APPENDIX G: ARCHAEOLOGY REPORT (UMWELT, 2003)

Hunter Catchment Management Trust

DRAFT
Aboriginal Cultural Heritage Assessment
Hexham Swamp Rehabilitation Project

January 2003

Umwelt
Environmental Consultants

EXECUTIVE SUMMARY

Hexham Swamp is a large wetland area that is part of the estuary of the Hunter River. The maximum extent of the current swamp is approximately 10 kilometres north-south (between Beresfield and Wallsend) and 5 kilometres east-west (between Sandgate and Minmi). Hexham Swamp provided the Awabakal people rich and diverse plant and animal resources for much of the last 6000 years. There are numerous Aboriginal sites around the margins of Hexham Swamp, as well as natural places or landforms which are of high cultural value to the local Aboriginal community.

The character of Hexham Swamp changed dramatically in 1970-71 when floodgates were installed near the mouth of Ironbark Creek in order to mitigate the impact of floods on grazing lands and businesses in the area. The diverse habitats have been replaced by meadow and reed communities (as a result of changes in hydrology and salinity); the available area for nursery habitat for fish, prawns and other marine organisms has declined; the number of water birds and migratory wader bird species has decreased; and weed and pest species such as alligator weed, pampas grass, water hyacinth, feral pigs and foxes has increased.

The Hunter Catchment Management Trust (HCMT) proposes to restore tidal circulation into parts of Hexham swamp by opening the Ironbark Creek floodgates. Restoration of tidal inundation of approximately 1700 hectares of Hexham Swamp will rehabilitate intertidal habitats and increase the diversity of habitats present in the wetland. In addition to restoring the natural values of the wetland, the proposed opening of the floodgates has the potential to benefit the cultural values of the wetland by restoring some of the variety of wetland landscapes enjoyed by Aboriginal people in the past.

The HCMT proposes to protect a small area of low lying land at Shortland from inundation after tidal ventilation is restored by constructing a low bund. This bund will extend from the base of a narrow spur to the base of another narrow spur approximately one kilometre to the north. The bund will cross the wetland and run roughly parallel with Ironbark Creek. It will be constructed of clean imported fill, placed over the existing land surface.

The Hexham Swamp Rehabilitation Project will not affect the stability or conservation status of Aboriginal sites in the area. The altered water levels will be restricted to the very low lying areas within the swamp and Ironbark Creek areas. No Aboriginal sites have been previously recorded in these areas. Such areas are unlikely to contain undiscovered archaeological evidence of traditional Aboriginal people because they would not have been comfortable places to camp or carry out activities such as tool making. The Project will, however, eventually restore the variety of wetland landscapes and the associated flora and fauna resources enjoyed by Aboriginal people in the past. Such landscapes and resources will be of cultural value to today's Aboriginal community. Additionally, the restoration of a tidal environment is likely to improve the conservation status of Aboriginal sites still in existence on the swamp margins by re-establishing (to a limited extent) the context of the sites.

The Awabakal Local Aboriginal Land Council (Awabakal LALC) and traditional owners of the Hexham Swamp area are supportive of the proposed rehabilitation of the environmental and ecological values of Hexham Swamp. They are keen to be actively involved in the rehabilitation works (such as weed removal and documentation of changes to the landscape). They would like to be informed and involved in the monitoring of ecological and habitat changes as the staged opening of the floodgates progresses. The restoration of intertidal habitats for fish, prawns and other marine organisms, as well as other fauna habitats is seen as the restoration of important cultural heritage values.

One Aboriginal stone artefact scatter was located during the archaeological survey of the proposed bund location. The artefacts are not *in situ*, being located at the base of a spur on a low ridge which has been constructed across the flat of Ironbark Creek. The area has been disturbed by earthworks,

cultivation and stock trampling. The archaeological and cultural significance of the site were assessed as low. The Awabakal LALC considers that the construction of the bund should proceed and have requested that the site be buried by the clean fill imported to construct the bund.

TABLE OF CONTENTS

FIGURES

PLATES

APPENDICES

1.0 INTRODUCTION AND BACKGROUND

For much of the last 6000 years, Hexham Swamp provided the Awabakal people with diverse plant and animal resources – as food and as raw materials for day to day implements. The swamp comprised diverse wetland habitats, including, at different times, an open bay with sandy beaches, fresh water floodplain wetlands along the tributary creeks on its western side, open brackish and fresh meadow, swamp forest and estuarine channels. The estuarine channels also provided a water transport route from the western part of the swamp to the Hunter River.

Hexham Swamp also contains a small rocky island that is considered to be of high cultural value to Aboriginal people. To the west of the swamp, and within its view catchment, the steep sandstone country of the Sugarloaf Range is also considered to be of high cultural value. There are many Aboriginal sites in this area, and important stories about the significance of Mount Sugarloaf to Aboriginal cultural practices.

Although the pattern of habitats in Hexham Swamp has evolved and changed over the last 6000 years, the character of Hexham Swamp has changed most dramatically over the last 50 years. Floodgates were installed near the mouth of Ironbark Creek during 1970-71 in order to mitigate the impacts of small and medium floods on grazing lands and businesses on low lying land in the Hexham Swamp area.

The floodgates consist of eight box culverts, each with a hinged flap gate on the Hunter River side. When water levels rise on the swamp side of the gates to a level higher than the water level in the Hunter River, the water level difference across the gates forces the gates open and water flows out of the swamp. If the Hunter River water level is higher than the swamp water level the gates close, preventing flow from entering Hexham Swamp from the Hunter River. The installation of the one-way operating floodgates has resulted in:

* A lowering of the water table behind the gates to below mean water;
* The elimination of saline waters entering the swamp area (ie. the restriction of tidal exchange);
* Stagnation of water behind the floodgates;
* Blocking the passage of debris from the Swamp.

Additionally, large areas of mangroves and saltmarsh have been replaced by meadow and reed communities (as a result of changes in hydrology and salinity); the available area for nursery habitat for fish, prawns and other marine organisms has declined; the number of water birds and migratory wader bird species has decreased; and weed and pest species such as alligator weed, pampas grass, water hyacinth, feral pigs and foxes has increased.

1.1 WETLAND REHABILITATION PROPOSAL

The Hunter Catchment Management Trust (HCMT) proposes to restore tidal circulation into parts of Hexham swamp by opening the Ironbark Creek floodgates. Restoration of tidal inundation of approximately 1700 hectares of Hexham Swamp will rehabilitate intertidal habitats and increase the diversity of habitats present in the wetland.

In addition to restoring the natural values of the wetland, the proposed opening of the floodgates has the potential to benefit the cultural values of the wetland by restoring some of the variety of wetland landscapes enjoyed by Aboriginal people in the past.

A preliminary draft EIS (1998) for the project addressed five options for opening of the Ironbark Creek floodgates. These options included:

* a 'do nothing' option;
* one gate open;
* eight gates open;
* eight gates open - highest tides excluded; and
* eight gates open – with bunding of selected properties.

The current assessment (WBM 2002) addresses a sixth option which involves eight gates open – highest tides excluded with bunding of selected properties.

This sixth option would reinstate tidal exchange between the Hunter River and Hexham Swamp resulting in restoration of intertidal habitats. This, in turn, would result in improvements in water quality, aquatic and bird habitats and create scientific, educational and eco tourism opportunities.

A variety of infrastructure and private assets are located on low lying land adjacent to Hexham Swamp. The HCMT has recognised that restoration of tidal ventilation in Hexham Swamp has the potential to impact adversely on some low lying properties. The HCMT has purchased much of this land.

As can be seen from **Figure 1.1**, the altered water levels within Hexham Swamp will be restricted to the very low lying areas within the swamp and Ironbark Creek areas. Water levels will not encroach onto surrounding slopes.

The Hunter Catchment Management Trust proposes to protect a small area of low lying land from inundation by constructing a bund (see **Figure 1.2**). This bund will extend from the base of a narrow spur to the base of another narrow spur approximately one kilometre to the north. The bund will cross the wetland and run roughly parallel with Ironbark Creek. It will consist of a trapezoidal shaped earth embankment, with a 7 metre wide base and a 3 metre wide crest (capable of being driven along for inspection purposes). The earth will be imported. The construction of this bund has the potential to impact on the physical evidence of past Aboriginal activity.

1.2 LOCATION OF THE STUDY AREA

Hexham Swamp is a large wetland area that is part of the estuary of the Hunter River. The maximum extent of the current swamp is approximately 10 kilometres north-south (between Beresfield and Wallsend) and 5 kilometres east-west (between Sandgate and Minmi). The extent of tidal inundation which would result from the opening of the Ironbark Creek floodgates is shown on **Figure 1.1**.

The proposed bund location is immediately west of and below the suburb of Shortland, near the Shortland Waste Water Treatment Works (see **Figure 1.2**).

For the purpose of this cultural heritage assessment, the study area also includes the landform that forms the shoreline context of Hexham Swamp, ie the interface between wetland/aquatic landscapes and terrestrial landscapes. The potential impacts of the proposal are almost exclusively on aquatic or wetland landscapes and the situation after the floodgates have been opened will be similar to pre 1970.

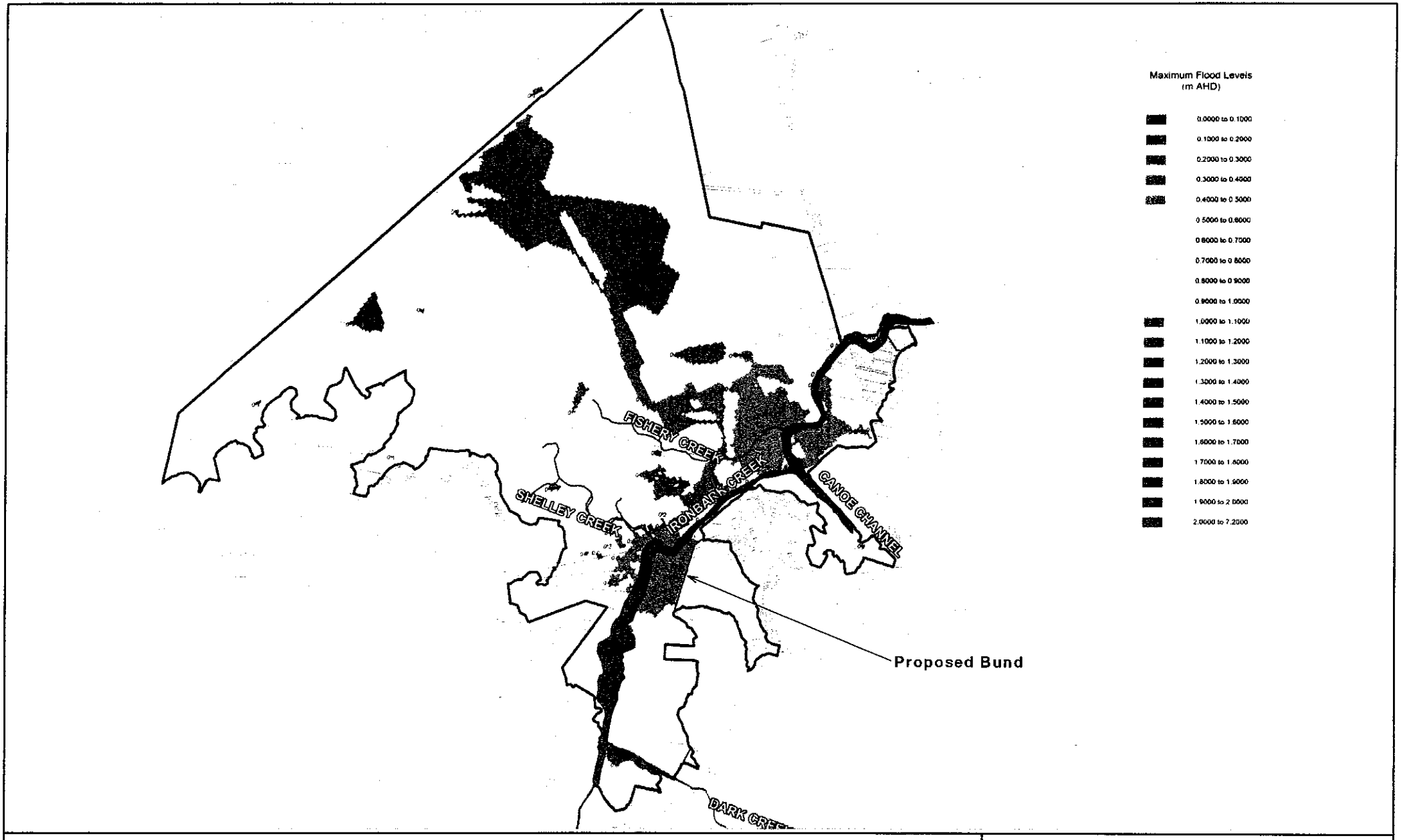
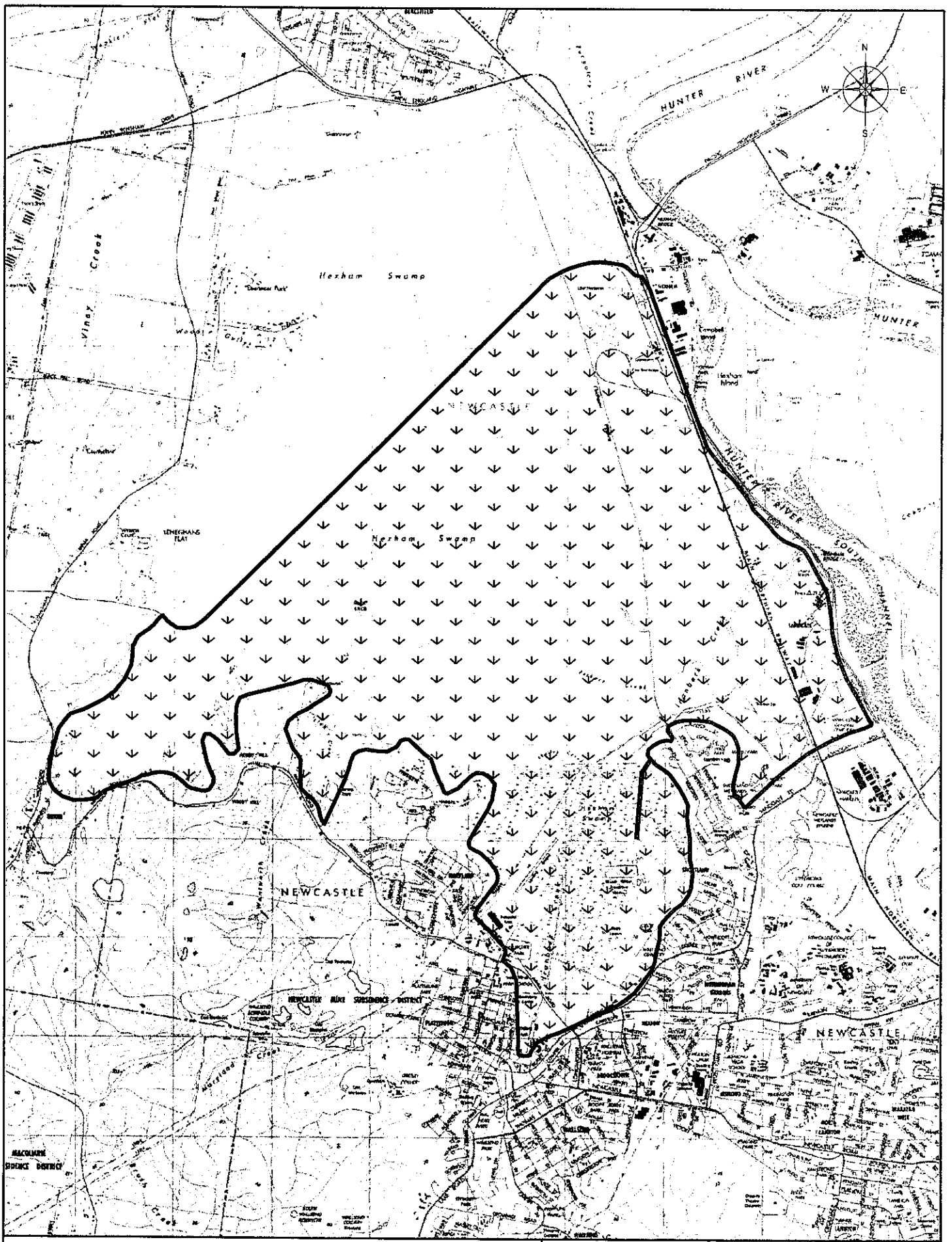


FIGURE 1.1
Proposed Areas of Inundation, 8 Floodgates Open, Spring Tide and Bunding

Umwelt (Australia) Pty Limited
Source: WBM Oceanics Australia

A4 Not to Scale | Ref No.:R01_V1/1645_012.dgn



Legend

Study Area

Bund

0 0.5 1 2km

Umwelt (Australia) Pty Limited
Source: Land and Property Information NSW, 2000

FIGURE 1.2
Location of Study Area and Proposed Bund

A4 Scale 1:50 000

Ref No.:R01_V1/1645_004.dgn

1.3 PURPOSE OF THIS REPORT

This report documents the results and recommendations of an Aboriginal cultural heritage assessment of the proposed rehabilitation of environmental and ecological values of Hexham Swamp.

Aboriginal cultural heritage is not just the physical evidence left behind by traditional Aboriginal people. It is 'the value people have given to items through their associations with those items' (NPWS 2002). Manifestations of cultural heritage values may include, among other things, cultural practices, knowledge, songs, stories and art. Natural elements of the landscape such as landforms, flora and fauna may also have meaning for particular groups and so these become cultural heritage.

This study aims to identify and assess the Aboriginal cultural heritage issues associated with the rehabilitation of Hexham Swamp, and to detail appropriate management options as identified by the local Aboriginal community and traditional owners.

This assessment also reviews the archaeological assessment undertaken for the draft EIS (1998). The Aboriginal cultural heritage investigations reported in the draft EIS were restricted to Aboriginal *archaeology*. Best practice assessment of impacts on Aboriginal culture now requires that the assessment address the broader concept of Aboriginal cultural heritage.

In this context, the objectives of the Aboriginal cultural heritage study and assessment presented in this document are:

* To liaise with the local Aboriginal community and any traditional owners who may have an interest in the area over which the development is proposed. This liaison included discussion regarding:
    - the rehabilitation of environmental and ecological values of Hexham Swamp and how this will impact cultural heritage values;
    - the potential for any works associated with the construction of a bund (an aspect of Option 6) to impact on cultural heritage values;
* To undertake a Native Title search for the area over which the development is proposed;
* To undertake an archaeological surface survey of the area that is proposed for bunding; and
* To review and update the landscape and archaeological context information in order to incorporate recent survey, excavation and landscape analysis results from the lower Hunter.

1.4 INTERESTED ABORIGINAL GROUPS

The National Parks and Wildlife Service (NPWS) Aboriginal Cultural Heritage Guidelines outlines three principles behind the collaborative approach to Aboriginal heritage survey and site management required by the Service. These principles are that Aboriginal culture is a living culture, that the Aboriginal community are the rightful cultural owners of cultural heritage information, and that NPWS decision making on Aboriginal heritage issues is transparent. Umwelt (Australia) Pty Limited supports the principles underlying the NPWS

approach and aims to involve the relevant Aboriginal community in all its heritage assessments.

The study area is located in the area of interest of the Awabakal Local Aboriginal Land Council (Awabakal LALC). Ron Gordon, Chief Executive Officer of Awabakal LALC was informed of the Hexham Swamp Rehabilitation Project and the proposed construction of the bund at Shortland. Mr Gordon co-ordinated representation for the local Aboriginal community.

Two meetings were held with Awabakal LALC to discuss the environmental, ecological and cultural outcomes of the proposed Hexham Swamp Rehabilitation Project, as well as the potential cultural heritage impacts, and opportunities for the Awabakal community to be further involved in the future management of Hexham Swamp . Also involved was Dean Hawken, representing Awabakal traditional owners. The first meeting was attended by Sharon Vernon from the Hunter Catchment Management Trust and Phillip Haines and Mark Wainwright from WBM Oceanics to explain the proposal and its environmental impacts, discuss future Aboriginal community involvement, and answer any queries that the community had.

Mr Bob Smith (representing the Awabakal LALC) and Katie Sachs (archaeologist (Umwelt (Australia) Pty Limited) undertook the survey of the location of the proposed bund. Management recommendations for the Aboriginal site recorded were discussed in-field.

A draft copy of this report was provided to the Awabakal LALC with a request that the Council consider the results and recommendations regarding the proposed bund and the meeting outcomes/discussion which forms the community cultural heritage assessment. A comment from the Awabakal LALC is attached as **Appendix 1**.

1.4.1 Native Title

A search request was forwarded to the National Native Title Tribunal on 23 August 2002. A search of the National Native Title Register on 20 May 2002 indicated that there are no registered Native Title Claims over the Hexham Swamp area.

1.5 STRUCTURE OF THIS REPORT

This report presents eight main types of information to clarify the cultural values of the Hexham Swamp area, and the interaction between those values and the proposed wetland restoration project. Outcomes of investigations and assessment are documented in relation to:

* the geomorphic evolution of Hexham Swamp;
* the natural habitats and resources of Hexham Swamp;
* the implications of the natural heritage of the wetland and its local context for the nature of past Aboriginal occupation and evidence of that occupation;
* a review of ethnographic/historical information about past Aboriginal use of the Hexham Swamp area. These records include references to the special cultural values of features such as "the Knob", as well as information about food resources and subsistence techniques;
* a review of records of known Aboriginal sites from the margins of Hexham Swamp. This review focuses on the evidence for past occupation in the estuarine sections of the

wetland, although it also considers the broader occupation context of the whole of Hexham Swamp;

* the results of discussions with representatives of the local Aboriginal community in relation to the concept of restoring Hexham Swamp;

* information about a local surface survey of the area that will be affected by the construction of the bund at Shortland;

* discussion of management options to protect Aboriginal cultural values during the restoration process and to provide further opportunities for the local Aboriginal community to participate in future management of the swamp.

2.0 ENVIRONMENTAL CONTEXT

2.1 LANDSCAPE EVOLUTION

This section reviews the information that is available about the physical environment of the Hexham Swamp area, drawing out particularly those environmental features that would have had significant implications for Aboriginal occupation. The proposed restoration of tidal inundation in parts of Hexham Swamp will impact only on the most recently deposited elements of the landscape. Other landscape evolution information is provided to show the relative cultural heritage sensitivity of the more recent features.

2.1.1 Soil Landscapes and Geomorphic Evolution

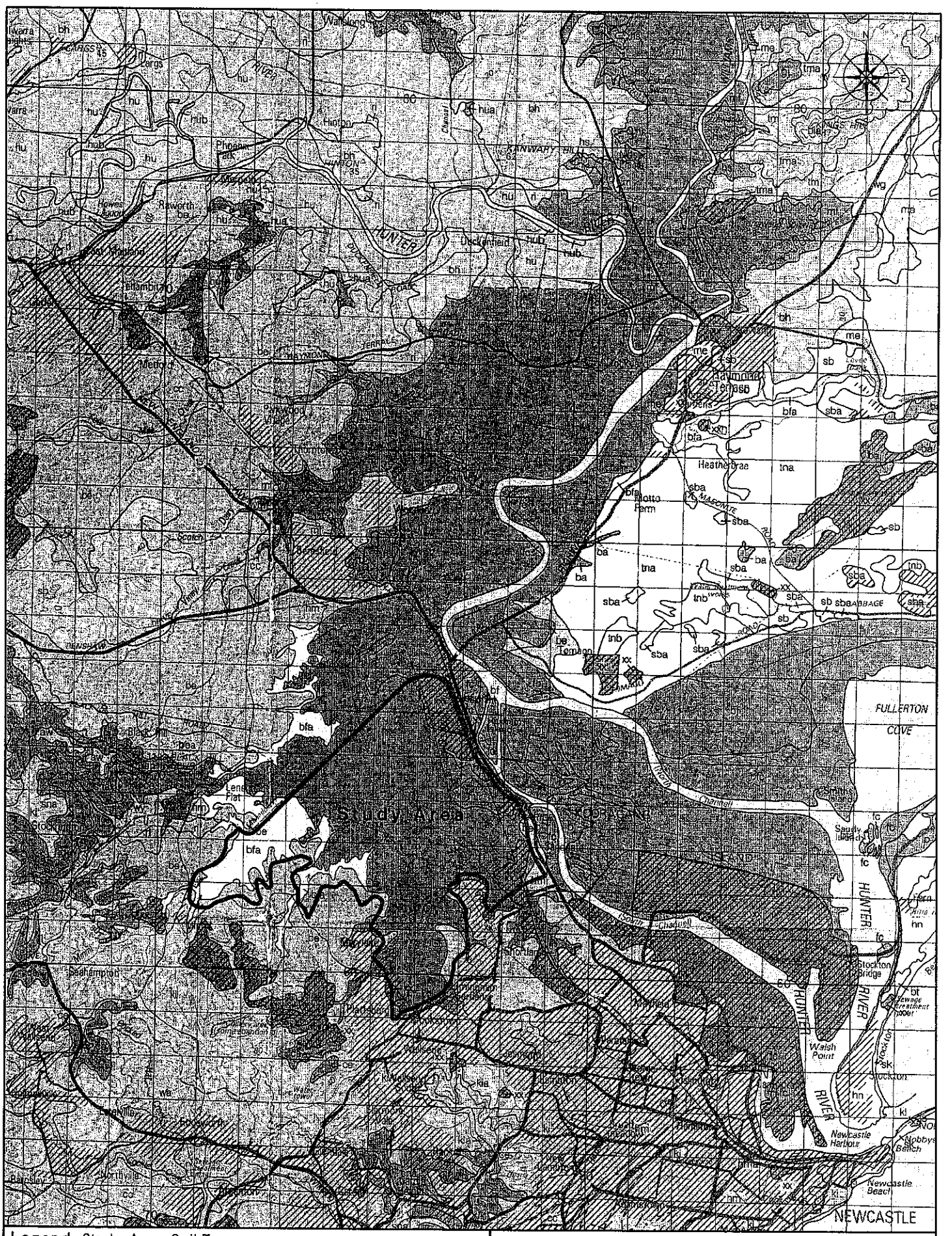
Soil landscapes are based on landforms, soils and vegetation and thereby provide a summary of major variations in the physical landscape. To some extent, soil landscape units also provide an indication of the landscape history of an area. Three soil landscape units have been mapped within the study area (Department of Land and Water Conservation 1995) (see **Figure 2.1**).

The majority of the study area consists of the swamp landscape of Hexham Swamp (hs). The western edge of the area consists of the Bobs Farm variant of the beach soil landscape (bfa). A number of spurs extend into the southern part of the area and form part of the Beresfield landscape system (be).

The principal characteristics of these three soil landscapes are outlined in **Table 2.1**, together with notes on the archaeological implications of these characteristics.

Table 2.1 - Characteristics of Soil Landscape Units

Soil Landscape	Characteristics	Archaeological implications
Hexham Swamp	Broad swampy estuarine backplains on the lower Hunter delta, widths 2-8 km and relief less than 2 metres. Deep tidal channels within Hexham Swamp.	Diverse habitat for plant and animal resources for Aboriginal people. Tidal channels suggest safe and easy boating access to marine/estuarine resources. Excellent fishing, with potential for nets and traps as well as line fishing.
	Sedgeland and saltmarsh, with mangrove in tidal channels; casuarina and melaleuca woodland; fresh swamp, fresh meadow and wet grassland.	As above 'The Knob' also occurs in this landscape. It comprises sandstone boulders / low cliffs and has rainforest species such as ficus.
	Soils are dark silty to medium clay, peaty, waterlogged.	This unit has accumulated during the Holocene, but some poorly drained flat land may also have occurred in this location during the late Pleistocene (at a much lower level than the current bed of the swamp).
Beresfield	Undulating low hills and rises, elevation 20-50 metres; Long, gentle side slopes common, occasional short steep side slopes; Deeply incised drainage lines; Rock outcrop generally absent.	Open woodland country with frequent intermittent streams - permanent water rare. Outcrop is generally absent, except for small outcrops of deeply weathered lithic sandstone on the steeper slopes adjacent to Hexham Swamp. It is unlikely that this material was suitable for grinding, because of its low quartz content. The Waratah Sandstone underlies the highest ridge crests and is present as float on the steeper upper slopes. Tuffs and silcrete occur in the geological stratigraphy.



Legend Study Area Soil Types:

- be Beresfield
- bfa Bobs Farm Landscape Variant
- Hexham Swamp
- Bobs Farm

Umwelt (Australia) Pty Limited
Source: Department of Land and Water Conservation
Soil Landscape Series Sheet 9232

FIGURE 2.1
Soil Landscapes

A4 Scale: 1:115 000

Ref No.:R01_V1/1645_005.dgn

Table 2.1 - Characteristics of Soil Landscape Units (cont)

Soil Landscape	Characteristics	Archaeological implications
Beresfield (cont)	Tall open forest (spotted gum and ironbark); melaleuca and wet sclerophyll species in drainage lines.	Diverse plant resources for food and implements.
	Texture contrast soils, with hardsetting sandy loam and loam A horizon, pedal clay subsoils; ironstone fragments common, and surface may be gravelly.	Potential for artefacts to behave in the same way as other inclusions in the A horizon.
	Susceptible to sheet, rill and gully erosion.	Artefacts likely to be moved vertically and laterally by erosive processes.
	Largely cleared and may be cultivated.	Stratigraphic context of artefacts much disturbed.
Bobs Farm variant	Holocene estuarine flat on margins of Hunter floodplain.	Now frequently cleared and drained. Natural stratigraphic context means that it is possible that stratified deposits remain in this soil landscape.
	20 cm dark brown loose loamy sand overlying beach sand and sandy clay loam, with sharp boundaries between materials. Described as a lake beach deposit (early Holocene).	The description implies that these deposits were associated with open water (estuarine) soon after sea level reached its current position 6000 years ago. The study area is the landward extent of the Holocene inundation of the late Pleistocene terrestrial landscape. Implies considerable change in the landscape over the last 20,000 years.
	Casuarina and melaleuca swamp, with occasional cabbage tree palm and swamp mahogany.	Adds to diversity of plant materials available for foods and implements. Some freshwater resources where tributary creeks enter the swamp through this landscape.

2.1.2 Geomorphic Evolution of the Lower Hunter Valley

The underlying valley form of the lower Hunter Valley (Ramage 1994) appears to be a single large valley that includes three main tributaries: the Hunter River, the Karuah River and the smaller valley of Ironbark Creek, under Hexham Swamp.

The environmental context of the study area has been dominated by the development of the Hunter floodplain, estuary and coastline in response to sea level changes. In terms of Aboriginal occupation strategies in the study area, the relevant period of environmental history is approximately the last 50000 years, with critical interest in the landscapes of the last 20000 years or so. A sea level curve for the last 120000 years, with detail for the last 20000 years is presented in **Figure 2.2**.

At the last glacial maximum, approximately 20000 years ago, sea level was some 120 metres lower than at present. Sea level rose rapidly from about 17000 years ago until about 10000 years ago, with the rate of rise tapering until the present sea level was attained 6500 years ago. Sea level has remained stable since 6500 years ago (Holocene stillstand), although there is some evidence of slightly higher sea levels (plus 1-2 metres) in the early part of the stillstand (Flood and Frankel 1989 and Bryant et al 1992). The sea level information suggests that the western and southern shores of Hexham Swamp would have been subject to active marine processes during the last interglacial, and in the early Holocene.

Figure A

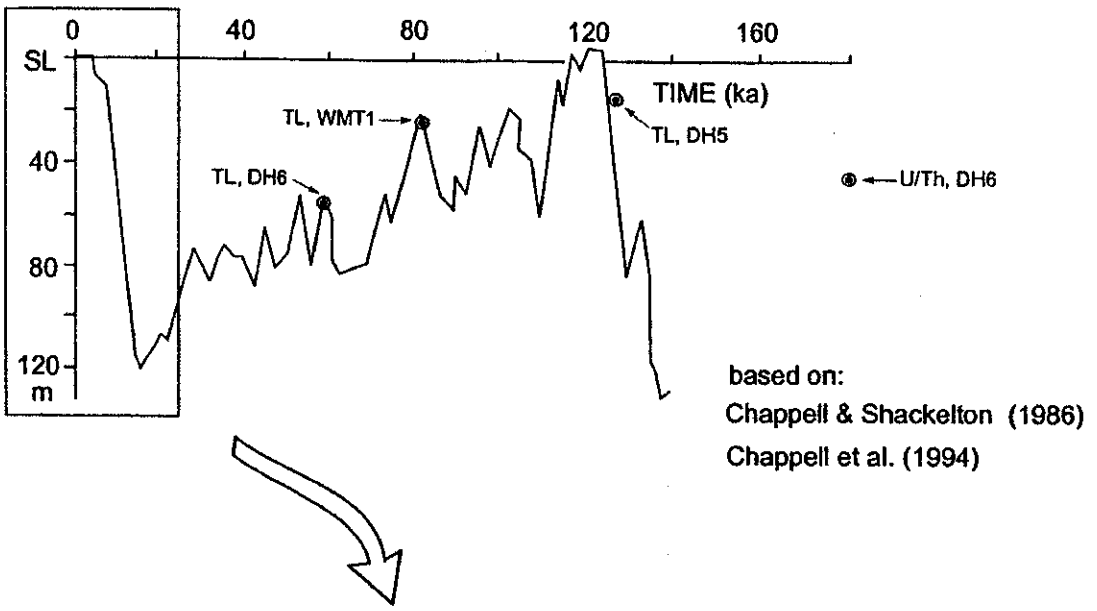
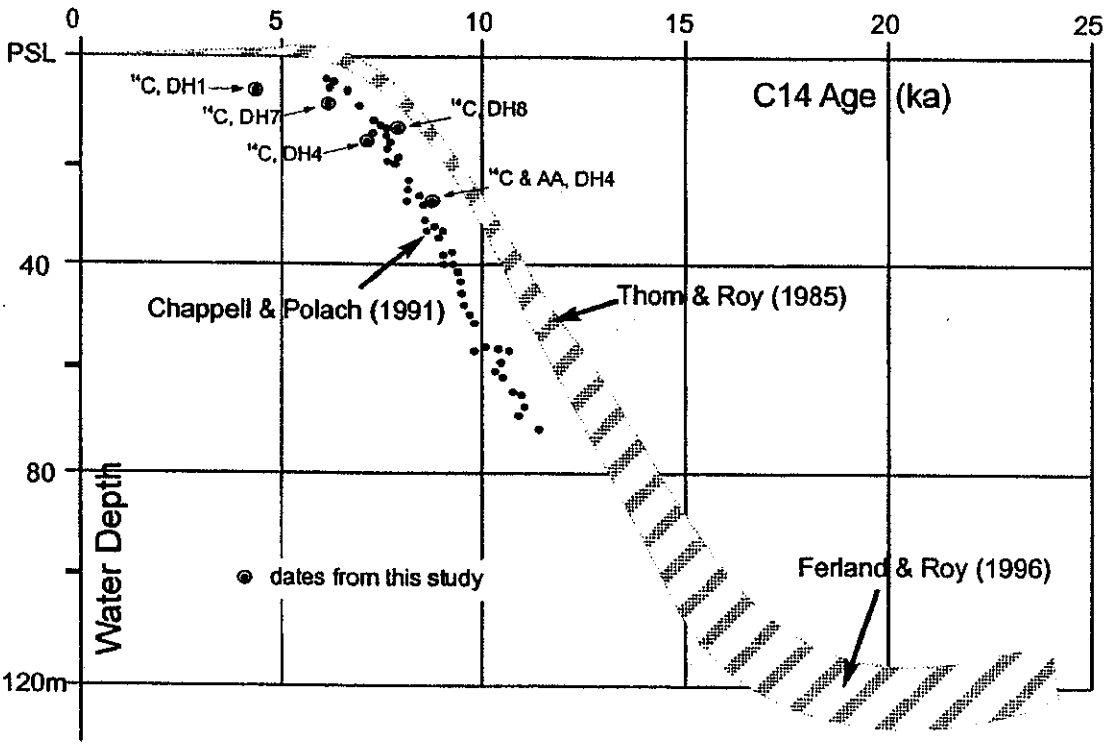


Figure B



Notes:

Figure A Comparison of dates reported from the Lower Hunter with the Sea-level curve, after Chappell and Shackelton (1986) and Chappell et al. (1994): (TL = Thermoluminescence, U/Th = Uranium-thorium series dating)

Figure B Comparison of dates reported from the Lower Hunter with the Sea-level curve for SE Australia, a compilation after Thom and Roy (1985), Ferland and Roy (1996), and Chappell and Polach (1991); (AA = Amino acid racemisation, ^{14}C = Radiocarbon series dating)

Umwelt (Australia) Pty Limited
Source: Andrew Walker MSc Thesis, Newcastle Uni (1999)

FIGURE 2.2
Sea Level History

A4 Not to Scale | Ref No.:R01_V1/1645_006.dgn

Detail about the evolution of the Hunter estuary in response to these sea level changes is presented in Roy, Hudson and Boyd (1995), Roy and Boyd (1996) and Walker (1999). The findings reported in these publications are summarised below.

Section 2.1.4 comments on the implications of the sedimentary and geomorphic history for Aboriginal resources and occupation patterns.

Last Interglacial – 120000 years ago

It is estimated that sea level at this time was 4 to 5 metres higher than today, and raised estuarine shell beds at Largs were deposited at this time. The inner coastal barrier formed at this time. Roy et al consider that an extensive deltaic floodplain, similar to today, formed in the lower valley. Isolated remnants of Pleistocene terrace deposits that remain in the lower Hunter Valley indicate that the Pleistocene floodplain was up to ten metres higher than the Holocene floodplain.

Last Glacial – approximately 18000 years ago

Roy et al 1996 note that as sea level fell in the lead up to the last glacial maximum, coastal rivers such as the Hunter gradually incised their valleys. They note that the last Glacial palaeovalley at Maitland is at –20 metres, deepening to –50 metres at the present coastline, where it was deeply excavated within a valley approximately 2 km wide (at the southern end of the Pleistocene barrier). At the height of the Glacial, the coastline was displaced approximately 25 km to the east. During this time, much of the old Pleistocene floodplain from around Maitland (i.e. the upper reaches of the Pleistocene estuary) was eroded, with the sediment transported out beyond the Glacial coastline. These floodplain sediments must therefore have been part of the sediment that was swept landward across the continental shelf as sea level began to rise.

Post glacial sea level rise and marine transgression – 18000 to 6500 years ago

The post glacial transgression was characterised by repeated landward migration of sand bodies, possibly in the form of a series of short lived proto barriers.

Commencement of the Holocene stillstand – 6500 years ago

When sea level stabilised at its present position, a new stable sandy barrier formed seaward of the old Pleistocene barrier, and "a new cycle of estuarine and deltaic sedimentation commenced in the lower Hunter valley". In the early stages of barrier formation, storm washover deposits were common. The barrier of the Hunter estuary is distinctive because of its high sediment supply and the multiple phases of dune transgression that were initiated between about 5000 years ago and 500 years ago (continuing to the present).

Roy and Boyd (1996) note that infilling of the estuary involves two processes: the build up of tidal delta marine sands in the lower estuary, and fluvial estuarine sedimentation in the upper estuary (gradually migrating seaward over time). They note that the Hunter estuary has filled rapidly with sediment, but that from 6500 years ago, until perhaps 4000 years ago, the Hunter estuary would have been more like Lake Macquarie or Wallis Lake in form, with an open lake lying behind the barrier, and a narrow shallow mouth that restricted tidal ranges.

The tidal delta in the Hunter estuary has a maximum thickness of 20 metres, and extends as far upstream as Hexham (15 km from the coastline). It also underlies part of Kooragang Island. Roy and Boyd (1996) argue that tidal delta sand bodies tend to have been deposited at the end of the Holocene transgression (with sea level still rising), but the extent to which sand was added to the tidal delta during the stillstand is not known.

The dominant sedimentary facies of the modern Hunter estuary is fine terrigenous mud deposited in the central basin of the estuary. The mud is deposited by floods, with lithic material augmented by abundant organic material. At the landward side of the mud basin, coarser fluvial material is deposited in small bay head deltas, while at the seaward side of the mud basin, the fine muds are mixed by marine sands. Roy and Boyd note:

> Estuarine muds vary laterally in response to changing environmental conditions. They are particularly shelly in the seaward part of the estuary where salinities are relatively stable and the estuary is marine dominated. They become less shelly and more organic rich in landward areas that are more strongly influenced by freshwater inflows.

The depth of the muds varies from a maximum of 40 metres at Hexham to 17 metres at Maitland.

Deposition since 4000 years ago

Roy and Boyd (1996) note that over time the river delta extends seaward over the estuarine sediments, and that eventually the river would commence to deliver fluvial sand directly to the sea. In their view, the Hunter estuary is approaching this condition, with true estuarine environments persisting in less then 10% of the former estuary around Newcastle and Fullerton Cove. The delta front is mid way down Kooragang Island and Fullerton Cove represents the last remnant of the former estuarine mud basin. It is not clear how long Roy and Boyd consider the estuary to have been in this condition. They note that at the time of first European settlement in 1797, the lower estuary was a complex of intersecting tidal channels, tidal flats and mangrove swamps.

The upper part of the estuary has been infilled by fluvial sands and muds, deposited as the fluvial delta prograded towards the coastline. The river channel is bounded by a wide floodplain that comprises overbank alluvium, deposited over the top of estuarine muds. The floodplain deposits are 8 metres thick at Maitland, tapering to 4 metres near Hexham.

Roy and Boyd (1996) note that organic muds and peats occur in backswamps on the floodplain, most commonly removed from the active channel. They accumulate organic material and sediment at a very slow rate when compared with other depositional environments. Roy and Boyd report a carbon date of 1750 BP from a buried backswamp deposit near Maitland. The deposit lies approximately 9.5 metres below the present floodplain surface. This suggests an extremely rapid rate of floodplain progradation over the last 2000 years (7 metres vertically and up to 20 km laterally).

Roy *et al* (1995) further discuss the evolution of the lower Hunter floodplain. Numerous paleo channels are present across the floodplain surface (see **Figure 2.3**), and Roy *et al* note that the age of these channels is not currently known. They may be quite old features – relict delta front distributaries that formed as the estuarine basin was infilling, or they may be much more recent, reflecting channel switching after the floodplain was formed. Nittim (1966) indicates that the river between Hexham and Maitland has shortened by 44% since 1860, associated with major reductions in sinuosity and channel shape. Whatever the age of these paleo channels (which must be no older than mid Holocene) and whatever the explanation for their presence, it is clear that the development of the floodplain over the last 4000 years or so has involved significant local variations in the form of the landscape, with associated changes in the presence of plant and animal habitats.

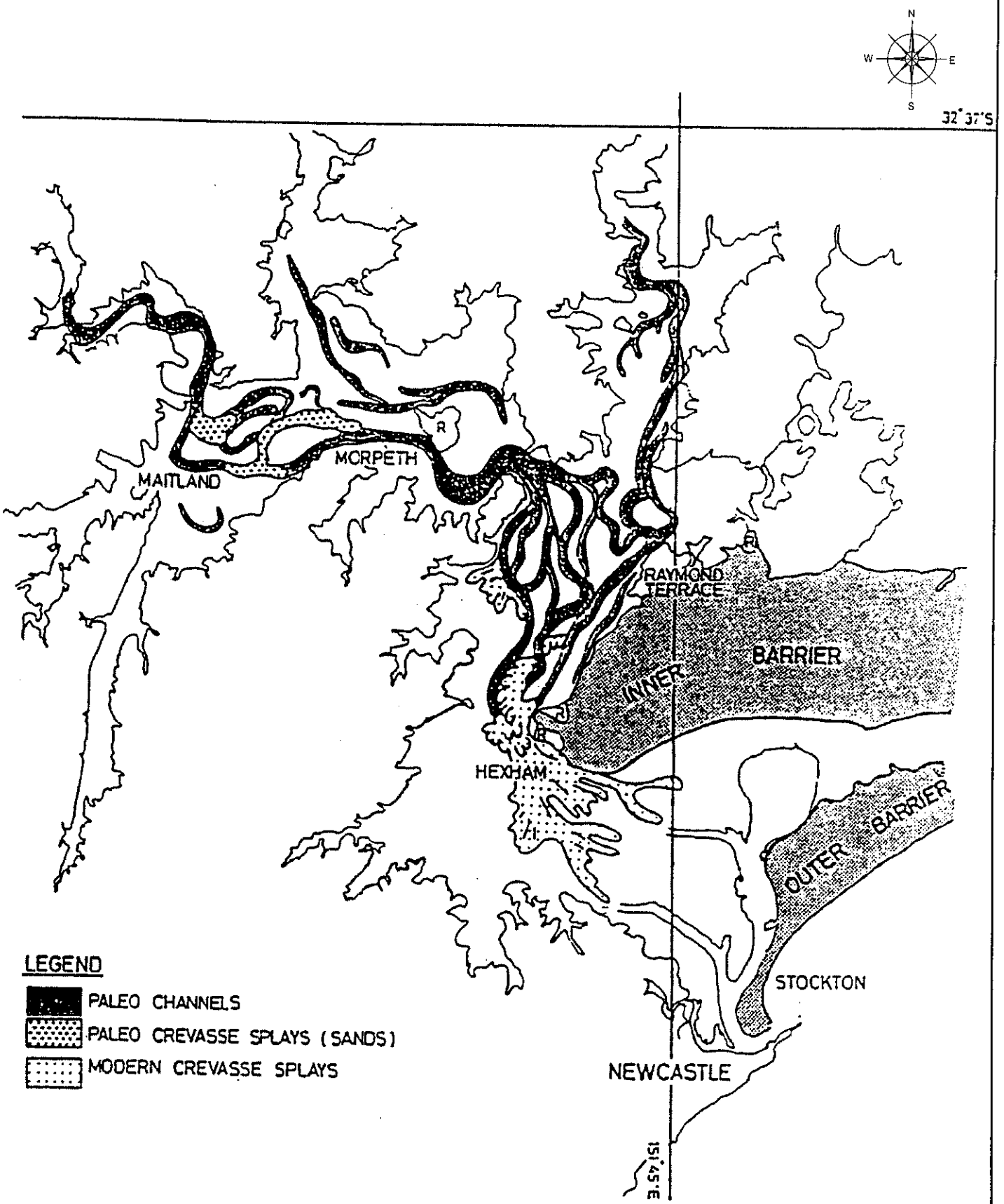


FIGURE 2.3
Paleo Channels in the Hunter Estuary

A4 Not to Scale	Ref No.:R01_V1/1645_007.dgn

Umwelt (Australia) Pty Limited
Source: Roy, Hudson & Boyd Report 1996

2.1.3 Stability and Rates of Change – Challenges to Flexible Resource Utilisation in the Holocene

The late Pleistocene and Holocene geomorphic information that is available from the Hunter estuary demonstrates major changes to the landscape that provided a home for Aboriginal people over the period from 20000 years ago to the time of European contact. Two periods of major change can be identified, including:

* 18000 BP to 10000 BP when sea level was rising rapidly and marine sands and temporary coastal barriers were rapidly translating landward. Towards the end of this period, it is likely that the area now occupied by Hexham Swamp was an open bay, largely dominated by marine processes and tidal delta deposition.

* The last 2000 years or so, when fluvial deposition of floodplain sediments dominated the estuary. The stratigraphy suggests deposition of as much as 7 metres of alluvium on the floodplain adjacent to the upper part of the estuary during this period, with overbank alluvium being deposited as far downstream as Hexham. It is assumed that deposition of flood deposits in Hexham Swamp also accelerated during this time, when compared to the preceding 4000 years.

The early part of the stillstand appears to been a period of more gradual change with deposition of muds in the estuarine basin, and the commencement of fluvial deltaic deposits in the upper estuary. Alluvial deposits originating from the catchment of Ironbark Creek, Bluegum Creek and Flaggy Creek / Wentworth Creek would have commenced deposition on the western margin of Hexham Swamp during this period. It is not clear why deposition would have accelerated after about 2000 BP, although it is probably related to climatically controlled changes in hydrology (see Nanson and Erskine 1988). Rapid changes in channel plan form and cross section have continued into recent times (Nittim 1966).

Roy and Boyd note that like many estuarine channels, the lowland channels of the Hunter are oversized (i.e. have larger cross sectional area than discharge would predict). They conclude that this is related to the nature of estuarine sediments and channel forming processes, rather than a relic of major erosional processes in prehistoric times. It is interesting to note however, that the second major phase of dune instability along Newcastle Bight appears to have been initiated about 2300 years ago, so a role for a small but destabilising climatic change remains a possibility.

2.1.4 Aboriginal Resource Evaluation

One of the predicted attractions of Hexham Swamp and adjacent low gradient ridgelines for Aboriginal people is resource diversity and richness over a long period. Key resource attributes are availability of fresh water, vegetation communities and fauna habitat, whilst outcrop of rock types suitable for flaking, or surfaces suitable for grinding/engraving would also have been valuable. Given the alluvial landscape of the lower Hunter Valley, rare outcrops of sandstone suitable for grinding (e.g. to resharpen edge ground axes) may have been highly valued.

Little scientific information is available about the vegetation of Hexham Swamp in pre European times, although substantial changes during the twentieth century, after the construction of floodgates on Ironbark Creek, are well documented. This means that it is difficult to reconstruct the pattern of vegetation communities and habitats that would have formed the landscape for Aboriginal people 2000 or 6000 years ago.

Winning (1996) notes that large parts of the swamp were covered by fresh water swamp forest in the early nineteenth century. Most of this had disappeared by the early years of the twentieth century, due to clearing for grazing. Changes to hydrology were also associated

with the construction of the main Northern railway line in 1857, the Richmond Vale-Pelaw Main railway in the late nineteenth century and the main water pipeline in the 1930s and 40s. Winning also notes that areas of freshwater reed/sedge land and intertidal wetland that were observed to be present in 1850 were essentially unchanged in 1954 and 1966.

Vernon (2001) provides a general description of twentieth century environments, noting grazing of predominantly freshwater wetlands in the south and west of the swamp. Estuarine vegetation communities were restricted to areas along Ironbark Creek and its tributaries. After the dredging of the North Arm of Hunter River and the creation of Kooragang Island (in its current form) in the 1950s and 1960s, tidal intrusion extended further into the swamp and threatened highly valued freshwater wetland pasture. The floodgates on Ironbark Creek were constructed in 1970, partly to protect these pastures.

Of the fourteen coastal wetland types described by Goodrick (1970) eleven were present in Hexham Swamp prior to the construction of the floodgates, with nine of these being freshwater communities.

Despite the emphasis on freshwater habitats in historical times, it is clear from the geomorphic history that the vegetation and habitats in the swamp area have not been static during the Holocene. The analysis presented by Walker (1998), and Roy and Boyd (1996) suggests extended periods of open estuarine bay/lake from 6000 years ago to perhaps the last 2000 years, with gradual encroachment of fresh water wetland habitats along the tributaries to the western part of the swamp (see **Figure 2.4**). The change to freshwater habitats appears to have accelerated within the last 2000 years. However, even as late as 1966, before the construction of the floodgates, Hexham Swamp contained roughly equivalent areas of freshwater wetland, brackish meadow and saltmarsh, with smaller areas of mangrove, confined largely to the channel of Ironbark Creek.

Common species in the freshwater wetlands of Hexham Swamp include common reed (*Phragmites australis*), bulrush (*Typha orientalis*), *Schoenoplectus littoralis, Bolboschoenus Caldwellii, Fimbristylis ferruginea, Triglochlin procerum* (water ribbons), water primrose (*Ludwigia peploides), Isolepis prolifera, Melaleuca quinquinervia, Myriophyllum aquaticum*. Riparian rainforest species occur around the swamp margins, including rusty fig, (*Ficus rubiginosa),* red ash *(Alphitonia excelsa),* grey myrtle *(Backhousia mytifolia)* and Boobialla *(Myoporum acuminatum*). Several of these, and numerous other wetland species that-are not obvious to the casual observer, are recorded ethnographically to have been used by Aboriginal people. An indication of the range of Aboriginal food or medicine species that may have been available from the freshwater swamp and swamp margin habitats is provided in **Table 2.2.**

Table 2.2 - Aboriginal economic plants that may have been available in and around Hexham Swamp
(Adapted from Flora List , WBM 1997: Appendix A)

Note that many of these plants occupy terrestrial habitats around the wetland margin, and would not have occurred within the wetland itself. Wetland plants are highlighted in bold.

Common and *Scientific* Name	**Use**	**Reference**
Bracken Fern ***Pteridium esculentum***	Underground fibrous stem roasted and beaten with a stone to remove starch	Zola and Gott 1992: 37
Bulbine Lily ***Bulbine bulbosa***	Tuber eaten raw or roasted	Low 1989: 115-116
Bulrush ***Typha sp.***	New shoots, flowering head and bulb eaten, fibre from bulb used for string	Low 1989: 109; Zola & Gott 1992:8
Bungwall ***Blechnum indicum***	Rhizome roasted, scraped and then cut up finely	Low 1989: 109-110

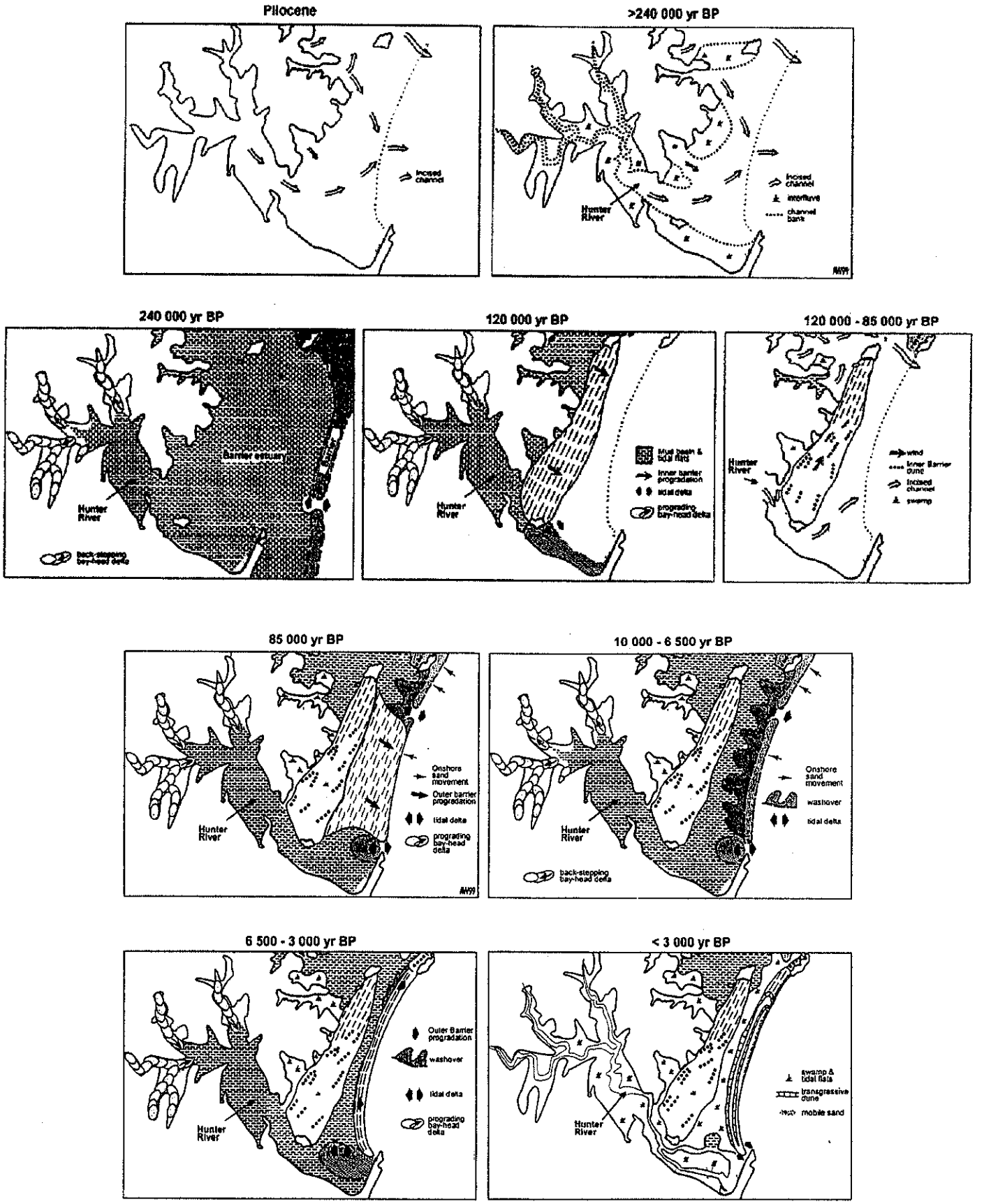


FIGURE 2.4
Model of Geomorphic Evolution of Hunter Estuary and Coastline

Umwelt (Australia) Pty Limited
Source: Andrew Walker MSc Thesis, Newcastle Uni (1999)

A4 Not to Scale | Ref No.:R01_V1/1645_008.dgn

Table 2.2 - Aboriginal economic plants that may have been available in and around Hexham Swamp (cont)

Common and *Scientific* Name	**Use**	**Reference**
Cabbage Palm *Livistona australis*	Inner palm shoots eaten	Low 1989:22, 130
Common Appleberry Vine *Billardiera scandens*	Berries eaten	Low 1989: 40
Common Reed *Phragmites australis*	Roots eaten, sections of reed strung into necklaces, stems used for spear shafts	Zola & Gott 1992: 12, 61
Corkwood *Duboisia myoporoides*	Reported from southern Queensland to have been used as a narcotic. "The aborigines make holes in the trunk and put some fluid in them, which, when drunk, produces stupor".	Low 1989: 192
Devils Vine *Cassytha galabella*	Fruits eaten	Low 1989: 44
Dianella *Dianella sp.*	Leaves split and used for weaving	Low 1989:8
Fringe Lily *Thysanotus tuberosus*	Small sugary tubers eaten	Low 1989: 112-113
Geebung *Persoonia sp.*	Fruit eaten	Zola Gott 1992: 35
Grass Tree *Xanthorrhoea sp.*	Base of leaves and pith inside eaten, resin used for hafting stone tools, flowering stems used for spear shafts	Low 1989: 130; Zola & Gott 1992:58-59
Headache Vine *Clematis glycinoides*	Crushed leaves inhaled for headache	Low 1990: 226
Kangaroo Grass *Themeda sp.*	Seeds ground for flour, leaves and stem used for fibre.	Greenway 1910:16 Zola & Gott 1992:58 pers. obs. 2001
Kurrajong *Brachychiton populneus*	Yellow seeds roasted and ground to make flour, underbark used to make string for nets and bindings. Tap root of young trees roasted and eaten.	Low 1989:87, 92, 187
Lily Pilly *Acmena smithii*	Berries eaten	Zola & Gott 1992: 34
Matt Rush *Lomandra sp.*	Long pliable leaves used for weaving baskets, leaf bases and flowers edible	Low 1989: 131, 174; Zola & Gott 1992:59
Macrozamia *Macrozamia sp.*	Seeds, cracked then soaked to remove toxins, then ground and baked	Low 1989: 84
Mangrove *Avicennia marina*	Seed pods eaten after pounding, soaking, winnowing and baking. Mangrove worm eaten as a delicacy	Low 1989:83
Milkmaids *Burchardia umbellata*	Starchy roots roasted and eaten	Zola & Gott 1992: 43
Mistletoe *Amyema sp.*	Berries eaten	Low 1989:14; Zola & Gott 1992:54
Mountain Devil *Lambertia formosa*	Nectar sucked from flowers	Low 1989: 170
Native Cherry *Exocarpus cupressiformis*	Enlarged succulent stalklet (pedicel) eaten	Low 1989: 46
Native Flax *Linum marginale*	Oily seeds eaten, stems spun to make string for fishing nets and line	Low 1989: 93
Native Geranium *Geranium sp.*	In some species root eaten in others with a high tannin content the roots were used to treat diarrhoea	Zola & Gott 1992:47, 56
Native Grape *Cissus hypoglauca*	Fruit eaten	Low 1989: 60

Table 2.2 - Aboriginal economic plants that may have been available in and around Hexham Swamp (cont)

Common and *Scientific* Name	**Use**	**Reference**
Native Long Yam *Dioscorea transversa*	Yam roasted and eaten	Low 1989: 105
Nodding Greenhood *Pterostylis nutans*	Starchy tubers eaten	Zola & Gott 1992: 46
Pale Ballart *Exocarpus strictus*	Enlarged succulent stalklet (pedicel) eaten	Low 1989: 50
Peach Heath *Lissanthe strigosa*	Fruits eaten	Low 1989: 42
Pink Fingers Orchid *Caladenia carnea*	Pea-sized white tubers eaten	Low 1989: 121
Pink Swamp Lily *Murdannia graminea*	Small tubers eaten	Low 1989: 118
Rats Tail Grass *Sporobulus creber*	Stems used for weaving, Aboriginal women from the Kimberley visiting Mindaribba LALC made baskets from this grass May 2001	Cribb and Cribb 1986 pers. obs. 2001
Red Ash *Alphitonia excelsa*	Head was bathed with crushed leaves for headache, crushed leaves were used to make cleansing lather (due to saponin content), crushed leaves can be put in water as fish poison	Low 1990: 185
Rushes and Sedges *Juncus, Carex & Cyperus sp.*	Under ground stem or tuber can be eaten in some species, leaves used for weaving	Low 1989:105; Zola & Gott 1992:60
Rusty Fig *Ficus rubiginosa*	Fruit eaten	Low 1989:67
Sandpaper Fig *Ficus coronata*	Fruit eaten	Low 1989: 22
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
Water Ribbon *Triglochin procera*	Bullet-shaped tubers roasted and eaten	Zola &-Gott 1992: 12
Wombat Berry Vine *Eustrephus latifolius*	Small sugary tubers eaten	Low 1989: 17
Wonga Vine *Pandorea pandorana*	Canes used for spears	Cunningham et al 1992:602

The wetlands would also have provided abundant fauna resources for Aboriginal people, including estuarine fish species, prawns, diverse water birds and waders and a variety of lizards. As with the vegetation communities and fresh water supplies, a different assemblage of fauna would be expected within the valleys of tributary drainage lines to that in the open wetlands of the main body of the swamp. The tributary drainage lines and their associated catchments would also have provided habitat for a variety of mammals, including possum, wallaroo, kangaroo, swamp wallaby, swamp rat, sugar glider, squirrel glider and bandicoot, in addition to wetland and aquatic species.

The vegetation community mapping that is available tends to confirm the view that the tributary creeks in the southwestern part of the swamp would have provided fresh water supplies and fresh water habitats for longer than any other part of the swamp, and would therefore have had a higher resource value for Aboriginal people up until the later part of the Holocene. Over the last 2000 years or so, with well established riparian communities

extending into the western swamp margin, the highest resource values may well have been associated with the interface of the freshwater tributary swamps, riparian communities and the freshwater/brackish wetland communities of the open parts of Hexham Swamp.

3.0 CULTURAL CONTEXT

3.1 ETHNOGRAPHY

The historical information regarding Aboriginal occupation of the Hexham Swamp region provides only a general insight into Aboriginal culture prior to the arrival of Europeans. It does highlight, however, the diversity of activities and material culture of Aboriginal people, and the extent of the cumulative impacts of both natural decay and post discard disturbance on the archaeological evidence of past activities.

Brayshaw (1986) provides a summary of historical references to the environment and activities of Aboriginal people in the lower Hunter Valley area generally, during the early years of the nineteenth century. These references include a number of descriptions of the Hunter estuary. Examples are noted below. One of the standout features of the ethnographic descriptions is the focus on implements that were made of plant materials. These ranged from shelters, to water containers, baskets and nets, fish traps, clubs, spear shafts and barbs, shields and other weapons. None of these materials would survive more than a short period in open campsites.

It is difficult to determine how representative the early European descriptions of Aboriginal economic activity are of the actual lifestyle and technology. There must have been a tendency to describe larger and more robust implements that would have been visible from a distance, or were left behind temporarily at some sites. Notwithstanding this, there is very limited reference to tools made of flaked stone in the lower Hunter Valley. In contrast, the archaeological record is dominated by flaked stone tools. The information provided below about economic technology used by Aboriginal people in the Hunter estuary serves to reinforce the view that the evidence retrieved from excavation of open campsites represents only a fraction of the actual physical culture. It also reinforces how important an understanding of the context of archaeological sites is to their interpretation.

3.1.1 Nineteenth Century References to Aboriginal Tool Kits in the Lower Hunter Valley

Hexham Swamp was known as Burraghihnbihng to the local Aboriginal people (Dangar 1826 in Hartley 1995:87). Hartley (1986:47) has provided a possible reconstruction of this environment before it was cleared and altered by European farming and other industries.

> (H)uge melaleucas (paperbark species) surrounded the shallow margins interspersed with reeds; casuarinas (she-oaks) abounded on the verges, intermingled with dense undergrowth and many species of eucalypts. On the southern extremity magnificent stands of Eucalyptus Maculata (spotted gum) were found on the rises, and rainforest species hugged the banks of the water courses meandering down to the big swamps. Snakes, eels and predatory animals found the area a useful habitat. Bird life was abundant with black swans, ibis, egrets, water fowl and ducks in great profusion, together with other types of water birds. Different varieties of parrots and honeyeaters came to enjoy the flowering and fruiting trees. Nearby Ironbark Creek, a tidal stream known to the Aboriginals as Toohrnbng, was a bountiful source of food for these people, providing fish and small crustaceans. The Knob, a remnant rainforest protuberance from an earlier geological age, stood sentinel over the swamps.

Grant (1801) observed "traces" of the presence of young and old Aboriginal people, including canoes which he described as "small and rudely put together".

Grant (1803) observed the fires of Aboriginal people and many individuals opposite Ash Island and on the banks of a creek. In the same area, Grant observed part of a net, the remains of fires and a weir in the creek. He also described a campsite that Aboriginal people

had left just before he arrived, and noted a scatter of shell fish (muscle (sic)) covering the ground.

Also in 1803, Grant observed several Aboriginal people in canoes downstream of Maitland (i.e. in the upper reaches of the estuary). He noted that there were fires in many canoes and also a food that the people called "cabra".

Barallier (1801) (lower Hunter Valley) saw many canoes and assumed from this that there were great numbers of Aboriginal people in the area.

Barallier (1802) noted a young Aboriginal person near Newcastle, looking for fern roots.

In 1826, Bundock described Aboriginal people in their canoes on the floodplain after a night of heavy rain that left the floodplain covered with water. The canoes were described as being made of bark, with their ends tied with "curridgeon bark" (Kurrajong?) and sealed with grass tree gum.

There are several different descriptions of canoes from the lower Hunter Valley and Lake Macquarie, all within traditional Awabakal territory. Threlkeld (reported in Gunson 1974) describes large canoes on Lake Macquarie made of a single piece of eucalyptus bark (he considered these large enough to hold 6 to 8 people). The canoes were propelled with short paddles (especially in deeper water), one in each hand. The bark for canoes was softened and shaped by fire and the ends were tied with vines. There was a stay across both ends and a vine cord across the centre to maintain shape. A clay hearth was present in the centre. These canoes could also be anchored using cord from vines and a heavy stone. In contrast, Barallier observed Aboriginal people on the Hunter estuary propelling canoes with a long pole.

Tea tree bark was used to make water holders. Wooden bowls were used for carrying water, and were sometimes carried from place to place. Other observers note that the wooden bowls were left at regularly visited campsites.

Barallier and Threlkeld also report the use of thread made from the bark of cabbage trees to repair canoes, and cord made from Kurrajong bark to ties up the ends of canoes, make fishing lines, nets and as binding for spear shafts. This is interesting, as Kurrajong (or at least the species now identified as Kurrajong) is not common in the vegetation communities of the lower Hunter Valley.

Several early commentators from the lower Hunter Valley describe netted baskets that were worn by women around their foreheads and hanging down their backs. These baskets were quite large and were used to carry fish hooks, prepared bark for string, gum for gluing spears and items of food.

There are widespread descriptions of spears used by Aboriginal people in the lower Hunter Valley, and Threlkeld notes that in the winter, men travelled from the coast to the mountains to exchange spears for cord made of possum fur. This is a curious observation as both the materials to make spears and possums would have been widely available throughout the region, and certainly not confined to either the coast or the mountainous hinterland. Perhaps these visits had a purpose other than trade. For instance, Threlkeld also notes that Aboriginal men from the Lake Macquarie mission went to the mountains to attend rituals, including a kangaroo hunt, for which preparation was made by burning off a large part of the country.

A detailed description of fishing spears is provided by Threlkeld. He notes that the shaft was made from the stem of a grasstree, to which were added four short pieces of hardwood. These were fastened with a thread (bark) covered with grass tree gum. The total length of the spear was up to nine feet (2.7 metres). At each of the joins of the hardwood pieces, small

wooden barbs were added. These were fire hardened and were also fastened with grass tree gum. To each wooden barb was added a sharp barb of bone. Hunting spears were even longer and were armoured with pieces of sharp quartz "so as to resemble the teeth of a saw".

A number of detailed descriptions of fishing in and around the Hunter estuary have been recorded. Shell hooks (described as being made of oyster shell) were is use in the Hunter at European contact, with most reports referring to women fishing from canoes with hook and line. Men used spears for fishing. Both small nets and woven weirs were also used. For example, Threlkeld describes:

> 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 water.

All of these fishing techniques could have been practised at times in and around Hexham Swamp. The study area would also have provided appropriate materials for the manufacture of string, wooden and bark water carriers and potentially canoes, as well as a range of other wooden economic and non economic implements (see **Section 2.1.4**).

Two illustrations from the early years of the nineteenth century show Aboriginal people on the banks of the Hunter estuary (**Plates 3.1** and **3.2**). In both cases, the scene appears to be near the mouth of the Hunter River, and cannot be considered to depict the specific activities of the people of the Big Swamps at the western margin of the estuary. Although clearly somewhat stylised, these illustrations do show some interesting features. Small groups are shown using shelters made of melaleuca bark. One group has a dog that appears to be domesticated. Men are shown fishing from the rocky shoreline with spears, whilst a woman is seen collecting plant material and bringing it to shore near a canoe. Another person is visible swimming just offshore (they may have been diving for shellfish?). In one illustration, a group, including men, women and children is seen on the shoreline, and another group is seen high above, in a lookout position.

3.1.2 The People of Hexham Swamp

Historical documents indicate that the Pambalong (also referred to as Bambalong) Tribe occupied the Hexham Swamp area (Gunson 1974:30). Uncertainty exists regarding Aboriginal groupings in this region. It is unclear whether the Pambalong were a sub-group of the Awabakal Tribe, or a group in their own right. Gunson (1974:30) argues that the Awabakal were the largest clan of a tribe in the Lake Macquarie region but because of Threlkeld's (an early missionary) well-known studies in the area, Awabakal became the name which represented the entire tribe. Early government documents indicate this large tribe was composed of a number of clans - the Awabakal (Lake Macquarie and Newcastle region), the Five Islands clan, the Ash Island clan, the Kurungbong clan (Cooranbong), and the Pambalong clan (Swamps district and near Newcastle). Tindale (1974) shows the Awabakal as one independent group in *Aboriginal Tribes of Australia*. **Figure 3.1** illustrates these boundaries and indicates that while the information is unclear, the broad geographical and cultural boundaries are consistent between sources.

According to Hartley (1991:5), the territory of the Pambalong 'extended from the south bank of the Hunter River, west to Tarro and the foothills of the Sugarloaf Range and south to Lake Macquarie. It is likely that the Newcastle district was also included in their tribal territory'. Only limited information can be gleaned from historical documents regarding these people, accounts being affected by the biases and fears of early European settlers.

The *Wallsend and Plattsburg Sun* provides anecdotal descriptions and historical information in a series entitled 'The Aborigines of the Big Swamp' which ran over December and January 1890-1891. By this time, the lives of local Aboriginal people had changed

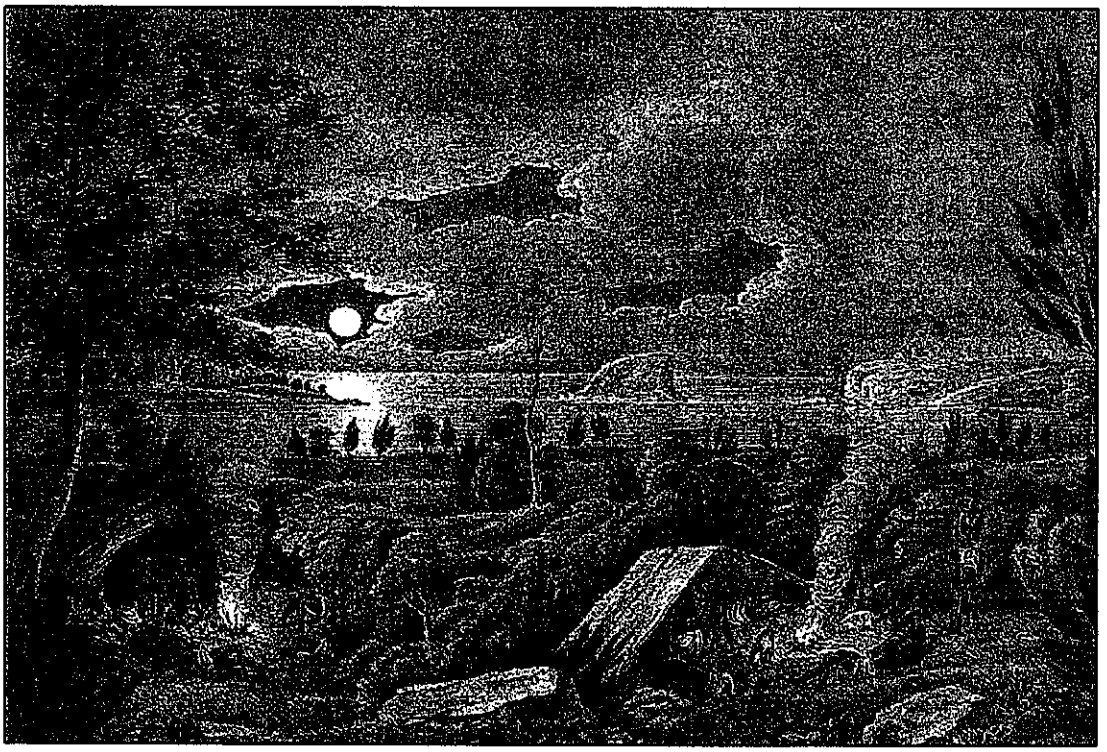


PLATE 3.1
Aboriginal People at the
Hunter Estuary

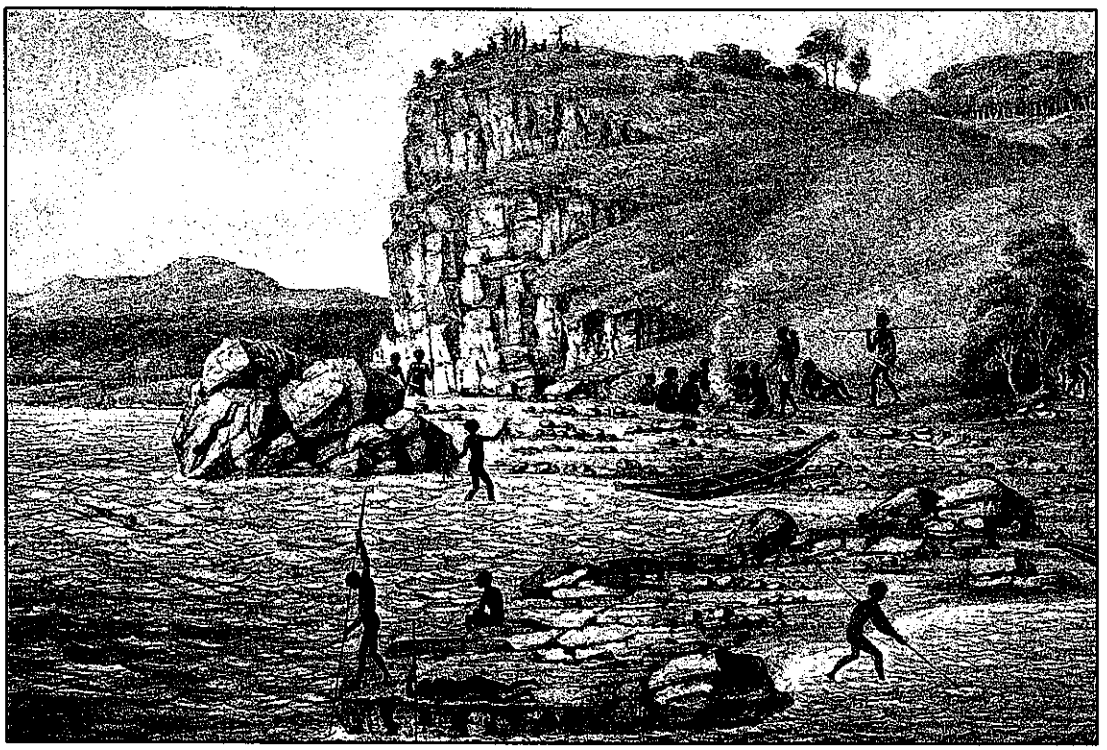
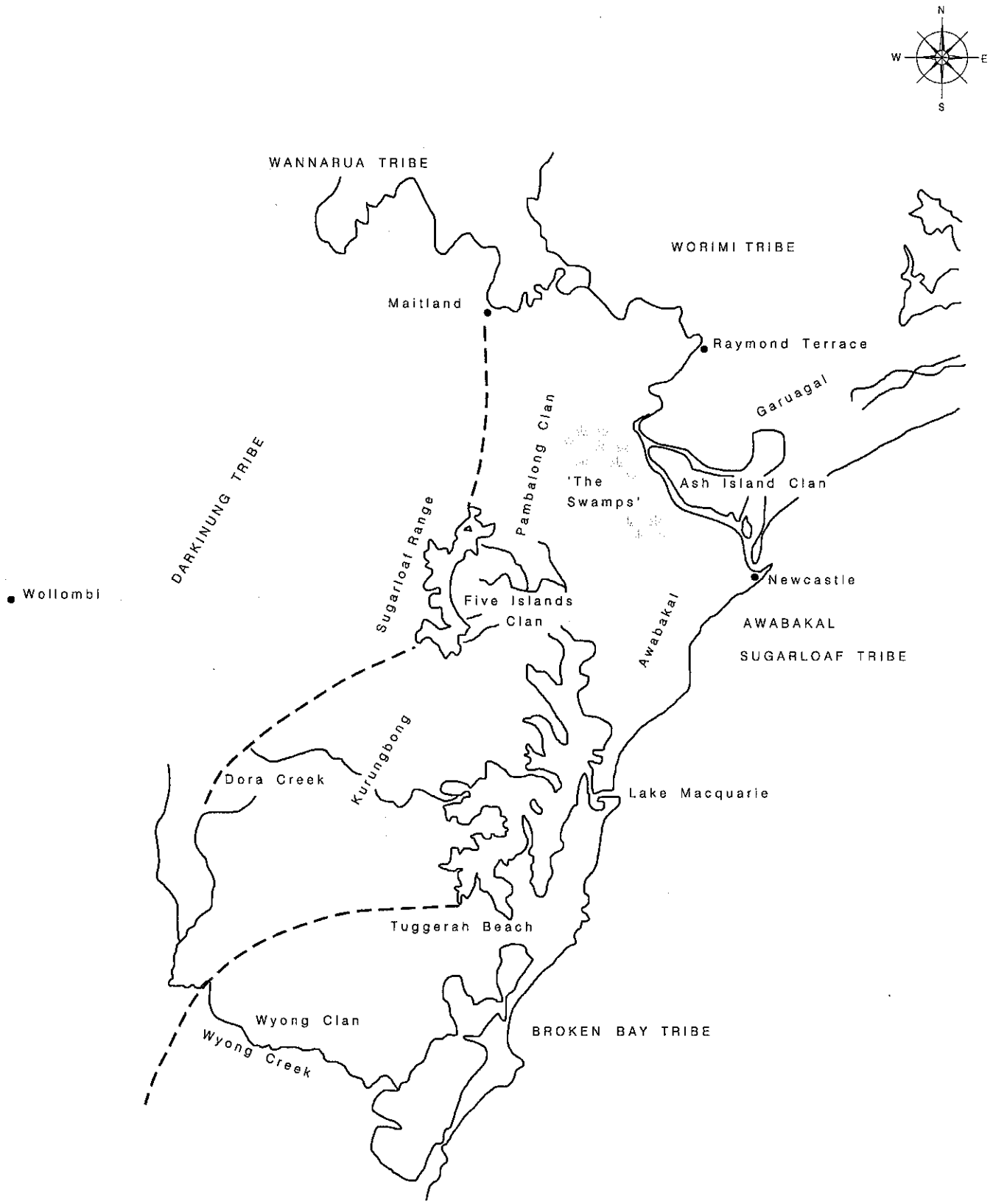


PLATE 3.2
Aboriginal People at the
Hunter Estuary

Umwelt (Australia) Pty Limited
Ref No.:RO1_V1/1645_011.dgn
Source: Turner & Blyton 1995:18, Courtesy of National Library of Australia



Legend

Tribal Boundary

FIGURE 3.1
Aboriginal Clan Boundaries

Umwelt (Australia) Pty Limited
Source: Gunson (1974)

A4 Not to Scale

Ref No.:R01_V1/1645_009.dgn

irrevocably. The quotes provided below are rarely sourced to individuals and the accuracy of the observations must be questioned. It is clear, however, that there was considerable interaction between Aboriginal people and the new settlers, and that important Aboriginal sites were abandoned very quickly.

> Does it ever occur to the toiler underground, as he plods to his bord, that the surface he travels was once the hunting field of the (Aboriginal) man?....Does it ever strike the tiller of the soil in and around Hexham that his plough-share pierces the ground in which rest the remains of the original inhabitants of the country? Can the residents of Minmi and the "Doghole" be made to believe that the latter place was the sacred spot where marriages were celebrated with mysterious tribal pomp? *(13 December 1890:3).*

The series goes on to discuss the population and movement of people:

> It is estimated that 4000 (Aboriginal people) dwelt happily between Tarro and Newcastle in the Big Swamp country, and well-defined laws regulated.
>
> (But) all tribal movements were made with the knowledge of neighbouring tribes, and in this matter the laws were very definite and religiously followed. The line of march was generally in a semi-circle by the Big Swamp (Aboriginal people). This plan when examined was stragetical (sic) as well as necessary. For instance, we'll suppose that a body of (Aboriginal people) in the Old House paddock (a favourite camp) were about to strike camp, they would signal to the Tarro tribe by means of fire and smoke of their intention to move. The signal would be well understood, the Big Swamp (now called Hexham) lying between the parties. The camps move the next day - one to the right, the other to the left - and when the day's march is over it will be found that the tribes stand no nearer to one another that before the camp was struck! This movement in opposite directions is essentially necessary, for if one tribe followed another the last must starve. This arrangement also allows the animal inhabitants of the hills and trees to recuperate *(17 December 1890:2).*

The division of labour:

> Of course, among the Big Swamp (Aboriginal people), like in other parts, the women did most of the work. Women had to provide wood and water for the camp, also the vegetable, fruit, and root dessert. It was the duty of the man, however, to kill the game in former times, but in latter times the unfortunate women had to do even that *(17 December 1890:2).*
>
> It is one of the laws that no man shall eat food prepared by hands of women. It is for the man to judge what is good and what is not good *(24 December 1890:3).*

The food supply:

> The principal animal food of the Aboriginal was the 'possum, wallaby, and kangaroo rat. The kangaroo, emu, and the hundred and one other animals that ranged the hills and scrub were also acceptable, but the 'possum was really the animal that he relied most upon.
>
> There are no stews made, so everything is grilled or roasted. By some tribes in Australia a kind of oven was made to bake meats, but the (Aboriginal people) of the Lower Hunter and the Big Swamp knew little of the baker's art. The 'possum (sic) was generally thrown on the fire just as killed. Sometimes the skin was desired for winter covering, or the hair for the purpose of spinning into twine, in which case the animal was skinned with a sharp shell, but otherwise the carcase was put on whole *(24 December 1890:3).*
>
> One particular reed (we forget the name this moment) was ground into a kind of flour by the women and so were certain roots. The grinding was done between flat stones.

> The roots of the fern were crushed. We have no knowledge if a cake was baked of the native flour; we are inclined to think it was eaten in a raw state. Whatever appeared after animal food was in the shape of a dessert. When the 'possum or rat was sufficiently roasted, the carcase was taken off by the man. With the aid of a shell the cook would open the belly and take out the inside in a solid ball as clean as the proverbial whistle. Sometimes the inside was eaten, but as a rule it was given to the dogs. The man then dined off the meat, throwing the parts he did not relish to the women, who, in turn tossed it on to the children, and then the bones went to the dogs *(3 January 1891:3).*

The introduction of European materials and changing hunting methods:

> (S)nares and traps were set at the foot of a tree in which a family of possums live, and generally one or two were caught in this manner. About sundown the "possum from his hole to drink and browse upon the tender herbage on the ground, and it is while descending that he invariably gets entangled in the snares made of fibre, the sinew of kangaroo, or spun hair. By setting dozens of these snares a breakfast was generally obtained. But the art of snaring was gradually lost to the natives by the introduction of the tomahawk. With it the (Aboriginal people) could obtain a good living on any of the rivers or creeks. All he had to do was to examine a tree - the bark of the gum tree shows the scratches from a 'possum's claws quite plainly - then cut steps in the soft bark about two feet apart upon the leaning side, and when in the fork of the trunk the rest was easy. The vicinity of the 'possum is soon discovered, and the animal cut out of his nest in less time than it takes to write *(24 December 1890:3).*

Laws and customs:

> The (marriage) ceremony of the Big Swamp (Aboriginal people) was rather of a solemn character: it was equal to that of man-making.....The courtship was conducted on the most approved style, and until the advent of the white man young women were rarely known to "go wrong".
>
> .....If he is desirous of obtaining a wife, he makes his wants known. The news soon goes about, and if (he) has not already fixed his eyes on a dark maiden he is soon introduced to several. He consults the parents on the matter. The daughter has really no voice in the matter. The young man, before he takes a wife, has to prove himself a man - to show he can keep a wife. In the first place he is compelled to live on the outskirts of the camp for a week, fortnight, or three weeks, and during that time he must bring home to his intended an abundant supply of game won by his own spear or boomerang. Should he fail in this test, the marriage ceremony is postponed for a few moons, or perhaps knocked in the head altogether. If he accomplishes the task set him successfully (and any fairly skilful hunter can accomplish it), he is next examined in tribal law and things in general, while old women prepare him for the marriage state. Having proved to the whole tribe that he is able to maintain a wife, he has really won a wife, but before he lives with his wife he has to go through certain mysterious ceremonies which finally end with him coming back with a front tooth knocked out. These ceremonies of man-making and marriage were generally performed at the Doghole (Bora). The Doghole is situate (sic) a couple of miles from Minmi and is the head of the Big (Hexham) Swamp. None but the initiated were allowed to visit the place..... *(3 January 1891:3).*

According to Hartley (1991:5 and 1995:88), the name 'Doghole' is probably a corruption of the original Aboriginal name. Its location is on a hill between Minmi and Black Hill, west of the modern Lenaghans Drive. The area is now known as Stockrington and contains rockshelters and small caves which were utilised by Aboriginal people.

On 23 April 1924, the *Newcastle Sun* ran a story entitled 'Fifty Years Progress. Memorable Days in Wallsend's History'. References to local Aboriginal people were made:

> The late Mrs Styles was going to get the cows, when she noted a spear from behind a tree. She called to the black who was aiming it, and as she knew him by name (Jacky) she called to him to come and get some flour and other eatables. He followed her, and on arrival at the homestead she got a sword that was in the house, and gave Jacky a taste of it. He didn't trouble them again.

The above incident occurred at Styles Grove, Minmi (now the site of the Bishop Tyrrell College). Additionally:

> The late Mr Kemp, of Maryland (Wallsend), also mentioned that he remembered the last of the Aboriginals about the vicinity of Maryland, Glendor and Stles' (sic) Grove. He also mentioned that there was an Aboriginal burying ground in the vicinity, but the signs of it have long since passed away. (Newcastle Sun, *23 April 1924)*

By the 1850s, the Big Swamp had been largely cleared for stock grazing. Hartley (1995:88) claims that early European settlers often uncovered stone artefacts, middens, and burials in the area. Accounts of the discovery of stone artefacts include that of a stone axe on a farm near Tarro which was handed to the anthropologist W.J. Enright. 'It weighed 7lbs and had an average length of 10 inches, 8 inches in width and was 3 inches thick. The axe was vastly different from others found in the Hunter Valley and seemed to be of fine-grained quartzite, quite foreign to the Tarro district' (*Mankind* 1932 in Hartley 1995:88). A flint axe head was also found on Birmingham Gardens subdivision, Wallsend (*Newcastle Sun* 23 April 1924).

The effect of European settlement was devastating to the Pambalong people. Their land was taken and the animal and plant resources in the area diminished. This brought misunderstanding and conflict and the majority of the group died through either conflict with Europeans or disease. On 21 June 1854, the *Maitland Mercury* reported that Harry Brown, "the last of the Newcastle Tribe", had died (Turner & Blyton 1995:43). Turner and Blyton (1995:44) speculate if Brown was the last of the Pambalong people that he 'was the last survivor of a group that had been flourishing when first settlement of the area began fifty years earlier'.

It is of note that most of the descriptions from the Wallsend Sun focus on terrestrial resources, and not the fish, eels and other marine resources that may have been available from parts of Hexham Swamp. This may reflect the nature of the swamp at the time of European settlement, when the western part appears to have been predominantly freshwater marshland, with little standing open water. The fishery resources may at that time have been restricted to the main estuary and its tributary creeks (for instance Ironbark Creek, but not Wentworth Creek or Minmi Creek). Similarly, if there was restricted open water access, canoe travel to the main estuary may not have been easily achieved, and travel times to the mouth of the estuary and coastline, where large reserves of flaking stone were procurable, may therefore have been longer than in earlier times. These conditions are not representative of the full Aboriginal history of Hexham Swamp.

It is also of note that the stories in local newspapers refer to the grinding of reeds and roots to make flour. These are likely to have been freshwater swamp resources. A number of grindstones were retrieved during excavations at Blue Gum Vista, Minmi, on the south western edge of the swamp. Residue analysis of the surface of one of these indicates that it had been extensively used for wet grinding of seeds. Residues and use-wear on other artefacts recovered during this project indicate the scraping and piercing of skins and the processing of wetland plants endemic to the Hunter region.

3.1.3 Sites of Cultural Importance

Sites of cultural importance include locations recorded as ceremonial grounds in historical sources, references to burial practices and locations, and landscape features that have been recorded as having spiritual significance to Aboriginal people.

Not surprisingly, ceremonial sites are rare in terms of the proportion of total known sites in the lower Hunter Valley. Threlkeld (in Gunson 1974) describes how some places (which would have been well known to Aboriginal people) were temporarily marked (with markings on the bark of trees) for ceremonial activities by initiated males. Threlkeld also describes a number of stone cairns (up to two metres high and a few hundred metres apart), that Awabakal Aboriginal people told him were brought there by eagles.

There are a number of references to a large ceremonial ground at Wallsend - a 'great corroboree centre' in the vicinity of Nelson and John Streets, Wallsend, and a sacred area near Minmi (probably in the Stockrington area) where marriages were held.

The importance of 'The Knob' (on the south western margin of Hexham Swamp) and its surrounds have been alluded to in a number of historic accounts and more recent studies. Hartley (1986:47) states that the area was 'of great spiritual significance' to the local Aboriginal people. She also claims that 'part of the higher ground was used as a burial site'. This use is not consistent with other descriptions of burials in the lower Hunter Valley.

Brayshaw (1986) notes that in the lower Hunter Valley, the deceased were wrapped in melaleuca bark, and were buried (sometimes covered by a mound of soil), with a range of their possessions. Threlkeld's observations were that coastal Aboriginal people in the early nineteenth century left little indication on the surface (at least that was visible to European observers) that a person had been buried, although this may have been a response to the presence of Europeans.

There are also historical references to Mount Sugarloaf as "the favoured haunt of a supernatural being – a demon called Puttikan", and the presence of a deep (bottomless) water hole between Mount Sugarloaf and Lake Macquarie which was considered to be the home of a monster fish that also lived in the swamps.

Gunson also reports that Nobbys Head was said to be the residence of a giant kangaroo that shook itself occasionally, dislodging stones.

3.1.4 Implications of Ethnographic Information for Types of Archaeological Evidence

The ethnographic information that is available for the lower Hunter Valley describes a wide range of activities and material culture practised by Aboriginal people. Whilst it is clear that much of the material culture could not have left archaeological evidence that is preserved in an open campsite context, it is also clear that a wide range of physical (and moderately robust) evidence of occupation would have been left in the landscape by Aboriginal people. Types of archaeological sites that could be expected in the Hexham Swamp region are noted in **Table 3.1**. It is important to note that none of these site types are likely to occur within the wetland itself. Rather they provide the context for activities that may have occurred within the swamp, and for which there is no archaeological signature.

Table 3.1 – Site types that could occur around the margins of Hexham Swamp

Site type	Site description
Isolated artefact	A single stone artefact. Although these will generally be the results of day to day economic activity, it is also possible (rare) to find isolated artefacts that relate to ceremonial activities (e.g. ceremonial axes, engraved stones, stone knives used in cicatrisation). Isolated artefacts on the surface do not necessarily indicate restricted discard of occupation debris; rather they are frequently only the visible component of more widespread material.
Artefact scatter or open campsite	An area in the landscape (not within a rockshelter or cave) that contains two or more stone artefacts, generally within 100 metres of each other (when recording evidence on the surface). These sites may include thousands of artefacts. Numerous open campsites are known from the lower Hunter Valley, and this is the most common form of evidence in the region. Open campsites can be defined from surface or sub-surface evidence, or from a combination of these. Stone artefact sites may occur on gentle slopes around the margin of Hexham Swamp.
Precontact burial sites	This refers to Aboriginal skeletal material that predates white settlement in Australia. Such sites are considered to be highly significant to modern Aboriginal people. Burials are known from the sand dunes of Newcastle Bight, and from small alluvial deposits in the Hunter Valley (i.e. generally in unconsolidated sediments, not bedrock derived soils). Local ethnographic and historical information hints at the presence of burials in this region but no definite references of physical evidence are available. It is most unlikely that restoration of tidal influence in part of the swamp would affect burial sites.
Stone arrangements	Stone arrangements may take the form of single or multiple cairns, upright standing stones, lines or rings of stones or even stones arranged into figurative designs such as snakes or turtles. The location of many of the recorded stone arrangements suggests that they were related to ceremonial grounds and in particular initiation grounds (McBryde 1974:31-42), while others appear to mark tribal boundaries (Leney 1907:72-77). A large ceremonial ground was located at Wallsend (see below).
Shell middens	Middens are accumulations of shells, often with other organic matter, and stone artefacts, that have been discarded after human (Aboriginal) meals. They are most common along coastlines and estuaries, but may also occur adjacent to fresh water supplies (e.g. when fresh water mussels are abundant). Midden material is possible in the Hexham Swamp area, although probably only in relation to occupation within a limited time frame during which the swamp was open water and strongly estuarine. It is unlikely that midden sites would be impacted by the proposed restoration program. Middens may also contain burials (e.g. on Broughton Island and at Dark Point).
Grinding grooves	Grinding grooves are grooves on rock surfaces that have been created by the sharpening of stone axe heads, stone chisels or fire hardened wooden spear points. Grinding grooves are commonly located on sandstone ledges that outcrop in creek and river beds, as the availability of water enhances the speed with which grinding proceeds. Less commonly, grinding grooves are located on rock surfaces away from water and on stone types other than sandstone. Grinding grooves appear to be secular in nature. Sandstone outcrop occurs widely at the break of slope to Hexham Swamp around its western shoreline. The sandstone is generally soft and lithic, and although it may have been used for grinding, the evidence would not be retained over long periods because of rapid surface weathering.
Stone quarries	Stone quarries are places where Aboriginal people have sourced raw material for the manufacture of tools. Quarries may be cobble beds in rivers or on beaches, or they may be rock outcrops. When outcrops are exploited the quarrying activity may take the form of the flaking of rock from the outcrop itself, or scree from below the outcrop may be used instead. Silcrete outcrops at Shortland, in the vicinity of the study area, but not within the study area itself.

Table 3.1 – Site types that could occur around the margins of Hexham Swamp (cont)

Site type	Site description
Ceremonial grounds	In the Hunter region the main type of ceremonial ground recorded was the Bora. Bora grounds generally consisted of two earthen rings or two rings outlined with stones. The Bora ground was used during male initiation ceremonies (Fife 1995). Bora grounds are believed by many contemporary Aboriginal people to be non-secular in nature, however, the literature suggests that generally only the viewing of the smaller of the two rings was restricted to initiated males (for a summary of the data recorded about Bora grounds see Fife (1995)).
Scarred and carved trees	Aboriginal people often removed the bark from the trunks of trees to make toe holds (to aid in climbing to extract honey or possums from tree hollows), bowls, shields, spearthrowers, coolamons, canoes and/or for roofing material for shelters. The bark removal leaves scars on the tree trunk, which indicate the Aboriginal use of an area. Other trees were carved with designs. These carved trees were used to mark ceremonial grounds and burials (Etheridge 1918:84, McBryde 1974:126). Scarred trees are generally secular in nature while carved trees are always non-secular. It seems highly likely that scarred trees were at one time present in the Hexham Swamp area.
Post contact burial sites	This term refers to burials/interments that have taken place since European settlement and that are not located in a recognised cemetery and are not documented. If they are documented then they are historic sites and not Aboriginal archaeological sites. May be secular or non-secular depending on the status/position of the deceased.
Aboriginal fringe camps/reserves	These terms refer to those places where Aboriginal people lived in post-contact times. To be archaeological sites they will not be documented in the historic literature, if they are, then they will be called Aboriginal historic sites. These site types are generally secular in nature. The ethnographic evidence demonstrates that Aboriginal people continued to live in the Hexham Swamp area after the arrival of Europeans, but the relationship was tense and did not continue for long.
Waterholes/wells	Generally natural rock waterholes that contain water used for drinking or for special ritual purposes. These may be either secular or non-secular in nature. It is possible that water was stored in natural waterholes along creeks such as Minmi Creek and Wentworth Creek.
Preservation of timber/fibre implements	The historical references indicate widespread use of implements made from plant materials. None of these could be expected to survive in terrestrial archaeological sites. It is possible that some implements are preserved in the anaerobic sediments of Hexham Swamp. The proposed restoration of tidal ventilation will not disturb these sediments.

3.2 CULTURAL RESPONSES TO WETLAND RESOURCES

The southern part of Hunter estuary and surrounding alluvial and residual landscapes is considered to lie within the area formerly occupied by the Awabakal people (Gunson 1974) (see **Figure 3.1**). To the north of the Hunter River, the Worimi people occupied the Williams and Paterson River valleys as well as the coastline and the coastal barrier systems of Newcastle Bight (and associated estuarine habitats). Darkinjung and Wonnarua people lived further to the west (west of the Sugarloaf Range and Maitland). If these tribal boundaries are correct, the Awabakal people occupied the majority of the freshwater wetland areas of the lower Hunter Valley and the Hexham Swamp area was close to the northern boundary of the Awabakal people. As discussed in **Section 2.1**, the distribution and nature of wetlands in and around the Hunter estuary has changed dramatically over the last 6000 years.

A large number of archaeological studies have now been completed in landscape units that relate to riparian, wetland and wetland margin environments in the lower Hunter Valley. In

these studies, "wetland margin" generally refers to sites within 200-300 metres of the shoreline of a significant freshwater or estuarine wetland. "Riparian corridor" generally refers to sites that are located along the valleys of tributary drainage systems (freshwater). These studies provide the archaeological context for investigations of Aboriginal occupation in the present study area. The locations of previous study areas that are understood to be within the area occupied by the Awabakal people are shown in **Figure 3.2** and the distribution of known sites is shown in **Figure 3.3**. Some sites close to the margins of Worimi and Wonnarua lands are also shown.

A list of the sites from the area has been included in **Appendix 2**.

3.2.1 Previous Archaeological Assessment of the Study Area

An archaeological assessment of the impact of the Hexham Swamp Rehabilitation Project was undertaken by Rex Silcox (archaeologist) and Bob Smith (Awabakal LALC) in 1998 (Silcox 1998). Survey coverage information was not provided in detail, however, it is stated that the field inspection concentrated on the elevated margins of Hexham Swamp. Access to the low lying sections of the swamp was impeded by extensive areas of freestanding water following heavy rainfall. Inspection opportunities on the elevated margins were also impeded due to urban and industrial development and dense vegetation cover in less developed areas.

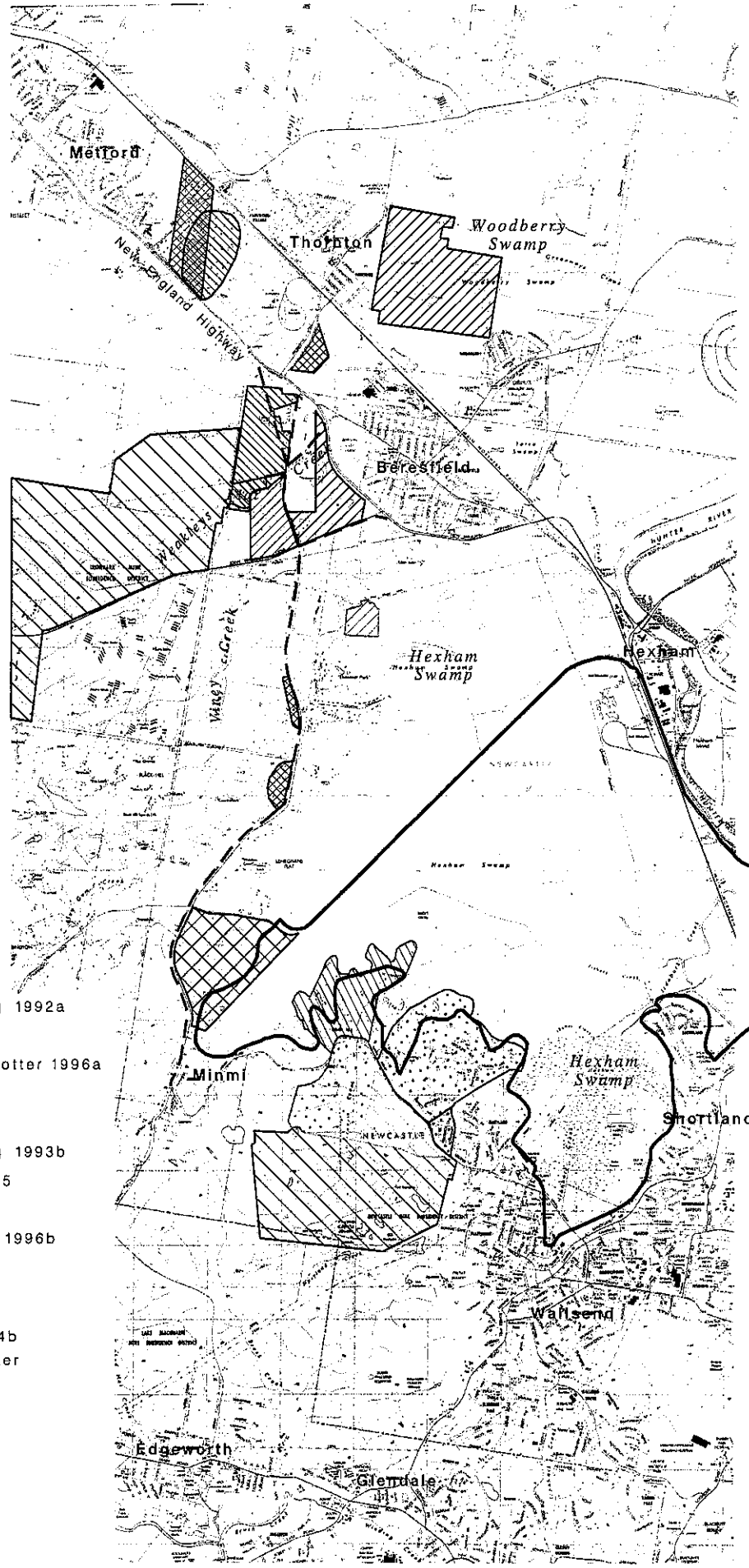
One Aboriginal site was located during the survey. This consisted of 'an amorphous indurated mudstone flaked piece lying on a gravelly exposure at the end of the ridge on which the Shortland Waste Water Treatment Plant is located' (draft EIS 1998:9). Map coordinates were not provided for this site but it is assumed that the end of the ridge referred to is the southern spur inspected during the current survey (refer to **Section 4**). A NPWS site card for this site was not submitted on completion of the survey. The site was not relocated during the current survey.

3.2.2 Site Location/Distribution

No physical evidence of past Aboriginal occupation is known from within Hexham Swamp. All of the studies associated with the swamp margins, that incorporated both surface and sub-surface investigation, or just sub-surface investigation, concluded that there was a general background scatter of artefacts across their study area with discrete concentrations of artefacts reflecting areas of greater intensity of site use (Kuskie 1994b; Silcox and Ruig 1996; Umwelt 1999; Kuskie and Kamminga 2000).

From the data supplied by the NPWS site register it can be noted that the location of isolated find and artefact scatter sites in the riparian corridors is heavily biased towards areas of lower slope associated with creek lines. In relation to the swamp margins, there is a roughly equal distribution of isolated finds between the edges of the spurs that form the swamp margins, and the small creeklines that are closely associated with the swamps. As mentioned earlier, this result has been skewed by the areas actually subject to survey (i.e. a former emphasis by archaeologists on the survey of creek lines) and the existence of erosion features that allow for the location of stone artefacts (more common along creek banks and around the margins of the spurs, especially in stocked areas). However, even taking these biases into account it is to be expected that Aboriginal camp sites, and thus, artefact scatter sites, will occur within reasonable access to potable water (most commonly within 200 metres but may be as far away as 500 metres).

It should be noted that the permanence of the water sources would have varied considerably over time. Lower floodplains of tributaries at the swamp margins are considered likely to have provided a more reliable water resource throughout the year than further upstream in tributary catchments, in the latter part of the Holocene. This was probably not the case in the



Legend

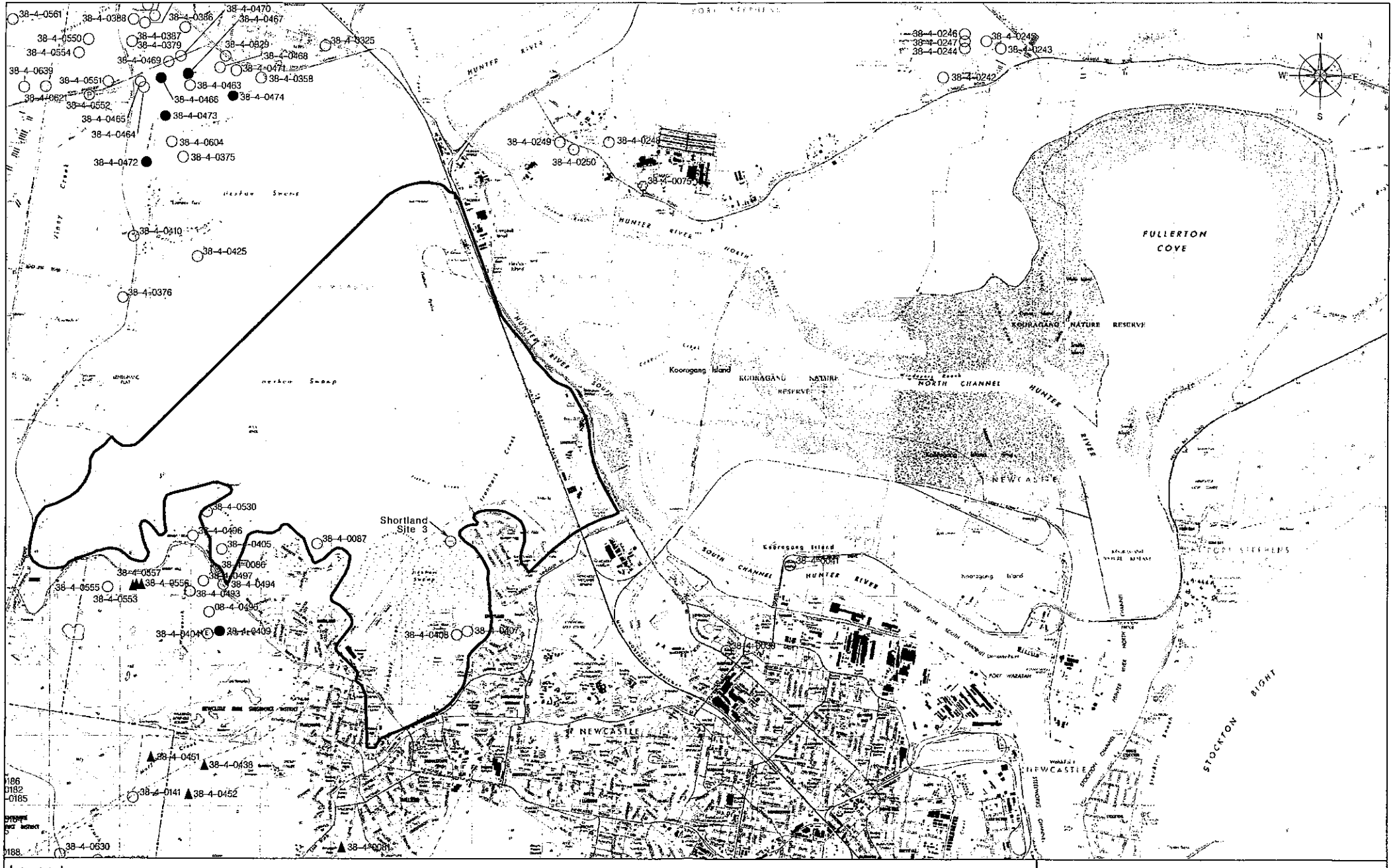
- Resource Planning 1992a
- Kuskie 1993b
- ERM Mitchell McCotter 1996a
- Kuskie 1997
- Umwelt 1999
- Resource Planning 1993b
- Silcox & Ruig 1995
- Dagg 1996c
- Stuart 1995, Dagg 1996b
- Dagg 1996b
- Effenberger 1998, Umwelt 1998, 2000
- Kuskie 1994a, 1994b
- Effenberger & Baker 1996, Kuskie & Kamminga 2000
- Umwelt 2001
- Brayshaw 1982
- Mills 1995
- Dean-Jones 1989
- Silcox 1999
- HLA 1995
- HLA 1996
- Umwelt 2002
- Study Area

0 1 2 4km

Umwelt (Australia) Pty Limited
Base Map Source: Beresfield and Wallsend Topographic Maps, 1:25 000

FIGURE 3.2
Approximate boundaries of areas previously surveyed in the Hexham Swamp area

A3 Scale 1:60 000 | Ref No.:R01_V1/1645_010.dgn



Legend

- Study Area
- ▲ Axe Grinding Groove
- ○ Artefact Scatter (Open Campsite)
- ● Isolated Find or Isolated Artefact
- Ⓟ Potential Archaeological Deposit
- Scarred or Carved Tree

0 1 2 3 km

Umwelt (Australia) Pty Limited
Source: Land and Property Information, NSW 2000

FIGURE 3.3
Aboriginal Sites within and in the Vicinity of Study Area

A3 Scale 1:50 000 | Ref No.:R01_V1/1645_003.dgn

early to mid Holocene, when there would have been a greater marine/estuarine influence. Overall, the studies indicate that the largest sites in respect of artefact numbers/densities were associated with the wetland margins (i.e. sites on low gradient spurs overlooking a wetland, and within 100 metes of the shoreline). The major exception to this is the Woods Gully site, which was located some 800 metres upstream of the Hexham Swamp margin. However, this site does appear to represent a specialist site (microblade manufacturing area) and is after all, an easy walk to the swamp and on a tributary that drains into the swamp.

3.2.3 Raw Material Use and Artefact Types

Silcrete and tuff are the dominant raw materials that have been located in the Aboriginal sites around the Hunter estuary. Minor components of the assemblages were chert, indurated mudstone (now known to be a tuff - Kuskie and Kamminga 2000), quartz, quartzite, sedimentary, silicified sandstone, chalcedony, basic volcanic and acid volcanic. The greatest varieties of raw materials were recorded in the sites located in association with Hexham Swamp. The sites in association with Woodberry Swamp also had a wider variety of raw materials than the riparian corridor sites. In this regard it should be noted that the areas near the swamps had larger artefact assemblages obtained from sub-surface investigation, and thus, the small sample size of the assemblages from the riparian corridors may be biasing this result (for a discussion on small sample size bias see Hiscock 2001:49).

Most studies from the western part of the Awabakal area concluded that the pattern of raw material use was related to local availability, with only minor use of raw materials from further afield (e.g. Nobbys tuff) and materials sourced from the Hunter River (Kuskie 1994, 1994b; Silcox and Ruig 1995; Effenberger and Baker 1996; Umwelt 1999; Kuskie and Kamminga 2000). It is not clear, however, exactly where these local stone resources have been obtained. Although a number of silcrete outcrops have been identified, mostly on lower level surfaces on the Tomago Coal Measures (and silcrete fragments are common at diverse locations in soil profiles in the Beresfield Soil Landscape), there is little direct evidence that these outcrops were used by Aboriginal people. In many cases, it is also not clear that the silcrete outcrop that is now at the surface was visible in the past. It should also be noted that the outcrops of Nobbys tuff along the Newcastle coastline were part of the Awabakal territory, and if canoe travel was used, the coastal headlands were only two days travel at most from the western most parts of the Awabakal lands.

3.2.4 Chronology

In terms of chronology only one site/artefact occurrence in the general vicinity of Hexham Swamp has been radiocarbon dated. This absolute date was 2,130±70 BP obtained from a fireplace at Woods Gully. For those sites where radiocarbon dating was not undertaken the chronology of the sites was relative and ascertained from the nature of the artefacts they contained. This relative dating technique draws on the occurrence of specific artefact types and knapping techniques from dated assemblages elsewhere (e.g. McCarthy 1964, 1976; Moore 1970; Hiscock 1993). For example, Baker (1996:14-15) suggests:

> All assemblages include the distinctively shaped "backed blade" implement which appears in the prehistoric record within the last 4,500 years. .... Associated blade cores and blade manufacturing debris support the identification of the Aboriginal sites discovered as being younger than 4,500 years (and probably younger than 3,500 years).

While Kuskie and Kamminga (2000:599) conclude:

> 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. The presence of distinctive typological markers, such as eloueras, indicates that one or more episodes of occupation also occurred within the last 2000 years, and possibly within the last few hundred years.

Overall, the consensus amongst archaeologists working in the area is that the artefact assemblages in the lower Hunter Valley date from the mid-Holocene. This position is consistent with the geomorphic evidence that suggests that overall the western margins of Hexham Swamp would have been more attractive for occupation in the latter part of the Holocene.

All the alluvial units in tributaries around the margin of Hexham Swamp are mid Holocene or younger. Possible locations of earlier deposits include the northern side of the Tank Paddock site, and extending upstream in Bluegum Creek (on the Riverdean and Hamilton Soil Landscapes). Further upstream in the Hunter estuary, Roy and Boyd (1996) have mapped several Pleistocene terrace deposits, and Pleistocene terraces are also known from the central lowlands of the Hunter (e.g. see Hughes and Hiscock (2000)). Along the main part of the Hunter floodplain and estuary, alluvial deposition over the last 3000 years or so has completed masked any earlier floodplain sites.

Hexham Swamp itself has only existed as an estuarine waterway since sea level stabilised at its current position. During the late Pleistocene, former alluvial deposits in this area would have been eroded, and the channels of Bluegum Creek, Minmi Creek, Wentworth Creek and Ironbark Creek would have flowed across the hinterland terrain. It is possible that late Pleistocene occupation would have been associated with these drainage lines, but such sites would have been either reworked or drowned by rising sea levels.

Pleistocene sites have been recorded in the lower Hunter Valley on the inner barrier of Newcastle Bight, adjacent to wetlands that may have persisted throughout the last Glacial (see Baker (1994), and Dean-Jones (1991)). The inner barrier is a Pleistocene deposit, although its surface was reshaped by aeolian processes during the last glacial.

Artefact types recorded in sites in the Hexham Swamp area include flakes, broken flakes, flaked pieces, broken blades, microblades, backed blades, broken cores, blade cores, and ground edge hatchets (Silcox and Ruig 1995; Effenberger and Baker 1996; Kuskie 1997; Kuskie and Kamminga 2000, Umwelt 2002). Broken flakes appear to be dominant. Very large numbers of lithic fragments have also been recovered. These frequently show strong heat impacts and are considered to be natural features.

3.3 PREDICTIVE MODEL

Previous geomorphic research indicates that:

* During the last Glacial, the study area was remote from the coastline, and the Pleistocene floodplain and wetlands of the lower Hunter Valley were severely dissected. Riparian habitats would have been present along intermittent drainage lines. The seasonal persistence of water in these drainage lines is not known, although there is a widespread view that low evaporation rates in the late Pleistocene may have produced a greater incidence of semi permanent water in tributary drainage lines.

  It is likely that most occupation activities at this time focused on the banks of the Hunter River, with subsidiary occupation within the valleys of Ironbark Creek, Bluegum Creek and Maryland Creek. Resources along these valleys would have been entirely terrestrial. Evidence of this occupation in the lower Hunter Valley is no longer visible, due to channel change and rapid late Holocene floodplain accretion. It is possible that Late Pleistocene and early Holocene occupation evidence is preserved beneath the accreted alluvium.

* As sea level rose during the period 17000 to 10000 years ago, the local riparian habitats would have retained their terrestrial resource characteristics, with only the proximity to ocean habitats and resources changing. Given the rate of sea level rise during this period, it is unlikely that estuarine wetland habitats developed to any great extent.

* As sea level approached its current position and then stabilised, the morphology and habitats of the new Hunter estuary began to emerge. Of particular significance, is the likelihood that what is now Hexham Swamp was a shallow, open estuarine bay, for most of the period from 8000 to 2500 years ago. Sufficient sand was present in the bed of the bay for low beach ridges/benches to form around the margins of the bay, where the shoreline faced into the fetch of southerly and easterly winds. The sandy bed was gradually accreted with silts and clays from floods. In the case of an open estuarine bay, little fresh water would have been available to Aboriginal people in the area, except along the major tributary creeks or if springs were present on the spurs. Abundant estuarine fish, crustacea and shellfish would have been available to Aboriginal fishers using spears, nets and lines, and gathering by hand.

  Features such as the Knob on the south western margin of the swamp would have been small islands in the bay during this period, separated by a shallow channel from the main spurs and headlands of the area.

* If the evidence from the Hunter floodplain can be transferred to the infilling of Hexham Swamp, then rapid sedimentation and accretion of creek deltas into the bay occurred within only the last 2500 or so years. During this time, the swamp area changed from open shallow estuarine bay to a complex of open water, estuarine channels (such as Fishery Creek and Ironbark Creek), saltmarsh, freshwater wetlands and the deltas of freshwater creeks. The patterns of these habitats would have varied seasonally and with longer term rainfall patterns. It is likely that during and after major floods, the entire swamp area was inundated with fresh water (depositing new layers of silt), but in dry periods, complex microhabitats were evident.

  On the basis of this reconstruction, the late Holocene period should have been the time when the Hexham Swamp area was most attractive to Aboriginal people. The issue of access to fresh water would have remained important if the area were to attract large numbers of people, or to support a relatively stable population. Thus, spurs along the margins of the main creek valleys may have had greater value for persistent occupation than other areas.

This analysis suggests that on the basis of broad resource accessibility, there is a possibility of long term low intensity use of the margins of Hexham Swamp, with more intensive use developing only in the latter part of the Holocene.

From the previous ethnographic and archaeological research in the Hexham Swamp area it can be predicted that:

* Stone artefact scatters and isolated finds are the most likely evidence of such occupation.

* The most likely landform units on which artefact scatters and isolated finds will occur is lower gradient spurs and ridges bordering the wetlands, particularly in areas associated with major tributaries (such as Ironbark Creek). Higher artefact densities are also likely in these areas. None of these areas will be impacted by the proposed wetland restoration project.

* The most likely stone artefact types will be flakes, broken flakes and flaked pieces. There is a possibility of finding retouched flakes, cores and ground edge axes, however, these will only make up a minor component of any assemblage.

* It is unlikely that Aboriginal sites will be located on low lying wetland areas (which compose the majority of the study area) due to the persistent past inundation of these areas.

* Evidence of Late Pleistocene and early Holocene Aboriginal occupation evidence may be present in areas associated with semi permanent water courses in existence at that time (such as Ironbark Creek), but it is likely that such evidence is buried beneath many metres of alluvium.

* Any cultural objects that may have been discarded at the swamp shoreline are likely to have been reworked by terrestrial erosion, wave action or land clearing.

3.4 CONSERVATION STATUS OF ABORIGINAL CULTURAL HERITAGE IN THE LOWER HUNTER VALLEY

In general, Aboriginal archaeological evidence is fragile in the environment. Sites generally comprise small fragments of cultural material, rather than robust masonry, and effective interpretation and significance assessment depends on understanding the extent to which the integrity of an assemblage of related fragments and its landscape context has been modified.

The integrity of archaeological evidence is affected by natural soil processes and by land use, with current and past land tenure having a significant impact on the extent of disturbance. In the lower Hunter Valley, there are no parcels of land that have been managed with a focus on cultural heritage conservation over an extended period. There are some areas that, by default, have been less disturbed than others; this applies particularly to some underground mining leases on the western side of Lake Macquarie, the State Forests land holdings in the Watagan Ranges, and to parts of the Tomago sandbeds / Newcastle Bight transgressive dunes that are managed by Hunter Water to provide back up potable water supplies for Newcastle.

In recent years, several other parcels of land have been placed in conservation management to protect natural heritage values. These include the Kooragang Nature Reserve, Hexham Swamp Nature Reserve, and most recently, the Pambalong Nature Reserve (a small area of wetland west of Leneghans Drive). The Bluegum Hills Regional Park has also recently been declared, and will protect some natural and cultural heritage values (including historic heritage) as well as providing passive recreational space for the Newcastle western corridor. These conservation areas provide protection for the Aboriginal cultural heritage material and values that are associated with past use of the wetland resources of Hexham Swamp. The Nature Reserves conserve the swamp habitats and resources, but do not necessarily conserve the evidence that demonstrates how Aboriginal people used those resources.

3.4.1 Affect of Rehabilitation Project on Conservation Status of Aboriginal Sites

The Hexham Swamp Rehabilitation Project will not affect the stability or conservation status of Aboriginal sites in the area. As explained in **Section 1.1**, the altered water levels will be restricted to the very low lying areas within the swamp and Ironbark Creek areas. Such areas are unlikely to contain archaeological evidence of traditional Aboriginal people because they would not have been comfortable places to camp or carry out activities such as tool making.

The Project will, however, eventually restore the variety of wetland landscapes and the associated flora and fauna resources enjoyed by Aboriginal people in the past. Such landscapes and resources will be of cultural value to today's Aboriginal community. Additionally, the restoration of a tidal environment is likely to improve the conservation status of Aboriginal sites still in existence on the swamp margins by re-establishing (to a limited extent) the context of the sites. That is, the rehabilitated swamp will make the environment in which traditional Aboriginal people lived and formed these sites more tangible and understandable to people today. For example, a stone artefact scatter on the swamp margin will be more meaningful when the types of plants and animals on which the stone tools were used can also be seen. The rehabilitated environment will demonstrate, to an extent, the type of environment Aboriginal people utilised and enjoyed, and provide some context to archaeological sites remaining today.

3.4.2 Community Views on Opening Ironbark Creek Floodgates

The Awabakal LALC and traditional owners of the Hexham Swamp area are supportive of the proposed rehabilitation of the environmental and ecological values of Hexham Swamp. They are keen to be actively involved in the rehabilitation works (such as weed removal and documentation of changes to the landscape). They would like to be informed and involved in the monitoring of ecological and habitat changes as the staged opening of the floodgates progresses. The restoration of intertidal habitats for fish, prawns and other marine organisms, as well as other fauna habitats is seen as the restoration of important cultural heritage values. These habitats and the rich plant resources of the swamp supported people with a rich and complex culture for thousands of years before the arrival of Europeans (refer to **Section 6**).

Comment from the Awabakal LALC and traditional owners of the Hexham Swamp area is contained in **Appendix 1**.

4.0 SURFACE SURVEY OF PROPOSED BUND LOCATION

4.1 SURVEY STRATEGY

An archaeological survey of the location of the proposed bund was undertaken by Bob Smith (Awabakal Local Aboriginal Land Council) and Katie Sachs (Umwelt (Australia) Pty Limited) on 10 September 2002. The bund site is the only part of the Hexham Swamp margin that will be directly impacted by earthworks associated with the proposal.

The entire linear route of the bund was investigated on foot (refer to **Figure 4.1**). Two people commenced from the southern spur, walked to the northern extremity of the proposed bund, and back again. The end of the southern spur was also briefly inspected although this landform will not be impacted by the proposed development.

4.2 GROUND SURFACE DISTURBANCE AND VISIBILITY

The entire route of the bund has been heavily trampled by cattle. A fence has also been constructed along the majority of the route. A cattle track has formed adjacent to this. At the northern end of the proposed bund, the flat associated with Ironbark Creek appears to have been cultivated at some stage in the past as evidenced by the types of weed growing there. Additionally, earthworks appear to have been undertaken in the area. A section of the base of the spur has been removed, there is a low ridge across the area (presumably built to limit flood water flowing across from Ironbark Creek), and a small dam has been constructed. The hummocky appearance of the entire flat area indicates some level of past ground surface disturbance.

Ground surface visibility along the route of the bund is low. The southern portion of the route is densely covered by succulent ground cover and rushes (*Juncus sp.*). Ground surface exposure is approximately 10%, caused by cattle tracks and other trampled areas. Visibility within the exposures is 100%. The central portion of the bund is densely covered by the common reed (*Phragmites australis*). Ground surface exposure in this portion is approximately 5%. The exposures were caused by cattle trampling. The northern portion of the bund is densely covered by grasses (eg. paspalum) and weeds such as blackberry, South American amaranth, and scotch thistle. Ground surface exposure in this portion is less than 5%. Exposures which do occur have been created by cattle trampling. Visibility within the exposures is 90 to 100%.

An exposure at the end of the southern spur was also briefly inspected (an area of approximately 30 x 30 metres). Visibility is this area was approximately 50%, impeded by gravel. This is probably the area in which an isolated find was located by Silcox (draft EIS 1998). The site was not relocated.

4.3 EFFECTIVE COVERAGE

The entire route of the bund was investigated, however ground surface visibility was extremely limited. Effective coverage of the bund route is estimated to have been less than 5%.

4.4 NEW SITES

One Aboriginal stone artefact scatter was located during the survey (Shortland Site 3). The location of the site is shown on **Figure 4.1**. The details of the artefacts are contained in

Table 4.1. The site is located on the alluvial flat (floodplain or low terrace) of Ironbark Creek (approximately 40 metres south east of the creek), at the base of the northern spur and at the northern extremity of the proposed bund location. Three artefacts were located within 2 metres of one another on a linear cattle track (0.5 x 20 metres). Visibility was 90%, slightly obscured by gravel. The immediate area has been cultivated and has also been disturbed by earthmoving. A large section at the base of the spur has been removed (less than 10 metres from the site), and the artefacts are located on a low ridge which has been constructed across the flat. The artefacts are therefore not *in situ*.

Table 4.1 - Artefact Details

Artefact type	Raw Material	Description
Flaked piece	Silcrete	Dimensions 28 x 15 x 7mm; 0% cortex; heat affected (colour change)
Retouched Flake	Tuff (indurated mudstone)	Dimensions 38 x 34 x 4mm; 0% cortex; platform width 8mm, platform thickness 3mm, 2 scars on platform surface; 3 scars on dorsal surface; acutely retouched on 1 margin; hinge termination
Flake	Tuff (indurated mudstone)	Dimensions 47 x 26 x 15mm; 50% cortex (pebble); platform width 3mm, platform thickness 3mm; 1 scar on platform surface; 2 scars on dorsal surface; feather termination

4.5 GEOARCHAEOLOGICAL POTENTIAL

The site is located on the floodplain of Ironbark Creek. The upper part of the deposit has some potential for containing subsurface archaeological deposits. The depth of such evidence is unknown. The surface of the area where the bund will be constructed is approximately 50 cm above the bank of the creek, and would only have provided a surface for occupation since alluvial accretion reached a level where the ground is not tidally or permanently inundated.

However, such evidence is likely to have been disturbed by cattle trampling, past earthmoving activities, and cultivation of the flat between the Ironbark Creek and the base of the spur. The potential for intact subsurface occupation evidence to be conserved at this location is considered to be low.

The proposed bund will be constructed of imported fill, which will be placed on top of the existing ground surface.

4.6 INTERPRETATION OF RESULTS

The Aboriginal artefact scatter is located in the vicinity of Ironbark Creek, an area which was predicted to be archaeologically sensitive:

* As sea level approached its current position and then stabilised (between 8000 to 2500 years ago), Hexham Swamp is likely to have been a shallow, open estuarine bay. Sources of fresh water would have been limited to the major tributary creeks and springs. Ironbark Creek, south of Hexham Swamp, was a significant tributary and so may have been a focus of Aboriginal occupation. This occupation would have been further upstream in the catchment than the area affected by any part of the Hexham Swamp rehabilitation project.

* Within the last 2500 years, the estuarine bay changed to a complex of open water, estuarine channels (such as Ironbark Creek), saltmarsh, freshwater wetlands, and the deltas of freshwater creeks. This change was a result of rapid sedimentation and accretion of creek deltas into the bay. The floodplain adjacent to the creek probably accreted at this time. Again, access to fresh water is likely to have been a major focus for Aboriginal occupation. The spurs immediately above the proposed bund route would have provided a dry camping location with ready access to the resources of Hexham Swamp and fresh water from Ironbark Creek.

The stone artefacts recorded at the proposed bund site are consistent with predictions regarding artefact type and raw material, although retouched flakes generally form only a minor component of assemblages recorded in the area. The low number of artefacts recorded during the current study prohibit any meaningful statistical analysis.

4.7 ABORIGINAL CULTURAL SIGNIFICANCE

The Aboriginal cultural significance can only be assessed by the traditional owners and local Aboriginal community and is often different to that of scientific significance. Comment from Awabakal LALC is provided in **Appendix 1**. The Awabakal LALC is very supportive of the proposed rehabilitation of Hexham Swamp, which they consider will restore former habitats of value to Aboriginal people. They also support the concept of landscape restoration and would like to be further involved. The Awabakal LALC does not attribute high cultural significance to the small group of artefacts identified during this survey.

4.8 ARCHAEOLOGICAL OR SCIENTIFIC SIGNIFICANCE

There are several criteria for assessing the archaeological significance of Aboriginal sites. The most common are:

* research potential (which depends on factors such as the potential of the site to answer questions of relevance to the contemporary archaeological/Aboriginal community; the site's uniqueness/rarity; the site's archaeological integrity; the site's relationship with other known sites);

* representativeness (which depends on a site's uniqueness; relative integrity; conservation status; and whether similar sites have already been researched); and

* teaching potential (which depends on the location and accessibility of a site and whether the site would suffer degradation if visited on a regular basis).

4.8.1 Archaeological Significance Assessment

The archaeological research potential and teaching potential of Shortland Site 3 are assessed as being low due to the disturbed nature of the site and its surrounding area; the low complexity of the site (only three artefacts); and the low possibility that the site has an associated undisturbed sub-surface component. The representativeness of the site is also considered low because it is typical of the types of sites in the Hexham Swamp region but its state of preservation is poor. Other, better preserved sites are conserved in the area, for example at the Blue Gum Vista Estate, Minmi, and potentially at the Tank Paddock.

4.9 COMMUNITY VIEWS ON IMPACT OF WORKS ASSOCIATED WITH OPTION 6

Considering the low complexity of the Aboriginal site, its level of disturbance and the overall positive values of the project, the Awabakal LALC considers that the construction of the bund should proceed. The Awabakal LALC have requested that the site be buried by the clean fill imported to construct the bund. An application for a Consent to Destroy for the site should be submitted prior to construction.

4.10 IMPACT OF PROPOSED BUND CONSTRUCTION AND MANAGEMENT RECOMMENDATIONS

Shortland Site 3 will technically be destroyed (buried) by the construction of the bund. The known artefacts will not be removed, and any other subsurface material that may be present will not be disturbed. The proposed bund occupies a very small portion of the total shoreline of Hexham Swamp, and a small portion of the alluvial terrain along tributary creeks. Its impact on areas of potential Aboriginal cultural heritage value is very low.

The following recommendations are made on the basis of:

* The legal requirement imposed by Sections 90 of the *National Parks and Wildlife Act 1974* which states that it is an offence to knowingly disturb, deface or cause or permit the destruction of relics or an Aboriginal place without the written consent of NPWS;

* The results of the Aboriginal cultural heritage survey and assessment;

* An evaluation of the impact of the Hexham Swamp Rehabilitation Project on cultural heritage;

* Inferences in relation to geoarchaeological potential;

* Assessment of archaeological significance of the site that has been located in the bund construction area;

* Consultation with the Awabakal LALC in relation to the Aboriginal significance of the site;

* Consideration of the possible management options for the site in consultation with the Awabakal LALC.

Recommendations

1. It is recommended that Hunter Catchment Management Trust submit a Consent to Destroy application for the site without the requirement for further work.

2. The Awabakal LALC has requested that the site be buried beneath the clean fill imported for the construction of the bund.

3. The Awabakal LALC has a strong interest in the Hexham Swamp project and would like to discuss opportunities for further involvement.

5.0 REFERENCES

Baker, N. 1994. Moffats swamp Dune: Final report on archaeological site salvage, testing and artefact analysis.

Baker, N. 1996. Part 2 in Effenberger, S. and Baker, N. 1996. Archaeological test excavation and significance assessment F3 Freeway, Black Hill. A report to the Roads and Traffic Authority, Major Projects, Newcastle.

Barrallier, F. 1802 Letter to C.F. Grenville. Banks Papers, Brabourne Collection. MS A78-3, Mitchell Library, Sydney.

Brayshaw, H. 1986 Aborigines of the Hunter Valley: A Study of Colonial Records. Scone and Upper Hunter Historical Society, Scone.

Bryant, E.A., R. W. Young, D. M. Price and S. A/ Short. 1992. Evidence for Pleistocene and Holocene raised marine Deposits, Sandon Point, NSW. Aust. J. Earth Science, Vol. 39, pp.481-493.

Bundock, Mrs. E. 1926. Memoirs, in J. F. Stevens, Histories (3) of pioneers in the Clarence, Hunter and Richmond River districts and in south eastern Queensland. Duplicated typescript. ML MS 1120.

Chappell, J. M. 1993. Holocene Evolution of Fluvial Deltaic lowlands : comparison of the Clarence and Tweed Valleys of northern NSW with Other systems in different estuarine and tectonic regimes. In G. J. Brierley, Abrooks and R. Ferguson (compilers); Field notes for floodplain systems along the coastal plain of NSW. 5th International Fluvial Sedimentology Conference:Field Excursion Guide #1

Cribb, A. B. and Cribb, J. W. 1974 Wild Food in Australia. Collins, Sydney.

Cunningham, G.M., Mulham, W.E., Milthorpe, P.L. and Leigh, J.H. 1992. Plants of Western New South Wales. Inkata Press. Australia.

Dagg, L 1996a. Archaeological assessment of land zoned 4 (b) Light Industrial, Glenwood Industrial Estate, Thornton, NSW. Report to Hill Top Planners Pty Ltd.

Dagg, L. 1996b. Archaeological assessment, proposed road and bridge crossing, Four Mile Creek, Thornton, NSW. A report prepared for Hill Top Planners Pty Ltd. Maitland. NSW. October 1996.

Dagg, L. 1996c. Archaeological assessment, proposed rural residential subdivision, Thornton, NSW. A report prepared for Hill Top Planners Pty Ltd. Maitland. NSW. December 1996.

Dangar, H. 1828 Map of the River Hunter and its Branches, Shewing the Lands Reserved Thereon for Church Purposes, the Locations Made to Settlers, and the Settlement and Part of the Lands of the Australian Agricultural Company at Port Stephens, Together with the Station of the Mission to the Aborigines Belonging to the London Missionary Society on Lake Macquarie, New South Wales. J. Cross, London.

Dean-Jones, P. 1991. (Resource Planning Pty Limited) Preliminary Assessment of the archaeological material and taphonomic geomorphology at RZ Mines Pty Ltd, Plant No. 1 Galloping Lead South. Results of Stage 1 investigation. February 1991.

Effenberger, S. and Baker, N. 1996. Archaeological test excavation and significance assessment: F3 Freeway, Black Hill NSW. Unpublished report to NSW Roads and Traffic Authority (Major Projects Newcastle).

Effenberger, S. 1996b Part 3 in Effenberger, S. and Baker, N. 1996. Archaeological test excavation and significance assessment F3 Freeway, Black Hill. A report to the Roads and Traffic Authority, Major Projects, Newcastle.

Etheridge, R. 1918. The dendroglyphs, or "carved trees" of New South Wales. Memoirs of the Geological Society of New South Wales. Ethnological Series No. 3.

Fife, L. R. 1995. An archaeological perspective of traditional Aboriginal ceremonial sites of south-eastern Australia. Unpublished B.A. Hons. Thesis. University of New England, Armidale, NSW.

Flood P.G. and Frankel E. 1989. Late Holocene higher sea level indicators in Eastern Australia. Marine Geology Vol. 90, pp. 193-195

Foley, R. 1981. A model of regional archaeological structure. Proceedings of the Prehistoric Society. 47:1-17.

Goodrick, G. N. 1970. A survey of wetlands of coastal NSW. Technical Ms. No. 5. CSIRO Division of Wildlife Research.

Grant, J. 1801. Journal at Hunter River. Historical Records of Australia. 1, 3, pp. 171-173.

Grant, J. 1803. Narrative of a Voyage of Discovery, Performed in his Vessel the Lady Nelson. 1800, 1801, and 1802 to New South Wales. London.

Greenway, Rev. C.C. 1910. Kamilari Tribe: Foods. Science of Man. Vol. XII. No. 1. May 2, 1910. pp. 15-16.

Gunson, N. 1974. Australian Reminiscences and Papers of L.E. Threlkeld. Volume 1. Australian Institute of Aboriginal Studies, Canberra.

Hartley, D.T. 1986. The Settlers of the Big Swamps. A Saga of the Thomas Family and Their Contemporaries. D. T. Hartley, Fennell Bay.

Hartley, D.T. 1991. Minmi: The Place of the Giant Lily. Compiled by Newcastle and Hunter District Historical Society.

Hartley, D.T. 1995. Men of Their Time. Pioneers of the Hunter River. Aquila Agribusiness Pty Ltd, North Arm Cove, NSW.

Hiscock, P. 1993. Bondaian technology in the Hunter Valley, New South Wales. Archaeology in Oceania. 28, pp. 65-76.

Hiscock, P. 1998. Stone artefact analysis. In Jo McDonald Cultural heritage Pty Ltd. Archaeological salvage excavation of an Aboriginal site, corner Baker and George Streets, Windsor, NSW. An unpublished report to Hopewood Partners.

Hiscock, P. 2001. Sizing up prehistory: sample size bias and composition of artefact assemblages. Australian Aboriginal Studies. Journal of the Australian Institute of Aboriginal and Torres Strait Islander Studies. No. 1 pp. 48-62.

Hughes, P. and Hiscock, P. 2000. Archaeological and Geomorphological excavations at the proposed Carrington Mine Site, Hunter Valley, NSW. NPWS Preliminary Research Permit #:SZ288. An unpublished report to Environmental Resources Management Australia Pty Ltd.

Kuskie, P. J. 1994a. An archaeological assessment of a proposed land rezoning at Lot 23, Beresfield West, NSW. An unpublished report prepared for Devine Erby Mazlin.

Kuskie, P. J. 1994b. An archaeological assessment of a land rezoning proposal at Lot 1 DP 559519, Thornton, NSW. An unpublished report to Gutteridge Haskins and Davey Pty Ltd.

Kuskie, P. J. 1997. An Aboriginal archaeological assessment of a Newcastle City Council Property at the corner of Lenaghans Drive and John Renshaw Drive, Beresfield, lower Hunter Valley, NSW. A report to Newcastle City Council.

Kuskie, P. J. 1999. Management Plan: Aboriginal Heritage at Woods Gully, along the F3 Freeway near Black Hill, Beresfield. A report to the NSW Roads and Traffic Authority Major projects, Northern Region.

Kuskie, P. J. (in prep.) Salvage of Aboriginal Heritage sites at South Lemington. Unpublished report in preparation to Lemington Coal Mine Pty Ltd.

Kuskie, P. J. and Kamminga, J. 2000a. Salvage of Aboriginal archaeological sites in relation to the F3 Freeway, near Lenaghans Drive, Black Hill, New South Wales. Volume A. A report to the Roads and Traffic Authority, New South Wales.

Kuskie, P. J. and Kamminga, J. 2000b. Salvage of Aboriginal archaeological sites in relation to the F3 Freeway, near Lenaghans drive, Black Hill, New South Wales. Volume B Figures, Plates and Appendices. A report to the Roads and Traffic Authority, New South Wales.

Kuskie, P. J. and Kamminga, J. 2000c. Salvage of Aboriginal archaeological sites in relation to the F3 Freeway, near Lenaghans drive, Black Hill, New South Wales. Volume C: Artefact Databases. A report to the Roads and Traffic Authority, New South Wales.

Low, T. 1989. Bush Tucker: Australia's Wild Food Harvest. Angus and Robertson. Australia.

Low, T. 1990. Bush Medicine: A Pharmacopoeia of Natural Remedies Angus and Robertson. Australia.

Maitland Mercury, 21 June 1854

Mankind 1932. Volume 1, No.4, 4 March 1932.

Matthei, L. E. 1995. Soil Landscapes of the Newcastle 1:100 000 Sheet. Report, Department of Land and Water Conservation. Sydney.

McBryde, I. 1974. Aboriginal Prehistory in New England. Sydney University Press, Sydney.

McCarthy, F. D. 1964. The archaeology of the Capertee Valley , New South Wales. Records of the Australian Museum. 26, pp. 197-246.

McCarthy, F. D. 1976. Australian Aboriginal Stone Implements. Australian Museum. Sydney.

McDonald, R. C., Isbell, R. F., Speight, J. G, Walker, J. and Hopkins, M. S. 1990. Australian Soil and Land Survey Field Handbook. Inkata press. Sydney.

Moore, D. R. 1970. Results of an archaeological survey of the Hunter River Valley, New South Wales, Australia. Part 1. The Bondaian Industry of the upper Hunter and Goulburn River Valleys. Records of the Australian Museum. 28 (2) pp.25-64.

Nanson G. C. and Erskine W. D. 1988. Episodic changes of channels and floodplains on coastal Rivers in NSW. In Warner RF (ed). Fluvial Geomorphology in Australia. Academic Press, pp. 201-221.

Newcastle 1:100,000 Geological Sheet S1 56-2 First edition. 1966.

Newcastle Sun 23 April 1924

Nittim R 1966. Flood Studies on the Lower Hunter River, NSW. M Tech thesis, university of NSW (unpublished)

NPWS 1996. Kooragang Nature Reserve and Hexham Swamp Nature Reserve Plan of Management. NSW NPWS unpublished report.

NPWS. 1997. Aboriginal Cultural Heritage Standards and Guidelines Kit: Standards for Archaeological Practice in Aboriginal Heritage Management. NSW NPWS, Hurstville.

NPWS. 1997. Aboriginal Cultural Heritage Standards and Guidelines Kit: Guidelines for Archaeological Survey Reporting. NSW NPWS, Hurstville.

NPWS 1998. Aboriginal Cultural Heritage and the Integrated Development Assessment Process. Information for Applicants 1 July 1998.

NPWS 2002 Cultural Heritage Community Consultation Policy. NSW NPWS, Hurstville.

Roy, P. S. 1994. Holocene Estuary Evolution; Stratigraphic studies from southeastern Australia. In Dalrymple R and R Boyd (eds.). Incised valley systems - origin and sedimentary sequence. SEPM Special Publication 51.

Roy, P. S., Hudson, J. P. and Boyd, R. L. 1995 Quaternary geology of the Hunter delta - An estuarine valley-fill case study. In Sloan, S. W. and Allman, M. A. (eds.) Conference on Engineering Geology of the Newcastle-Gosford Region. Australian Geomechanics Society. Sydney.

Roy, P. S. Hudson, J.P. and Boyd, R. 1995. Quaternary Geology of the Hunter Delta – an estuarine valley fill case study. In Engineering Geology of the Newcastle Gosford Region.

Roy P. S. and Boyd, R. 1996. Quaternary Geology of a Tectonically Stable, wave dominated sediment deficient margin, South East Australia. IGCP Project #367, Field Guide to the Central NSW Coast, November 1996, NSW Geological Survey, Sydney, 174pp

Roy, P. and Boyd, R. 1996. International Geological Correlation Program Project No. 367. Quaternary Geology of South-east Australia: a Tectonically Stable, Wave Dominated, Sediment Deficient Margin: Field Guide to the Central New South Wales Coast. Geological Survey of NSW. Dept. of Mineral Resources. Sydney.

Silcox, R. 1998 Report on Archaeology, Appendix J in draft Hexham Swamp EIS (EJE Townplanning)

Silcox, R. and Ruig, J. 1995. Test excavations on a rural residential estate at Black Hill, Tarro, NSW. An unpublished report to P. & S. Evans.

Stuart, I. 1995. An archaeological survey of the Thornton Industrial Area. A report prepared for HLA Envirosciences Pty Limited. Pymble. NSW.

Thom, B G., Shepherd, M., Ly, C. K., Roy, P. S., Bowman, G. M. and Hesp, P. A. 1992. Coastal Geomorphology of the Port Stephens-Myall Lakes Area. Australian National University, Canberra.

Tindale, N. B. 1965. Stone implement making among the Nakako, Ngadadjara and Pitjandjara of the Great Western Desert. Records of the South Australian Museum. pp.131-164.

Tindale, N. B. 1974. Aboriginal tribes of Australia: Their Terrain, Environmental Controls, Distribution Limits and Proper Names. Australian National University Press, Canberra.

Tindale, N.B. 1985. Australian Aboriginal techniques of pressure-flaking stone implements: some personal observations. In Plew, M. G. Woods, J. C. and Pavesic, M. G. (eds.) Stone Tool Analysis: Essays in Honour of Don E. Crabtree. University of Mexico Press. Albuquerque. pp. 1-33.

Turner J. and Blyton, G. 1995. The Aboriginals of Lake Macquarie. A Brief History. Lake Macquarie City Council.

Umwelt (Australia) Pty Limited (Rheinberger P). 1998a. Primary Submission to Commission of Inquiry, Proposed Donaldson Open Cut Coal Mine: Archaeological Assessment. A report prepared for Wootmac Pty Ltd.

Umwelt (Australia) Pty Limited (Rheinberger P). 1998b. Submission in Reply to Commission of Inquiry, Proposed Donaldson Open Cut Coal Mine: Archaeological Assessment. A report prepared for Wootmac Pty Ltd.

Umwelt (Australia) Pty Limited (Rheinberger, P. and Dean-Jones, P.) 1999. Archaeological Assessment, sub-surface investigation of land east of Thornton Road, Thornton, NSW.

Umwelt (Australia) Pty Limited (Rheinberger, P). 2000. Aboriginal Sites Management Plan, Year 1: Donaldson Open Cut Coal Mine, Beresfield near Newcastle. A report prepared for Wootmac Pty Ltd.

Umwelt (Australia) Pty Limited (Rheinberger, P). 2001. Report of a Supplementary Archaeological Study of the Mine Impact Area: Donaldson Open Cut Coal Mine, Beresfield near Newcastle. A report prepared for Wootmac Pty Ltd.

Umwelt (Australia) Pty Limited (Wilson, J.). 2001. Aboriginal archaeological assessment and sub-surface investigation of the proposed Freeway Industrial Estate, South Beresfield, NSW. An unpublished report to Harper Somers Surveyors Pty Ltd.

Vernon, S. 2001. Hexham Swamp, vegetation in transition. In Hunter Flora, October 2001. Occasional Newsletter of the Hunter Catchment Management Trust.

Walker A. 1999. Quaternary Sequence Stratigraphy of the Lower Hunter River Valley. MSc Thesis, Newcastle University (unpublished)

Wallsend and Plattsburg Sun 13 December 1890

Wallsend and Plattsburg Sun 17 December 1890

Wallsend and Plattsburg Sun 24 December 1890

Wallsend and Plattsburg Sun 3 January 1891

WBM 2002 Environmental Impact Statement for the Rehabilitation of Hexham Swamp (Draft). Also draft 1998 version.

Winning, J. 1996. Vegetation of the Kooragang and Hexham Swamps Nature Reserves. Quoted in WBM Oceanics (Australia) 2000. Unpublished draft EIS for rehabilitation of Hexham Swamp for HCMT.

Zola, N. and Gott, B. 1992. Koorie Plants Koorie People: Traditional Aboriginal Food, Fibre and Healing Plants of Victoria. The Koorie Heritage Trust. Melbourne.

APPENDIX 1

Letter from Awabakal Local Aboriginal Land Council

AWABAKAL
LOCAL ABORIGINAL LAND COUNCIL
127 MAITLAND ROAD
ISLINGTON NSW 2296
ABN: 19 759 066 759

4th December, 2002

Ms Sharon Vernon
Hunter Catchment Management Trust
Private Bag 2010
PATERSON NSW 2421

Dear Sharon

Re: Restoration of estuarine habitats in Hexham Swamp – Aboriginal Cultural Heritage Issues.

Following a recent meeting with you and project consultants from WBM and Umwelt, the Awabakal Local Aboriginal Land Council has discussed the proposed restoration of estuarine habitats in Hexham Swamp. We are particularly interested in this project because we consider that the swamp would, in its natural condition, have provided Aboriginal people with many different plant and animal resources. The tributary channels in the swamp would have been navigable by canoe, and the swamp would have provided excellent fishing.

The significant site near the western margin of the swamp is an important place for Awabakal people. There are many archaeological sites around the margins of Hexham Swamp, providing abundant artefactual evidence of the places favoured by the Aboriginal people who lived in the area. We are also aware that the local historical records, in newspapers, private journals etc, document conflicts between European settlers and the local Aboriginal people during the early and mid nineteenth century, as the Aboriginal community's access to traditional foods, fishing grounds, camping sites and ceremonial sites was destroyed.

We understand that since the construction of the floodgates on Ironbark Creek some 30 years ago, the landscape of Hexham Swamp, which was in the past highly valued by Aboriginal people, has changed a great deal. The swamp vegetation is much more dominated by reed beds than previously, and much of detailed habitat patterning has been lost.

Therefore, we applaud the work of the HCMT to restore the tidal water circulation in Hexham Swamp by at least partly opening the Ironbark Creek floodgates. The landscape that is created by this process will reflect more closely the landscape and resources that were valued by Aboriginal people in the past. The restored tidal circulation will encourage fish breeding and help to maintain fish stocks in the Hunter Estuary.

We would like to comment on two aspects of the project:

Firstly, we would like to have an ongoing role in the restoration process. This might involve several things. For instance, we would like to contribute, with the HCMT and NP&WS to the ongoing management of the swamp, so that Aboriginal community values and ideas are always given consideration.

Several people in the Awabakal community have excellent skills in graphic art, printmaking and film making, and we would welcome an opportunity to discuss with the HCMT how we could contribute to the documentation and interpretation of the restoration process. This is very important to us.

Secondly, we have been working with Umwelt's archaeologists to assess the potential impacts of the restoration of tidal water flows in the swamp on Aboriginal sites. We have discussed the possibility that increased water levels would allow wave action to encroach on sites around the swamp margin. We understand that this impact will not occur, because water levels (including fold levels) around most of the swamp margin will not change.

We have also discussed the potential impacts of Aboriginal artefacts of the construction of a low bund wall along the margin of the swamp at Shortland. This bund will protect a small area of low-lying property from occasional inundation. When we visited this location, three flaked stone artefacts were observed on the low-lying land that has been disturbed by horse grazing.

In our view, these artefacts should remain where they are. We recommend that the bund is made of clean imported soil, with no on-site excavation, and that the artefacts be buried under the bund. We consider that this is the best way to protect the artefacts. The location of the artefacts can be recorded with GPS, so that they can be recovered at a later date if the Land Council wishes to do so.

Thank you for opportunity to provide our views. We re-iterate our view that the restoration of Hexham Swamp is an excellent project for the Hunter estuary. If you would like more information, please contact Ron Gordon at the Awabakal Local Aboriginal Land Council office on 49654532.

Kind Regards

Andrew Smith
Chairperson

APPENDIX 2

NPWS Site Register Search

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0415	BQ4;	AMG	56	365040	6364130	AFT,	Open Camp Site	Nightingale,A (18-MAY-95)	
38-4-0612	EASTWOOD 2	AMG	56	365200	6357120	AFT,		Besant,A (01-AUG-01)	
38-4-0336	NSS 1;Newcastle Sub Station 1;	AMG	56	365900	6355900	AFT,	Open Camp Site	Oakley,B (01-JUN-93)	
38-4-0236	Blue Gum Creek;	AMG	56	365990	6361050	GDG	Axe Grinding Groove		1333, 98165,
38-4-0335	NSS 2;Newcastle Sub Station 2;	AMG	56	366000	6356000	AFT,	Open Camp Site	Oakley,B (01-JUN-93)	
38-4-0235	Blue Gum Creek;	AMG	56	366040	6361050	GDG	Axe Grinding Groove		1333, 98165,
38-4-0089	Killingworth;M-W-6;	AMG	56	366230	6354900	AFT,	Open Camp Site		543,
38-4-0158	Reynolds Rock.;	AMG	56	366250	6364610	GDG	Axe Grinding Groove		1333,

Number of Sites :165

29/08/2002 11:24:26

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0109	Stockrington Grooves;Minmi;	AMG	56	366380	6360280	GDG	Axe Grinding Groove	Happ,G (01-MAR-82)	98165,
38-4-0090	Killingworth;	AMG	56	366450	6354950	AFT,	Open Camp Site	ASRSYS, (01-JAN-00)	351,
38-4-0137	Site 3;	AMG	56	366750	6358750	AFT,	Open Camp Site	Donlon,D (22-MAY-86)	1022, 1221, 98165,
38-4-0297	George Booth 3;	AMG	56	366820	6358900	AFT,	Isolated Find	Lloyd,A (01-JUL-91)	607, 2067, 98165,
38-4-0222	Blue Gum Creek;	AMG	56	367250	6361340	GDG	Axe Grinding Groove		1333, 98165,
38-4-0106	Black Hill Open Site;	AMG	56	367450	6365400	AFT,	Open Camp Site	Greer,S (02-JUN-83)	
38-4-0338	Ironbark 1;	AMG	56	367590	6369690	AFT,	Isolated Find	Ruig,J (30-AUG-93)	2681,

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0543	FC-OS-1	AMG	56	367790	6356330	AFT,		Mills,R (23-AUG-00)	
38-4-0140	Four Mile Creek 2;	AMG	56	367820	6366880	AFT,	Open Camp Site	Brayshaw,H (01-JUN-85)	580, 1221,
38-4-0091	Floggy Creek;M-W-8;	AMG	56	367890	6355750	GDG	Axe Grinding Groove	ASRSYS, (01-JAN-00)	
38-4-0096	Burkes Creek;M-W-13;	AMG	56	367900	6354750	AFT,	Open Camp Site	ASRSYS, (01-JAN-00)	
38-4-0092	Floggy Creek;M-W-9;	AMG	56	367900	6355670	GDG	Axe Grinding Groove	ASRSYS, (01-JAN-00)	
38-4-0101	Slatey Creek;SC1;	AMG	56	367900	6355750	GDG	Axe Grinding Groove	ASRSYS, (01-JAN-00)	
38-4-0326	Slatey Creek;	AMG	56	367900	6355770	GDG	Axe Grinding Groove		1333,

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0138	Site 4;	AMG	56	367900	6359200	STA,	Stone Arrangement	Donlon,D (01-MAY-86)	1221, 98165,
38-4-0095	Burkes Creek;M-W-12;	AMG	56	368050	6354800	AFT,	Open Camp Site	ASRSYS, (01-JAN-00)	
38-4-0139	Four Mile Creek 1;	AMG	56	368130	6367020	AFT,	Open Camp Site	Brayshaw,H (01-JUN-85)	580, 1221,
38-4-0094	Burkes Creek;M-W-11;	AMG	56	368200	6354780	AFT,	Open Camp Site	ASRSYS, (01-JAN-00)	
38-4-0327	Cherry's Bridge;	AMG	56	368240	6355180	GDG	Axe Grinding Groove	Bluff,W (22-JUN-92)	1333,
38-4-0392	Seahampton;	AMG	56	368320	6360090	GDG	Axe Grinding Groove		98165,
38-4-0394	Seahampton 1;	AMG	56	368470	6359680	GDG	Axe Grinding Groove		98165,
38-4-0078	Teralba:1;	AMG	56	368630	6353310	GDG	Axe Grinding Groove		312, 1456,

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0640	Donaldson Monitoring Site 4 (DMS4)	AMG	56	368649	6368181	AFT,		Umwelt Australia (14-AUG-02)	
38-4-0393	Seahampton;	AMG	56	368680	6359980	GDG	Axe Grinding Groove		98165,
38-4-0093	Floggy Creek;M-W-10;	AMG	56	368787	6354571	GDG	Axe Grinding Groove	ASRSYS, (01-JAN-00)	
38-4-0079	Teralba;2;	AMG	56	368990	6353230	GDG	Axe Grinding Groove	ASRSYS, (01-JAN-00)	312, 1456,
38-4-0620	Donaldson Monitoring Site 3 (DMS3)	AMG	56	369090	6367962	AFT,		Umwelt Australia (11-JUL-02)	
38-4-0339	Ironbark 2;	AMG	56	369190	6367890	AFT,	Isolated Find	Ruig,J (30-AUG-93)	2681,
38-4-0341	Black Hill Quarry 1;	AMG	56	369240	6364730	AFT,	Isolated Find		2746,
38-4-0398	ISF2;	AMG	56	369350	6355550	AFT,	Isolated Find	Effenberger,S (10-NOV-95)	3464,

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0378	ISF 2;Cockle Creek;	AMG	56	369350	6355550	AFT,	Isolated Find	Effenberger,S (10-NOV-95)	
38-5-0183	NL-IF-4	AMG	56	369430	6358410	AFT,	Isolated Find		
38-4-0397	ISF1;	AMG	56	369500	6355400	AFT,	Isolated Find	Effenberger,S. (10-NOV-95)	3464,
38-4-0377	ISF 1;Cockle Creek;	AMG	56	369500	6355400	AFT,	Isolated Find	Effenberger,S (10-NOV-95)	
38-5-0180	NL-IF-3	AMG	56	369580	6357790	AFT,	Isolated Find		
38-4-0606	NL-IF-8	AMG	56	369680	6358480	AFT,		Mills,R (03-MAY-99)	4448,
38-5-0187	NL-OS-2	AMG	56	369720	6358750	AFT,	Isolated Find		
38-4-0560	Donaldson Monitoring Program Site 1	AMG	56	369761	6369088	AFT,		Wilson,J (20-MAR-02)	

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0562	ISF2	AMG	56	369800	6368950	AFT,		Prisma Consultancies (05-FEB-97)	
38-5-0182	NL-OS-1	AMG	56	369840	6358330	AFT,	Open Camp Site		
38-4-0080	Teralba;4;	AMG	56	369850	6353260	GDG	Axe Grinding Groove	ASRSYS, (01-JAN-00)	312, 1456,
38-5-0189	NL-IF-1	AMG	56	369860	6357940	AFT,	Isolated Find		
38-5-0181	NL-IF-2	AMG	56	369860	6358310	AFT,	Isolated Find		
38-4-0115	1 Cocked Hat Creek;Wallsend;	AMG	56	369890	6357800	GDG	Axe Grinding Groove		607, 1022, 1221, 2067, 2561,
38-4-0295	George Booth 1;	AMG	56	369900	6356300	AFT,	Isolated Find	Lloyd,A (01-JUL-91)	607, 2067,
38-4-0296	George Booth 2;	AMG	56	369900	6356300	AFT,	Isolated Find	Lloyd,A (01-JUL-91)	607, 2067,
38-5-0188	NL-OS-3	AMG	56	369950	6357350	AFT,	Isolated Find		

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-5-0184	NL-IF-5	AMG	56	369950	6357920	AFT,	Isolated Find		
38-5-0186	NL-IF-7	AMG	56	369960	6358320	AFT,	Isolated Find		
38-5-0185	NL-IF-6	AMG	56	370090	6358040	AFT,	Isolated Find		
38-4-0070	Minmi Road;	AMG	56	370266	6363377	AFT,	Open Camp Site	ASRSYS, (01-JAN-00)	
38-4-0108	Booragul;	AMG	56	370317	6355880	GDG	Axe Grinding Groove	Sullivan,K (01-DEC-82)	
38-4-0561	ISF1	AMG	56	370500	6369100	AFT,		Prisma Consultancies (05-FEB-97)	
38-4-0639	Donaldson Monitoring Site 5 (DMS5)	AMG	56	370665	6368177	AFT,		Umwelt Australia (14-AUG-02)	
38-4-0638	Donaldson Monitoring Site 6 (DMS6)	AMG	56	370809	6369721	TRE,		Umwelt Australia (14-AUG-02)	

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0621	Donaldson Monitoring Site 2 (DMS2)	AMG	56	370966	6368184	AFT,		Umwelt Australia (11-JUL-02)	
38-4-0630	IF1/Glendale	AMG	56	371180	6357400	AFT,		Brayshaw,H (20-JUN-00)	97766,
38-4-0116	Site 2	AMG	56	371400	6354600	AFT,	Open Camp Site		1022, 1221, 2067,
38-4-0554	Viney Creek 2 Artefact Scatter	AMG	56	371433	6368649	AFT,		Wilson,J (16-MAR-01)	97572,
38-4-0550	Viney Creek 1 Artefact Scatter	AMG	56	371567	6368830	AFT,		Wilson,J (16-MAR-01)	97572,
38-4-0552	South Beresfield Freeway Industrial Estate	AMG	56	371575	6368060	PAD,		Wilson,J (16-MAR-01)	97572,
38-4-0631	IF2/Glendale	AMG	56	371710	6357310	AFT,		Brayshaw,H (20-JUN-00)	97766,

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0555	M-1F-1	AMG	56	371840	6361170	AFT,		Australian Museum Business Ser (25-SEP-99	
38-4-0551	John Renshaw Drive Isolated Find	AMG	56	371846	6368253	AFT,		Umwelt Australia (16-MAR-01)	97572,
38-4-0376	ISF3/ISF4;	AMG	56	372050	6365250	AFT,	Open Camp Site	Effenberger,S (10-NOV-95)	
38-4-0379	BS2;	AMG	56	372180	6368800	AFT,	Open Camp Site	Curran,N (04-OCT-95)	
38-4-0387	BS2;	AMG	56	372180	6368800	AFT,	Open Camp Site	Curran,N (04-OCT-95)	
38-4-0553	M-GG-1	AMG	56	372190	6361120	GDG		Australian Museum Business Ser (25-SEP-99	
38-4-0141	Site 3;	AMG	56	372200	6358200	AFT,	Open Camp Site	Donlon,D (01-APR-86)	1221,

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0410	Woods Gully	AMG	56	372200	6366100	AFT,	Open Camp Site	Effenberger,S (21-MAR-96)	
38-4-0388	BS3;	AMG	56	372200	6369100	AFT,	Open Camp Site	Curran,N (04-OCT-95)	
38-4-0401	Thorn-1;	AMG	56	372200	6371600	AFT,	Open Camp Site		3060,
38-4-0557	M-GG-2	AMG	56	372240	6361140	GDG		Martin,G (26-SEP-99)	
38-4-0442	Brush Creek;	AMG	56	372260	6356800	GDG	Axe Grinding Groove	Miller,R (03-MAY-97)	1333,
38-4-0465	Site 6;Beresfield;	AMG	56	372300	6368250	AFT,	Open Camp Site	Kuskie,P (02-NOV-97)	4211,
38-4-0556	M-GG-3	AMG	56	372310	6361140	GDG		Australian Museum Business Ser (26-SEP-99	

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0603	BRUSH CREEK 2	AMG	56	372340	6356280	AFT,		Brayshaw,H (19-JUN-00)	97766,
38-4-0464	Site 5;Beresfield;	AMG	56	372350	6368170	AFT,	Open Camp Site	Kuskie,P (01-NOV-97)	4211,
38-4-0382	BS6;	AMG	56	372360	6369050	AFT,	Open Camp Site	Curran,N (04-OCT-95)	
38-4-0391	BS6;	AMG	56	372360	6369050	AFT,	Open Camp Site	Curran,N (04-OCT-95)	
38-4-0472	Site 1;Beresfield;	AMG	56	372380	6367130	AFT,	Isolated Find	Kuskie,P (01-NOV-97)	4211,
38-4-0380	BS4;	AMG	56	372400	6369300	AFT,	Open Camp Site	Curran,N (04-OCT-95)	
38-4-0389	BS4;	AMG	56	372400	6369300	AFT,	Open Camp Site	Curran,N (04-OCT-95)	

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0476	TT 1;Thorton;	AMG	56	372400	6371000	AFT,	Open Camp Site	Rheinberger,P (01-MAY-98)	
38-4-0451	Maryland Creek;	AMG	56	372450	6358700	GDG	Axe Grinding Groove	Miller,R (16-AUG-97)	1333,
38-4-0381	BS5;	AMG	56	372500	6369150	AFT,	Open Camp Site	Curran,N (04-OCT-95)	
38-4-0390	BS5;	AMG	56	372500	6369150	AFT,	Open Camp Site	Curran,N (04-OCT-95)	
38-4-0466	Site 7;Beresfield;	AMG	56	372590	6368300	AFT,	Isolated Find	Kuskie,P (02-NOV-97)	4211,
38-4-0473	Site 2;Beresfield;	AMG	56	372650	6367770	AFT,	Isolated Find	Kuskie,P (01-NOV-97)	4211,
38-4-0469	Site 11;Beresfield;	AMG	56	372700	6368520	AFT,	Open Camp Site	Kuskie,P (02-NOV-97)	4211,

Number of Sites :165

29/08/2002 11:24:26

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0493	NR-OCS-1	AMG	56	373000	6361110	AFT,	Open Camp Site		
38-4-0463	Site 4;Beresfield;	AMG	56	373000	6368200	AFT,	Open Camp Site	Kuskie,P (01-NOV-97)	4211,
38-4-0496	NR-0CS-4	AMG	56	373040	6361900	AFT,	Open Camp Site		
38-4-0425	Black Hill 3;BH3;	AMG	56	373100	6365820	AFT,	Open Camp Site	Nightingale,A (14-JUN-96)	
38-4-0497	NR-OCS-5	AMG	56	373190	6361260	AFT,	Open Camp Site		
38-4-0167	Winding Creek (Glendale);	AMG	56	373200	6355400	AFT,	Open Camp Site		1672,
38-4-0438	Rons find;	AMG	56	373200	6358590	GDG	Axe Grinding Groove	Miller,R (16-AUG-97)	1333,
38-4-0348	Thornton 4;	AMG	56	373200	6371670	AFT,	Open Camp Site	Kuskie,P (24-MAY-94)	
38-4-0530	Blue Gum Hills 1	AMG	56	373240	6362240	AFT,	Open Camp Site		

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0347	Thornton 3;	AMG	56	373450	6371700	AFT,	Open Camp Site	Kuskie,P (24-MAY-94)	
38-4-0494	NR-OCS-2	AMG	56	373470	6361210	AFT,	Open Camp Site		
38-4-0168	Winding Creek (Glendale) Site 5;	AMG	56	373500	6355300	AFT,	Open Camp Site		1672,
38-4-0170	Winding Creek Glendale Site 3;	AMG	56	373500	6355400	AFT,	Open Camp Site		1672,
38-4-0329	MB2;	AMG	56	373500	6368600	AFT,	Open Camp Site	Steel,N (24-SEP-92)	2410,
38-4-0172	Winding CK Glendale Site 6;	AMG	56	373600	6354900	TRE,	Scarred Tree		1672,
38-4-0474	Site 3;Beresfield;	AMG	56	373600	6368050	AFT,	Isolated Find	Kuskie,P (01-NOV-97)	4211,
38-4-0471	Site 10;Beresfield;	AMG	56	373650	6368400	AFT,	Open Camp Site	Kuskie,P (02-NOV-97)	4211,
38-4-0171	Winding Creek Glendale Site 4;	AMG	56	373700	6355100	AFT,	Open Camp Site		1672,

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0360	Thornton 12;	AMG	56	373750	6371400	AFT,	Open Camp Site	Kuskie,P (24-AUG-94)	
38-4-0366	Thornton 11;	AMG	56	373750	6371400	AFT,	Open Camp Site		
38-4-0346	Thornton 2;	AMG	56	373750	6371900	AFT,	Open Camp Site	Kuskie,P (24-MAY-94)	
38-4-0345	Thornton 1;	AMG	56	373900	6371700	AFT,	Open Camp Site	Kuskie,P (24-MAY-94)	
38-4-0358	Glenrowan;	AMG	56	374000	6368300	AFT,	Open Camp Site	Atkinson,G (22-NOV-91)	
38-4-0087	Sandgate;Shelley Creek;	AMG	56	374790	6361790	AFT,	Open Camp Site	ASRSYS, (01-JAN-00)	
38-4-0325	Tarro;	AMG	56	374900	6368750	AFT,	Open Camp Site		
38-4-0081	Wallsend;	AMG	56	375133	6357434	GDG	Axe Grinding Groove	ASRSYS, (01-JAN-00)	

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0343	Garden Suburb	AMG	56	376200	6353500	GDG	Axe Grinding Groove		
38-4-0357	Garden Suburb;	AMG	56	376200	6353500	GDG	Axe Grinding Groove	Effenberger,S (11-JAN-94)	
38-4-0408	Shortlands Site 1;	AMG	56	376750	6360500	AFT,	Open Camp Site		3498,
38-4-0407	Shortlands Site 2;	AMG	56	376900	6360550	AFT,	Open Camp Site		
38-5-0154	Myall Rd;	AMG	56	377000	6353000	AFT,	Open Camp Site	Effenberger,S (17-JUN-96)	
38-4-0016	Cardiff;Blackbutt Reserve;	AMG	56	377222	6353359	GDG	Axe Grinding Groove	ASRSYS, (01-JAN-00)	
38-4-0017	Cardiff;Blackbutt Reserve;	AMG	56	377222	6353359	GDG	Axe Grinding Groove	ASRSYS, (01-JAN-00)	
38-4-0082	Lambton;	AMG	56	377918	6355201	GDG	Axe Grinding Groove	ASRSYS, (01-JAN-00)	

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0085	Lambton;	AMG	56	377918	6355201	GDG	Axe Grinding Groove	ASRSYS, (01-JAN-00)	
38-4-0249	T 8;	AMG	56	378200	6367400	AFT,	Open Camp Site		1845,
38-4-0250	T 8 A (T9);	AMG	56	378400	6367300	AFT,	Open Camp Site		1845,
38-4-0248	T 7;	AMG	56	378900	6367400	AFT,	Open Camp Site		1845,
38-4-0075	Tomago;	AMG	56	379380	6366800	TRE,	Scarred Tree	ASRSYS, (01-JAN-00)	533,
38-4-0030	Waratah;Mayfield;	AMG	56	380565	6360280	AFT,	Open Camp Site	ASRSYS, (01-JAN-00)	
38-4-0041	Dempsey Island;By New Bridge;	AMG	56	381456	6361486	AFT,	Open Camp Site	ASRSYS, (01-JAN-00)	
38-4-0242	T 1;	AMG	56	383600	6368300	AFT,	Open Camp Site	Ross,A (01-MAR-90)	1845,

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0244	T 3;	AMG	56	383900	6368700	AFT,	Open Camp Site	Ross,A (01-MAR-90)	1845,
38-4-0247	T 6;	AMG	56	383900	6368800	AFT,	Open Camp Site	Ross,A (01-MAR-90)	1845,
38-4-0246	T 5;	AMG	56	383900	6368900	AFT,	Open Camp Site	Ross,A (01-MAR-90)	1845,
38-4-0245	T 4;	AMG	56	384200	6368800	AFT,	Open Camp Site	Ross,A (01-MAR-90)	1845,
38-4-0544	700 Hunter Street	AMG	56	384250	6356020	AFT,		Steele ,D (09-OCT-01)	
38-4-0243	T 2;	AMG	56	384400	6368700	AFT,	Open Camp Site	Ross,A (01-MAR-90)	1845,
38-4-0048	Merewether;Dixon Park;	AMG	56	384704	6354141	AFT,	Open Camp Site	ASRSYS, (01-JAN-00)	

AHIMS
Aboriginal Heritage Information Management System

List of Sites (List)

ahims6465

Grid Reference Type = AMG Zone = 56 Easting From = 365000 Easting to = 385000 Northing From = 6353000 Northing to = 6372000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types (recorded prior to June 2001)	Recording (Primary)	Reports (Catalogue Number)
38-4-0559	The Broadwalk- Newcastle 1	AMG	56	385000	6356250	PAD,		Dallas,M (01-FEB-02)	