Gerroa Sand Mine Extension

Archaeological Subsurface Testing Program

October 2006

A Report to Perram and Partners
on behalf Cleary Bros (Bombo)

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EXECUTIVE SUMMARY

Cleary Bros (Bombo) operates a sand mine near Gerroa on the south coast of NSW. Cleary Bros is now seeking to extend the sand mining area to the north. In 2005 Navin Officer Heritage Consultants produced an Aboriginal Cultural Heritage Review of the extension to the extraction area for internal use by Cleary Bros.

The 2005 Cultural Heritage Review found that there was a need to conduct additional archaeological investigations within the proposed extension area. Further investigation was considered necessary to determine the nature of any sites and to assess the significance of archaeological material in the area. It was also considered that additional investigation within the previously approved mine area, as part of the overall extension proposal, was warranted for comparative purposes.

This report details the results of the subsurface investigations that were undertaken in April 2006.

Aboriginal consultation involved members of the Jerrinja LALC and the Jerrinja Consultants. Representatives of each group participated in the investigations.

A total of fifty-one (51) test pits were conducted during the Gerroa Sand Mine subsurface testing program.

Shell material was recovered from 26 of the 51 test pits.

A total of 39 lithic items were recovered from five of the 51 test pits.

The pattern of shell midden distribution within the proposed mining area is characterised by sparse, spasmodic and fragmented Pipi shell scattered across the dune. However, there appears to be isolated occurrences of higher concentrations of midden on the crest on the western side of the dune, in particular overlooking Foys Swamp.

Overall, the lithic assemblage likely represents occasional manufacture of implements such as backed artefacts and retouched items, and flake production from small freehand and bipolar cores. The occurrence of artefacts is even sparser than shell midden material.

There is some potential for burials to exist within the study area. However, monitoring of the soil stripping operations by local Aboriginal representatives for the existing sand mine has failed to locate any burials.

Overall, the limited nature of the research potential of the site reduces its significance. Despite this the site retains value given the reduced representation of this site type in the local area. Based on an assessment of the archaeological features revealed by the present investigation (refer Section 7) the site complex within the study area can be characterised as having moderate significance at a local level and low to moderate significance at a regional level.

Given the level of information available, there are no archaeological reasons to prevent the sand mine extension from proceeding, with some conditions. While the size of the archaeological site is being diminished, the potential for other such sites to occur in the local Shoalhaven Bight area is high.

The preservation of 6000m^2 of dune crest will ensure that a portion of the current site is retained. This area needs to be permanently set aside for archaeological as well as floral values. The proposed rainforest and archaeological conservation area would therefore likely preserve a sample of the archaeological record within the study area that is twice the size identified previously.

Unanswered research questions about the site should also to be addressed. These include the age of the site and if possible a more in depth study of the stone artefact component. Detailed excavation is the best possible method for obtaining the data to address these issues. Limited targeted salvage excavation should be a condition of Consent for the project.

It is recommended that should the sand mining extension proceed the following conditions be applied (Full recommendations are provided in Section 10).

- The area outside the proposed mine extension identified as littoral rainforest is preserved also for archaeological values. It should be mapped, and marked prior to any other work proceeding. The area should be afforded a suitable batter so that erosion into the dredge pond does not occur in the long term future.

- Limited salvage excavations should occur at appropriate locations prior to mining proceeding to that location. Excavation would be aimed to retrieve and analyse a sample of the artefacts within the site. Salvage excavation would also retrieve a sample of material (shell and or charcoal) for radiocarbon dating and further analysis.

- Monitoring of soil stripping by the Aboriginal community should occur to recover additional archaeological material.

- Cleary Bros should adopt the Protocol in Appendix 5.

- Ongoing consultation with the Aboriginal community should also be carried out.

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1. INTRODUCTION

1.1 Project Background

Cleary Bros (BOMBO) operates a sand mine near Gerroa on the south coast of NSW (Figure 1.1). Since 1988, a number of archaeological assessments have been undertaken as part of the ongoing environmental assessment and management processes and following rulings by the Land and Environment Court (Colley 1988, Lance 1989, 1990, Paton 1992, Huys 1997, Barber 2000, 2002, Navin Officer 2005). These investigations have identified a number of archaeological sites within the sand extraction area. The results of the Paton investigations also produced a recommendation that areas be reserved from mining activity.

Cleary Bros is now seeking to extend the sand mining area to the north. In 2005 Navin Officer Heritage Consultants produced an Aboriginal Cultural Heritage Review of the extension to the extraction area for internal use by Cleary Bros. This investigation included a review of the entire application area within previously approved sand mining areas and the new sand mining area defined as a narrow strip along Seven Mile Beach Road (Figure 1.2). The investigation included a review of the previous work conducted in the Gerroa sand mining area, an assessment of the status of previously identified conservation areas in the area, a field inspection of the area and Aboriginal consultation.

Overall, the study area was assessed as potentially having moderate to high archaeological significance. However, the exact extent of the midden deposits and their nature and preservation status could not be determined based on previous surveys. The proposed extension within a cleared strip of ground outside the previous mining approval boundary had not been subject to subsurface investigations.

The 2005 Cultural Heritage Review found that there was a need to conduct additional archaeological investigations within the proposed extension area. Further investigation was considered necessary to determine the nature of any sites and to assess the significance of archaeological material in the area. It was also considered that additional investigation within the previously approved mine area, as part of the overall extension proposal, was warranted for comparative purposes.

This report details the results of the subsurface investigations that were undertaken in April 2006.

1.2 Current Proposal

Cleary Bros is seeking to extend the sand mining operation to the northeast. This extension area is a long narrow stretch of sand dune between Blue Angle Creek and the Gerroa-Nowra Road, also known as Crooked River Road or Seven Mile Beach Road. The area of the proposed extension, from the edge of the existing dredge pond, is an area of approximately 800 m long and varying in width from 60-170 m. The boundaries of the extension proposals have been determined by logistical and environmental constraints, including the need to preserve significant vegetation communities.

Given the history of the study area, it was recognised by Cleary Bros that additional archaeological subsurface investigations would be required to assess the potential impact of the mining proposals on Aboriginal sites in the study area.

The previous program of subsurface investigations conducted by Paton (1992) only included part of the newly proposed extension area. Given that the study was conducted over 13 years ago, it was considered that a re-examination of the complete extension area was warranted. Paton's investigations did not include the new area of proposed mine extension in the cleared paddock. Part of the present investigation was to assess the relevance and content of preservation areas A and B identified by Paton.

This report forms part of the Environmental Assessment for the proposed sand mining project. The study has been undertaken with regard to correspondence from the relevant Government Authorities including the Department of Planning (letter dated 20/1/06) and the Department of Environment and

Conservation (letters dated 21/12/04, 30/9/05 and 28/4/06). This assessment has been prepared in consideration of the following guidelines from the Department of Environment and Conservation:

- Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation; and
- Aboriginal Cultural Heritage Standards and Guidelines Kit.

This Aboriginal heritage assessment documents the results of a program of archaeological subsurface testing within the proposed mine extension area that is subject to the new application by Cleary Bros. The report was commissioned by Perram and Partners on behalf of Cleary Bros. The subsurface testing was carried out under permit #2398 issued by the Department of Environment and Conservation.

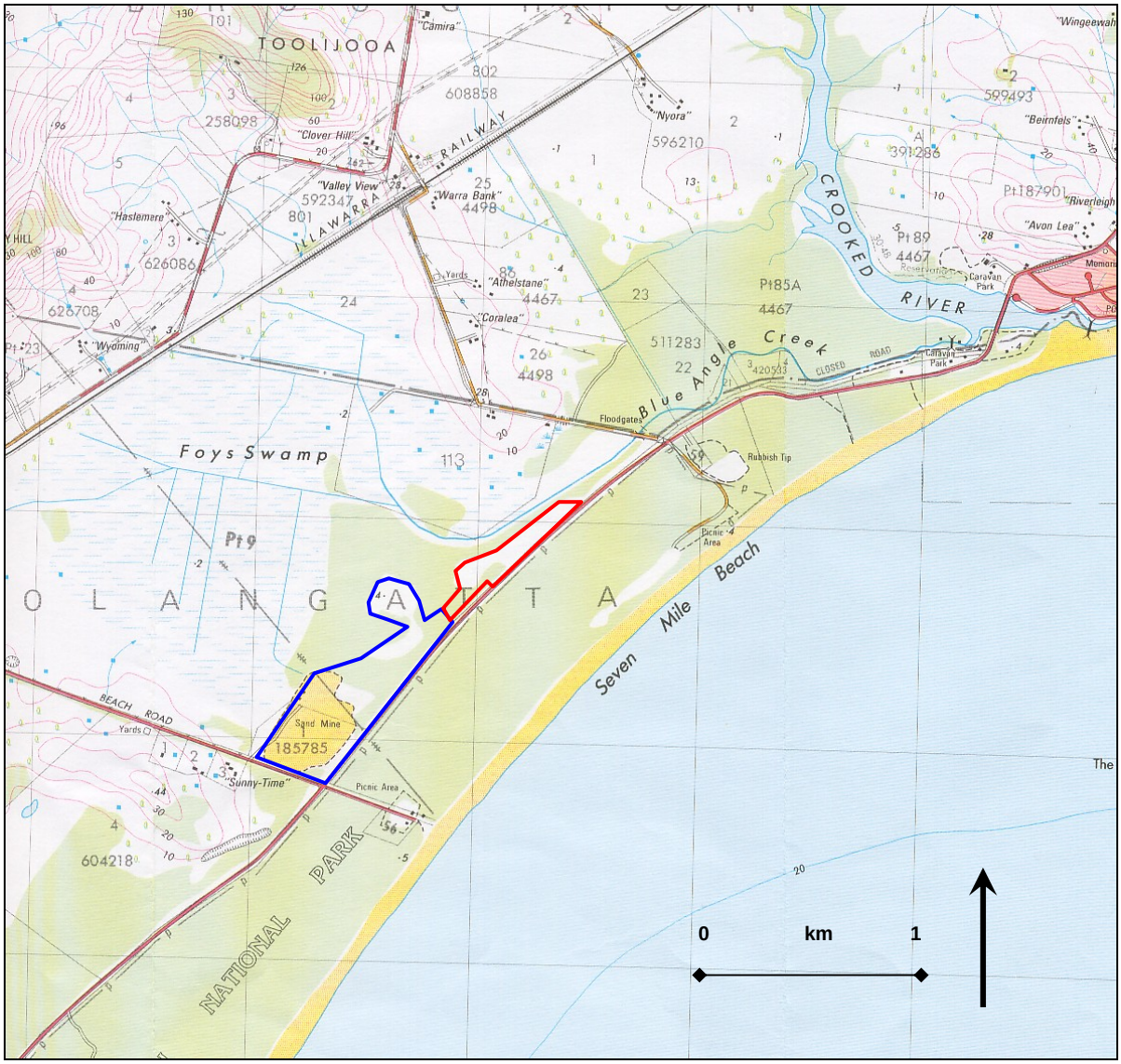

Figure 1.1 The Cleary Bros Sand Mine showing previously mined area (Blue) and proposed extension (Red).
Gerroa 1:25,000 topo map 2nd Edition

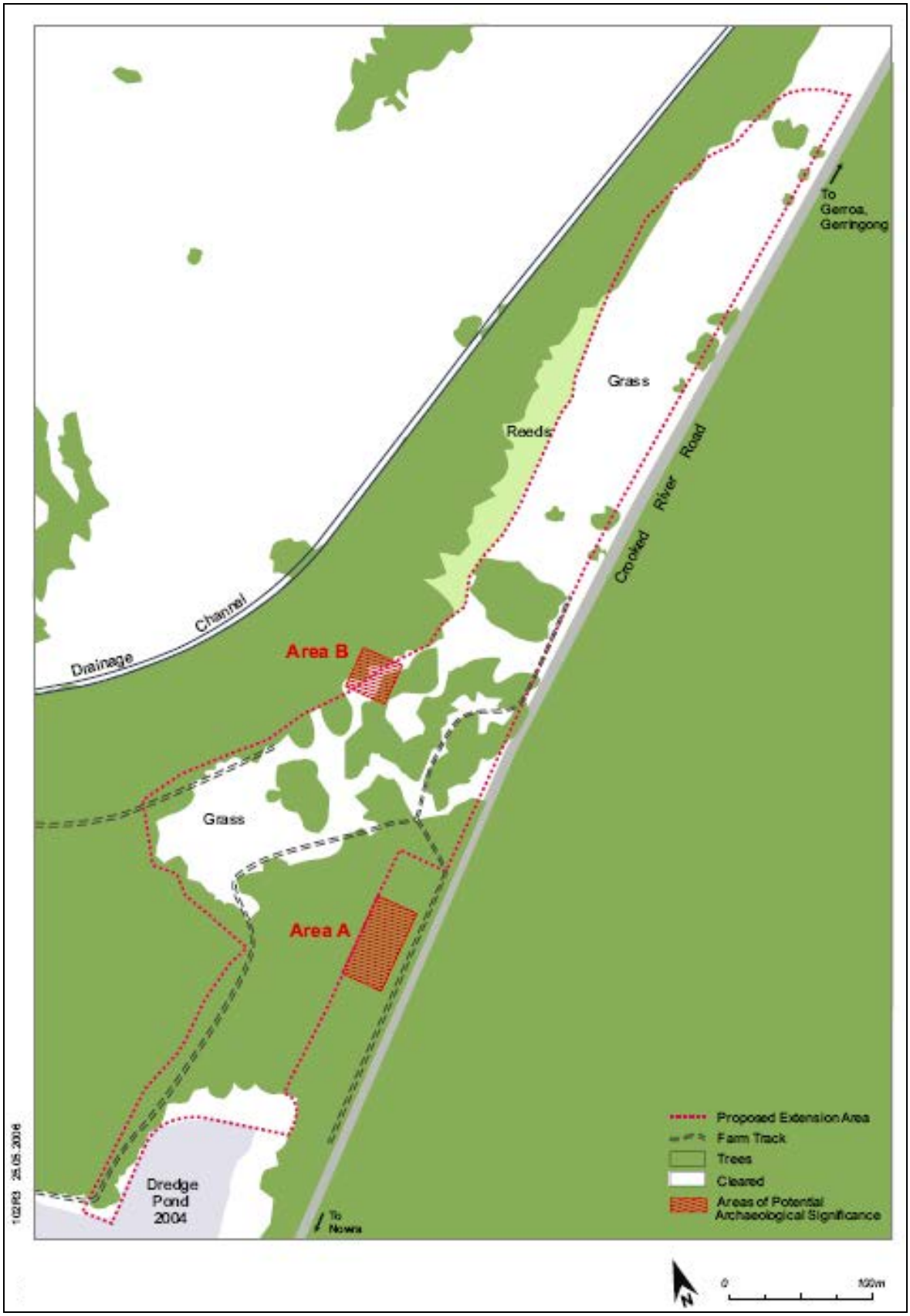

Figure 1.2. Boundaries of proposed sand mine extension (study area in red) showing approximate locations of conservation zones identified by Paton. Map supplied by client.

1.3 Personnel Involvement

The field investigations were undertaken by archaeologists Kelvin Officer, Nicola Hayes and Tom Taverner, with field assistance provided by Daniel Powell. Aboriginal representatives also participated in the fieldwork, as indicated below. Fieldwork was undertaken in two stages, three days from 15-17 March and 21-22 March 2006.

The report was written by Nicola Hayes and Matthew Barber. Lithic analysis and related sections of the report was undertaken and written by Dr Chris Clarkson.

2. ABORIGINAL CONSULTATION

The study area falls within the boundaries of the Jerrinja Local Aboriginal Land Council (LALC) and the Jerrinja Tribal Elders. Members of the Jerrinja Aboriginal community have been involved in the archaeological and cultural assessments of the Cleary Bros sand mine over the last 14 years. Both groups were contacted prior to the commencement of the field program and subsequently representatives from each group participated, including:

Jerrinja LALC: Graham Connolly (Jnr), Alfred Wellington, Desley Wellington, Noel Wellington and Craig Wellington.

Jerrinja Consultants: Graham Connolly, Gerald Carberry, Dennis Wellington and Joanne Wellington.

Records of Aboriginal Participation are provided in Appendix 1.

Once the draft report was completed, copies were provided to each group as an opportunity to provide comments about the report and recommendations and to identify the cultural significance of the area or the sites.

A letter was received from the Jerrinja LALC and is included in Appendix 2. The letter states that the proposal has merit but should not be seen as a basis for determining the significance of sites on the rest of the Cleary Bros property. The Jerrinja LALC identifies that the study concentrated on the physical evidence of Aboriginal occupation and that these are only part of the Aboriginal story. The LALC notes that the recommendations address the issues identified in the report. The Jerrinja LALC would like to continue to be consulted and involved in further monitoring works at the site.

No assessment of the cultural significance of the site or study area was provided. However, it may be inferred through the importance of the “stones and bones” that the sites have at least some cultural significance.

No response was received from the Jerrinja Consultants at the time of report completion.

3. ENVIRONMENTAL CONTEXT

3.1 General

The environmental setting of the Gerroa study area has been well documented in previous reports. A brief summary is provided for the current report.

The extension area is situated on western edge of a beach barrier dune sequence at the northern end of Seven Mile Beach. The sand would have originated offshore within Shoalhaven Bight from deposits expelled from the Shoalhaven River and creeks and redeposited by wave action between approximately 7000 and 3000 years ago. The ridgeline morphology has been relatively stable for about 3000 years (Thom et al. 1981). The surface of the ridges consists of a variably shallow mantle of windblown and re-sorted (aeolian) sands.

The southern part of the investigation area comprises the elevated dune crest and the western flanks that lead down to a sandy flat adjacent to the expansive Foys Swamp to the west (Plate 3.1). The elevation of the dune crest is approximately 6 m above sea level, down to about 2 m on the flat. The vegetation of the dune consists mainly of Blackbutt (*Eucalyptus pilularis*) and Bangalay (*E. botryoides*). There is also an understorey of mixed native, banksias, grasses and bracken and introduced plants (lantana).

The extension area continues in a north-easterly direction, where the dune parallels Blue Angle Creek. This section has been cleared of native vegetation and was subject to ploughing and cultivation. The upper deposits are therefore heavily disturbed, and the dune appears to have been partially deflated and levelled. The area has more recently been used for grazing. Vegetation now consists of pasture grasses with the occasional remnant tree (Plate 3.2). The dune in this section of the study area reaches a high point of about 6 m before dropping sharply to the west down to the creek. Blue Angle Creek is a tributary of Crooked River, which outlets to the sea at the northern end of Seven Mile Beach. Blue Angle Creek emanates from Foys Swamp which has been drained and is now used for grazing.

The sand dune continues further north but the elevation decreases and the ground is characterised by more undulating terrain with crests and swales of sandy deposit that appear to represent a change in the dune formation or orientation. This area is not part of the proposed sand mine extension.

3.2 Location of Test Pits

Archaeological test pits were located to test the landscape features including:

- Low sandy flat;
- High ground that is probably the dune crest;
- The cleared and grazed area; and
- Creek margin.

Plate 3.1 Low sandy flat of extension area looking north

Plate 3.2 Cleared section of extension area looking north east

4. ARCHAEOLOGICAL CONTEXT

4.1 Tribal Area and Language

The Gerroa area falls within the tribal area delineated by Tindale (1974) as Wodi Wodi, an area which extends from Wollongong to north of the Shoalhaven, and west as far as Picton, Marulan and Moss Vale. Eades (1976) defines the language spoken by Wodi Wodi as Dharawal. Some contemporary Aboriginal groups now identify the Illawarra tribe(s) as the Elouera, possibly guided by early references to the pronunciation of Illawarra as 'Eloura' or 'Ellowera' meaning a pleasant place (Thornton's 1896 word list published in Organ 1990:358, also McCaffrey's notebook 13, 1910-1930, in Organ 1990:486).

4.2 Aboriginal Occupation in the Historic Period

There are a small number of references in official and ethno-historic documentation that indicate that the Gerringong/Gerroa and Black Head area were a focus for Aboriginal occupation following European settlement within the Illawarra.

The 1834 Return of Aboriginal Natives taken at Shoal Haven identifies 11 people, including five male adults, 3 'wives' and three children, belonging to the *'Gerongong'* tribe. The Gerongong tribe was noted to reside at Blackhead, (in Organ 1990:189), and thus probably infers an encampment site on the Crooked River estuary mouth, in the general area of present day Gerroa. In the 1836 Return, the Gerongong tribe included 14 people, and by 1837, 21 people, including 11 male adults, five wives and five children (in Organ 1990:201, 214). A similar number was indicated in a Census of Natives by Berry in 1838 (in Organ 1990:240). Berry's blanket return for 1840 simply lists eleven adult male recipients (in Organ 1990:264).

In 1867, the death of an Aborigine known as 'Commodore' or 'Commandant' was noted 'from the effects of exposure and want' at the Minnamurra Estuary Aboriginal encampment, on the then Eureka Estate. 'Commandant', or Jaunda, had been listed as a member of the Gerongong tribe, aged 14 in the 1837 return (in Organ 1990:214, 321). This is suggestive of considerable movement of Aborigines between the main encampments in this part of the Illawarra, namely between Mt Coolangatta (on the Berry Estate), Crooked River, and the Minnamurra River Estuary.

4.3 Regional Archaeological Context

The New South Wales south coast and its hinterlands have been the subject of extensive archaeological research over the last thirty years, much of it concentrated along the coastline and estuaries. This includes excavations of Aboriginal sites, mainly shell middens and rock shelters, and detailed and systematic regional surveys. The majority of archaeological sites located in this region date to the last 6,000 years, when the sea levels stabilised to approximately the present level (the Holocene stillstand).

Following the stabilisation of sea levels the development of coastal estuaries, mangrove flats and sand barriers would have increased the resource diversity, predictability, and the potential productivity of coastal environments for Aborigines. In contrast, occupation during the late Pleistocene ie. prior to 10,000 years BP (Before Present), may have been sporadic and the Aboriginal population relatively small. Sites older than 6,000 years are rare, as most of these would have related to previous shorelines which have now been destroyed or submerged by rising seas.

Many Aboriginal sites have been located in the course of archaeological surveys within the Illawarra region. Site types include rock shelters with art and/or cultural deposit, grinding grooves, artefact scatters, scarred trees, coastal and estuarine midden sites and burials.

Shell middens are the most common Aboriginal site type to occur within the coastal landscape. These sites are generally located on rocky headlands and on coastal sand dunes adjacent to rock platforms or creek and estuary entrances. Further inland the most common site type to be

encountered is small scatters of stone artefacts, sometimes referred to as 'open camp sites'. Based on present evidence, the most common stone materials utilised by the Aborigines of the Illawarra area were chert, quartz, silcrete, silicified wood and a variety of volcanics.

4.4 Previous Studies in the Gerroa Area

To date some twenty three Aboriginal archaeological sites have been recorded in 10 x 12 km area around the study area (NPWS Site Register Search). Site types recorded in the Gerringong/Gerroa region include shell middens, artefact scatters and a burial site. The most commonly occurring site type is the shell midden.

Much of the archaeological investigation work conducted in the Gerringong/Gerroa locale has been carried out in within the Cleary Brothers' Blue Angle Creek property. This work is summarised in Section 4.5 below.

Brief examinations of the beach ridge complex in Seven Mile Beach National Park undertaken by Lance (1989) and Sullivan (1982) revealed minor traces of pipi shells in the foredunes.

In 1999 Jo McDonald Cultural Heritage Management conducted an archaeological assessment of proposed Sewage Treatment Plant (STP) and Sewage Pump Stations (SPS) sites as a component of the Environmental Impact Statement for the proposed Gerringong Gerroa Sewerage Scheme. McDonald identified various zones of archaeological sensitivity and five Aboriginal scarred trees within the STP site, which is located on the western side of Gerroa Road immediately south of Crooked River. She also identified five SPS sites as sensitive. She recommended that subsurface archaeological investigation be conducted within the STP area and at five of the SPS sites.

Subsequently a comprehensive program of archaeological subsurface testing (Navin Officer Heritage Consultants 2000a) and salvage was conducted for the Gerringong Gerroa Sewerage Scheme. Fifty four test pits were excavated within the STP and access road study areas in the testing program, using both machine and hand excavation methods. A total of 2,507 stone artefacts were recovered from 40 of the 54 excavated pits.

Forty eight artefacts were recovered from two of the five sewage pumping station sites, (ie two out of the seven test pits). An Aboriginal burial was located in sand deposits in the course of salvage archaeological excavations for the Sewerage Scheme.

Navin Officer Heritage Consultants (2000b) conducted a survey of a proposed subdivision area, the '*Elambra Estate'*, located just south of Gerringong. Two Aboriginal artefacts (isolated finds) were located in the course of the survey.

Navin Officer Heritage Consultants conducted an archaeological survey of five hectares of land comprising Lots 4 and 6 DP 541889, in East Gerringong in 2002. One Aboriginal site, East Gerringong 1 (EG1), and one potential archaeological deposit (PAD1) were recorded within the study area. Subsequently a program of subsurface testing was conducted at East Gerringong (Navin Officer Heritage Consultants 2003). A total of twenty seven lithic items were recovered from eight (50%) of the sixteen test pits excavated at East Gerringong.

In March 2003, Matthew Barber conducted a survey relating to upgrading facilities in the Seven Mile Beach National Park (Barber 2003). One small pipi midden was identified in the course of his survey. The shell material was visible over an area of about 4 x 3 m on the crest and eastern slope of a low dune near an existing toilet block and septic tank at the eastern end of Beach Road.

4.5 Previous Studies in the Sand Mine Area

The bulk of the archaeological information for the local area comes from the archaeological surveys and assessments undertaken in relation to the Cleary Bros mining operations. Colley (1988) conducted a brief investigation of the sand mining area and concluded that more extensive archaeological investigations were required.

Subsequently, Lance (1989) carried out a study of the sand mining area, including site mapping, artefact collection and subsurface testing by auger and excavation. Lance concluded that the midden deposits that were noted were generally about 20 cm below the surface and the main shell type was Pipi. Pipi shell was also noted extending from the existing sand extraction area to the Crooked River. Lance concluded the sites were not archaeologically significant and that they could be destroyed under a Consent to Destroy permit.

There were some objections from the NPWS to the significance assessment made by Lance and after a court review, Paton (1992) was contracted to undertake more intensive investigations within the sand mining development area. In conjunction with Wilfred Shawcross and students from the ANU, they carried out detailed site mapping, an extensive auguring program and some hand excavations. The study examined both the development area and the sand dunes within Seven Mile Beach National Park, on the eastern side of Gerroa Road.

The study found surface evidence of 41 middens, of which 29 were regarded as intact, the rest disturbed or redeposited. The auguring program was undertaken at a 5 m grid, auguring 2,000 holes, and located 31 midden deposits within the sand mining study area but curiously no midden deposits within the 1000 auger holes within the National Park. There was a pattern in the location of the sites, with 81% located on the crest of the dunes, 16% on the eastern face and only one midden (3%) on the western face of the dune system.

Six areas were chosen for hand excavation by Paton, which revealed that where shell midden was located, it was consistently in a band 10-20 cm below the surface. Below this, a more decomposed midden was found at depths of 40-60 cm. Artefacts were found in association with the deeper midden but also occurred to 100 cm below the surface.

The artefacts recovered during the excavations were found by Paton to represent two cultural phases of Aboriginal occupation. The artefacts from the lower deposits were characteristic of the microblade tradition, of small flakes and retouched or backed flakes and blades. This tradition dates from approximately 5,000 years ago. The upper levels of the deposits contained artefacts made using Bipolar technology, which is thought to have essentially replaced the microblade tradition.

The conclusion drawn by Paton from the excavations was that the crest and western edge contained a full cultural sequence of stone artefacts, whereas the eastern side contained no artefacts in the lower yellow sands (Paton 1992:40). There is some contradiction in this conclusion in relation to the location of shell middens but this is not discussed further in Paton's report.

In relation to the lack of archaeological material within the National Park, Paton concluded that the Park had few water sources (ephemeral depressions), was not close to any foci of food resources (eg Foys Swamp) and the dunes within the park were not as high and level as those in the Cleary Bros property. Paton considered that the negative result was 'an accurate reflection of the general absence of sites in this area' (Huys 1997:15).

Paton identified four areas of subsurface archaeological deposit for exclusion from the development as representative samples of the midden deposits. The mapping provided in the Paton report only shows two conservation areas, both of which were in the northern section of the original application area.

In 1996 as part of her Honours degree, Lee analysed some of the material excavated from the study area. Taking into account the ethnohistorical records and an examination of sites in the surrounding area, Lee concluded that the sites within the extraction area were used periodically. She suggests that while men were undertaking initiation ceremonies at nearby ceremonial sites, the women and children occupied the dune. They would have collected pipis from the nearby beach and sat around the campfire until the men returned.

In 1997 Huys examined the sand mine area as part of the ongoing management program. He found that extraction zones 1D and 2D had been completely mined and that no archaeological material would have remained. He found that the other areas within the study area had not been disturbed by mining activity.

Barber (2000) completed a re-assessment and survey of parts of the sand quarry. Areas 5D, 6D, 7D and 8D were re-inspected as well as two of the exclusion areas identified by Paton. A new extension area to the quarry was also inspected. A new site CB2 (#52-5-0415) was identified during this study comprising a quartzite core and scattered midden shell within the proposed extension area.

A subsurface testing program was then undertaken by Barber (2002) within the proposed extension area in the vicinity of CB2. A total of 220 auger holes and a 50 x 50 cm test pit were excavated across the proposed extension area. Only 20 of the auger holes contained cultural material, eleven with stone artefacts and nine with shell midden.

Subsequently, a monitoring and collection salvage of the site CB2 was undertaken by Navin Officer Heritage Consultants (2004). The monitoring found two artefacts during the topsoil stripping process and three other artefacts in some overburden. This was considered as a low return for the potential number of artefacts within the site area.

Navin Officer Heritage Consultants (in prep) undertook an archaeological assessment for a proposed golf course on the Cleary Bros property incorporating part of the current extension proposal and part of the drained Foys Swamp. The survey for the golf course recorded a scatter of pipi midden on the surface of a dune parallel to Blue Angle Creek, within the current mine extension proposal area.

There are four previously recorded sites within the Cleary Bros mining area (Table 1). Recorded sites #259 and #261 include multiple exposures and subsurface deposits of shell midden and stone artefacts, forming a complex of archaeological material. Three of the sites have been issued with section 90 'Consent to Destroy' permits.

Table 4.1 Previously recorded sites within the Gerroa sand mine

NPWS Site #	Site Name	Site Type	Recorder/Date	AGD reference (approx.)
52-5-0259 (section 90 issued)	Brickies Pit	midden, artefacts	Lance 1989	296600.6148425
52-5-0261 (section 90 issued)	Gerroa; Cleary Bros Sand Mine	midden, open camp site	Feary 1991	296300.6148300
52-5-0385	Cleary Bros	midden	?	296830.6148500
52-5-0415 (section 90 issued)	CB2	midden, isolated find	Barber 2000	295370.6150800

The Navin Officer (2005) investigation noted that there was scattered shell material in most ground surface exposures within the mine extension study area and Aboriginal stone artefacts were visible at some locations. The locations of the cultural material were combined into a single site recording (Cleary Bros 3) as it was considered that the material was likely to extend throughout the deposits.

The previously identified conservation areas A and B (Paton 1992) were found to be intact and undisturbed by mining activity.

Overall, the area was assessed as potentially having moderate to high archaeological significance. However the exact extent of the midden deposits and their preservation status could not be determined based on the available data. It was recommended that further investigations were required to make a more informed assessment of the significance of this area. The results of that investigation are detailed below.

5. STUDY METHODOLOGY

5.1 Objectives of subsurface testing program

This Aboriginal heritage assessment forms part of the Environmental Assessment for the proposed sand mining project. The aims of the subsurface testing program were to determine if Aboriginal sites or Aboriginal Objects (as defined by the NPW Act) are located subsurface within the proposed mine extension areas.

Specific aims were to:

1. Determine if subsurface artefacts are present within the extension area.

2. Characterise the nature of any archaeological deposits encountered (within the limitations of the sampling and processing methodology).

3. Identify the need for any further archaeological work, such as salvage excavation.

4. Reassess the suitability of the conservation areas.

5. Provide informed mitigative measures and management recommendations for any sites located within the proposed development area.

5.2 Scope of the subsurface testing program

Fifty one (51) test pits, including thirty-five (35) primary pits and sixteen (16) secondary pits were excavated during the testing program.

The primary pits (30-45 cm diameter) were excavated first and the secondary, smaller (10 cm diameter) pits were excavated where there was a concentration of cultural material recovered from the primary pits. The secondary pits were used to define the boundaries of the concentration.

Primary pits were located in a 50 m grid over the area to be effected by the future mining operation. Placement of the pits within the grid varied according to several factors for example dense vegetation, access, significant landscape features (eg high ground) and areas that will not be effected by any future works, which were excluded from testing.

Conservation area A is outside the proposed development area and was not subject to testing, while the smaller area B was tested.

5.3 Excavation Methodology

The following excavation methodology was followed for mechanical auger pits.

1. Mark out and record the required pit location. Basic surveying measurements along the test transects were recorded.

2. Excavate auger pit.

Pits were excavated using a mechanically driven auger, mounted on a mini excavator (Plate 5.1). The diameter of the auger for the first nine primary test pits was 30 cm. The subsequent primary auger holes were 45 cm in diameter (the difference due to unavailability of the larger auger for the first day of fieldwork).

Auger holes were dug incrementally with spit depths ranging between 20 and 50 cm, depending on sediment conditions and testing requirements. The preferred spit interval was 30 cm. The final depth of each pit varied between 130 and 170 cm.

All material was collected from each pit (Plate 5.2) and was sieved with the aid of pressurised water from a water truck (Plate 5.3). All material was sieved through 3 mm mesh, with use of a top 5 mm mesh where appropriate.

Identified or suspected cultural lithic and shell material recovered from sieving was retained, bagged and labelled.

3. During pit excavation, the soil profile and characteristics were described.

4. All pits were backfilled, using both the remaining excavated and sieved spoil, and where necessary with imported clean fill material.

5. After the primary test pits were completed a series of secondary pits were excavated when required, using a 10 cm auger mounted on a mini excavator. These pits were excavated around primary pits where there was a concentration in cultural material (shell midden or artefacts) recovered. The secondary pits were used to locate the boundaries of any midden or artefact concentrations.

The final depth of these pits varied between 100 and 165 cm.

Again all of the material was sieved through 3 mm mesh, with use of a top 5 mm mesh where appropriate. Identified or suspected cultural lithic and shell material recovered from sieving was retained, bagged and labelled.

The soil profile and characteristics were described and all pits were backfilled.

Plate 5.1 Excavation by mechanical auger

Plate 5.2 Collecting deposit from the auger.

Plate 5.3 Wet sieving the excavated material.

5.4 Lithic Analysis Methodology

Analysis involved macroscopic inspection and classification of stone artefacts into one of 8 technological categories, or “assemblage elements” out of a much larger set of possible categories. Artefacts were first sorted into cores, flakes and retouched flakes. This scheme recognizes these three categories to be mutually exclusive, chronologically distinct stages in the reduction of stone materials (Hiscock 2001). Cores are defined as artefacts possessing only negative conchoidal scars. Four sub-types of cores are recognized in the analysis: single platform, mulitplatform, and uni- and multi-directional bipolar cores. Flakes are defined as artefacts possessing one or more of the following fracture features: ring-crack, platform, eraillure scar, waves of force, or a clearly discernable ventral and dorsal surface. Flakes that remove old platform edges are classified as redirecting flakes. Retouch is defined as any scar longer than 3mm deriving from the lateral margins that was formed subsequent to the creation of the ventral surface. Scars less than 3mm are classified as edge-damage. Artefacts that clearly derive from conchoidal fracture but lack the distinguishing features of flakes or cores are here termed flaked pieces.

The typological categories employed are entirely morphologically defined and no assumptions are made about function. Various types may form arbitrary divisions of morphological continuums or stages within a reduction sequence (Clarkson 2002, 2005; Hiscock and Attenbrow 2003).

Raw material type was recorded for each stone artefact, however, no attempt was made to identify various types of stone beyond broad categories such as ‘quartz’ ‘volcanic, ‘silcrete’, ‘chert’ etc. Artefacts made from raw materials that were more difficult to identify were classified as either ‘fine-grained-sedimentary’ or ‘fine-grained-volcanic’ stone. Attributes for each artefact in the assemblage are entered into a relational database and digital photographs are taken of selected artefacts.

5.5 Curation of the lithic artefact collection

The lithic items after examination and measurement will be stored individually in standard resealable plastic bags. These containers will be labelled in permanent black pen with the item's unique identification number and details of its provenance within the excavation.

Following completion of the analysis of the assemblage, all the lithic items will be lodged with the Australian Museum, or will be subject to a Care and Control Permit granted to the Jerrinja LALC.

6. RESULTS AND DISCUSSION

A total of fifty-one (51) test pits were conducted during the Gerroa Sand Mine subsurface testing program. Test pit locations are shown in Figure 6.1.

Shell material was recovered from 26 of the 51 test pits.

A total of 39 lithic items were recovered from five of the 51 test pits.

Further analysis and discussion is provided below.

6.1 Soil Profile

Two soil profiles were observed during the subsurface testing program.

1. Aeolian soil profile consisting of light grey/brown fine aeolian sand which grades to light yellow/brown at c. 15 – 25 cm. This then grades to an orange/brown sand at c.50-60 cm, this continues and becomes lighter with depth. This profile occurred in a majority of the pits (1-36 and 38-51) with some variation including truncation (Pit 4), a mottled transition between the grey/brown and the yellow/brown sand (Pits 5, 15, 16, 18, 19, 31-34) and the absence of the orange layer (Pits 13 and 47).

2. Swamp profile consisting of grey/brown fine aeolian sand (more grey than the other soil type), that grades to brown sand and then a gradual change to light yellow/brown sand that is slightly less fine grained than soil profile type 1. The profile occurred in pits 37 to 39. This profile was wetter than the other profile type.

Charcoal was scattered through the soil profile and across the study area. At one location, Pit 44, higher concentrations of charcoal were found in association with a shell midden deposit. Samples of the charcoal were taken but it is unclear if the charcoal is from an Aboriginal campfire or more recent burning during clearing. A summary of pit details and soil profiles are included in Appendix 3.

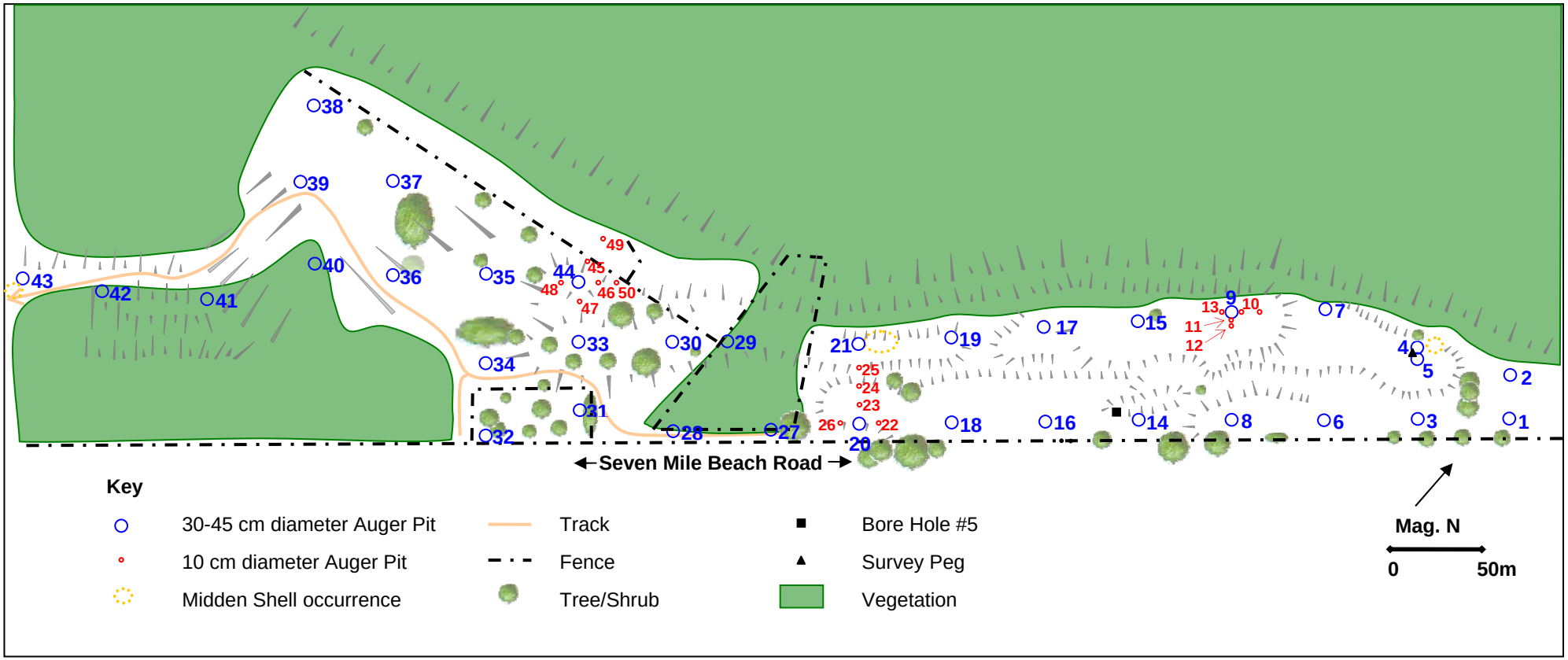

Figure 6.1 Location of Auger holes.

6.2 Shell Remains

Shell material was recovered from twenty-six (26) of the fifty-one (51) test pits (51%). Table 6.1 shows the distribution of the shell for each auger hole and Figure 6.2 shows the spatial distribution of the shell midden material across the study area.

As expected from previous investigations, the bulk of the shell was Pipi (*Donax* sp), which would have been obtained from Seven Mile Beach and brought back to the sand dunes for consumption. Two pieces of *Cabestana* shell, were recovered from separate pits. The closest rocky headland from which this species most likely came from is at Black Head, about 3.5 km north east of the study area.

Much of the shell material is fragmented. This is common within such middens but additional fragmentation is likely to have been caused by the clearing and ploughing of the open area and also by the auger. Despite this, minimum number of individual (MNI) shells were calculated for each test pit. While the weight of the fragmented shell provides an indication of the amount of shell present, the MNI attempts to provide a guide as to the number of individual shells that were present at each location.

MNI for *Donax* was counted from the triangular hinge of the bivalve shell. Being a bivalve, two hinges equates to only one individual shell MNI. The MNI were calculated from the number of hinges divided by two. Where no hinges were present within a pit but shell was present, an nominal MNI of one was assigned.

Table 6.1 Shell Material

Pit No.	Spit No.	Wt. (g) bold = <0.1g	No. Bivalve hinges	MNI	Sp.
1	2	**0.1**	0	1	Donax sp.
4	1	**0.1**	0	1	Donax sp.
5	1	6.6	1	0	Donax sp.
5	2	5.7	2	1	Donax sp.
5	3	7.9	3	1	Donax sp.
5	4	3.6	1	0	Donax sp.
5	5	2.9	1	0	Donax sp.
7	1	0.6	0	1	Donax sp.
8	1	0.9	0	1	Donax sp.
9	1	48	14	7	Donax sp.
9	2	13.2	4	2	Donax sp.
9	3	4.3	3	1	Donax sp.
9	5	2.9	0	0	Donax sp.
9	6	10.1	3	1	Donax sp.
10	1	122.5	35	17	Donax sp.
10	2	48	14	7	Donax sp.
10	3	8.1	2	1	Donax sp.
11	1	1.1	0	0	Donax sp.
11	2	1.1	0	0	Donax sp.
11	3	0.1	0	1	Donax sp.
13	1	3.9	4	2	Donax sp.
13	2	2.6	0	0	Donax sp.
13	3	0.1	0	0	Donax sp.
15	1	0.3	0	0	Donax sp.
15	2	0.1	0	1	Donax sp.
17	1	0.2	0	1	Donax sp.
18	1	1.2	0	0	Donax sp.
18	2	0.2	0	1	Donax sp.

Pit No.	Spit No.	Wt. (g) bold = <0.1g	No. Bivalve hinges	MNI	Sp.
19	1	0.9	0	1	Donax sp.
20	1	10.1	3	1	Donax sp.
21	1	6.1	3	1	Donax sp.
21	2	0.2	0	0	Donax sp.
21	4	0.8	0	0	Donax sp.
22	1	0.3	1	0	Donax sp.
22	2	**0.1**	0	1	Donax sp.
23	1	**0.1**	0	0	Donax sp.
23	2	0.2	1	1	Donax sp.
27	1	**0.1**	0	0	Donax sp.
27	4	**0.1**	0	1	Donax sp.
28	1	4	1	1	Donax sp.
29	4	0.6	0	1	Donax sp.
31	1	2.7	0	1	Donax sp.
36	1	28.5	-	1	Cabestana sp.
42	4	2.8	0	1	Donax sp.
44	1	0.4	0	0	Donax sp.
44	2	67.6	26	13	Donax sp.
44	3	1.9	0	1	Cabestana sp.
44	3	18.2	5	2	Donax sp.
44	4	2.9	0	0	Donax sp.
46	1	20.6	5	2	Donax sp.
46	2	4	1	0	Donax sp.
46	3	**0.1**	0	0	indeterminate fragment
46	3	2.2	0	0	Donax sp.
47	1	0.6	0	1	Donax sp.

The results show that auger hole 10 contained the most shell, in terms of MNI and weight. This was a small diameter (10 cm) test hole 5 m north of pit 9, where it was noted that a high concentration of midden was present. Test pit 11, 5 m east of pit 9 and test pit 13, 5 m south of pit 9 also contained smaller amounts of midden. Test pits 12 (10 m north of pit 9) and 51 (15 m north of pit 9) contained no shell. This indicates that the shell midden is likely to be an isolated concentration of Pipi shell.

A similar pattern was found surrounding the large pit 44. While this pit contained a relatively large amount of shell, the adjacent test pits in a 10 m radius had little or no shell. This included two test pits that were in or adjacent to the conservation area B (pits 49 and 50 respectively) and neither of these pits contained any shell.

Overall, the pattern of shell midden distribution within the proposed mining area is characterised by sparse, spasmodic and fragmented Pipi shell scattered across the dune. However, there appears to be isolated occurrences of higher concentrations of midden on the crest on the western side of the dune, in particular overlooking Foys Swamp.

Most of the shell midden material was located in the upper 60 cm of the deposits with generally decreasing frequency with depth.

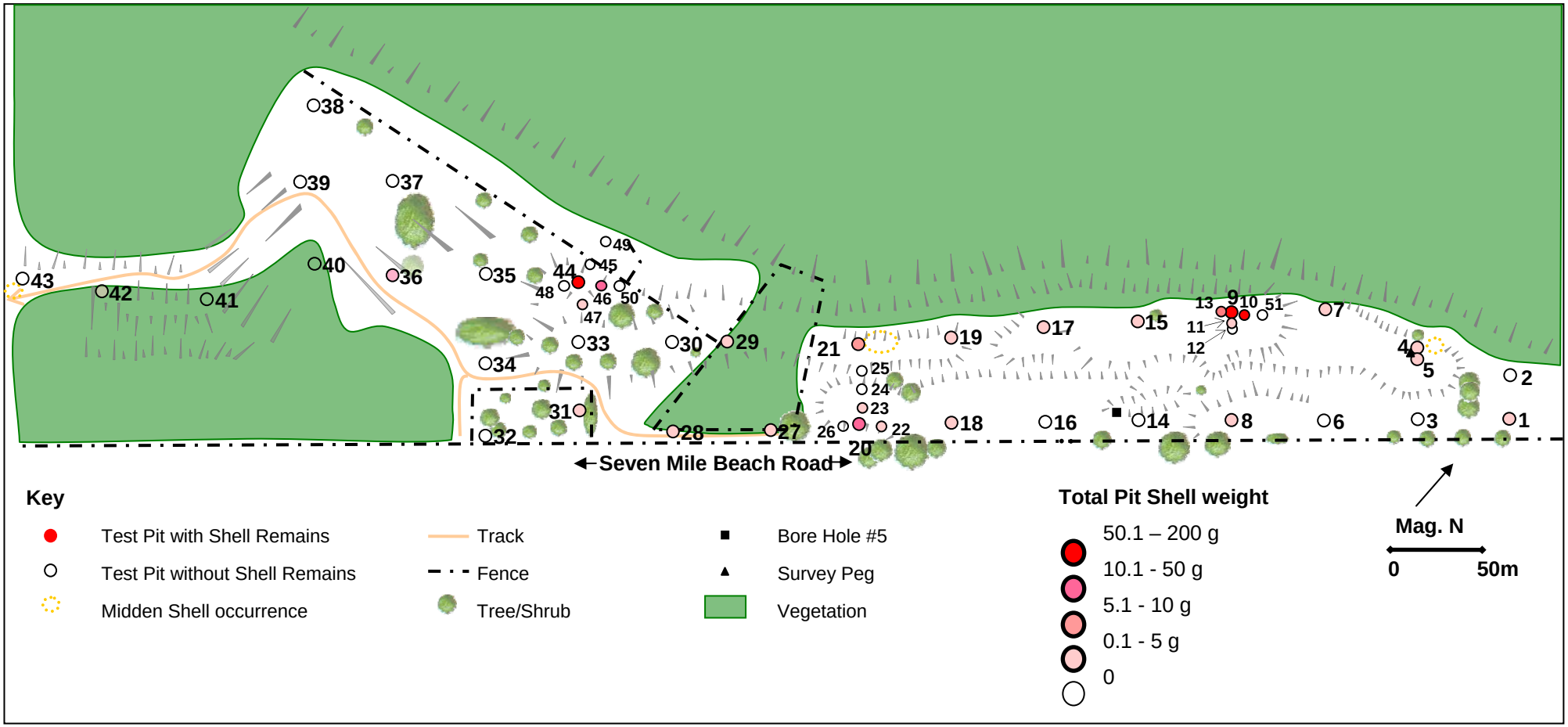

Figure 6.2 Occurrence of shell material within test pits

6.3 Lithic Analysis

6.3.1 Assemblage Composition

The recovered assemblage is very small, with only 39 stone artefacts found in five of the 51 pits. The complete lithic inventory is included in Appendix 4. These stone artefacts can be classified into eight technological categories, of which complete flakes are the most abundant (n=18), followed by broken flakes (n=13), flaked pieces (n=2) and bipolar cores (n=2). A single retouched flaked piece, a pot lid, a broken redirecting flake and an asymmetric backed artefact (i.e. Bondi) were also recovered. Overall assemblage composition is shown in Figure 6.3, while Table 6.3 gives the breakdown of artefacts by excavation pit and spit.

Table 6.2: Breakdown of assemblage components by pit and spit.

Pit	Spit	Asymmetric Backed Artefact	Bipolar Core	Broken Flake	Broken Redirecting Flake	Complete Flake	Flaked Piece	Pot Lid	Retouched Flaked Piece	Heat Affected	Total Number of Artefacts	Weight of Artefacts (g)
Surface						4					4	8
7	3			2		1			1		4	5.9
7	4							1		1	1	0.5
7	6						1				1	0.1
19	4					1					1	0.8
20	1			1		1					2	0.9
20	2					1					1	0.3
20	3	1		6		6					13	14.1
21	2			2		1					3	0.3
21	4			2							2	0.2
44	2		2		1	1	1				5	5.8
44	3					2					2	0.7

Silcrete is the dominant raw material at the site (59%) followed by quartz (18%), chert (10%), sandstone (5%), chalcedony (5%), and volcanic stone (3%). The silcrete is predominantly light grey in colour, with some artefacts grading to a light yellow. A single red silcrete flake is also present. Silcrete artefacts are predominantly small flakes (<30mm), but a broken backed artefact was also made of this material (Plate 6.1).

Quartz is a near ubiquitous raw material on the NSW coast, and usually makes up a high proportion of all assemblages. Quartz artefacts consisted of small flakes and two small bipolar cores (Plate 6.1). Quartz is frequently reduced using bipolar technique on the NSW coast. This is sometimes because quartz pebbles are too small to easily reduce using free hand percussion.

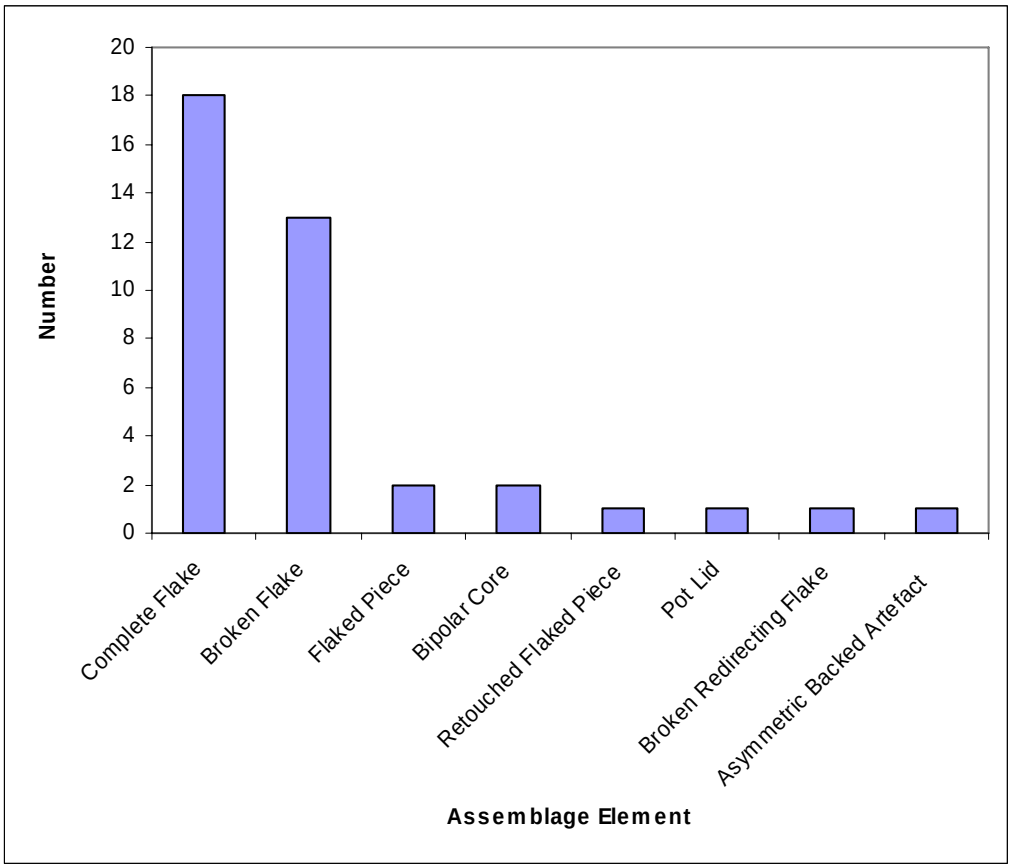

Figure 6.3: Overall assemblage composition for the 35 recovered stone artefacts**.**

Chert and chalcedony is also common in sites around Gerroa and can make up a very high proportion of some assemblages in the region. The chert and chalcedony artefacts in the assemblage are all very small flakes that may be bi-products of core reduction or flake retouching. Chert, chalcedony and perhaps quartz likely derive from the conglomerates of the Illawarra Coal measures located on the Illawarra Escarpment. It is likely that sources of this material can be obtained from gravels in the nearby Crooked River and its tributaries.

The number of artefacts recovered from the sub-surface testing is too small to make reliable observations about site formation, artefact taphonomy or even the horizontal and vertical distribution of human activities. However, it is clear that the majority of stone artefacts derive from small, concentrated areas. Pit 21 on the western edge of the central part of the study area and pit 20 on the eastern edge of the central section, both contained artefacts, but the pits excavated across the crest between them contained no artefacts. Likewise, Pit 44, on the western edge of the southern portion of the study area contained stone artefacts but the pits surrounding it did not. The other pits to contain artefacts (7 and 19) were both on the western edge of the study area.

Spit 3 of Pit 20 contained the greatest number of artefacts in the recovered assemblage, while Pit 21 revealed small numbers of stone artefacts to a depth of around 1 metre. A low density scatter of artefacts was also found in Pits 19 and 20 to a depth of around a metre. Pit 44 and Pit 7 also contained subsurface artefacts. Pit 7 contained a small number of artefacts down to a depth of 120-150cm, and Pit 44 contained several artefacts at a depth of 30-65cm. The tendency in each of these pits with subsurface artefacts is for artefact numbers to decrease with depth.

Overall, the subsurface presence of stone artefacts appears extremely limited in number and spatial distribution. Large area excavations would have to be undertaken to retrieve a sizeable enough assemblage to warrant detailed examination. This is an extremely sparse concentration of artefacts in comparison to other sites subsurface tested within 3km of the current project area. Low artefact numbers probably do not reflect any kind of recent disturbance as the dune system has probably been relatively stable for the last 3,000-6,000 years and much of the assemblage is deeply buried and therefore unlikely to have been affected by surface activities. Low artefact numbers more likely reflect very low infrequency/low intensity flaking by past populations in this area. This reduces the significance of the site in terms of its potential to shed light on past stone manufacturing practices.

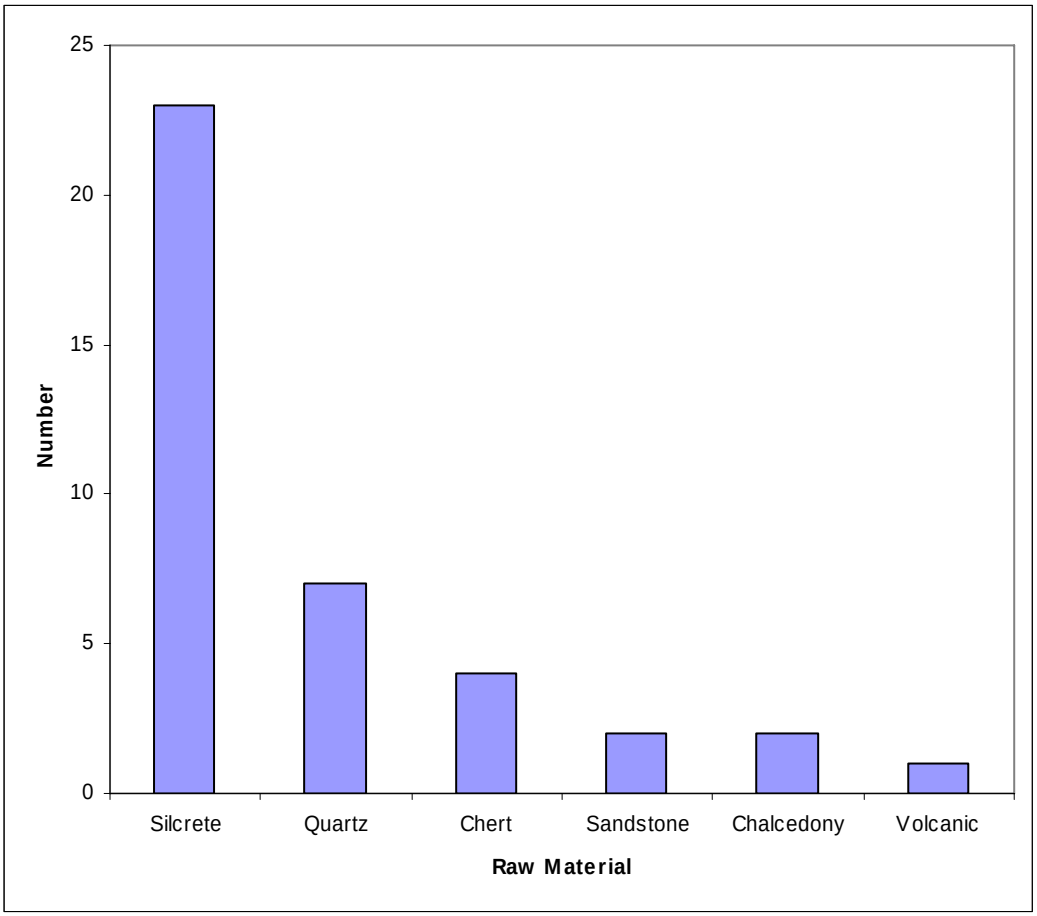

Figure 6.4: Breakdown of raw materials.

6.3.2 Artefact Density

The analysis of the incidence of artefacts across the test pits is best conducted using an areal measure of incidence rather than a volumetric measure, such as density. This approach is required for two reasons: the variable volumes of the excavation units, and the inability to relate artefact depth with chronology.

The methodology of excavation resulted in variable spit intervals and differing maximum pit depths. This variation is a consequence of a number of factors including the skill of the mechanical auger operator, the resistance of the sediments, and other unrelated factors such as the need to gain geomorphological and soil profile information. Given that the volumes of excavation units are inconsistent and unrelated to the incidence of artefacts, density calculations generated from this data are of limited application and would relate more to the methodology of excavation than actual artefact occurrence.

An example would be two spit samples, from different pits, each including the same 50 mm lens of identical artefact density. Spit 1 from Pit A consists of a 100 mm interval, where as Spit 1 from Pit B consists of a 150 mm interval. The density of spit 1, Pit A will be greater than for Spit 1 Pit B, despite each providing a sample of the same deposit. In another example, two pits of different maximum depths, each sampling the

same incidence of artefacts, will return very different density figures. The reason for the difference in pit depth may be due to changes in geomorphology, or decisions made by the excavation director. In either case the difference in density values will not be of use in interpreting the behaviours responsible for the evident artefact discard.

In addition to these methodological considerations, the bioturbated nature of most artefact distributions in open site contexts means that variations in density across any particular soil profile generally will reflect post-depositional soil processes rather than cultural or chronological relationships.

In order to avoid problems associated with density calculations, a measure of areal artefact incidence has been adopted for this project. This allows comparisons across pits and test sites using data which demonstrably relates to cultural variation rather than methodology or geomorphological variables. The number of artefacts per test area (calculated as a number per square metre) has been calculated for each test pit.

Artefact incidence varied across the study area but was generally low, ranging from 6.3 to 100.6 artefacts per square metre with an average of 53.3/m^2. The incidence values can be compared to other South Coast sites subject to similar methods of archaeological testing:

Currarong	14.9/m^2
Dolphin Point, Burrill Lake	21/m^2
Lagoon Restaurant at Wollongong	38/m^2
Sandon Point, Wollongong	67/m^2
Gerroa (Sewerage Plant)	116/m^2
Coila Lake 1	318/m^2

This shows that the site at the Cleary Bros property at Gerroa is mid range in comparison to other sites.

Table 6.3: Breakdown of raw materials found in the assemblage by pit and spit.

Pit	Spit	Silcrete	Chert	Quartz	Sandstone	Chalcedony	Volcanic	Total
Surface		3	1					4
7	3	3		1				4
7	4		1					1
7	6		1					1
19	4	1						1
20	1					2		2
20	2	1						1
20	3	10			2		1	13
21	2	2	1					3
21	4			2				2
44	2	1		4				5
44	3	2						2

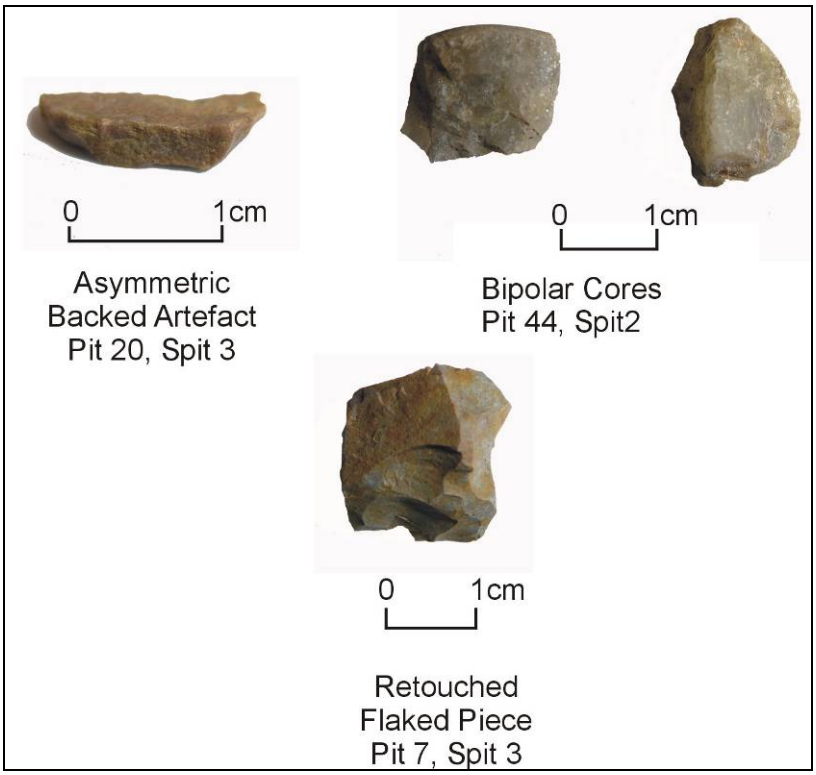

Plate 6.1 Selected artefacts from the excavations.

6.4 Conclusions

The pattern of shell across the study area appears to be sparse and spasmodic, with isolated concentrations of midden. The pattern identified first by Paton (1992), that midden is more concentrated on the crest of the dune appears to be supported by the present investigation. Although shell was found across the study area, by far the higher concentrations were identified on the dune crest, on the western edge of the study area, close to Foys Swamp and Blue Angle Creek.

The lithic artefact assemblage likely represents occasional manufacture of implements such as backed artefacts and retouched items, and flake production from small freehand and bipolar cores. The occurrence of these technological traits also supports the conclusions drawn by Paton that the site contains a sequence of Aboriginal occupation. However, given the low numbers and low density of stone artefacts, it is difficult to draw further conclusions about the function of the site or past human behaviour, except for the simple observations of assemblage structure and raw material usage. While the total mine extension area theoretically contains a large number of stone artefacts owing to its size, extraction of this assemblage would be difficult due to the low density of artefacts either on the surface or beneath the ground. The archaeological research potential is therefore limited. The occurrence of artefacts is even sparser than shell midden material.

The archaeological investigation has found that the nature of the cultural material within the study area is scattered and spasmodic. Delineation of individual site boundaries is therefore difficult. It would be more correct to characterise the study area as containing a site complex, comprising isolated concentrations of shell midden and even fewer concentrations of stone artefacts.

Aboriginal burials are sometimes found in sand dunes in association with midden deposits. A burial has been uncovered in dunes, about 2 km north of the study area near the Crooked River. There is some potential for burials to exist within the study area. However, monitoring of the soil stripping operations by local Aboriginal representatives for the existing sand mine has failed to locate any burials.

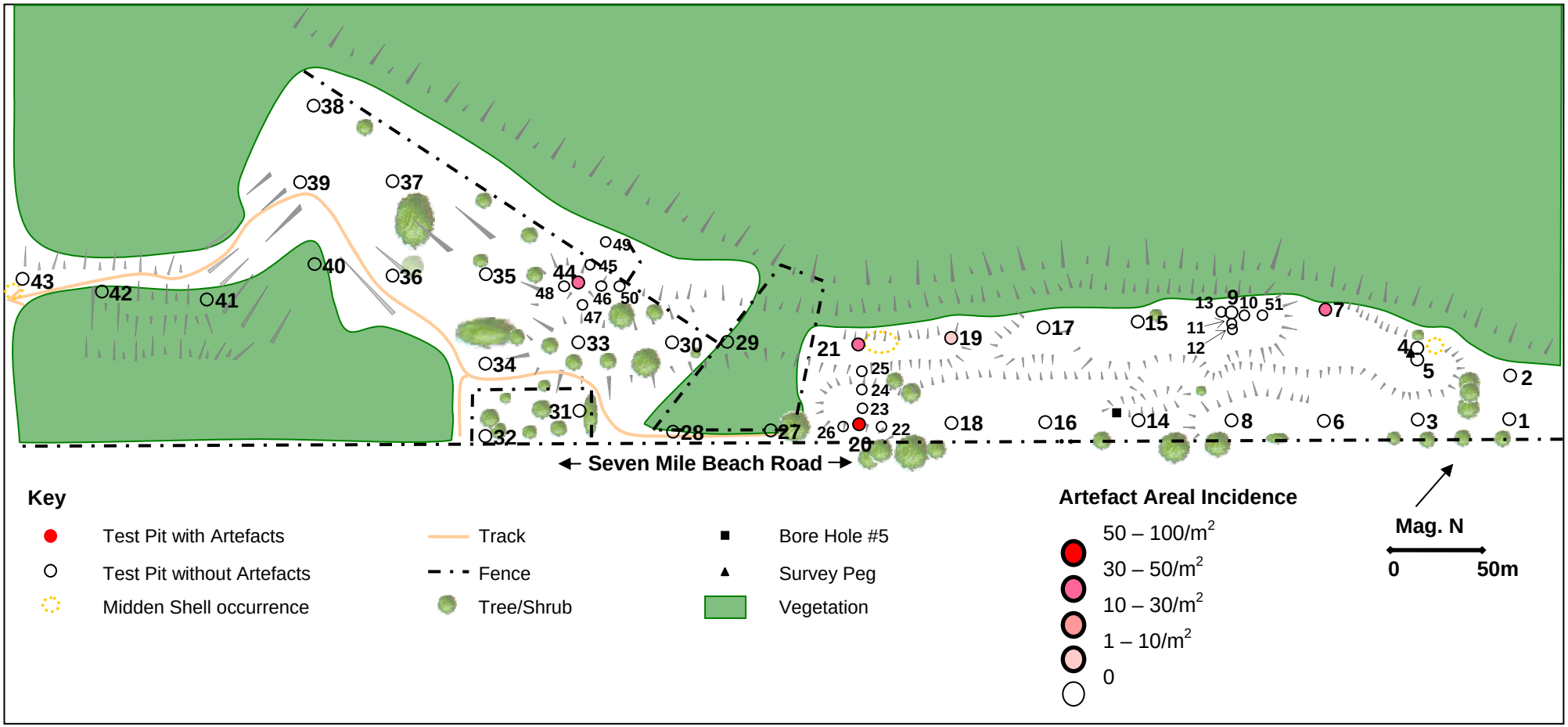

Figure 6.3 Occurrence of artefacts within test pits.

7. SIGNIFICANCE ASSESSMENT

7.1 Aboriginal Heritage

The Burra Charter of Australia defines cultural significance as 'aesthetic, historic, scientific or social value for past, present and future generations' (Aust. ICOMOS 1987). The assessment of the cultural significance of a place is based on this definition but often varies in the precise criteria used according to the analytical discipline and the nature of the site, object or place.

In general, Aboriginal archaeological sites are assessed using five potential categories of significance:

- significance to contemporary Aboriginal people,
- scientific or archaeological significance,
- aesthetic value,
- representativeness, and
- value as an educational and/or recreational resource.

Many sites will be significant according to several categories and the exact criteria used will vary according to the nature and purpose of the evaluation. Cultural significance is a relative value based on variable references within social and scientific practice. The cultural significance of a place is therefore not a fixed assessment and may vary with changes in knowledge and social perceptions.

Aboriginal significance can be defined as the cultural values of a place held by and manifest within the local and wider contemporary Aboriginal community. Places of significance may be landscape features as well as archaeologically definable traces of past human activity. The significance of a place can be the result of several factors including: continuity of tradition, occupation or action; historical association; custodianship or concern for the protection and maintenance of places; and the value of sites as tangible and meaningful links with the lifestyle and values of community ancestors. Aboriginal cultural significance may or may not parallel the archaeological significance of a site.

Scientific significance can be defined as the present and future research potential of the artefactual material occurring within a place or site. This is also known as archaeological significance.

There are two major criteria used in assessing scientific significance:

1. The potential of a place to provide information which is of value in scientific analysis and the resolution of potential research questions. Sites may fall into this category because they: contain undisturbed artefactual material, occur within a context which enables the testing of certain propositions, are very old or contain significant time depth, contain large artefactual assemblages or material diversity, have unusual characteristics, are of good preservation, or are a constituent of a larger significant structure such as a site complex.

2. The representativeness of a place. Representativeness is a measure of the degree to which a place is characteristic of other places of its type, content, context or location. Under this criteria a place may be significant because it is very rare or because it provides a characteristic example or reference.

The value of an Aboriginal place as an educational resource is dependent on: the potential for interpretation to a general visitor audience, compatible Aboriginal values, a resistant site fabric, and feasible site access and management resources.

The principal aim of cultural resource management is the conservation of a representative sample of site types and variation from differing social and environmental contexts. Sites with inherently unique features, or which are poorly represented elsewhere in similar environment types, are considered to have relatively high cultural significance.

The cultural significance of a place can be usefully classified according to a comparative scale which combines a relative value with a geographic context. In this way a site can be of low, moderate or high significance within a local, regional or national context. This system provides a means of comparison, between and across places. However it does not necessarily imply that a place with a limited sphere of significance is of lesser value than one of greater reference.

The significance ratings of either low, moderate or high provide a shorthand means of characterising the overall significance of a site based on individual assessments made according to the categories outlined above. Once assigned, the rating, together with it's geographic context provides a basis for drafting management strategies. The relative value of each rating can be effectively understood by considering how the potential loss of that site, or site complex, would impact upon archaeological and cultural values within local, regional or greater contexts.

Low significance may be assigned to a site where the destruction of the site would not significantly reduce the archaeological record or cultural values. A site of low significance typically has little research value, is likely to be a common type and to contain common features. The cultural values of such sites will not be exceptional or include unusual or highly valued traits. Sites that have been heavily disturbed often fall into this category. Sites of low significance are not generally considered to warrant *in situ* preservation or salvage.

Moderate significance may be assigned to a site where destruction would lead to a modest reduction in the archaeological record or to cultural values. Sites of moderate significance typically have a moderate level of research and/or cultural value, may be uncommon but not rare, and potentially contain uncommon or notable features or associations. The archaeological values of these sites may have been reduced to some extent by disturbance but remain intact enough to retrieve scientific information of value. Such sites are usually considered to warrant some form of salvage to recover scientific information before they are impacted. A variety of actions may also be required to mitigate the loss of cultural values.

High significance may be assigned to a site where destruction would severely deplete the archaeological record or have a major impact on cultural values. Such sites typically have high research and/or cultural value, may be rare, or have features and associations that are uncommon, rare or unique. Sites of high archaeological significance are likely to be in a relatively undisturbed condition. The cultural values of such sites are likely to be exceptional and may include unusual or highly valued traits. Where a site is rated as having high significance, the conservation and maintenance of its significant values is considered to be warranted. This would normally require the *in situ* conservation of archaeological deposits.

In general, an assessment of low or moderate significance *within a local context* would not exclude a management strategy which includes the physical destruction of a site or complex. An assessment of high significance, or moderate to greater significance within a regional or larger geographic context would typically be associated with recommendations to conserve the significant values of the site or place

The following significance assessments are made with full reference to the scientific, aesthetic, representative and educational criteria outlined above. Reference to Aboriginal cultural values has also been made where these values have been communicated to the consultants. It should be noted that Aboriginal cultural significance can only be determined by the Aboriginal community, and that confirmation of this significance component is dependent on written submissions by the appropriate representative organisations.

7.2 The Gerroa Sand Mine Extension Area

7.2.1 Archaeological Significance

The scientific or archaeological significance of the deposits within the Gerroa Sand Mine Extension subsurface testing area can be assessed according to the following criteria:

Extent of deposit disturbance

The test locations showed mostly consistent deposits, apart from some slight surface disturbance associated with clearing of vegetation and cultivation. The soil profiles were quite regular and consistent across the study area, suggesting the deposits had not been subject to deep disturbance.

As with most open sites in sandy deposits in southeastern Australia, the deposits would have been subject to bioturbation. This will have significantly reduced any vertical integrity of archaeological material, especially where they occur in relatively low densities. (Vertical integrity refers to the ability to identify the original sequence of discard from the current position of the artefact within the soil profile).

Stratigraphic integrity

Most of the test locations do not display evidence for temporal differentiation (vertical integrity) through the vertical profile. The observed vertical distribution of lithic items, is likely to be the result of post-deposition processes such as bioturbation and disturbance of upper levels.

Presence of cultural features

A possible cultural feature apart from the shell and artefacts was detected during the auguring program at pit 44. Some charcoal was recovered from the test pit associated with a shell layer from 60-72 cm below the surface.

Potential for dating

Shell midden material is able to be dated to provide an indication of the age of the deposits. Additionally, charcoal associated with a shell midden in Pit 44 could potentially be used for dating although its cultural association is unclear.

Areal incidence of artefacts

The overall areal incidence of lithic items within the site varies from low to medium, ranging from 6.3 to 100.6 artefacts per square metre. The average of 53.3/m^2 is moderate compared to other studies on the south coast.

Representativeness (Local and Regional Context)

The sites identified in the study for the Gerroa sand mine are typical of the local area, as identified by previous studies within the Cleary Bros property (Paton 1992, Barber 2000, 2002). The site is however, relatively poor in comparison to the Pipi midden and dense artefacts found just to the north at the Sewerage Treatment Plant (STP). Sections of the site at the STP have been preserved from development (Navin Officer Heritage Consultants 2000).

Paton (1982:42-44), based on work done by Sullivan, addressed the issue of representativeness in detail and his discussion is still relevant and summarised here.

Pipi middens occur in a number of areas on the NSW South Coast. Their occurrence is limited however, to the few locations where the local conditions enable *Donax* to survive. These conditions

involve the presence of long extensive, open sandy beaches, often part of a barrier dune system, where there is a good supply of nutrients from freshwater rivers or lakes. Such conditions are common on the north coast of NSW due to the large river systems present there. However, on the south coast, such conditions are not as common and as a result, the presence of Pipi middens is also less frequent.

Paton notes that midden sites dominated by Pipi occur in the local region at Bherwerre Beach, Kurnell and Bulli. Within the broader south coast context, Paton identifies the barrier beaches at Tuross, Murrah and Wallagoot Lakes as well as Bithery Inlet as containing Pipi midden complexes.

A review of the geological and topographic maps on the south coast from the Victorian border to Wollongong reveals that there are other environments that would be suited for Pipi populations. These include Merimbula Bay, Bingie Beach and Bengello Beach between Moruya Heads and Broulee as well as potentially numerous smaller beaches with suitable environmental conditions.

Paton notes that the paucity of such sites on the south coast is due more to the environmental conditions than cultural preferences. The Gerroa/Shoalhaven Bight area is conducive for *Donax* and therefore the resource was exploited by Aboriginal people.

There are Pipi middens within the local region (Wollongong to Jervis Bay) and therefore the sites within the development area are not considered rare. However, Paton concluded that Pipi middens were not very common in the local area, increasing their significance rating.

Within the broader south coast regional context, Pipi middens are present where the environmental conditions allow Pipis to live. The sites at the Gerroa locality are therefore part of a larger suite of similar sites on the NSW south coast.

It must be recognised that continued mining of the sand dunes on the Cleary Bros property since Paton's 1992 study has further reduced the occurrence of this site type. However, Paton considered this and concluded that mining could proceed with conservation areas to preserve a sample of the site. A similar approach was adopted for the STP adjacent to the Crooked River.

The nature of the stone artefact association with the middens is not uncommon and the artefacts themselves are typical of the region. There is no rarity value associated with the artefacts themselves.

Conclusion

Based on the above outline, it can be concluded that the subsurface archaeological deposits investigated within the study area are typical of others that have been identified within the Cleary Bros sand mine at Gerroa. These cultural deposits have been previously classified as having moderate significance (Paton 1992, Huys 1997, Barber 2000, 2002).

The content of the sites within the proposed sand mining extension are generally sparse Pipi midden and even sparser stone artefacts. The archaeological subsurface testing has not identified areas of other obvious cultural activity. The nature of the site appears to be infrequent use for consumption of Pipi and occasional manufacture of stone tools. As such the potential for addressing complex research questions about Aboriginal occupation is limited.

The reduction in the archaeological resource since 1992 by sand mining has meant that the sites represented in the study area has been reduced. This makes the key issue of representativeness even more important. The reduction of this type of site in the local area means that the significance of the remaining part of the site is increased.

Overall, the limited nature of the research potential of the site reduces its significance. Despite this the site retains value given the reduced representation of this site type in the local area. In a regional context, the site is typical of others that have been recorded. Based on an assessment of the archaeological features revealed by the present investigation the site complex within the study area can be characterised as having moderate significance at a local level. The archaeological features have a low to moderate significance in the regional context.

7.2.2 Aboriginal Cultural Significance

All Aboriginal sites are valued by the local Aboriginal community as a tangible link with their tribal territory, cultural land values and the traditional occupation practices of their ancestors. The cultural significance of the archaeological remains at these sites need not necessarily correspond with the scientific significance as assessed by archaeologists.

An assessment of Aboriginal cultural significance can only be conducted by appropriate representatives of the custodial community. A copy of this report was provided to both of the Aboriginal community groups that participated in the investigation, with an invitation to comment and provide an assessment of cultural values, and any management considerations arising from these assessments.

The Jerrinja LALC provided a response but has not identified the specific significance of the sites or study area.

8. STATUTORY OBLIGATIONS[1]

The project at Gerroa is subject to part 3A of the *Environment Planning and Assessment* Act (1979). As such, Part 6 provisions under the *National Park and Wildlife* Act (1974) do not apply. Where Aboriginal sites and objects have been identified in the project area then their effective management must be defined in a Statement of Commitments, which forms part of the project approval. The Statement of Commitments is subject to review and approval by the Department of Environment and Conservation, as part of the review of applications by the Department of Planning.

Aboriginal Objects (as defined under the NPW Act) have been identified within the Gerroa Sand Mine Extension Area. The presence of these objects means that where the NPW Act applies to the development, no activities can occur in the proposed development area that may disturb either known surface artefacts or subsurface archaeological deposits, without the receipt of an appropriate permit from the DEC. However, if the project is approved under Part 3A of the EP&A Act, the NPW Act does not apply and such permits are not required.

[1] The following information is provided as a guide only and is accurate to the best knowledge of Navin Officer Heritage Consultants. Readers are advised that this information is subject to confirmation from qualified legal opinion.

9. MANAGEMENT CONSIDERATIONS

The proposed mine extension would remove a large area of sand dune that contains some Aboriginal cultural sites in the form of sparse deposits of shell middens and even sparser deposits of stone artefacts. There is also a potential that the area contains Aboriginal burials, although none have been found in the previously mined area.

The archaeological assessment undertaken by Paton (1992) identified two areas that were to be subject to preservation from mining. Paton recommended:

> "Of the known 31 subsurface archaeological deposits, five have been substantially salvaged during this field investigation and 4 lie outside or on the border of the planned mine area. To positively ensure that a representative sample of intact subsurface material is retained, it is recommended that the latter 4 subsurface deposits be excluded from any development, and be fenced off before any work begins in nearby areas. "(1992:44)

One of the four subsurface deposits identified by Paton lies outside the mining area and is preserved. Three of the deposits are adjacent to or within the proposed mine extension. Two small areas of land containing these deposits have been designated conservation areas,, two deposits are located in conservation area A and the third is conservation area B.

Area B is a 30 x 30 m area (900 m^2) at the northern extent of the original mining application area. It is situated in the western central part of the proposed mine extension. The position of area B was determined using the original mapping in Paton's 1992 report. The conservation area incorporates part of the crest and steep western slopes of the dune leading down to Blue Angle Creek. The proposed mine extension bisects area B, taking in the upper slopes and crest portion of this conservation area, leaving the steeper lower slopes within the conservation area.

The subsurface testing conducted during this study excavated a number of test pits adjacent to area B and two within the conservation area. Neither of these latter two pits (45 and 49) contained shell or artefacts. Pit 44 on the south eastern corner of the conservation area, contained moderate amounts of shell and artefacts. Test pit 46, adjacent to the eastern boundary of the conservation area also contained a moderate amount of shell midden, while pit 50 on the north eastern corner contained no cultural material.

Subsurface investigation of area B found that there was no cultural material of significance located within the area defined by Paton.

The distribution of the cultural material appeared from these results to be concentrated on the crest of the dune. Only a very small portion of conservation area B incorporates the dune crest. Most of the conservation area incorporates the steep western slopes of the dune, where little archaeological material occurs. The position of the conservation area may not therefore be optimal for preservation of cultural material. It is possible that a better conservation outcome could be achieved through refinement or redesign of the conservation areas.

Conservation area A is situated more on the crest of the dune, within an area of littoral rainforest. Its dimensions are 60 x 30 m (1800 m^2). The rainforest has been identified as having high conservation value and it is to be preserved from the mining extension (T Perram pers comm.). Thus conservation area A is also to be preserved from the mine extension. The rainforest and archaeological conservation areas were not subject to the current testing program as they will not be impacted.

The extent of rainforest preservation area is shown in Figure 9.1. It shows that an area of approximately 200 x 30 m (6,000m^2) along the crest of the dune would be excluded from the mining extension. Paton's study concluded that the full cultural sequence of midden and artefacts was more likely to occur on the dune crest. The current proposed rainforest and archaeological conservation area would therefore likely preserve a sample of the archaeological record within the study area that is twice the size identified by Paton.

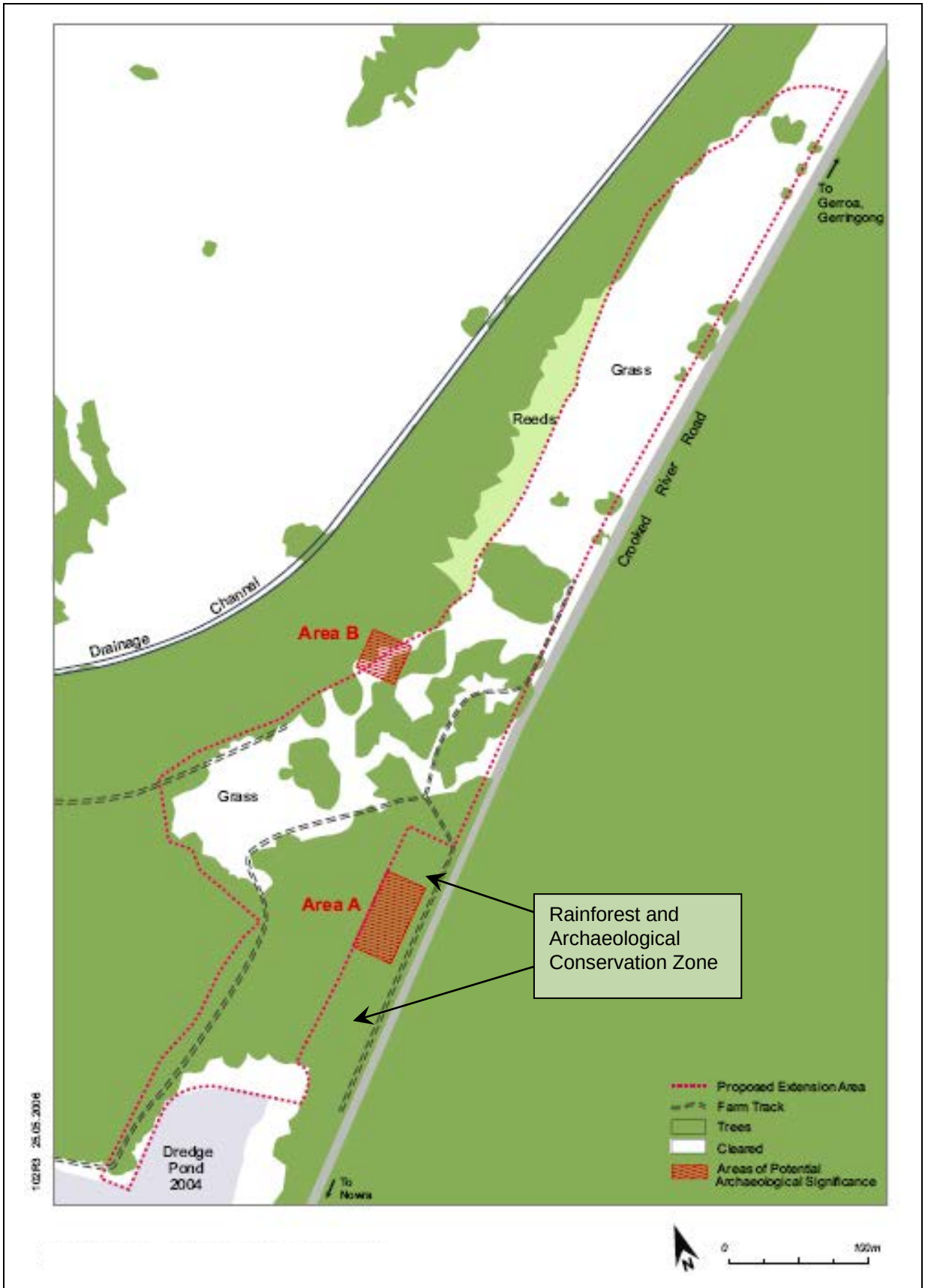

Figure 9.1 Mine extension boundaries with conservation areas

Part of the research potential that has not been realised at present is the age of the sites. No empirical dating of shell or charcoal has been undertaken. In addition, there has been no in depth lithic analysis of the artefacts that have been excavated to date. The Paton study retrieved over 400 artefacts but these do not appear to have been analysed. Subsequent archaeological investigations (Barber 2002, Navin Officer Heritage Consultants 2004) and the present investigation have failed to retrieve large enough sample for meaningful analysis.

It may be that the methods of testing, while sufficient to identify the general nature and pattern of cultural material, is not suitable for obtaining a statistically valid artefact sample for detailed analysis. The research potential of the artefact component of the site has yet to be fulfilled.

In making recommendations about the management of the site, the representativeness issue is one for heavy consideration. The extension to the mining will almost totally destroy the remaining portion of the known site. Untested sandy deposits are present to the immediate north of the study area that probably contains similar deposits. The barrier dune system is also present further north near the junction of Blue Angle Creek and the Crooked River. Cultural deposits have been identified in this area but they have also been reduced in extent by development (Navin Officer Heritage Consultants 2000, in prep).

The barrier dune system extends south of the Cleary Bros property on the eastern side of the extensive Coomonderry Swamp. It is highly likely that Pipi middens and artefacts are situated in these dunes. However, this area has not been subject to archaeological investigation and so conclusions are only tentative.

The archaeological investigations carried out to date within the Gerroa sand mine have provided a clear understanding of the distribution of cultural material. In doing so, many but not all of the research questions have been addressed from these studies. During previous mining activity local Aboriginal representatives have monitored topsoil stripping. Some stone artefacts have been collected during this process but no burials have been identified. Controlled soil stripping with a grader and bulldozer was also undertaken as part of a salvage exercise for a previous mine extension. However the results were poor and the scientific validity of conducting salvage in this way was questioned (Navin Officer Heritage Consultants 2004).

Given the level of information available, there are no archaeological reasons to prevent the sand mine extension from proceeding, with some conditions. While the size of the archaeological site is being diminished, the potential for other such sites to occur in the local Shoalhaven Bight area and the broader south coast region is high.

The current testing has also shown that preservation area B contains very little archaeological material. The preservation value of this area is therefore not considered to be a high priority. If sand mining proceeded within this area, the loss of archaeological material would not be substantial.

The preservation of 6000m^2 of dune crest will ensure that a portion of the current site is retained. This area needs to be permanently set aside for archaeological as well as floral values. The proposed rainforest and archaeological conservation area would therefore likely preserve a sample of the archaeological record within the study area that is twice the size identified by Paton.

The unanswered research questions about the site should be addressed. These include the age of the site and if possible an in depth study of the stone artefact component. Detailed excavation is the best possible method for obtaining the data to address these issues. This would include targeted hand excavation to obtain a detailed stratigraphic profile with recovery of what cultural material was available to answer the research questions. Limited targeted salvage excavation should be a condition of Consent for the project.

While there is potential for burials to occur within the study area, their location cannot be predicted. Adoption of a protocol to deal with the accidental unearthing of a burial would ensure that it was treated appropriately. A Human Skeletal Remains Protocol has been developed and is included as Appendix 5.

10. RECOMMENDATIONS

The following recommendations are provided based on the results of the present investigations and the discussion above.

It is recommended that should the sand mining extension proceed the following conditions be applied.

1. The area outside the proposed mine extension identified as littoral rainforest is preserved also for archaeological values. It should be mapped, and marked prior to any other work proceeding. The area should be afforded a suitable batter so that erosion into the dredge pond does not occur in the long term future.

2. Limited salvage excavations should occur at appropriate locations prior to mining proceeding to that location. Excavation would be aimed to retrieve and analyse a sample of the artefacts within the site. Salvage excavation would also retrieve a sample of material (shell and or charcoal) for radiocarbon dating and further analysis.

3. Monitoring of soil stripping by the Aboriginal community should occur to recover additional archaeological material.

4. Cleary Bros should adopt the Protocol in Appendix 5.

5. Ongoing consultation with the Aboriginal community should also be carried out.

6. A copy of this report should be sent to each of the Aboriginal groups that participated in the study for comment.

   Jerrinja Local Aboriginal Land Council
   C/- RSM Bird Cameron
   GPO Box 200
   CANBERRA ACT 2601

   Jerrinja Consultants Pty Ltd
   PO Box 5009
   NOWRA DC NSW 2541

7. Three copies of the report need to be provided to the Department of Environment and Conservation for review.

   Dr. Phil Boot
   Archaeologist
   Environment Protection and Regulation Division
   Department of Environment and Conservation
   PO Box 2115
   QUEANBEYAN NSW 2620

11. REFERENCES

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APPENDIX 1

ABORIGINAL PARTICIPATION FORMS

Record of Aboriginal Representative Participation*

Project Name: **Gerroa Sand Quarry** - Archaeological Subsurface Testing Proram

Aboriginal Organisation: Jerrinja Local Aboriginal Land Council

Client Name & Address: Cleary Bros c/- Perram and Partners 12 Clanwilliam Street EASTWOOD NSW 2122

Archaeologist(s): name & address: Nicola Hayes @ Navin Officer Heritage Consultants, Unit 4, 71 Leichhardt St Kingston ACT 2604

Name of Representative	Date	Type of Participation	Start time	Finish time
Graham Connolly	15/3/06	Subsurface testing	9am	5pm
Alfred Wellington	16/3/06	"	8:30am	5pm
Desley Wellington	17/3/06	"	8:30am	3pm
~~Joanne Connolly~~	21/3/06	"	10:30am	5pm
Noel Wellington				
Craig Wellington	22/3/06	"	9am	5:30pm

Issues raised:

Signed *(archaeologist)*: N. Hayes *(Aboriginal representative)*: D. Wellington Date 17/3/06

(Aboriginal representative): J. Connolly Date 21/3/06

(Aboriginal representative): C. Wellington Date 22/3/06

(Aboriginal representative): Date

- *please note this form is not an invoice. For payment, please send an invoice from your organisation to the client name and address provided above.*

Record of Aboriginal Representative Participation*

Project Name: **Gerroa Sand Quarry** - Archaeological Subsurface Testing Proram

Aboriginal Organisation: Jerrinja Consultants representing Jerrinja Tribal Elders

Client Name & Address: Cleary Bros c/- Perram and Partners 12 Clanwilliam Street EASTWOOD NSW 2122

Archaeologist(s): name & address: Nicola Hayes @ Navin Officer Heritage Consultants, Unit 4, 71 Leichhardt St Kingston ACT 2604

Name of Representative	Date	Type of Participation	Start time	Finish time
Graham Connolly	15/3/06	Subsurface Testing	9 am	5pm
Gerald Carberry	16/3/06	"	8:30am	5pm
Dennis Wellington	17/3/06	"	8:30am	3pm
~~Noel Wellington~~	21/3/06	"	10:30am	5pm
Joanne Connolly				
Graham Connolly	22/3/06	"	9 am	5:30pm

Issues raised:

Signed ***(archaeologist)***: N. Hayes ***(Aboriginal representative)***: **Date** 17/3/06

(Aboriginal representative): N. Wellington **Date** 21/3/06

(Aboriginal representative): **Date** 22/3/06

(Aboriginal representative): **Date**

- *please note this form is not an invoice. For payment, please send an invoice from your organisation to the client name and address provided above.*

APPENDIX 2

ABORIGINAL RESPONSE

JERRINJA LOCAL ABORIGINAL LAND COUNCIL

Office: Roseby Park
Orient Point NSW 2540
Postal Address: PO Box 167
Culburra Beach NSW 2540
Phone: (02) 4447 4207
Fax: (02) 4447 4230

Contact: Adell Hyslop
Email: jlalc@bigpond.com
Our ref: JER4025

Matthew Barber
Navin Officer Heritage Consultants P/L
Number 4
Kingston Warehouse
71 Leichhardt St
Kingston ACT 2604

Dear Matthew,

Re: Gerroa Sand Mine Extension Archaeological Assessment

I refer to our conversation on the 24th August 2006 regarding the request for the Jerrinja Local Aboriginal Land Council ('JLALC') providing comments to the draft archaeological assessment for the proposed Gerroa Sand Mind Extension.

After reviewing the report it is noted that the proposal has merit, though it should not be considered as a conclusive basis to determining Aboriginal cultural heritage significance of the entire property.

While it may be possible to consider the potential cultural heritage 'significance' of archeological material found during surveys it is a concern that assessments tend to primarily focus on Aboriginal cultural heritage as just being 'bones and stones'. The identification of artefacts is important in telling the story about the people and the use of the land and assists in understanding the relationship to the tangible and intangible values between the people and the cultural landscape.

It is also noted that the proposed recommendations are based only on the results of this survey, and address the identified issues within the report. It is further requested that the JLALC continue to be consulted by Cleary Bros on any matters relating to making informed decisions on the protection, conservation and preservation of Aboriginal cultural heritage and the proactive involvement of on site monitoring of works on potential areas such as at identified Area B.

Again, we thank you for the opportunity to reply to the draft report, and we look forward to the opportunity to working with you in the future.

Regards

Adell Hyslop
Coordinator

15/9/06

APPENDIX 3

SUMMARY OF PIT DATA AND SOIL PROFILE DESCRIPTIONS

Pit No.	Spit No.	Depth (cm)	Auger size (cm)	Description	Shell (g)	Lithic Items
1	1	0-26	30	0-15 cm light grey/brown fine Aeolian sand grading to light yellow/brown fine sand at base of spit. Scattered charcoal.		
	2	26-50		Light yellow/brown fine dune sand with moderate density if dispersed charcoal fragments, some in concentrations, apparently from roots. Quick change at 50 cm to light yellow/brown sand.	<0.1	
	3	50-77		Continues as above with marked decrease in the amount of charcoal.		
	4	77-104		As above, becoming lighter with depth.		
	5	104-125		As above, becoming lighter.		
	6	125-150		As above. Small amount of charcoal throughout pit.		
2	1	0-23	30	Light brown fine sand (Aeolian).		
	2	23-48		Gradual change to light yellow/brown sand, some sparse charcoal fragments at base of spit.		
	3	48-75		Gradual change to orange/brown sand at c.60cm.		
	4	75-95		Continues as above, orange/brown fine sand.		
	5	95-120		As above, becoming lighter with depth.		
	6	120-145		As above, becoming lighter. Small amount of charcoal throughout pit.		
3	1	0-20	30	light grey/brown fine sand (Aeolian) some small flecks of charcoal in base of spit.		
	2	20-46		Change at 24 cm to light yellow/brown very fine loose sand, small amount of charcoal.		
	3	46-70		Grades to orange/brown very fine sand.		
	4	70-95		Continues, but slightly more orange.		
	5	95-115		Continues but becomes lighter with depth.		
	6	115-150		Continues, again lighter with depth. Small amount of charcoal throughout pit.		
4	1	0-24	30	Grey/brown fine sand, quick change to orange/brown fine sand. Truncated profile.	<0.1	

Pit No.	Spit No.	Depth (cm)	Auger size (cm)	Description	Shell (g)	Lithic Items
	2	24-59		Continues as above.		
	3	59-78		Continues as above, becoming lighter sith depth.		
	4	78-95		Continues as above, lighter with depth.		
	5	95-130		Continues.		
	6	130-150		Continues. Small amount of charcoal throughout pit.		
5	1	0-20	30	Grey/brown fine sand, some mixing with yellow/brown sand at base of spit. Small amount of charcoal present throughout pit.	6.6	
	2	20-45		Mottled grey/brown and yellow/brown fine sand.	5.7	
	3	45-86		Continues as above.	7.9	
	4	86-95		Continues as above, primarily grey/brown with some yellow/brown, mottling decreases with depth.	3.6	
	5	95-120		Sharp change at c. 100 cm to light yellow/brown sand.	2.9	
	6	120-150		Light yellow/brown sand continues. Small amount of charcoal throughout pit.		
6	1	0-25	30	Grey/brown fine sand.		
	2	25-44		Continues, yellow/brown sand appearing in base, some scattering of charcoal.		
	3	44-73		Grey/brown continues to 55 cm where a band of grey/black sandy charcoal onto light yellow/brown fine sand.		
	4	73-100		Light yellow/brown sand continues with some charcoal present.		
	5	100-120		Becomes more orange with depth.		
	6	120-150		Grades to orange/brown fine sand. Small amount of charcoal throughout pit.		
7	1	0-20	30	Grey/brown fine sand grading to yellow/brown fine sand at base of pit.	0.6	
	2	20-45		Continues to 34 cm then grades quickly to orange/brown sand.		
	3	45-70		Continues, small scattering of charcoal throughout pit		4

Pit No.	Spit No.	Depth (cm)	Auger size (cm)	Description	Shell (g)	Lithic Items
	4	70-90		Continues, becomes lighter with depth.		1
	5	90-115		Continues.		
	6	115-140		Continues, now a light yellow/brown.		1
8	1	0-20	30	Grey/brown fine sand grades to light yellow/brown fine sand at base of spit.	0.9	
	2	20-54		Light yellow/brown continues at c. 48 cm, small amount of charcoal present.		
	3	54-70		Light yellow/brown continues, becoming more orange with depth.		
	4	70-90		Grades to orange/brown fine sand.		
	5	90-120		Orange/brown sand continues, becomes lighter with depth.		
	6	120-150		Continues to light orange/brown fine sand. Small amount of charcoal throughout pit.		
9	1	0-25	30	Grey/brown fine sand, quick change at c.18cm to light yellow/brown.	48	
	2	25-50		Light yellow/brown fine sand, becomes more orange with depth.	13.2	
	3	50-73		Continues as above as light orange/brown fine sand.	4.3	
	4	73-98		Continues, becomes lighter with depth.		
	5	98-117		Continues.	2.9	
	6	117-150		Continues. Small amount of charcoal throughout pit.	10.1	
10	1	0-56	10	Grey/brown fine sand grades to yellow/brown sand at base of spit.	122.5	
	2	56-100		Grades to orange/brown fine sand.	48	
	3	100-130		As above, becomes lighter with depth. Small amount of charcoal throughout pit.	8.1	
11	1	0-57	10	Grey/brown fine sand grades to light yellow/brown fine sand at c.20 cm.	1.1	
	2	57-90		As above, grades to orange/brown fine sand.	1.1	
	3	90-130		Continues as above becomes lighter with depth. Small amount of charcoal throughout pit.	0.1	

Pit No.	Spit No.	Depth (cm)	Auger size (cm)	Description	Shell (g)	Lithic Items
12	1	0-58	10	Grey/brown fine sand grades to yellow/brown sand at c.20 cm.		
	2	58-92		Grades to orange/brown fine sand.		
	3	92-135		As above becomes lighter with depth. Small amount of charcoal throughout pit.		
13	1	0-50	10	Grey/brown fine sand grades quickly at c.15 cm to light yellow/brown fine sand.	3.9	
	2	50-85		As above, becomes lighter with depth.	2.6	
	3	85-120		As above, becomes lighter with depth. Small amount of charcoal throughout pit.	0.1	
14	1	0-20	45	Grey/brown fine sand onto light yellow/brown sand at base of pit.		
	2	20-54		Grey/brown fine sand grades to mottled grey/brown and yellow/brown fine sand. Yellow/brown sand increases with depth.		
	3	54-95		Mottling continues until c.85 cm, then onto yellow/brown sand.		
	4	95-140		Continues as yellow/brown fine sand.		
	5	140-170		Continues, becomes lighter with depth. Small amount of charcoal throughout pit.		
15	1	0-27	45	Grey/brown fine sand grades to mottled grey/brown and yellow/brown fine sand.	0.3	
	2	27-64		At c.40 cm a darker charcoal concentrated layer to c.45 cm then grades to orange/brown fine sand. North side of pit less orange than south side.	0.1	
	3	64-120		Continues as orange/brown fine sand.		
	4	120-155		Continues as above, becomes lighter with depth. Small amount of charcoal throughout pit.		
16	1	0-38	45	Grey/brown fine sand grades at 20 cm to mottled yellow/brown and grey/brown fine sand. Grades quickly to yellow/brown mottled fine sand. At c25 cm darker charcoal layer.		
	2	38-60		From predominantly yellow/brown dominated mottling to grey/brown dominated mottling at c46 cm.		
	3	60-100		Grades to yellow/brown fine sand at base of spit.		

Pit No.	Spit No.	Depth (cm)	Auger size (cm)	Description	Shell (g)	Lithic Items
	4	100-130		Grades to orange/yellow/brown sand, becomes lighter with depth.		
	5	130-156		Continues, becomes lighter with depth. Small amount of charcoal throughout pit.		
17	1	0-23	45	Yellow/brown fine sand grades quickly at c13 cm to yellow/brown fine sand.	0.2	
	2	23-60		Grades to orange/brown fine sand.		
	3	60-105		Continues, becomes lighter with depth.		
	4	105-145		Continues. Small amount of charcoal throughout pit.		
18	1	0-27	45	Grey/brown fine sand grades to mottled grey/brown and yellow brown fine sand at c13 cm. More charcoal within mottled layer.	1.2	
	2	27-65		At c50cm grades to mostly yellow/brown fine sand with some mall mottles of grey/brown.	0.2	
	3	65-110		Grades to orange/brown sand, becomes lighter with depth.		
	4	110-150		Continues, becomes lighter with depth. Small amount of charcoal throughout pit.		
19	1	0-23	45	Grey/brown fine sand grades quickly at c15cm to orange/yellow/brown sand, some mottling between layers.	0.9	
	2	23-60		Continues as orange /brown fine sand.		
	3	60-110		Continues, becomes lighter with depth.		
	4	110-144		Continues. Small amount of charcoal throughout pit.		1
20	1	0-24	45	Grey/brown sand grades to light yellow/brown sand at base of spit, charcoal at base of spit.	10.1	2
	2	24-60		Grades to yellow/brown fine sand. Flecks of charcoal in profile.		1
	3	60-110		Continues, becomes more orange with depth.		13
	4	110-145		Continues.		
21	1	0-27	45	Grey/brown fine sand grades quickly at c10 cm to yellow/brown sand. Charcoal throughout pit.	6.1	
	2	27-58		Grades to orange/brown fine sand.	0.2	3

Pit No.	Spit No.	Depth (cm)	Auger size (cm)	Description	Shell (g)	Lithic Items
	3	58-105		Continues.		
	4	105-130		Continues, becoming lighter with depth.	0.8	2
	5	130-160		Continues. Small amount of charcoal throughout pit.		
22	1	0-40	10	Grey/brown sand grading at base of pit to yellow/brown fine sand.	0.3	
	2	40-90		Continues, becomes more orange with depth.	<0.1	
	3	90-130		Continues, becomes lighter with depth. Small amount of charcoal throughout pit.		
23	1	0-50	10	Grey/brown fine sand grades to yellow/brown sand with grey/brown mottling.	<0.1	
	2	50-73		Grades to orange/yellow/brown sand, very fine and dry.	0.2	
	3	73-107		Continues, becomes lighter with depth. Small amount of charcoal throughout pit.		
24	1	0-45	10	Grey/brown fine sand grades to yellow/brown fine sand, some mottling between layers.		
	2	45-90		Continues, becomes more orange with depth.		
	3	90-148		Continues, becomes lighter with depth. Small amount of charcoal throughout pit.		
25	1	0-50	10	Light grey/brown fine sand grades to slightly mottled grey/brown with small amount of yellow/brown fine sand at base of pit.		
	2	50-80		Very fine and dry grey/brown sand, mottling increases with depth.		
	3	80-136		Continues, not yet onto yellow/brown sand fully. Small amount of charcoal throughout pit.		
26	1	0-58	10	Grey/brown fine sand grades at c25 cm to yellow/brown sand.		
	2	58-110		Grades to orange/yellow/brown fine sand.		
	3	110-165		Continues, becoming lighter with depth. Small amount of charcoal throughout pit.		
27	1	0-20	45	Grey/brown fine sand, charcoal flecks throughout.	<0.1	
	2	20-50		Grades to light yellow/brown very dry sand at c33 cm. Small flacks of charcoal throughout.		

Pit No.	Spit No.	Depth (cm)	Auger size (cm)	Description	Shell (g)	Lithic Items
	3	50-80		Continues and more orange with depth still very dry and loose, some large charcoal pieces.		
	4	80-125		Grades to bright brown/yellow sand. Water added to pit to aid retrieving sample.	<0.1	
	5	125-135		Continues, becomes lighter with depth. Small amount of charcoal throughout pit.		
28	1	0-30	45	Grey/brown fine sand.	4	
	2	30-60		Grey/bropwn fine sand grades to yellow/brown fine sand at c40 cm.		
	3	60-90		Grades to orange/yellow/brown sand.		
	4	90-115		Continues.		
	5	115-140		Continues, becomes lighter with depth. Small amount of charcoal throughout pit.		
29	1	0-26	45	Grey/brown fine sand grades to yellow/brown at base of pit.		
	2	26-60		Grades to yellow/brown fine sand, becomes more yellow/orange with depth.		
	3	60-93		Continues, becoming drier with depth.		
	4	93-120		Continues, becoming lighter with depth.	0.6	
	5	120-145		Continues. Small amount of charcoal throughout pit.		
30	1	0-28	45	Grey/brown fine sand, charcoal in base of pit.		
	2	28-60		Grades to yellow/brown sand. Two large lumps of charcoal at c48 cm and c56 cm, making sand around them darker grey/brown colour.		
	3	60-90		Grades to orange/brown fine sand.		
	4	90-130		Continues.		
	5	130-150		Continues, becomes lighter with depth. Small amount of charcoal throughout pit.		
31	1	0-24	45	Grey/brown fine sand.	2.7	
	2	24-59		Grades to yellow/brown sand at c45 cm. Flecks of charcoal evident, patch of charcoal in east wall. Mottled transition.		

Pit No.	Spit No.	Depth (cm)	Auger size (cm)	Description	Shell (g)	Lithic Items
	3	59-97		Continues, some small patches of charcoal, making sand in those areas greyer than surrounds.		
	4	97-135		Grades to orange/yellow sand.		
	5	135-153		Continues, becomes lighter with depth. Small amount of charcoal throughout pit.		
32	1	0-24	45	Grey/brown fine sand grades to yellow/brown fine sand at base of spit.		
	2	24-55		Onto yellow/brown sand, mottled transition from c20-37 cm. Large tree root running north-south through pit.		
	3	55-103		Grades to yellow/orange/brown fine sand. Becoming lighter with depth. Onto drier layer of sand.		
	4	103-118		Continues, becoming lighter with depth.		
	5	118-130		Continues, becomes drier with depth. Sediment fall from side of pit giving inaccurate depth. Small amount of charcoal throughout pit.		
33	1	0-30	45	Grey/brown fine sand. Slight yellow/brown mottling at base of pit.		
	2	30-60		Grades to yellow/brown sand at c39 cm.		
	3	60-100		Continues.		
	4	100-140		Grades to orange/brown fine sand.		
	5	140-150		Continues, becomes lighter with depth. Small amount of charcoal throughout pit.		
34	1	0-30	45	Grey/brown fine sand grading onto yellow/brown sand at base of pit. Charcoal fleck evident.		
	2	30-60		Grades to orange/yellow/brown sand with mottled transition from c46-54 cm.		
	3	60-96		Orange /yellow/brown fine sand continues.		
	4	96-146		Continues, becomes lighter with depth.		
	5	146-160		Continues. Small amount of charcoal throughout pit.		
35	1	0-30	45	grey/brown fine sand.		
	2	30-60		Grades slowly to yellow/brown fine sand at base of pit.		

Pit No.	Spit No.	Depth (cm)	Auger size (cm)	Description	Shell (g)	Lithic Items
	3	60-100		Yellow/brown fine sand continues becoming more orange with depth.		
	4	100-130		Continues, becomes lighter with depth.		
	5	130-149		Continues. Small amount of charcoal throughout pit.		
36	1	0-30	45	Grey/brown fine sand, yellow/brown fine sand appearing at base of spit.	28.5	
	2	30-60		Grading slowly to yellow/brown fine sand.		
	3	60-98		Continues to slowly grade to base of spit where it is full yellow/brown sand.		
	4	98-130		Continues, becoming more orange with depth.		
	5	130-150		Continues, becomes lighter with depth. Small amount of charcoal throughout pit.		
37	1	0-28	45	Grey/brown fine sand, sand appears more grey than previous pits.		
	2	28-58		Grey/brown continues.		
	3	58-100		Grey/brown continues, becomes lighter with depth.		
	4	100-126		Grades to brown sand.		
	5	126-150		Grades to light yellow/brown sand, mottled transition. Overall sand appears not as fine with depth as previous pits but still Aeolian sand. Small amount of charcoal throughout pit.		
38	1	0-30	45	Grey fine sand, some charcoal.		
	2	30-59		Grey fine sand becoming lighter with depth.		
	3	59-87		Grey fine sand grades quickly to brown sand at c70 cm grades quickly to light yellow/brown sand at base of pit.		
	4	87-128		Continues, becomes very light with depth. Sand is larger grained with depth but still fine.		
	5	128-150		Onto grey/black very humic fine sand (smelly).		
39	1	0-33	45	Black/grey very fine sand.		
	2	33-58		Grey fine sand.		
	3	58-90		Dark grey sand grades to brown sand at base of pit.		

Pit No.	Spit No.	Depth (cm)	Auger size (cm)	Description	Shell (g)	Lithic Items
	4	90-120		Continues becomes lighter with depth to light brown fine sand.		
	5	120-150		Continues becomes slightly darker with depth and damp and grain size increases.		
40	1	0-30	45	Light grey fine sand.		
	2	30-64		Continues, becomes lighter with depth, flecks of charcoal present.		
	3	64-88		Grades to very light yellow/brown fine sand, larger chunks of charcoal, quite dry.		
	4	88-105		Continues, becomes more yellow with depth also wetter with depth. Small gravel sized pebbles of pumice throughout pit in lighter sand.		
	5	105-130		Becomes slightly darker with depth. Pumice continues but decreasing.		
	6	130-150		Continues. Small amount of charcoal throughout pit.		
41	1	0-33	45	Light grey/yellow/brown sand grades quickly to yellow/brown fine sand at c18 cm.		
	2	33-68		Continues, as fine yellow/brown sand.		
	3	68-100		Continues, becomes more orange with depth. Very dry, water added to aid in the collection of the sample.		
	4	100-120		Continues, very dry, water added.		
	5	120-150		Continues, becomes lighter with depth. Very dry water added. Small amount of charcoal throughout pit.		
42	1	0-30	45	Light slightly grey/brown sand grades quickly to light yellow/brown sand at base of pit.		
	2	30-68		Light yellow/brown sand continues becoming drier with depth and more yellow.		
	3	68-94		Continues becomes lighter with depth. Very dry, water added.		
	4	94-110		Continues. Very dry, water added.	2.8	
	5	110-145		Continues. Very dry, water added. Not much sample able to be retrieved due to dryness of sediment. Small amount of charcoal throughout pit.		

Pit No.	Spit No.	Depth (cm)	Auger size (cm)	Description	Shell (g)	Lithic Items
43	1	0-30	45	Grey/brown fine sand grades to yellow/brown sand at base of spit.		
	2	30-60		Continues, becoming more orange with depth.		
	3	60-110		Grades to orange/brown sand.		
	4	110-150		Continues, becomes lighter with depth. Small amount of charcoal throughout pit.		
44	1	0-30	45	Grey/brown fine sand grading to yellow/brown at base of pit.	0.4	
	2	30-65		Continues, charcoal and midden shell at base of spit, sample taken of charcoal.	67.6	5
	3	65-105		Light yellow/brown sand continues, becomes lighter with depth. Charcoal layer from c65-72 cm.	1.9	2
	4	105-150		Continues becomes more orange with depth.	2.9	
45	1	0-33	45	Grey/brown fine sand grades to yellow/brown at base of spit.		
	2	33-69		Continues becomes more orange with depth.		
	3	69-110		Continues becomes lighter with depth.		
	4	110-150		Continues.		
46	1	0-60	10	Grey/brown fine sand grading to yellow/brown at base of pit.	20.6	
	2	60-125		Yellow/brown fine sand with grey/brown mottles grades to continues becoming lighter with depth.	4	
	3	125-150		Light yellow/brown fine sand with grey/brown mottles. Small amount of charcoal throughout pit.	<0.1	
47	1	0-40	10	grey /brown fine sand grades to yellow/brown at c20 cm.	0.6	
	2	40-97		Continues as yellow/brown fine sand.		
	3	97-150		Continues becoming lighter with depth. Small amount of charcoal throughout pit.		
48	1	0-60	10	Grey/brown fine sand grades to yellow/brown at c20 cm		
	2	60-85		Grades to orange brown fine sand.		
	3	85-100		Continues, becomes lighter with depth. Small amount of charcoal throughout pit.		

Pit No.	Spit No.	Depth (cm)	Auger size (cm)	Description	Shell (g)	Lithic Items
49	1	0-75	10	Grey/brown fine sand grades to yellow/brown at c40 cm.		
	2	75-90		Yellow/brown continues.		
	3	90-130		Grades to orange/yellow becomes lighter with depth. Small amount of charcoal throughout pit.		
50	1	0-72	10	Grey/brown fine sand grades to yellow/brown at c30 cm.		
	2	72-95		Continues, becomes lighter with depth.		
	3	95-130		Continues. Small amount of charcoal throughout pit.		
51	1	0-60	10	Grey/brown sand grading to yellow/brown.		
	2	60-85		Grades to orange/brown.		
	3	85-110		Continues, becomes lighter with depth. Small amount of charcoal throughout pit.		

APPENDIX 4

LITHIC INVENTORY

Pit	Spit	Asymmetric Backed Artefact	Bipolar Core	Broken Flake	Broken Redirecting Flake	Complete Flake	Flaked Piece	Pot Lid	Retouched Flaked Piece	Heat Affected	Total	Weight
Surface						4					4	8
7	3			2		1			1		4	5.9
7	4							1		1	1	0.5
7	6						1				1	0.1
19	4					1					1	0.8
20	1			1		1					2	0.8
20	2					1					1	0.3
20	3	1		6		6					13	14.1
21	2			2		1					3	0.3
21	4			2							2	0.2
44	2		2		1	1	1				5	5.7
44	3					2					2	0.7

APPENDIX 5

HUMAN SKELETAL REMAINS PROTOCOL

Human Skeletal Remains Protocol

The potential for human skeletal remains to be uncovered when excavating in sand deposits in relative proximity to water sources and known areas of Aboriginal occupation cannot be discounted. These actions should be followed if human skeletal material is detected during development activities:

1. If the remains are detected within or during an archaeological excavation, then no further excavation that involves the removal of *in situ* bones is to occur until local Aboriginal community and DEC representatives have been contacted and consensus is reached regarding the continuation of the excavation.

   If the remains are detected within the context of mining related activities, then all ground surface disturbance in the area of the finds should cease immediately the finds are uncovered.

2. If there is substantial doubt regarding a human origin for the bones, then evaluate if it is possible to gain a qualified opinion from an archaeologist within a short period of time. If feasible within a short period of time, seek an informed opinion (this can circumvent proceeding further along the protocol for non-human remains). If a quick opinion cannot be gained, or the identification is positive, then proceed to the next step.

3. Notify immediately the following people of the discovery:

   - the local Police (required by law);
   - a DEC archaeologist or Aboriginal Heritage Officer from South Branch ,Queanbeyan (6298 9707);
   - a representative from the *Jerrinja LALC* or the *Jerrinja Consultants*
   - the project archaeologist (if not already present).

4. Facilitate, in co-operation with the appropriate authorities and Aboriginal representatives, the definitive identification of the skeletal material by a qualified person (if not already completed). This must be done with as little further disturbance to any remaining *in situ* material as possible.

   If the skeletal material is identified as human, but not Aboriginal, then all further decisions and responsibilities regarding the remains rest with the NSW Police.

   If the skeletal material is identified as Aboriginal then:

   4.1 Ascertain the requirements of the local Aboriginal organisations, the DEC and the project archaeologist.

   4.2 Based on the above, determine and conduct an appropriate course of action. Possible strategies could include:

   - avoiding further disturbance to the find and conserving the burial *in situ*, (this option may require relocating the mining activity and this may not be possible in some contexts)
   - conduct (or continue) archaeological salvage of the finds
   - scientific description of the remains prior to reburial
   - recovery of samples for dating and other analyses
   - subsequent reburial at another place and in an appropriate manner determined by local Aboriginal organisations.

5. Following the removal of the skeletal and associated burial material to the satisfaction of the project archaeologist and local Aboriginal organisation representatives, recommence previous activities.