred to be minimal;

- Burial cave on the side of Mount Sugarloaf: Only one of the 26 rock shelters with PADs will be susceptible to possible subsidence impacts (greater than 10% probability). Although the location of any burials is unknown (and none may even occur within the investigation area), on this basis the potential for subsidence impacts or adverse effects to this cultural value is inferred to be minimal;

- The heirophany Mount Sugarloaf represents between the secular and the sky-world: Mount Sugarloaf itself is located marginally outside the Project area and the entire area surrounding the peak will be protected by an SCZ for 'Communications Towers' (Figure 13). As such, it is concluded that the potential impacts of subsidence on this cultural value/area will be very unlikely;

- The presence of quartz in the investigation area, and its associations with the clever man (karadji man): The potential impacts of subsidence on any of the open artefact sites is assessed as very low or negligible. As such, it is concluded that the potential impacts of subsidence on this cultural value will be very unlikely;

- In general terms, the use of subsistence and other resources from within the investigation area: As for the overall investigation area, while the implementation of the SCZs will significantly reduce the potential for subsidence impacts in many areas of high cultural significance, elsewhere subsidence impacts are expected to occur as documented by Ditton (2012). This may have some adverse effect on this cultural value, however this decrease in value is inferred to be minimal;

- In general terms, the traditional use of the area by Awabakal and Wonnarua people, and an ongoing cultural and spiritual connection to the land by the descendants of these people: As for the overall investigation area, while the implementation of the SCZs will significantly reduce the potential for subsidence impacts in many areas of high cultural significance, elsewhere subsidence impacts are expected to occur as documented by Ditton (2012). This may have some adverse effect on this cultural value, however this decrease in value is inferred to be minimal; and

- In relation to the Aboriginal objects identified within the investigation area (for example, stone artefact sites, grinding grooves and rock shelters), the contemporary significance of these to the Aboriginal community: refer to the individual site subsidence assessments discussed above and listed in Table 15.

9.3 Regional Context and Cumulative Impacts

An objective of the NP&W Act (Section 2A) is the "conservation of objects, places or features … of cultural value within the landscape, including, but not limited to … places, objects and features of significance to Aboriginal people …". This objective is to be achieved by applying the principles of ecologically sustainable development (Section 2A), defined in Section 6 of the *Protection of the Environment Administration Act 1991* as requiring the integration of *economic* and *environmental* considerations (including cultural heritage) in the decision-making process. In regard to Aboriginal cultural heritage, ecologically sustainable development can be achieved by applying the principle of intergenerational equity and the precautionary principle (DECCW 2009b), which are discussed in Section 8.2.

Hence, the extent to which the heritage resource present within the investigation area may exist elsewhere in the region is therefore highly relevant to an assessment of the potential impacts of the Project with respect to the principles of ecologically sustainable development, intergenerational equity and the precautionary principle, along with the significance assessment of the sites (representative value) and an assessment of the cumulative impacts of the Project.

An analysis of the evidence from the investigation area within a regional context has been undertaken (refer to Section 5.3.7). However, there are various problems and constraints that limit comparison of the evidence within a regional context. Notable constraints to the assessment are the absence of quantitative baseline data from the region, along with the limited extent of the region that has been subject to systematic archaeological sampling (particularly the Southern Mountains), and the problems inherent with the quality and suitability of the information from the existing studies. No regional heritage assessments have been undertaken to any level of detail sufficient to provide suitable quantitative or baseline data for comparison. In fact, the present study represents one of the most detailed and comprehensive heritage assessment undertaken to date within the Southern Mountains region of the Hunter Valley.

Two avenues of inquiry can be pursued, as to whether similar heritage resources to those identified within the investigation area exist elsewhere within the region:

1) By comparison of the *identified resource* with other heritage studies in the region and known site databases; and

2) By examination of topographic mapping and aerial photographs to identify if comparable environmental contexts exists elsewhere in the region, in which a similar *potential resource* may occur.

Identified Resource

The identified heritage resource and cultural values of the investigation area have been analysed in a regional context in Section 5.3.7.

The results from the mountainous terrain of the investigation area contrast markedly with many other studies in the region undertaken within the lower elevation Coastal Lowlands or Central Lowlands (refer to Section 3.2). Specifically, the known ceremonial/spiritual associations with Mount Sugarloaf and the investigation area, and nature of physical evidence (numerous grinding grooves, a number of rock shelters with PADs, but limited stone artefact evidence, particularly of more focused occupation), contrasts with the adjacent terrain, particularly areas that correspond to primary or secondary resource zones. In these other areas, evidence of Aboriginal occupation primarily pertains to the secular world. In the mountainous terrain of the study area, occupation primarily pertained to the non-secular world.

However, there are similarities with the study by Umwelt (2010) of the West Wallsend Colliery, in similar mountainous terrain several kilometres south of the present investigation area. Key similarities include the nature of site types recorded, types of grinding grooves, types and frequencies of stone materials, low numbers of artefacts in open sites and location of open artefact sites predominantly on low-gradient crests. Strong traditional, historical and contemporary cultural values have been identified in both investigation areas by the Aboriginal stakeholders.

Notwithstanding some similarities with the West Wallsend study area of Umwelt (2010), the Tasman Extension investigation area (and immediate surrounds) hosts Aboriginal heritage evidence (including cultural sites and values) in the form of a cultural landscape that is not replicated elsewhere locally and is of representative value within both local and regional contexts.

Six of the cultural places/values have been assessed as being of high significance within a regional context and two of low to moderate significance within a regional context. One grinding groove site has been assessed as being of high significance within a regional context, and two (including the grinding groove and open artefact site) as being of low to moderate significance within a regional context.

As discussed in Sections 9.1 and 9.2 and 10.2, the impacts of the Project on the sites of regional significance can almost entirely be avoided or mitigated.

Hence, it is concluded that in the absence of appropriate management and mitigation measures (including the Subsidence Control Zones for the approved mine), the impacts of the Project on Aboriginal heritage would be high within a local context and moderate within a regional context. However, with the implementation of mitigation measures, particularly the Subsidence Control Zones, the impacts of the Project on Aboriginal heritage will be reduced to low within a local context and very low within a regional context.

Potential Resource

The primary potential resource of the investigation area relates to stone artefacts within sub-surface deposits. The investigation results and occupation model indicate that while there is potential for stone artefacts to occur in a widespread distribution of variable density across virtually all landform units of the investigation area, none of the investigation area can be characterised as being located within a primary or secondary resource zone. As such, any potential artefact evidence will typically be of a very low density, consistent with background discard, as demonstrated by the survey results. The potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value to occur is generally low.

Extensive investigations elsewhere in the Coastal Lowlands and Central Lowlands demonstrate that such a resource is very widespread. As such, any impacts to this resource within the investigation area (which will affect minimal areas in association with surface facilities and continuing land use), will have negligible impact upon the overall potential resource of the region. Similar environmental contexts (and potential resources) are present within the adjacent portions of Sugarloaf State Conservation Area.

Cumulative Impact

Following a conclusion that the impacts of the Project will be relatively low within a regional context after the implementation of mitigation measures, it logically follows that the cumulative impact of the Project within a regional context will be very low.

Conclusion

In the absence of appropriate management and mitigation measures (including the Subsidence Control Zones for the approved mine), it is concluded that the impacts of the Project on Aboriginal heritage would be high within a local context and moderate within a regional context. However, with the implementation of mitigation measures as outlined in Sections 10 and 11, particularly the Subsidence Control Zones, the impacts of the Project on Aboriginal heritage will be reduced to low within a local context and very low within a regional context. By extension, the cumulative impacts of the Project within a regional context will also be very low.

The Project is not inconsistent with the principle of intergenerational equity as outlined in Section 8.2. With the implementation of the mitigation measures as outlined in Sections 10 and 11, the Project will not cause, within a regional context, a loss of heritage resources that could be viewed as being very rare or unique or unlikely to exist elsewhere.

In relation to the precautionary principle (refer to Section 8.2), the comprehensive nature of the archaeological survey and assessment and consultation process substantially reduces the risk of lack of scientific certainty.

The present study sampled virtually the geographic extent of the investigation area, consistent with the DEC (2005) *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation*. Measures are proposed in Sections 10 and 11 to obtain survey coverage of the approximate 10% portion of the investigation area that could not be sampled during the current assessment due to property access restrictions.

Nevertheless, as identified in Section 7.2, in the absence of excavation of deposits, the nature and significance of evidence within the rock shelters cannot be known for certain. Controlled excavation of any shelter may lead to a revision of the assessment of significance, either upward (in the case of a shelter where deposits of higher research value than anticipated are revealed) or downward (in the case of a shelter where anticipated deposits of research value do not exist or are in a state of low integrity). If occupation deposits were to be identified in rock shelters that relate to human burials, spiritual/ceremonial use and/or occupation earlier than the mid-late Holocene period (older than say 5,000 years BP), these may rate as being of regional significance. Measures are proposed in Sections 10 and 11 to satisfactorily address this issue, with respect to consideration of the principles of ecologically sustainable development.

10. POTENTIAL MITIGATION AND MANAGEMENT STRATEGIES

10.1 General Strategies

General strategies for the management of the identified and potential Aboriginal heritage resources and cultural areas/values within the investigation area and immediately adjacent area are presented below. Specific options for the Project are discussed in Section 10.2 and the recommended strategies are presented in Section 11.

A key consideration in selecting a suitable strategy is the recognition that Aboriginal heritage is of primary importance to the local Aboriginal community, and that decisions about the management of the sites should be made in consultation with the registered Aboriginal parties.

10.1.1 Strategy A (Further Investigation)

In circumstances where an Aboriginal heritage site is identified (particularly an open artefact site, rock shelter or shell midden), but the extent of the site, the nature of its contents, its level of integrity and/or its level of significance cannot be adequately assessed solely through surface survey (generally because of conditions of low surface visibility or sediment deposition), sub-surface testing may be an appropriate strategy to further assess the site. Sub-surface testing may also be appropriate in locations where artefact or midden deposits are predicted to occur (for example, in rock shelters or in open contexts) through application of a predictive model, in order to identify whether such deposits exist and their nature, extent, integrity and significance.

Test excavations can take the form of auger holes, shovel pits, mechanically excavated trenches or surface scrapes. The selection of a methodology (including a sampling strategy) is a process that involves (*cf*. Boismier 1991):

1) Identification of the specific environmental/cultural characteristics of the investigation area;

2) Construction of a model of Aboriginal occupation for the locality;

3) Definition of the expected nature and distribution of evidence (predictive model);

4) Formation of research questions and a methodology to retrieve the required data/evidence, in consideration of the expected nature and distribution of evidence; and

5) Analytical techniques for the evidence recovered that are appropriate to address the research questions and project objectives.

A Section 90 AHIP is not required for test excavations undertaken in compliance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b), although implementation of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* policy (DECCW 2010c) is required.

However, under the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*, archaeological test excavation is necessary when (regardless of whether or not there are objects present on the ground surface) it can be demonstrated through Requirements 1, 2, 3, 4, and 5 of the Code that sub-surface Aboriginal objects with potential conservation value have a high probability of being present in an area, and the area cannot be substantially avoided by the proposed activity.

A Section 90 AHIP is also not required under Section 89J of Part 4 of the EP&A Act, for any investigative or other activities required to be carried out for the purpose of complying with environmental assessment requirements issued in connection with a development application for State Significant Development (such as the current Project).

In all other circumstances a Section 90 AHIP is normally required from the OEH to undertake sub-surface testing. The OEH determination of AHIP applications is guided by the OEH (2011c) *Guide to Aboriginal Heritage Impact Permit Processes and Decision-Making* policy. Typically, approval of an AHIP can take up to 60 days, following receipt by the OEH of all necessary information.

This is a pro-active strategy, which should result in the identification, assessment and management of the Aboriginal heritage resource prior to any development activity occurring. Following assessment of each Aboriginal site, management strategies as outlined in Sections 10.1.2 - 10.1.5 can be applied.

Several other aspects of the potential heritage resource may require consideration as to whether further investigation is necessary as part of the Environmental Assessment stage or post-approval stage. These include areas that were not sampled during the assessment (for example, due to property access restrictions) or for which subsequent design changes may occur (outside of the currently known 'investigation area'). Typically, small areas or modifications can satisfactorily be addressed in a post-approval management plan.

10.1.2 Strategy B (Conservation)

Conservation is a suitable strategy for all heritage sites, but particularly those of high archaeological significance and/or high cultural significance. Conservation is also appropriate for specific archaeological resources and environmental/cultural contexts, as part of a regional strategy aimed at conserving a representative sample of identified and potential heritage resources.

Options exist within development proposals that can be utilised for the conservation of identified or potential Aboriginal heritage resources, including exclusion of development from zones of high heritage significance or potential, preservation of areas within formal conservation zones, or the re-design of works to avoid specific areas.

In the case of underground mining, options for conservation include the avoidance of undermining specific significant sites or areas susceptible to subsidence (eg. grinding grooves, rock shelters and culturally significant areas with rock formations) by altering mine plans to avoid any undermining and subsidence, or restricting the extent of coal extracted ("partial extraction") underneath the sites in order to minimise the potential level of subsidence.

In the case of surface impacts, options for conservation include re-routing linear impact zones (such as new roads or pipelines) to avoid identified sites or areas of significance, relocating minor surface infrastructure (such as ventilation shafts) where feasible to avoid identified sites of significance, and/or altering construction methods to minimise the surface impact area within the vicinity of significant sites or potential resources.

In the case of continuing land use, such as the continued use and maintenance of existing roads, the options for conservation tend to be limited. Typically, a similar resource will potentially exist in adjacent, less-disturbed areas, and therefore options such as closing an existing road and constructing a new road are actually likely to result in higher impacts to the heritage resource.

10.1.3 Strategy C (Mitigated Impact)

In circumstances where an Aboriginal site may be of archaeological and/or cultural significance, but the options for conservation are limited and the surface collection of artefacts or excavation of deposits could yield benefits to the Aboriginal community and/or the archaeological study of Aboriginal occupation, mitigation measures (salvage) may be warranted.

Salvage in these circumstances may include the collection of surface artefacts and/or systematic excavation of artefact or midden deposits. Salvage of other site types may also be warranted, for example scarred trees or grinding grooves. Salvage of a scarred tree may involve cutting and removing the tree or the portion of the tree containing the scar. Similarly, grinding grooves may be salvaged by removal of the freestanding rock they are situated on, or in the case of grooves on open bedrock, cutting and removing the section of bedrock with the grooves.

The imperative for salvage measures can be assessed in relation to:

- The nature of the identified and expected evidence, its significance and its research potential (ie. the potential for salvage to provide additional, useful evidence that will enhance the overall understanding of the nature of human occupation in the locality);
- The views of the Aboriginal stakeholders, as salvage may be warranted to minimise the impacts of development on the cultural values of the evidence; and
- The extent of potential development impacts on particular sites or potential resources.

Under the terms of the NP&W Act it is an offence to harm or desecrate an object that the person knows is an Aboriginal object, or to harm an Aboriginal object. As such, a Section 90 AHIP must normally be obtained from the OEH prior to impacting any Aboriginal objects, including through mitigation activities. The OEH determination of AHIP applications is guided by the OEH (2011c) *Guide to Aboriginal Heritage Impact Permit Processes and Decision-Making* policy. Typically, approval of an AHIP can take up to 60 days, following receipt by the OEH of all necessary information.

A Section 90 AHIP is generally not required for impacts to Aboriginal objects where the project is for State Significant Development under Part 4 of the EP&A Act (such as the current Project), and commitments relating to the management of and mitigation of impacts to Aboriginal heritage *in lieu* of a Section 90 AHIP (typically in the form of an Aboriginal Heritage Management Plan) are approved by the DP&I and implemented.

Salvage typically involves the development of a detailed research design (including the nature of the methodology and sampling strategy, as discussed in Section 10.1.1). Where an AHIP is required, an Aboriginal heritage impact assessment must be undertaken in accordance with the DECCW (2010b) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* and Aboriginal community consultation in accordance with the DECCW (2010c) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* policy.

10.1.4 Strategy D (Unmitigated Impact)

The strategy of unmitigated impact involves the proponent causing impacts to the heritage evidence without any mitigation measures. This strategy is typically suitable when the heritage evidence is of low scientific and cultural significance, the registered Aboriginal parties hold no objections, and it is unfeasible to implement any other strategy.

Under the terms of the NP&W Act it is an offence to harm or desecrate an object that the person knows is an Aboriginal object, or to harm an Aboriginal object. As such, a Section 90 AHIP must normally be obtained from the OEH prior to impacting any Aboriginal objects. The OEH determination of AHIP applications is guided by the OEH (2011c) *Guide to Aboriginal Heritage Impact Permit Processes and Decision-Making* policy. Typically, approval of an AHIP can take up to 60 days, following receipt by the OEH of all necessary information.

A Section 90 AHIP is generally not required for impacts to Aboriginal objects where the project is for State Significant Development under Part 4 of the EP&A Act (such as the current Project), and commitments relating to the management of and mitigation of impacts to Aboriginal heritage *in lieu* of a Section 90 AHIP (typically in the form of an Aboriginal Heritage Management Plan) are approved by the DP&I and implemented.

Where an AHIP is required, an Aboriginal heritage impact assessment must be undertaken in accordance with the DECCW (2010b) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* and Aboriginal community consultation in accordance with the DECCW (2010c) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* policy.

10.1.5 Strategy E (Monitoring)

An alternative strategy for zones where archaeological deposits are predicted to occur is to monitor construction, particularly any initial earthmoving and soil removal works, for the presence of artefacts, shell or skeletal remains.

Monitoring is one of the primary strategies for managing the possible occurrence of Aboriginal skeletal remains. Monitoring for the presence of shell and stone artefacts is also often of value to the Aboriginal community, who may be seeking to identify and salvage material that was not visible on the surface during a preliminary study. The sieving of graded deposits is also a practical measure that enhances the benefits of monitoring for artefacts. However, the nature of construction methods (eg. the use of earthmoving machinery to rapidly excavate large quantities of soil) tends to limit the potential for successful identification of heritage evidence during monitoring.

Monitoring for artefacts (in preference to controlled excavation) is not a widely accepted method within the context of a scientific investigation, because it could result in substantial and costly delays to construction (particularly if a Section 90 AHIP or Part 4 State Significant Development approval is not in force), late revisions to development plans, and/or cause undesirable impacts to sites of significance. However, monitoring for the presence of artefacts and other features during initial earthworks can be of scientific benefit and benefit to the Aboriginal community, by enabling the identification and retrieval of cultural evidence that may not otherwise have been recorded or salvaged.

In relation to potential subsidence impacts, monitoring is primarily associated with inspecting and recording the condition of identified grinding groove and rock shelter sites before and after undermining has taken place, in order to identify if any subsidence related impacts have occurred. Such information can be used to refine the modelling involved in assessing potential subsidence impacts and guide future assessments within a locality.

10.2 Assessment of Specific Management Options for Aboriginal Sites and Cultural Areas/Values

The assessment of specific strategies for the management of the identified and potential Aboriginal heritage resources and cultural values within the Project area can be considered in relation to various criteria such as the nature of the heritage evidence, its significance, the nature of the potential impacts, and the views of the registered Aboriginal parties.

Consideration of management options can be discussed within general categories, based on the nature and level of potential impacts (refer to Sections 10.2.1-10.2.4):

- Broad-scale high level impacts, comprising the area of the new pit top, including new roads, ventilation shafts and stockpiles (surface investigation area, adjacent to George Booth Drive);
- Small-scale low-high level impacts, comprising areas with potentially some flexibility in location (eg. small area impacts such as exploratory drilling, subsidence monitoring, environmental monitoring and subsidence remediation);
- Low-high level continuing land-use impacts, comprising areas such as existing vehicle tracks or power easements, that will be subject to use and potentially maintenance; and
- Subsidence impacts.

The recommended management strategies and the primary rationale for each strategy for each Aboriginal site or cultural area/value are presented in Section 11 and Table 16.

10.2.1 Management of Broad-Scale High Level Impacts

No Aboriginal heritage sites have been identified in the location of the proposed surface works associated with the new pit top and infrastructure adjacent to George Booth Drive. A maximum area of approximately 11.3 hectares would be affected by these works.

As discussed in Section 5.3.8, there remains a potential for stone artefacts to occur across this area. However, given the absence of primary or secondary resource zones, this evidence is expected to comprise a very low density of artefacts and potentially a shallow very low-density sub-surface deposit of artefacts. Consistent with the results of the investigation, relatively higher artefact discard may occur on the level to gentle crests within this area. Nevertheless, the potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value to occur is low.

Of the cultural areas/values identified by the Aboriginal parties, the overall Tasman Extension Investigation Area Cultural Landscape, the use of subsistence and other resources, and the ongoing cultural and spiritual connection, may be affected. The proposed works may result in some loss of these values, albeit the focus of the works on the lower foothills north of Mount Sugarloaf is not directly within any of the more significant areas.

Considering the factors below, further heritage investigation (eg. test excavations) or specific conservation or mitigation measures are not warranted:

- Absence of identified heritage evidence directly within the surface impact area;
- Low potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value;
- Relatively limited impact on cultural values (particularly the values/areas of higher significance);
- Existence of similar environmental contexts and potential heritage resources to those of the impact area elsewhere in the region, including in immediately adjacent areas, that will not be subject to impacts; and
- The very low cumulative impact of the works within a regional context.

However, consideration should be given to any request by the registered Aboriginal parties for monitoring of construction works (requests were made during the on-site meeting on 27 January 2012). If this occurs, it would most appropriately comprise a reinspection of the ground surface after the initial removal of vegetation, or the use of controlled surface scrapes to carefully remove the vegetation and upper layers of soil. In either option, any identified artefacts should be collected and recorded.

A reinspection of the ground surface after the initial vegetation removal should only involve careful removal of the vegetation, such that the upper soil horizon is exposed. It should not involve earthmoving works that totally remove the A unit soil. After the vegetation is removed, the surface could be inspected on foot and any visible evidence collected, with recording of provenance and other relevant information.

A limited program of surface scrapes that samples the different environmental contexts within this zone may provide some useful information to test the occupation model, and may be a feasible alternative to reinspection after the initial vegetation removal. Surface scrapes may involve the systematic mechanical exposure of samples of the potential deposit from within the impact zone, to enable investigation of the spatial distribution of artefacts and features over this area, with controlled hand excavation of any features of significance (eg. hearths or dense artefact clusters) that may be identified. This may involve use of a dozer or similar machinery to systematically expose the A unit soil by progressively removing thin layers of soil. After each layer is removed, the surface could be inspected on foot and any visible evidence collected, with recording of provenance and other relevant information. Where features of potential significance are identified, hand excavation could occur to retrieve the feature. Generally, each scrape/excavation area should be photographed and recorded, a plan prepared with the scrape location, and any artefacts collected subject to washing and drying if required, followed by recording and curation.

Procedures for reinspection after vegatation removal and/or surface scrapes, collection and recording of lithic items and reporting would need to be specified in the Aboriginal Heritage Management Plan (AHMP) prepared under the Part 4 Project Approval to guide the management of and mitigation of impacts to Aboriginal heritage *in lieu* of a Section 90 AHIP. Curation of the recovered evidence would need to be resolved with the registered Aboriginal parties, with potentially a Care Agreement required under Section 85A of the NP&W Act. A process for determining the curation method can be established in the AHMP.

10.2.2 Management of Small-Scale Low-High Level Impacts

It is not possible at present to identify the location of all future minor surface impacts that may occur under the Project Approval within the Project area, outside of the surface investigation area (which is addressed in Section 10.2.1). These impacts may arise from exploratory drilling (including new vehicle access where required), subsidence and environmental monitoring, and subsidence remediation. These impacts would be limited to small discrete areas, and as such it is anticipated that it will be highly feasible to avoid impacts to identified heritage sites.

Provisions would need to be included in the AHMP for the reassessment of any proposed surface disturbance works outside of the surface investigation area, once detailed design plans are available for each proposed activity. As a minimum, this would involve review of the works location against the known Aboriginal site data. Where survey sampling has already occurred to current OEH standards as part of the Environmental Assessment (refer to Figure 10), further archaeological inspection may not be warranted. Where survey sampling has not occurred to the current standards (ie, the properties in which access was not available at the time of the Environmental Assessment; refer to Figure 10), survey sampling would be required by a qualified archaeologist in consultation with the registered Aboriginal parties, prior to any impacts occurring, using the same methodology as for the present investigation.

Any sites identified during additional surveys, or previously recorded within close proximity of any proposed ground disturbance works, can be managed in accordance with procedures specified in the AHMP. Typically, this would involve avoidance of impacts to identified sites.

Where impacts are to be avoided to identified heritage sites, but occur within close proximity, appropriate site-specific precautionary measures, such as informing relevant staff and contractors of the nature and location of the items and need to avoid impacts, along with temporary protective fencing and signage, may be warranted.

Where impacts cannot be avoided to heritage sites of low significance, where the proposed impacts are minimal in extent, unmitigated impact may be an appropriate management strategy. Alternatively, mitigated impact, potentially involving surface collection of identified artefacts, may be warranted.

Avoidance of impacts to all grinding groove and rock shelter sites, and any other sites of significance that are currently known or are identified during further surveys, would be strongly warranted.

10.2.3 Management of Low-High Level Continuing Land-Use Impacts

Almost all of the open artefact sites within the Project area are located on vehicle tracks, including within power easements. The use of and potential maintenance of these tracks by Donaldson Coal (for example, during exploratory drilling or subsidence or environmental monitoring or remediation works), may result in impacts to these sites.

Approximately 31 open artefact sites may be subject to impacts from ongoing use or future maintenance of vehicle tracks (refer to Table 14). This includes several sites located marginally outside the investigation area on key access roads which are likely to be utilised for the Project.

These sites typically exhibit moderate to high levels of disturbance, by virtue of their location in exposures created by ground disturbance. However, most potential impacts from the Project are unlikely to be any greater than those that have occurred in the past from other land users (such as Forests NSW, the OEH, essential service providers and recreational users).

Most of these sites are of low scientific significance, apart from TE157/A (moderate to high significance within a local context) and TE135/A (low to moderate significance within a local context) (refer to Tables 13 and 16).

Where impacts cannot be avoided to the open artefact sites of low significance, unmitigated impact may be an appropriate management strategy. Alternatively, mitigated impact, potentially involving surface collection of identified artefacts, may be warranted where requested by the registered Aboriginal parties. In relation to the ongoing impacts to sites TE135/A and TE157/A, systematic surface collection may be warranted to assist in mitigating any potential impacts of the Project.

Procedures for surface collection, recording of lithic items, reporting and curation would need to be specified in the AHMP.

10.2.4 Management of Subsidence Impacts

After the implementation of the additional SCZs for the Extension Project (above those already in place for the Tasman Mine/Approved Project), only one rock shelter with PAD (TE39/A of low-moderate significance within a local context and low significance within a regional context) has a greater than 10% probability of perceptible impacts from subsidence.

This site is located on the margin of the Men's Area and an SCZ for the 'Steep Slopes and Minor Cliffs' (Figure 13). The shelter has a low roof, limiting the potential for deposits of high significance to occur, and reduces the potential benefits of any salvage excavation. Another two rock shelters with PADs, TE46/A and TE46/B (moderate significance within a local context and low significance within a regional context), are assessed as having an 'unlikely' (5-10% probability) of perceptible impacts. These sites are already located within an SCZ for the 'Steep Slopes and Minor Cliffs' (Figure 13).

Given that the risk ratings for these sites are relatively low, the significant offsetting/conservation measures that will be achieved by the SCZs (23 or 88% of rock shelter PADs would have a <5% probability of exhibiting perceptible impacts), and the overall limited impacts of the Project on rock shelter sites, further mitigation or conservation measures are not warranted. Monitoring may be the only measure warranted.

Inspecting and recording the condition of these and all other identified rock shelter sites before and after undermining has taken place, in order to identify if any subsidence related impacts have occurred, can assist with refining the modelling involved in assessing potential subsidence impacts and thereby guide future assessments within the locality and any refinements to the SCZs. It would also enable documentation of the actual impacts of the Project and provide an understanding of the intact heritage resource post-mining. The detailed site recordings undertaken during the present assessment are assumed to be generally sufficient for baseline data. Fresh cracking or rock fall should generally be readily identifiable during post-subsidence monitoring.

After the implementation of the additional SCZs for the Extension Project (above those already in place for the Tasman Mine/Approved Project), five open grinding groove sites have a greater than 10% probability of perceptible impacts. Four of these sites (TE41/A, TE71/A, 38-4-623 and 38-4-624) are of low local significance, and comprise only one or two grooves each. Given the limited nature of evidence at these sites, lack of certainty that any impacts would directly occur (either to the rock surfaces or the grooves themselves), the significant offsetting/conservation measures that will be achieved by the SCZs (27 or 75% of grinding groove sites would have a <5% probability of exhibiting perceptible impacts), and the overall limited impacts of the Project on grinding groove sites, further mitigation or conservation measures are not warranted for these sites. Monitoring may be the only measure warranted (refer below).

Site TE57/A is of low-moderate local significance and comprises 11 grooves. Assuming offsetting measures are implemented, including the further detailed study of the grinding grooves (refer to Section 10.2.5), and a program of monitoring occurs across all grinding groove sites in the Project area, further mitigation or conservation measures are not warranted. There is no certainty that cracking would actually affect the grooves or rock surface on which they are hosted. Salvage of the grooves (by cutting/excavation) is not warranted as it would likely cause substantially more impact than would potentially arise from subsidence. The vast majority of grinding groove sites (75%) are very unlikely to experience subsidence impacts, due in large part to the SCZs established for the Project. These sites include one of high local and regional significance, one of moderate-high local and low regional significance, three of moderate local and low regional significance, 14 of low-moderate local and low regional significance.

Four open grinding groove sites have an 'unlikely' (5-10% probability) of perceptible impacts. Three of these sites (TE67/A, TE67/B and TE88/A) are of low-moderate significance within a local context and low significance within a regional context. Given the relatively low risk of any subsidence impacts occurring, further mitigation or conservation measures are not warranted. However, one site, #38-4-447, is of high significance within a local context and low-moderate significance within a regional context. Notwithstanding that the assessed risk of subsidence is low (5-10% probability), given the high significance of this site, the imperative for adjusting the mine plan to ensure that impacts are reassessed in the 'very unlikely' category is strong. This site is located within the culturally significant Grinding Groove Area in a '1st order stream' SCZ. Additional protection is highly warranted.

Given the assessed minimal potential for subsidence impacts to open artefact sites, specific mitigation or conservation measures are not warranted for these sites.

The potential impacts of subsidence on many of the cultural values/areas is inferred to be minimal. Many of the most significant areas (for example, the Men's Area, Grinding Groove Area, Sugarloaf Pathways and Keepa Keepa Pathways Area) are located within proposed SCZs, and as such subsidence impacts will be minimal. Given the significant offsetting/conservation measures that will be achieved by the SCZs, along with the relatively low risk of subsidence impacts to the cultural values/areas, further mitigation or conservation measures are not warranted, other than a program of monitoring. Monitoring would most appropriately focus on the significant rock formations in the Men's Area (such as the warrior rocks and phallic rock), the identified grinding groove sites within the Grinding Groove Area, and the ridgelines which form the Sugarloaf Pathways and Keepa Keepa Pathways Area.

10.2.5 Further Investigation Required

As identified in Sections 10.2.1-10.2.4, further investigation is required of specific Aboriginal sites and zones within the Project area, or in relation to certain types of impacts. Specific mitigation and monitoring measures are summarised in Section 10.2.6.

Any further investigations should only be undertaken by archaeologists qualified and experienced in Aboriginal heritage in consultation with the registered Aboriginal parties, and should occur prior to any development impacts occurring to those specific areas or sites.

Due to property access constraints at the time of the survey, approximately 130 hectares or 10% of the overall investigation area has not been subject to archaeological survey (refer to Figure 10). Survey is strongly warranted for this area by a qualified archaeologist in consultation with the registered Aboriginal parties, prior to any impacts occurring, using the same methodology as for the present investigation. Any sites identified can be managed in accordance with procedures specified in the AHMP.

Provisions are required in the AHMP for the reassessment of any proposed surface disturbance works outside of the surface investigation area, once detailed design plans are available for each proposed activity. As a minimum, this would involve review of the works location against the known Aboriginal site data (including updated searches of the OEH AHIMS). Where survey sampling has already occurred to current OEH standards as part of the Environmental Assessment (refer to Figure 10), further archaeological inspection may not be warranted. Where survey sampling has not occurred to the current standards (ie, the properties in which access was not available at the time of the Environmental Assessment; refer to Figure 10), survey sampling would be required by a qualified archaeologist in consultation with the registered Aboriginal parties, prior to any impacts occurring, using the same methodology as for the present investigation. Any sites identified can be managed in accordance with procedures specified in the AHMP.

Similar provisions are required in the AHMP to address any future works that may be proposed (that are not currently anticipated), which may cause impacts within the underground investigation area (outside of the surface investigation area), or outside of the investigation area altogether.

Provisions are also required in the AHMP to provide an assessment process to address any potential changes to the mine plan. Where any alterations are proposed to the underground mine plan, the potential impacts of any changes on the Aboriginal heritage resource will need to be assessed by a qualified archaeologist and a subsidence expert. Where the alterations to the underground mine plan are proposed in areas already subject to heritage survey sampling (consistent with the methodology and standards in the Environmental Assessment), this will involve an assessment of potential subsidence impacts by a qualified subsidence expert and reconsideration of the management strategies for relevant Aboriginal sites and cultural values by an appropriately qualified and experienced archaeologist, in consultation with the registered Aboriginal parties. Where the alterations are proposed in areas that have not been subject to heritage survey sampling (consistent with the methodology and standards in the EA), the procedures outlined above would need to be implemented first.

More detailed analysis of individual grinding grooves is warranted, in order to address requests of the Aboriginal stakeholders and relevant questions relating to the use of the grooves (eg. shaping and sharpening of ground-edge hatchets and/or axes, seed-grinding, or other plant food, animal food or ochre processing, or preparation of medicine) and the occupation model for the investigation area. This analysis would also assist in offsetting the potential impacts of the Project on several grinding groove sites (particularly TE57/A). Recently developed residue and use-wear analysis techniques, involving non-destructive biochemical analysis (Stephenson 2011), may enable identification of the functions of particular grooves and facilitate comparison of grooves between areas hypothesised to be primarily associated with non-secular use, and areas inferred to be associated with secular use. Examination of the grooves in relation to experimental data (eg. Dickson 1981, Wilson 1994) is also warranted, and may assist in further analysing the potential uses.

Further investigation of the rock shelters with PADs could assist to establish whether any evidence of occupation is present, the nature of that evidence and the relationship of these shelters with the non-secular uses of the locality and the occupation model. Further investigation of the potential use of any of the shelters within the investigation area for human burial practices, as referred to by Threlkeld (in Gunson 1974), may also be warranted. However, given the limited potential for impacts from the Project to almost all of the rock shelters (only one rock shelter with PAD, of low-moderate significance within a local context and low significance within a regional context, has a greater than 10% probability of perceptible impacts) test excavation of any rock shelters is not warranted.

Prior to granting a Regulation 88 approval under the *Coal Mine Health and Safety Regulation 2006* (NSW) to allow underground mining to proceed, the NSW Department of Trade, Investment, Regional Infrastructure and Services (DTIRIS) generally requires submission and approval of an SMP application. This requirement is now being enforced through the powers available under Section 239(2) of the NSW *Mining Act 1992*. The intention of this approval is not to redefine the activities permitted under a Project Approval and Mining Lease, but to assess and ensure appropriate management systems are in place to address potential subsidence related impacts resulting from the approved mining. The SMP applications normally must be prepared in accordance with the Department of Primary Industries (DPI) (2003) *Guidelines for Subsidence Management Approval Applications*. Subsequent to the completion of the archaeological survey of the areas susceptible to subsidence impacts for which coverage was not achieved during the present study, it is anticipated that future SMP requirements in relation to Aboriginal heritage will have been fulfilled, and further surveys or consultation will not be required in relation to any SMP requirements.

A number of registered Aboriginal parties expressed a desire for greater inclusion and expression of cultural values within the heritage assessment (Table 11, issue #50). Notwithstanding that significant efforts have been made during the ten month consultation process for this Project to involve the Aboriginal community in the Project, identify cultural values and cultural significance, and seek input into the heritage assessment and heritage management strategies (as acknowledged by a number of the registered parties and documented in this report), Donaldson Coal has agreed to facilitate and fund further documentation of the cultural values of the Project area by those registered Aboriginal parties with cultural knowledge and traditional connections with the Project area.

10.2.6 Mitigation and Monitoring Required

As identified in Sections 10.2.1-10.2.4, mitigation and monitoring measures are required for specific Aboriginal sites and zones within the Project area, or in relation to certain types of impacts. Such investigations should only be undertaken by archaeologists qualified and experienced in Aboriginal heritage in consultation with the registered Aboriginal parties, and should occur prior to any development impacts occurring to those specific areas or sites.

In the surface impact area near George Booth Drive, to address requests by the registered Aboriginal parties, either a reinspection of the ground surface after the initial removal of vegetation, or the use of controlled surface scrapes to carefully remove the vegetation and upper layers of soil, may be warranted (refer to Section 10.2.1 for discussion of potential methods). Procedures for reinspection after vegatation removal and/or surface scrapes, collection and recording of lithic items, reporting and curation would need to be specified in the AHMP.

Surface collection may be warranted for two open artefact sites should direct surface impacts occur from continued use of the access roads and any future maintenance works. Collection of these sites, TE157/A (moderate to high significance within a local context) and TE135/A (low to moderate significance within a local context), may assist in mitigating any potential impacts of the Project. In general, a typical procedure may involve delineation of the area of the site and proposed impacts, followed by systematic collection of artefacts within the area of proposed impact, with artefact locations recorded (eg. by using measurements off baselines, or by collection within a grid such as 5 x 5 metre squares, or by GPS). Generally, each site should be photographed and recorded, a plan prepared with the artefact locations, and the artefacts subject to washing and drying if required, followed by recording and curation.

Curation of any recovered evidence would need to be resolved with the registered Aboriginal parties, with potentially a Care Agreement required under Section 85A of the NP&W Act. A process for determining the curation method can be established in the AHMP.

All heritage mitigation and monitoring measures undertaken for the Project will need to be adequately documented, and provision of those reports to relevant stakeholders (such as the registered Aboriginal parties and the DP&I) within appropriate timeframes.

Monitoring of subsidence impacts is warranted for all rock shelter sites and open grinding groove sites, along with the significant rock formations in the Men's Area (such as the warrior rocks and phallic rock) and the ridgelines which form the Sugarloaf Pathways and Keepa Keepa Pathways Areas. This is anticipated to comprise inspection and recording of the condition of these sites/areas after undermining has taken place, and comparison with the condition prior to undermining, to identify any subsidence impacts. The detailed site recordings undertaken during the present assessment are assumed to be generally sufficient for baseline data. Fresh cracking or rock fall should generally be readily identifiable during post-subsidence monitoring. Monitoring will assist with refining the modelling involved in assessing potential subsidence impacts and thereby guide future assessments within the locality and any refinements to the SCZs. It will also enable documentation of the actual impacts of the Project and provide an understanding of the heritage resource left intact post-mining.

A modification to the mine plan is strongly warranted to ensure that the risk of perceptible impacts is lowered from 'unlikely' to 'very unlikely' for site #38-4-447. This site is of high significance within a local context and low-moderate significance within a regional context.

The continued maintenance of an Aboriginal Site Database established for this Project that lists known Aboriginal sites within the Project area, in both tabular and Geographic Information System (GIS) form, would be an important part of the AHMP. Site records would also need to be lodged in a timely manner with the OEH for any previously unrecorded Aboriginal heritage evidence that is identified within the Project area during the course of operations and/or further heritage assessments, or that is subject to salvage.

In general, heritage awareness training is also warranted for all staff and contractors prior to undertaking any tasks on site that may give rise to any interactions with Aboriginal heritage. Such training may include the presentation of information about the Aboriginal culture and history of the locality, nature of the identified and potential Aboriginal heritage evidence within the Project area, heritage management measures and legal obligations.

Provisions will also need to be included in the AHMP to guide the management of any previously unrecorded sites or different forms of heritage evidence within the Project area (for example, skeletal remains), that may be identified during future investigations or works, *in lieu* of a Section 90 AHIP. This may include temporary protection, longer-term conservation or avoidance of impacts, mitigation, monitoring or unmitigated impact. Strategies will vary in relation to the nature of the evidence, its significance and the nature of the proposed impacts.

11. RECOMMENDATIONS

This Aboriginal cultural heritage assessment of the Tasman Extension Project has been prepared by South East Archaeology for Donaldson Coal in relation to an approval being sought from the DP&I for the Project under Division 4.1 ('State Significant Development') of Part 4 of the EP&A Act.

The Project is a proposed extension of the underground mining operations and development of surface infrastructure, including a new pit top (and associated run-of-mine coal handling infrastructure) and ventilation surface infrastructure. The proposed mining operations would involve continued use of the bord and pillar method, with total and partial pillar extraction (refer to Section 1). The approval would consolidate and replace the existing Development Consent for the Tasman Underground Mine.

A total of 74 Aboriginal sites, comprising 38 open artefact sites, 35 open grinding groove sites, and one open grinding groove and open artefact site, along with 26 rock shelters with PADs are known to occur directly within or immediately adjacent to the Tasman Extension investigation area. Significant and widespread traditional, historical and contemporary cultural values and associations with the investigation area have been identified by the registered Aboriginal parties (and are also known through ethnohistorical evidence). These do not necessarily involve Aboriginal objects or physical evidence. The entire Mount Sugarloaf area (including the investigation area) is a cultural landscape of high cultural significance to the Aboriginal community.

The potential impacts of the Project will be limited, largely due to the implementation of Subsidence Control Zones (SCZs) (refer to Figure 13).

Surface impacts would largely be confined to the small area adjacent to George Booth Drive where a new pit top and associated ROM coal handling infrastructure would be constructed. No Aboriginal heritage evidence has been identified in this location. Direct surface impacts elsewhere within the Project area would be very limited in extent and primarily relate to exploratory drilling, subsidence and environmental monitoring, subsidence remediation and continued use of existing vehicle tracks.

Potential subsidence impacts to Aboriginal sites and cultural areas/values will be significantly reduced by the implementation of the proposed SCZs (above those already in place for the Tasman Mine/Approved Project). After the implementation of the additional SCZs for the Extension Project, only one rock shelter with PAD and five open grinding groove sites would have a greater than 10% probability of perceptible impacts from subsidence. This represents just 10% of all rock shelter with PAD and grinding groove sites in the investigation area. The potential impacts of subsidence on many of the cultural values/areas is inferred to be minimal. Many of the most significant areas (for example, the Men's Area, Grinding Groove Area, Sugarloaf Pathways and Keepa Keepa Pathways Area) are located within proposed or existing SCZs, and as such subsidence impacts will be minimised.

The following recommendations are made on the basis of legal requirements under the EP&A Act and NP&W Act, the results of the investigation and consultation with the registered Aboriginal parties:

1) Provisions relating to Aboriginal heritage will be included in an Aboriginal Heritage Management Plan (AHMP) for the Project. These provisions will be formulated in consultation with the registered Aboriginal parties and the DP&I and the OEH and specify the policies and actions required to manage the potential impacts of the Project on Aboriginal heritage after Part 4 approval is granted. The AHMP will comprise detail that, subject to Part 4 Project Approval, will guide management of the Aboriginal heritage resource *in lieu* of a Section 90 Aboriginal Heritage Impact Permit. The primary elements of the AHMP are outlined below:

    a) The Subsidence Control Zones will be established and maintained (as marked on Figure 13) and managed in accordance with relevant guidelines to minimise the potential impacts of subsidence within these zones below the relevant specified criteria;

    b) Further investigation will occur for specific heritage sites or areas, including:

        i) Detailed analysis of a sample of individual grinding grooves, in order to address the requests of registered Aboriginal parties and relevant questions relating to the use of the grooves and the occupation model for the investigation area, and to assist in offsetting the potential impacts of the Project on several grinding groove sites (particularly TE57/A). This analysis will involve residue and use-wear techniques and experimental data, as outlined in Section 10.2.5;

        ii) Reassessment of any proposed surface disturbance works outside of the surface investigation area, once detailed design plans are available for each proposed activity. This would involve review of the works location against the known Aboriginal site data (including updated searches of the OEH AHIMS). Where survey sampling has already occurred to current OEH standards as part of the EA (refer to Figure 10), further archaeological inspection would not be warranted. Where survey sampling has not occurred to the current standards (eg. properties in which access was not available at the time of the EA; refer to Figure 10), survey sampling would be required by a qualified archaeologist in consultation with the registered Aboriginal parties, prior to any impacts occurring, using the same methodology as for the present investigation. Any sites identified or potentially affected can be managed in accordance with procedures specified in the AHMP, but would include avoidance of impacts to all grinding groove and rock shelter sites, and any other sites of significance that are identified during further surveys;

        iii) Archaeological survey of all potential impact areas that could not be sampled during the present investigation, currently totalling about 130 hectares for the potential subsidence impact area (refer to Figure 10). The survey will be conducted by a qualified archaeologist in consultation with the registered Aboriginal parties using the same methodology as for the present investigation, prior to any impacts occurring. Subsequent to the survey, management strategies can be implemented as outlined in the AHMP for previously unrecorded sites;

    c) In order to mitigate the impacts of the Project on scientific and cultural values and/or to retrieve and conserve samples of the heritage evidence, mitigation measures will be implemented prior to any impacts occurring to specified sites and areas, including:

        i) A modification to the mine plan to ensure that the risk of perceptible subsidence impacts is lowered from 'unlikely' to 'very unlikely' for the grinding groove site #38-4-447;

ii) Where requested by the registered Aboriginal parties, salvage of stone artefacts by systematic surface collection from the open artefact sites TE135/A and TE157/A, involving procedures outlined in Section 10.2.6;

iii) Where requested by the registered Aboriginal parties, in a sample of the area of proposed surface impacts within the surface investigation area, reinspection of the ground surface after the initial removal of vegetation and/or the use of controlled mechanical surface scrapes with localised hand excavation of any features of significance identified during the scrapes, involving procedures outlined in Section 10.2.1;

d) Monitoring of subsidence impacts will be conducted for all rock shelter sites and open grinding groove sites in the Project area, along with the significant rock formations in the Men's Area and the ridgelines which form the Sugarloaf Pathways and Keepa Keepa Pathways Areas. This will comprise inspection and recording of the condition of these sites/areas after undermining has taken place, and comparison with the condition recorded prior to undermining to identify any subsidence impacts. Monitoring will assist with refining the modelling involved in assessing potential subsidence impacts and thereby guide future assessments within the locality and any refinements to the SCZs, enable documentation of the actual impacts of the Project and provide an understanding of the heritage resource left intact post-mining. Provisions will be included in the AHMP for alterations to be made to the mine plan to protect sites and cultural areas should monitoring indicate that impacts are in excess of predictive levels;

e) Donaldson Coal will facilitate and fund further documentation of the Aboriginal cultural values of the Project area by those registered Aboriginal parties with cultural knowledge and traditional connections with the Project area;

f) Donaldson Coal will undertake a further subsidence and stability assessment of the rock formations within the Men's Area prior to undermining, and where necessary will alter the mine plan to ensure that these features are not subject to impacts;

g) All heritage mitigation and monitoring measures undertaken for the Project will be adequately documented with reference to relevant OEH guidelines. Reports will be prepared consistent with the Project Approval and AHMP, and provided to relevant stakeholders (such as the DP&I and the OEH and the registered Aboriginal parties) within appropriate timeframes;

h) All heritage evidence salvaged under the Project Approval will be curated in an appropriate manner, as determined in consultation with the registered Aboriginal parties and the OEH during preparation of the AHMP. An application will be made to the OEH under Section 85A of the NP&W Act for the curation of any salvaged items that are removed from any heritage site. Temporary storage of items at locations off the mine site (for example, during analysis and recording) will be allowed;

i) Where impacts from surface works will be avoided to identified heritage evidence, appropriate site-specific precautionary measures, such as informing relevant staff and contractors of the nature and location of the items and need to avoid impacts, potentially along with temporary protective fencing and signage, will be implemented for those sites within close proximity of the area of works;

j) As a general principle, all relevant contractors and staff engaged on the Project who are undertaking tasks on site that may give rise to any interactions with Aboriginal heritage will receive heritage awareness training prior to commencing work on-site. The training package will be formulated in consultation with the registered Aboriginal parties and include, but not be limited to, the presentation of information about the Aboriginal culture and history of the locality, nature of the identified and potential Aboriginal heritage evidence within the Project area, heritage management measures, and legal obligations. Cultural awareness training could be extended to all mine staff and contractors regardless of their specific interactions on site with heritage, to broaden general awareness and understanding of Aboriginal culture and heritage;

k) The Aboriginal Site Database established for this Project that lists known Aboriginal sites within the Project area, in both tabular and GIS form, will continue to be maintained and regularly updated. Given the land tenure of the Project area, this will also involve regular updated searches of the OEH AHIMS;

l) Site records will be lodged in a timely manner with the OEH for any previously unrecorded Aboriginal heritage evidence that is identified within the Project area during the course of operations and/or further heritage assessments, or that is subject to salvage;

m) Provisions will be included to guide the assessment of any future alterations that may be proposed to the mine plan. This will include an assessment of the potential impacts of any changes on the heritage resource, and formulation of management strategies in consultation with the registered Aboriginal parties, following the procedures outlined in Section 10.2.5;

n) Provisions will be included to guide the assessment of any future works that may be proposed (that are not currently anticipated), which may cause impacts within the underground investigation area (outside of the surface investigation area), or outside of the investigation area altogether, following the procedures outlined in Section 10.2.5 and above for proposed surface disturbance works outside of the surface investigation area;

o) Provisions will be included to guide the management of any previously unrecorded Aboriginal heritage sites within the Project area, that may be identified during future investigations or works, *in lieu* of a Section 90 AHIP. Management provisions will vary in relation to the nature of any evidence identified, its significance and the nature of the proposed impacts, and may include temporary protection, further investigation, longer-term conservation or avoidance of impacts, mitigation, monitoring or unmitigated impact;

p) Should any skeletal remains be detected during the course of the Project, work in that location will cease immediately and the finds will be reported to the appropriate authorities, including the Police, the OEH and the registered Aboriginal parties. Subject to the Police requiring no further involvement, the management of any Aboriginal skeletal remains will be determined in consultation with the DP&I, the OEH and the registered Aboriginal parties;

q) Archaeological investigations will only be undertaken by archaeologists qualified and experienced in Aboriginal heritage, in consultation with the registered Aboriginal parties, and occur prior to any development impacts occurring to those specific areas or sites;

r) Provisions will be included to ensure that Aboriginal community representatives are permitted access to any identified sites or cultural areas within Donaldson Coal controlled land when requested, in consideration of safety and operational requirements at the time;

s) The AHMP will be regularly verified to establish that it is functioning as designed (ie. policies adhered to and actions implemented) to the standard required. This will involve review of the plan to identify the degree to which the policy objectives are being met, the suitability of the actions in terms of addressing the policy objectives, the quality of performance of the actions, and any additional policies or actions or modifications to existing policies or actions that may be required to enable better functioning of the plan;

t) The AHMP will be revised in the event that a Native Title Claim is granted within the Project area, with future Aboriginal involvement in the area that is the subject of the granted Claim to only involve the successful Claimant;

2) Under the terms of the NP&W Act it is an offence to harm or desecrate an object that the person knows is an Aboriginal object, or to harm an Aboriginal object ('strict liability offence'). Therefore, no activities or work should be undertaken within the Aboriginal site areas as described in this report and marked on Figure 11 without a valid Section 90 AHIP or *in lieu*, Part 4 State Significant Development approval;

3) Other land users (for example, the OEH, Forests NSW and essential service providers) should be made aware of the nature and location of the Aboriginal sites identified during the present investigation along the roads and power easements, to ensure that inadvertent impacts are avoided; and

4) Copies of this report should be forwarded to each registered Aboriginal party and the DP&I and the OEH (North East Planning and Aboriginal Heritage Section).

Table 16: Summary of recommended management strategies and consequent potential impacts to Aboriginal sites, cultural areas/values and potential deposits within or immediately adjacent to the investigation area after the implementation of mitigation measures.

				Potential Impacts		Management Strategy		Consequent Impacts	
Site Name	**Site Type**	**Comments**	**Overall Significance[18]**	**Surface**	**Subsidence**	**Rationale**	**Recommended Strategy**	**Surface**	**Subsidence**
Mt Sugarloaf (38-4-0440)	Open grinding groove		high L, high R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Mt Sugarloaf (38-4-0443)	Open grinding groove	Not relocated during current survey.	low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Mt Sugarloaf (38-4-0444)	Open grinding groove		mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Mt Sugarloaf (38-4-0445)	Open grinding groove		mod-high L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Mt Sugarloaf (38-4-0446)	Open grinding groove		mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Mt Sugarloaf (38-4-0447)	Open grinding groove		high L, low-mod R	nil proposed by Project	unlikely	minimise, offset impacts; high significance	alter mine plan to reduce potential impacts to 'very unlikely'; subsidence monitoring, SCZs	no loss of value	probably no loss of value
Mt Sugarloaf (38-4-0448)	Open grinding groove		low-mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Mt Sugarloaf (38-4-0449)	Open grinding groove		mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Mt Sugarloaf (38-4-0450)	Open grinding groove	Not relocated during current survey.	low-mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Heaton State Forest (38-4-0457)	Open grinding groove	Not relocated during current survey.	low-mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Heaton State Forest (38-4-0486)	Open grinding groove		low-mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Heaton State Forest (38-4-0487)	Open grinding groove	Not relocated during current survey.	low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Heaton State Forest (38-4-0488)	Open grinding groove		low-mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Sugarloaf Range 1 (38-4-0610)	Open grinding groove		low-mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Mt Sugarloaf (38-4-0618)	Open grinding groove	Not reinspected during present survey due to property access restrictions.	low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value (after SCZ)
Mt Sugarloaf (38-4-0619)	Open grinding groove	Not reinspected during present survey due to property access restrictions.	low-mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value

[18] A number of registered Aboriginal parties have expressed the view that all of the sites/places are of high cultural significance (ie. high importance) and make no differentiation on the comparative level of value between any site or place. This is acknowledged and respected.

Site Name	Site Type	Comments	Overall Significance[18]	Potential Impacts		Management Strategy		Consequent Impacts	
				Surface	Subsidence	Rationale	Recommended Strategy	Surface	Subsidence
Mt Sugarloaf (38-4-0623)	Open grinding groove	Not reinspected during present survey due to property access restrictions.	low L, low R	nil proposed by Project	moderate	offset impacts; low significance	subsidence monitoring, SCZs	no loss of value	possibly partial or no loss of value
Mt Sugarloaf 2 (38-4-0624)	Open grinding groove	Not reinspected during present survey due to property access restrictions.	low L, low R	nil proposed by Project	moderate	offset impacts; low significance	subsidence monitoring, SCZs	no loss of value	possibly partial or no loss of value
Heaton SF (38-4-0869)	Open grinding groove	Outside investigation area.	low-mod L, low R	nil (outside Project area)	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Wallis Creek 1 (38-4-0975)	Open artefact site	Not reinspected during present survey as outside investigation area by 35 metres.	low L, low R	low-high level continuing land use (vehicle track, power easement); nil proposed by Project	very unlikely	no impacts proposed; low significance	no action required	no loss of value	probably no loss of value
Tasman Extension 1/A	Open artefact site	35 metres outside investigation area	low L, low R	low-high level continuing land use (vehicle track, power easement); nil proposed by Project	very unlikely	no impacts proposed; low significance	no action required	no loss of value	probably no loss of value
Tasman Extension 1/B	Open artefact site		low L, low R	low-high level continuing land use (vehicle track, power easement)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 10/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 29/A	Open artefact site		low L, low R	nil proposed by Project	very unlikely	no impacts proposed; low significance	no action required	no loss of value	probably no loss of value
Tasman Extension 32/A	Open grinding groove		low-mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 34/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 39/A	Rockshelter with PAD		low-mod L, low R	nil proposed by Project	moderate	minimise, offset impacts; limited potential for deposits of high significance, negates need for salvage	subsidence monitoring, SCZs	no loss of value	possibly partial or no loss of value
Tasman Extension 41/A	Open grinding groove		low L, low R	nil proposed by Project	moderate	offset impacts; low significance	subsidence monitoring, SCZs	no loss of value	possibly partial or no loss of value
Tasman Extension 45/A	Open grinding groove		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value

Site Name	Site Type	Comments	Overall Significance[18]	Potential Impacts		Management Strategy		Consequent Impacts	
				Surface	Subsidence	Rationale	Recommended Strategy	Surface	Subsidence
Tasman Extension 46/A	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	mod L, low R	nil proposed by Project	unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	possibly partial or no loss of value
Tasman Extension 46/B	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	mod L, low R	nil proposed by Project	unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	possibly partial or no loss of value
Tasman Extension 46/C	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 46/D	Rockshelter with PAD	40-80 metres outside investigation area but under current proposed mine workings	mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 50/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 51/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 53/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 53/B	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 56/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 56/B	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 57/A	Open grinding groove		low-mod L, low R	nil proposed by Project	moderate	mitigate, offset impacts; requests of Aboriginal parties	residue and experimental analysis of this and other groove sites; subsidence monitoring, SCZs	no loss of value	possibly partial or no loss of value
Tasman Extension 57/B	Open grinding groove		low-mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value

Site Name	Site Type	Comments	Overall Significance[18]	Potential Impacts		Management Strategy		Consequent Impacts	
				Surface	Subsidence	Rationale	Recommended Strategy	Surface	Subsidence
Tasman Extension 64/A	Rockshelter with PAD		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 64/B	Rockshelter with PAD		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 64/C	Rockshelter with PAD		mod-high L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 64/D	Rockshelter with PAD		low-mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 67/A	Open grinding groove		low-mod L, low R	nil proposed by Project	unlikely	minimise, offset impacts; low risk; low-moderate significance	subsidence monitoring, SCZs	no loss of value	possibly partial or no loss of value
Tasman Extension 67/B	Open grinding groove		low-mod L, low R	nil proposed by Project	unlikely	minimise, offset impacts; low risk; low-moderate significance	subsidence monitoring, SCZs	no loss of value	possibly partial or no loss of value
Tasman Extension 71/A	Open grinding groove		low L, low R	nil proposed by Project	possible	offset impacts; low significance	subsidence monitoring, SCZs	no loss of value	possibly partial or no loss of value
Tasman Extension 77/A	Rockshelter with PAD		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value (after SCZ)
Tasman Extension 77/B	Rockshelter with PAD		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 77/C	Rockshelter with PAD		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 79/A	Open grinding groove		low-mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 79/B	Open artefact site		low L, low R	nil proposed by Project	very unlikely	no impacts proposed; low significance	no action required	no loss of value	probably no loss of value
Tasman Extension 79/C	Rockshelter with PAD		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 79/D	Rockshelter with PAD		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 80/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 80/B	Open artefact site	25 metres outside investigation area	low L, low R	nil proposed by Project	very unlikely	no impacts proposed; low significance	no action required	no loss of value	probably no loss of value
Tasman Extension 80/C	Open artefact site	outside investigation area	low L, low R	nil proposed by Project	very unlikely	no impacts proposed; low significance	no action required	no loss of value	probably no loss of value
Tasman Extension 84/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 85/A	Open artefact site	outside investigation area	mod L, low R	nil proposed by Project	very unlikely	no impacts proposed; low significance	no action required	no loss of value	probably no loss of value
Tasman Extension 86/A	Open grinding groove		low-mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value

Site Name	Site Type	Comments	Overall Significance[18]	Potential Impacts		Management Strategy		Consequent Impacts	
				Surface	Subsidence	Rationale	Recommended Strategy	Surface	Subsidence
Tasman Extension 86/B	Open grinding groove		low-mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 86/C	Open grinding groove		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 86/D	Open grinding groove		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 88/A	Open grinding groove		low-mod L, low R	nil proposed by Project	unlikely	minimise, offset impacts; low risk; low-moderate significance	subsidence monitoring, SCZs	no loss of value	possibly partial or no loss of value
Tasman Extension 92/A	Open grinding groove and open artefact site		high L, low-mod R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 92/B	Rockshelter with PAD		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 96/A	Rockshelter with PAD		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value (after SCZ)
Tasman Extension 96/B	Rockshelter with PAD		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 96/C	Rockshelter with PAD		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 104/A	Rockshelter with PAD		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value (after SCZ)
Tasman Extension 104/B	Rockshelter with PAD		low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 104/C	Rockshelter with PAD		mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 107/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track, power easement)	unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 124/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track, power easement)	unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 126/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track, power easement)	unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 126/B	Open artefact site		low L, low R	low-high level continuing land use (vehicle track, power easement)	unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 126/C	Open artefact site		low L, low R	low-high level continuing land use (vehicle track, power easement)	unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value

Site Name	Site Type	Comments	Overall Significance[18]	Potential Impacts		Management Strategy		Consequent Impacts	
				Surface	Subsidence	Rationale	Recommended Strategy	Surface	Subsidence
Tasman Extension 135/A	Open artefact site		low-mod L, low R	low-high level continuing land use (vehicle track)	unlikely	low level impacts; low-mod significance; mitigate impacts	surface collection if requested by Aboriginal parties	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 135/B	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 135/C	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 135/D	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 152/A	Rockshelter with PAD	20 metres outside investigation area	low L, low R	nil proposed by Project	very unlikely	no impacts proposed	no action required	no loss of value	probably no loss of value
Tasman Extension 152/B	Rockshelter with PAD	70 metres outside investigation area	low L, low R	nil proposed by Project	very unlikely	no impacts proposed	no action required	no loss of value	probably no loss of value
Tasman Extension 153/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 154/A	Open grinding groove	outside investigation area	low L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension 154/B	Open artefact site	outside investigation area	low L, low R	low-high level continuing land use (outside Project area, but key access vehicle track)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 154/C	Open artefact site	outside investigation area	low L, low R	low-high level continuing land use (outside Project area, but key access vehicle track)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 155/A	Rockshelter with PAD	outside investigation area	low L, low R	nil proposed by Project	very unlikely	no impacts proposed	no action required	no loss of value	probably no loss of value
Tasman Extension 157/A	Open artefact site		mod-high L, low R	low-high level continuing land use (vehicle track)	very unlikely	low level impacts; mod-high significance; mitigate impacts	surface collection if requested by Aboriginal parties	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 176/A	Open grinding groove		low-mod L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value (after SCZ)
Tasman Extension 178/A	Rockshelter with PAD	outside investigation area	low L, low R	nil proposed by Project	very unlikely	no impacts proposed	no action required	no loss of value	probably no loss of value
Tasman Extension 181/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value

Site Name	Site Type	Comments	Overall Significance[18]	Potential Impacts		Management Strategy		Consequent Impacts	
				Surface	Subsidence	Rationale	Recommended Strategy	Surface	Subsidence
Tasman Extension 181/B	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 181/C	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 182/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 182/B	Open artefact site		low L, low R	low-high level continuing land use (vehicle track, power easement)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 188/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track, power easement)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 199/A	Open artefact site		low L, low R	low-high level continuing land use (vehicle track, power easement)	very unlikely	low level impacts; low significance	unmitigated impact / no action required	possibly total or partial or no loss of value	probably no loss of value
Tasman Extension 200/A	Rockshelter with PAD		mod-high L, low R	nil proposed by Project	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	no loss of value	probably no loss of value
Tasman Extension Investigation Area	Cultural area/value		high L, high R	broad-scale high level (small portion), small-scale low-high level (very small portions), low-high level continuing land use (very small portions)	varies	minimise, mitigate and offset impacts	subsidence monitoring, SCZs; salvage of several artefact sites where required by Aboriginal parties; further analysis of grooves; reinspection and/or surface scrapes in surface investigation / impact area	probably partial loss of value	possibly partial or no loss of value
Men's Area	Cultural area/value		high L, high R	small-scale low-high level (if drilling, monitoring or remediation works)	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	possibly partial or no loss of value	probably no loss of value
Grinding Groove Area	Cultural area/value		high L, high R	small-scale low-high level (if drilling, monitoring or remediation works)	very unlikely	minimise, mitigate and offset impacts	alter mine plan to reduce potential impacts to #38-4-447 to 'very unlikely'; subsidence monitoring, SCZs; residue and experimental analysis of groove sites	possibly partial or no loss of value	probably no loss of value

Site Name	Site Type	Comments	Overall Significance[18]	Potential Impacts		Management Strategy		Consequent Impacts	
				Surface	Subsidence	Rationale	Recommended Strategy	Surface	Subsidence
Keepa Keepa Pathways Area	Cultural area/value		high L, low-mod R	low-high level continuing land use (vehicle track)	varies	minimise, offset impacts	subsidence monitoring, SCZs	possibly partial or no loss of value	possibly partial or no loss of value
Sugarloaf Pathways	Cultural area/value		high L, low-mod R	low-high level continuing land use (vehicle track)	very unlikely	minimise, offset impacts	subsidence monitoring, SCZs	possibly partial or no loss of value	probably no loss of value
Sugarloaf and the Supreme Being, 'Koe-in'	Cultural area/value		high L, high R	small-scale low-high level (if drilling, monitoring or remediation works), low-high level continuing land use	very unlikely	minimise, offset impacts	SCZs	possibly partial or no loss of value	probably no loss of value
Sugarloaf and the Supernatural Spirit 'Puttikan'	Cultural area/value		high L, high R	small-scale low-high level (if drilling, monitoring or remediation works), low-high level continuing land use	varies	minimise, offset impacts	SCZs	possibly partial or no loss of value	possibly partial or no loss of value
Burials in a cave on the side of Mount Sugarloaf	Cultural area/value		uncertain	uncertain	varies	minimise, offset impacts	subsidence monitoring, SCZs	uncertain	probably no loss of value
Mount Sugarloaf as a heirophany between the secular world and the sky-world	Cultural area/value		high L, high R	probably nil from Project (peak outside of Project area)	very unlikely	minimise, offset impacts	SCZs	probably no loss of value	probably no loss of value
Presence of quartz and associations with the Clever Man	Cultural area/value		low L, low R	small-scale low-high level (if drilling, monitoring or remediation works), low-high level continuing land use	very unlikely	minimise, mitigate and offset impacts	surface collection if requested by Aboriginal parties for two sites; otherwise no impacts or unmitigated impact	possibly partial or no loss of value	probably no loss of value
Use of subsistence and other resources	Cultural area/value		mod L, low R	broad-scale high level (small portion), small-scale low-high level (very small portions), low-high level continuing land use (very small portions)	varies	minimise and offset impacts	SCZs	probably partial loss of value	possibly partial or no loss of value

Site Name	Site Type	Comments	Overall Significance[18]	Potential Impacts		Management Strategy		Consequent Impacts	
				Surface	Subsidence	Rationale	Recommended Strategy	Surface	Subsidence
Ongoing cultural and spiritual connection	Cultural area/value		mod L, low R	broad-scale high level (small portion), small-scale low-high level (very small portions), low-high level continuing land use (very small portions)	varies	minimise, mitigate and offset impacts	subsidence monitoring, SCZs; salvage of several artefact sites where required by Aboriginal parties; further analysis of grooves; reinspection and/or surface scrapes in surface investigation / impact area	probably partial loss of value	possibly partial or no loss of value
Contemporary significance of Aboriginal objects	Cultural area/value	Refer above for each recorded Aboriginal site	Refer above for each site	Refer above for each site	Refer above for each site	Refer above for each site	Refer above for each site	Refer above for each site	Refer above for each site

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- Cheryl Kitchener, David Ahoy, Darren Carney, Richard McGuinness, Margaret Harvey and members of the Awabakal Local Aboriginal Land Council.

DISCLAIMER

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

However, as no independent verification is necessarily available, South East Archaeology provides no guarantee that the base data (eg. the OEH AHIMS) or information from informants (obtained in previous studies or during the course of this investigation) is necessarily correct, and accepts no responsibility for any resultant errors contained therein and any damage or loss which may follow to any person or party. Nevertheless this study has been completed to the highest professional standards.

APPENDIX 1.

DIRECTOR-GENERAL'S REQUIREMENTS

Major Projects Assessment
Mining & Industry Projects
Contact: Carl Dumpleton
Phone: 9228 6283
Fax: 9228 6466
Email: carl.dumpleton@planning.nsw.gov.au

Our Ref: 11/08834

Mr Doug Gordon
General Manager
Open Cut and Surface Operations
Newcastle Coal Company Pty Ltd
Level 7, 167 Macquarie Street
SYDNEY 2000

Dear Mr Gordon

State Significant Development - Director-General's Requirements
Tasman Coal Extension Project (SSD-4962)

I have attached a copy of the Director General's environmental assessment requirements (DGRs) for the preparation of an Environmental Impact Statement (EIS) for the Tasman Coal Extension Project.

These requirements are based on the information you have provided to date and have been prepared in consultation with relevant government agencies. I have attached a copy of their comments for your information (see Attachment 2). Please note that the Director-General may alter these requirements at any time, and that you must consult further with the Department if you do not lodge a development application and EIS for the project within two years of the date of issue of these DGRs. The Department will review the EIS for the project carefully before putting it on public exhibition, and will require you to submit an amended EIS if it does not adequately address the DGRs.

Your project may require separate approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Department encourages you to confirm whether such an approval will be required as soon as possible. If an EPBC Act approval is required, I would appreciate it if you would advise the Department accordingly, as the Commonwealth approval process may be integrated into the NSW approval process, and supplementary DGRs may need to be issued.

I would appreciate it if you would contact the Department at least two weeks before you propose to submit the development application and EIS for your project. This will enable the Department to:

- confirm the applicable fee (see Division 1AA, Part 15 of the *Environmental Planning and Assessment Regulation 2000*); and
- determine the number of copies (hard-copy and CD-ROM) of the EIS required for review.

If you have any enquiries about these requirements, please contact Carl Dumpleton at the details listed above.

Yours sincerely

DKitto 14/12/11

David Kitto
Director, Mining and Industry
Delegate of the Director-General

Director General's Environmental Assessment Requirements

Section 78A(8A) of the *Environmental Planning and Assessment Act 1979*

State Significant Development

Application Number	SSD 4962
Development	The Tasman Coal Extension Project which includes: • extending the existing underground mining operation to extract up to 1.5 million tonnes of coal a year for 15 years; • developing new pit top facilities, including coal handling, administration and service infrastructure; • decommissioning and rehabilitating the existing pit top facilities; and • transporting coal from the mine by public and private roads to Bloomfield Colliery's coal preparation plant for processing.
Location	via George Booth Drive, Seahampton, in the Cessnock and Lake Macquarie LGAs
Applicant	Newcastle Coal Company Pty Limited
Date of Issue	14 December 2011
General Requirements	The Environmental Impact Statement (EIS) for the development must meet the form and content requirements in Clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.* In addition, the EIS must include a: • detailed description of the development, including: – need for the proposed development; – justification for the proposed mine plan, including efficiency of coal resource recovery, mine safety, and environmental protection; – likely staging of the development - including construction, operational stage/s and rehabilitation; – likely interactions between the development and existing, approved and proposed mining operations in the vicinity of the site; – plans of any proposed building works; • consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments; • risk assessment of the potential environmental impacts of the development, identifying the key issues for further assessment; • detailed assessment of the key issues specified below, and any other significant issues identified in this risk assessment, which includes: – a description of the existing environment, using sufficient baseline data; – an assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; and – a description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to manage any significant risks to the environment; and • consolidated summary of all the proposed environmental management and monitoring measures, highlighting commitments included in the EIS.
Key Issues	The EIS must address the following specific issues: • **Subsidence** – including a detailed quantitative and qualitative assessment of the potential conventional and non-conventional subsidence impacts of the development that includes: - the identification of the natural and built features (both surface and sub-

surface) within the area that could be affected by subsidence, and an assessment of the respective values of these features using any relevant statutory or policy documents;
- accurate predictions of the potential subsidence effects and impacts of the development, including a robust sensitivity analysis of these predictions;
- a detailed assessment of the potential environmental consequences of these effects and impacts on both the natural and built environment, paying particular attention to those features that are considered to have significant economic, social, cultural or environmental values; and
- a detailed description of the measures that would be implemented to avoid, minimise, remediate and/or offset subsidence impacts and environmental consequences (including adaptive management and proposed performance measures);

- **Land Resources** – including a detailed assessment of the potential impacts on:
  - soils and land capability (including land contamination);
  - landforms and topography, including cliffs, rock formations, steep slopes, etc; and
  - land use, including agricultural, forestry, conservation and recreational use, with particular reference to Heaton State Forest – including impacts on forestry resources and forestry activities and consideration of appropriate compensation in relation to forestry production;
- **Water Resources** – including:
  - detailed assessment of potential impacts on the quality and quantity of existing surface and ground water resources, including:
    - detailed modelling of potential groundwater impacts;
    - impacts on affected licensed water users and basic landholder rights; and
    - impacts on riparian, ecological, geo-morphological and hydrological values of watercourses, including environmental flows;
  - a detailed site water balance, including a description of site water demands, water disposal methods (inclusive of volume and frequency of any water discharges), water supply infrastructure and water storage structures;
  - identification of any licensing requirements or other approvals under the *Water Act 1912* and/or *Water Management Act 2000*;
  - demonstration that water for the construction and operation of the development can be obtained from an appropriately authorised and reliable supply in accordance with the operating rules of any relevant Water Sharing Plan (WSP);
  - a description of the measures proposed to ensure the development can operate in accordance with the requirements of any relevant WSP or water source embargo;
  - a detailed description of the proposed water management system (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts;
- **Biodiversity** – including:
  - measures taken to avoid, reduce or mitigate impacts on biodiversity;
  - accurate estimates of proposed vegetation clearing;
  - a detailed assessment of potential impacts of the development on any:
    - terrestrial or aquatic threatened species or populations and their habitats, endangered ecological communities and groundwater dependent ecosystems; and
    - regionally significant remnant vegetation, or vegetation corridors;
  - impacts on Sugarloaf State Conservation Area – including impacts on the conservation and recreational values of the reserve and landowner consent issues; and
  - a comprehensive offset strategy to ensure the development maintains or improves the terrestrial and aquatic biodiversity values of the region in the medium to long term;

	• **Heritage** – including: - an Aboriginal cultural heritage assessment (including both cultural and archaeological significance) which must: o demonstrate effective consultation with Aboriginal communities in determining and assessing impacts, and developing and selecting mitigation options and measures; o outline any proposed impact mitigation and management measures (including an evaluation of the effectiveness and reliability of the measures); and - a Historic heritage assessment (including archaeology) which must: o include a statement of heritage impact (including significance assessment) for any State significant or locally significant historic heritage items; and, o outline any proposed mitigation and management measures (including an evaluation of the effectiveness and reliability of the measures); • **Air Quality** – including a quantitative assessment of potential: - construction and operational impacts, with a particular focus on dust emissions including $PM_{2.5}$ and PM_{10} emissions and dust generation from coal transport; - reasonable and feasible mitigation measures to minimise dust emissions, including evidence that there are no such measures available other than those proposed; and - monitoring and management measures, in particular real-time air quality monitoring; • **Greenhouse Gases** – including: - a quantitative assessment of potential Scope 1, 2 and 3 greenhouse gas emissions; - a qualitative assessment of the potential impacts of these emissions on the environment; and - an assessment of reasonable and feasible measures to minimise greenhouse gas emissions and ensure energy efficiency; • **Noise** – including a quantitative assessment of potential: - construction, operational and off-site transport noise impacts; - reasonable and feasible mitigation measures, including evidence that there are no such measures available other than those proposed; and - monitoring and management measures, in particular real-time and attended noise monitoring; • **Traffic & Transport** – including: - a detailed economic justification of transporting coal on public roads, including assessment of the costs and benefits of alternative transport methods; - an assessment of potential traffic impacts on the capacity, efficiency and safety of the road network; and - a description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network network in the surrounding area over the life of the project; • **Visual** – including: - a detailed assessment of the: o changing landforms on site during the various stages of the project; o potential visual impacts of the project on private landowners in the surrounding area as well as from key vantage points in the public domain; and - a detailed description of the measures that would be implemented to minimise the visual impacts of the project; • **Waste** – including: - accurate estimates of the quantity and nature of the potential waste streams of the development, including tailings and coarse reject; - a tailings and coarse reject disposal strategy; and - a description of measures that would be implemented to minimise production of other waste, and ensure that that waste is appropriately managed;

	• **Hazards** – paying particular attention to public safety, including bushfires; • **Social & Economic** – including an assessment of the: - potential direct and indirect economic benefits of the project for local and regional communities and the State; - potential impacts on local and regional communities, including: o increased demand for local and regional infrastructure and services (such as housing, childcare, health, education and emergency services); and o impacts on social amenity; - a detailed description of the measures that would be implemented to minimise the adverse social and economic impacts of the project, including any infrastructure improvements or contributions and/or voluntary planning agreement or similar mechanism; and - a detailed assessment of the costs and benefits of the development as a whole, and whether it would result in a net benefit for the NSW community; and • **Rehabilitation** – including the proposed rehabilitation strategy for the site, having regard to the key principles in the Strategic Framework for Mine Closure, including: - rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria; - nominated final land use, having regard to any relevant strategic land use planning or resource management plans or policies; and - the potential for integrating this strategy with any other rehabilitation and/or offset strategies in the region.
Plans and Documents	The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the *Environmental Planning and Assessment Regulation 2000*. These documents should be included as part of the EIS rather than as separate documents.
Consultation	During the preparation of the EIS, you must consult with relevant local, State and Commonwealth Government authorities, service providers, community groups and affected landowners. In particular you must consult with the: • Commonwealth Department of Sustainability, Environment, Water, Population and Communities; • Office of Environment and Heritage (including the Heritage Branch); • Environment Protection Authority; • Division of Resources and Energy within the Department of Trade and Investment, Regional Infrastructure and Services; • Department of Primary Industries (including the NSW Office of Water, NSW Forestry, Agriculture and Fisheries sections, Catchments and Lands (Crown Lands Division)); • Transport for NSW (including the Centre for Transport Planning, Roads and Maritime Services); • Mine Subsidence Board; • TransGrid; • Hunter Central Rivers Catchment Management Authority; • Cessnock City Council; and • Lake Macquarie City Council. The EIS must describe the consultation process and the issues raised, and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.
Further consultation after 2 years	If you do not lodge a DA and an EIS for the development within 2 years of the issue date of these DGRs, you must consult further with the Director-General in relation to the requirements for lodgement.

References	The assessment of the key issues listed above must take into account relevant guidelines, policies, and plans as identified. While not exhaustive, Attachment 1 contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of this development.

ATTACHMENT 1
Technical and Policy Guidelines

The following guidelines may assist in the preparation of the Environmental Impact Statement. This list is not exhaustive and not all of these guidelines may be relevant to your proposal.

Many of these documents can be found on the following websites:
http://www.planning.nsw.gov.au
http://www.bookshop.nsw.gov.au
http://www.publications.gov.au

Policies, Guidelines & Plans

Risk Assessment	
	AS/NZS 4360:2004 Risk Management (Standards Australia)
	HB 203: 203:2006 Environmental Risk Management – Principles & Process (Standards Australia)
Biodiversity	
	Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECCW 2009)
	Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DECC 2004)
	BioBanking Assessment Methodology and Credit Calculator Operational Manual (DECCW 2008)
	The Threatened Species Assessment Guideline – The Assessment of Significance (DECC 2007)
	NSW State Groundwater Dependent Ecosystem Policy (DLWC)
	Policy & Guidelines - Aquatic Habitat Management and Fish Conservation (NSW Fisheries)
	State Environmental Planning Policy No. 44 – Koala Habitat Protection
Water Resources	
	National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Guidelines for Sewerage Systems – Effluent Management (ARMCANZ/ANZECC)
	National Water Quality Management Strategy: Guidelines for Sewerage Systems – Use of Reclaimed Water (ARMCANZ/ANZECC)
	Using the ANZECC Guideline and Water Quality Objectives in NSW (DEC)
	State Water Management Outcomes Plan
	Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009
Surface Water	NSW Government Water Quality and River Flow Objectives (DECC)
	Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC)
	Managing Urban Stormwater: Soils & Construction (Landcom) and associated Volume 2E: Mines and Quarries.
	Managing Urban Stormwater: Treatment Techniques (DECC)
	Managing Urban Stormwater: Source Control (DECC)
	Floodplain Development Manual (DIPNR)
	Floodplain Risk Management Guideline (DECC)
	A Rehabilitation Manual for Australian Streams (LWRRDC and CRCCH)
	Technical Guidelines: Bunding & Spill Management (DECC)
	Environmental Guidelines: Use of Effluent by Irrigation (DECC)

Groundwater	National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC)
	NSW State Groundwater Policy Framework Document (DLWC, 1997)
	NSW State Groundwater Quality Protection Policy (DLWC, 1998)
	NSW State Groundwater Quantity Management Policy (DLWC, 1998)
	Murray-Darling Basin Groundwater Quality. Sampling Guidelines. Technical Report No 3 (MDBC)
	Murray-Darling Basin Commission. Groundwater Flow Modelling Guideline (Aquaterra Consulting Pty Ltd)
	Guidelines for the Assessment & Management of Groundwater Contamination (DECC, 2007)
	Any relevant Water Sharing Plan for groundwater and surface water resources
Air Quality	
	Protection of the Environment Operations (Clean Air) Regulation 2002
	Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC)
	Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DEC)
Noise & Blasting	
	NSW Industrial Noise Policy (DECC)
	Environmental Noise Management – Assessing Vibration: a technical guide (DEC)
	NSW Road Noise Policy (DECCW)
	Interim Guidelines for the Assessment of Noise From Rail Infrastructure Projects (DECC)
	Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZECC)
Land Resources	
	Draft Agricultural Impact Assessment Guidelines 2011 (DP&I)
	Agfact AC25: Agricultural Land Classification (NSW Agriculture)
	State Environmental Planning Policy No. 55 – remediation of Land
	Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC)
Traffic & Transport	
	Guide to Traffic Generating Development (RTA)
	Road Design Guide (RTA)
Heritage	
Aboriginal	Draft Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation (DEC 2005)
	The Burra Charter (The Australia ICOMOS charter for places of cultural significance)
Historic	NSW Heritage Manual (NSW Heritage Office)
	The Burra Charter (The Australia ICOMOS charter for places of cultural significance)
Greenhouse Gases	
	National Greenhouse Accounts Factors (Australian Department of Climate Change (DCC))
	Guidelines for Energy Savings Action Plans (DEUS)
Waste	
	Waste Classification Guidelines (DECC)
Hazards	
	State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
	Hazardous and Offensive Development Application Guidelines - Applying SEPP 33
	Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis

Rehabilitation	
	Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia)
	Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia)
	Strategic Framework for Mine Closure (ANZMEC-MCA)
Socio-Economic	
	Draft Economic Evaluation in Environmental Impact Assessment (DoP)
	Techniques for Effective Social Impact Assessment: A Practical Guide (Office of Social Policy, NSW Government Social Policy Directorate)

NSW GOVERNMENT | Office of Environment & Heritage

Our reference: DOC11/48389; LIC09/163
Contact: Ross Brylynsky
(02) 4908 6809

Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Attention: Carl Dumpleton

Dear Mr Dumpleton

TASMAN EXTENSION PROJECT (SSD-4962)
REQUEST FOR INPUT INTO DIRECTOR-GENERAL'S REQIREMENTS

I refer to your letter of 20 October 2011 to the Office of Environment and Heritage (OEH) requesting Director General's Requirements (DGR'S) for an Environmental Impact Assessment (EIA) in respect to an application under Part 4 of the *Environment Planning and Assessment Act* 1979 for the extension of mining at the Tasman Coal Mine, via George Booth Drive, Seahampton.

OEH understands that the proposal is to increase coal extraction up to approximately 1.5M tonnes per annum, with an additional operational life of approximately 15 years. Newcastle Coal Company Pty Ltd holds Environment Protection Licence 12483 for Tasman Coal Mine.

OEH has considered the details of the proposal as provided by NSW Department of Planning and Infrastructure (DP&I) and has identified the information it requires to assess the proposal (see **Attachment 1**). The proponent should ensure that the EIA is sufficiently comprehensive to enable OEH to determine the extent of the impact(s) of the proposal.

In carrying out the assessment, the proponent should refer to the relevant guidelines as listed in **Attachment 2**, and any relevant industry codes of practice and best practice management guidelines.

OEH requests 2 hard copies and 4 electronic (CD) copies of the EIA for assessment. These documents should be addressed to:

Regional Manager, Hunter
Office of Environment and Heritage
PO Box 488G NEWCASTLE 2300.

If you wish to discuss this matter, please contact Ross Brylynsky on (02) 4908 6809.

Yours sincerely

Scrivener 4/11/2011

REBECCA SCRIVENER
A/Head Regional Operations Unit – Hunter
Environment Protection and Regulation

PO Box 488G Newcastle NSW 2300
117 Bull Street, Newcastle West NSW 2302
Tel: (02) 4908 6800 Fax: (02) 4908 6810
ABN 30 841 387 271
www.environment.nsw.gov.au

Attachment 1

Office of Environment and Heritage
Recommended Director General's Requirements for
Tasman Extension Project - Environmental Impact Assessment

ENVIRONMENTAL IMPACTS OF THE PROJECT

Impacts related to the following environmental issues need to be assessed, quantified and reported on:

- Aboriginal cultural heritage
- Air Issues
  - air quality
  - greenhouse gas
- Biodiversity
- Noise and vibration
- Waste including hazardous materials and radiation
  - General waste – any proposal
  - Hazardous materials and radiation
- Water and Soils
  - Acid sulfate soils
  - Contaminated sites
  - Flooding and coastal erosion
  - Soils - general
  - Water quality and discharges

Environmental Impact Assessments (EIA') should address the specific requirements outlined under each heading below and assess impacts in accordance with the relevant guidelines mentioned. A full list of guidelines is at **Attachment 2**.

LICENSING REQUIREMENTS

1. Newcastle Coal Company Pty Ltd holds Environment Protection Licence (EPL) 12483 for Tasman Coal Mine. The EIA should address the requirements of Section 45 of the *Protection of the Environment Operations Act 1997* (POEO Act) by determining the extent of any impacts, and provide sufficient information to enable OEH to determine if any variation of the current EPL would be required.

2. Should project approval be granted, the proponent may need to make a separate application to OEH for a variation of the EPL. Additional information is available through the *OEH Guide to Licensing* document (www.environment.nsw.gov.au/licensing/licenceguide.htm).

SPECIFIC ISSUES

Aboriginal Cultural Heritage

1. The EIA must address and document the information requirements set out in the draft "*Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation'* (Department of Environment and Conservation 2005). This document is available from the DECCW and DoP upon request.

2. The EIA must include surveys by suitably qualified archaeological consultants in consultation with all of the local Aboriginal knowledge holders.

3. The EIA should identify the nature and extent of impacts on Aboriginal cultural heritage values across the project area and clearly articulate strategies proposed to avoid/minimise these impacts. If impacts are proposed as part of the final development, clear justification for such impacts should be provided.

4. The EIA must assess and document the archaeological and Aboriginal significance of the sites Aboriginal cultural heritage values.

5. Describe the actions that will be taken to avoid or mitigate impacts of the project on Aboriginal cultural heritage values. This must include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented. Any proposed methodology for investigation should reflect best practice standards set by DECCW (2010) in the *Code of Practice for Archaeological Investigations of Objects in New South Wales*

6. The EIA must provide documentary evidence to demonstrate that effective community consultation with Aboriginal communities has been undertaken in assessing impacts, developing protection and mitigation options and making final recommendations. OEH supports broad-based Aboriginal community consultation and as a guide DECCW's '*Aboriginal cultural heritage consultation requirements for proponents 2010*' provides a useful model to follow. This requirement is available on OEH's website at:
http://www.environment.nsw.gov.au/licences/consultation.htm.

7. If impacts on Aboriginal cultural heritage values are proposed as part of the final development, an assessment of the proposed impacts in the context of '*inter generational equity*' and cumulative impact must be undertaken. This assessment must examine both cultural and archaeological perspectives equally at both the local and regional levels, with consideration given to the site level and broader landscape level.

Note: If the EIA is relying on past surveys it is critical to confirm that the surveys are consistent with the requirements of the above guidelines. Further, whilst there is no requirement for obtaining an Aboriginal Heritage Impact Permit (AHIP) under Part 6 of the *National Parks and Wildlife Act 1974*, as amended (NPW Act) for projects approved under Part 4.1 (State Significant Development) of the EPA Act, the remainder of Part 6 remains valid. This includes the requirement to obtain a Care Agreement for salvaged objects (Section 85) and reporting to OEH on the status of new or impacted Aboriginal sites (Section 89A).

If any new sites or objects are located, they must be recorded on OEH site cards and registered on OEH's Aboriginal Heritage Information Management System (AHIMS). For site updates for impacted sites it is a requirement to use the Aboriginal Site Impact Recording form and registered on AHIMS. Both forms are located at: http://www.environment.nsw.gov.au/licences/DECCAHIMSSiteRecordingForm.htm. The contact details for the AHIMS are: Phone: (02) 9585 6470, address: Lvl 6, 43 Bridge Street, Hurstville, NSW, 2220, e-mail: ahims@environment.nsw.gov.au.

AIR ISSUES

Air Quality

The EIA should include a detailed air quality impact assessment (AQIA). The AQIA should:

1. Assess the risk associated with potential discharges of fugitive and point source emissions for all stages of the proposal. Assessment of risk relates to environmental harm, risk to human heath and amenity.

2. Justify the level of assessment undertaken on the basis of risk factors, including but not limited to:
    a. proposal location;
    b. characteristics of the receiving environment; and
    c. type and quantity of pollutants emitted.

3. Describe the receiving environment in detail. The proposal must be contextualised within the receiving environment (local, regional and inter-regional as appropriate). The description must include but need not be limited to:

Attachment 2

Office of Environment and Heritage
Tasman Extension Project - Environmental Impact Assessment

GUIDANCE MATERIAL

Title	Web address
Relevant Legislation	
Commonwealth Environment Protection and Biodiversity Conservation Act 1999	http://www.austlii.edu.au/au/legis/cth/consol_act/epabca1999588/
Contaminated Land Management Act 1997	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+140+1997+cd+0+N
Environmentally Hazardous Chemicals Act 1985	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+14+1985+cd+0+N
Environmental Planning and Assessment Act 1979	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
National Parks and Wildlife Act 1974	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+80+1974+cd+0+N
Protection of the Environment Operations Act 1997	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+156+1997+cd+0+N
Threatened Species Conservation Act 1995	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+101+1995+cd+0+N
Water Management Act 2000	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+92+2000+cd+0+N
Licensing	
OEH Guide to Licensing	www.environment.nsw.gov.au/licensing/licenceguide.htm
Aboriginal Cultural Heritage	
Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (2005)	Available from DPI.
Aboriginal Cultural Heritage Consultation Requirements for Proponents (OEH, 2010)	http://www.environment.nsw.gov.au/licences/consultation.htm
Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (OEH, 2010)	http://www.environment.nsw.gov.au/licences/archinvestigations.htm
Aboriginal Site Impact Recording Form	http://www.environment.nsw.gov.au/licences/OEHAHIMSSiteRecordingForm.htm
Air Issues	
Air Quality	
Approved methods for modelling and assessment of air pollutants in NSW (2005)	http://www.environment.nsw.gov.au/resources/air/ammodelling05361.pdf
POEO (Clean Air) Regulation 2010	http://www.legislation.nsw.gov.au/maintop/view/inforce/subordleg+642+2002+cd+0+N
Greenhouse Gas	
The Greenhouse Gas Protocol: Corporate Standard, World Council for Sustainable Business Development &	http://www.ghgprotocol.org/standards/corporate-standard

APPENDIX 2.

RELEVANT PREVIOUSLY RECORDED ABORIGINAL SITE RECORDS[1]

[1] Courtesy OEH AHIMS.

OEH #38-4-0001 (Great Sugar Loaf)

Sugarloaf Range (S) (III) 9232 SI/56-2 NEWCASTLE SI56-2. 38-4-1
96. Sugarloaf Locality S STONE ARRANGEMENTS

Military map/other reference 32°56' S 151°32' E Newcastle 1:250,000 (range)
~~56-9250~~
c. 4525.9347

Pastoral or other property, park

Type of arrangement Rows of flat stones.

Description of site Situated halfway between point where power line crosses range and Mt. Vincent. Area of 15' x 20' covered by rows of flat stones like a paved courtyard.
Informant: R.H. Stewart, Newcastle. 1.4/45/315. (A.M. file).

Kinds and sizes of stones From 12 x 8" to 30 x 20" in size. Rough surfaces turned down.

38-4-0001

Nearest water supply

State of preservation

Length Width Height

COM: AUST. MUS. INDEX.

OEH #38-4-0440 (Mt Sugarloaf)

[✓] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 5/88

38-4-0440

1:250,000 map sheet: Newcastle NPWS Code 38

AMG Grid reference (Full reference - please include leading digits): 250K 362790 mE 25K; 250K 6358990 mN 5/6 25K

Scale of map used for grid reference (Please use largest scale available): [✓] 25K, 50K (preferred) [ ] 100K [ ] 250K

1:25K, 50K, 100K map name: Bulahdelah

Site name: Mt Sugarloaf Locality/property name:

NPWS District: Taree Region: Central

Reason for investigation: Private

Portion no: Parish: Northumberland

HEAD OFFICE USE ONLY:
NPWS Site no: 38-4-440
Site types: A.C.C.
Accessioned by: Date:
Data entered by: US Date: 4/7/98
Owner/Manager
Address

Photos taken? yes
How many attached? 15.

How to get to the Site (refer to permanent features, give best approach to site eg. from above, below, along cliff) (Draw/diagram on separate sheet): from Bulahdelah 1:25k 6334-5962 N proceed south along Gresford Rd c. 8.5km past on left iron track follow fence line down & creek c. 450m then left and follow down stream c. 100m & on Hand side

Other sites in locality? yes Site Types include: A.C.C.
Are sites in NPWS Register? no

Have artefacts been removed from site? When?
By whom? Deposited where?

Is site important to local Aborigines?
Give contact(s) name(s) + address(es)

Contacted for this recording? NOT KNOWN
(Attach additional information separately) If not, why not?

Verbal/written reference sources (including full title of accompanying report): NPWS Report Catalogue # 0/1333

Checklist surface visibility, damage/disturbance/ threat to site: Condition of site: Weathering

Recommendations for management & protection (attach separate sheet if necessary)

Site recorded by: [illegible] K Hattle Date: 3/5/97
Address/institution: Mt Dale Golgewoth.

SITE POSITION & ENVIRONMENT | OFFICE USE ONLY: NPWS site no:

1. Land form a ~~beach/hill slope/ridge top~~, etc: Creek Bed b. site aspect: N-S. c. slope: Flat

d mark on diagram provided *or* on your own sketch the position of the site. e. Describe briefly:

f Local rock type: Conglomerate Sandstone Ironstone g Land use/effect:

2. Distance from drinking water: at creek Source: Unnamed creek

3 Resource Zone associated with site (~~estuarine, riverine~~, forest etc): Riparian

4 Vegetation: Blackpoodle Ironbark Callitris Spotted Gum Mahogany Ironbark

5 Edible plants noted: Tea Tree Acacia Blackthorn Geebung Native Lily Lilly Pilly Native Plum

6 Faunal resources (include shellfish): Macropods Reptiles Wombats

7 Other exploitable resources (river pebbles, ochre, etc).

Site type: A.G.G.'s

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth.

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG: structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

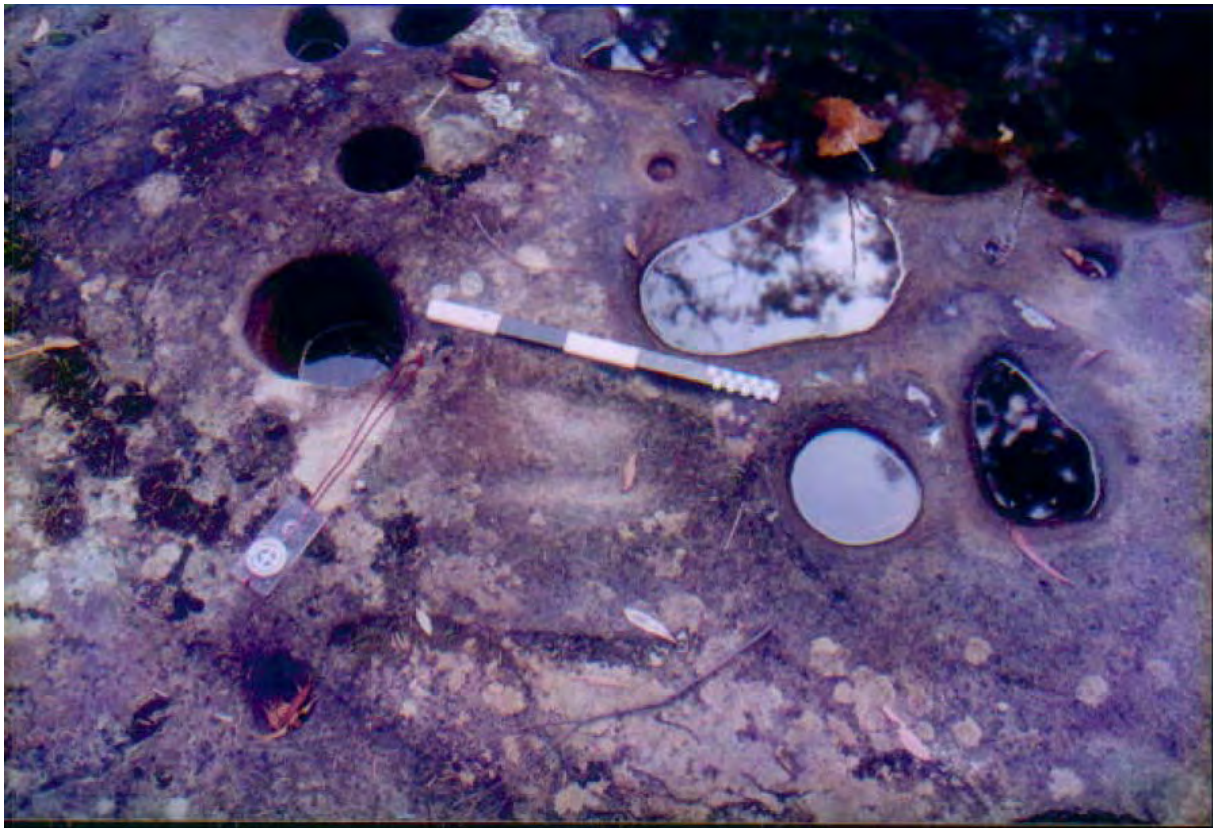
DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do **NOT** dig, disturb, damage site or contents.

Minimum 90 AGG's in 5 Series along creek bed

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.



OEH #38-4-0443 (Mt Sugarloaf)

[+ New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 5/88

38-4-0443

1:250,000 map sheet: NEWCASTLE NPWS Code 138

AMG Grid reference (Full reference - please include leading digits)
250K 361940 mE 25K
250K 6359300 mN 5/6 25K

Scale of map used for grid reference (Please use largest scale available) [✓] 25K, 50K (preferred) [ ] 100K [ ] 250K

1:25K, 50K, 100K map name: Wallsend.

HEAD OFFICE USE ONLY:
NPWS Site no: 38-4-443
Site types A.C.C.
Accessioned by: Date:
Data entered by: US Date: 4/7/98

Owner/Manager
Address

Site name MTSUGARLOAF Locality/property name:

NPWS District Hunter Region: Central

Reason for investigation: Private

Portion no:
Parish: Northumberland.

Photos taken? Yes
How many attached? 2

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along cliff) (Draw diagram on separate sheet.): from Wallsend 250K 6334E 5618N proceed South along gravel road c.825m pass on left cross track and follow fence line flow to creek c.450m, turn right and follow main creek upstream 300m to site

Other sites in locality? Yes
Are sites in NPWS Register? No

Site Types include:

Have artefacts been removed from site?
By whom?
When?
Deposited where?

Is site important to local Aborigines?
Give contact(s) name(s) + address(es)

Contacted for this recording?
(Attach additional information separately) If not, why not? NOT KNOWN

Verbal/written reference sources (including full title of accompanying report)

NPWS Report Catalogue #: C/1333

Checklist: surface visibility, damage/disturbance/ threat to site

Condition of site: Weathering

Recommendations for management & protection (attach separate sheet if necessary)

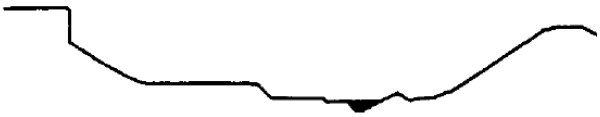
Site recorded by: [illegible] K Miller Date: 3/5/97
Address/institution: Mayfield Edgeworth

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1. Land form a ~~beach/hill slope/ridge top~~, etc: Creek bed. b. site aspect: N – S. c. slope: Mod

d. mark on diagram provided *or* on your own sketch the position of the site. e. Describe briefly:



f. Local rock type: Permian/Triassic Sandstone g. Land use/effect: Conglomerate

2. Distance from drinking water: at site Source: Unnamed creek

3. Resource Zone associated with site (estuarine, riverine, forest etc):

4. Vegetation: Angophora, Stringybark, Bloodwood, White Mahogany, Casuarina, Heath, Grass, Fern, Shrubs

5. Edible plants noted: Acacia, Eucalyptus, Banksia, Lomatia, Geebung, Melaleuca, Pea

6. Faunal resources (include shellfish): Macropods, Reptiles, Wombats.

7. Other exploitable resources (river pebbles, ochre, etc).

Site type:

A & G.

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do NOT dig, disturb, damage site or contents.

2 A & G's in each bed.

CHECKLIST TO HELP

length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth.

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.

[✓] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 5/88

38-4-0444

NPWS Code 38

1:250,000 map sheet: Newcastle

AMG Grid reference (Full reference - please include leading digits): 250K 36[2]9[5]0 mE (25K); 250K 6359040 mN (5/6 | 25K)

Scale of map used for grid reference (Please use largest scale available): [✓] 25K, 50K (preferred) [ ] 100K [ ] 250K

1:25K, 50K, 100K map name: Wallarah

Site name: Mt Sugarloaf Locality/property name:

NPWS District: Hunter Region: Central

Reason for investigation: Proposed

Portion no: Parish: Northumberland

Photos taken? Yes How many attached? 4

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along creek) (Draw diagram on separate sheet): 6334E5918N proceed South along gravel track c. 825m from Wallsend 1:25K map then left cross creek and follow fence line down to creek c. 450m then right and track 1st branch on right and follow to 1st bend of rock in creek bed and site

Other sites in locality? Yes Are sites in NPWS Register? No Site Types include: A.C.S.

Have artefacts been removed from site? When? By whom? Deposited where?

Is site important to local Aborigines? Give contact(s) name(s) + address(es)

Contacted for this recording? (Attach additional information separately) If not, why not? NOT KNOWN

Verbal/written reference sources (including full title of accompanying report):

NPWS Report Catalogue # C/1333

Checklist surface visibility, damage/disturbance/ threat to site | Condition of site: Weathering

Recommendations for management & protection (attach separate sheet if necessary):

Site recorded by: J. Hiscock & A. Mitchell Date: 3/5/97

Address/institution: Matthew Edgeworth

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1. Land form a. ~~beach/hill slope/ridge top~~, etc Creek bed b. site aspect: E - W c. slope: Mod.

d. mark on diagram provided *or* on your own sketch the position of the site e. Describe briefly:

f. Local rock type: Ironstone Consolidation Conglomerate. g. Land use/effect:

2. Distance from drinking water: at site Source: Minmi Creek

3. Resource Zone associated with site (~~estuarine, riverine~~, forest etc):

4. Vegetation: Angophora, Bloodwood, Mahogany association. Spotted Gum Ironbark.

5. Edible plants noted: Acacia, Blackboy, Bynole, Lily, Banksia, Brenswoong, Kurrajong, Melaleuca bee

6. Faunal resources (include shellfish): Macropods, Reptiles, Wombat.

7. Other exploitable resources (river pebbles, ochre, etc):

Site type:

A.C.G

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth.

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do NOT dig, disturb, damage site or contents.

12. A.C.G.'s in creek bed

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.

[✓] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 5/88

38-4-0445

1:250,000 map sheet: Newcastle NPWS Code 38

AMG Grid reference (Full reference - please include leading digits): 250K 3 6 2 8 6 0 mE (25K) 250K 6 3 5 9 0 1 0 mN (5/6 25K)

Scale of map used for grid reference (Please use largest scale available): [✓] 25K, 50K (preferred) [ ] 100K [ ] 250K

1:25K, 50K, 100K map name: Dalleare

Site name: Mt Sugarloaf Locality/property name

NPWS District: Hunter Region: Central

HEAD OFFICE USE ONLY:
NPWS Site no: 38-4-1445
Site types: A.C.C.
Accessioned by: _____ Date: _____
Data entered by: LLS Date: 4/7/98

Owner/Manager

Address

Reason for investigation: Survey

Portion no:
Parish: Northumberland

Photos taken? Yes
How many attached? 3.

How to get to the site (refer to permanent features, give best approach to site eg from above, below, along cliff) (Draw diagram on separate sheet): from Wallsend 1:25K 6334ES968N Proceed South along gravel track c. 825m park on left cross track and follow fence line down track c. 450m then left and follow creek downstream short distance.

Other sites in locality? Yes
Are sites in NPWS Register? No.

Site Types include: A.C.C.

Have artefacts been removed from site?
By whom?
When?
Deposited where?

Is site important to local Aborigines?
Give contact(s) name(s) + address(es)

Contacted for this recording? NOT KNOWN
Attach additional information separately) If not, why not?

Verbal/written reference sources (including full title of accompanying report)

NPWS Report Catalogue #: C/1333

Checklist: surface visibility, damage/disturbance/ threat to site

Condition of site: Weathering

Recommendations for management & protection (attach separate sheet if necessary)

Site recorded by: J. Black & K Mills Date: 3/5/97

Address/institution: Muldale Edgeworth

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1. Land form a ~~beach/hill slope/ridge~~ top, etc: Creek Bed b. site aspect: N. S. c. slope: Flat.

d mark on diagram provided *or* on your own sketch the position of the site. e. Describe briefly.

f Local rock type: Ironstone Sandstone conglomerate g Land use/effect:

2. Distance from drinking water: At site Source: Unnamed creek

3 Resource Zone associated with site (~~estuarine, riverine~~, forest etc):

4 Vegetation: Bloodwood Angophora Casuarina sp. Spotted Gum Melaleuca Ironbark.

5 Edible plants noted: Lily Acacia species Geebung Grass tree Banksia Melaleuca Blackthorn

6 Faunal resources (include shellfish): Macropods Kangaroo Wallabies Wombats

7 Other exploitable resources (river pebbles, ochre, etc):

Site type:

A.C.G.

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth

QUARRIES rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do **NOT** dig, disturb, damage site or contents.

24 A.C.G's. in creek bed.

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.

OEH #38-4-0446 (Mt Sugarloaf)

[✓] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 3/88

38-4-0446

1:250,000 map sheet: Newcastle NPWS Code 38

AMG Grid reference (Full reference - please include leading digits): 250K 362610 mE 25K; 250K 6358980 mN 25K S/6

Scale of map used for grid reference (Please use largest scale available): [✓] 25K, 50K (preferred) [ ] 100K [ ] 250K

1:25K, 50K, 100K map name: Wallarah

HEAD OFFICE USE ONLY:
NPWS Site no: 38-4-446
Site types A. G. C
Accessioned by: ____ Date: ____
Data entered by: LLS Date: 4/7/98
Owner/Manager
Address

Site name Mt Sugarloaf Locality/property name

NPWS District Hunter Region Central

Reason for investigation: private

Portion no.
Parish: Northumberland

Photos taken? Yes
How many attached? 3

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along creek) (Draw diagram on separate sheet): 0334598N 6358980E proceed south along gravel track & 4WD track past on left on track follow fence line down to shed c.450m turn left and follow c.350m to site in creek bed

Other sites in locality? Yes Site Types include A.G.C.
Are sites in NPWS Register? No

Have artefacts been removed from site? When?
By whom? Deposited where?

Is site important to local Aborigines?
Give contact(s) name(s) + address(es)

Contacted for this recording?
(Attach additional information separately) If not, why not? NOT KNOWN

Verbal/written reference sources (including full title of accompanying report)

NPWS Report Catalogue # 9/1333

Checklist surface visibility, damage/disturbance/ threat to site: Condition of site: Weathering

Recommendations for management & protection (attach separate sheet if necessary)

Site recorded by: J. Bluff & K. Miller Date: 3/5/97
Address/institution: Mt Dale Edgeworth

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1. Land form a ~~beach/hill slope/ridge top~~, etc: Creek bed b. site aspect: N-S. c. slope: Mod

d. mark on diagram provided *or* on your own sketch the position of the site e. Describe briefly.

f. Local rock type: Conglomerate, Ironstone, Sandstone g. Land use/effect:

2. Distance from drinking water: on site Source: Unnamed creek

3. Resource Zone associated with site (~~estuarine~~, riverine, forest etc)

4. Vegetation: Blackwood, Eucalyptus, Callitris, Spotted gum, Mahogany, Ironbark.

5. Edible plants noted: Eucalyptus, Blackboy, Lomandra, Yams, Spear Lily, Bracken, Fern

6. Faunal resources (include shellfish): Macropods, Reptiles, Wombats

7. Other exploitable resources (river pebbles, ochre, etc).

Site type:

A.C.C.'s.

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do **NOT** dig, disturb, damage site or contents.

15 A.C.C.'s in creek bed

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth.

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG: structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.

OEH #38-4-0447 (Mt Sugarloaf)

[✓] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 5/88

38-4-0447

1:250,000 map sheet: Newcastle NPWS Code 38

AMG Grid reference (Full reference - please include leading digits): 250K 36250 mE 25K; 250K 63590 10 mN 25K 5/6

Scale of map used for grid reference (Please use largest scale available): [✓] 25K, 50K (preferred) [ ] 100K [ ] 250K

1:25K, 50K, 100K map name: Wallarah

Site name: Mt Sugar-loaf Locality/property name

NPWS District: Hunter Region: Central

HEAD OFFICE USE ONLY:
NPWS Site no: 38-4-447
Site types: A.C.C.
Accessioned by: _____ Date: _____
Data entered by: VS Date: 6/7/98

Owner/Manager

Address:

Reason for investigation: private

Portion no

Parish: Northumberland

Photos taken? Yes

How many attached? 4.

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along creek) (Draw diagram on separate sheet): from Wallarah 1:25K 6334E 5918N proceed southalong travel track 2.5km from left prop track follow fence line down the creek 450m then left and follow creek down stream & waterfall over creek valley

Other sites in locality? Yes Site Types include A.C.C.

Are sites in NPWS Register? No

Have artefacts been removed from site? When?

By whom? Deposited where?

Is site important to local Aborigines?

Give contact(s) name(s) + address(es)

Contacted for this recording?

Attach additional information separately) If not, why not? NOT known

Verbal/written reference sources (including full title of accompanying report)

NPWS Report Catalogue #

C/1333

Checklist surface visibility, damage/disturbance/ threat to site

Condition of site: Weathering

Recommendations for management & protection (attach separate sheet if necessary)

Site recorded by: J. Bluff K. Miller Date: 3/ /97

Address/institution: Mardale Edgeworth.

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1. Land form a ~~beach/hill slope/ridge top~~, etc: Creek bed b. site aspect: N-S c. slope: Mod

d mark on diagram provided *or* on your own sketch the position of the site e. Describe briefly

f Local rock type: g. Land use/effect:

2. Distance from drinking water: on site Source: Annangrove Creek

3 Resource Zone associated with site (~~estuarine, riverine~~, forest etc): Forest

4 Vegetation: Blackwood, Angophora, Spotted Gum, Mahogany, Ironbark

5 Edible plants noted: Eg Lomandra, Kangaroo Apple, Native Yam, Gymea Lily, Banksia, Geebung, Orange Native Pear.

6 Faunal resources (include shellfish): Macropod, Reptiles, Goanna.

7 Other exploitable resources (river pebbles, ochre, etc):

Site type

AGs

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth.

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do **NOT** dig, disturb, damage site or contents.

19 AGs in creek bed.
above waterfall.

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.

[+ New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 5/88

38-4-0448

NPWS Code 38

1:250,000 map sheet: Newcastle

AMG Grid reference (Full reference - please include leading digits): 250K 36 2 6 40 mE 25K; 250K 6 2 5 39 00 mN 5/6 25K

Scale of map used for grid reference (Please use largest scale available): [+ 25K, 50K (preferred)] [ ] 100K [ ] 250K

1:25K, 50K, 100K map name: Wallsend

HEAD OFFICE USE ONLY:
NPWS Site no: 38-4-448
Site types A.C.G.
Accessioned by: _____ Date: _____
Data entered by: MS Date: 4/7/98

Owner/Manager

Address

Site name: MT Sugarloaf Locality/property name

NPWS District: Hunter Region: Central

Reason for investigation: Private

Portion no: Parish: Northumberland

Photos taken? YES
How many attached? 2.

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along cliff) (Draw diagram on separate sheet): from Wallsend 1:25K 6334 5468N proceed east 4 along gravel track c. 8.25KM from left cross track proceeding S SW. direction 650m to site 2 second creek c. 2 levels back from main creek

Other sites in locality? YES
Are sites in NPWS Register? NO

Site Types include A C G

Have artefacts been removed from site?
By whom?

When?
Deposited where?

Is site important to local Aborigines?
Give contact(s) name(s) + address(es)

Contacted for this recording?
(Attach additional information separately) If not, why not? NOT Known

Verbal/written reference sources (including full title of accompanying report)

NPWS Report Catalogue #
e/1333.

Checklist: surface visibility, damage/disturbance/ threat to site

Condition of site: Weathering

Recommendations for management & protection (attach separate sheet if necessary)

Site recorded by: J. Tibbett K. Mattle Date: 3/5/97
Address/institution: Muswellbrook Edgeworth

SITE POSITION & ENVIRONMENT | OFFICE USE ONLY: NPWS site no:

1. Land form a ~~beach/hillslope/ridge top~~, etc: Creek bed b. site aspect: E-W c. slope: Mod

d. mark on diagram provided *or* on your own sketch the position of the site e. Describe briefly

f. Local rock type: Conglomerate Bonnet Lam g. Land use/effect:

2. Distance from drinking water: at site Source: seasonal creek

3. Resource Zone associated with site (~~estuarine, riverine~~, forest etc):

4. Vegetation Blood wood Ang. apt. Tor. Casuarina spotted Gum Mahogany Ironbark

5. Edible plants noted: Bracken Fern Lily Grass Melaleuca Kurrawang Black Boy Fennel Lily Banksia Guinea

6. Faunal resources (include shelter): Macropod Reptiles Lambats

7. Other exploitable resources (river pebbles, ochre, etc)

Site type: A.C.C.

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do **NOT** dig, disturb, damage site or contents.

3. A.C.C. in creek bed.

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.

[✓] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 5/88

38-4-0449

NPWS Code 38

1:250,000 map sheet: Newcastle

AMG Grid reference (Full reference - please include leading digits): 250K 362740 mE (25K); 250K 6358710 mN (5/6 25K)

Scale of map used for grid reference (Please use largest scale available): [✓] 25K, 50K (preferred) [ ] 100K [ ] 250K

1:25K, 50K, 100K map name: Wallsend

Site name: Mt Sugarloaf Locality/property name:

NPWS District: Hunter Region: Central

HEAD OFFICE USE ONLY:
NPWS Site no: 38-4-449
Site types: A. CG.
Accessioned by: Date:
Data entered by: US Date: 4/7/98

Owner/Manager:

Address:

Reason for investigation: private

Portion no:
Parish: Northumberland

Photos taken? Yes.
How many attached? 3

How to get to the site (refer to permanent features, give best approach to site eg. from above/below, along cutline) (Draw diagram on separate sheet): from Maitland 1:25K 6330E 5962N proceed south along gravel track c. 8.25 km past on left cross track proceed in S.W. direction c. 550m to site in ecotonal creek c. 3 level from Main Creek

Other sites in locality? Yes Site Types include: ACG.
Are sites in NPWS Register? No

Have artefacts been removed from site? When?
By whom? Deposited where?

Is site important to local Aborigines?
Give contact(s) name(s) + address(es)

Contacted for this recording? NOT known
(Attach additional information separately) If not, why not?

Verbal/written reference sources (including full title of accompanying report):

NPWS Report Catalogue #: C/1333

Checklist surface visibility, damage/disturbance/ threat to site

Condition of site: N weathering

Recommendations for management & protection (attach separate sheet if necessary)

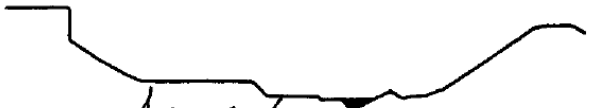
Site recorded by: J. Blatt A. Miller Date: 3/5/97
Address/institution: Mankato Edgeworth

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1. Land form a. ~~beach/hill slope/ridge top~~, etc: Creek bed b. site aspect: E-W c. slope: Mod

d mark on diagram provided *or* on your own sketch the position of the site. e. Describe briefly



f Local rock type: Sandstone / conglomerate / Ironstone g. Land use/effect:

2. Distance from drinking water: At site Source: seasonal creek

3 Resource Zone associated with site (~~estuarine, riverine~~, forest etc):

4 Vegetation: Ironbark, Mahogany, Spotted Gum, Casuarina, Open sclera, Blackwood.

5 Edible plants noted: Bangalow Palm, Lily, Lomandra, Melaleuca, Burrawang, Yellow Lily, Blackboy, Bracken fern

6 Faunal resources (include shellfish): Macropod, Reptiles, Wombat

7 Other exploitable resources (river pebbles, ochre, etc):

Site type:

AGG

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth

QUARRIES rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do **NOT** dig, disturb, damage site or contents.

? AGG. in creek bed.

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.

OEH #38-4-0450 (Mt Sugarloaf)

[✓] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 3/88

38-4-0450

NPWS Code

1:250,000 map sheet:

AMG Grid reference (Full reference - please include leading digits)

250K 362200 mE 25K

250K 6257900 mN 25K 5/6

Scale of map used for grid reference (Please use largest scale available) [✓ 25K, 50K (preferred)] [ ] 100K [ ] 250K

1:25K, 50K, 100K map name: Wallarah

HEAD OFFICE USE ONLY:

NPWS Site no: 38-4-0450

Site types: A GC

Accessioned by: _____ Date: _____

Data entered by: CS Date: 4/7/98

Owner/Manager

Address

Site name: MT Sugarloaf Locality/property name

NPWS District: Hunter Region: Central

Reason for investigation: Private

Portion no:

Parish: Northumberland

Photos taken? Yes

How many attached? 1

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along cliff) (Draw diagram on separate sheet.): 1:25K 634000E 6257600N follow gravel track towards MT Vincent 2-3K stop go onto foot on left and follow ridge line to site on top of ridge

Other sites in locality? Site Types include.

Are sites in NPWS Register?

Have artefacts been removed from site? When?

By whom? Deposited where?

Is site important to local Aborigines?

Give contact(s) name(s) + address(es)

Contacted for this recording? NOT KNOWN

(Attach additional information separately) If not, why not?

Verbal/written reference sources (including full title of accompanying report)

NPWS Report Catalogue #: 01333

Checklist surface visibility, damage/disturbance/ threat to site

Condition of site: Weathering

Recommendations for management & protection (attach separate sheet if necessary)

Site recorded by: Mitchell Rowlett

Address/institution: Malcolm Edgeworth

Date: 15/9/97

SITE POSITION & ENVIRONMENT | **OFFICE USE ONLY: NPWS site no:**

1. Land form a ~~beach~~/hill slope/~~ridge~~-top, etc: Creek bed b. site aspect: E—W c. slope: Flat

d. mark on diagram provided *or* on your own sketch the position of the site: e. Describe briefly:

f. Local rock type: Sandstone g. Land use/effect:

2. Distance from drinking water: at site Source: Unnamed Ephemeral creek

3. Resource Zone associated with site (~~estuarine, riverine~~, forest etc):

4. Vegetation: Spotted Gum, Grey Gum, Ironbark, Casuarina, Peppermint, Angophora

5. Edible plants noted: Burrawang, Lucasia, Geebung, Lilly apple berry, Native Cherry

6. Faunal resources (include shellfish): Macropods, Reptiles, Lumbars

7. Other exploitable resources (river pebbles, ochre, etc):

Site type: ACh

DESCRIPTION OF SITE & CONTENTS.
Note state of preservation of site & contents. Do NOT dig, disturb, damage site or contents.

15 ACh's in 3 small groups

CHECKLIST TO HELP:
length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.
DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.
ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.
BURIALS: number & condition of bone, position, age, sex, associated artefacts.
TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth
QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.
OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.
Attach annotated photos (stereo where useful) showing scale, particularly for art sites.

[ ] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 5/88

38-4-0457

NPWS Code

1:250,000 map sheet: _____

AMG Grid reference (Full reference - please include leading digits)

250K 361340 mE 25K

250K 6357710 mN 5/6 25K

Scale of map used for grid reference (Please use largest scale available): [ ] 25K (preferred) [ ] 50K [ ] 100K [ ] 250K

1:25K, 50K, 100K map name: Wallsend

HEAD OFFICE USE ONLY:

NPWS Site no: 38 - 4 - 457

Site types: AR

Accessioned by: _____ Date: _____

Data entered by: RS Date: 4/7/97

Owner/Manager: State Forest

Address:

Site name: Heaton S F Locality/property name:

NPWS District: Hunter Region: Central

Reason for investigation: Private

Portion no: Parish: Cessnock Northumberland

Photos taken? Yes

How many attached? 2.

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along cliff) (Draw diagram on separate sheet): from Wallsend 1:25K 6345E 5970N proceed South 3.9K to track cross gravel on foot to creek gully on western side/ridge and follow down to site

Other sites in locality? Site Types include:

Are sites in NPWS Register?

Have artefacts been removed from site? When?

By whom? Deposited where?

Is site important to local Aborigines?

Give contact(s) name(s) + address(es):

Contacted for this recording?

Attach additional information separately (if not, why not)? NOT KNOWN

Verbal/written reference sources (including full title of accompanying report):

NPWS Report Catalogue #: C/1333

Checklist: surface visibility, damage/disturbance, threat to site

Condition of site: Weathered.

Recommendations for management & protection (attach separate sheet if necessary):

Site recorded by: [illegible] R Mills Date: 21/1/97

Address/institution: Mankdale Edgewood

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1 Land form a ~~beach / hill slope / ridge top~~, etc. Creekbed. b site aspect N S c. slope Mod

d mark on diagram provided *or* on your own sketch the position of the site e. Describe briefly

f Local rock type Sandstone g Land use/effect Aeration S.F.

2 Distance from drinking water at site Source: seasonal creek bed

3 Resource Zone associated with site (~~estuarine, riverine~~, forest etc)

4 Vegetation Peppermint, White Mahogany, Spotted Gum, Grey Gum, Red Ironbark, Scribbly Gum, Turpentine, Stringybark

5 Edible plants noted Burrawang, Melaleuca, Geebung, Banksia

6 Faunal resources (include shellfish) Macropods, Reptiles, Small mammals

7 Other exploitable resources (river pebbles, ochre, etc)

Site type

ACG's

CHECKLIST TO HELP
length, width, depth, height of site, shelter deposit, structure, element eg. tree scar, grooves in rock
DEPOSIT colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types
ART area of surface decorated, motifs colours, wet, dry pigment, technique of engraving, no of figures, sizes, patination
BURIALS number & condition of bone, position, age, sex, associated artefacts
TREES number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth
QUARRIES rock type, debris, recognisable artefacts, percentage quarried
OTHER SITES EG structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions, massacres, cemeteries) as appropriate

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do NOT dig, disturb, damage site or contents.

11 ACG's on outcrop in seasonal creek bed.

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.

OEH #38-4-0486 (Heaton S.F., Heaton State Forest)

Magellan G.P.S. 2000XL used [X] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 9585 6444

Standard Site Recording Form Revised 5/88

38-4-0486

NPWS Code

1:250,000 map sheet:

AMG Grid reference (Full reference - please include leading digits): 250K 362860 mE 25K; 250K 6359220 mN 5/6 25K

Scale of map used for grid reference (Please use largest scale available): [X] 25K, 50K (preferred) [ ] 100K [ ] 250K

1:25K, 50K, 100K map name: Wallsend

HEAD OFFICE USE ONLY:
NPWS Site no: 38-4-486
Site types: ACC
Accessioned by: RS Date: 4-2-98
Data entered by: _____ Date: _____

Owner/Manager:
Address: State Forest Comm.

Site name: Heaton S.F. Locality/property name: Heaton S.F.

NPWS District: Hunter Region: Central

Reason for investigation: Private.

Portion no:
Parish: Northumberland

Photos taken? Yes
How many attached? 2.

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along cliff) (Draw diagram on separate sheet.): from Wallsend 1:25K 6345E 5970N. Follow Sugarloaf Quarry Rd. 800m park in alcove on left hand side of road and descend into Heaton creek running E-W. Follow creek up stream about ½ km to site

Other sites in locality? Yes
Are sites in NPWS Register? Yes
Site Types include: ACC's

Have artefacts been removed from site?
By whom?
When?
Deposited where?

Is site important to local Aborigines?
Give contact(s) name(s) + address(es)

Contacted for this recording?
(Attach additional information separately) If not, why not? NOT KNOWN

Verbal/written reference sources (including full title of accompanying report)

NPWS Report Catalogue #: C/1333

Checklist: surface visibility, damage/disturbance/ threat to site

Condition of site: Weathering

Recommendations for management & protection (attach separate sheet if necessary)

Site recorded by: W Bladen
Address/institution: Maitland

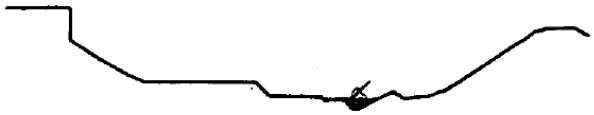
Date: 22/6/98

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no: L)

1. Land form a. ~~beach/hill slope/ridge top~~, etc: Creek Bed b. site aspect: N-S c. slope: Flat

d. mark on diagram provided *or* on your own sketch the position of the site: e. Describe briefly:



f. Local rock type: Conglomerate g. Land use/effect: Aeration S.F.

2. Distance from drinking water: at site Source:

3. Resource Zone associated with site (~~estuarine, riverine~~, forest etc):

4. Vegetation: Open tree & scattered grass Lomandra Peppermint Stringybark Blood wood Grey Gum Cabbage Gum Deadwood.

5. Edible plants noted: Lomandra Hymenanthera Lily Leptospermum Melaleuca Banksia Native Cherry Native Orchid Blackboy

6. Faunal resources (include shellfish): Marsupials Reptiles Lizards

7. Other exploitable resources (river pebbles, ochre, etc):

Site type: AGG's

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.
DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.
ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.
BURIALS: number & condition of bone, position, age, sex, associated artefacts.
TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth
QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.
OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do **NOT** dig, disturb, damage site or contents.

at least 5 AGG's on flat form in creek.

G.P.S. fixes G.R. e.75M west of creek. shown on map.

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.
Attach annotated photos (stereo where useful) showing scale, particularly for art sites.

OEH #38-4-0487 (Heaton S.F., Heaton State Forest)

[✓] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 5/88

38-4-0487

NPWS Code

1:250,000 map sheet: _____

AMG Grid reference (Full reference - please include leading digits): 250K 3 6 2 8 7 0 mE (25K) 250K 6 3 5 9 2 7 0 mN (5/6 | 25K)

Scale of map used for grid reference (Please use largest scale available): [ ] 25K, 50K (preferred) [ ] ~~100K~~ [ ] ~~250K~~

1:25K, ~~50K, 100K~~ map name: Karuah

Site name: Heaton S.F. Locality/property name: Heaton S.F.

NPWS District: Hunter Region: Central

HEAD OFFICE USE ONLY:

NPWS Site no: 38-4-487

Site types: ACr

Accessioned by: RS Date: 4-8-93

Data entered by: _____ Date: _____

~~Owner~~/Manager

Address: State Forest

Reason for investigation: Survey

Portion no

Parish: Northumberland

Photos taken? Yes

How many attached? 2

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along cl... (Draw diagram on separate sheet.): 634SE590N Follow Singer Road/Long Rd. 300m park in ... Karuah 1:25K drive on till [illegible] on track, a grass road on ... Opposite on to main ... Creek running E-W-S. then ... right follow track up ... approx. 250m to site ... above drop off

Other sites in locality? Yes

Are sites in NPWS Register? Yes

Site Types include: ACr

Have artefacts been removed from site?

By whom?

When?

Deposited where?

Is site important to local Aborigines?

Give contact(s) name(s) + address(es)

Contacted for this recording?

Attach additional information separately) If not, why not? Not known.

Verbal/written reference sources (including full title of accompanying report)

NPWS Report Catalogue #: 01333

Checklist: surface visibility, damage/disturbance/ threat to site

Condition of site: Weathering

Recommendations for management & protection (attach separate sheet if necessary)

Site recorded by: [signature]

Address/institution: Muswellbrook

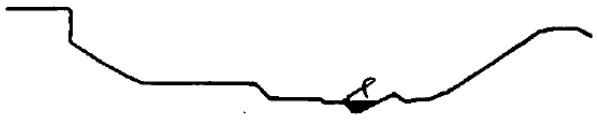
Date: 28/6/93

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1. Land form a. ~~beach/hill slope/ridge top~~, etc: Creek bed b. site aspect: NO - SE c. slope: Mod

d mark on diagram provided *or* on your own sketch the position of the site:



e. Describe briefly:

Austen S.F.

f Local rock type: Conglomerate g. Land use/effect:

2. Distance from drinking water: on site ~~Source~~:

3 Resource Zone associated with site (~~estuarine, riverine~~, forest etc):

4 Vegetation: Sapling Pine Spotted Gum Gahnia Peppermint Stringybark Bloodwood Grey Gum Dodonaea

5. Edible plants noted: Acacia Cypress Lily Cypress Melaleuca Bracken Orchids Native Grape Fern Bleach Reg.

6 Faunal resources (include shellfish): marsupials Reptiles Lizards.

7 Other exploitable resources (river pebbles, ochre, etc):

Site type:

ACG

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth.

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do NOT dig, disturb, damage site or contents.

1 ACG deside rock pool

G.P.S gives G.R c. 90m west of creek

shown on map

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.

Magellan GPS 2000XL used [✓] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 5/88

38-4-0488

NPWS Case

1:250,000 map sheet:

AMG Grid reference (Full reference - please include leading digits): 250K 56 28 80 mE (25K) 250K 63 57 23 0 mN (25K, 5/6)

Scale of map used for grid reference (Please use largest scale available): [✓] 25K, 50K (preferred) [ ] 100K [ ] 250K

1:25K, 50~~/100~~K map name: Wallarah

Site name: Heaton S.F. Locality/property name: Heaton S.F.

NPWS District: Hunter Region: Central

HEAD OFFICE USE ONLY:

NPWS Site no: 38-4-488

Site types: ACG.

Accessioned by: RS Date: 4-8-98

Data entered by: _____ Date: _____

Owner/Manager: State Forest

Address: Comm.

Reason for investigation: private

Portion no

Parish: North Umberleemee

Photos taken? Yes

How many attached? 2

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along cl~~r~~ (Draw diagram on separate sheet): from Wallarah 1:25K 345E 5970N follow Sugarloaf Range Rd. 800m park in alcove on left proceed on foot across ridge & descend into creek system & C. N-S. Main Ridge follow creek upstream c. 190m. A site

Other sites in locality? Yes Site Types include ACG's.

Are sites in NPWS Register? Yes

Have artefacts been removed from site? When?

By whom? Deposited where?

Is site important to local Aborigines?

Give contact(s) name(s) + address(es)

Contacted for this recording? Not Known

(Attach additional information separately) If not, why not?

Verbal/written reference sources (including full title of accompanying report) NPWS Report Catalogue #

C/1333

Checklist: surface visibility, damage/disturbance, threat to site

Condition of site: Weathering

Recommendations for management & protection (attach separate sheet if necessary)

Site recorded by: [illegible]

Address/institution: Morisset

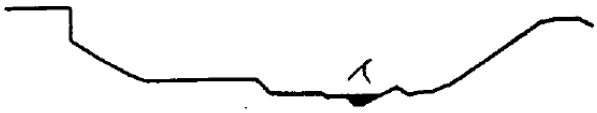
Date: 2/6/98

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1. Land form a ~~beach/hill slope/ridge top~~, etc: Creek Bed b. site aspect: N-S c. slope: Mod

d mark on diagram provided *or* on your own sketch the position of the site: e. Describe briefly:



f Local rock type: Conglomerate g Land use/effect: Aeration S.F.

2. Distance from drinking water: at site Source:

3 Resource Zone associated with site (~~estuarine, riverine~~, forest etc):

4 Vegetation: Turpentine Spotted Gum Lomatia Peppermint Stringybark Blackwood Grey Gum Dogwood

5 Edible plants noted: Geebung Typha Lily Cyperus Melaleuca Banksia Orchid Native grape fern Bracken

6 Faunal resources (include shellfish): Macropod Reptiles Wombats.

7 Other exploitable resources (river pebbles, ochre, etc).

Site type:

ACG's

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth.

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG: structures (fish traps, stone arrangements, bora rings, ma mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

DESCRIPTION OF SITE & CONTENTS.

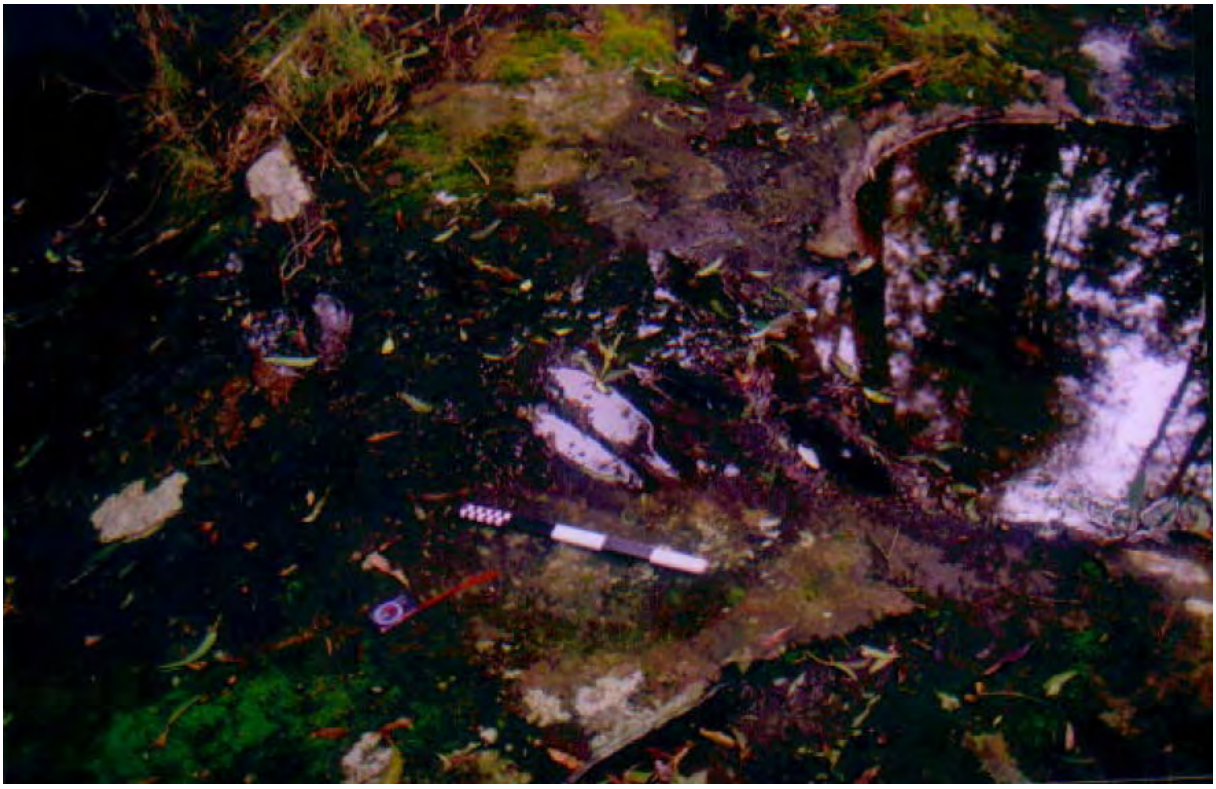
Note state of preservation of site & contents. Do NOT dig, disturb, damage site or contents.

at least 7 ACG's ~~in~~ platform in creek bed. Beside rockhole

G.P.S. 9105 G.R. c. 50m west of creek shown on map

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.



open ag. [ ] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 9585 6444

Standard Site Recording Form Revised 5/88

1:250,000 map sheet: Newcastle NPWS Code 13,8

AMG Grid reference 56 250K 360710 mE 25K; 250K 6365750 mN 5/6 25K

Full reference - please include leading digits

Scale of map used for grid reference [ ] 25K, 50K (preferred) [ ] 100K [ ] 250K

Please use largest scale available

1:25K, 50K, 100K map name: Wallsend

HEAD OFFICE USE ONLY:

NPWS Site no: 38-4-0610

Site types: ACG's

Accessioned by: Date:

Data entered by: NSP Date: 06/06/02

Owner/Manager:

Address:

Site name: Sugarloaf Range Locality/property name: Heaton SF

NPWS District: Hunter Region: Central

38-4-0610

Reason for investigation

Private

Portion no: Parish: Lake Macquarie County: Northumberland

Cessnock

Photos taken? Yes

How many attached? 4

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along cliff (Draw diagram on separate sheet) FROM WALLSEND 1:25K 6365750N. FOLLOW GRAVEL ROAD SOUTH TO SUMMIT POINT T.O.C. 3.9K TURN RIGHT AND FOLLOW FOR 1.1K TO PICNIC GROUND SITE IS IN FIRST GULLY LOOKING BACK TOWARDS EAST FROM PICNIC GROUND ON NORTH SIDE.

Other sites in locality? Site Types include:

Are sites in NPWS Register?

Have artefacts been removed from site? When?

By whom? Deposited where?

Is site important to local Aborigines?

Give contact(s) name(s) + address(es)

Contacted for this recording? Not Known

(Attach additional information separately) If not, why not?

Verbal/written reference sources (including full title of accompanying report) NPWS Report Catalogue #

C1333.

Checklist surface visibility, damage/disturbance/ threat to site

Condition of site

Weathering

Recommendations for management & protection (attach separate sheet if necessary)

Site recorded by: [illegible] Kinrumbo

Address/institution: A Miller Edgeworth

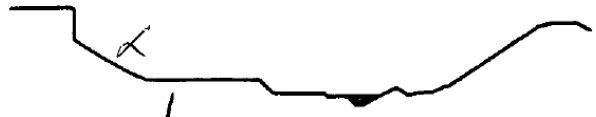
Date: 7/6/2000

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1. Land form a. ~~beach~~/hill slope/ridge top, etc: Creekbed b. site aspect: N - S c. slope: Mod

d. mark on diagram provided *or* on your own sketch the position of the site: e. Describe briefly:



f. Local rock type: Sandstone g. Land use/effect: Grazing S.F

2. Distance from drinking water: at site Source: Seasonal

3. Resource Zone associated with site (~~estuarine, riverine~~, forest etc):

4. Vegetation: Casuarina Peppermint Stringybark Spotted Gum Turpentine

5. Edible plants noted: Acacia Burrawang Native Grape

6 Faunal resources (include ~~shellfish~~): Macropods Reptiles Wombats

7. Other exploitable resources (river pebbles, ochre, etc):

Site type:

ACG's

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do NOT dig, disturb, damage site or contents.

3 small groups of ACG's scattered along in seasonal creek bed.

Sites down stream 2 ACG's Near fallen log c. 10 m down stream 4 ACG's Near + under fallen (same) c. 30 m further down stream 1 ACG

Several circular depressions are suspicious

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.


38-4-0610

Site Name: Mt Sugarloaf [✓] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 9585 6444

Standard Site Recording Form Revised 5/88

Grinding Groove Open Site

NPWS Code

1:250,000 map sheet: ZONE = 56

AMG Grid reference (Full reference - please include leading digits): 250K 360660 mE; 250K 6359560 mN (2SK; 5/6; 2SK)

Scale of map used for grid reference (Please use largest scale available): [✓] 25K, 50K (preferred) [ ] ~~100K~~ [ ] ~~250K~~

1:25K, 50K, 100K map name: Wallarah

HEAD OFFICE USE ONLY:

NPWS Site no: 38-4-0618

Site types: AGG

Accessioned by: _____ Date: _____

Data entered by: NSP Date: 19/06/02

Owner/Manager:

Address:

38-4-0618

Site name: Mt Sugarloaf Locality/property name.

NPWS District: Hunter Region: Central

Reason for investigation: Private

Portion no: Parish: Stanford Northumberland.

Photos taken? Yes

How many attached? 2

How to get to the site (refer to permanent features, give best approach to site eg from above, below, along cliff) (Draw diagram on separate sheet): Maitland Rd + Kurri Kurri Rd Quarrobalong 1:25K 5558c6964N. Follow Maitland Rd to 1.8K Right Forest Rd 9.2K Right Forest Rd through 200m track Right Forest Rd Power pole with Letter + Number 96W Park 1.4K follow track 2.3K Power pole HTB 9972 TR 34 & HTB 9971.96W. ~~Unmarked cable pole with~~ follow track along ridge 3.1K Junction 300m ~~to~~

Other sites in locality? Site Types include: axe in another.

Are sites in NPWS Register?

Have artefacts been removed from site? When?

By whom? Deposited where?

Is site important to local Aborigines?

Give contact(s) name(s) + address(es)

Contacted for this recording?

(Attach additional information separately) If not, why not? Not Known

Verbal/written reference sources (including full title of accompanying report)

NPWS Report Catalogue # 4/1323

Checklist surface visibility, damage/disturbance/ threat to site

Condition of site: Good

Recommendations for management & protection (attach separate sheet if necessary)

Site recorded by:

Address/institution: Kincumber

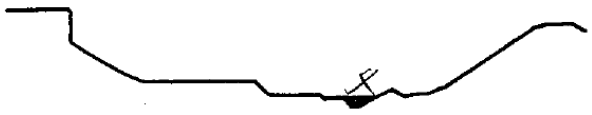
Date: 26/10/2000

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1. Land form a. ~~beach/hill slope/ridge top~~, etc: Creek bank b. site aspect: SW-NE c. slope: Mod

d. mark on diagram provided *or* on your own sketch the position of the site: e. Describe briefly:



f. Local rock type: Conglomerate g. Land use/effect:

2. Distance from drinking water: at site Source: unnamed creek

3. Resource Zone associated with site (estuarine, riverine, forest etc):

4. Vegetation: Grass Grass Shelter Grass Blackbutt wood Open Rock Grass Grass bark Iron bark

5. Edible plants noted: Callistemon Blackberry Banana berry

6. Faunal resources (include shellfish): Kangaroo Macropod Reptiles Small

7. Other exploitable resources (river pebbles, ochre, etc):

Site type:

ACh

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do NOT dig, disturb, damage site or contents.

3 ACh's in creek bed on largest conglomerate surface with one large rock pool c. 6M x 4M

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.


38-4-0618

OEH #38-4-0619 (Mount Sugar Loaf)

[+] New recording [ ] Additional info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 5/88

Grinding Groove

Open Site

NPWS Code

1:250,000 map sheet: ZONE = 56

AMG Grid reference (Full reference - please include leading digits): 250K 360550 mE 25K; 250K 6359440 mN 25K 5/6

Scale of map used for grid reference (Please use largest scale available): [ ] 25K, 50K (preferred) [ ] 100K [ ] 250K

1:25K, 50K, 100K map name: Wallarah

Site name: Mt Sugarloaf Locality/property name:

NPWS District: Hunter Region: Central

HEAD OFFICE USE ONLY:

NPWS Site no: 38-4-0619

Site types: AFG

Accessioned by: Date:

Data entered by: NSP Date: 19/06/02

Owner/Manager

Address

38-4-0619

Reason for investigation: Site Name Mt Sugarloaf Private

Portion/no: Parish: Glen Ford Northumberland

Photos taken? yes

How many attached? 2

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along cliff) (Draw diagram on separate sheet): FROM JUNCTION OF MAITLAND Rd & WALLARAH RD TRAVEL 10.6KM TO CROSSROADS TURN LEFT 2.5KM TO SSSSE TO GATE ON RIGHT FOLLOW RICHARDSONS ACCESS ROAD 1.15K GATE ON RIGHT PROCEED THROUGH FOR 200M TAKE RIGHT FORK AT POWER POLE WITH LARGE WHITE LETTERS + NUMBERS 96 WTL 46 FOLLOW TRACK 2.35K STOP POWER POLE H18.9972. TRIG H18.9971.96M TELSTRA OPTICAL CABLE LINE AT 250 WALLARAH CREEK IN S.W DIRECTION C.1.42SM SITE INCLOSED

Other sites in locality? Yes Site Types include ACC's

Are sites in NPWS Register? NO

Have artefacts been removed from site? When?

By whom? Deposited where?

Is site important to local Aborigines?

Give contact(s) name(s) + address(es)

Contacted for this recording? NOT Known

(Attach additional information separately) If not, why not?

Verbal/written reference sources (including full title of accompanying report)

NPWS Report Catalogue #

9/1333

Checklist: surface visibility, damage/disturbance, threat to site

Condition of site: Weathering

Recommendations for management & protection (attach separate sheet if necessary)

Site recorded by: J. Hiscock

Address/institution: Kincumber

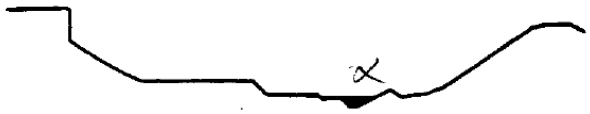
Date: 24/10/2000

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1. Land form a ~~base/hill slope/ridge top~~, etc: Creek Bed b. site aspect: SW. NE c. slope: Mod

d mark on diagram provided *or* on your own sketch the position of the site. e. Describe briefly:



f Local rock type: Conglomerate g. Land use/effect:

2. Distance from drinking water: Water Source: Commercial Creek

3 Resource Zone associated with site (~~estuarine, riverine~~, forest etc): Forest

4 Vegetation: Shelter Gum Ribbon Bark Apple Bloodwood Ironbark Grey Gum Stringybark

5 Edible plants noted: Native Cherry Lillypilly Geebung Burrawang

6 Faunal resources (include shellfish): Echidna Reptiles Lizards

7 Other exploitable resources (river pebbles, ochre, etc):

Site type: AGG's.

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do NOT dig, disturb, damage site or contents.

5 AGG's in creek bed

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth.

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.


38-4-0619

OEH #38-4-0623 (Mount Sugarloaf)

[T New recording [ ] Additional info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 3/88

Grinding Groove

Open Site

NPWS Code

1:250,000 map sheet: ____

Zone 56

AMG Grid reference (Full reference - please include leading digits): 250K 360620 mE 25K; 250K 6354510 mN 25K 5/6

Scale of map used for grid reference (Please use largest scale available): [T 25K, ~~50K~~ (preferred) [ ] ~~100K~~ [ ] ~~250K~~

1:25K, ~~50K~~, ~~100K~~ map name: Wallarah

HEAD OFFICE USE ONLY:

NPWS Site no: 38-4-0623

Site types: ACG

Accessioned by: ____

Data entered by: ____

38-4-0623

Owner/Manager

Address

Site name: MT Sugarloaf Locality/property name

NPWS District: Hunter Region: Central

Reason for investigation: Site name: Mt Sugarloaf Private

Portion no: Parish: Wallarah North Number Lands

Photos taken? Yes

How many attached? 3

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along cliff) (Draw diagram on separate sheet): FROM JUNCTION OF MAITLAND RD & RICHMOND VALE RD QUORROBOLONG 1:25K 5558E 6069N FOLLOW RICHMOND VALE Rd. 1.15K GATE ON RIGHT PROCEED THROUGH FOR 200M. TAKE RIGHT FORK AT POWER POLE SMITH LARGE WHITE LETTERS+NUMBERS 96W TL46 FOLLOW TRACK 2.35K STOP POWER POLE HT89972. TR 344 HT89971.96W TELSTRA OPTICAL CABLE MARKS ALSO WALK UP CREEK IN SW DIRECTION C.325M TO SITE IN CREEK BED

Other sites in locality? Yes Site Types include: ACG

Are sites in NPWS Register? NO

Have artefacts been removed from site? When?

By whom? Deposited where?

Is site important to local Aborigines?

Give contact(s) name(s) + address(es)

Contacted for this recording? NOT known

(Attach additional information separately) If not, why not?

Verbal/written reference sources (including full title of accompanying report)

NPWS Report Catalogue #: C/1333

Checklist: surface visibility, damage/disturbance/ threat to site

Condition of site: Weathering

Recommendations for management & protection (attach separate sheet if necessary)

Site recorded by: W Bluth

Address/institution: Kincumber

Date: 20/10/2000

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1. Land form a ~~beach / hill slope / ridge~~ top, etc: creek bed b. site aspect: SW, NE c. slope: flat

d mark on diagram provided or on your own sketch the position of the site. e. Describe briefly:

f Local rock type: Conglomerate g Land use/effect:

2. Distance from drinking water: at site Source: unnamed creek

3 Resource Zone associated with site (~~estuarine, riverine~~, forest etc):

4 Vegetation: Open forest Red gum Bloodwood Angophora Stringybark Ironbark

5 Edible plants noted: Wattle Acacia Blackberry Burrawang Geebung Banksia

6 Faunal resources (include shellfish): Macropods Reptiles Lorikeets

7 Other exploitable resources (river pebbles, ochre, etc):

Site type

AGS.

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do **NOT** dig, disturb, damage site or contents.

2 AGS ON EDGE OF POOL.

conglomerate surface creek bed

Narrow less than 2M wide

CHECKLIST TO HELP:

length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth.

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.

OEH #38-4-0624 (Mount Sugarloaf)

[ ] New recording [ ] Additional info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 5/88

Grinding Groove Open Site

NPWS Code

1:250,000 map sheet:

ZONE - 56

AMG Grid reference (Full reference - please include leading digits): 250K 360590 mE / 25K; 250K 6357490 mN / 5/6 / 25K

Scale of map used for grid reference (Please use largest scale available): [ ] 25K, ~~50K~~ (preferred) [ ] ~~100K~~ [ ] ~~250K~~

1:25K, ~~50K~~, ~~100K~~ map name: Wallarah

HEAD OFFICE USE ONLY:
NPWS Site no: 38 - 4 - 0624
Site types: ACC
Accessioned by: ____ Date: ____
Data entered by: JA Date: 18/7/12

Owner/Manager

Address

38 - 4 - 0624

Site name: MT Sugarloaf Locality/property name

NPWS District: Hunter Region: Central

Reason for investigation: Site Name MT Sugarloaf Survey

Portion no - Parish: Vacant Northumberland

Photos taken? Yes

How many attached? 2

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along cliff. Draw diagram or separate sheet): FROM JUNCTION OF PACIFIC HWY & RICHMOND VALE RD TRAVEL NORTH ON RICHMOND VALE RD FOR 1.15K CATEON RIGHT PROCEED THROUGH FOR 200 M TAKE RIGHT FORK AT POWER POLES WITH LARGE WHITE LETTER + NUMBERS 96WTL46 FOLLOW TRACK 2.35K STOP POWER POLE HTB.9972.TR344 HTB.9971.96W TELSTRA OPTICAL CABLE LINE ALSO WALK UP CREEK IN SW DIRECTION C. 350M SITE IN CREEK BED

Other sites in locality? YES Are sites in NPWS Register? No

Site Types include ACC

Have artefacts been removed from site? By whom?

When? Deposited where?

Is site important to local Aborigines? Give contact(s) name(s) + address(es)

Contacted for this recording? Attach additional information separately) If not, why not? NOT known

Verbal/written reference sources (including full title of accompanying report)

NPWS Report Catalogue # 9/1333

Checklist: surface visibility, damage/disturbance, threat to site

Condition of site: Weathering

Recommendations for management & protection (attach separate sheet if necessary)

Site recorded by

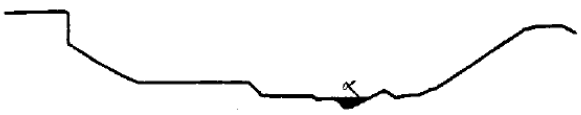
Address/institution: Kincumber.

Date: 20/10/2000

SITE POSITION & ENVIRONMENT | **OFFICE USE ONLY: NPWS site no:**

1. Land form a ~~beach/hill slope/ridge top~~, etc: Creek Bed b. site aspect: SW - NE c. slope: Mod

d mark on diagram provided *or* on your own sketch the position of the site. e. Describe briefly.



f Local rock type: Conglomerate g Land use/effect:

2. Distance from drinking water: at site Source: unnamed creek

3. Resource Zone associated with site (~~estuarine, riverine~~, forest etc)

4 Vegetation: Grey Gum Spotted Gum Stringybark Ironbark Angophora Blood wood Ironbark

5 Edible plants noted: Kurrajong Wild Quince Black Boy Burrawang Gahnia Bracken

6 Faunal resources (include shellfish): Macropods Reptiles Wombat

7 Other exploitable resources (river pebbles, ochre, etc):

Site type:

AGS

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do NOT dig, disturb, damage site or contents.

1 large AGS on NORTH END of PAD.

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth.

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG: structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

Attach sketches etc, eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.

opn gg [/] New recording [ ] Additional Info

National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form Revised 5/88

38-4-0869

NPWS Code 13.81

1:250,000 map sheet: Newcastle 56

AMG Grid reference (Full reference - please include leading digits): 250K 3[illegible]0 mE; 250K 63[illegible]0 mN

60 25K 90 5/6 57 25K 51

Scale of map used for grid reference (Please use largest scale available): [/] 25K, 50K (preferred) [ ] 100K [ ] 250K

1:25K, 50K, 100K map name: Wallsend

Site name: Heaton St Locality/property name: Heaton St

NPWS District: Hunter Region: Central

Reason for investigation: private

Portion no

Parish: Cessnock Northumberland

Photos taken? Yes

How many attached? 2

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along cliff) (Draw diagram on separate sheet if necessary): From Wallsend 1:25K 60SE 690 proceed out towards Buchanan Point right hand turn cattle grid 100m past left gas meter and follow fence line down hill skirting WB side (left) of fence to bushland site

Other sites in locality? Site Types include

Are sites in NPWS Register?

Have artefacts been removed from site? When?

By whom? Deposited where?

Is site important to local Aborigines?

Give contact(s) name(s) + address(es)

Contacted for this recording? Not Known

(Attach additional information separately) If not, why not?

Verbal/written reference sources (including full title of accompanying report)

NPWS Report Catalogue # 91333

Checklist: surface visibility, damage/disturbance/ threat to site

Condition of site: Weathering

Recommendations for management & protection (attach separate sheet if necessary)

Site recorded by: [illegible] Date: 15/8/2000

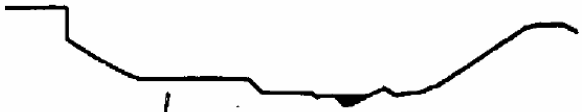
Address/institution: [illegible]

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1. Land form a. beach/hill slope/ridge-top, etc: Creek bed b. site aspect: NE - SW c. slope: Mon.

d mark on diagram provided *or* on your own sketch the position of the site: e. Describe briefly:



f Local rock type: Sandstone g. Land use/effect: Beef & F

2. Distance from drinking water: at site Source: seasonal

3 Resource Zone associated with site (~~estuarine, riverine~~, forest etc):

4 Vegetation: Spotted Gum Casuarina Iron bark Stringybark Grey Gum Angophora

5 Edible plants noted: Native Cherry Acacia Fig Native Cherry orchids Native Hazelnut

6 Faunal resources (include shelter): Macropods Reptiles Birds

7 Other exploitable resources (river pebbles, ochre, etc):

Site type: ACG's

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do **NOT** dig,disturb,damage site or contents.

C10 ACG's does SM in creek bed.

CHECKLIST TO HELP: length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES. number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth

QUARRIES rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

Attach sketches etc. eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.

OEH #38-4-0974 (Wallis Creek 2)

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220
Standard Site Recording Form

New Recording ☒ Additional information ☐

Site name	Wallis Creek 2			**NPWS Site Number**	38-4-0974
Owner/manager					
Owner Address					
Location	On the 330 kV transmission line easement to east of Richmond Vale Road, c.60 m to the west of a 1st order tributary of Surveyors Creek				
How to get to the site	turn south on to the Richmond Vale Road from George Booth Drive, turn again, immediately on to the unnamed road in a southerly direction. Upon reaching the intersection of the road and the 330 kV easement Take a right turn towards the east. Continue along the vehicle track within the easement for a distance of c.1.7 km				
1:250,000 map name	Wallsend			**NPWS map code**	
AMG Zone	56	**AMG Easting**	362440	**AMG Northing**	6361318
Method for grid reference	Hand-held GPS	**Map scale (if method = map)**		**Map name**	
NPWS District				**NPWS Zone**	Northern Zone
Portion no.	N/A			**Parish**	Stockrington
Site type(s)	open stone artefact scatter			**Site type code (NPWS use only)**	
Description of site and contents CHECKLIST: eg. length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock. DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types. ART: area of decorated surface, motifs, colours, wet,/dry pigment, engraving technique, no. of figures, sizes, patination. BURIALS: number & condition of bone, position, age, sex, associated artefacts. TREES: number, alive, dead. likely age, scar shape, position, size, patterns, axe marks, regrowth. QUARRIES: rock type, debris, recognisable artefacts, percentage quarried	four white mudstone flakes found within 6 m of one another ona vehicle track running along the southern perimeter of the easement. Artefact dimensions: 30 x 15 mm 17 x 8 mm 40 x 15 mm 40 x 15 mm exposure in the vicinity of the site is limited to the vehicle track. visibility - 15% exposure - 10% the potential further subsurface deposits containing further archaeological artefacts is moderately high				

Version: June 1998	Data entered by:	Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

Land form	flat			**Aspect**		**Slope**
Mark position of the site						
Local rock type	?			**Land use/effect**	transmission line easement	
Distance from drinking water	c.60 m			**Source**	1st order tributary of Surveyors Creek	
Resource zone (eg. estuarine, river, forest)	forest			**Vegetation**	eucalypt	
Edible plants				**Faunal resources** (include shellfish)		
Other exploitable resources (eg. ochre)						
Are there other sites in the locality	Yes	**Are they in the Sites Register**	No	**Other site types include**	artefact scatters	

Site condition	Disturbed	Disturbances associated with the construction of the easement, such as vegetation clearance and the construction of nearby transmission line posts, the site itself has been disturbed by the vehicle track, in close vicinity to the site an optical fibre cable was located.		
Management recommendations	Current development plans do not affect this site			
Have artefacts been removed from site	No		**When**	
By whom			**Deposited at**	
Consent applied for	☐		**Consent issued**	☐
Date of issue			**Consent number**	

Reason for investigation	A survey was commissioned by Harper Somers O'Sullivan as part of an REF for a pipeline route from Seahampton to Rutherford		
Were local Aborigines contacted or present for the recording	☐ Not contacted ☒ Contacted and present ☐ Contacted but not present	**Names and addresses**	Tracy Skene Lower Hunter Wonnarua Council Inc 19 O'Donnell Cres Metford NSW 2323 Marrie Waugh Lower Wonnarua Tribal Consultancy Pty Ltd 156 The Inlet Rd Bulga NSW 2330 Phillip Hall Mindaribba Local Aboriginal Land Council Lot 475 Chelmsford Medford

Version: June 1998	Data entered by:	Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

			NSW 2323 PO Box 401 EAST MAITLAND NSW 2320

Is the site important to local Aborigines	yes		
Verbal/written reference sources	ERM (2004) Heritage assessment for the proposed gas pipeline from Seahampton to Rutherford	**ASR report number(s)**	C- C-
Photographs taken	Yes	**No of Photos attached**	2
Site recorded by	Tudur Llwyd Davies	**Date of recording**	13 April, 2004
Address/institution	Environmental Resources Management Australia, Building C, 33 Saunders Street, Pyrmont, NSW 2009		

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220
Standard Site Recording Form

New Recording ☒ Additional information ☐

Site name	Wallis Creek 1	**NPWS Site Number**	38-4-0975
Owner/manager			
Owner Address			

Location	On the 330 kV transmission line easement to east of Richmond Vale Road, c.10 m to the west of a 1st order tributary of Surveyors Creek				
How to get to the site	turn south on to the Richmond Vale Road from George Booth Drive, turn again, immediately on to the unnamed road in a southerly direction. Upon reaching the intersection of the road and the 330 kV easement Take a right turn towards the east. Continue along the vehicle track within the easement for a distance of c.2 km				
1:250,000 map name	Wallsend			**NPWS map code**	
AMG Zone	56	**AMG Easting**	362624	**AMG Northing**	6361265
Method for grid reference	Hand-held GPS	**Map scale (if method = map)**		**Map name**	
NPWS District				**NPWS Zone**	Northern Zone
Portion no.	N/A			**Parish**	Stockrington

Site type(s)	Isolated Stone Artefact	**Site type code (NPWS use only)**	
Description of site and contents CHECKLIST: eg. length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock. DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types. ART: area of decorated surface, motifs, colours, wet,/dry pigment, engraving technique, no. of figures, sizes, patination. BURIALS: number & condition of bone, position, age, sex, associated artefacts. TREES: number, alive, dead. likely age, scar shape, position, size, patterns, axe marks, regrowth. QUARRIES: rock type, debris, recognisable artefacts, percentage quarried	One white mudstone flake - c.15 x 25 mm, found c.12 m south of the vehicle track running along the southern perimeter of the easement exposure limited to area of sparse vegetation an the nearby vehicle track. visibility - 5% exposure - 10% moderate potential further subsurface deposits containing further archaeological artefacts		

Version: June 1998	Data entered by:	Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

Land form	open depression		**Aspect**		**Slope**
Mark position of the site					
Local rock type	?		**Land use/effect**	transmission line easement	
Distance from drinking water	c.10 m		**Source**	1st order tributary of Surveyors Creek	
Resource zone (eg. estuarine, river, forest)	forest		**Vegetation**	eucalypt	
Edible plants			**Faunal resources** (include shellfish)		
Other exploitable resources (eg. ochre)					
Are there other sites in the locality	Yes	**Are they in the Sites Register**	No	**Other site types include**	artefact scatters

Site condition	Disturbed	Disturbances associated with the construction of the easement, such as vegetation clearance and the construction of nearby transmission line posts, the area in close vicinity to the site has been disturbed by a vehicle track and an optical fibre cable.	
Management recommendations	Current development plans do not affect the site		
Have artefacts been removed from site	No	**When**	
By whom		**Deposited at**	
Consent applied for	☐	**Consent issued**	☐
Date of issue		**Consent number**	

Reason for investigation	A survey was commissioned by Harper Somers O'Sullivan as part of an REF for a pipeline route from Seahampton to Rutherford		
Were local Aborigines contacted or present for the recording	☐ Not contacted ☒ Contacted and present ☐ Contacted but not present	**Names and addresses**	Tracy Skene Lower Hunter Wonnarua Council Inc 19 O'Donnell Cres Metford NSW 2323 Marrie Waugh Lower Wonnarua Tribal Consultancy Pty Ltd 156 The Inlet Rd Bulga NSW 2330 Phillip Hall Mindaribba Local Aboriginal Land Council Lot 475 Chelmsford Medford NSW 2323

Version: June 1998 Data entered by: Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

			PO Box 401 EAST MAITLAND NSW 2320	
Is the site important to local Aborigines	yes			
Verbal/written reference sources	ERM (2004) Heritage assessment for the proposed gas pipeline from Seahampton to Rutherford		**ASR report number(s)**	C- C-
Photographs taken	Yes		**No of Photos attached**	2
Site recorded by	Tudur Llwyd Davies		**Date of recording**	13 April, 2004
Address/institution	Environmental Resources Management Australia, Building C, 33 Saunders Street, Pyrmont, NSW 2009			