Lilli Pilli Point Reserve Conservation Management Plan

Prepared by Australian Museum Business Services
for Sutherland Shire Council

Final Report

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Executive Summary

This Conservation Management Plan (CMP) is for that part of the Lilli Pilli Point Reserve located to the east of Lilli Pilli Point Road. It encompasses the ecological, Aboriginal and historic heritage of the Lilli Pilli Point Reserve. Detailed research findings are presented as a basis for an assessment of the significance of the site with regard to these three areas of heritage, and for the development of management strategies.

The Lilli Pilli Point Reserve has significance to the local community for its natural, Aboriginal and historic heritage values.

The elements of both Littoral Rainforest and SSSFTS (i.e. all of the natural bushland) within the Reserve are remnants of vegetation communities that were once widespread, but are now in decline. Both vegetation communities have significance to the State of NSW and to the local community.

The archaeological and historic resources of Lilli Pilli Point Reserve have the potential to make an important contribution to an understanding of the transition of the local area from a natural and cultural environment used by the Aboriginal community to a landscape modified for the recreational needs of European settlers. Heritage resources are represented in the presence of Aboriginal sites and places such as middens, rockshelters, grinding grooves, rock art, and natural bushland interrelating to form a remnant cultural landscape; and the remains of historic material culture such as boatsheds, wharves, steps and slipways. Both Aboriginal and historic heritage resources at Lilli Pilli Point Reserve have significance as cultural sites of importance for present and future groups in the European and Aboriginal communities, and as a shared cultural heritage resource.

Opportunities and constraints are discussed in the context of the Burra Charter and applicable legislation.

To enhance enjoyment and preservation of the significant natural, Aboriginal and historic heritage values of the Reserve, it is recommended that a formalised pathway is constructed. Further management recommendations are provided for:

- Management of native vegetation;
- Conservation of Aboriginal places;
- Conservation of historic heritage; and
- Site interpretation..

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1 Introduction

Preamble

The Australian Museum Business Services (AMBS) has been commissioned by Sutherland Shire Council to prepare a Conservation Management Plan for that part of the Lilli Pilli Point Reserve located to the east of Lilli Pilli Point Road. This Conservation Management Plan (CMP) encompasses the Ecology, Aboriginal and Historical heritage of the Lilli Pilli Point Reserve (the study area).

Study Area

Lilli Pilli is a suburb within the Sutherland Shire Council Local Government Area (LGA), 26km to the south of Sydney (*Figure 1.1*). Lilli Pilli Point Reserve is on the northern foreshore of Port Hacking, to the east and west of Lilli Pilli Point Road. Lilli Pilli Point Reserve comprises Lot 7004, DP 93567, and Lot 7005, DP 93567 in the Parish of Sutherland, County Northumberland.

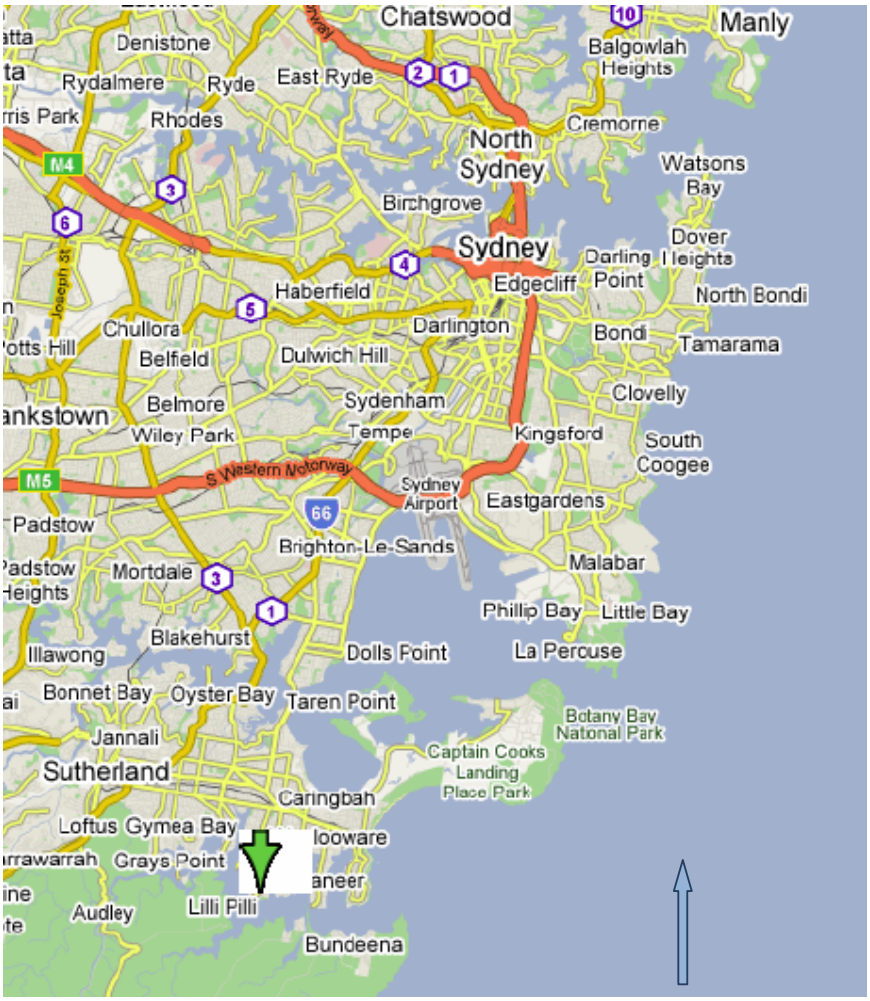

Figure 1.1 Location map of the Lilli Pilli Point Reserve (*Source: Google Maps*).

The land belongs to the State Government but is currently under the care, control and management of the Sutherland Shire Council. Under the Sutherland Shire Local Environment Plan 2006 the area

is covered by two public open space zonings. Generally, areas containing bushland are classified as Zone 14 Public Open Space (Bushland) and open grassed areas are classified as Zone 13 Public Open Space.

The Lilli Pilli Point Reserve is a narrow area of foreshore parkland at the south and west of Lilli Pilli Point. The subject of this CMP is that section of the Lilli Pilli Point Reserve to the east of Lilli Pilli Point Road. The total study area is 3.92 ha, comprised of two key areas:

- **Reserve 66504** which is 25,811 m^2 in area and extends in a band 30.48 m wide along the Port Hacking foreshore; and
- **Part of Reserve 135** which is 13,406 m^2 in area and adjoins the preceding reserve at the eastern tip of the Point.

To the north and east of the Reserve are residential properties on Korokan Road and Bareena Street.

Figure 1.2 The study area comprising part of Reserve 66504 and all of Reserve 135 is the foreshore section of the Lilli Pilli Point Reserve outlined in red (*Source: Sutherland Shire Council*).

Methodology and Authorship

This Conservation Management Plan (CMP) is consistent with the principles and guidelines of the Burra Charter (*The Australia ICOMOS charter for the conservation of places of cultural significance*). The report has been prepared in accordance with current heritage best practice guidelines as identified in the Heritage Office, Department of Planning, *NSW Heritage Manual* and associated documents *Archaeological Assessments* and *Assessing Heritage Significance*.

The vegetation recorded within the Reserve and species list developed by the previous plan of management (SSC 1997) were used to assess the vegetation within the Reserve against the following criteria:

- Ecological communities and species listed under the Schedules of the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act); and

- Other significant species including those considered as Rare or Threatened Australian Plants (ROTAP species; Briggs and Leigh 1995) and those considered locally significant on Sutherland Shire Councils Indigenous Species list (SSC 2006).

Nomenclature for flora follows that of Harden (1990; 1991; 1992; 1993) and Harden & Murray (2000) with up to date revisions as included in the *PlantNET* database (Royal Botanic Gardens, Sydney).

Sections of this report addressing Aboriginal heritage have been prepared in accordance with current heritage best practice as specified by the Department of Environment and Climate Change (DECC) documents *Aboriginal Cultural Heritage Standards and Guidelines Kit* and *Draft Aboriginal Heritage Impact Assessment Guidelines*.

Ecological surveys of the Reserve were undertaken on 4 May 2007 by David Thomas, Botanist, and on 3 October 2007 by David James, AMBS Senior Project Manager and Brian Towle AMBS Project Officer (Ecology).

Emma Harrison surveyed the Reserve on 3 October 2007 for Aboriginal heritage. Despite efforts by the Local Aboriginal Land Council (LALC) and AMBS, the La Perouse LALC community representatives were unable to attend the field survey due to staffing shortages, however, the LALC has provided an endorsement of the findings of this report (Appendix E).

Amanda Dusting, AMBS Project Officer, undertook the survey to assess the historic heritage of the Lilli Pilli Point Reserve on 4 May 2007 and prepared those sections of this report addressing the historic heritage of the place.

The Aboriginal sections of this CMP have been reviewed by AMBS Project Manager, Chris Langeluddecke. The sections dealing with ecological aspects of the Lilli Pilli Point Reserve have been reviewed by David James, AMBS Senior Project Manager, Ecology and, AMBS Senior Project Manager Archaeology & Heritage, Jennie Lindbergh, provided technical advice, and undertook final review of the report.

2 Environmental Context

2.1 The Physical Environment

The Port Hacking geology is characterised by steep, Hawkesbury Sandstone slopes and ridges of the Woronora Plateau, with medium to coarse grained quartz sandstone and minor shale and lamnite lenses present. Massive or cross bedded sheet facies with vertical or subvertical joint sets and the combination of bedding planes and widely spaced joints gives stone outcrops in the area a distinctly blocky appearance (Hazelton and Tille 1990:45). The region to the east has a varying landscape of rugged sea cliffs and sandy beaches, and swampy bay coasts backed by sand dunes. To the west the surface consists of a broad plateau rising gently to the south west and cut-into by several deep river gorges (Branagan 1997:1).

Lilli Pilli is located on the north shore of the Port Hacking estuary. The adjacent suburbs of Caringbah, Port Hacking and Dolans Bay are located to the north and the east. The Royal National Park is situated across the water on the foreshore of Port Hacking directly to the south, and is visible from Lilli Pilli Point Reserve. Maianbar and Bundeena villages are located to the southeast on the opposite bank of Port Hacking. Lilli Pilli is surrounded by Gannons Bay, Little Turriel Bay, and Great Turriel Bay. Yowie Bay and the Port Hacking River are located to the west, with Burraneer, Gunnamatta and Bate Bays located to the east. The highest point of the peninsula, approximately 50m above sea level, occurs south of the junction of Lilli Pilli Point Road and Winnunga Avenue. From here the topography slopes gently down towards the Reserve and to the waterline (*Figures 1.1* and *1.2*).

2.1.1 Soils

The study area is located within the Hawkesbury Soil Landscape (Hazelton and Tille 1990:45-49). These soils are characteristically shallow, discontinuous Lithosols/Siliceous Sands associated with rocky outcrops; Earthy Sands and Yellow Earths and locally deep sands on the inside of benches and along joints and fractures; and Yellow and Red Podzolic Soils associated with shale lenses. This is a colluvial landscape in which sediment and debris on hillslopes are subject to natural creep downslope over time with the force of gravity, gradually accumulating on lower slopes.

Limitations of this soil landscape are extreme soil erosion hazard; shallow, stony, highly permeable soil; steep slopes and rocky outcrops; and low soil fertility. Such limitations have resulted in predominantly residential land use around the region, with urban development along the Port Hacking foreshore (Hazelton and Tille 1990: 45-9). It has been shown that severe sheet erosion often occurs during storms after ground cover has been removed by bushfires in the area (Atkinson 1983).

Gully erosion, often to bedrock, commonly occurs along unprotected tracks and fire trails, especially those used regularly (Hazelton and Tille 1990:47). Gully erosion occurs after the removal of soil along drainage lines by surface water runoff. Once started, erosion gullies will continue to erode unless stabilisation steps are taken. Prompt action on such processes has proven to be less complicated and more cost effective than letting the process run unchecked.

2.1.2 Hydrology & Drainage

Sutherland Shire Council plans of the stormwater drainage system at the peninsula show that two stormwater mains are relevant to the study area. One runs from Northeast Crescent at the northwestern edge of Reserve 135 in a roughly north-south orientation, and onwards towards the waterline. The other runs along the line of Lilli Pilli Point Road on its western edge from Koala Road towards the foreshore and thence presumably through the foreshore Reserve area to the waterline.

2.1.3 Vegetation

The remnant native vegetation includes vegetation associated with the enriched sandstone soils of gullies in the region, remnants of littoral rainforest along the foreshores in addition to mangroves and salt-marsh species along the high tide mark. A more detailed description of vegetation within the Reserve is provided in *Section 5*.

2.1.4 Land Use & Disturbance

The earliest historic description of the Lilli Pilli peninsula is in a report by Robert Cooper Walker (1868), in which he described the Sutherland Estate of wealthy wool merchant, timber getter and politician Thomas Holt (Pollon 1988: 154). Holt (1811-88) was a prominent local figure who owned a substantial estate comprising most of the lands stretching from Sutherland to Cronulla. Cooper's early account explains that the Lilli Pilli peninsula was named on account of 'native myrtle' trees that grew in 'rich black soil' there.

To the south, the Royal National Park was officially dedicated in 1879, and by 1880 lands between the Georges River and Port Hacking were under extensive private ownership. The principal eastern area of what we recognise today as Lilli Pilli Point Reserve was surveyed in 1884 and gazetted in 1886. This area was later extended in 1900 to include the foreshore area.

Development remained limited during the early twentieth century, and was mostly limited to small 'weekender' residences. The post-war period saw more accelerated growth in the area, and during the 1950s and 1960s the large grounds of local historic estates such as 'Moombara' and 'Nuimburra' were subdivided into smaller lots. The 1970s saw the development of a number of battleaxe blocks in the eastern area of the point. The Reserve itself has remained relatively undisturbed.

The extent of disturbance to sites, soil profiles and archaeological deposits in the study area will depend mainly upon any impact sustained within the Reserve by nearby activities. Residential construction, public recreational uses, and environmental factors such as gully erosion and fluvial action are relatively minor in terms of the scale of disturbance when compared with unrelated, more extensive impact factors such as major land clearance, agriculture, and on-site residential or industrial construction. The relative absence of these add to the cultural, archaeological, and heritage potential of the area.

3 Aboriginal Context

3.1 Regional Archaeological Context

Culturally, the Port Hacking district falls into an area known in the past as 'Djeeban' by Aboriginal inhabitants. We now call these peoples the Tharawal or Dharawal, although they would have then referred to themselves by their clan names of Gwegal, Cadagal, Bidegal, Nor-noregal, Cobragal, and many other names now lost (Bursill 2004:10).

The South West Arm Creek region of the Royal National Park, approximately 4km southwest of Lilli Pilli Point, was of particular local significance. Communities from the wider Illawarra district gathered here annually to camp, fish and hunt wallabies, possums, and bandicoots. Here too was the ancient 'crossing place' for the South Coast Aborigines on their annual walkabout to the northern coastal areas for the winter season. Signs of these ancient activities, such as rockshelters, paintings and engravings, are widely located throughout the Royal National Park (Hutton Neve 2000:1)

Study of Aboriginal archaeology in the Shire region was largely pioneered by F.D. McCarthy, who undertook the excavation of rockshelter sites, first at Lapstone Creek and later in the Capertee Valley (McCarthy 1948, 1964). On the basis of this work McCarthy was able to establish a tripartite system known as 'The Eastern Regional Sequence' which could be used to interpret the Aboriginal past of the region based on stone tool indicators.

McCarthy's sequence divided the material past into three phases, beginning with the Capertian, a phase characterised mainly by scrapers and pebble tools. The earliest date for this phase was established from rockshelter excavation at Burrill Lake where radiocarbon dates have indicated an occupation phase from around 20,500 B.P. While this site is located adjacent to the coastline, at the time of first occupation, the site would have been approximately15km inland away from the coast and overlooking river valleys. Most other sites excavated on the south coast of NSW date from after 8,000 years ago when sea levels had risen, and the vast majority of sites date from the last 3,000 years. The middle phase of the Eastern Regional Sequence is known as the Bondaian and is characterised by small microlithis (backed blades) that have been termed 'Bondi Points' after their initial discovery near Bondi Beach in Sydney. The final, most recent phase is known as the Eloueran and is characterised by the 'elouera' type stone adze flake.

The existence of these three phases was confirmed by excavations at one of seven rock shelters, Curracurrang Cove in the Royal National Park, from where the first sequence of radiocarbon dates for the Sydney region were produced. Here the basal date of approximately 8,000 years B.P. is very similar to those dates produced from similar material at Capertee. The middle levels of the Curracurrang rockshelter site have been dated as ranging between 2,500 and 850 years B.P., and were rich in artefacts with over 1,000 microliths recovered (Megaw 1997: 9; 1974).

The uppermost levels of the Curracurrang shelter were rich in faunal material such as single and double ended spear barbs made from animal bone. These artefacts, as well as shell and bone debris, are valuable evidence for local Aboriginal exploitation of the marine and inshore environment prior to European settlement. The site also contained human burials with associated artefacts which indicate contact between the local Aboriginal community and Europeans. Studies of stone waste

flakes from the site included geological thin sectioning of tools which indicated distant sources of raw material, particularly chert from the Bateman's Bay.
Excavations at three sites around Wattamolla Lagoon, immediately north of Curracurrang, provided a variation on this pattern (Megaw and Roberts 1974). Prey such as fish, shellfish, seals and marine birds were exploited. The earliest radiocarbon sample from the site dates to 2,000 B.P. and the stone tool technology was consistent with this date. The site also contained evidence of the complex manufacture of worked bone and shell fishing implements, showing parallels with other sites of the last phase of Aboriginal coastal settlement.

Surrounding Wattamolla and Curracurrang are several engravings of animal figures of the type best represented in the Ku-ring-gai Chase/Hawkesbury vicinity. Excavations at one painted rock shelter located above the Hacking River at Audley contained a midden, where valuable contextual evidence had been destroyed by looting. A handful of artefacts were recovered; however, dating of these was impossible. Audley nevertheless retained Aboriginal art, including depictions of local fauna and hand stencils.

Research undertaken at Captain Cook's Landing Place, Kurnell (Megaw 1968b) utilised a multi-disciplinary approach to interpret the latter periods of archaeology. The site has been recognised by archaeologists from the 1960s onwards as a large open midden and camp site used over at least 500 years. Archaeological investigations in the region indicated that the area had Aboriginal occupation history going back to at least 5,000 B.P. The midden demonstrated utilisation of the coastal food resources, including Sydney cockle, oysters, turban shells, mussels, and snapper and bream fish varieties. Evidence of more widespread hunting was demonstrated in remnants of seal, dolphin, whale, a range of marsupials, and the remains of dingo and marine bird species (Megaw 1997:10; Hutton Neve 2000:1).

3.2 Local Archaeological Context

3.2.1 NSW DECC Aboriginal Sites Register (AHIMS Data)

There are a total of 15 Aboriginal sites over Lilli Pilli Point recorded in the DECC AHIMS register (see *Table 3.1*), with a possible nine of these within Lilli Pilli Point Reserve. The majority of these sites are concentrated towards the shoreline in the middle section of Lilli Pilli Point, between 50-100m east (5 sites) and around 200m west (six sites) of Lilli Pilli Point Road. The remaining four sites are scattered with locations at Lilli Pilli Point Reserve (east), the southern shores of Little Turriell Bay, and at Beckton Place south of Gannons Bay.

Those six sites located west of Lilli Pilli Point Road are concentrated on the western side of Immarna Avenue near the waterline, either within or on the periphery of Lilli Pilli Point Reserve. Those sites east of Lilli Pilli Point Road appear to be on residential lands on the block bounded by Lilli Pilli Point Road, Winnunga Road, North East Crescent, and Kamira Road; and in the residential area directly east of this between North East Crescent and the waterline of Little Turriell Bay. There are a further two sites located within Lilli Pilli Reserve (east) south of Kamira and Karokan Roads. Aboriginal sites recorded in the AHIMS register are presented in *Table 3.1*.

Table 3.1 DECC AHIMS sites recorded on the Lilli Pilli peninsula.

Site Number	Easting	Northing	Site Type
52-3-0492	325580	6228290	Midden
52-3-0489	325600	6228020	Shelter with midden
52-3-0441	326180	6228150	Midden
52-3-0440	326050	6228140	Midden
52-3-0439	326000	6228440	Shelter with midden
52-3-0437	325940	6228070	Shelter with midden
52-3-0436	325710	6227990	Open midden
52-3-0416	326150	6228150	Midden
52-3-0121	N/A	N/A	Rock engraving
52-3-0122	N/A	N/A	Shelter with deposit
52-3-0120	N/A	N/A	Axe grinding grooves
52-3-0116	N/A	N/A	Shelter with midden (?)
52-3-0113	N/A	N/A	Shelter with deposit and art
52-3-0112	321180	6229120	Shelter with deposit
52-3-0488	326300	6228200	Shelter with midden

3.3 Discussion

The majority of sites known from the Port Hacking area are shell midden deposits, with concentrations of these sites known particularly from the southern side of the Hacking River around Leg of Mutton Bay and around Grays Point, approximately 2.5km west of the study area. These middens occur either in the open or in association with rockshelters (AMBS 2004:4).

Middens are the most common type of site at Lilli Pilli Point. All but two recorded sites are associated with midden deposits. These are recorded sometimes in isolation (four sites), but most commonly middens are in direct association with rockshelters (eight sites), or less commonly with rockshelters and art (one-two sites). In addition to the midden related sites, axe grinding grooves (one) and rock engravings (one) are also known, although these occur in close proximity to the other site types and should be considered as culturally and archaeologically interrelated.

Middens generally provide considerable archaeological evidence, particularly concerning Aboriginal dietary information and thus the exploitation of coastal food resources. They are also known, in some contexts, to have been used as Aboriginal burial places as they provide suitable soft, deep deposits. The archaeological potential of midden deposits is further increased as they are an alkaline environment which facilitates the preservation of archaeological data such as shells and bones (Mulvaney and Kamminga 1999:20-2). Typically middens are located on headlands, coastal estuaries, and sand dunes along the coastal fringe where they are usually less than 6,000 years old as they edge the present-day seashore which had stabilised about that time (Mulvaney and Kamminga 1999:21-2).

In addition to Aboriginal burials known from midden contexts in the Shire district (discussed in *Section 3.1*), a number of Aboriginal burials in the Port Hacking area were documented after their disturbance in 1918 (see *Figures 3.1 - 3.4*). Burials were noted approximately 1.5 km northeast of the study area at a rockshelter and midden site at Turriell Point (Sutherland Shire Libraries 2007). This demonstrates the potential for midden deposits to be associated with Aboriginal burials not only regionally, but locally in relation to the study area. Such burials are extremely sensitive cultural areas

for Aboriginal people. Burials and their contexts may further provide significant contributions to archaeological research questions if this is authorised by Aboriginal community representatives in the pursuit of investigating their cultural heritage.

Figure 3.1 Rockshelter at Turiell Point where an Aboriginal burial was unearthed in 1918 (Source: Sutherland Shire Libraries).

Figure 3.2 An Aboriginal burial and artefacts unearthed from a shelter at Turriell Point, 1918 (Source: Sutherland Shire Libraries).

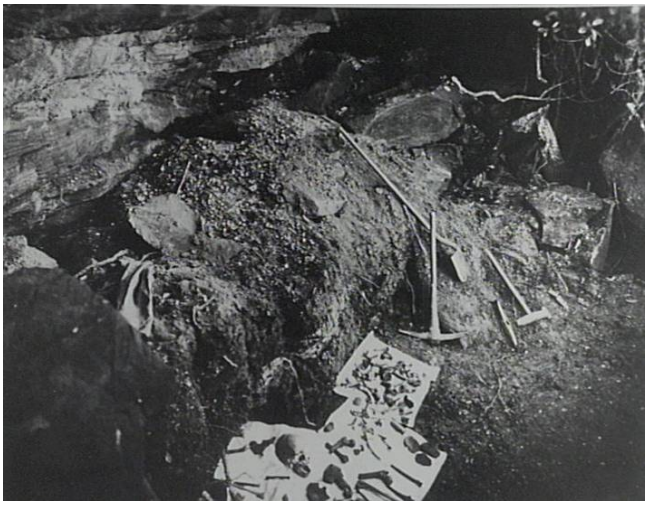

Figure 3.3 An Aboriginal burial and artefacts unearthed from a shelter at Port Hacking, 1918. (Source Sutherland Shire Libraries).

The abundance of midden sites at Lilli Pilli Point, one of which has a surface area measurement of approximately 20m² (AHIMS#52-3-0436), is a clear indication that the area was exploited for important coastal food resources and habitation regularly and over long periods of time. Such deposits have been shown locally to be of considerable depth.

Margaret Gifford provides an account relating to the house *Moombara*, located less than 500m across Little Turiell Bay from Lilli Pilli Point Reserve (Gifford 1984:13). Gifford writes of the name *Moombara* as meaning "camping ground" in the local Aboriginal dialect. Gifford's account comments briefly upon the process of cutting through a bank during construction of a tennis court at *Moombara*: 'The rocks at the water's edge were massed with oyster shells... 50 feet above the water line, the men dug through layers and layers of oyster shell, showing that the place had been used as an Aboriginal camp for hundreds of years...' (Gifford 1984:13).

The profusion of *Ostrea angasi* (freshwater oyster), *Mytilus edulis planulatus* (mussel), *Velacumantus australis* (periwinkle), *Anadara trapezia* (cockle) and *Pyrazus ebeninus* (whelk) shells recorded at the AHIMS Lilli Pilli Point sites shows that these edible species were readily available. Edible shellfish are known to have provided an abundant, reliable and easily gathered source of protein, gathered as part of a pattern of seasonal mobility which would have been necessary for a successful hunter gatherer economy (Kohen 1999:64-5).

Lilli Pilli peninsula also retains stands of edible and medicinal native flora such as Fig (*Ficus)*, Tea Tree (*Melaleuca)*, Lilli Pilli (*Acmena)*, Sarsparilla (*Smilax)* and *Banksia* species, which would have presented important resources for hunter-gatherer dietary and subsistence needs. Local vegetable sources probably contributed to more than half of the daily hunter gatherer dietary energy requirements (Meehan 1982). Plant fibres, gums and resins were also essential raw materials in the production of Aboriginal weapons, tools, clothing, ornamentation, baskets, rope, nets, string and toys (Wesson 2005a:12-13). Soft bark, such as that of the Stringybark, was used to provide layers of waterproofing and insulation (Wesson 2005b:30).
Rock art sites on the peninsula are known to consist of both figurative rock engravings (petroglyphs) and paintings (pictographs). The presence of rock art sites on the peninsula is particularly significant

for the archaeological and cultural heritage of the area as these depictions are the result of past systems of communication, ritual and encoded knowledge. Such motifs retain their cultural and spiritual significance long after their makers have gone, and positively signify for their viewers' Dreaming ancestors and sacred viewers (Mulvaney and Kamminga 1999:31). As such they are regarded as "fragments of prehistory located in place" and potentially provide a source of insight into Aboriginal spirituality, material possessions, and their sense of personal and group identity (Mulvaney and Kamminga 1999:357).

Axe grinding grooves such as those recorded in the Lilli Pilli region are physical evidence of tool making or food processing by Aboriginal people, with the manual rubbing of stones causing the grooves. They are generally found on flat areas of soft rock, particularly sandstone, in areas near creek beds or other water sources, and may be found in locations associated with rockshelters and rock art. Their interpretation may be either purely practical or both practical and symbolic. The placement of axe grinding grooves close to water is practical as water is needed to wash away sand and keep the axe cool during the grinding process.

The AHIMS register shows that no scarred trees are recorded on the peninsula. There is some minor potential for these sites to exist within stands of old growth vegetation, provided trees are older than around 150 years. Dense native vegetation is present within the Reserve of species known to have been favoured by Aborigines for bark resources (e.g. *Melaleuca* and *Eucalyptus*). In addition, the area is close to waterways where watercraft may have been utilised. It is documented that the area was favoured over time as a hunting ground of tree dwelling species such as possums. Elsewhere trees with carved climbing footholds are evidence of such hunting practices, and the gathering of nuts and honey.

The history of land use in the area (see *Section 2.5*) suggests that native vegetation within the main Reserve area has remained free from large-scale land clearance following European settlement. However, any suitable timber resources on the peninsula are likely to have been utilised during construction of the early boatsheds and other structures along the foreshore. Therefore the likelihood for carved and scarred tree sites to remain within the Reserve is low.

3.4 Aboriginal Heritage Site Prediction Modelling

Given the regional and local archaeological contexts and the recorded archaeological sites on the Lilli Pilli peninsula, it is possible to formulate a site prediction model based on this prior research. The model is intended to outline specific local trends in site location that may be applied to the study area in order to assess the potential for the presence of Aboriginal cultural heritage sites and their likely type. Based on this local research the model for the Lilli Pilli Point Reserve is as follows:

- midden deposits are the most common site type on the Lilli Pilli peninsula. Middens occur extensively within the Lilli Pilli Point Reserve and are concentrated adjacent to the waterline;
- rockshelters are the most likely sites to be associated with middens;
- rockselters with art, grinding grooves and engravings are also likely to occur in association with middens. However, these are less common than rockshelters without these features;
- The likelihood of the presence of grinding grooves increases as proximity to water increases; and

- The likelihood of the presence of scarred trees in the area is comparatively low. However, potential for these sites to exist within stands of existing mature growth native vegetation should not be discounted.

3.5 Aboriginal Consultation

AMBS is committed to providing heritage and archaeological services in consultation with Aboriginal community groups. As part of AMBS's professional responsibilities Aboriginal community groups will be invited to comment and to have input into the heritage and archaeological assessment process. Such consultation has been undertaken according to the NSW Department of Environment and Climate Change (DECC) *Interim Community Consultation Guidelines* (DEC 2004). AMBS archaeology and heritage staff are also members of the Australian Association of Consulting Archaeologists Incorporated (AACAI), they therefore also abide by the AACAI code of ethics which states that: "*A member shall be sensitive to, and respect the legitimate concerns of groups whose cultural background is the subject of investigations*."

In accordance with guidelines and professional codes of best practice AMBS has undertaken consultation with the Aboriginal community representatives. La Perouse Local Aboriginal Land Council (LALC) has been provided with the opportunity to participate in the field components of the project as well as to comment on the draft report. Unfortunately, a representative of La Perouse LALC was unable to attend the field investigations, however, La Perouse LALC was provided with a copy of the draft report and have given their endorsement of the cultural heritage management plan (letter attached in Appendix E).

4 Historic Context

4.1 Historic Overview

Table 4.1. Chronology of European historic events.

Date	Event
1770	*Endeavour* sails into Botany Bay and lands on southern shore
1796	Bass and Flinders explore and name Port Hacking
1815	James Birnie first recorded landowner at Kurnell
1840	Land grant 20acres Francis Mitchell 30 June 1840
1861	Surrounding area bought by Thomas Holt 12000 acres
1864	Tom Ugly's punt begins operation across the Georges River
1868	Lilli Pilli Point described by Walker – report commissioned by Holt
1879	Royal National Park created
1884	Survey of Reserve 135 (Eastern part of LPPR)
1885	Illawarra Railway line opened to Sutherland
1886	Gazette of Reserve 135 (Eastern part of LPPR)
1881	Holt-Sutherland Estate Land Company Ltd. formed, offering 99 year leases
1888	Holt dies having returned to England
1891	Subdivision 4 August 1891 (Hunt 1997: app 3).
1900	Crown takes possession of Reserve 66504 – 100 foot of foreshore (Western part of LPPR)
1900	Holt Sutherland Estate Act passed, Holt Sutherland Estate Company Limited formed – tenants now able to convert land from leasehold to freehold.
1906	Parliament ruling re: Holt Sutherland Estate Company Limited, leasing land on the foreshore Reserve
1908	Survey of foreshore Reserve 66504 (Western part of LPPR)
1908	Public wharf built at Lilli Pilli Point – Cronulla to Audley ferry stops regularly at Lilli Pilli Point
1910	Permissive Occupancy for 5 boathouses on the foreshore
1914	Suttons Estate subdivision
1915	Bundeena Ferry service begins
1929	Tom Ugly's bridge opened
1937	Reserve 66504 gazetted for public recreation (Western part of LPPR)
1949	Lilli Pilli Point Public wharf gazetted 9 December

4.2 Early History

Lilli Pilli Point, also known as Great Turriell Point, is part of an original grant of 20 acres (Portion 14) made on 30 June 1840 to Francis Mitchell (Hunt 1997:Appn. 3). Little is known of Mitchell who may have been a farmer or store keeper; however, the following references are relevant:

Francis Mitchell residing in Darlinghurst appears in the census of 1841 (return # 470 – State records);

- Francis Mitchell received a grant of 39 acres in Watsons Bay in 10 October 1840 (Woollahra Municipal Council Historic Facts);
- Francis Mitchell was mentioned in a rape case in Maitland, Rex v. Foley NSW Supreme Court 75, 4 November 1831:

I am a waterman living on the Farm of Mr Francis Mitchell. He was in Mr Francis Mitchell's service (Dowling, *Select Cases*, Archives Office of N.S.W., 2/3466);

- Francis Mitchell appeared as a witness in the court case Wight v. Barker and Hallen, Supreme Court of New South Wales, 16 October 1839 and another in 1838 (Dowling C.J., Burton and Willis JJ, 30 June 1838, Sydney Gazette, 3 July 1838);
- Francis Mitchell appears in letters pertaining to land in the state records dating from 1831-1855 (State Records website).

It appears that Mitchell did not exploit, cultivate or develop his land grant at Lilli Pilli Point. As the recipient of other grants, and possibly owning farmland in the Maitland area, the relatively isolated position and poor soils of the grant at Lilli Pilli may have contributed to this lack of exploitation. It is unclear when Mitchell's tenure of the grant ceased as parish maps of the 1880's and one in 1913 continue to assign the land to his name. This is not unusual, as the transfer of land was often not clearly documented until the Torrens title system was introduced to NSW in 1863. Interestingly, most histories of the area designate ownership of the land to the wealthy wool merchant, pastoralist; financier, rabbit breeder and politician Thomas Holt (1811-88) (*Figure 4.1*).

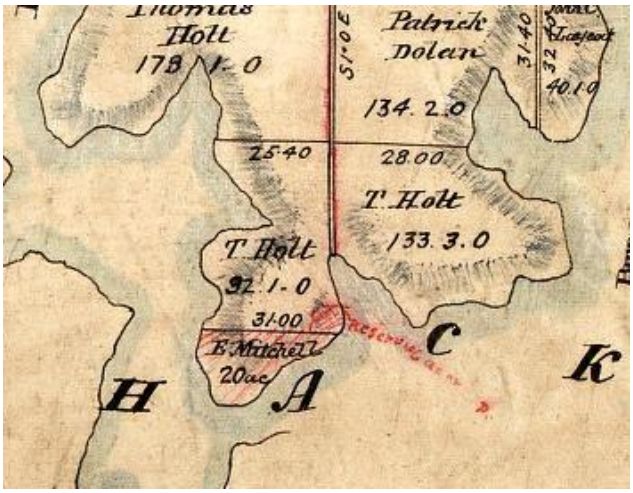

Figure 4.1 Detail of parish map 14039301 dated between c.1861 and c.1888.

4.2.1 Thomas Holt

Yorkshire born Thomas Holt (*Figure 4.2*) arrived in NSW in 1842 and, by 1861, had acquired, through systematic purchasing, a substantial estate of 12,000 acres (4856 ha). This comprised land stretching from Botany Bay to Port Hacking to encompass most of Sutherland (Geeves 1972: 414). Holt was a Member of the first NSW Legislative Assembly and its first Treasurer June - August 1856. He was the Member for Newtown (July 1861 - November 1864) and a Member of the Legislative Council (1868 - 1883).

In 1856, Holt bought land from original grantees and the first government auction in the Sutherland area (Ashton *et al* 2006:37). Holt's estate included land adjacent and to the north and northeast of Mitchell's holding (*Figure 4.1)*. It is possible that he acquired Mitchell's 20 acres around this time (Hunt 1997: Appendix 3).

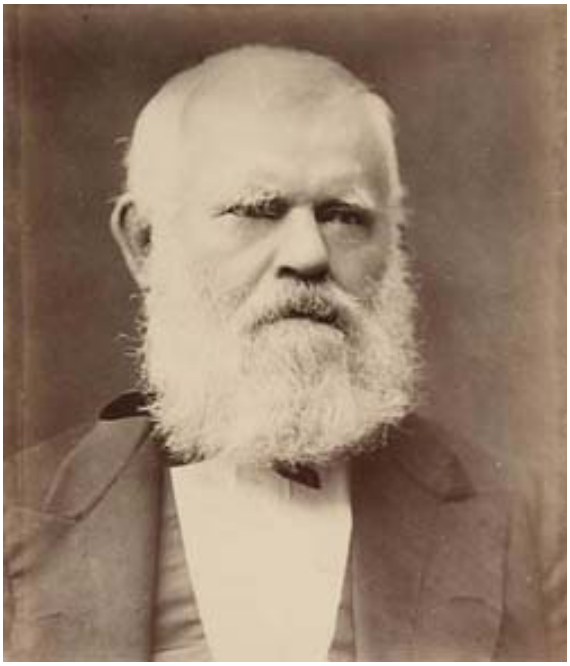

Figure 4.2 Thomas Holt by unknown photographer (*Source State Library of NSW PX*D 624*).

The earliest known description of the Lilli Pilli peninsula is an 1868 report by Robert Cooper Walker (1833- 1897) the first Librarian of the Free public Library (Larkin 1998:12). The report, commissioned by Holt, described Holt's Sutherland Shire estate which included the following:

"*...towards the South West there is another small point, called 'Lilly Pilly Point'* [sic] *on account of the native myrtles that grow there, in rich black soil*"
(Pollen 1988:154, Larkin 1998:12).

It is possible that Walker was describing the view from Holt's Estate, on the north eastern boundary of Mitchell's land, the site of *Nuimburra* (16-18 Korokan Road, Lot 24, DP 524917). *Nuimburra* is a cottage built in the 1860s to house Holt's estate manager (Short history of Nuimburra 1991:1). Holt himself resided in a Victorian Gothic mansion named *The Warren* overlooking the Cook's River in Newtown. In 1879 Holt also built a mansion at Sylvania, *Sutherland House*, which was gutted by fire and demolished in 1918 (Perumal Murphy Wu 1993:4).

Holt attempted a variety of agricultural pursuits on his Sutherland estate including; sheep and cattle grazing on imported buffalo grass, scientific oyster farming, coal mining and timber-getting, the most successful of which proved to be timber-getting. In order to facilitate this enterprise Holt had saleable timber on his land systematically ringbarked from 1862 to 1865, selling standing timber of ironbark and blackbutt on the property for £5000 (Ashton 2006:40, Cridland 1924:113). Despite investing a vast amount of capital into the property, Holt's Sutherland estate was largely unproductive and by 1881, Holt had abandoned his attempts to exploit the area.

4.2.2 The Holt-Sutherland Land Company 1881-1900

Not wishing to completely relinquish control of the land, Holt agreed to grant the Holt-Sutherland Land Company Limited a 99 year lease for the use of surface rights, whilst retaining the mining

rights. The same year, Holt returned to England where he later died, leaving his Sutherland estate to his son Frederick. In September 1881, the Holt-Sutherland Estate Land Company Limited leased the estate from Holt for a period of 56 years. The terms of the lease entitled the company the right to grant subleases to tenants for up to 99 years. Thus began the subleasing and subdivision of Holt's estate into small acreages. In the early 1880s, a financial recession caused large scale unemployment and, many families sought to support themselves by taking up small farm leases on the Estate, engaging in market gardening, orcharding and poultry farming.

Few houses survive from the period of the original Holt-Sutherland Estate Land Company Limited. One that has, in a modified form, is *Moombara* (17-19 Moombara Crescent Lilli Pilli). *Moombara* was built by Richard Critchett-Walker (1841-1903) in the early 1880s, overlooking Little Turriell Bay. Despite the limiting nature of a 99 year lease Crichtett –Walker was one of the first to acquire such a lease from the company, and built a substantial stone cottage with iron roof, which he used as a country retreat (*Figure 4.3*) (Curby 1998:16; Perumal Murphy Wu 1993:3).

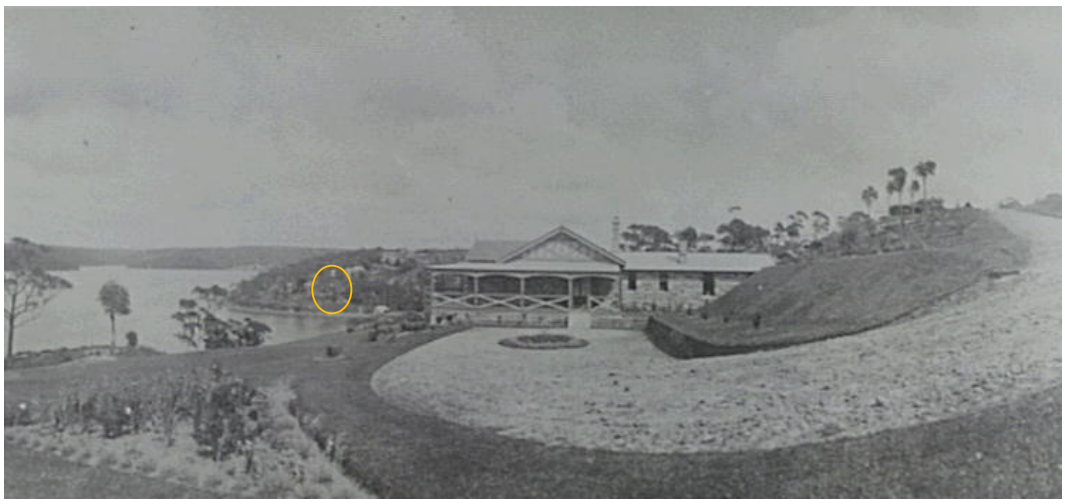

Figure 4.3 Moombara c. 1900 with Lilli Pilli Point in the background; Nuimburra house is circled.

Other houses from this period, although largely modified in the 20th century, were *Wai Wera* (Lot 1, 20 Bareena Street) and *Beulah* (Lot 8, 6 Bareena Street) both of which originally would have backed onto the foreshore Reserve (Perumal Murphy Wu 1993: photo and map).

These two properties were later described as "well built weatherboard cottages" when included in the sale of the Sutton Estate subdivision (see *Figure 2.8*). Initial extensions and modifications made to *Nuimburra*, may also be assigned to this phase as Attorney General John Henry Want (1846-1905) resident in the 1890's, is attributed with building a two storey stone structure adjacent to the cottage known as the *Bachelors Quarters* (see *Figure 7.2*).

Given the relatively small size of allotments leased from the Holt-Sutherland Estate Land Company at Lilli Pilli Point, the houses built on the point during the late 1800s may represent holiday cottages rather than permanent residences; however a 1914 pamphlet shows an orchard present, suggesting some market gardening activity (see *Figure 4.4*). By 1914 there were at least six cottages on the foreshore.

4.2.3 Subdivision

In 1900, at the instigation of Frederick Holt and the sub-lessees, the *Holt-Sutherland Estate Act 1900* was invoked whereby the terms of the lease agreement with the, now bankrupt, Holt-Sutherland Estate Land Company was changed. A new lease was granted to the newly formed Holt-Sutherland Estate Company; the entailing of the estate to Holt's heirs was broken and sub-lessees were granted the right to freehold purchase of the land in return for 25 years ground rent (Cridland 1924:120). Some of the leaseholders converted their leases by purchase, whereas others vacated their rented farms and moved to the Menai and Heathcote areas when those Crown Lands were opened up a few years later.

Following the Act of 1900, new subdivisions heralded the rapid development of Holt's Sutherland estate; advertised as a "Suburb for Pleasure and Profit" (Ashton *et al* 2006:41). No longer promoted for farming, the leased acreages were subdivided into suburban building allotments and areas or *estates* were released and auctioned. The area around Lilli Pilli Point survived this form of subdivision until 1914, when the Sutton's Estate auction occurred, promoting the recreational aspects and accessibility to transport as a feature of the estate (see *Figure 4.4*). The age of the weekender had arrived.

The Sutton Estate subdivision, resulted in a number of dwellings added to the area and the formalising of Bareena Street, which had previously been a private access road. Undated pamphlets (post *c.*1919) advertising the Carinya Estate and the Sea Breeze Estate showed cottages on most of the Sutton Estate allotments.

Cridland described how makeshift cottages were erected:

"I could tell how we selected a block for each new-comer, how we patronised, and acted as architects for, the latest settler, how we made mid-week working bees to put up someone's flagpole ….nearly everyman in this part had been his own architect, and started with the idea of putting up a couple of rooms only as a weekender." (Cridland 1924:147, 150).

53: Little Turriel Point to Willarong Point sub-division plan 5(1) 13 Apr 1914 DP 8557 (Nth),

Figure 4.4 Pamphlet advertising the Suttons Estate Port Hacking Subdivision 13 April 1914 DP 8557 (***Paul Davies 1998: plan 5***)**.**

Many of these houses were initially built as holiday homes, and then later enlarged as permanent residences. Conforming to this pattern of development is *Waratah*, Lot 2 of the Sutton Estate or 18 Bareena Street, a weatherboard cottage with timber fence and two camphor laurel trees (See *Figure 7.1*). The property was owned by the Papworth family who built the house, but do not appear to have occupied it until later, as they are not registered on early electoral rolls for the area, and the birth of both their children were registered at Waterloo. It is probable that the family retired to the house as Harold Papworth died there in 1944 and his son Tom was still resident until 1976 (*The Propeller* 2 March 1944, *St. George Sutherland Shire Leader* 14 January 1976:9).

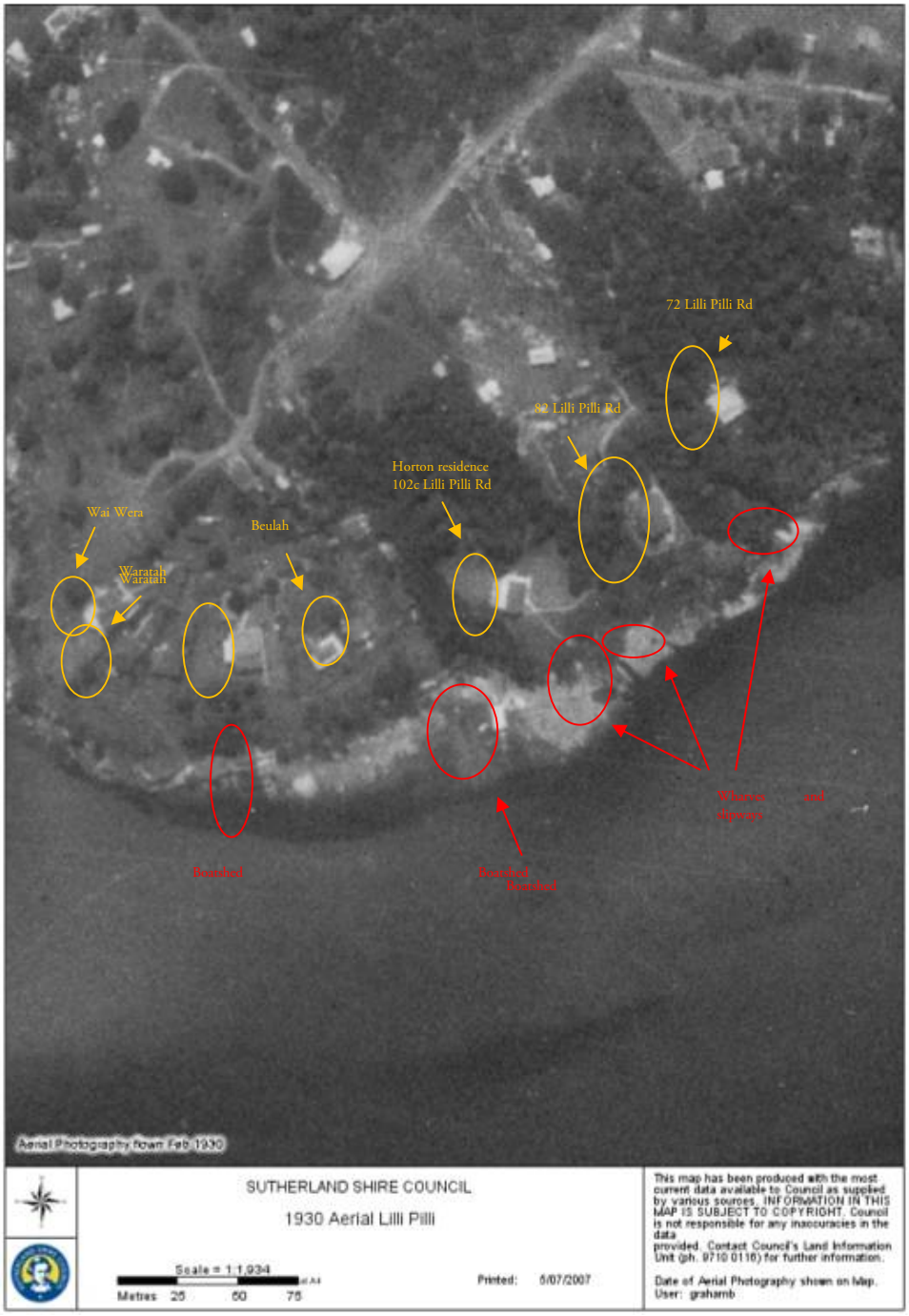

Figure 4.5 1930 aerial photograph with residencies, boatsheds and slipways circled.

Similarly *Wai Wera* at 20 Bareena Street was purchased shortly after 1919 as a holiday house by the James family who then took up permanent residence in the 1940s (the house was recently demolished (1996) for dual occupancy) (Curby 1998:17). The move to permanent residency may be linked with the increased efficiency of motor transport and the development of local infrastructures, such as the electricity supply connected in 1927 (Curby 1998:42). By 1930, there were more than

ten houses adjacent to the Reserve (see *Figure 4.5*). The impact of improved access to the area saw the most intense development during the post World War II period up to the present.

The development from the 1960s has seen many earlier structures removed or elaborately altered (Paul Davies 1998:4). This development can be traced through aerial photographs from 1930 through to 2006 (see *Figures 1.2, 4.5, 4.15, 7.9 & 7.11*). Examples of original cottages, demolished to make way for larger residences, can be seen at 102c Lilli Pilli Point Road identified as the Horton House on the 1914 pamphlet seen in *Figure 4.4*, which was still standing by 1970, and had been rebuilt by 1978. Another example is the house at 82 Lilli Pilli Point Road, shown as the original cottage from 1930 through to 1984, then disappearing to make way for a swimming pool and new four storey house (see *Figure 7.4*).

4.2.4 Lilli Pilli Point Foreshore Reserves

The Royal National Park on the southern shore of Port Hacking was dedicated in 1879 to quickly become a tourist destination, attracting visitors and day-trippers. The Lilli Pilli Point Reserve comprises two portions of land: Reserve 135 and Reserve 66504 (*Figure 1.2*). The study area encompasses all of Reserve 135 and that area to the east of Lilli Pilli Point Road and is part of Reserve 66504.

Reserve 135 was surveyed by George H. Knibbs in May 1884, and gazetted for recreation and other public purposes 26 June 1886. Knibbs noted that the area was "not very stony, the soil thereon is fair and timber chiefly Oak" (Hunt 1997: Appendix 3). The Reserve came under the supervision of Sutherland Shire Council on 18 September 1907.

Reserve 66504 was taken by the Crown on 27 June 1900. The foreshore Reserve was marked out in August 1906 by Surveyor T.H. Madsen following the raising of an issue in Parliament regarding a house and fencing being built on the Reserve, near Koala Road on the western side of Lilli Pilli Point Road. The land adjoining the Reserve on which the house was built had been leased from the Holt-Sutherland Company, which was accused of leasing part of the Reserve. The matter was resolved when the house and fencing were removed. The Reserve was surveyed in December 1908 and gazetted on 8 January 1937 for Public Recreation. Sutherland Shire Council took control of the Reserve pursuant to the provisions of Section 48, *Local Government Act 1993*.

4.2.5 Recreation

Access to Sutherland and Lilli Pilli Point had improved greatly with the opening of the railway and bridge crossing the Georges River by 1885. Horse-drawn coaches began to travel the distance between the railhead at Sutherland to Cronulla on the coast, and in 1911 a steam tram service began operation. This opened up the area to seaside holiday-makers. By *c.*1900 parish maps show that Lilli Pilli Point Road had been established, running from Port Hacking Road south to Lilli Pilli Point (*Figure 4.7*). It was at this time that the Crown took possession of the foreshore Reserve 66504, coinciding with the Holt-Sutherland Act of 1900 and the ensuing subdivision of land (see *Figure 4.7*).

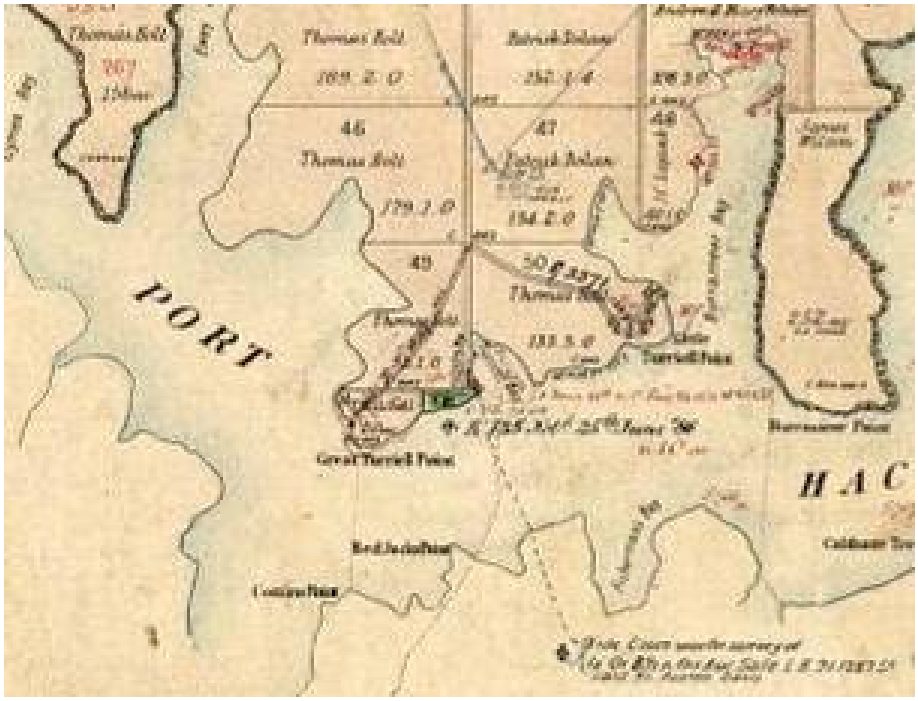

Figure 4.6 Parish Map 14047001 *c.*1882.

Lilli Pilli Point was opening up as a recreational area. By 1908 a wharf had been built at the end of Lilli Pilli Point Road and a ferry service from Cronulla to Audley was instituted, stopping at Lilli Pilli Point twice daily (*Figures 4.9* and *4.10*) (Curby 1998:17).

Figure 4.7 Cronulla – Audley ferry at Lilli Pilli Point wharf.

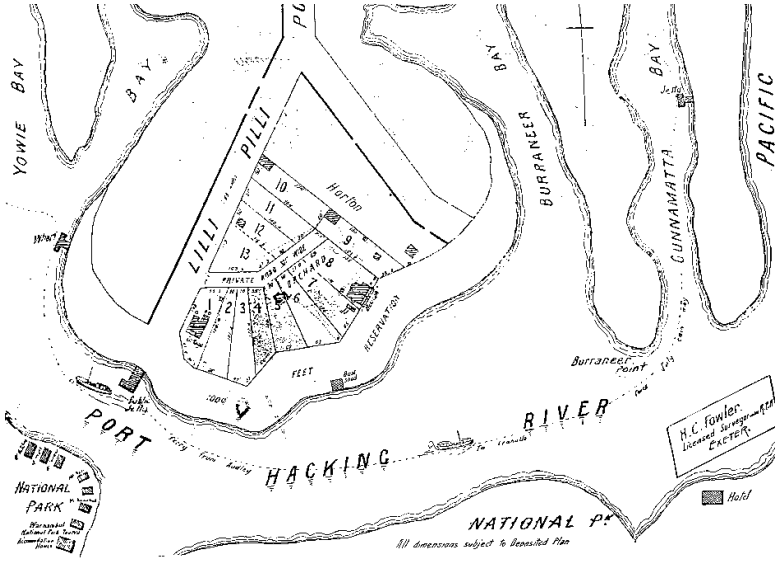

Figure 4.8 Undated map of Lilli Pilli Point showing ferry route and 1914 proposed subdivision. Also shown are houses Wai Wera, Beulah and a tramcar used for temporary accommodation on Lot 7 (*Curby 1998:17*).

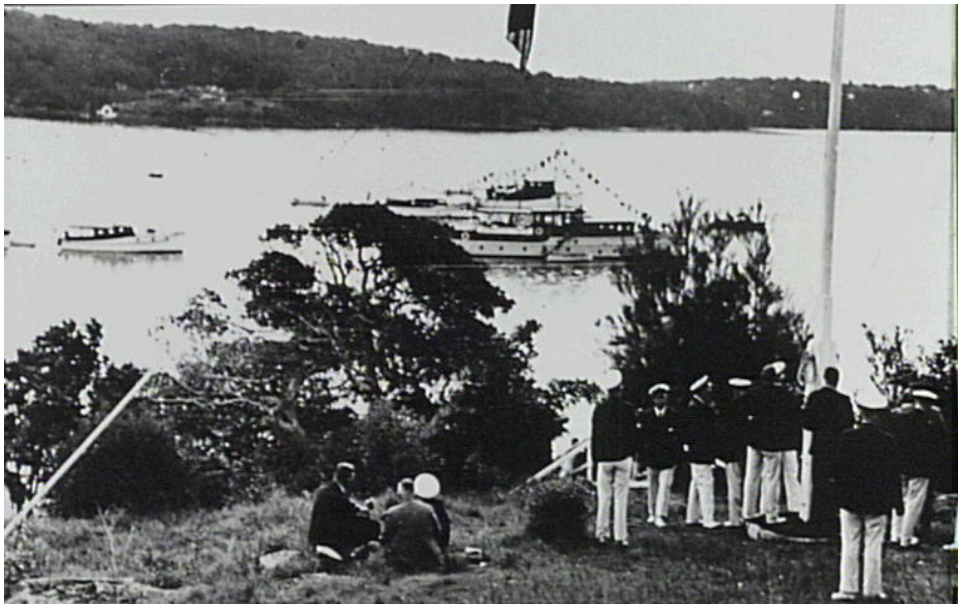

Figure 4.9 Lilli Pilli Point c.1920s showing motor launches of the Royal motor Yacht club.

By the 1920's Lilli Pilli Point was used almost exclusively for recreational activities such as boating, fishing and swimming. *Moombara* and *Nuimburra* were examples of aggrandised holiday houses of the Sydney elite, with the owners vying with each other as to the prestige of their house guests (see *Figures 4.10* and *4.11*) (Short History of Nuimburra 1991:2).

Figure 4.10 Photograph of the Russian Ballet picnic and boating party at Moombara c.1937 (***taken for J.C.Williamson***)**.**

The owners of *Nuimburra* included Surgeon General McCormick who used it for boating parties on Port Hacking and Mr John Kitchen of the Lever and Kitchen soap empire. In 1922, Kitchen extended and reconfigured the house based on a design by architects Joseland & Gillings in the style of a Mediterranean courtyard/Atrium house (Curby 1998:18). Stone for the construction was quarried on site by stonemasons brought from Scotland. Kitchen's *Nuimburra* property was used extensively for weekend and holiday entertaining, with Kitchen dredging Little Turriell Bay to accommodate his large motor yacht. The gardens of *Nuimburra* were planted with citrus trees and Kitchen employed six gardeners and a resident caretaker to maintain the 33 acre property, yet by the 1980s the grounds of *Nuimburra* had been subdivided and the house stood on 0.6 acres (Curby 1998:6, Short history of *Nuimburra* 1991:1).

4.2.6 Boating

During the 1920s and 1930s, the grounds of *Nuimburra* extended to the water, and Kitchen is said to have had stone steps built down to the waterfront. Although no extant photos of a boatshed are available, it is probable that a boatshed and wharf associated with the house may have resembled that at nearby *Moombara* (see *Figures 4.11* and *4.12*).

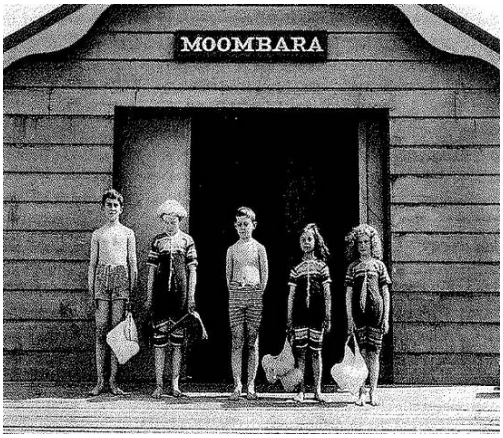

Figure 4.11 Children outside the *Moombara* boatshed c.1904 (*Larkin 1998: 159, PX*D 609, Mitchell Library, State Library of NSW*).

Figure 4.12 *Moombara* with boatshed and wharf – note second storey added to main house in 1903 (*Sutherland Shire Council Image MF000203.jpg*).

Figure 4.12 Parish Map c.1913 showing Permissive Occupancy permits, allotments 1-9 (which may define the initial subdivision of Mitchell's land grant after 1881) and wharfs in numbered circles (PM14039802).

Parish map 14039802 dated to *c.*1913 (cancelled 1925), shows the location of Permissive Occupancy for boatsheds known to have been in existence by 1910 (*Figure 4.13*). Permissive Occupancy relates to the permission to occupy Crown land granted under section 136K of the *Crown Lands Consolidation Act 1913*. By 1930 a number of wharves, jetties and boat-ramps had been constructed (as shown in an aerial photograph of the time; see *Figure 4.5*), associated with the houses above them. These include the sandstone jetty PO 35 associated with 72 Lilli Pilli Point Road, and the jetty and boat pen PO 43 associated with 102c Lilli Pilli Point Road. It can be assumed therefore, that the residents of houses bordering the Reserve were utilising their recreational rights to the foreshore, and modifying the landscape accordingly.

A 1932 map shows a substantial boathouse and wharf complex located in front of Lots 5 and 6 of the Sutton Estate (10-12 Bareena Street) (see *Figure 4.14*). This boatshed also appears on an earlier plan c.1914 (see *Figure 4.9*). An aerial photograph from 1955 shows the outline of an enclosed sea-water swimming pool adjacent to the boatshed shown on the plan of 1932. Between 1930 and 1955, a number of boatsheds were constructed on the foreshore generally associated with the pre-existing sandstone wharves and slipways, and by 1955 at least seven existed (see *Figure 4.15*).

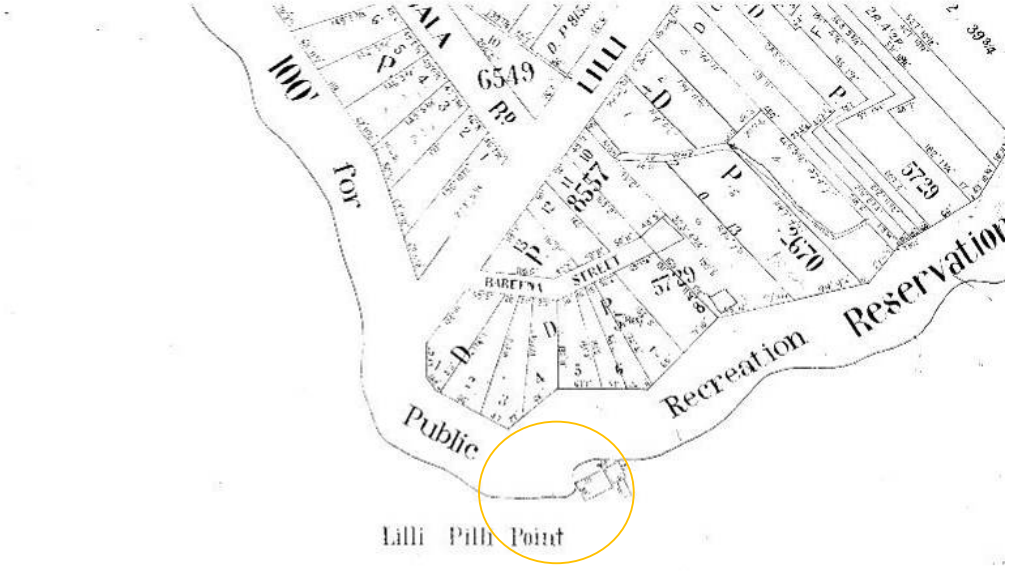

Figure 4.13 Map c.1932 Lilli Pilli Point Reserve with boatshed (*Sutherland Shire Council map76*).

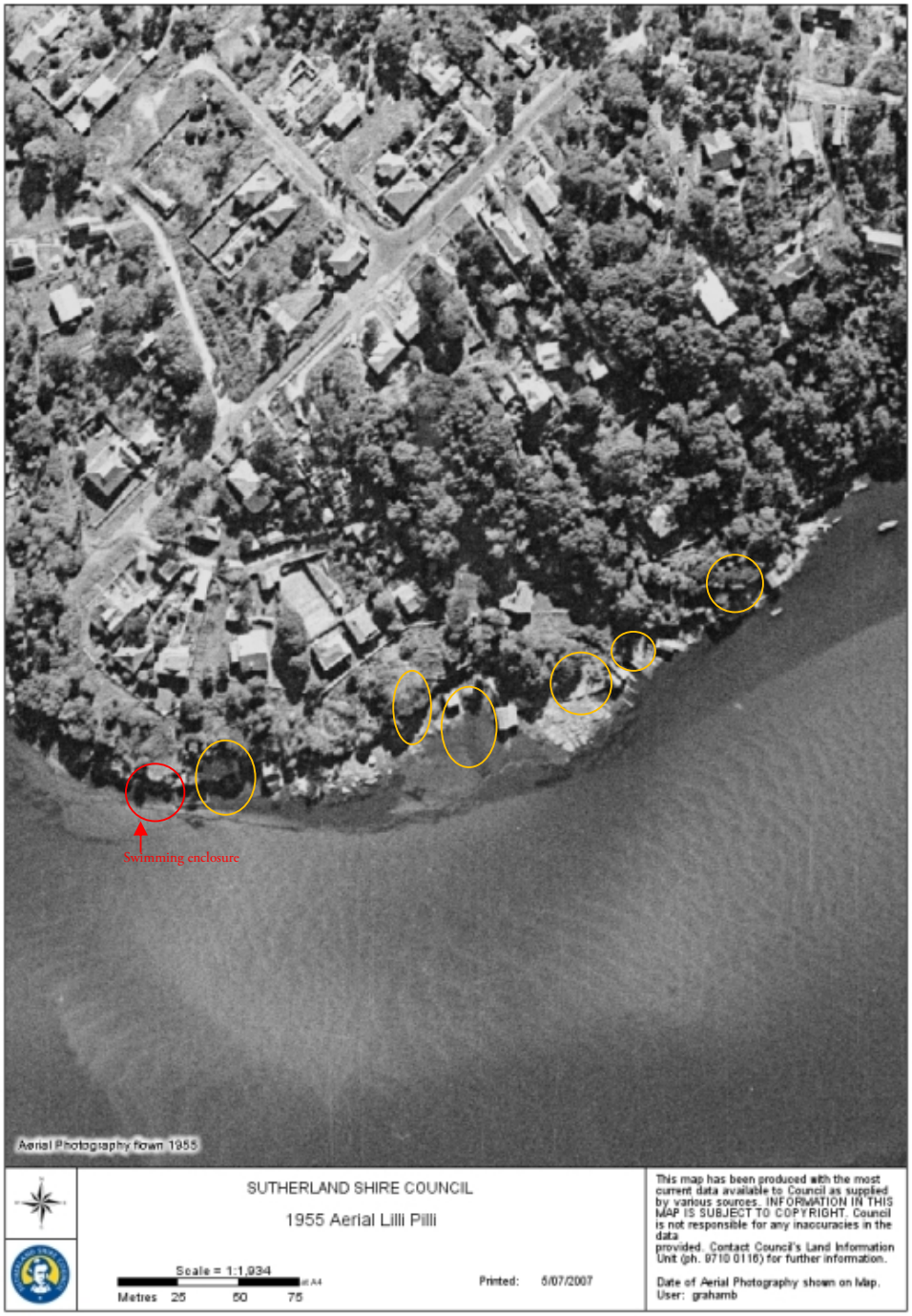

Figure 4.14 Aerial photograph c. 1955 with boatsheds circled in orange and enclosed swimming area circled in red. ***Source Sutherland Shire Council***

Boatsheds built within the study area are likely to have been used for housing and maintaining privately owned pleasure craft and associated boating equipment rather than for boatbuilding or commercial fishing. Most boatsheds, or boathouses, were constructed of timber weatherboards with corrugated iron roofs, although some later repairs or alterations may have had brick, concrete or fibrous cement (asbestos) elements (see *Figures 4.11* and *4.16*) (Arnold 2006: 1). Most boat sheds

had gabled, pitched roofs (Paul Davies 1998: 24). During the Depression the Port Hacking area saw unemployed people settling in waterfront shacks, with some boatsheds also being converted into accommodation, with varying standards of comfort (Curby 1998:42). The remnants of a hearth / chimney is in situ in one boatshed, which suggests such occupation. This may have been a temporary phenomenon within the study area, but this has not been confirmed (see *Figure 7.13*). By 1978 all the boatsheds within the study area had been removed (see *Figure 7.10*).

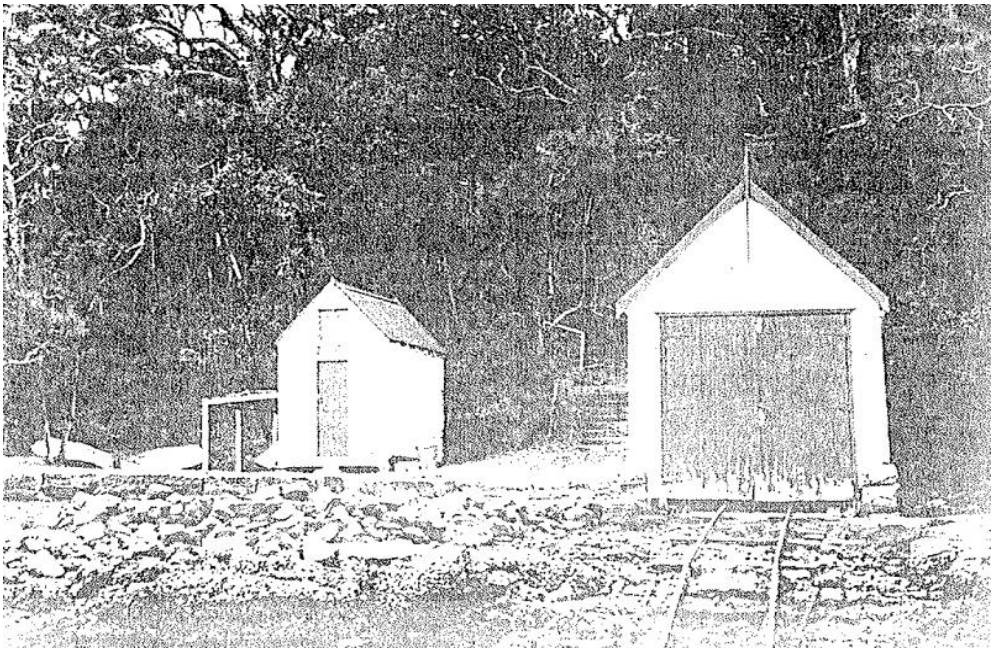

Figure 4.15 Extant boatshed and outbuilding at Gannons Bay Lilli Pilli, LEP ref.B237. These preserved buildings are representative of those removed from the foreshore Reserve at Lilli Pilli Point.

5 Vegetation Survey

5.1 Preamble

The vegetation of the Reserve was assessed on 4 May 2007 by David Thomas and 3 October 2007 by Brian Towle, using a modification of the Random Meander Technique (Cropper 1993). This technique involved making observations during three passes along the entire length of the Reserve in addition to closer examinations of microhabitats identified within the Reserve. An extensive species list had already been developed for the Reserve (SSC 1997) and this technique provided a more rapid assessment of the vegetation within the Reserve than a plot or transect based surveys.

A total of 135 plant species were identified during the vegetation survey. This included 105 local native species; four potentially introduced native species, and 26 exotic species. Of the 105 local native species recorded, 12 were not previously recorded within the Reserve (*Table 3.1*). The non-local native species recorded in the Reserve (*Table 3.1*) are likely to have been planted. The updated species list for the Reserve (*Appendix A*) now lists 174 local native species and also includes revised nomenclature.

Table 5.1 Native species recorded which were not previously recorded in Lilli Pilli Point Reserve

	Botanical name	Common name
	Adiantum hispidulum	Rough Maidenhair Fern
	Claoxylon australe	Brittlewood
	Clematis glycinoides	Headache Vine
#	*Cyathea cooperi*	Straw Treefern
	Doodia aspera	Prickly Rasp Fern
	Ficinia nodosa	Knobby Club-rush
	Glycine tabacina	
#	*Melaleuca quinquenervia*	Broad-leaved Paperbark
	Opercularia aspera	Coarse Stinkweed
	Psilotum nudum	Skeleton Fork-Fern
#	*Syncarpia glomulifera*	Turpentine
	Veronica plebeia	Trailing Speedwell

(**# indicates species likely to have been planted into the Reserve**).

5.2 Description of vegetation within the Reserve

The remnant vegetation in the western and eastern extents of the Reserve is punctuated by areas of exotic grasslands with planted non-local species including *Melaleuca armillaris* (Bracelet Honey-myrtle) and *Melaleuca quinquenervia* (Broadleaved Paperbark). The central area of Lilli Pilli Point Reserve, Reserve 135, is the widest part of the Reserve, with the native vegetation only interrupted by the walkway which runs across the entire Reserve (*Figure 1.2*).

The vegetation in the east and the west of Lilli Pilli Point Reserve is characterised by evergreen mesic and coriaceous species, including *Cupaniopsis anacardiodes* (Tuckeroo), *Ficus rubiginosa* (Rusty Fig) and *Guioa semiglauca* (Guioa). Vines are common within the canopy, including *Cissus antarctica* (Kangaroo Vine) and *Cissus hypoglauca* (Water Vine). This area is punctuated by exotic grasslands creating 'islands' of native vegetation. These 'islands' of vegetation are largely free from exotic species, although evidence of bush regeneration works suggests that exotic species previously have

been located in these areas and that ongoing weeding is required. An approximately 600mm wide area around the borders of islands of native vegetation appears to be actively sprayed with herbicide to prevent exotic grass incursion into the islands of native vegetation. This sprayline is eroding in areas with slight depressions present. Occasional weed species observed in this area included *Anredera cordifolia* (Madeira vine) and *Acetosa sagittata* (Turkey Rhubarb), both of which are persistent environmental weeds that can be difficult to eradicate. Other weed species observed in this area included the exotic trees *Erythrina sykesii* (Coral Tree) and *Pinus radiata* (Radiata Pine) which are present in small numbers in the west and east of the Reserve, respectively.

The vegetation in the central, wider area of the Reserve included more sclerophyllous species commonly associated with Sydney sandstone gullies. The canopy included *Eucalyptus piperita* (Sydney Peppermint), *Eucalyptus botryoides* (Bangalay), Angophora *costata* (Sydney Red Gum) and *Corymbia gummifera* (Red Bloodwood). The mid strata included *Allocasuarina littoralis* (Black She-Oak), *Ceratopetalum gummiferum* (NSW Christmas Bush) *Elaeocarpus reticulatus* (Blueberry Ash) *Acacia* spp. (Wattles) and *Persoonia linearis* (Narrow-leaf Geebung). The vegetation within this area included a number of exotic species including escaped garden plants, environmental weeds and listed noxious weeds, although the total cover of weeds was generally low. The dominant weed observed through this area was *Asparagus scandens* (Asparagus fern) which was widespread though the ground layer, particularly adjacent to one of the drainage lines. Other weeds scattered throughout this area included *Lantana camara* (Lantana), *Nephrolepis cordifolia* (Fishbone Fern) and *Tradescantia albiflora* (Wandering Jew) (*Figure 5.1)*.

Figure 5.1 Exotic species *Tradescantia albiflora* and *Asparagus scandens* within the Reserve.

5.3 Vegetation Communities within the Reserve

The vegetation within the Reserve is characteristic of two vegetation communities, *Southern Sydney sheltered forest on transitional sandstone soils* and *Littoral Rainforest*. Both of these communities are listed as endangered under Schedule 2 of the TSC Act.

The following features of the vegetation within the east and west of the Reserve were used to define this vegetation as *Littoral Rainforest* as described in the final determination (*Appendix B*):

- Includes a range of rainforest species with evergreen mesic or coriaceous leaves, such as *Ficus rubiginosa* (Rusty Fig);
- Includes several species with compound leaves, such as *Cupaniopsis anacardiodes*, *Guioa semiglauca* and *Polyscias* spp.;

- A large number of vine species are common, which form a large component of the canopy in some areas, including *Cissus antarctica*, *Cissus hypoglauca*, *Legnephora moorei* (Roundleaf Vine), *Parsonsia straminea* (Common Silkpod) and *Sarcopetalum harveyanum* (Pearl Vine);
- The Reserve is located on soils derived from the underlying Hawkesbury sandstone adjacent to Port Hacking and as such has maritime influence; and
- A total of 30 (38%) of the 79 characteristic species listed in the Final determination have been recorded within the Reserve.

Littoral Rainforest is a rare community which is confined to many small stands along the entire coast of NSW (DECC, 2005). A number of processes currently threaten its long term survival. As such, *Littoral Rrainforest* has high conservation significance. Additionally, the *Littoral Rainforest* within the Reserve has additional conservation significance due to the presence of *Celtis paniculata* (Native Celtis) which indicates that it may be potential habitat for the threatened population of *Menippus fugitivus* (Lea), a beetle, in Sutherland Shire (DECC, 2005).

The following paragraph is summarised from the NSW Scientific Committee (2000) for *Menippus fugitivus* (Lea). The population of *Menippus fugitivus* (Lea) in Sutherland Shire is listed as an Endangered Population under the TSC Act. It is a rare, small, light green, chrysomelid beetle approximately 5mm in length. It has been recorded from only three locations in Australia: Lord Howe Island, coastal North Queensland and Grays Point Reserve, adjacent to Port Hacking in Sutherland Shire. The population of *M. fugitivus* at Grays Point Reserve feeds solely and appears dependent on *Celtis paniculata*. Approximately 10-15 trees of this species exist at Grays Point Reserve. The population of beetles is estimated at approximately 500 individuals and is of conservation significance because it is the only location where this insect occurs in mainland New South Wales.

The vegetation within the central area of the Reserve appears to broadly meet the description for *'Southern Sydney sheltered forest on transitional sandstone soils'* (SSSFTS) described in the final determination (*Appendix C*). The Reserve is located on the slopes of a gully in the broad sense, with sandstone derived soils which show signs of lateral movement of moisture, nutrients and sediment from more fertile substrates up slope. Evidence of the lateral movement of moisture, nutrients and sediments within the Reserve include the presence of *Littoral Rainforest* on the edge of the Reserve which indicates increased moisture movement, the presence of *Eucalyptus tereticornis* (Forest Red Gum) which occurs on soils of medium to high fertility (Harden 1991) and the historical description of "rich black soils" at Lilli Pilli Point which indicates the presence of soils derived from substrates other than the underlying sandstone geology.

The structure and floristics of the vegetation within the central area of the Reserve closely match the description within the final determination for SSSFTS. The vegetation in this area has an open forest structure, although in some areas the canopy forms a closed forest. The species recorded within the Reserve include 39 (70%) of the 56 characteristic species listed in the final determination including the listed dominant species within each structural layer:

- the canopy species *Angophora costata, Eucalyptus piperita* and *Corymbia gummifera*;
- the subcanopy species *Allocasuarina littoralis, Ceratopetalum gummiferum Elaeocarpus reticulatus* and *Pittosporum undulatum* (Sweet Pittosporum);

- the shrub species *Acacia* spp. *Banksia* spp. *Persoonia* spp. and *Lomatia silaifolia* (Native Parsley); and
- a range of climbers, ferns, large tussocks and graminoides with the ground layer;

In conclusion, the vegetation within the central area of the Reserve appears to best match the description of SSSFTS, although there are some discrepancies between the final determination and the central area of the Reserve. The central area of the Reserve was not gentle terrain as described in the final determination, with slopes exceeding 10° and sandstone outcrops occurring. Additionally, the Reserve is better described as occurring on the upper slopes of a drowned river valley, rather than a gully. Floristically four species are listed in the final determination which distinguishes SSSFTS from more typical sandstone gully forest in addition to a relatively dense groundcover of ferns, grasses, rushes, lilies and forbs. Within the
Reserve, two species of the four distinguishing species were recorded, *Elaeocarpus reticulatus* and *Pittosporum undulatum*, alongside a relatively dense groundcover of ferns, rushes, lilies and forbs.

5.4 Significant plant species

Of the 174 local native species previously recorded in the Reserve, 10 species are listed as locally significant (SSC 2006) and one, *Lomandra brevis*, is a listed ROTAP species (Briggs and Leigh 1995; Table E4). In addition to these 11 species, another five species can be considered locally significant as they are rare in the Sydney district or at edge of their range (*Table 3.2*).

The locally significant species within the Reserve should be propagated to increase their numbers within the Reserve. Particular emphasis should be placed on *Celtis paniculata* due to its local significance, the limited number of individuals within the Reserve and its association with the endangered population of *Menippus fugitivus*. Opportunities for propagation of the *Celtis paniculata* individual within the Reserve and the individuals at Grays Point should be explored.

Table 5.2 Significant plant species recorded within Lilli Pilli Point Reserve

Botanical Name	Common name	Status
Acianthus exsertus	Mosquito Orchid	Locally Significant (1)
Celtis paniculata	Native Celtis	Locally Significant (1)
Dendrobium linguiforme [aka Dockrillia linguiformis]	Tongue Orchid	Locally Significant (1)
Elaeodendron australe var. australe [formely Cassine australis var. australis]	Red Olive Plum	Locally Significant (1)
Guioa semiglauca	Guioa	Locally Significant (1)
Livistona australis	Cabbage Palm	Locally Significant (1)
Lomandra brevis	Tufted Mat-rush	ROTAP 2RC-(2)
Maclura cochinchinensis	Cockspur Thorn	Locally Significant (1)
Myrsine howittiana [aka Rapanea howittiana]	Brush Muttonwood	Locally Significant (1)
Polyscias elegans	Celery Wood	Locally Significant (1)
Sarcomelicope simplicifolia subsp. Simplicifolia	-	Locally Significant (1)
Species considered uncommon in the area, or at the limit of their distribution		
Brachyscome angustifolia var. angustifolia [aka Brachycome angustifolia var. angustifolia]	-	Rare on the coast (3)
Cestichis reflexa [aka Liparis reflexa]	-	Uncommon in the Sydney district (3)
Cupaniopsis anacardioides	Tuckeroo	At southern limit of its distribution (4)
Marsdenia suaveolens	Scented Milkvine	Uncommon in the Sydney district (3)
Pterostylis pedunculata	-	Uncommon in the Sydney district (3)

Sources: (1) SSC 2006; (2) Briggs & Leigh 1995; (3) SSC 1997; (4) Fairleigh & Moore 1995.

6 Aboriginal Heritage Survey

6.1 Preamble

The study of the Aboriginal heritage of Lilli Pilli Point Reserve was undertaken in accordance with the DECC *Aboriginal Cultural Heritage Standards and Guidelines Kit* (NPWS 2005). Prior to the field assessment, review of the available background information regarding the Lilli Pilli Point Reserve and local area was undertaken (see *Section 3*).

The Aboriginal heritage survey targeted areas where Aboriginal sites were most likely to occur. Confirmation of those sites recorded on the DECC AHIMS register was also planned. The survey concentrated on the informal walkway area and its immediate surrounds, as well as those areas of formal (steps) and informal (tracks, paths) access points leading from the main track down to the high water mark. Associated archaeological features and their relation to the tracks were assessed and recorded.

6.2 Middens

Survey of the Reserve area revealed that midden deposits are extensive and virtually continuous along the entire eastern foreshore of the Point, with major concentrations in two main zones (identified below) where extensive midden deposits and the informal track area converge in the foreshore area. Although discussion will focus on these two major midden deposit concentrations, it should be noted that midden deposits are visible in surface exposures and soil profiles to varying degrees along the entire foreshore area.

Midden deposits have been extensively disturbed and destroyed in some places, with evidence of significant ongoing threat from natural and human-induced erosion. The midden deposits are particularly concentrated and visible on flat sandstone terraces overlooking the water and around the two small coves. The track passes directly adjacent to these areas.

No evidence of midden deposits is visible in the elevated central area of the Reserve where the track runs through the remnant gully forest. Here, localised soil exposures and profiles within the immediate vicinity of the track showed complete absence of midden deposits (*Figure 4.1*). However, deposits are visible at the foreshore approximately 20m directly downslope from the track. These remain at relatively low risk as they are protected as by dense groundcover and the inaccessibility posed by the steep gradient of the slope (*Figure 4.2*).

Figure 6.1 Soil profile exposed in development area 10m northwest of track in rainforest zone. Shows A and B horizons, but no midden deposits. View northwest.

Figure 6.2 Section at the foreshore, c.20m downslope from the rainforest track, showing midden deposits in this area.

For ease of reference, midden sensitivity within the Reserve can be divided into Zones A and B, each with key areas designated 1-4:

Midden Zone A

This comprises the foreshore area in Reserve 66504, extending east from the terminus of Lilli Pilli Point Road to the beginning of the gully forest community. Areas of particular midden exposure include:

1. The exposed and eroding deposits in the grassed area of the 'perched midden' overlooking Port Hacking (*Figure 6.3*). Here remnant, isolated patches of midden lie exposed on the edges of the rock platform, enclosed by grass cover, as they gradually slip from the rock platform to the tidal zone below. Evidence of this process is seen in the patches of fallen deposit visible on the rocks below (*Figure 6.3*). Extensive midden deposits beneath the grass cover are evident as they erode from the edges of the grass cover and onto the rock platform (*Figure 6.4*);

Figure 6.3 Remnants of perched midden overlooking Port Hacking. Midden is slipping into the sea, top right, with fallen deposits visible on rocks below. View west.

Figure 6.4 Midden eroding at grassline in the same general area as above, view east.

2. Sandstone steps lead from the informal track across the top (roof) of a rockshelter to a small cove and beach with a headland to the northeast. midden deposits are visible across this entire area from the path and across the sandstone rockshelter. Midden deposits are also visible as wash along the slope to the foreshore (*Figures 6.5* and *6.6*);

Figure 6.5 Steps above rockshelter in small cove. Rockshelter located below overhang mid-left of frame. Midden deposits visible in section at bottom left. View west.

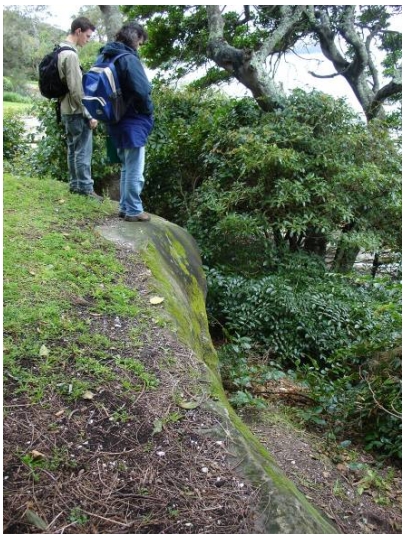

Figure 6.6 Headland area northeast of the rockshelter and cove area. Midden deposits eroding from soils beneath the grass and across the sandstone rock shelf, visible at lower left.

3. The adjacent cove, to the northeast, has cut sandstone steps and grassy terraces extending to the foreshore is also characterised by extensive midden deposits. A small headland overlooking the cove at the northeastern end also has midden deposit across the top (*Figures 6.7* and *6.8*); and

Figure 6.7 Cut sandstone steps extending to grassed terrace. Exposed midden deposits visible in left foreground.

Figure 6.8 Elevated headland area at the north-eastern end of the cove. Arrow shows visible midden deposits in the section slipping downslope.

4. The sandstone slab steps extending from the track in the eastern forested area to the shoreline through scrub have cut into midden deposits c.10m above high water mark (Figures 6.9 and 6.10).

Figure 6.9 Sandstone steps extending from the Reserve track (top) down to the foreshore area. Midden exposures are visible to the left and right of the steps. View west.

Figure 6.10 Detail of midden exposure showing the cut of the steps and the exposure and erosion of midden deposits.

Midden Zone B

The second main area of midden sensitivity is located in the eastern tip of the northern Reserve within Reserve 135, particularly where the grassy clearing extends over a sandstone terrace overlooking the water (*Figure 6.11*). This grassed area, an ascending slope to the northeast, and the slope below the terrace area are associated with a rockshelter and extensive midden deposits. The key areas are:

1. Extensive midden deposits are spread throughout and beyond the grassy clearing and sandstone overhang overlooking Port Hacking, as well as the immediate eastern periphery of that area. Midden deposits are eroding out of the edges of the grass cover overlying the sandstone platform (*Figure 6.12*).

Figure 6.11 The grassy clearing area upon the sandstone overhang overlooking Port Hacking, at the eastern tip of the Reserve area. View southeast.

Figure 6.12 South-eastern extremity of the clearing. Midden deposits are washing from the edges of the grass cover out across the sandstone shelf. View east.

2. Herbicide spraying between the grass and the bush regeneration area that has been used at the eastern periphery of the clearing to create a buffer zone between the exotic grasses and native vegetation has led to exposure of soils and midden deposits, causing accelerated midden erosion downslope (*Figures 6.13* and *6.14*);

Figure 6.13 The bush regeneration area at eastern periphery of clearing. Exposures created by herbicide spraying have led to the erosion of midden deposits downslope (direction indicated by arrow).

Figure 6.14 The eastern extent of the upper bush regeneration area, showing the erosion of midden deposits downslope (direction indicated by arrow) towards the lower staircase area. View southeast.

3. The area of the wooden steps adjacent to the eastern edge of the grassed area and extending downwards in two flights to the shore below (*Figure 6.15*).

Figure 6.15 Upper flight of steps leading down from the eastern edge of the grassy area, showing the cut through the midden and extensive wash. View southeast.

Figure 6.16 Lower flight of steps leading to the shoreline. Midden wash continues down these steps.

The flight of steps passes a rockshelter located approximately 1.5m to the west (see *Section 6.3, Figure 6.21*). The rockshelter is associated with extensive midden deposits, predominantly of cockle (*Anadara trapezia*), that extend downslope from within the shelter and are clearly visible in exposed profiles on either side of the steps (*Figure 6.16*). The deposits have been directly truncated during construction of the staircase and remnant deposits on either side of this construction now remain exposed and subject to accelerated erosion. This process is attested in midden wash that is accumulating on each step as it erodes away from the exposed side profiles (*Figure 6.18*). Depths of the midden deposit above the rockshelter in the grassed area are estimated to be up to 1.5m, and are likely to be deeper on the slope leading from the rockshelter below (see *Section 6.1.2* below).

Figure 6.17 Midden deposits located within the rockshelter overhang. Cockle (anadara trapezia) predominate. View west.

Figure 6.18 The steps and rockshelter (overhang top left), showing the truncation of midden deposits by step construction and subsequent erosion of midden. View west.

6.3 Rockshelters

During the survey four rockshelters were located in association with the Lilli Pilli Point Reserve track. It is likely that several more exist below the track along the rocky line of foreshore above the high water mark. This area between the track and the high water mark is relatively inaccessible from the Reserve walking track, but could be accessed at low tide from the shoreline (this area could not be accessed during the survey due to restrictions of time, weather and tides). Of these four shelters identified on the survey, three in particular are directly associated with the Reserve track, being both visible and directly accessible from there.

The rockshelters are located as follows:

1. travelling east along the foreshore from Pilli Pilli Point Road, the first shelter is located in Reserve 66504 amongst scrub on a sheer slope facing Port Hacking, around 100m east of the road;
2. the next is located in Reserve 66504 directly below the grassy track area on the beach of a cove;
3. another is situated up a steep slope and through dense scrub northwest of the track in the gully forest area; and
4. the last is situated at the eastern tip of the Reserve 135 directly adjacent to a flight of wooden steps leading down to the water.

All but one of these shelters occurs in association with midden deposits. The shelter upslope from the track in the area of gully forest has no visible associated midden deposit, but this may partly be due to the dense ground layer vegetation in the area.

1. The first rockshelter is at relatively minor risk due to its obscured location (*Figure 6.19*). It is close to the informal track area (*c.* 10m south) but is relatively inaccessible from there, being accessible only through scrub and situated on a sheer slope overlooking Port Hacking, *c.* 2m above the high water mark. The shelter has associated midden deposits that are being affected by natural erosion, but not necessarily by human induced disturbance.

Figure 6.19 Rockshelter in the area south of Lilli Pilli Point Road, below the informal track. View southeast.

2. Proceeding, The second rockshelter along the informal track to northeast and mentioned above (Midden Zone A, 2) is in a cove with beach and is accessed via sandstone steps. The shelter lies between the track and the beach, with informal access to the cove running directly across the overhang and down past the dripline of the shelter to the beach. The steps have been cut into a sandstone rock directly outside the shelter and the remains of a small brick and cement barbecue (?) structure (*Figure 6.20*) are located approximately 2m outside the shelter to the southeast.

   Midden deposits from the area above the shelter near the track are continually eroding downslope and are visible in exposures around the shelter (see *Section 6.2, Figure 6.18*). The likelihood of extant *in situ* deposits associated with the shelter is low considering the unsheltered position of the site and its evident disturbance as a result of localised erosion, pedestrian traffic and small-scale construction. Further, the sandstone shelf jutting out below the shelter indicates that any existing deposits above are very shallow, sandy and unstable considering the continuing localised impacts of public access, tidal action, weather, erosion and fluvial action.

Figure 6.20 Rockshelter accessed directly from the track and situated above the beach in a small cove. Profile of access steps is visible at top right and barbecue structure is seen at bottom right. View northwest

3. The third rockshelter is located in dense vegetation approx 20m above the section of track following the gully forest. The shelter is barely visible up a steep slope on the northwest side of the track, and there is no track/trail leading towards the shelter that would otherwise indicate its presence. Surface survey within the shelter and its immediate surrounds indicated that no midden or artefact-related deposits are associated with this shelter, although vegetation and groundcover are dense.

4. The final rockshelter is the most significant as it is associated with *in situ* midden deposits. Depth of the deposits are difficult to determine, but are estimated at up to 1.5m. Unfortunately this site has been most heavily impacted. The Midden deposits associated with the shelter and its condition has been discussed above (see *Section 6.1.1*). It is important to note here that midden deposits associated with the shelter have been directly truncated by the wooden staircase construction 1.5m east of the shelter. The remnant *in situ* deposits on either site of the steps are rapidly eroding downslope, facilitated by the cut of the staircase, which effectively acts as an erosion channel through the deposits.

Erosion occurring upslope through herbicide spraying in the bush regeneration area is washing downslope into the staircase in the rockshelter area.

Erosion processes are evident in the thick wash of midden shells and debris accumulating on the staircase from deposits both around and below the rockshelter and the above sandstone plateau. *In situ* deposit extends from directly within the rockshelter, including abundant remains of whole cockle shells (*Figure 6.17* and *Figure 6.21*). If localised disturbance continues unchecked these remaining deposits will be increasingly degraded and possibly destroyed.

Figure 6.21 The rockshelter west of the steps, showing midden deposits extending from within the shelter. View southwest.

6.4 Art and Grinding Grooves

Although two rock art sites in the area are recorded in the AHIMS register, these were not successfully located during the survey despite extensive searching. Directions and grid references cited on the AHIMS site cards were outdated and/or unspecific, and limitations of time, high-tide, and personnel meant that it was not possible to survey the entire foreshore area, although the area in direct association with the informal foreshore tracks and paths was thoroughly surveyed. Information from local Aboriginal community representatives was unavailable on the day of the survey.

A possible axe grinding groove site, perhaps the previously recorded AHIMS#52-3-0120 was located on flat, low-lying sandstone rocks within the tidal zone of Reserve 66504 (*Figure 6.22* and *6.23*). The grooves are approx. 30cm in length, 3-5cm in width and 3-5cm in depth; with a V-shape rather than a rounded section. This suggests they are likely to be spear grinding grooves rather than axe grinding grooves, as the latter tend to have a wide and well-rounded section, rather than a narrow, V-shaped section. The site is accessible from the foreshore.

Figure 6.22 Possible grinding groove site, arrow showing location of grooves. View southeast.

Figure 6.23 Detail of grinding groove site, with thin, linear grooves visible along the rock ledge as highlighted.

The Lilli Pilli peninsula was clearly an important zone for subsistence needs, with Aboriginal communities returning to sites over time for intensive exploitation of available coastal marine resources. The relationship of the individual archaeological sites to each other, and resulting implications for the intensive use of the peninsula by Aboriginal people, is a fundamental factor in determining the archaeological significance of the Reserve area.

Occupation sites such as shell middens and rockshelters represent significant archaeological research potential for dateable archaeological occupation sequences and hunter gatherer dietary subsistence habits. They represent direct and visible evidence of Aboriginal occupation of a specific area over time, and are culturally significant in allowing Aboriginal communities to connect culturally and spiritually with that heritage.

Given the profusion of midden and other sites within this small region, and the likelihood that further subsurface archaeological evidence exists, it is fitting to regard the whole peninsula as an area of cultural and archaeological significance in which recorded sites are visible and interacting indicators of this significance.

7 Historic Heritage Survey

7.1 Preamble

The Lilli Pilli Point Reserve is located at the end of Lilli Pilli Point Road, below a cul-de-sac (turning circle) at the termination of the Road. To the left of the road is the western portion of the Reserve, an area that has a formal asphalt roadway with parking bays and landscaping. The extant structure of the Lilli Pilli Wharf is also to the west of the road, described as *an extensive recognisable structure of rectangular sandstone blocks three courses high with a rubble filled core with some concrete and a flight of twelve sandstone steps at the east end* (Perumal Murphy Wu 1993:3).

The historic heritage survey was undertaken on Friday 4 May by AMBS Project Officer, archaeologist Amanda Dusting. The survey focused upon the foreshore of the Reserve area and those places where historic structures were known to exist (such as steps and boatsheds). The aims of the survey were to identify any potential heritage items and historical archaeology that may be present.

Lilli Pilli Point has been extensively developed over the last 40 years with many new houses replacing the early cottages and bungalows. Currently the historic remains within the study area comprise the remnants of slipways, boatsheds, sets of steps and wharves. The remains are predominantly stone footings and steps constructed from sandstone blocks or cut directly into the rock of the shoreline. There are also the remains of iron rail slipways, some brick and concrete features.

7.2 The Lilli Pilli Point Reserve

The survey began adjacent to the turning circle at the end of Lilli Pilli Point Road where a grassed area leads to the eastern portion of the Reserve. This is gently undulating and extends from the boundaries of housing allotments to the north to trees and cliff edges to the south. An informal track has developed, running parallel with the shoreline, approximately five metres from the house boundaries (*Figure 5.1*). There is also a walking track through the densely forested area of the Reserve 135 to the east. This is of hard packed earth with wooden edging in some sections. The informal track traversing the grassed area has been created by pedestrian traffic, also causing the exposure of residual demolition material and midden deposits beneath.

Figure 7.1 View of informal walking track and grassed area facing north east.

7.3 Houses

Within the vicinity of the study area are *Waratah* at 18 Bareena Street, located near the start of the grassed area, and *Nuimburra* at 16-18 Korokan Road located on the eastern boundary of the Reserve (*Figure 7.2* and *7.3*).

Figure 7.2 Waratah, 18 Bareena Street facing north.

Figure 7.3 Looking north to the rear of Nuimburra showing three construction phases.

The area is generally characterised by relatively modern and earlier, modified, buildings, several of which feature swimming pools on or near the boundary with the Reserve. Most houses are oriented towards the water and all have access to the Reserve via gateways in fences or are unfenced. What appears to be the original sandstone boundary wall to the cottage at 84 Lilli Pilli Point Road, which is now associated with a new structure was still standing in 1984 (*Figure 7.4*).

Figure 7.4 Sandstone boundary wall at 82 Lilli Pilli Point Road.

7.4 Stairs, wharves and boat-ramps

A number of informal pathways and flights of sandstone steps provide access from the grassed Reserve, through the bush, to the foreshore. Not far from Lilli Pilli Point Road, and adjacent to *Waratah* is a set of roughly constructed sandstone steps leading to the waters' edge. Beyond this, to the east, a flight of sandstone and concrete steps leading to a small boat ramp, also built of sandstone blocks with a concrete rendered slipway surface. The remains of sandstone piers lead to the east at a right angle to the ramp (see *Figure 7.5*). The ramp and piers are the probable remains of one of the boatsheds listed as PO 39. It is possible that this boatshed was used by the residents of *Wai Wera* or *Waratah.*

Figure 7.5 Sandstone boat ramp and piers, probably the remains of PO 39

A combination of stairs cut into the rock-shelf and sandstone blocks creating steps down to a sandy cove define the next access route to the foreshore (see *Figure 7.6*). There are no oyster covered rocks and there is evidence of modification of the cove to facilitate swimming and a place from which to launch boats. The rock overhangs of the cove are currently used to store small boats or tenders.

Figure 7.6 Foreshore, rock-shelf, stone steps and grassed area with housing in the background.

An open grassed area sloping gently to the waters' edge opposite 102C and 102B Lilli Pilli Point Road to a sandstone foreshore complex comprising a boat-ramp with iron rail, a sandstone jetty and a rectangular boat pen (see *Figures 5.7* and *5.8*). These are the remains of boatsheds that were still extant in 1970 (*Figure 5.9*). Although the superstructure of the boatshed no longer exists, the ramp and pen are still in use as launching and boat storage areas. The remaining structure is in good condition, and appears to have been repaired relatively recently.

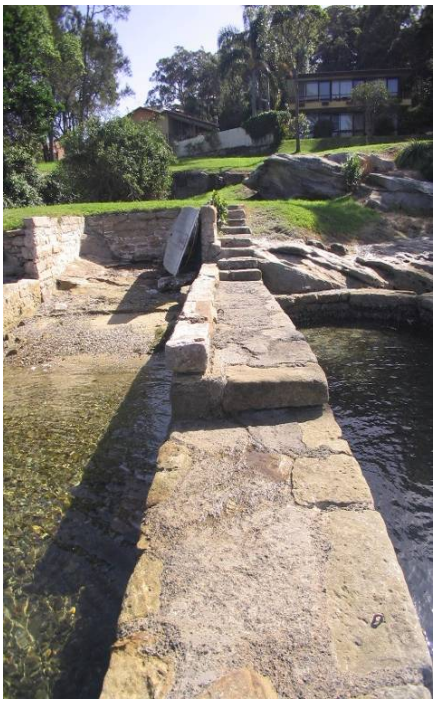

Figure 7.7 The sandstone complex; the remains of Permissive Occupancy 43.

Figure 7.8 The iron rails used for slipways facing south.

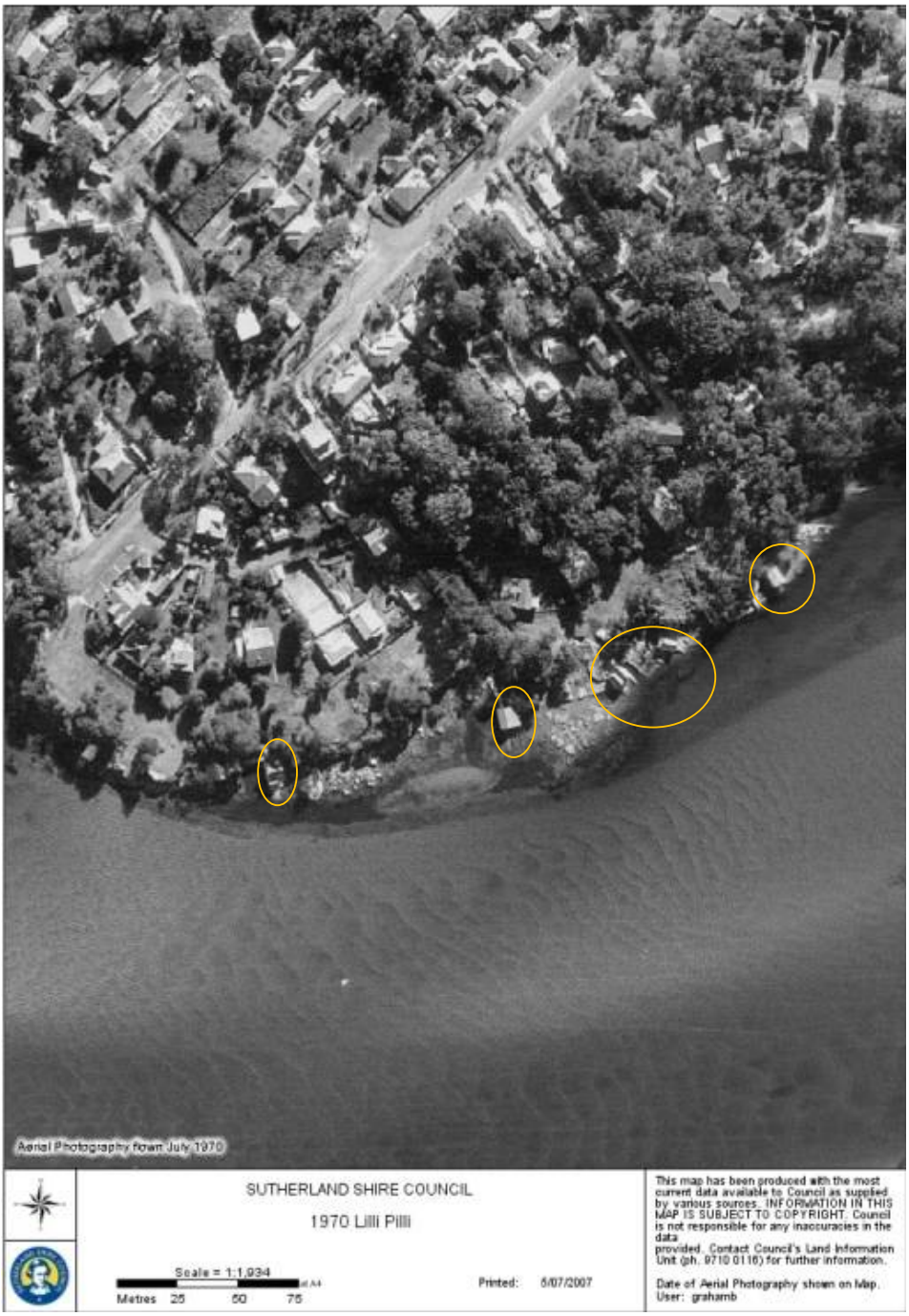

Figure 7.9 Aerial photograph of c. 1970 showing boatsheds still standing.

Adjacent to the rock-cut inlet, the cliff face has been covered by dumped demolition debris (*Figure 7.10*). It is probable that this debris relates to the demolition of boatsheds in the immediate vicinity which were no longer standing by 1978 (*Figure 7.11*). The demolition material includes iron sheeting, brick and some asbestos cement (AC / fibro) a bonded or non friable from of asbestos in use extensively during the 1950s to the 1970s (Noel Arnold 2006:6).

Figure 7.10 Demolition dump on foreshore with part of an Aboriginal midden visible above.

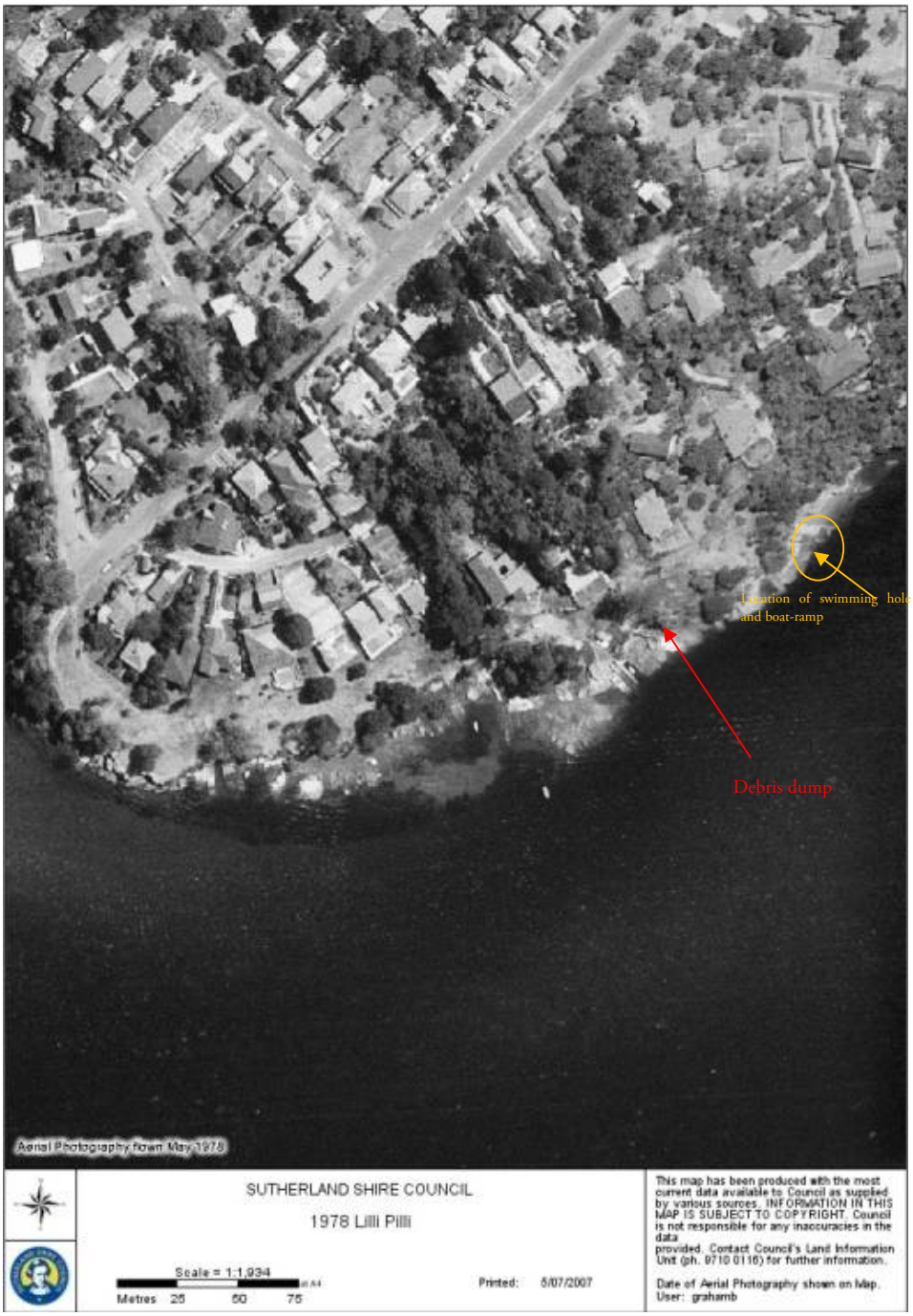

Figure 7.11 Aerial photograph of c.1978 showing demolition dump and absence of boatsheds.

Further modification of the landscape is evident at the eastern end of the foreshore Reserve, where rocks have been removed or repositioned to form an informal circular swimming hole or fish trap (*Figure 7.12*). This feature is between a sandstone boat-ramp and the remains of a boat house. The remnant boathouse comprises the foundations of a brick chimney, tiling and plaster indicating that the building was more substantial and complex than merely for boat storage (*Figure 7.13*).

Figure 7.12 Swimming hole formed by removing rocks below PO 35 facing south west. Note brick pier at bottom right associated with demolished boatshed.

Figure 7.13 Remains of a brick chimney base from a demolished building associated with PO 35.

The last of the formal sandstone wharves within the study area is accessed by a set of rough stairs through the bush to the cliff edge and then by an aluminium ladder (*Figure 7.14*). Although permissive occupancy was in existence by 1913 it is unknown with which house this wharf was originally associated (see *Figure 2.13*).

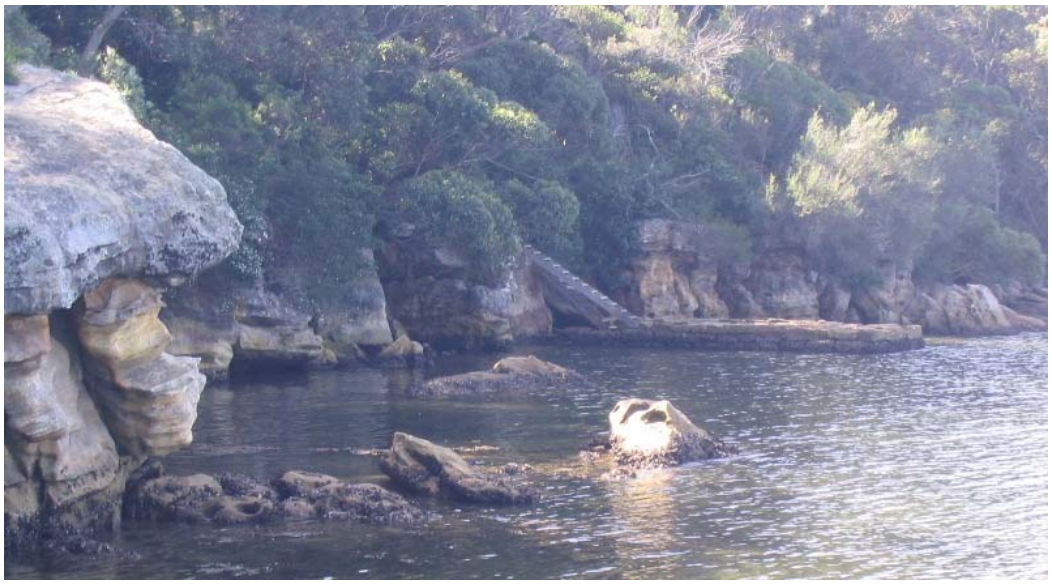

Figure 7.14 Wharf constructed of sandstone facing east, probably the remnant of PO 97.

7.5 Bushtrack

The track leading through the triangular section of bushland that is Reserve 135 runs through dense bush, hugging the land which rises steeply from the waters' edge (*Figure 7.15*). Several access hatches to a Sydney Water sewer line traversing Reserve 135 are located along the track, and in some cases the track has eroded away such that the access shafts sit proud of the surface (*Figure 7.16*). Culverts are also a feature of the area where rainwater runoff crosses the track and continues down the slope to the shoreline. Some culverts are well built of stone, concrete or brick whereas others are less defined and have washed away areas of the track (*Figure 7.17*). There are some informal tracks located intermittently leading from the path down to the water's edge, which also function as informal storm water runoff routes (*Figure 7.18*).

Figure 7.15 View to the east along the track through the Reserve

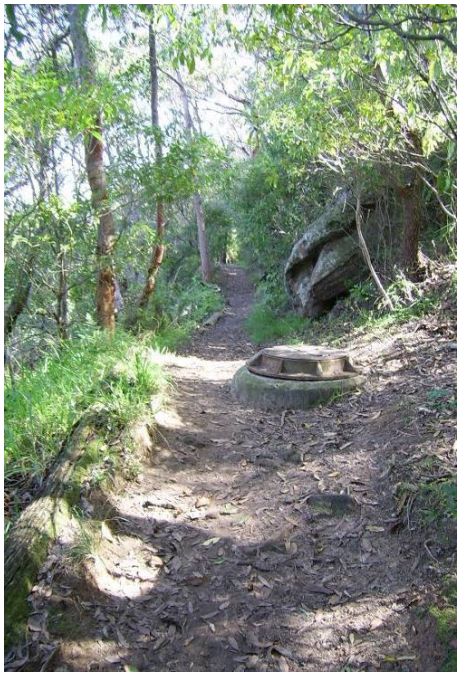

Figure 7.16 Track facing south west with raised sewer line access hatch

Figure 7.17 Stone culvert running under track

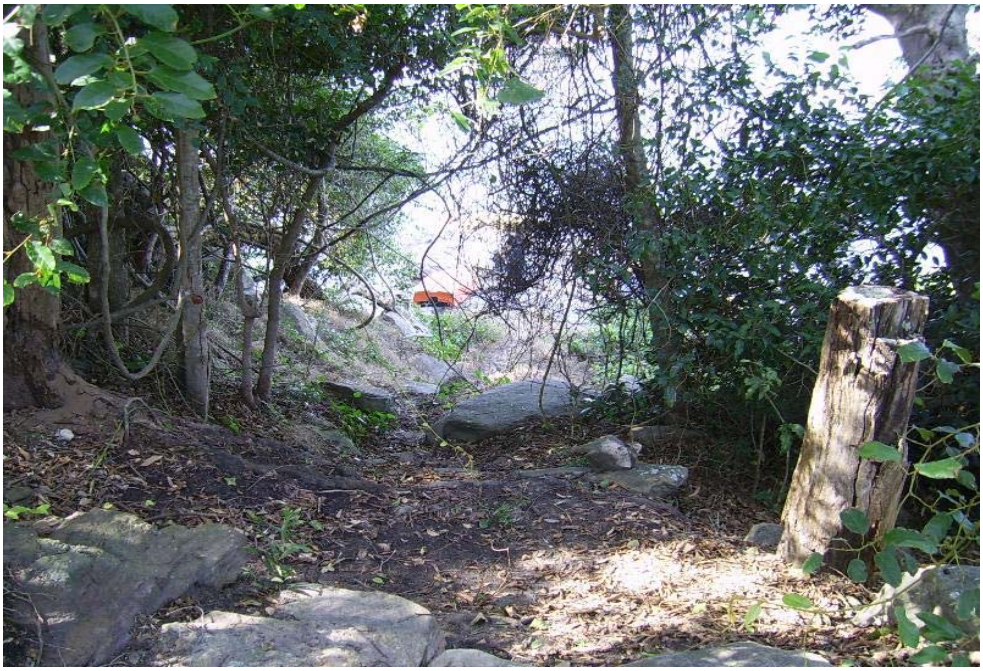

Figure 7.18 View down an informal path to the waters' edge in the south east.

8 Significance Assessment

8.1 Preamble

The physical evidence of past activities is a valuable resource that is embodied in the fabric, setting, history and broader environment of an item, place or archaeological site. The value of this resource to a community can be evaluated by assessing its cultural and natural heritage values. 'Cultural significance' and 'heritage value' are terms used to express the intangible and tangible values of an item, place or archaeological site, and the response that it evokes in the community. Assessment of significance will provide the framework for the development of management strategies to protect an item or place, for future generations.

8.2 Previous Significance Assessments

The Lilli Pilli Point Reserve has not been identified on any registers or lists; however, the following describes items identified in the vicinity of the Reserve.

Sutherland Shire Council Local Environmental Plan 2006

Schedule 6 'Heritage items' of the Sutherland Shire Council Local Environmental Plan 2006 (LEP) includes a number of items which are in the vicinity of the Lilli Pilli Point Reserve, and which were identified in the following heritage studies.

The Sutherland Heritage Study 1993

The Sutherland Heritage Study was prepared to identify heritage items, places, landscapes and archaeological sites within the Sutherland LGA and as supporting documentation to the development of the LEP heritage schedule. The Heritage Study identifies the remains of the public wharf at the end of Lilli Pilli Point Road as item AO 45 on Schedule 6. The Statement of Significance for the public wharf is as follows:

> *The site of the Lilli Pilli Point Ferry represents one of the few remaining examples of "pleasure grounds" and their associated landscaping which were part of a pattern of leisure and recreational facilities popular in the Sutherland Shire after the railway overcame problems of access (Perumal Murphy Wu 1993).*

Waratah and *Nuimburra* are also identified in the Heritage Study as B118 and B262 on Schedule 6 respectively. The Statement of Significance for *Waratah* 18 Bareena Street is as follows:

> *Old weatherboard cottage of considerable character and charm, a good example of the persistence of the Georgian form probably built in the late Federation period. One of the oldest houses in the area, and like most built as a weekender. Virtually intact, of local significance. LEP Evaluation criteria: historic - rare, aesthetic – rare.*

Trees in the garden of 18 Bareena Street are also identified on the Sutherland Shire LEP register as item L6. The Statement of Significance for the trees is:

> *Setting of characteristic symmetrical Camphor laurel trees to 11m behind simple timber picket fence (representative).*

The Statement of Significance for *Nuimburra* and adjoining house 16-18 Korokan Road is:

> *A pair of interesting older style stone houses. Hard to say how true to original. Somewhat compromised by alterations and replacement of fabric but retaining some original character. Further investigation required. Evaluation criteria: Historic – ?, Aesthetic – rare. (Perumal Murphy Wu 1993).*

The Sutherland Shire Foreshore Study 1998

The Foreshore study noted some general characteristics of the waterfront which are relevant to the study area:

- *The predominance of stone construction for sea walls and waterfront construction generally throughout the Shire which is the single most consistent element of the waterways;*
- *The use of stone unifies varied and often disparate waterfronts and gives the greatest clues to the early development of the area. Many of the stone waterfront constructions date from the earliest settlement of the area (these are extremely difficult to date and have often been rebuilt) and continue to have an important role in the definition of the waterways;*
- *All stone foreshore construction is considered to be of high potential heritage value to the Shire; and*
- *There are a large number of relatively intact early foreshore structures, predominantly boatsheds or adapted boatsheds that survive and give strong character to much of the waterfront. While some areas have a concentration of good examples of early waterfront development, there are remnant structures across most of the Shire* (Paul Davies 1998:6).

Specific reference to the Lilli Pilli Point Reserve is made in the study:

> [Lilli Pilli Point] *has an extensive waterfront reserve that provides bushland and significant setback to housing. These are important elements in establishing a predominantly natural setting to the main visual focal points of Port Hacking. There are several small individual items of significance and a number of ruins at Lilli Pilli Point of heritage value* (Paul Davies 1998:46).

8.3 Discussion of the Significance of Lilli Pilli Point Reserve

The elements of Littoral Rainforest within the Reserve are remnants of a vegetation community which was once widespread, but is now in decline. Rainforest, as a whole, once covered most of the ancient southern supercontinent Gondwana and remains the most ancient type of vegetation in Australia. The remaining rainforests in NSW are discontinuous patches or islands separated by sclerophyllous vegetation types. Littoral rainforest is restricted to areas with maritime influence (generally less than 2km from the sea) and constitutes a minor component of remnant rainforest in NSW (NPWS 2004). It supports some extremely rare species, in some cases the last remaining populations (eg. *Menippus fugitivus* (Lea)). The significance of this community has been recognized and it is protected in NSW by State Environmental Planning Policy 26: Littoral Rainforests (SEPP 26) and is listed as an endangered ecological community under the Schedules of the NSW *Threatened Species Conservation Act 1995* (TSC Act).

The SSSFTS within the Reserve is the remnant of a community with a highly restricted distribution which has been cleared in the past. The community is currently estimated to occupy an area of approximately 400 - 4 000 ha, (Orscheg *et al.* 2006). Clearing has resulted in a moderate to large reduction in the geographic distribution of the community. This

vegetation community has been listed as an endangered ecological community under the Schedules of the NSW *Threatened Species Conservation Act 1995* (TSC Act).

Lilli Pilli Point Reserve is essentially one large Aboriginal cultural and archaeological site with a number of interacting components. These comprise extensive midden deposits and associated rockshelters, rock art, and grinding grooves.

Midden deposits in the Reserve area should be considered for their potential to contain Aboriginal ancestral burials, particularly when deposits are potentially deep and associated with rock shelters (as in Midden Zone B). Excavated middens in similar environments locally and regionally are known to contain these burials.

Lilli Pilli Point Reserve has potential to contribute to Aboriginal archaeological research questions in the future. Although parts of the midden have been disturbed, the majority of midden deposits along the foreshore remain relatively intact. Depths of midden deposits are difficult to determine; however, the open midden appears to be deep in places. Deposits associated with the rockshelter at the eastern end of the Reserve have been disturbed, although those extending from directly within the shelter appear to be *in situ* and of considerable depth. While shell middens are not uncommon in the Port Hacking area, most of these are not recorded as being extensive. A smaller midden site with a similar level of significance is known at nearby Gray's Point.

The setting of Aboriginal places within a remnant natural bushland environment at Lilli Pilli Point Reserve is an integral part of interpreting its heritage value and is fundamental to the fabric of this Aboriginal cultural landscape (Andrews *et al.* 2006:19). The visible elements of Aboriginal culture and remnant natural bushland act cohesively to heighten cultural value.

An Aboriginal cultural landscape is defined as follows:

> "[It is] *a place or area valued by an Aboriginal group (or groups) because of their long and complex relationship with that land. It expresses their unity with the natural and spiritual environment. It embodies their traditional knowledge of spirits, places, land uses and ecology. Material remains of the association may be prominent, but will often be minimal or absent."* (US/ICOMOS 1996).

Since the beginning of European activity and settlement, modifications to the foreshore, the Reserve and the adjacent area have included: the removal of midden material in the process of *shell gritting* and clearing of native bushland to enhance views and for housing construction. The modifications to the foreshore also demonstrate a continuity of land use by European settlers in the creation of picnic or leisure grounds, the creation of boating facilities through excavation, dredging and construction, the removal or relocation of rocks to create swimming enclosures and other recreational facilities, and foreshore stairs, boatshed foundations, wharves, and slipways. However, despite these small scale constructions, the early resumption and gazettal of Reserve 135 (1886) and the foreshore Reserve 66504 (1900) for public recreational purposes have ensured that modification of the local environment and destruction of natural bushland has been limited, thus preserving, at least in part, the original aesthetic values of the area.

8.4 Assessment against Criteria

The seven criteria developed by the NSW Heritage Office (now Heritage Office, Department of Planning) were designed to assess and identify the cultural and natural heritage

significance of items, places and archaeological sites in NSW. An item will be considered to be of State or local significance if, in the opinion of the Heritage Council, it meets one or more of the following criteria:

a) Importance in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area)

- The abundance and complexity of Aboriginal archaeological sites in the area is demonstrative of habitation and utilisation of the area by Aboriginal communities over long periods of history, particularly in the case of the extensive midden deposits. Such intensive utilisation of the area over time by Aboriginal people indicates the significance of the area for local Aboriginal cultural history.
- The historical resources of the Lilli Pilli Point Reserve are demonstrative of the European land use patterns in the local area. Such patterns include the historical development of the study area as originally dominated by large estates which were subdivided into small allotments or *weekenders* for private recreational use and the resumption of land as a Reserve for public recreational use. These patterns have importance to the development and history of the local region in the evolution of recreational use and tourism.
- The Reserve contains 'layers' of Aboriginal and European heritage values within a popular public recreational area. This indicates the potential value and significance of the area to the European and Aboriginal wider community in representing aspects of a continuous Australian past.

b) Strong or special associations with the life or works of a person, or group of persons, of importance in the cultural history of NSW (or the local area)

- The network of Aboriginal cultural sites at the Lilli Pilli Point Reserve is representative of long periods in the cultural past for the local Dharawal people. When considered individually such sites are not rare at a local or regional level. However, these sites retain strong cultural and spiritual significance, sense of place, and heritage value for the Dharawal people, and are representative of the daily lives of their ancestors. The retention of sites as part of a remnant cultural landscape that incorporates ecological and cultural heritage values heightens this association. In this way Lilli Pilli Point Reserve should be considered as holding strong and special association with the past of the local Dharawal people.
- The Lilli Pilli Point Reserve has an association with the early landowner, Thomas Holt, the eminent parliamentarian, pastoralist and land speculator. The Reserve has further association with the Holt-Sutherland Estate Act and development of the settlement pattern that characterised the local area up to 1900.
- The study area has a more tenuous association with Attorney General Want and John Kitchen of Lever and Kitchen as residents of the neighbouring aggrandised weekender *Nuimburra*, the site of which is adjacent to the study area.

c) An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area)

- The combination of grassy sloping lawns, natural bushland and the foreshore with its man-made inlets within the Lilli Pilli Point Reserve demonstrate strong aesthetic qualities. The remains of sandstone stairs, wharves and slipways contribute to the overall unifying construction style of sea walls and marine

facilities in the Sutherland Shire and, as such are demonstrative of the early patterns of land use in the area.

d) An item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons

- Any strong or special association that the local Aboriginal community may have with the Lilli Pilli Reserve has not been investigated as part of this study. However the archaeological resources of the Lilli Pilli Point Reserve have social, spiritual and cultural associations that are likely to be highly valued by the local Dharawal community.

  The network of Aboriginal cultural sites at the Lilli Pilli Point Reserve is representative of long periods of importance in the cultural past for the local Dharawal people. Rock art in the area indicates surviving systems of past cultural communication. Midden areas and their association with ancestral burials locally indicate potential for strong spiritual significance in the Reserve. As such midden areas should be considered as potential sites of memory and emotion, spiritually and culturally sacred to the Dharawal. Sites at the Reserve may now provide important links for present and future Dharawal people to relate to their cultural and spiritual heritage.

- Any strong or special association that the local European community may have with the Lilli Pilli Reserve has not been investigated as part of this study; however, the historical evidence suggests that the Reserve continues to have value to recreational users.

e) An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area)

- The interrelating Aboriginal places on the Lilli Pilli peninsula provide tangible means and opportunity for education of both local Aboriginal and European communities, children and adults, in important aspects of Dharawal cultural history and elements of our collective human past.

- Extensive visible shell midden remains throughout the eastern foreshore area indicate the potential for relatively deep, *in situ* archaeological deposits in some areas of the Reserve. Such deposits present the potential opportunity for future archaeological research to take place, addressing key research questions and adding valuable insight into the cultural history of the Dharawal people. Such potential is limited in some areas by disturbance/destruction resulting from erosion and development.

- The historical archaeological resources of the Lilli Pilli Point Reserve study area are demonstrative of a modified landscape type that characterises early foreshore land use patterns in NSW in order to create recreation areas. The early resumption of Reserve 135 (1886) and Reserve 666504 (1900) contribute to an understanding of the evolution of tourism and leisure in the greater Sydney region.

- The historical archaeological resources associated with the Lilli Pilli Point Reserve foreshore stairs, boatshed foundations, wharves, swimming enclosures and slipways have the potential to make a contribution to an understanding of the historical use of the Reserve for both private and public recreational activities; including boating, fishing, swimming and picnicking.

f) An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area)

- The Aboriginal sites on the Lilli Pilli peninsula are representative of a small, remnant Aboriginal cultural landscape. The significant remnant community of natural, unmodified bushland adds to the fabric and integrity of the cultural landscape. The various types of archaeological sites act as interrelating features of this landscape which would have once extended locally to include the wider region. Such landscapes represent significant cultural places but are not well documented locally.

- The vegetation within the Reserve includes remnants of vegetation communities which may once have been more extensive throughout the local area and the state, or are of restricted distribution. Urban development and sand-mining have reduced and fragmented the distribution of these communities to the point where they are now recognised as endangered aspects of NSW's natural environment.

- The historical archaeological resources, and the evidence of modifications to the landscape, are representative of similar landscape modification in coastal environments, and as such is not a rare or endangered aspect of Australia's natural or cultural history.

g) An item is important in demonstrating the principal characteristics of a class of NSW's Cultural or natural places or environments (or in the local area).

- Aboriginal places in the Reserve provide accessible, tangible heritage values that are evocative of the past lifestyles of the Dharawal people and their interaction with the natural environment. These places are present throughout the Reserve in the form of key cultural and archaeological remains (rockshelters, grinding grooves, middens) interrelating within a wider cultural environment (Lilli Pilli Peninsula, Port Hacking). Remnant natural bushland is considered as an integral part of this cultural landscape.

- The historical archaeological resources associated with the Lilli Pilli Point Reserve itself are demonstrative of the early resumption of Reserve 135 (1886) and the foreshore Reserve 66504 (1900) and resultant land use practice of limited environmental modification and destruction of natural bushland.

8.5 Historic Themes

In addition to the evaluation criteria, the national and state government authorities have developed a series of Historic Themes to provide a framework for understanding the significance of a place. The major historic themes that are identified as applying to the Lilli Pilli Point Reserve area are summarised in Table 8.1.

Table 8.1: Lilli Pilli Point Reserve historic themes

Australian Theme	NSW Theme	Local Theme
4. Building settlements, towns and cities	Land tenure	Subdivision patterns and land use practices associated with the Holt- Sutherland Estate Land Company
8. Developing Australia's cultural life	Leisure & tourism	Activities relating to relaxation and recreation such as boating, fishing, swimming and picnicking.

8.6 Summary Statement of Significance

The archaeological and natural resources of the Lilli Pilli Point Reserve study area have potential to make an important contribution to an understanding of the development of the local area from a natural and cultural environment used by the Aboriginal community to a landscape modified to fulfil the recreational needs of European settlers. Heritage resources are represented in the presence of Aboriginal sites and places such as middens, rockshelters, grinding grooves, rock art, and natural bushland interrelating to form a remnant cultural landscape; and the remains of historic material culture such as boatsheds, wharves, steps and slipways. Both Aboriginal and historic heritage resources at Lilli Pilli Point Reserve have significance as cultural sites of importance for present and future groups in the European and Aboriginal communities, and as a shared cultural heritage resource.

The Lilli Pilli Point Reserve has significance to the local community for its natural, Aboriginal and historic heritage values.

8.6.1 Ecological Significance

The elements of both Littoral Rainforest and SSSFTS (i.e. all of the natural bushland) within the Reserve are remnants of vegetation communities which were once widespread, but are now in decline. Both communities have significance to the State of NSW and to the local community.

8.6.2 Aboriginal Significance

The Reserve as a whole has the potential to provide important tangible links to a past and present cultural identity for local Aboriginal communities, specifically the local Dharawal people. The material remains of the area have a strong and special association with the lives of past local Aboriginal people over long periods of time, and in this way is an important cultural and spiritual resource for present and future Aboriginal communities. These tangible resources also present valuable opportunities for non-Aboriginal communities to learn about and relate to our collective human past, and to learn about and appreciate Aboriginal culture. In these ways Lilli Pilli Point Reserve offers significant cultural resources to the local community.

The Lilli Pilli Point study area is of high archaeological significance, and has potential for future scientific/archaeological research. Lilli Pilli Point Reserves 135 and 66504 can be viewed as areas of one large archaeological site with a number of components situated within these Reserves. Components include extensive open middens, one rock shelter with shell midden, and grinding grooves.

8.6.3 Historic Significance

The historical archaeological resources associated with the Lilli Pilli Point Reserve have the ability to demonstrate early land use practices and settlement patterns laid down during the nineteenth century. In particular, by Thomas Holt; the early landowner, eminent parliamentarian, pastoralist and land speculator, and the Holt-Sutherland Estate Act. The resumption of lands along the foreshore and establishment of Reserve 135 in 1886, and Reserve 666504 in 1900 is demonstrative of the early recognition of the social importance of, and interest in recreation. The remains of the stairs, wharves and slipways of the historical built environment represent the remnants of structures related to late nineteenth and early twentieth century recreational activities of the Port Hacking region. The modifications to the foreshore, with the construction of boating facilities, add to an understanding of the development of recreation and tourism in the area and as such have high significance to the local area.

9 Managing Change

9.1 Preamble

The *Burra Charter* has established the conservation and planning principles for managing historic heritage places. These principles are also relevant to the management and conservation of places with natural values and Aboriginal heritage places. Development of conservation policies is informed by the relevant constraints and opportunities for all places of significance. These are as follows:

- requirements for the retention of significant features and attributes;
- Council's requirements and/or feasible uses;
- Requirements of the broader strategic planning frameworks; and
- physical condition of the site.

9.2 Statutory Context

9.2.1 Threatened Species Conservation Act

The Littoral Rainforest and SSSFTS within the Reserve are endangered ecological communities listed on the schedules of the *Threatened Species Conservation Act 1995*. The significance of any proposed activities with potential to remove or modify part of these communities must be assessed by Assessments of Significance (or 7-part tests) under the EP&A Act (Section 5A). Seven part tests are statutory requirements that help to determine whether a proposed activity is likely to have a significant effect on threatened ecological communities, threatened species or threatened populations listed under the TSC Act.

Where potentially significant impacts of a proposal are identified by 7-part tests, the proponent is required to prepare *Species Impacts Statements* for the relevant ecological communities or species.

9.2.2 The Protection of Aboriginal Cultural Heritage

All Aboriginal heritage sites within NSW are afforded protection under the provisions of the *National Parks and Wildlife Act 1974* (NPW Act) and the *Environmental Planning and Assessment Act* 1979 (EP&A Act).

Under the provisions of the NPW Act, all Aboriginal Objects are protected regardless of their significance or land tenure. Aboriginal Objects are defined as "*any deposit, object or material evidence (not being a handicraft made for sale) relating to Aboriginal habitation of the area that comprises NSW, being habitation before or concurrent with the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains".*

Aboriginal objects are limited to physical evidence and may be referred to as 'Aboriginal sites', 'relics' or 'cultural material'. Aboriginal objects can include pre-contact features such as scarred trees, middens and open campsites, as well as the physical evidence of post-contact activities such as Aboriginal built fencing, stockyards, or fringe camps.

The NPW Act also protects Aboriginal Places, which are defined as *"a place that is or was of special significance to Aboriginal culture. It may or may not contain Aboriginal objects".* Aboriginal Places can only be declared by the Minister.

Under Section 91 of the Act, the DECC must be informed of the identification of all Aboriginal Objects. Failure to do this within reasonable time is an offence under the Act.

Under Section 90 of the Act, it is an offence for a person to destroy, deface, damage or desecrate an Aboriginal Object or Aboriginal Place without the prior issue of a Section 90 consent. The Act requires a person to take reasonable precautions and due diligence to avoid impacts on Aboriginal Objects, which includes burial. Section 90 consents may only be obtained from the Environmental Protection and Regulation Division (EPRD) of DECC. It is also an offence under Section 86 of the NPW Act to disturb or excavate land for the purpose of discovering an Aboriginal object, or to disturb or move an Aboriginal object on any land, without first obtaining a permit under Section 87 of the NPW Act.

The EP&A Act requires that consideration is given to environmental impacts as part of the land use planning process. In NSW environmental impacts include cultural heritage impacts, and, as such any required Review of Environmental Factors (REF), Environmental Impact Statement (EIS), or Assessment (EIA) should incorporate an assessment of Aboriginal cultural heritage. The consent authority is required to consider the impact on all Aboriginal heritage values, including natural resource uses or landscape features of spiritual importance, as well as the impact on Aboriginal objects and Aboriginal places.

9.2.3 NSW Heritage Act, 1977

The *NSW Heritage Act 1977* provides statutory protection to relics, archaeological artefacts, features or deposits. Sections 139 to 146 of the Act require that excavation or disturbance of land that is likely to contain, or is believed may contain, archaeological relics is undertaken in accordance with an excavation permit issued by the Heritage Council (or in accordance with a gazetted exception to this Section of the Act). The Act defines an archaeological relic as:

> *any deposit, object or material evidence:*
>
> > *(a) which relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and*
> >
> > *(b) which is 50 or more years old.*

9.2.4 Sutherland Shire Council Local Environmental Plan 2006

Clauses 14, 15 and 16 of Part 1 of the Sutherland Shire Council Local Environmental Plan (LEP) identifiy the processes for the protection of heritage items and potential and known archaeological sites (Aboriginal and historic). The provisions are consistent with the NPW Act and the Heritage Act.

9.3 Opportunities and Constraints

9.4 Formal Pathway

The existing pathway along the foreshore in Reserve 66504 and through Reserve 135 should be formalised to protect the natural environment and Aboriginal midden and should take into consideration:

- **Users** – hard surfaces are required for wheeled users (bicycles, strollers and wheelchairs); softer surfaces are required for running and jogging; most users require smooth surfaces that are free of potholes and are well maintained;
- **Economic considerations** – A balance is required between installation costs and maintenance costs;

- **Environmental impacts** – Potential impacts requiring consideration include visual intrusion of the formalised pathway; leaching of chemicals from paving materials; and effects of stormwater run-off;
- **Archaeological impacts** – Degradation or impact on Aboriginal midden deposits should be avoided. Any direct impact (such as post holes, trenching, etc.) to the middens or any other Aboriginal objects and/or places within the Reserve may only be undertaken in accordance with a Section 90 permit issued by DECC.

The pathway design should have a low impact and intrusions into the underlying deposits should be minimised. Some examples of low impact pathway designs include:

- **Porous pavement system** – comprising a series of interlocking blocks allowing for the growth of grasses through the blocks. The blocks retain permeability, offer load support avoiding soil compaction, allow the root mat of grasses to persist, and are wheelchair accessible.

  The porous pavement system is designed to sit level with the desired or natural ground level and usually requires excavation to a depth of c. 50mm (the height of the block). As excavation is not desirable, imported clean fill material should be used to build up the surrounding areas to the height of the blocks.

  Once the blocks have been installed, and grass has grown through the blocks, they are not visible and would not define the pathway. However, through the planting of tall sedge species (including *Lomandra longifolia* and *Dianella* spp.) along the track edge and taller shrubs species (see *Table 10.4*) the pathway could be defined. Such a design is visually unobtrusive, would enhance the natural bushland aesthetic of the place, and requires minimal upkeep.

- **Timber walkway** or boardwalk – could be constructed over areas where the total removal of hazardous material has been unsuccessful, and where the informal pathway directly impacts on the integrity of midden deposits.

  A walkway or boardwalk would require a supporting substructure. Postholes for piers should be located at the greatest possible intervals and excavated depths should be minimised to avoid adverse impacts on midden material.

  However, a timber walkway is relatively costly and may be visually intrusive. Access to service hatches located along the current pathway would need to be considered as part of the walkway design.

  Construction of a raised walkway would result in the total degradation of grasses growing below the walkway. Vegetative groundcover provides important surface cohesion for the midden deposits, and removal would lead to accelerated erosion and instability of the midden deposits in these areas.

  For these reasons, the timber walkway option is not the preferred option for the pathway through Reserve 66504. However, although costly, this option could be considered in the gully forest zone within Reserve 135 subject to economic feasibility.

- **Decomposed granite** – a pathway created from a bed of fine grain decomposed granite with timber edging (features reduced runoff and visual intrusion). This method requires excavation to a depth of approximately 10cm in intended pathway areas. Building up the existing ground level with an introduced fill

intended to sustain such excavation impacts would protect the underlying midden from adverse impact and would avoid further exposure of demolition material (which would require remediation). This design would provide a high level of pathway definition and allows for drainage; however, it does require maintenance.

The lifespan can be up to 20 years assuming regular intervals of rain – requiring 30% replacement of the surface annually (it is evident that although materials such as decomposed granite may have lower visual impacts and lower construction costs, their lifecycle costs are considerably higher than bitumen or concrete).

The composition of decomposed granite is generally neutral to very slightly acidic in nature. During the process of weathering decomposed granite may lead to the gradual release of small amounts of aluminium silicate-hydroxide (kaolinite clay), potassium, iron and magnesium into the surrounding environment.

A decomposed granite pathway can be designed with a curving or meandering pattern to fit the natural topography or to avoid or incorporate obstacles (e.g. incorporation of service hatches through building up the fill around them), which would be visually pleasing.

- **Expanded steel mesh** - construction would require little excavation and therefore would have low impact. Should grass be encouraged to grow through the mesh, any visually intrusive aspects of the mesh would be overcome. Where a section of midden cannot be avoided a raised walkway on stumps would have least impact on the archaeological resources.
- **Stepping stones** - sandstone stepping stones would be less visually intrusive, would require little excavation if placed within introduced fill over middens and, be sympathetic to existing structures. However, as surrounding soils are likely to erode causing degradation to local midden deposits and trip hazards to joggers or people with disabilities, this option would require regular maintenance. Stepping stones may be suited to the smaller branch pathways leading to the foreshore in areas where midden deposits are not located.

9.5 Endangered Ecological Communities

The endangered ecological communities and the associated legislative protection constrains further development within the Reserve that is likely to significantly impact upon the remnant vegetation. However, this vegetation provides the opportunity to conserve and consolidate an isolated remnant of an endangered ecological community (littoral rainforest) and to provide the local residents access to a rare natural area with inherent aesthetic values.

9.5.1 Conservation and consolidation of remnant native vegetation

The potential for enhancement and expansion of existing bushland in the study area is limited because of the small area of the Reserve and its location adjacent to medium density residential development along three sides and Port Hacking along the southern side. However, within the Reserve itself there is an opportunity to conserve, enhance and consolidate the distribution of the Littoral Rainforest and increase connectivity by linking the small islands of remnant vegetation which occur in the west of the Reserve.

Management of native vegetation within the reserve should aim to:

- conserve and protect the remnant native vegetation within the reserve;

- enhance the quality and integrity of remnant native vegetation within the reserve by ameliorating threatening processes currently in operation within the reseve; and
- consolidate the existing, fragmented, islands of vegetation. The previous plan of management, and observations made on site, indicate that the strategy being undertaken to consolidate 'islands' of remnant vegetation has been successful. This technique is to be commended and should continue in the future.

To successfully achieve these aims, management of remnant native vegetation within the reserve would require works to control weed infestations, revegetate areas currently supporting exotic grasslands and protect native vegetation from identified threatening processes.

The revegetation and weed removal works required should be detailed in a Vegetation Management Plan (VMP) that specifies the locations of required works, prioritises the works to be undertaken, sets specific aims for works within the Reserve, outlines a timetable for works within the Reserve and schedules long term monitoring. This VMP should outline the process for the removal of all noxious and environmental weeds.

In the event that a VMP is not prepared, weeding works should commence in the relatively resilient, undisturbed vegetation with works progressing towards the more disturbed areas within the Reserve. Works should involve removal of weeds from the existing bushland (the central area of the Reserve), before islands of remnant vegetation in the east and west of the Reserve are consolidated.

Revegetation Works

Revegetation works within the Reserve should be undertaken to assist natural regeneration in disturbed areas, to stabilise actively eroding areas, to define pathways and to suppress weed germinations. In addition to this, selective planting should be undertaken to consolidate the fragmented islands of remnant vegetation in the west of the Reserve, thereby increasing the distribution of native vegetation.

The conservation significance of the vegetation is such that only locally indigenous species that occur, or are known to have occurred previously, in the Reserve should be planted. These should be grown from locally collected plant propagules that are collected within one kilometre of the Reserve, with the majority being collected within the Reserve.

Plantings should reflect natural densities and arrangements, relevant to the type of plant community. Wherever it is not advisable to plant trees or tall shrubs, to retain water views for residents, lower growing species should be used (

Table 9.1). These should be similar to the ground cover and lower shrub stratum of the relevant natural plant communities (*Appendix D*). Despite some restrictions to the planting of trees, trees should be planted where possible in this zone as the naturally occurring vegetation communities within the Reserve are tree-based communities.

Recent revegetation works have involved wide spread use of a small number of species including *Westringia fruticosa* (Coastal Rosemary). This may reflect the limited availability of locally native species, or the success achieved with these species. Where this has occurred, infill planting with locally native species should be undertaken to increase diversity and to

create areas which more accurately represent the diverse vegetation which would have occurred.

Table 9.1: Low growing rainforest species suitable for planting in areas where residential views are to be retained.

Species	Common name	Habitat*	Growth habit*
Acacia maidenii	Maiden's wattle	Grows on the margins of rainforest and in wet sclerophyll forest	Erect or spreading tree 5-20 m high
Breynia oblongifolia	Coffee Bush	in or near warmer rainforest, also in moist areas in woodland and eucalypt forest	Shrub to 3 m high
Claoxylon australe	Brittlewood	warmer rainforest	Shrub or small tree
Clerodendrum tomentosum	Hairy Clerodendrum	Grows in or on the margins of warmer rainforest	Shrub or tree, 1-10 m high
Elaeocarpus reticulatus	Blueberry Ash	Gullies, along watercourses, in tall eucalypt forest or in or near rainforest	Shrub or small tree
Elaeodendron australe var. australe		Grows in coastal and inland rainforest	Shrub or small tree to 8 m high
Guioa semiglauca	Guioa	warmer rainforest	Tree up to 6 m high
Maclura cochinchinensis	Cockspur Thorn	warmer rainforest	Woody climbers or straggling shrubs
*Myrsine howittiana***	Muttonwood	In and near rainforest	Small tree
*Myrsine variabilis***	Mock-olive	Sheltered forest and rainforest margins	Tall shrub
Notelaea venosa	Veined Mock-olive	Grows in or near rainforest	Bushy shrub or small tree to 6 m high or occasionally to 10 m
Polyscias sambucifolia	Elderberry Panax	wet or dry sclerophyll forest or on the margins of most types of rainforest	shrub or small tree to 5 m high
Sarcomelicope simplicifolia subsp. simplicifolia		Grows in and on the margins of warmer rainforest	Shrub or small tree

* Harden (1990-1993)
**Fairley and Moore (1995)

Weed control

The aim of weed removal works should be the complete removal of all exotic and non local native species from the areas of native vegetation within the reserve. However, the achievement of this aim is unlikely and impractical given the presence of exotic grasses adjacent to the areas of native vegetation, and the presence of large exotic species including *Pinus radiata* in the east of the reserve. Given this, weeding works should aim to minimise the weedy biomass within the areas supporting native vegetation, concentrating particularly on the listed noxious weeds and those species with potential to outcompete native species.

Weed removal works should be undertaken during three stages, primary, secondary and maintenance weeding.

Primary weeding is the first round of weeding which aims to remove of the majority of the weedy biomass. The first stage of primary weeding should begin with the removal of weeds with potential to form monocultures and have a large impact on native diversity, including *Lantana camara* (Lantana) and *Rubus discolour* (Blackberry), both of which are recognised as weeds of national significance. Other weeds to be targeted at this stage should include *Acetosa sagittata* (Turkey Rhubarb), *Anredera cordifolia* (Madeira Vine), *Asparagus* spp. (Asparagus Fern), *Cinnamomum camphora* (Camphor-laurel), *Ligustrum sinense* (Small-leaved Privet), *Nephrolepis cordifolia* (Fishbone Fern), *Senna pendula* var. *glabrata* and *Tradescantia albiflora*.

Plantings should be undertaken in the bare areas created during the primary weeding stage, where natural regeneration is not expected. These areas are likely to be confined to the east and west of the reserve where a native seed bank may be absent. Following primary weeding and planting in areas where natural regeneration is expected to be limited, secondary weeding and consolidation of remnant islands should be undertaken. Secondary weeding involves removing regrowth of any weeds and should be temporally separated from primary weeding by approximately six months.

Maintenance weeding will be required to ensure the long term control of weed growth following secondary weeding.

Managing existing threats

If the remnant vegetation communities are to be conserved and enhanced the processes/activities which threaten their long-term survival must be addressed. Threats which have been identified to Littoral Rainforest and SSSFTS across NSW include:

- loss of canopy integrity arising from salt and wind damage as a result of clearing or damage to stand margins;
- clearing of understorey (including for firewood collection);
- grazing and physical disturbance of understorey including by feral deer;
- inappropriate collection of a range of plant species (including, but not restricted to, epiphytes);
- fire, particularly incursions along boundaries;
- visitor disturbance including soil compaction, soil disturbance, erosion from foot, cycle, trail bike and 4 wheel drive tracks, introduction of pathogens, and disturbance from creation of new planned and unplanned tracks;
- increased visitation and resulting increased demand for and use of, visitor facilities such as walking tracks, viewing platforms, toilet blocks, picnic areas etc;
- dumping of garden waste causing weed infestation;
- car and other rubbish dumping;
- Loss of fauna due to predation by feral animals, road kill, loss of habitat and feeding resources, disturbance from human visitation (faunal elements are essential to the ecological functioning of littoral rainforest and loss, or reduction, in pollinators and seed dispersal agents will adversely affect long term vegetation health);

- fragmentation resulting in loss of connectivity and possibly reduced genetic exchange between populations; and
- For stands not protected by State Environmental Planning Policy 26, clearing and development remains a possibility.

The threats listed above are not applicable, or are not currently in operation at the Reserve, including active grazing, rubbish dumping, clearing of the understorey and the inappropriate collection of plant species. However, the possibility for these threats to occur in the future does exist, particularly the collection of plant species given the large number and range of orchids which have been recorded within the Reserve.

Within the Reserve threats including loss of canopy integrity arising from salt and wind damage as a result of clearing or damage to stand margins, visitor damage, dumping of garden waste and fragmentation are occurring or have occurred in the past. Additional threats identified by the previous management plan and identified during the site visit also included encroachment of residential gardens into the Reserve, uncontrolled spread of *Pittosporum undulatum* and increased nutrient supply and subsequent weed infestation along drainage lines.

Unauthorised Clearing of Native Vegetation

Clearing of the Littoral Rainforest within the Reserve has occurred in the past and created the islands of remnant vegetation which remain. Additionally, clearing of rainforest vegetation has occurred more recently, probably to improve or maintain water views (*Figure 9.1*). The clearing of native vegetation is known to disrupt ecological functions and lead to changes in the structure and composition of vegetation communities. Within Littoral rainforest the clearing of native vegetation produces a changed light, wind and salt regime which can lead to the establishment of more common salt tolerant species and a reduction in the integrity of the community.

Figure 9.1 Clearing of Littoral rainforest within the Reserve.

Visitor Facilities

The Reserve serves as a recreation destination for visitors with an informal track running through the length of the Reserve, offering views of Port Hacking and the Royal National Park. During site visits it was observed that this track has a high visitation rate and is popular with local residents.

The presence of the informal track fragments the bushland within the Reserve and has the potential to disturb vegetation within the Reserve through the introduction of weed seeds

and trampling of native vegetation. However, the presence of the track may attract visitors to the Reserve and may promote the natural beauty and its significance. The attraction of visitors to the Reserve provides the opportunity to develop a sense of pride and foster a sense of ownership among visitors and local residents. This may help deter activities which threaten the natural and cultural aspects of the Reserve including unauthorised clearing and dumping of garden waste.

Dumping of Garden Waste

A number of the exotic species within the Reserve appear to have escaped from adjacent gardens, including *Delairea odorata* (Cape Ivy). There appears to be two avenues by which garden plants are making their way into the Reserve, by natural dispersal and by dumping of garden waste.

Natural dispersal methods include dispersal of seed by wind, water, gravity, and fauna, and overgrowth into the Reserve. There is no way to prevent the dispersal of seed from exotic garden plants in neighbouring gardens. Instead residents should be educated on the value of the bushland within the Reserve, the harm caused by escaped garden plants and the benefits of locally native plants which they can plant in their gardens.

The dumping of garden waste has previously been identified as a management problem and may be the cause of some of the exotic species recorded within the Reserve. Dumping of garden waste can promote the growth of exotic species by spreading seeds and shoots, and increasing nutrient levels within soils which favours the growth of weeds.

Encroachment onto the Reserve

The boundaries separating residential properties to the north from the Reserve are not clear in many areas, and residents appear to be taking advantage of this confusion to extend their backyards (*Figure 9.2*). The extension of backyards reduces the areas available for the extension of natural bushland and increases the distribution of exotic species within the Reserve. The boundaries of residential properties need to be surveyed and established and any encroachments into the Reserve removed and appropriately regenerated.

Figure 9.2 Encroachment of residential gardens into the Reserve.

Pittosporum undulatum (Sweet Pittosporum) Control

Pittosporum undulatum is subcanopy to shrub species which is native in certain moist forests on fertile soils (Howell 2003). Recently this species has been recorded outside its natural range in response to the suppression of fire and increased nutrient supply from stormwater. The increased range of *Pittosporum undulatum* and the tendency of its thick foliage to suppress the growth of shrubs and herbs beneath it, has led to it being labelled an 'environmental weed' (Howell 2003). Additionally, *Pittosporum undulatum* has been linked to an increased presence of the Pied Currawong (*Strepera graculina*) (Ian McAlan, NSW Bird Atlassers, pers. comm.) which has been implicated in the decline in diversity of smaller bird species (Australian Museum 2003). Despite this, *Pittosporum undulatum* is a natural component of the vegetation within the Reserve, and is characteristic of both Littoral Rainforest and SSSFTS.

The previous management plan states that the *Pittosporum* population in the study area has been controlled by periodic culling in order to prevent it dominating the bushland within the Reserve. Some bush regenerators have been known to consider it an exotic species and sometimes remove it without adequate justification or documentation.

At the time of inspection, there was no obvious problem with *Pittosporum* densities in the study area. This may be the result of ongoing culling, and without culling in the future densities may increase and displace other native species. It is recommended that the density of *Pittosporum* be monitored and that periodic culling is only undertaken in response to increases in *Pittosporum* density. Where *Pittosporum undulatum* begins to form clumps or monocultures its density should be reduced. The target density of *Pittosporum undulatum* is as a co-dominant subcanopy species in combination with a number of other species (including *Acmena smithii*, *Allocasuarina littoralis*, *Banksia* spp. and *Cupaniopsis anacardioides*).

Stormwater Flows

Stormwater flows through the Reserve are concentrated in a few small drainage lines. The flow of nutrients into these drainage lines has favoured the growth of exotic species along drainage lines. The previous management plan recommended digging channels to direct runoff and minimise the area affected by nutrient-rich storm water flows. Digging of channels should be avoided as this has the potential to increase erosion. Other management options, including water flow or nutrient control devices, are not feasible due to the steep slopes and lack of space. The only feasible management option is to remove the weeds from these drainage lines and to densely plant these areas with suitable local native species. This should be undertaken in a staged approach focussing on one drainage line at a time with the aim to create drainage lines with an understorey containing similar species to the adjacent forest. This will help to suppress further weed germination. Ongoing monitoring of these areas will be required to eradicate any germinating weed species.

Use of Fire for Ecological Management

Due to the small size of the Reserve, and the proximity to nearby homes, the use of fire is not practical. Fire, particularly fire incursion along boundaries, is recognized as a threat to Littoral Rainforest by the NSW Scientific Committee (*Appendix B*), while frequent fires and other fuel reduction measures may pose a threat to SSSFTS. Despite the recognition of long

intervals between fires as a threat to SSSFTS and the potential for fire (involving burning of piles of dried weeds or excess plant litter), to stimulate the growth and regeneration of native species, the size of the Reserve makes this impractical.

9.6 Aboriginal Heritage

The Aboriginal sites within the Lilli Pilli Point Reserve and their legislative protection constrain further development within the Reserve that is likely to have impacts upon the remnant objects. However, protection and conservation of remnant objects provides opportunities for the preservation of important cultural resources within a wider, "layered" heritage area; for formalisation of the walking track; and for enhancement of the natural vegetation of the recreation area.

Midden Deposits

The management of Aboriginal midden deposits along the foreshore requires their protection from degradation and destruction. This constrains further development within the Reserve that is likely to impact upon the cultural resource, and to some extent it also constrains recreational use of the area (such as in Midden Zone B). The loss of groundcover in midden areas through public traffic and herbicide spraying has led to degradation of exposed midden deposits, with severe degradation and destruction sustained in some areas through the past construction of staircases accessing the foreshore from the track area. These destructive processes should be addressed because they are a primary short-term threat to midden site stability. Conservation in the Reserve should be undertaken to minimise this destruction.

The preservation of Aboriginal sites will provide an opportunity to preserve Aboriginal heritage and cultural resources within a landscape of remnant natural ecological communities, and alongside historical heritage resources. This "layering" of heritage within the Reserve will form a diverse community heritage resource. It will also provide the opportunity for the sites to contribute to possible future research into the cultural history of the area.

The popularity of the Reserve as a public place that is enjoyed by the community places constraints on the conservation of Aboriginal cultural resources. Drawing direct attention to Aboriginal sites has the potential to subject them to ongoing unsympathetic treatment. It is considered advisable to stabilise and revegetate the resource wherever possible to ensure the conservation and protective management for the Aboriginal cultural resource as well as providing an opportunity for the enhancement of natural vegetation in the area (Pearson and Sullivan 1997: 204).

Rockshelters, Grinding Grooves and Art

The primary constraint to development concerns the rockshelter located in Midden Zone B, where midden deposits occur. Midden deposits associated with the past Aboriginal use of this rockshelter, although already considerably degraded, are still considered to hold significant importance as a cultural heritage resource for the local Aboriginal community, and potential for possible future academic research.

9.6.1 Stabilisation of localised midden erosion.

Stabilisation of midden erosion in areas where current practices are causing accelerated erosion and rapid midden deterioration should be a priority. Access steps leading from the informal track to the shoreline, and the currently bare sprayline around the edge of remnant

islands of vegetation in the east and west of the Reserve are areas of concern. Herbicide spraying should be stopped in these areas. No new picnic facilities should be constructed.

Where the midden is eroding and the soil profile is relatively stable, a dense layer of locally native sedge and grass species including *Dianella* spp. and *Lomandra longifolia* (Spike Mat-rush) should be planted. These plantings should stabilise the midden profiles and in the previously sprayed areas, should prevent exotic grasses growing into the islands of native vegetation. The tubestock to be planted should be of the minimum size possible, such as Grow-Cells and other multi-cell tray types in order to minimise disturbance to the midden.

Figure 9.3 Examples of areas in which planting is recommended in order to prevent erosion and stabilise the midden

Where the sprayline around islands of remnant vegetation has caused erosion below the natural soil profile, clean fill or mulch should be introduced prior to planting. In some areas, particularly on the edge of sandstone outcrops, the midden is located within steep slopes and a relatively large volume of soil has eroded. In these areas clean fill should be introduced and a more natural/sustainable soil profile created (Areas 4 and 5 of Zone A and all of Zone B, *Section 6.2*). Stabilisation of the introduced fill may include plantings, laying geotextile or construction of a small retaining wall.

Figure 9.4 Area in Midden Zone B, where imported fill will be required to create a sustainable soil profile before planting

9.7 Historic Heritage

The historic uses of the Lilli Pilli Point Reserve are associated with recreational and boating activities along the foreshore following the resumption and gazettal of Reserve 135 (1886) and the foreshore Reserve 66504 (1900) as recreational picnic or pleasure grounds. The physical evidence of these activities occurs as the remains of boating facilities, swimming enclosures and other recreational facilities such as foreshore stairs, boatshed foundations, remnant wharves, and slipways constructed to cater to public recreational purposes along the foreshore.

These remnants provide tangible physical evidence of former recreational activities and their associated facilities and as such they should be protected as integral elements within the local foreshore landscape. Protective measures should include maintaining these archaeological relics in their ruinous state, and prohibiting use of footings to construct new facilities. Informal access to the foreshore should be discouraged as a means for protection of the historic remnants of early recreational activities.

Demolition material scattered along the foreshore and adjacent to the pathway in Reserves 66054 is associated with the construction of boating facilities; however, this material makes no contribution to an understanding of the historic development of the area. The demolition material has an adverse effect on the aesthetic values of the foreshore and on the continued safe use of the area. Within the demolition material are fragments of asbestos cement sheet (AC or 'fibro') which should be removed.

9.8 Asbestos Removal

This CMP endorses the methodology outlined in the Asbestos Management Plan (AMP) for the removal of those historic remnants, the demolition material fragments of asbestos bearing materials (Noel Arnold & Associates 2006).

The AMP identifies the presence of asbestos in demolition material within the reserve. Removal of such contaminants is in the best interests of all Reserve users in maintaining a safe, clean, and visually pleasing recreational area. One such area was located by AMBS during the site survey and is shown in *Figure 6.8* and *Figure 7.10*. This demolition dump is adjacent to the foreshore and does not support any native vegetation. The removal of the demolition dump, if undertaken effectively, would not disturb any remnant native vegetation, nearby Aboriginal midden deposits or other sites.

Asbestos removal in the Lilli Pilli Point Reserve is constrained by limited access and the fragility of Aboriginal sites along the pathway (particularly middens), precluding the use of mechanical removal. As outlined in the AMP (2006:V-VI), contaminated material is to be removed manually with a shovel or the "emu bobbing" method. Provided these methods are employed, and vehicle access into the Reserve area is not permitted, no foreseeable impacts to middens in the study area will be incurred.

10 Management Recommendations

The management of the Lilli Pilli Point Reserve study area should consider the future requirements of the stakeholders/users of the Reserve, the traditional/ historical role of the Reserve and the natural and cultural heritage values of the place. The Reserve is currently used by local residents and others for walking, jogging, fishing, picnicking and dog walking. Issues for consideration are:

- Threats to the existing endangered ecological communities;
- Ongoing degradation of midden deposits between the grassed and bush regeneration areas caused by herbicide spraying leading to erosion;
- The ongoing impact of the informal pathway use on Aboriginal middens;
- Ongoing degradation and destruction of exposed middens adjacent to stepped access points;
- Degradation of historic heritage elements; and
- The exposure of asbestos in extant demolition material.

The natural and cultural heritage values, the physical evidence of traditional and historical activities at this significant place and Council's requirements are considerations in the development of a management strategy for Lilli Pilli Point Reserve. Management strategies should aim to:

- Maintain and enhance the recreational values of the Reserve and identify any potential for future visitor facilities;
- Conserve and enhance the distribution, condition and integrity of the ecological communities within Lilli Pilli Point Reserve;
- Conserve the condition and integrity of Aboriginal places within Lilli Pilli Point Reserve; and
- Conserve and protect the physical evidence of historical recreational activities in the form of historical modifications to the Port Hacking foreshore.

Maintaining control of visitor access points and removing weed infestations will make an important contribution to ensuring the long-term survival of the endangered vegetation communities, and the Aboriginal midden deposits, within the Reserve from the existing threats (as identified in *Section 9.6*).

The existing Aboriginal places within the Reserve will require minimisation of surface exposure in midden areas, arising from loss of groundcover. Depletion of groundcover is caused by spraying herbicides, pedestrian traffic, and construction activities (e.g. access stairways). Control of erosion and measures to address any potential groundcover loss will be necessary in those areas.

The extant historic heritage (sandstone steps, remnant boatsheds and wharves) should be conserved and protected from damage caused by passing traffic. Maintaining formal access to the foreshore and discouraging informal access will make a contribution to the protection of these relics while, at the same time, ensuring that they do not pose a safety hazard to visitors. Any attempt to construct new elements along the foreshore should be discouraged. Incorporation of the historic relics into an interpretation of the Reserve would enhance public awareness and understanding of the development of the local as a popular recreational location.

The following recommendations have been developed to provide guidance for the appropriate future management of this significant place.

10.1 Management of native vegetation

The native vegetation within Lilli Pilli Point Reserve includes remnants of two vegetation communities which are considered rare and threatened within NSW. As such the management of this vegetation should be directed towards the protection and conservation of this vegetation.

Recommendation 1

Weed removal and revegetation works should be undertaken to enhance the quality and integrity of the native vegetation within the reserve and to ameliorate threatening processes through:

- *Control of noxious weed species invading remnant native vegetation including Asparagus scandens, Lantana camara, Nephrolepis cordifolia and Tradescantia albiflora. The exotic trees* Pinus radiata *should not be removed.*
- *Prevention and remediation of encroachment of garden landscaping and planting into the Reserve, including clearing of remnant native vegetation.*
- *Unauthorised tree clearance should be rewarded with the installation of signage to obscure the new view. Signage should inform the public about the Reserve and its significance, while act as visual reminder of inappropriate behaviour.*
- *stabilisation of actively eroding areas, particularly within drainage lines, the shallow soils overlying rack outcrops and exposed soils adjacent to rock outcrops and accessways.*
- *Monitoring and where appropriate, controlling the population of Pittosporum undulatum.*
- *Retain the* Pinus radiata.

Recommendation 2

Revegetation works should be undertaken in areas where islands of remnant vegetation can be consolidated and expanded into the exotic grasslands, without impacting on the recreational value of the reserve. Plantings associated with this process should reflect the natural densities and arrangements within adjacent remnant stands and should be propagated from local native species.

Recommendation 3

Prior to commencement of works within the Reserve, all personnel, volunteers and professionals, involved in any weeding, planting or remediation works, should be briefed on the natural and heritage values within the Reserve, with particular attention given to the significance of the Aboriginal midden. The briefing should include identification of measures for minimising disturbance to the middens.

Recommendation 4

No development of visitor facilities, that include excavation into middens, or would encourage increased pedestrian traffic across the middens, should be undertaken.

10.2 Pathway Construction

Reserve 66504

The nature of this portion of the Reserve lends itself to a less formal, more natural landscape design as compared with the formal landscaping already in place in the Reserve outside of the study area west of Lilli Pilli Point Road. Conservation issues affecting the foreshore Reserve

area include: the degradation of the grassed area and the consequent exposure of Aboriginal midden deposits; exposure of buried asbestos; the existence of degraded stairs; the remains of wharves and boatsheds; and the presence of Littoral Rainforest.

Reserve 135

The existing track within this section of the Reserve is well defined and in a fair condition, with the exception of the eastern-most grassed area adjacent to the rockshelter and midden. Management requirements for the walkway within the majority of Reserve 135 concern the reduction of trip hazards along the pathway; service access hatches that now project above ground level. Management of the grassed eastern-most area of Reserve 135 should address the degradation of Aboriginal midden deposits, the existence of degraded stairs and the presence of Littoral Rainforest.

Recommendation 5

The existing pathway through the Reserve should be formalised. The design and location should ensure least impact on the Aboriginal midden remains within the Reserve. A reduced form of the pathway may be included as branches to foreshore access steps without further degrading the grassed area. Construction of a porous pavement system is the preferred option for Reserve 66504 and parts of Reserve 135, incorporating introduced clean fill over the existing ground surface and allowing for subsequent growth of vegetative ground cover.

Recommendation 6

Access to the service hatches along the pathway in Reserve 135 should be a consideration in the design selection in this area. Appropriate options would be either a raised timber walkway or a fine-grain decomposed granite pathway with timber edges. Either of these would allow for access to the service hatches.

Where the pathway in Reserve 135 enters the grassed area and terrace above the rockshelter, the pathway should revert to the midden-sensitive porous pavement design recommended for Reserve 66504.

Pathway construction in all areas should be undertaken in a way that precludes heavy vehicle access throughout Reserve 66504 and in the southeastern area of Reserve 135.

Recommendation 7

Access to the foreshore should be formalised by repairing and stabilising existing well established routes. Repairs should comprise sympathetic materials in keeping with the characteristic local sandstone. Materials may include purpose cast concrete blocks reflecting the dimensions of extant sandstone blocks. Installation of a hand rail may be required in steeper sections. The planting of locally native species may assist in stabilising and formalising, the existing access routes, and halt deterioration of adjacent midden deposits.

10.3 Conservation of Aboriginal Places

The significant Aboriginal places within the Reserve include rockshelters, grinding grooves, extant art sites and middens that should be protected from harm. Protective measures should include formalisation of access to the foreshore adjacent to the rockshelter at the cove in Reserve 66504, and access across the top of the rockshelter should be avoided. The grinding grooves in this area are within the tidal zone and therefore not at direct risk from traffic associated with the pathway.

The integrity of midden deposits along the foreshore in Reserves 66504 and 135; Midden Zone A and B, should be maintained and protected from erosion and pedestrian traffic. Protective measures should include raising the level of the path in some areas, revegetation of exposed areas and, where necessary, filling of steep, exposed areas (i.e. in Midden Zone B).

Recommendation 8

Design and construction of the formalised pathway through Reserves 66054 and 135 should be informed by the requirements of the significance of the Aboriginal midden and the need for its conservation.

Recommendation 9

Exposed and/or eroding Aboriginal midden areas should be stabilised. These areas include the sprayline bordering remnant islands of vegetation at the eastern and western parts of the Reserve. Spraying of herbicide within these areas should cease.

Planting a dense layer of locally native sedge and grass species including Dianella spp. and Lomandra longifolia (Spike Mat-rush) interspersed with local native shrub species should be used to stabilise the midden, expand the distribution of native vegetation within the Reserve and prevent exotic grasses growing into the islands of native vegetation. The tubestock to be planted should be of the minimum size possible, such as Grow-Cells and other multi-cell tray types to minimise disturbance to the soil and midden.

Recommendation 10

All works that have the potential to impact Aboriginal Objects and/or Places will require a Section 90 Consent from DECC. Such impacts will include:

- *The excavation of midden deposits in the installation of piers;*
- *Reburial of exposed midden deposits in the importation fill;*
- *Revegetation works.*

Such works will also require consultation with the Aboriginal community, and a qualified Aboriginal heritage specialist, in appropriately managing the development impacts.

10.4 Historic Heritage

Within Reserves 66054 and 135 there are remnants of foreshore stairs, wharves and slipways that are the physical evidence for the recreational activities of the late nineteenth and early twentieth century. The construction of boating facilities reflects the development of maritime recreational activities along the foreshores and as such the foreshore modifications should be conserved and protected. The primary means for such protection is in the formalisation of the pathways leading the foreshore to inhibit informal access.

Recommendation 11

The remnant foreshore relics reflecting early foreshore recreational facilities and structures should be retained and protected. Damage to the modified features should be avoided and any attempts to erect structures over early footings should be discouraged as such actions are likely to cause damage to European and Aboriginal foreshore features. Formalised pathways should restrict access to specified areas only of the foreshore.

Recommendation 12

Visible demolition material, especially where asbestos is present, should be removed without heavy vehicle access through the Reserve. Where the impact of removal has been dramatic, stabilisation and remediation should include rebuilding the surface with clean fill and revegetating.

10.5 Interpretation

The Lilli Pilli Point Reserve has been identified as having natural, Aboriginal and historic cultural heritage values which should be conserved for present and future generations. Preservation of the natural, Aboriginal and historic heritage values of Reserve 66504 and Reserve 135 is an important part in the retention of the scenic values of the place of Lilli Pilli. The association and relationship with the waters of Port Hacking makes a significant contribution to an understanding of the values of this place.

Opportunities for the conservation of the heritage and natural values of the place that could be explored may include the preparation of an interpretation strategy for the Reserve. A meaningful interpretation would contribute to an understanding of its significance and the continuity of its use by Aboriginal and European communities.

Recommendation 13

Consideration should be given to developing an interpretation of the area encompassed by Reserve 66504 and Reserve 135 that is readily accessible and makes a meaningful contribution to the dissemination of the natural, Aboriginal and historic values of the Lilli Pilli Point and its relationship with Port Hacking.

11 References

AMBS 2004 *Grays Point Reserve Boardwalk Assessment of Aboriginal Heritage* report to Sutherland Shire Council.

Andrews, G., C. Daylight and J. Hunt 2006 *Aboriginal Cultural Heritage Landscape Mapping of Coastal NSW* prepared for the Comprehensive Coastal Assessment (DoP) by the Department of Natural Resources, Sydney.

Arnold, N 2006 *Asbestos Management Plan for the Lilli Pilli Point Reserve* prepared for Sutherland Shire Council.

Aston, P., J. Cornwall, A. Salt 2006 *Sutherland Shire A History* UNSW Press

Atkinson, G. 1983. Erosion damage following bushfires. *Journal of Soil Conservation NSW* 40: 4-9.

Australian Museum 2003 Fact Sheets: Pied Currawong. [Available online: http://www.amonline.net.au/factsheets/pied_currawong.htm. accessed 10 September 2007].

Bursill, L. 2004 'The Shire' in: *Placenames Australia: Newsletter of the Australian National Placenames Survey:* 10ANPS, Macquarie University Sydney.

Branagan, D.F. 1997 'Geology and Geography of the Sutherland Shire' in: *Geography and Geology, Aboriginal Archaeology* Sutherland Shire Studies No. 3: 1-8 Sutherland Shire Council.

Briggs, J.D. & Leigh, J.H. 1995 *Rare or threatened Australian Plants* Revised Edition CSIRO Publishing, Australia.

DECC (2005) Endangered Ecological Community Profile: *Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions* Department of Environment and Climate Change NSW: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10867

Department of Natural Resources, 2006 Comprehensive Coastal Assessment, Summary Report of CCA Project 26: *Aboriginal Cultural Heritage Landscape Mapping of Coastal New South Wales* NSW Government.

Fairley & Moore, 1995 *Native Plants of the Sydney District. An Identification Guide*. Kangaroo Press, Australia.

Gifford, M. 1984 *I Can Hear the Horses.* Sydney: Methuen Hayes.

Harden, G. J. 1990 – 1993 Flora of New South Wales. New South Wales University Press, Sydney.

Harden, G. J. & Murray L. J. 2000 Supplement to Flora of New South Wales. University of New South Wales Press, Sydney.

Hazelton, P.A. and P.J. Tille 1990 *Soil Landscapes of the Wollongong-Port Hacking 1:100 000 Sheet.* Sydney: Soil Conservation Service of NSW.

Howell, J. 2003 *Pittosporum undulatum* as a case study for native species that change range – how to avoid inappropriate responses? *Cunninghamia* 8(1): 153-155.

Hunt, G. 1997 *A Brief History of the Creation of the Lilli Pilli Point Foreshore Reserves* Plan of Management for Lilli Pilli Point Reserve, Lilli Pilli: Appendix 3.

Hutton Neve M. 2000 *A Brief History of Sutherland Shire* Sutherland Shire Studies No. 1. Sutherland Shire Council.

Kohen J. 1999 *Aboriginal Environmental Impacts* UNSW Press Sydney

McCarthy, F.D. 1948 'The Lapstone Creek excavation: two culture periods revealed in eastern New South Wales' *Records of the Australian Museum* 26: 197-246.

McCarthy, F.D. 1964 'The archaeology of the Capertee Valley' *Records of the Australian Museum* 26: 197-246.

Megaw J.V.S. 1997 'Aboriginal Archaeology of the Sutherland Shire' in: *Geography and Geology, Aboriginal Archaeology* Sutherland Shire Studies No. 3 Sutherland Shire Council. 9-12.

Meehan, B. 1982 *Shell Bed to Shell Midden.* Australian Institute of Aboriginal Studies Canberra

Megaw, J.V.S. (ed.) 1974 *The Recent Archaeology of the Sydney District. Excavations 1964-1967* Australian Institute of Aboriginal Studies Canberra

Megaw, J.V.S. 1968a 'A dated culture sequence for the south Sydney region of New South Wales' *Current Anthropology* 9(4): 325-9.

Megaw, J.V.S. 1968b 'Trial excavations in Captain Cook's Landing Place Reserve, Kurnell, New South Wales' *Australian Institute of Aboriginal Studies Newsletter* 2 (9):17-20.

Megaw, J.V.S. and A. Roberts 1974 'The 1967 excavations at Wattamolla Cove, Royal National Park, New South Wales' in J.V.S. Megaw (ed). *The Recent Archaeology of the Sydney District. Excavations 1964-1967* Australian Institute of Aboriginal Studies, 1-12 Canberra

Mulvaney, D.J. 1969 *The Prehistory of Australia* Penguin London

Mulvaney, J. And J. Kamminga 1999 *Prehistory of Australia* Allen and Unwin Sydney.

Noel Arnold & Associates Pty Ltd 2006 *Asbestos Management Plan: Lilli Pilli Point Reserve, NSW* report to Sutherland Shire Council.

NPWS 1997 'Guidelines for Archaeological Survey Reporting' in *Aboriginal Cultural Heritage Standards and Guidelines Kit* NSW National Parks and Wildlife Service, Hurstville.

NSW Scientific Committee 2000 *Menippus fugitivus* (a beetle) population, Sutherland Shire - endangered population listing. NSW Scientific Committee, Hurstville: http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Menippus+fugitivus+a+beetle+population+Sutherland+Shire+endangered+population+listing (updated 16 December 2004).

Paul Davies Architects & Heritage Consultants 1998 *Sutherland Shire Foreshore Study.* Report to the Foreshore Heritage Study Steering Committee, Sutherland Shire Council.

Pearson, M. and S Sullivan 1995 *Looking after Heritage Places: The Basics of Heritage Planning for Managers, Landowners and Administrators*. Melbourne University Press.

Perumal Murphy Wu Pty Limited 1993 *Sutherland Shire Heritage Study* prepared for Sutherland Shire Council

Pollon, F 1988 *The Book of Sydney Suburbs.* Sydney. Harper Collins.

Sullivan, S. and S Bowdler 1984 *Site Survey and Significance Assessment in Australian Archaeology.* Research School of Pacific Studies ANU Canberra.

Sutherland Shire Council (SSC) 1997. *Plan of Management for Lilli Pilli Point Reserve, Lilli Pilli*. Unpublished report for Sutherland Shire Council (March 1997).

Sutherland Shire Council Indigenous Species (SSC) 2006 Internal Report, Sutherland Shire Council.

Sutherland Shire Libraries, 2007 Online Local Studies Collection, Historical Photographs. Accessed 13/11/2007. http://www.sutherlandlibrary.com/picturesutherland/Results.asp?search=aboriginal

Wesson, S. 2005a. *Murni Dhungang Jirrar: Living in the Illawarra.* Sydney: Department of Environment and Conservation.

Wesson, S. 2005b *A History of Aboriginal People of the Illawarra 1770 to 1970.* Sydney: Department of Environment and Conservation.

Walker, R.C. 1868 *Sutherland Estate Report*. Unpublished manuscript, Sutherland Shire Libraries 994.41SUT.

Appendix A. Flora recorded within Lilli Pilli Point Reserve

NB: - * before the botanical name indicates an exotic species;
- # before the botanical name indicates a non-local native.

Family		Botanical name	Common Name	AMBS	SSC 1997
Acanthaceae		*Avicennia marina* subsp. *australasica*	Grey Mangrove	X	X
Adiantaceae		*Adiantum aethiopicum*	Common Maidenhair Fern	X	X
		Adiantum hispidulum	Rough Maidenhair Fern	X	
Aizoaceae		*Tetragonia tetragonioides*	New Zealand Spinach,	X	X
Alliaceae	*	*Nothoscordum borbonicum*	Onion Weed	X	
Anacardiaceae	*	*Toxicodendron succedaneum*	Rhus Tree, Wax Tree		X
Anthericaceae		*Caesia parviflora*	Pale Grass Lily		X
		Thysanotus tuberosus	Common Fringe Lily,		X
Apiaceae		*Actinotus helianthi*	Flannel Flower		X
		Platysace lanceolata	Lance-leaf Platysace		X
		Platysace linearifolia			X
		Xanthosia pilosa		X	X
Apocynaceae		*Marsdenia rostrata*	Common Milkvine		X
		Marsdenia suaveolens	Scented Milkvine	X	X
		Parsonsia straminea	Common Silkpod,	X	X
Araliaceae		*Polyscias elegans*	Celery Wood	X	X
		Polyscias sambucifolia	Elderberry Panax	X	X
		Livistona australis	Cabbage Palm,	X	X
Arecaceae	*	*Phoenix canariensis*	Canary Island Date		X
Asparagaceae	*	*Asparagus aethiopicus*	Asparagus Fern	X	
	*	*Asparagus plumosus*	Climbing Asparagus Fern		X
	*	*Asparagus scandens*	Asparagus fern	X	
	*	*Asparagus sp.*			X
Aspleniaceae		*Asplenium flabellifolium*	Necklace Spleenwort,		X
Asteraceae		*Brachyscome angustifolia* var. *angustifolia*		X	X
		Helichrysum rutidolepis	Everlasting		X
		Senecio linearifolius	Fireweed Groundsel	X	X
	*	*Bidens pilosa*	Farmer's Friend, Cobblers Pegs	X	X
	*	*Conyza sp.*		X	X
	*	*Delairea odorata*	Cape Ivy		X
	*	*Sonchus oleraceus*	Common Sow-thistle,	X	
Basellaceae	*	*Anredera cordifolia*	Madeira Vine	X	X

Family		Botanical name	Common Name	AMBS	SSC 1997
Bignoniaceae		*Pandorea pandorana*	Wonga Vine	X	X
Blechnaceae		*Blechnum cartilagineum*	Gristle Fern	X	X
		Doodia aspera	Prickly Rasp Fern	X	
Caprifoliaceae	*	*Lonicera japonica*	Japanese Honeysuckle		X
Casuarinaceae		*Allocasuarina littoralis*	Black She-Oak	X	X
		Casuarina glauca	Swamp Oak,	X	X
Celastraceae		*Elaeodendron australe* var. *australe*	Red Olive Plum	X	X
Chenopodiaceae		*Sarcocornia quinqueflora*	Glasswort, Samphire	X	X
Commelinaceae		*Commelina cyanea*	Blue Spiderwort	X	X
	*	*Tradescantia albiflora*	Wandering Jew	X	X
Convolvulaceae	*	*Ipomoea indica*	Blue Morning Glory	X	X
Cunoniaceae		*Ceratopetalum gummiferum*	NSW Christmas Bush	X	X
Cyatheaceae	*	*Cyathea cooperi*	Straw Tree-fern	X	
Cyperaceae		*Cyperus laevigatus*		X	X
		Ficinia nodosa	Knobby Club-rush	X	
		Gahnia clarkei	Saw-sedge	X	X
		Lepidosperma laterale	Variable Sword-sedge		X
Davalliaceae	*	*Nephrolepis cordifolia*	Fishbone Fern	X	X
Dennstaedtiaceae		*Pteridium esculentum*	Bracken	X	X
Dicksoniaceae		*Calochlaena dubia*	Rainbow Fern, False Bracken	X	X
Dilleniaceae		*Hibbertia dentata*	Guinea-flower	X	X
		Hibbertia scandens	Twining Guinea-flower	X	X
Elaeocarpaceae		*Elaeocarpus reticulatus*	Blueberry Ash	X	X
Ericaceae - Styphelioideae		*Epacris longiflora*	Fuchsia Heath	X	X
		Leucopogon ericoides	Beard-heath	X	X
Euphorbiaceae		*Breynia oblongifolia*	Coffee Bush	X	X
		Claoxylon australe	Brittlewood	X	
		Glochidion ferdinandi	Cheese Tree	X	X
		Phyllanthus hirtellus	Thyme Spurge		X
		Poranthera microphylla	Small Poranthera		X
		Ricinocarpos pinifolius	Wedding Bush		X
Fabaceae - caesalpinioideae	*	*Senna pendula* var. *glabrata*		X	X
Fabaceae - faboideae		*Glycine clandestina*	Twining Glycine		X
		Glycine tabacina		X	
		Hardenbergia violacea	False Sarsaparilla	X	X
		Kennedia rubicunda	Dusky Coral-pea	X	X
		Platylobium formosum	Handsome Flat-pea		X
		Pultenaea daphnoides	Large-leaf Bush-pea	X	X
	*	*Erythrina x sykesii*	Coral Tree	X	X

Family		Botanical name	Common Name	AMBS	SSC 1997
	*	*Vicia tetrasperma*	Slender Vetch	X	
Fabaceae - mimosoideae		*Acacia implexa*	Hickory Wattle	X	X
		Acacia linifolia	Flax-leaved Wattle		X
		Acacia longifolia subsp. *longifolia*	Sydney Golden Wattle, Sallow Wattle	X	X
		Acacia maidenii	Maiden's wattle	X	X
		Acacia myrtifolia	Red Stemmed Wattle	X	X
		Acacia suaveolens	Sweet Wattle		X
		Acacia terminalis subsp. *aurea*	Sunshine Wattle	X	X
		Acacia ulicifolia	Prickly Moses	X	X
Geraniaceae		*Geranium homeanum*	Native Geranium	X	X
Goodeniaceae		*Goodenia ovata*			X
Haloragaceae		*Gonocarpus teucrioides*			X
Iridaceae		*Patersonia glabrata*	Native Iris		X
	*	*Crocosmia x crocosmiiflora*	Montbretia		X
Lamiaceae		*Clerodendrum tomentosum*	Hairy Clerodendrum		X
		Plectranthus parviflorus		X	X
		Westringia fruticosa	Coast Rosemary,	X	X
Lauraceae		*Cassytha glabella*	Devil's Twine	X	X
		Cassytha pubescens	Devil's Twine	X	X
	*	*Cinnamomum camphora*	Camphor-laurel	X	
Liliaceae	*	*Lilium formosanum*			X
Lindsaeaceae		*Lindsaea linearis*	Screw Fern	X	X
		Lindsaea microphylla	Lacy Wedge-fern		X
Lobeliaceae		*Lobelia alata*	Angled Lobelia		X
		Lobelia gracilis	Trailing Lobelia		X
		Pratia purpurascens	Whiteroot	X	X
Lomandraceae		*Lomandra brevis*	Tufted Mat-rush		X
		Lomandra cylindrica	Needle Mat-rush		X
		Lomandra gracilis			X
		Lomandra longifolia	Spike Mat-rush	X	X
		Lomandra obliqua			X
Luzuriagaceae		*Eustrephus latifolius*	Wombat Berry	X	X
		Geitonoplesium cymosum	Scrambling Lily	X	X
Malaceae	*	*Cotoneaster sp.*			X
	*	*Eriobotrya japonica*	Loquat		X
	*	*Pyracantha sp.*	Firethorn		X
Menispermaceae		*Legnephora moorei*	Roundleaf Vine	X	X
		Sarcopetalum harveyanum	Pearl Vine	X	X
Moraceae		*Ficus rubiginosa*	Port Jackson Fig, Rusty Fig	X	X

Family		Botanical name	Common Name	AMBS	SSC 1997
		Maclura cochinchinensis	Cockspur Thorn	X	X
	*	*Morus alba*	Mulberry		X
Myrsinaceae		*Myrsine howittiana*	Brush Muttonwood		X
		Myrsine variabilis	Muttonwood		X
	*	*Anagallis arvensis*	Pimpernel	X	
Myrtaceae		*Acmena smithii*	Lilly-pilly	X	X
		Angophora costata	Sydney Red Gum	X	X
		Callistemon citrinus	Scarlet Bottlebrush	X	X
		Corymbia gummifera	Red Bloodwood	X	X
		Eucalyptus botryoides	Bangalay	X	X
		Eucalyptus piperita	Sydney Peppermint		X
		Eucalyptus robusta	Swamp Mahogany	X	X
		Eucalyptus saligna	Sydney Blue Gum		X
		Eucalyptus sieberi	Silvertop Ash	X	X
		Eucalyptus tereticornis	Forest Red Gum	X	X
		Kunzea ambigua	Tick-bush	X	X
		Leptospermum laevigatum	Coast Tea-tree	X	X
		Leptospermum trinervium	Paperbark Tea-tree	X	X
		Melaleuca quinquenervia	Broadleaved Paperbark	X	
		Melaleuca styphelioides	Prickly Paperbark	X	X
		Syncarpia glomulifera	Turpentine	X	
	#	*Melaleuca armillaris*	Bracelet Honey-myrtle	X	X
Nyctaginaceae	*	*Mirabilis jalapa*	Marvel of Peru		X
Oleaceae		*Notelaea longifolia*	Mock-olive	X	X
		Notelaea venosa	Veined Mock-olive	X	X
	*	*Ligustrum sinense*	Small-Leaved Privet	X	X
Orchidaceae		*Acianthus exsertus*	Mosquito Orchid	X	X
		Acianthus fornicatus	Gnat Orchid	X	X
		Calochilus paludosus	Red Beard-orchid		X
		cestichis reflexa		X	X
		Cryptostylis erecta	Tartan Tongue Orchid		X
		Dendrobium linguiforme	Tongue Orchid	X	X
		Dipodium variegatum	Hyacinth Orchid		X
		Pterostylis concinna	Trim Greenhood		X
		Pterostylis curta	Blunt Greenhood		X
		Pterostylis erecta			X
		Pterostylis grandiflora	Superb Greenhood		X
		Pterostylis longifolia	Greenhood Orchid		X
		Pterostylis nutans	Nodding Greenhood	X	X
		Pterostylis pedunculata		X	X
		Thelymitra pauciflora	Slender Sun Orchid		X

Family		Botanical name	Common Name	AMBS	SSC 1997
Oxalidaceae		*Oxalis sp.*			X
Phormiaceae		*Dianella caerulea* var. *producta*		X	X
		Dianella revoluta	Blue Flax-lily		X
Pinaceae	*	*Pinus radiata*	Radiata Pine	X	
Pittosporaceae		*Billardiera scandens*	Appleberry, Dumplings, Snotberry		X
		Pittosporum revolutum	Yellow Pittosporum	X	X
		Pittosporum undulatum	Pittosporum	X	X
Plantaginaceae	*	*Plantago lanceolata*	Plantain, Ribwort	X	
Poaceae		*Aristida vagans*	Threeawn Speargrass		X
		Austrodanthonia tenuior	Wallaby Grass		X
		Digitaria didactyla	Queensland Blue Couch		X
		Echinopogon caespitosus	Tufted Hedgehog Grass		X
		Entolasia marginata	Bordered Panic		X
		Eragrostis brownii	Brown's Lovegrass		X
		Imperata cylindrica	Blady Grass		X
		Microlaena stipoides	Meadow Rice-grass, Weeping Grass	X	X
		Oplismenus aemulus	Broad-leaved Basket Grass	X	X
		Paspalidium distans			X
		Poa affinis			X
		Themeda australis	Kangaroo Grass	X	X
	*	*Axonopus fissifolius*	Narrow-leafed Carpet Grass	X	X
	*	*Digitaria sanguinalis*	A Summer Grass		X
	*	*Ehrharta erecta*	Panic Veldgrass	X	
	*	*Pennisetum clandestinum*	Kikuyu	X	X
	*	*Sporobolus africanus*	Parramatta Grass		X
	*	*Stenotaphrum secundatum*	Buffalo Grass	X	X
Podocarpaceae		*Podocarpus spinulosus*		X	X
Polygalaceae		*Comesperma volubile*	Twining Milkwort,		X
Polygonaceae	*	*Acetosa sagittata*	Rambling Dock, Turkey Rhubarb	X	
Polypodiaceae		*Platycerium bifurcatum*	Elkhorn Fern		X
		Pyrrosia rupestris	Rock Felt Fern	X	X
Proteaceae		*Banksia integrifolia*	Coast Banksia	X	X
		Banksia serrata	Saw Banksia, Old Man Banksia		X
		Banksia spinulosa	Hairpin Banksia		X
		Grevillea mucronulata			X
		Grevillea sericea	Pink Spider Flower	X	X
		Lomatia silaifolia	Native Parsley, Crinklebush	X	X

Family		Botanical name	Common Name	AMBS	SSC 1997
		Persoonia laurina subsp. *laurina*	Laurel Geebung		X
		Persoonia levis	Broad-leaved Geebung		X
		Persoonia linearis	Narrow-leaf Geebung	X	X
Psilotaceae		*Psilotum nudum*	Skeleton Fork-fern	X	
Ranunculaceae		*Clematis glycinoides*	Headache Vine, Old Man's Beard	X	
Rosaceae	*	*Rubus sp.*	Blackberry		X
Rubiaceae		*Morinda jasminoides*	Morinda		X
		Opercularia aspera	Common Stinkweed	X	
		Pomax umbellata	Pomax		X
Rutaceae		*Sarcomelicope simplicifolia* subsp. *simplicifolia*		X	X
		Zieria pilosa		X	X
Santalaceae		*Exocarpos cupressiformis*	Cherry Ballart, Native Cherry		X
Sapindaceae		*Cupaniopsis anacardioides*	Tuckeroo	X	X
		Dodonaea triquetra	Hopbush	X	X
		Guioa semiglauca	Guioa	X	X
Scrophulariaceae		*Veronica plebeia*	Creeping Speedwell	X	
Smilacaceae		*Smilax glyciphylla*	Sweet Sarsaparilla	X	X
Solanaceae	*	*Solanum nigrum*	Blackberry Nightshade	X	
Stylidiaceae		*Stylidium graminifolium*	Grass-leaf Triggerplant		X
Thymelaeaceae		*Pimelea linifolia*	Rice Flower	X	X
Tropaeolaceae	*	*Tropaeolum majus*	Nasturtium		X
Ulmaceae		*Celtis paniculata*	Native Celtis	X	X
Verbenaceae	*	*Lantana camara*	Lantana	X	X
Vitaceae		*Cayratia clematidea*	Slender Grape	X	X
		Cissus antarctica	Kangaroo Vine	X	X
		Cissus hypoglauca	Native Grape, Water Vine	X	X
Xanthorrhoeaceae		*Xanthorrhoea arborea*	Forest Grass-tree	X	X
		Xanthorrhoea media	Grass Tree		X
Zingiberaceae	*	*Hedychium gardnerianum*	Yellow Ginger, Ginger Lily		X

Appendix B. Littoral Rainforest

Littoral rainforest in the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing

NSW Scientific Committee – final determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act, and as a consequence, to omit reference to the Sutherland Shire Littoral Rainforest from Part 3 of Schedule 1 (Endangered Ecological Community) of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.
The Scientific Committee has found that:

1. Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions is generally a closed forest, the structure and composition of which is strongly influenced by proximity to the ocean. The plant species in this ecological community are predominantly rainforest species with evergreen mesic or coriaceous leaves. Several species have compound leaves, and vines may be a major component of the canopy. These features differentiate littoral rainforest from sclerophyll forest or scrub, but while the canopy is dominated by rainforest species, scattered emergent individuals of sclerophyll species, such as *Angophora costata*, *Banksia integrifolia, Eucalyptus botryoides* and *E. tereticornis* occur in many stands. Littoral Rainforest in NSW is found at locations along the entire NSW Coast in the NSW North Coast Bioregion, Sydney Basin Bioregion and South East Corner Bioregion. The areas mapped for inclusion in State Environmental Planning Policy 26 Littoral Rainforest are examples of the Littoral Rainforest ecological communities, but the mapping for SEPP 26 is not exhaustive and stands of the Littoral Rainforest ecological community occur at locations not mapped under SEPP 26. Some stands may be regrowth or in the process of regenerating. The Sutherland Shire Littoral Rainforest Endangered Ecological Community which was previously listed as an endangered ecological community is included within this Community.

2. Littoral rainforest occurs on both sand dunes and on soils derived from underlying rocks (McKinley *et al*. 1999). Stands on headlands exposed to strong wind action may take the form of dense windpruned thickets (for example the Bunga Head Rainforest illustrated by Keith & Bedward 1999, or MU5 Littoral Windshear Thicket in NPWS 2002). In more sheltered sites, and in hind dunes, the community is generally taller, although still with wind pruning on the windward side of stands. Floristically there is a high degree of similarity between stands on different substrates. Most stands of Littoral Rainforest occur within 2 km of the sea, but may occasionally be found further inland, but within reach of maritime influence.

3. Littoral Rainforest comprises the *Cupaniopsis anacardioides – Acmena* spp. alliance of Floyd (1990). This alliance as described by Floyd includes five sub-alliances – *Syzygium leuhmannii – Acmena hemilampra, Cupaniopsis anacardioides, Lophostemon confertus, Drypetes – Sarcomelicope – Cassine – Podocarpus* and *Acmena smithii – Ficus - Livistona – Podocarpus.* The distribution of some of these sub-alliances is geographically restricted – the *Syzygium luehmannii – Acmena hemilampra* sub-alliance is restricted to the north coast, while the most widespread sub-alliance *Acmena smithii – Ficus – Livistona – Podocarpus* is the only one present on the coast south of Sydney. The *Lophostemon confertus* suballiance, synonymous with Forest Type 25 Headland

Brush Box (Forestry Commission of NSW 1989) is restricted to exposed headlands in the North Coast Bioregion. There is considerable floristic variation between stands and in particular areas localised variants may be recognised (for example on the south coast a number of variants within the *Acmena smithii – Ficus – Livistona – Podocarpus* sub-alliance have been described, see Mills 1996, Mills & Jakeman 1995; Keith & Bedward 1999, NCC 1999, NPWS 2002). Small, depauperate stands may be difficult to assign to sub alliances. A number of species characteristic of Littoral Rainforest in NSW reach their southern limits at various places along the coast (for example *Cupaniopsis anacardioides* reaches its southern limit between Sydney and the Illawarra) but a number of temperate species are restricted to the south coast, and the total Littoral Rainforest flora declines from north to south. Characteristic species of littoral rainforest include:

	Acacia binervata		*Acmena hemilampra*
	Acmena smithii	+	*Acronychia imperforata*
	Acronychia oblongifolia	+	*Alpinia caerulea*
	Alectryon coriaceus		*Alyxia ruscifolia*
+	*Aphananthe philippinensis*	+	*Archontophoenix cunninghamiana*
	Arthropteris tenella	+	*Arytera divaricata*
	Asplenium australasicum	+	*Baloghia marmorata*
	Banksia integrifolia subsp. *integrifolia*	+	*Beilschmiedia obtusifolia*
	Breynia oblongifolia	+	*Bridelia exaltata*
+	*Calamus muelleri*		*Canthium coprosmoides*
+	*Capparis arborea*		*Cayratia clematidea*
	Celtis paniculata		*Cissus antarctica*
	Cissus hypoglauca		*Cissus sterculiifolia*
	Claoxylon australe	+	*Cordyline congesta*
+	*Cordyline stricta*		*Cryptocarya glaucescens*
	Cryptocarya microneura	+	*Cryptocarya triplinervis*
	Cupaniopsis anacardioides		*Cynanchum elegans*
	Dendrocnide excelsa	+	*Dendrocnide photinophylla*
	Dioscorea transversa		*Diospyros australis*
	Diospyros pentamera		*Doodia aspera*
	Duboisia myoporoides	+	*Dysoxylum fraserianum*
	Ehretia acuminata	+	*Elaeocarpus obovatus*
+	*Elattostachys nervosa*		*Endiandra discolor*
	Endiandra sieberi		*Eucalyptus botryoides*
	Eucalyptus tereticornis		*Eupomatia laurina*

	Eustrephus latifolius		*Ficus coronata*
	Ficus obliqua		*Ficus rubiginosa*
+	*Ficus watkinsiana*		*Flagellaria indica*
	Geitonoplesium cymosum		*Glochidion ferdinandi*
	Glycine clandestina	+	*Gossia bidwillii*
	Guioa semiglauca	+	*Ixora beckleri*
+	*Jagera pseudorhus*	+	*Lepidozamia peroffskyana*
	Litsea reticulata		*Livistona australis*
	Lomandra longifolia	+	*Lophostemon confertus*
	Maclura cochinchinensis	+	*Mallotus philippensis*
	Melaleuca quinquenervia		*Melicope micrococca*
+	*Melicope vitiflora*	+	*Mischocarpus pyriformis*
+	*Monococcus echinophorus*	+	*Morinda jasminoides*
+	*Mucuna gigantea*		*Myoporum acuminatum*
	Notelaea longifolia	+	*Olea paniculata*
	Oplismenus imbecillis	+	*Pandanus pedunculatus*
	Pandorea pandorana		*Pararchidendron pruinosum* var. *pruinosum*
	Parsonsia straminea	+	*Pentaceras australis*
	Piper novae-hollandiae	+	*Pisonia umbellifera*
	Pittosporum multiflorum		*Pittosporum undulatum*
	Platycerium bifurcatum		*Podocarpus elatus*
	Pollia crispata		*Polyscias elegans*
	Pouteria australis		*Pouteria cotinifolia* var. *cotinifolia*
+	*Pouteria myrsinoides*		*Rapanea variabilis*
	Rhodamnia rubescens	+	*Rhodomyrtus psidioides*
	Ripogonum album		*Ripogonum discolor*
	Sarcomelicope simplicifolia		*Scolopia braunii*
	Smilax australis		*Smilax glyciphylla*
+	*Sophora tomentosa* subsp. *australis*		*Stephania japonica* var. *discolor*
	Synoum glandulosum		*Syzygium australe*
+	*Syzygium luehmannii*		*Syzygium oleosum*

Syzygium paniculatum	+	*Tetrastigma nitens*
Trophis scandens subsp. *scandens*		*Viola banksii*
Wilkiea huegeliana		

Those species marked '+' are found in littoral rainforest north of Sydney, with some restricted to the north coast or in only a few sites south of the North Coast Bioregion. The other species are geographically more widespread.
Given the small size of many stands and the history of fragmentation, the number of characteristic species in any stand is likely to be smaller than this list. In addition, the total richness of stands declines with increasing latitude and a number of the species listed above are absent or rare in the south.

4. The total species list of the community is considerably larger than that given above, with many species present in only one or two sites or in low abundance. The species composition of a site will be influenced by the size of the site, recent rainfall or drought condition and by its disturbance (including fire) history. The list of species given above is of vascular plant species, the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. These components of the community are poorly documented but the assemblage in individual stands will depend on geographic location, size of stand, degree of exposure, history of disturbance and, if previously disturbed, stage of regeneration.

5.Threatened species and populations for which Littoral Rainforest is known or likely habitat include:

Acronychia littoralis	*Cryptocarya foetida*
Archidendron hendersonii	*Macadamia tetraphylla*
Cynanchum elegans	*Hicksbeachia pinnatifolia*
Fontainea oraria	*Syzygium moorei*
Senna acclinis	*Xylosma terrae-reginae*
Syzygium paniculatum	

Amaurornis olivaceus	Bush-hen
Coracina lineata	Barred Cuckoo-shrike
Lichenostomus faciogularis	Mangrove Honeyeater
Monarchia leucotis	White-eared Monarch
Ninox strenua	Powerful Owl
Pandion haliaetus	Osprey
Ptilinopus magnificus	Wompoo Fruit-dove
Ptilinopus regina	Rose-crowned Fruit-dove
Ptilinopus superbus	Superb Fruit-dove

Tyto tenebricosa	Sooty Owl
Dasyurus maculatus	Spotted-tailed Quoll
Kerivoula papuensis	Golden-tipped Bat
Mormopterus beccarii	Beccari's Freetail-bat
Mormopterus norfolkensis	Eastern Freetail-bat
Myotis adversus	Large-footed Myotis
Nyctimene robinsoni	Eastern Tube-nosed Bat
Potorous tridactylus	Long-nosed Potoroo
Pteropus alecto	Black Flying Fox
Pteropus poliocephalus	Grey-headed Flying Fox
Syconycteris australis	Eastern Blossom Bat
Thylogale stigmarica	Red-legged Pademelon
Coeranoscincus reticulatus	Three-toed Snake-tooth Skink
Hoplocephalus bitorquatus	Pale-headed Snake
Thersites mitchellae	Mitchell's Rainforest Snail

Emu, *Dromaius novaehollandiae*, population in the NSW North Coast Bioregion and Port Stephens Local Government Area

Menippus fugitivus (Lea), a beetle population in the Sutherland Shire

Most of the species included in this list are found at only some sites, or vary in occurrence and abundance. As such they are not regarded as part of the characterisation of the community. Nevertheless, they are of conservation significance and need to be considered in recovery planning.

6. Littoral Rainforest occurs in numerous, small stands and in total comprises less than 1% of the total area of rainforest in NSW. The largest known stand occurs in Iluka Nature Reserve, which is approximately 136 ha. Many, but not all, stands of Littoral Rainforest have been included in mapping for State Environmental Planning Policy 26 Littoral Rainforest, but degradation of the ecological community is still occurring.

7. Weed species that threaten the integrity of particular stands include *Ambrosia artemisifolia*, *Anredera cordifolia, Arecastrum romanzoffianum, Asparagus* spp*., Cardiospermum grandiflorum, Chrysanthemoides monilifera, Coprosma repens, Ehrharta* spp., *Gloriosa superba, Ipomoea* spp; *Impatiens walleriana, Lantana camara, Macfadyena unguis-cati, Rivina humilis, Pennisetum clandestinim, Schefflera actinophylla, Senna septemtrionalis, Solanum mauritianum Thunbergia alata* and *Tradescantia fluminensis.*

8. Other threats include loss of canopy integrity arising from salt and wind damage as a result of

clearing or damage to stand margins; clearing of understorey (including for firewood collection); grazing and physical disturbance of understorey including by feral deer; inappropriate collection of a range of plant species (including, but not restricted to, epiphytes); fire, particularly fire incursion along boundaries: visitor disturbance including soil compaction, soil disturbance, erosion from foot, cycle, trail bike and 4 wheel drive tracks, introduction of pathogens, and disturbance from creation of new planned and unplanned tracks; increased visitation and resulting increased demand for and use of, visitor facilities such as walking tracks, viewing platforms, toilet blocks, picnic areas etc; dumping of garden waste causing weed infestation; car and other rubbish dumping. Loss of fauna due to predation by feral animals, road kill, loss of habitat and feeding resources, disturbance from human visitation (faunal elements are essential to the ecological functioning of littoral rainforest and loss, or reduction, in pollinators and seed dispersal agents will adversely affect long term vegetation health); fragmentation resulting in loss of connectivity and possibly reduced genetic exchange between populations. For stands not protected by State Environmental Planning Policy 26, clearing and development remains a possibility. (Adam 1987, 1992; Floyd 1990; Mills 1996).

9. In view of the above the Scientific Committee is of the opinion that Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

Associate Professor Paul Adam
Chairperson
Scientific Committee

Proposed Gazettal date: 04/06/04
Exhibition period: 04/06/04 – 16/07/04

References:

Adam P (1987) *New South Wales rainforests. The nomination for the World Heritage List*. NPWS, Sydney.

Adam P (1992) *Australian rainforests* Oxford University Press, Oxford.

Floyd AG (1990) Australian rainforests in New South Wales. Surrey Beatty and Sons, Sydney.

Forestry Commission of New South Wales (1989) Research Note No 17. Forest types in New South Wales FCNSW, Sydney.

Keith DA and Bedward M (1999) Native vegetation of the South East Forests region, Eden, New South Wales. *Cunninghamia* **6** (1), 1-218.

McKinley A, Milledge D, Nicholson H, Nicholson N and Stewart B (1999) Identification of littoral rainforest on krasnozem soils between the Queensland – New South Wales border and the Richmond River. Report for the National Parks and Wildlife Service.

Mills K (1996) Littoral Rainforests in Southern NSW: inventory, characteristics and management. Revised version of 1988 Illawarra Vegetation Studies, Paper 1.

Mills K and Jakeman J (1995) Rainforests of the Illawarra District. Coachwood Publishing, Jamberoo.

NCC (1999) Towards an Illawarra Regional Vegetation Management Plan. Vols. 1 & 2. Nature Conservation Council, Sydney.

NPWS (2002) Native Vegetation of the Wollongong Escarpment and Coastal Plain. Draft unpublished report for the Bioregional Assessment Study of the Wollongong LGA. NSW National Parks and Wildlife Service, Hurstville.

Appendix C. Southern Sydney sheltered forest

Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion - endangered ecological community NSW Scientific Committee - final determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list the Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion is the name given to the ecological community characterised by the species assemblage listed in paragraph 2. The community typically has an open forest structure, although disturbance may result in local manifestations as woodland or scrub. The community is typically associated with sheltered heads and upper slopes of gullies on transitional zones where sandstone outcrops may exist, but where soils are influenced by lateral movement of moisture, nutrients and sediment from more fertile substrates, such as shale/ironstone caps or dolerite dykes, in adjacent areas.

2. Southern Sydney sheltered forest on transitional sandstone soils is characterised by the following assemblage of species:

Acacia binervata
Acacia suaveolens
Acacia ulicifolia
Angophora costata
Banksia ericifolia subsp. *ericifolia*
Banksia serrata
Billardiera scandens
Cassytha pubescens
Corymbia gummifera
Dianella caerulea
Doryanthes excelsa
Entolasia stricta
Eucalyptus pilularis
Gahnia sieberiana
Gonocarpus teucrioides
Hakea sericea
Hibbertia aspera subsp. *aspera*
Kunzea ambigua
Leptomeria acida
Lepyrodia scariosa
Lindsaea linearis
Lomandra obliqua
Opercularia aspera
Acacia linifolia
Acacia terminalis
Allocasuarina littoralis
Aotus ericoides
Banksia oblongifolia
Banksia spinulosa var. *spinulosa*
Calochlaena dubia
Ceratopetalum gummiferum
Dampiera stricta
Dodonaea triquetra
Elaeocarpus reticulatus
Epacris longiflora
Eucalyptus piperita
Gleichenia dicarpa
Grevillea oleoides
Hardenbergia violacea
Imperata cylindrica var. *major*
Lepidosperma laterale
Leptospermum polygalifolium
Leucopogon lanceolatus var. *lanceolatus*
Lomandra longifolia
Lomatia silaifolia
Persoonia levis

Persoonia linearis
Persoonia pinifolia
Pittosporum undulatum
Platylobium formosum
Platysace linearifolia
Pteridium esculentum
Pultenaea daphnoides
Selaginella uliginosa
Smilax glyciphylla
Xanthorrhoea arborea
Xanthosia pilosa

3. The total species list of the community is considerably larger than that given above, with many species present in only one or two sites or in low abundance. The species composition of a site will be influenced by the size of the site, recent rainfall or drought condition and by its disturbance (including fire) history. The number of species, and the above ground relative abundance of species will change with time since fire, and may also change in response to changes in fire regime (including changes in fire frequency). At any one time, above ground individuals of some species may be absent, but the species may be represented below ground in the soil seed banks or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers. The list of species given above is of vascular plant species; the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. These components of the community are not well documented.

4. Southern Sydney sheltered forest on transitional sandstone soils is an open forest dominated by eucalypts with scattered subcanopy trees, a diverse shrub layer and well-developed groundcover of ferns, forbs, grasses and graminoids. Some stands may take on structural forms of woodland or scrub, as disturbance associated with past clearing has resulted in reduced density and/or dense regrowth of the tree stratum. The dominant trees include *Angophora costata, Eucalyptus piperita* and occasionally *E. pilularis*, particularly around Helensburgh. *Corymbia gummifera* occurs frequently within the community, although generally at lower abundance than the other eucalypts. An open subcanopy includes *Allocasuarina littoralis, Ceratopetalum gummiferum* and occasionally *Elaeocarpus reticulatus* and *Pittosporum undulatum*. The understorey includes an open, diverse shrub stratum with species of *Acacia, Banksia, Persoonia* and several other genera. *Leptospermum polygalifolium, Leucopogon lanceolatus* and *Lomatia silaifolia* are frequently occurring shrubs, as are *Allocasuarina littoralis* and some of the other subcanopy tree species. *Smilax glyciphylla* and several other scramblers frequently occur in the shrub and ground strata. The prominent ground stratum comprises ferns (*Calochlaena, Pteridium, Gleichenia, Lindsaea*), large emergent tussocks of *Doryanthes excelsa* and *Gahnia sieberiana*, and a range of grasses and graminoids including *Lomandra longifolia, Entolasia stricta, Imperata cylindrica, Lepidosperma laterale* and *Lepyrodia scariosa*. Herbs, *Gonocarpus teucrioides* and *Dianella caerulea,* are also frequent components of the groundcover. There is considerable variation in species composition, richness and structure within the community in response to local edaphic gradients and geographic gradients across the range.

5. Southern Sydney sheltered forest on transitional sandstone soils is primarily associated with the heads and upper slopes of sandstone gullies, which are downslope from residual shale or ironstone caps. This is mainly gentle terrain, with slopes not often exceeding 10°, and sandstone outcrops occur infrequently, relative to sites within well-developed, steeper gullies. The associated shale caps may be weathered to varying degrees, and are sometimes represented only by outcropping ironstone on the adjacent ridges (indicating heavy weathering). Many of these shale and ironstone caps were mapped by Walker (1960) as the Woronora and Hammondville soil groups, although some locations of these soils were apparently overlooked at Walker's

(1960) coarse scale of mapping. In some cases, the transitional edaphic habitat may occur where sandstone overlies shale (e.g. Garrawarra Ridge). The community also occurs on sandstone sites associated with substrates other than shales and ironstones. For example, on the lower alluvial flats of the Hacking River near Audley, colluvial input from steep adjacent sandstone slopes mixes with loamy riverine deposits to create an enriched sandy loam supporting an unusual variant of the community. Another unusual occurrence is associated with a small dolerite dyke in Royal National Park, where lateral movement of sandstone-derived soils mix with more fertile loams derived from the dolerite.

6. Southern Sydney sheltered forest on transitional sandstone soils intergrades with other plant assemblages on sandstone, shale and ironstone substrates. Features that distinguish Southern Sydney sheltered forest of transitional sandstone soils from vegetation more typical of sandstone gullies in the eastern Sydney basin include its occurrences of *Eucalyptus pilularis, Acacia binervata, Elaeocarpus reticulatus, Pittosporum undulatum* and its relatively dense groundcover of ferns, grasses, rushes, lilies and forbs. These elements are apparently a response to enrichment of sandstone-derived soils from sources of additional nutrients, such as shale/ironstone caps, or rarely dolerite dykes and riparian material, which result in deeper, less rocky, more fertile sandy loams than those typical of sandstone gullies. Forests that occur on shales in the vicinity of Southern Sydney sheltered forest on transitional sandstone soils typically have a greater component of mesophyllous species in their shrub and subcanopy stratum, and trees such as *Eucalyptus globoidea, E. resinifera, E. paniculata* or *Syncarpia glomulifera*, which are not common in this community. These latter forests are classified as 'Sydney Shale-Ironstone Cap Forest' (map unit p143) by Tindall *et al*. (2004) and Tozer *et al*. (2006). This regional-scale map unit includes Endangered Ecological Communities, including Duffys Forest Ecological Community in the Sydney Basin Bioregion and O'Hares Creek Shale Forest.

7. Southern Sydney sheltered forest on transitional sandstone soils includes 'Tall Blackbutt-Apple Shale Forest' (map unit 20 of NPWS (2002), map unit 16 of NPWS (2003)). However, the description of this map unit as occurring 'on remnant shale caps' (NPWS 2002, 2003) is inaccurate, as the community is associated primarily with transition zones between shale and sandstone (see paragraph 5 above, Orscheg *et al.* 2006). In the extensive regional vegetation surveys of Tindall *et al*. (2004) and Tozer *et al*. (2006), Southern Sydney sheltered forest on transitional sandstone soils is one of several plant assemblages classified within a broader map unit (p140), Coastal Sandstone Gully Forest (Orscheg *et al.* 2006). Southern Sydney sheltered forest on transitional sandstone soils belongs to the Sydney Coastal Dry Sclerophyll Forests vegetation class of Keith (2004).

8. Southern Sydney sheltered forest on transitional sandstone soils has been recorded from the local government areas of Campbelltown, Hurstville, Kogarah, Sutherland, Wollondilly and Wollongong within the Sydney Basin Bioregion and may occur elsewhere in the Bioregion.

9. Southern Sydney sheltered forest on transitional sandstone soils is found within an estimated total extent of occurrence of less than 45 000 ha, bounded approximately by Hurstville, Carss Park, Bundeena, Otford, Stanwell Tops, Darkes Forest, Punchbowl Creek and Menai. Within this range, the community is currently estimated to occupy an area of approximately 400 - 4 000 ha, (Orscheg *et al.* 2006). These estimates indicate that the geographic distribution of Southern Sydney sheltered forest on transitional sandstone soils is highly restricted.

10. Clearing of areas where suitable habitat exists for Southern Sydney sheltered forest on transitional sandstone soils has occurred within the local government areas of Hurstville, Kogarah and Sutherland, where the community persists as small fragments surrounded by urban development. The remaining area of the community is principally in the upper Hacking River catchment around Helensburgh and in Royal National Park, although considerable clearing of the community has also occurred around the Helensburgh-Otford-Stanwell Tops area. Clearing has resulted in a moderate to large reduction in the geographic distribution of the community. Some areas of the community continue to be threatened by small-scale clearing and fragmentation associated with urban and rural residential subdivision, development and maintenance of transport corridors and easements. Clearing of native vegetation is listed as a Key Threatening Process under the Threatened Species Conservation Act.

11. The juxtaposition of Southern Sydney sheltered forest on transitional sandstone soils with urban and other developed areas exposes the community to influx of weeds and stormwater, heavy recreational use, incidental disturbance and some willful damage. These result in degradation of the community, reduction in its ecological function and ongoing management challenges that are typical of bushland remnants in urban landscapes (Benson and Howell 1990). Stands of the community located downslope from developed areas are predisposed to further degradation. Weed infestations are most severe on the interfaces between bushland and urban and industrial areas and along drainage lines that carry stormwater runoff from developed areas. Problematic weed species in the community include the following:

Ageratina adenophora	Crofton Weed
Ageratina riparia	
Andropogon virginicus	Whiskey Grass
Asparagus spp.	Spanish Heath
Cinnamonum camphora	Camphor Laurel
Coreopsis lanceolata	
Hedychium gardnerianum	
Lantana camara	Lantana
Ligustrum sinense	Small-leaved Privet
Lilium formosum	
Lonicera japonica	Honeysuckle
Pennisetum clandestinum	Kikuyu
Plantago lanceolata	
Senna pendula	
Setaria gracilis	
Tradescantia albiflora	

Invasion and establishment of exotic vines and creepers', 'Invasion of native plant communities by exotic perennial grasses' and 'Invasion, establishment and spread of Lantana (*Lantana camara* L. *sens. lat.*)' are listed as Key Threatening Processes under the Threatened Species Conservation Act.

12. Frequent fires and other fuel reduction measures may pose a threat to the community, particularly along urban interfaces, where it occurs within strategic fire management zones for asset protection. Royal National Park also has a history of frequent unplanned ignitions through arson and incidental causes (National Parks and Wildlife Service, fire history records). Frequent fires may interrupt life cycles of key plant species, resulting in changes to vegetation structure

and fauna habitats (Catling 1991, Keith 1996). In combination with other disturbances, they may also accelerate weed invasion. 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' is listed as a Key Threatening Process under the Threatened Species Conservation Act. Conversely, small isolated vegetation remnants in long-established urban areas may experience very long intervals between fires, resulting in senescence and recruitment failure in some species whose populations depend on periodic fires for persistence.

13. The distribution of Southern Sydney sheltered forest on transitional sandstone soils occurs within an area that has been invaded by exotic Rusa deer (Moriarty 2002). Deer are generalist herbivores that browse and graze on a wide range of native and exotic plant species (Keith and Pellow 2004). This adversely affects survival and reproduction in some native plants. The effects of deer herbivory appear to be more severe in small, recently burnt areas, as the animals concentrate their foraging activities on these areas to obtain fresh plant growth. Deer populations reach very high densities in areas where Southern Sydney sheltered forest on transitional sandstone soils adjoins the urban interface, including areas such as Helensburgh and Grays Point. 'Herbivory and environmental degradation caused by feral deer' is listed as a Key Threatening Process under the Threatened Species Conservation Act.

14. Ongoing fragmentation, influx of stormwater, pollutants and nutrients, the invasion of weeds, changes in vegetation structure and continuing degradation associated with altered fire regimes and feral deer have collectively resulted in a large reduction in the ecological function of the community.

15. Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion is eligible to be listed as an endangered ecological community as, in the opinion of the Scientific Committee, it is facing a high risk of extinction in New South Wales in the immediate future, as determined in accordance with the following criteria as prescribed by the Threatened Species Conservation Regulation 2002:

Clause 26
The ecological community's geographic distribution is estimated or inferred to be:
(b) highly restricted,
and the nature of its distribution makes it likely that the action of a threatening process could cause it to decline or degrade in extent or ecological function over a time span appropriate to the life cycle and habitat characteristics of the ecological community's component species.

Clause 27
The ecological community has undergone, is observed, estimated, inferred or reasonably suspected to have undergone, or is likely to undergo within a time span appropriate to the life cycle and habitat characteristics of its component species:

(c) a large reduction in ecological function,
as indicated by any of the following:
(d) change in community structure
(e) change in species composition
(f) disruption of ecological processes
(g) invasion and establishment of exotic species
(h) degradation of habitat

Professor Lesley Hughes
Chairperson
Scientific Committee
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References

Benson DH, Howell, J (1990) The natural vegetation of the Penrith 1:100 000 map sheet. *Cunninghamia* **2**, 541-596.

Catling PC (1991) Ecological effects of prescribed burning practices on the mammals of south-eastern Australia. In: 'Conservation of Australia's forest fauna' (Ed. D Lunney), pp 353-363. (Surrey Beatty and Sons: Sydney)

Keith DA (1996) Fire-driven mechanisms of extinction in vascular plants: a review of empirical and theoretical evidence in Australian vegetation. *Proceedings of the Linnean Society of New South Wales* **116,** 37-78.

Keith DA (2004) Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT. NSW Department of Environment and Conservation, Sydney.

Keith DA, Pellow BJ (2005) Effects of Javan rusa deer (*Cervus timorensis*) on native plant species in the Jibbon-Bundeena area, Royal National Park, New South Wales. *Proceedings of the Linnean Society of New South Wales* **126**, 99-110.

Mills K (2005) 'Supplementary vegetation assessment. Landcom project 12860/3. Frances Street, Helensburgh, City of Wollongong.' Kevin Mills and Associates, Jamberoo.

Moriarty A (2004) The liberation, distribution, abundance and management of wild deer in Australia. *Wildlife Research*, **31**, 291-299.

NPWS (2002) Bioregional assessment study. Part 1. The native vegetation of the Illawarra escarpment and coastal plain. (NSW National Parks and Wildlife Service: Hurstville).

NPWS (2003) The native vegetation of the Woronora, O'Hares and Metropolitan catchments. (NSW National Parks and Wildlife Service: Hurstville).

Orscheg C, Ooi M, Keith D (2006) The ecological relationships and conservation status of Tall Apple-Blackbutt Shale Forest. Report to the NSW Scientific Committee, Sydney.

Thackway R, Creswell ID (1995) (eds) An interim biogeographic regionalisation of Australia: a framework for establishing the national system of reserves. (Australian Nature Conservation Agency: Canberra)

Tindall D, Pennay C, Tozer MG, Turner K, Keith DA (2004) Native vegetation map report series. No. 4. Araluen, Batemans Bay, Braidwood, Burragorang, Goulburn, Jervis Bay,

Katoomba, Kiama, Moss Vale, Penrith, Port Hacking, Sydney, Taralga, Ulladulla, Wollongong. (NSW Department of Environment and Conservation and NSW Department of Infrastructure, Planning and Natural Resources: Sydney)

Tozer MG (2003). The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities. *Cunninghamia* **8**, 1-75.

Tozer MG, Turner K, Simpson C, Keith DA, Beukers P, Tindall D, Pennay C (2006) Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. Version 1.0. (Department of Environment and Conservation and Department of Natural Resources: Sydney)

Walker PH (1960) A soil survey of the county of Cumberland, Sydney region. (New South Wales Government Printer: Sydney)

Appendix D. Planting Guide

Selective planting guide for Lilli Pilli Point, based on native species recorded within Reserve, grouped by structure.

Species	Common Name	Community/location for planting
Canopy species		
Angophora costata	Sydney Red Gum	SSSFTS
Avicennia marina subsp. australasica	Grey Mangrove	Intertidal zone
Corymbia gummifera	Red Bloodwood	SSSFTS
Eucalyptus botryoides	Bangalay	Littoral Rainforest
Eucalyptus piperita	Sydney Peppermint	SSSFTS
Eucalyptus tereticornis	Forest Red Gum	Littoral Rainforest
Livistona australis	Cabbage Palm, Cabbage-tree Palm	Littoral Rainforest
Canopy and/or subcanopy species		**Canopy and/or subcanopy species**
Celtis paniculata	Native Celtis	Littoral Rainforest
Ficus rubiginosa	Rusty Fig	Littoral Rainforest
Banksia serrata	Saw Banksia, Old Man Banksia	SSSFTS
Cupaniopsis anacardioides	Tuckeroo	Littoral Rainforest
Guioa semiglauca	Guioa	Littoral Rainforest
Shrub or small tree species		
Acmena smithii	Lilly-pilly	Littoral Rainforest
Allocasuarina littoralis	Black She-Oak	SSSFTS
Banksia integrifolia	Coast Banksia	Littoral Rainforest
Banksia spinulosa	Hairpin Banksia	SSSFTS
Claoxylon australe	Brittlewood	Littoral Rainforest
Elaeocarpus reticulatus	Blueberry Ash	SSSFTS
Glochidion ferdinandi	Cheese Tree	Littoral Rainforest
Myrsine variabilis	Muttonwood	Littoral Rainforest
Polyscias elegans	Celery Wood	Littoral Rainforest
Polyscias sambucifolia	Elderberry Panax	Elderberry Panax
Platylobium formosum	Handsome Flat-pea	SSSFTS
Shrub or groundlayer species		
Acacia linifolia	Flax-leaved Wattle	SSSFTS
Acacia suaveolens	Sweet Wattle	SSSFTS
Acacia terminalis subsp. aurea	Sunshine Wattle	SSSFTS
Acacia ulicifolia	Prickly Moses, Prickly Wattle	SSSFTS
Breynia oblongifolia	Coffee Bush	Littoral Rainforest
Dodonaea triquetra	Hopbush	SSSFTS
Epacris longiflora	Fuchsia Heath	SSSFTS
Lomatia silaifolia	Native Parsley, Crinklebush	SSSFTS

Notelaea longifolia	Mock-olive	Littoral Rainforest
Notelaea venosa	Veined Mock-olive	Littoral Rainforest
Persoonia levis	Broad-leaved Geebung	SSSFTS
Persoonia linearis	Narrow-leaf Geebung	SSSFTS
Platysace linearifolia		SSSFTS
Pultenaea daphnoides	Large-leaf Bush-pea	SSSFTS
Xanthorrhoea arborea	Forest Grass-tree	SSSFTS
Maclura cochinchinensis	Cockspur Thorn	Littoral Rainforest
Xanthosia pilosa		SSSFTS
Grasses/sedges		
Dianella caerulea		Throughout the reserve*
Dianella revoluta	Blue Flax-lily, Spreading Flax-lily	Throughout the reserve*
Imperata cylindrica	Blady Grass	Throughout the reserve*
Lepidosperma laterale	Variable Sword-sedge	Throughout the reserve*
Lomandra longifolia	Honey Reed, Spike Mat-rush	Throughout the reserve*
Lomandra obliqua		Throughout the reserve*
Microlaena stipoides	Meadow Rice-grass, Weeping Grass	Throughout the reserve*
Patersonia glabrata	Native Iris, Leafy Purple-flag	Throughout the reserve*
Themeda australis	Kangaroo Grass	Throughout the reserve*
Climbers and vines		
Cayratia clematidea	Slender Grape	Littoral Rainforest
Cissus antarctica	Kangaroo Vine	Littoral Rainforest
Cissus hypoglauca	Native Grape, Water Vine	Littoral Rainforest
Eustrephus latifolius	Wombat Berry	Littoral Rainforest
Geitonoplesium cymosum	Scrambling Lily	Littoral Rainforest
Glycine clandestina	Twining Glycine	Littoral Rainforest
Glycine tabacina		
Hardenbergia violacea	False Sarsaparilla	SSSFTS
Pandorea pandorana	Wonga Vine	Littoral Rainforest
Parsonsia straminea	Common Silkpod, Monkey Rope	Littoral Rainforest
Smilax glyciphylla	Sweet Sarsaparilla	Littoral Rainforest

* Planting of grasses and sedges is recommended in actively eroding areas, bare areas and in areas where weed infestations have been removed to stabilise the soil and to suppress the germination of weeds.

Appendix E. Aboriginal Community Consultation

La Perouse Local Aboriginal Land Council
P.O. Box 365, Matraville NSW 2036
Telephone: (02) 9311 4282
Facsimile: (02) 9661 7423

Jennie Lindbergh
Australian Museum Business Services
6 College Street
Sydney
NSW 2010

RE: Lilli Pilli Reserve

Dear Jennie

After reviewing the conservation management plan the La Perouse Local Aboriginal Land Council agree with the plan of management. We are happy to endorse the Conservation Management Plan.

We feel we need to be consulted as the works are being carried out specifically any ground disturbance activity eg. constructing the path

We also believe Lilli Pilli Point was a part of the previous heritage study done on Port Hacking for Sutherland Shire Council

If there are any further enquiries please call David Ingrey on 0406 314 132

David Ingrey
Sites Officer
La Perouse LALC

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