

Part 2 – Foreshore Information and Analysis

2.0 Physical Environment

The Port Stephens foreshore (as defined for this study) is more than 250 kilometres in length. The physical character and processes operating on the shoreline vary markedly around its length. The Inner Port (to the west of Soldiers Point) (see **Figure 1.2**) is dominated by fluvial processes (Thom, et al 1992:177). This section of the port is characterised by wide mud flats with mangrove and saltmarsh. Sediments consist of muddy lithic sands that originate from the Karuah River. Tidal currents are responsible for the dispersal of sediment. The Outer Port (to the east of Soldiers Point) (see **Figure 1.2**) is dominated by tidal and wave processes. The form and composition of the sands and mud in the Outer Port are predominantly tidal in origin (Thom, et al 1992:177).

The dynamic sedimentary nature of the estuary means that the environmental context of the foreshore is in a constant state of change. For example, variations in rainfall can affect the balance of freshwater and marine water in the estuary, and the load of nutrients, bacteria, acid and suspended sediment from the catchment. Additionally, storm events can cause substantial changes, particularly in the outer port. The associated wave action influences shoaling and erosion in particular sections of the port and its shoreline. The final destruction of Myall Point (which once extended from the northern foreshore to within approximately 100 metres of the southern foreshore) by one of several large storms in the late 1920s, and the subsequent impacts that this has had on the stability of Winda Woppa, Jimmys Beach and sections of the southern foreshore illustrates the changes that storm events can cause.

Whilst there is abundant evidence of the variability of intensity, duration and focus of geomorphic processes impacting on the shoreline of Port Stephens, natural resources and asset managers are now also considering the potential impacts of longer term trends and patterns associated with climate change. DECC (2008) has highlighted the potential for increased storminess, enhanced seasonality of rainfall and sea level rise to impact on coastal systems, such as estuary foreshores. Sea level is projected to rise by 40 centimetres above 1990 Mean Sea Level by 2050 and 90 centimetres above the 1990 Mean Sea Level by 2100 (DECC 2008). Such a sea level would increase the erosion (recession) hazard on sandy shorelines. The inundation hazard for low lying shoreline areas is also expected to increase.

The diverse character of the foreshore means that there is a diverse range of values associated with it. There are many different natural values associated with the various ecological habitats found along the shoreline. There are also many different community values associated with the use, accessibility and visual amenity of different parts of the foreshore. The physical diversity of the foreshore also means that some sections are more prone to some threats than others. For example, a rocky shoreline will be less prone to wave erosion than one composed of sand, particularly in areas where riparian vegetation has been removed.

As discussed in **Section 1.1**, in order to facilitate clear definition of issues and options, the foreshore has been divided into Management Zones (see **Figure 1.2**). This division is mainly based on physical character, but also takes into consideration the nature of development and use, recreational preferences, and visual catchment. A physical description and a summary of the features, uses and issues in each Management Zone are provided in **Table 2.1**.

Table 2.1 – Description of Management Zones

Management Zone	Physical Description	Significant Features/Uses/Issues
Zone A – Southern shoreline of outer Port Stephens. Includes sub zones A1 to A3	Sandy beaches separated by rocky headlands.	The shoreline is of high aesthetic value. There is high recreational demand along all beaches, foreshore reserves, and nearshore waters in this zone, with uses including swimming, scuba diving, fishing, sailing, paddle boats, power boats and picnic activities.
A1 – Tomaree Headland to Nelson Bay	Tomaree Headland is a steep bedrock outcrop that provides 360° views of Port Stephens and the adjacent coastline. This gives way to a series of sandy bays and headlands between Shoal Bay and Nelson Bay.	Tomaree Headland is located within Tomaree National Park. Includes Shoal Bay SEPP 14 wetland. Adjoins General, Habitat Protection and Sanctuary Zones in the Marine Park. Valuable sea grass habitat in nearshore. The Shoal Bay shoreline is affected by erosion and requires careful management to maintain recreational value and to protect infrastructure. Zone includes the main commercial and tourist developments of Port Stephens. The zone also includes Nelson Bay Harbour and D’Albora Marina. This is the main fishing port of the estuary, and the main berthing facility for commercial cruising and charter vessels. There is also a small marina at Little Beach. Boat launching ramps are located at Shoal Bay, Little Beach. Overcrowding occurs at Little Beach during peak periods. European heritage sites at Tomaree Headland and Nelson Head.
A2 – Nelson Bay to Corlette Point	Sandy bays and rocky headlands.	Zone includes longstanding residential area and a substantial section of undeveloped foreshore at Bagnalls Beach. There is a marina at Corlette (The Anchorage). Adjoins General zone in Marine Park, except for a small area of Habitat Protection. Valuable sea grass habitat in nearshore.

Table 2.1 – Description of Management Zones (cont)

Management Zone	Description	Features/Uses/Issues
A3 – Corlette Point to Soldiers Point	Sandy beaches separated by rocky headlands.	<p>The Salamander Bay area is the major urban growth area within the immediate catchment of Port Stephens.</p> <p>The Salamander Bay foreshore is backed by Mambo Wetland (SEPP14). Valuable sea grass habitat in the nearshore.</p> <p>There is a single boat ramp and jetty, and numerous moorings in Salamander Bay.</p> <p>Foreshore erosion is an issue in some areas. There are numerous seawalls and other foreshore structures (some unauthorised) in this Management Zone.</p> <p>Adjoins Marine Park Sanctuary zone in Salamander Bay, Habitat Protection off Soldiers Point.</p> <p>Significant Aboriginal attachment to the Soldiers Point area.</p>
Zone B – Cromartys Bay and Tilligerry Creek (Inner Port). Includes sub zones B1 to B3	The Soldiers Point ridgeline separates the open estuary bay of the outer port from the confined estuary waters of the inner port.	<p>Flushing times increase from less than one day in the outer port to 10-12 days in the inner port. Water quality in the sheltered bays of the inner port is significantly affected by catchment runoff, and is also often turbid because of a combination of catchment inputs after rain, and the re-suspension of fine sediments by wind waves and tidal currents.</p> <p>On-site sewerage systems affect water quality in some areas.</p> <p>Contains large areas of koala habitat.</p>
B1 – Cromartys Bay	Very low gradient shoreline of muddy sand. Seagrass beds extend across most of the bay. The western shoreline of the bay is mangrove wetland which is periodically inundated.	<p>Zone includes extensive active oyster leases and oyster processing facility.</p> <p>Major boat ramp facility and marina at Soldiers Point. Small ramp at Taylors Beach.</p> <p>Some urban development along the western shoreline but majority of shoreline is in natural condition, with areas of two EECs, as well as mangrove and sea grass.</p> <p>Most of the bay is zoned General Use in the Marine Park.</p> <p>Significant roosting area for migratory water birds.</p>

Table 2.1 – Description of Management Zones (cont)

Management Zone	Description	Features/Uses/Issues
B2 – Tilligerry Creek	A long narrow channel occupying a depression between the Pleistocene and Holocene sandy barriers of Newcastle Bight. The creek has very restricted water circulation. Foreshore characterised by muddy tidal flats.	<p>Foreshore area has been modified through the construction of drains and embankments. Surrounding area has high potential for acid sulphate soils.</p> <p>Area used for rural residential settlement and small scale agricultural enterprises, with on-site wastewater management systems. These have affected local water quality.</p> <p>Oyster leases and processing/packing facilities on the foreshore.</p> <p>Foreshore erosion and protection structures an issue in the lower part of the creek.</p> <p>Adjoins Habitat Protection zone in the Marine Park. Most of the creek is lined with SEPP 14 wetland. Significant transfer of foreshore land from Crown land to DECC since 2006.</p>
B3 – Lemon Tree Passage	Mouth of Tilligerry Creek. Channel between mainland (Tilligerry Peninsula) and Bulls Island. Muddy tidal flats along Bulls Island shoreline. Foreshore area along mainland foreshore highly modified through reclamation and seawalls.	<p>Regional scale boat ramp facilities and marina. Major facilities for western part of Port Stephens.</p> <p>Numerous moorings in channel.</p> <p>Long established small urban area.</p> <p>Principally adjoins General Use zone in the Marine Park.</p> <p>Some sea walls and other structures are unauthorised.</p>
Zone C – Western part of the upper port. Comprises sub zones C1 to C2	Open and closed embayments on the southern shore of the inner port. Primarily within low lying alluvial/wetland terrain.	<p>The water of the inner port is frequently turbid, reflecting both the re-suspension of fine sediments by wind waves and the effects of discharges from the Karuah River catchment in wet weather. The flushing time of 10-12 days is considered long enough to permit algal blooms to occur and affect water quality in terms of recreational use.</p> <p>Tourist development is relatively restricted. Long established discrete small urban areas along the foreshore.</p>

Table 2.1 – Description of Management Zones (cont)

Management Zone	Description	Features/Uses/Issues
C1 – Mallabula and Tanilba Bay	Steep embankments and seawalls drop to gently sloping sandy mud/muddy sand.	<p>This southern shoreline faces a long fetch and is subject to relatively high energy wind waves. Wave attack has affected shoreline stability and is threatening koala habitat and littoral vegetation.</p> <p>Large areas of seagrass in Tanilba Bay.</p> <p>Local stormwater drains affect shoreline stability and cause water quality concerns.</p> <p>Extensive foreshore reserve. Many boat moorings.</p> <p>Zone contains two of the largest oyster processing operations in Port Stephens.</p> <p>Primarily adjoins General Use zone in the Marine Park, other than a short section of Sanctuary zone.</p>
C2 – Big Swan Bay, Twelve Mile Creek, Little Swan Bay and Reedy Creek	Tidal flats of sandy mud.	<p>Large areas of seagrass in Big Swan Bay but not Little Swan Bay.</p> <p>SEPP14 wetlands (salt marsh and mangrove) in Twelve Mile Creek and Reedy Creek. Significant areas of roosting habitat for migratory bird species.</p> <p>Numerous operational and derelict oyster leases.</p> <p>Large marina and slipway, serving oyster industry and boat maintenance.</p> <p>Much of Twelve Mile Creek is managed by Defence, with DECC managed lands in the upper catchment.</p> <p>Twelve Mile Creek is managed as Sanctuary Zone in the Marine Park zoning plan. The remainder of the area is zoned General Use.</p>

Table 2.1 – Description of Management Zones (cont)

Management Zone	Description	Features/Uses/Issues
Zone D – Karuah River upstream of Karuah Bridge	Tidal flats with muddy sand, low embankments to shallow sandy mud beaches, bedrock/rock platform.	<p>Floodplain is underlain by acid sulphate soils and gravel deposits.</p> <p>Small upstream settlements are unsewered.</p> <p>Significant sections of intact riparian vegetation, including SEPP 14 wetland, and saltmarsh EEC.</p> <p>Intensive chicken production is a major agricultural land use.</p> <p>This area is outside the Marine Park boundary.</p>
Zone E – Northern Shoreline of Inner Port Stephens	Relatively steep and rocky foreshore. Moderate slopes to muddy sand tidal flats and rock platforms in North Arm Cove/Fame Point area. The Pindimar area is characterised by sandy, mangrove lined shoreline, backed by flood prone land at the base of steep slopes.	<p>Majority of shoreline is in private ownership. Important European heritage sites at Carrington/Tahlee</p> <p>All villages in this area are unsewered.</p> <p>Public boat ramps are rare but there are numerous private boat ramps, jetties and seawalls, including a significant number of unauthorised structures.</p> <p>Areas of SEPP 14 wetland along tributary creeks, including salt marsh EEC; sea grass habitat along the shoreline at Pindimar.</p> <p>Adjoins General Use zone in Marine Park, except for Sanctuary Zone at the head of North Arm Cove.</p> <p>Erosion of the sandy shoreline at Pindimar is causing concern. Concern regarding sediment/erosion associated with development sites at North Arm Cove.</p> <p>Derelict oyster leases.</p> <p>Heavy boat usage in summer months, with protected moorings (e.g. Fame Cove area).</p>
Zone F – Northern Shoreline of Outer Port Stephens	Dynamic sedimentary environments.	This broad zone includes the former Paddy Marrs Bar area extending across the Port, the lower Myall River and the Jimmy's Beach/Winda Woppa peninsula, leading to Yacaaba Headland.

Table 2.1 – Description of Management Zones (cont)

Management Zone	Description	Features/Uses/Issues
F1 – Corrie Island and Corrie Channel. Comprises sub zones F1 to F3	Tidal flats.	<p>Corrie Island is a Nature Reserve that is managed by National Parks and Wildlife Services (NPWS).</p> <p>Both the eastern and western channels around Corrie Island are extensively shoaled, making navigation into the Myall River hazardous.</p> <p>Cost of channel maintenance is an issue. Vocal community concern about the effect of shoaled channels on the water quality in the Myall Lakes system.</p>
F2 – Jimmys Beach and Yacaaba Headland	Steep beach face. Marine sand.	<p>Severe erosion at Jimmys Beach. Beach nourishment programs over the past 10 years have failed to stabilise the beach. Threats to residences and beach amenity (very popular beach in summer, with nearby holiday and caravan park accommodation). Investigation of more effective long term solution to beach and dune erosion is ongoing (this issue is therefore not addressed in detail in the current document).</p> <p>Principally adjoins General Use zone in Marine Park, with Habitat Protection zone at Yacaaba Headland.</p>
F3 – Lower Myall River	Tidal flats, low embankment to gently sloping sandy beach, large sections completely modified by development.	<p>Pressure for further urban development.</p> <p>Extensive SEPP14 wetlands, including saltmarsh EEC, mangrove and sea grass.</p> <p>Regional boat ramp at Tea Gardens. Shoaling in channel causes boat access difficulties.</p> <p>Multiple European heritage sites along the lower Myall River.</p> <p>Mixture of General Use, Habitat Protection and Sanctuary zones in Marine Park.</p>

3.0 Social Environment

Port Stephens LGA has a population of more than 61 000 (ABS 2001 Census data) and is growing at a rate of 2 per cent annually (Port Stephens Council 2004). The main population centres on the southern shoreline are Shoal Bay/Nelson Bay and Salamander Bay/Soldiers Point, although the entire shoreline of the outer port is fairly intensely developed. The area is attractive to retirees and people seeking a coastal lifestyle. The area is also within easy commuting distance to employment in the Newcastle region and is becoming increasingly more accessible from Sydney. Interestingly, the Port Stephens population not only has an above average proportion of retirees but it also has an above average proportion of people younger than the state average. Due to the high number of older people in the community, approximately 25 per cent of the population suffers from mobility impairment. Such statistics have a bearing on the type of facilities that are required in the foreshore study area.

The Port Stephens LGA is also one of the largest tourist destinations in NSW, with over one million annual visitors (defined as a person who lives more than one hundred kilometres away and stays for at least 24 hours) and one million day trippers annually. The principal attraction for tourists is the largely natural outdoor coastal environment and so the demand for safe and adequate facilities in parks and reserves is high.

A survey of Sydney residents who have visited Port Stephens was undertaken by the Hunter Valley Research Foundation in 2000. It indicated that 77.2 per cent of people visiting Port Stephens went to the beach, 73.9 per cent went to Nelson Bay shops, 32.7 per cent used cycleways/walking trails, 29 per cent went fishing, and 18.8 per cent went on a dolphin cruise (all figures are approximate). This survey confirms that the foreshore is the major attraction for visitors, and most activities require the use of a facility on the foreshore (e.g. boat ramps, jetties, and cycleways/pathways).

The Great Lakes region is also experiencing rapid growth and this is expected to continue, particularly as travelling times from Sydney are reduced by improvements to the Pacific Highway, and the roads linking Newcastle and Port Stephens are upgraded. With regard to the Port Stephens foreshore, the majority of the northern shoreline is undeveloped. The main population centre is Hawks Nest/Tea Gardens on the lower Myall River with a population of 2545 (ABS 2001 Census data). This population expands to over 9000 people in peak summer holiday periods. Smaller villages include Pindimar, Bundabah and North Arm Cove.

The region has a relatively aged population. In 2001, its largest age group was 60-64 years, with a median age of 47 years (DIPNR 2004:16). By 2031, the region is expected to have a dependency ratio of over 100. This means that there will be more people in the dependent age groups (0-14 and over 65 years) than in the working age population. Simultaneously, the Tea Gardens/Myall Lakes area has become an upmarket holiday area over the past decade. Again, the public facilities provided by Council need to reflect the requirements of this unique population.

There has also been a steady change in the economic character of the Port Stephens and Great Lakes regions. The agriculture, logging and fishing industry has been steadily diminishing while the cultural and recreational industry has experienced very strong growth over the last decade (Port Stephens Council 2004:42). Significant local development has also resulted in a thriving construction industry. The tourism industry continues to grow and expand exponentially. The existing tourist areas of Shoal Bay and Nelson Bay on the southern shoreline, and Myall Lakes and Tea Gardens on the northern shoreline are becoming increasingly popular. Additionally, destinations such as the Tilligerry Peninsula are becoming popular with people seeking a quieter holiday with an environmental focus (Port Stephens Council 2004).

Tourists and local residents are attracted to the Port Stephens foreshore for the same reasons – peace and quiet and the beautiful natural environment. They also undertake similar activities – utilise the foreshore reserves for picnicking, swimming, walking, cycling and other recreational outdoor pursuits. The use and enjoyment of these areas by both tourists and residents is dependent upon accessibility, and the adequacy and safety of facilities. The Port Stephens Council 2002 Community Survey (Hunter Valley Research Foundation 2002) found that the majority of local residents in foreshore areas were satisfied with the character of their neighbourhood and the facilities offered, although they were concerned about further development. There is no formal data available regarding the level of satisfaction of tourists and day trippers.

Waterway usage for recreational boating activities has increased significantly over the last ten years, although actual numbers of waterway users are not well documented. Both residents and tourists are better able to afford boats than ever before. This has resulted in the intense use of some boat ramps and sections of the foreshore by boat based users. It has also resulted in more accidents and near misses as less experienced people negotiate unfamiliar and crowded boat ramps and facilities. There is a strong expectation from both residents and tourists that this situation will improve.

The high proportion of retirees living in the population centres around the foreshore may partly explain the high level of community participation and concern in the management and care of the foreshore environment and facilities. A number of Tidy Towns and Landcare Committees are active around the foreshore and have undertaken some major improvements in the natural environment, parks, reserves and facilities. There is consequently a strong sense of community ownership of many foreshore parks and reserves. Any management decision and action undertaken by Councils or other government agencies must take this into consideration.

The key considerations with regard to the Port Stephens foreshore social environment are:

- both residents and tourists are attracted to the Port Stephens area (particularly the foreshore) by the beautiful natural environment, the relatively undeveloped nature of the area, the peaceful environment, and the recreational activities offered by the waterway, beaches, parks and reserves;
- the residential and tourist population is growing and will continue to grow over the foreseeable future. Consequently, usage of foreshore reserves and facilities will continue to increase, as will pressures on the natural environment;
- the number of people who are accessing and using the waterway in boats is increasing. The usage of boat ramps and jetties, as well as foreshore reserves accessible by boat will continue to increase;
- there is a strong sense of community concern and ownership of foreshore reserves, the waterway and the environment in general; and
- people are concerned that future development will impact on the values which make the foreshore so attractive and important to them.

The retention and improvement of public access to and along the foreshore should be a paramount consideration by Council and Government Agencies, in accordance with the NSW Coastal Policy.

4.0 Ecological Habitat

The Port Stephens Foreshore supports a large number of significant ecological features, such as threatened species, EECs and SEPP 14 wetlands. The Port Stephens Estuary is listed on the Directory of Important Wetlands in recognition of the significant wetland habitats it supports. It is estimated that Port Stephens supports 21 per cent of NSW's mangroves, 13 per cent of saltmarsh and 5 per cent of seagrasses (West et al 1985).

The extent of natural vegetation along the foreshore of Port Stephens is a key value that has been identified by the local community. This 'naturalness' contributes to high conservation value, and high recreational and aesthetic values. The northern and inner shores of Port Stephens retain a relatively high proportion of natural vegetation. There are several Nature Reserves in this area, including Corrie Island, Bull Island and Swan Island. Although much of the northern shoreline retains natural vegetation, many areas are privately owned, with potential for a range of land uses within the existing zoning. The majority of natural vegetation along the southern shoreline is located within Crown or Council land that is zoned to protect recreational values rather than ecological values. However, there is scope for the protection of significant ecological values through plans of management or DCPs.

The following sections provide a brief summary of the key ecological features of the Port Stephens foreshore. A more detailed account is provided in the **Reference Document (Ecological Habitats)**. Relevant identified management actions are detailed in **Section 12.0**.

Key ecological assets are listed in the [Foreshore Inventory](#).

4.1 Key Ecological Features of the Foreshore Environment

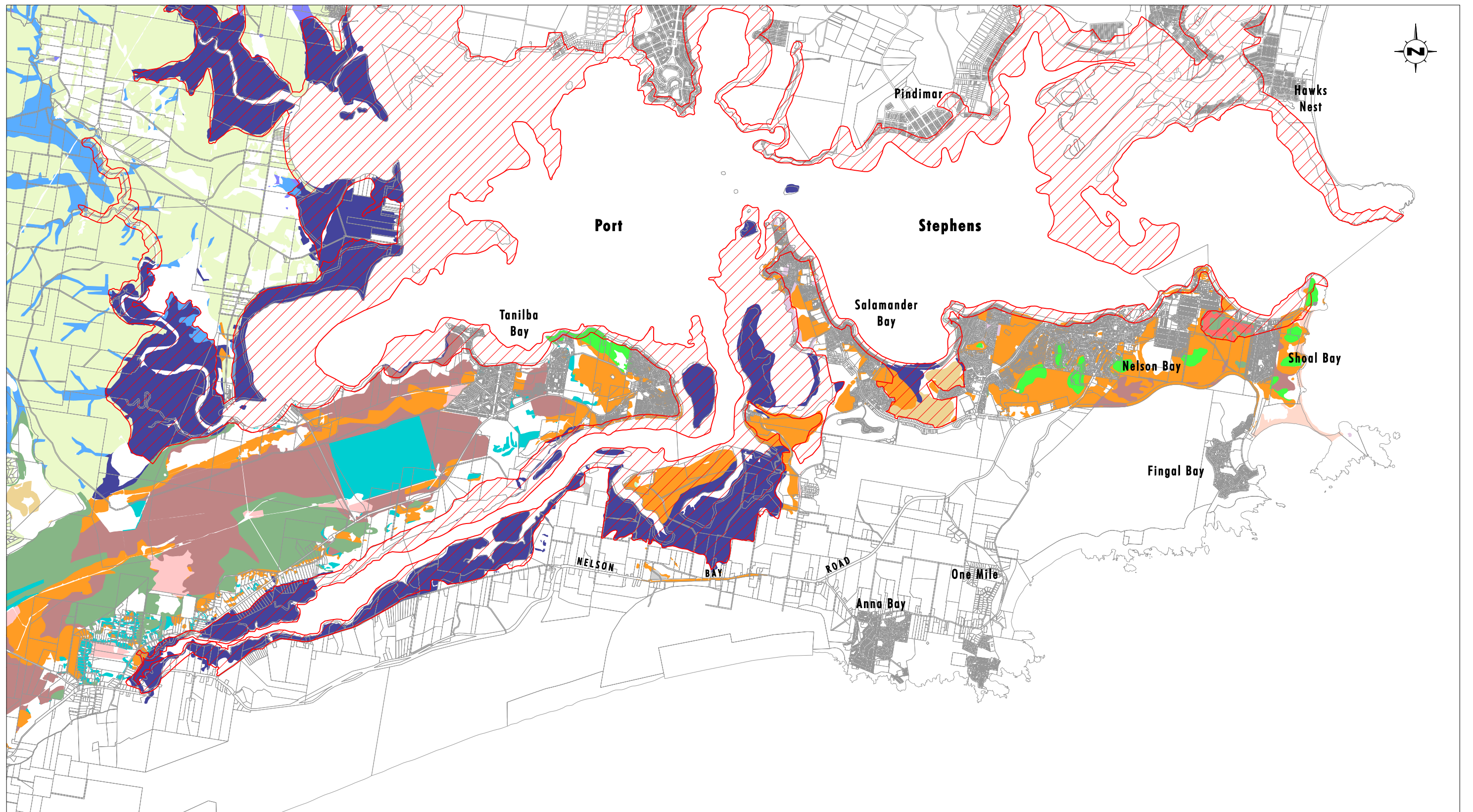
4.1.1 Vegetation Communities of the Port Stephens Foreshore

Regional vegetation studies which cover areas of the Port Stephens LGA include the *Tomaree National Park Vegetation Survey* (Bell 1997); *Great Lakes Council Vegetation Strategy – Eastern Portion* (Great Lakes Council 2003) and the *Lower Hunter and Central Coast Regional Biodiversity Conservation Strategy Extant Vegetation Community Map* (House 2002). These regional vegetation surveys, supplemented with field surveys, have been drawn upon to identify the vegetation communities occurring within the Port Stephens Foreshore area. As shown on **Figures 4.1 (a) and (b)**, there are 36 vegetation communities occurring within the foreshore area, demonstrating the high diversity which it supports.

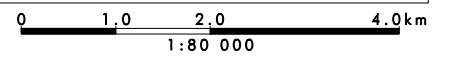
4.1.2 Threatened Flora

A search of the DECC Atlas of NSW Wildlife was undertaken in order to identify threatened flora species that have previously been recorded within the Port Stephens Foreshore area. Five threatened flora species have previously been recorded:

- black-eyed Susan (*Tetradlea juncea*);
- Parramatta red gum (*Eucalyptus parramattensis* subsp. *decadens*);
- sand double-tail (*Diuris arenaria*);
- sand spurge (*Chamaesyce psammogeton*); and
- Grove's paperbark (*Melaleuca groveana*).



Source: Port Stephens Council (2006)
 Note: Seaward study area boundary defined by -2 metre (AHD) contour.

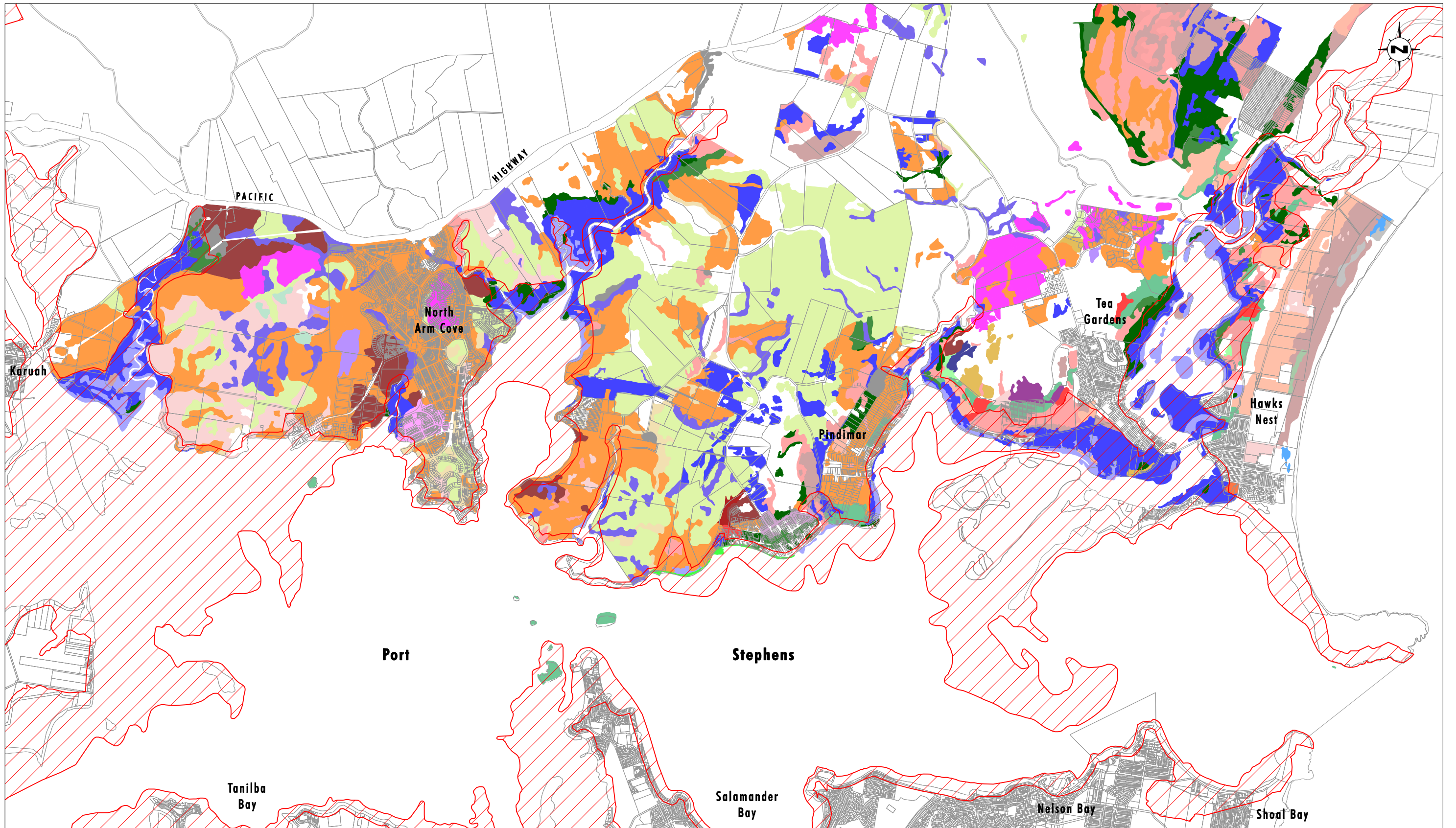


Legend

- | | | |
|---|---|-----------------------------------|
| Study Area | Coastal Sand Scrub | Littoral Rainforest |
| Alluvial Tall Moist Forest | Coastal Sand Wallum Woodland - Heath | Mangrove - Estuarine Complex |
| Beach Sands | Coastal Sheltered Apple - Peppermint Forest | Nerong Smooth Barked Apple Forest |
| Beach Spinifex | Coastal Wet Sand Cyperoid Heath | Riparian Melaleuca Swamp Woodland |
| Coastal Clay Heath | Freshwater Wetland Complex | Tomago Sand Swamp Woodland |
| Coastal Foothills Spotted Gum Ironbark Forest | Heath | |
| Coastal Plains Smooth-barked Apple Woodland | Hunter Valley Moist Forest | |
| Coastal Sand Apple Blackbutt Forest | Lepironia Swamp | |

FIGURE 4.1(a)

Vegetation Communities of the Port Stephens Foreshore (Port Stephens LGA)



Source: Great Lakes Council (2006) Note: Seaward study area boundary defined by -2 metre (AHD) contour.

0 1.0 2.0 3.0km
1:50 000

Legend	
[Red Hatched Box]	Study Area
[Grey Box]	Banksia
[Green Box]	Blackbutt-Bloodwood Apple
[Blue Box]	Cleared Land
[Light Green Box]	Disturbed Heath
[Pink Box]	Dry Blackbutt
[Purple Box]	Fig Giant Stinger
[Light Green Box]	Flooded Gum
[Orange Box]	Forest Red Gum
[Blue Box]	Grey Gum Grey Ironbark White Mahogany
[Brown Box]	Heath
[Light Green Box]	Heath Paperbark
[Light Green Box]	Ironbark
[Purple Box]	Ironbark Smoothbarked Apple Sydney Peppermint
[Blue Box]	Mangrove
[Light Green Box]	Moist Blackbutt
[Pink Box]	Paperbark
[Grey Box]	Paperbark Smoothbarked Apple Sydney Peppermint
[Orange Box]	Paperbark Blackbutt
[Blue Box]	Paperbark Flooded Gum
[Green Box]	Paperbark Swamp Oak
[Pink Box]	Pine
[Purple Box]	Red Bloodwood Forest
[Light Green Box]	Sand
[Orange Box]	Scribbly Gum
[Blue Box]	Scrub
[Brown Box]	Smoothbarked Apple
[Orange Box]	Smoothbarked Apple Sydney Peppermint Stringybark
[Light Green Box]	Spotted Gum
[Purple Box]	Spotted Gum Ironbark Grey Gum
[Blue Box]	Swamp
[Green Box]	Swamp Mahogany
[Red Box]	Swamp Mahogany Paperbark
[Green Box]	Swamp Oak
[Red Box]	Sydney Blue Gum
[Purple Box]	Tallwood Sydney Blue Gum
[Blue Box]	White Mahogany Red Mahogany Grey Ironbark Grey Gum

FIGURE 4.1(b)
Vegetation Communities of the
Port Stephens Foreshore
(Great Lakes LGA)

Of these five flora species, the latter three occur only in environments near the foreshore, and therefore the protection of foreshore ecosystems is very important to the survival of these species. Large tracts of these habitats have been greatly modified or removed from past land use practices.

4.1.3 Threatened Fauna

A search of the DECC Atlas of NSW Wildlife was undertaken, identifying 31 threatened aquatic and terrestrial fauna species that have been previously recorded within the Port Stephens Foreshore area. An additional five fauna species have been added to the list, being recorded in the Port Stephens foreshore by Stuart (2004) but have not been added to the DECC Atlas of NSW Wildlife. **Table 4.1** lists the 31 threatened fauna species that have been previously recorded in the Port Stephens Foreshore.

Table 4.1 – Threatened Fauna

Common Name	Scientific Name
Dugong	<i>Dugong dugon</i>
green turtle	<i>Chelonia mydas</i>
Koala	<i>Phascolarctos cinereus</i>
brush-tailed phascogale (southern subsp.)	<i>Phascogale tapoatafa tapoatafa</i>
little bentwing-bat	<i>Miniopterus australis</i>
eastern freetail-bat	<i>Mormopterus norfolkensis</i>
squirrel glider	<i>Petaurus norfolcensis</i>
eastern bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>
grey-headed flying-fox	<i>Pteropus poliocephalus</i>
long-nosed potoroo	<i>Potorous tridactylus</i>
spotted-tailed quoll	<i>Dasyurus maculatus maculatus</i>
large-eared pied bat	<i>Chalinolobus dwyeri</i>
wompoo fruit-dove	<i>Ptilinopus magnificus</i>
bush stone-curlew	<i>Burhinus grallarius</i>
swift parrot	<i>Lathamus discolor</i>
Osprey	<i>Pandion haliaetus</i>
powerful owl	<i>Ninox strenua</i>
glossy black-cockatoo	<i>Calyptorhynchus lathami</i>
black-necked stork	<i>Ephippiorhynchus asiaticus</i>
sooty oystercatcher	<i>Haematopus fuliginosus</i>
pied oystercatcher	<i>Haematopus longirostris</i>
southern giant-petrel	<i>Macronectes giganteus</i>
Gould's petrel	<i>Pterodroma leucoptera leucoptera</i>
masked owl	<i>Tyto novaehollandiae</i>
little tern	<i>Sterna albifrons</i>
Emu	<i>Dromaius novaehollandiae</i>
black-tailed godwit	<i>Limosa limosa</i>

Table 4.1 – Threatened Fauna (cont)

Common Name	Scientific Name
terek sandpiper	<i>Xenus cinereus</i>
Sanderling	<i>Calidris alba</i>
greater sand plover	<i>Charadrius leschenaultii</i>
lesser sand plover	<i>Charadrius mongolus</i>

4.1.4 Endangered Ecological Communities

Reflective of the fact that foreshore environments have been extensively cleared, or otherwise been highly modified through previous land use practices, many of the vegetation communities within of the Port Stephens Foreshore are listed as EECs under the *Threatened Species Conservation Act 1995 (TSC Act)*.

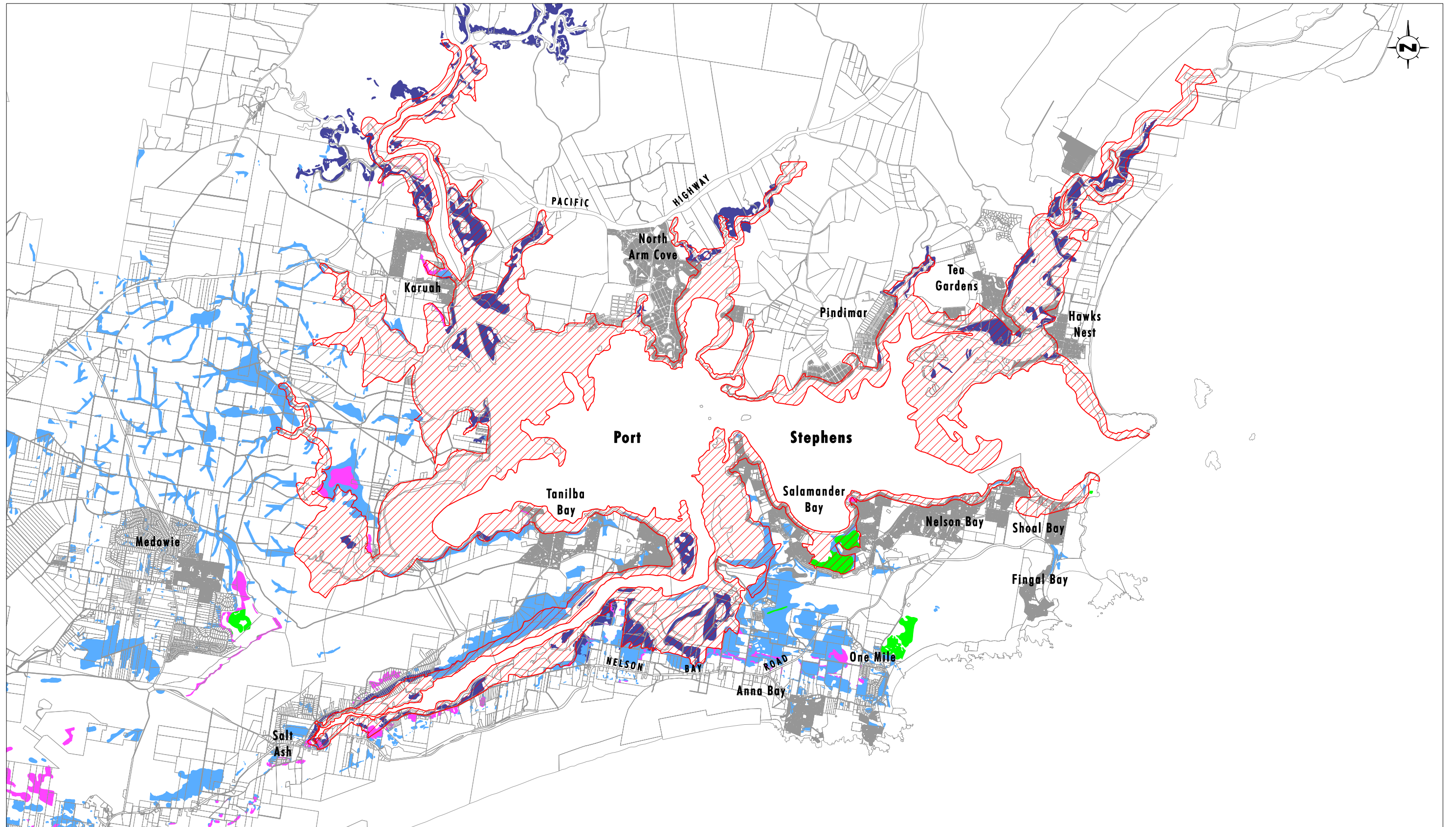
There are five EECs which occur within the Port Stephens Foreshore area (**Figure 4.2**). Detailed surveys of the vegetation along the northern foreshore of the Port have not been undertaken to date, and therefore no EECs have mapped for those areas. It is considered that should detailed studies occur in the northern foreshore, further areas of EECs will be identified. The five EECs occurring within the Port Stephens Foreshore area are:

- Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South-East Corner Bioregions;
- Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South-east Corner Bioregions;
- Littoral Rainforest in the NSW North Coast, Sydney Basin and South-east Corner Bioregions;
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South-east Corner Bioregions; and
- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South-east Corner Bioregions.

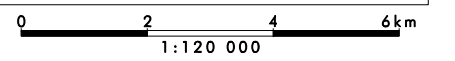
In addition to these five EECs, Seagrass is a protected community under the *Fisheries Management Act 1998*.

4.1.5 Endangered Populations

An isolated population of emu occurring within the NSW North Coast Bioregion and the Port Stephens LGA is listed as endangered population under part 2, Schedule 1 of the *TSC Act*. It is not clear as to when the emu was last recorded within the Port Stephens LGA, however records from the DEC Wildlife Atlas Database indicate this was around 1992. There have been nine records in the Port Stephens LGA between 1977 and 1992. This includes records at Tilligerry Creek, Lemon Tree Passage, Corlette and the Karuah River. Due to the lack of recent records, it is considered very unlikely that a population of emus remains within the Port Stephens LGA. The population previously occurring is considered to have become extinct as a result of threatening processes such as loss and fragmentation of habitat due to clearing for agricultural and urban development, inappropriate fire regimes, deliberate killing, predation of eggs and young by pigs, dogs and foxes, road kill and altered population dynamics (NPWS 2004e).



Source: LPI NSW (2000), Great Lakes Council, Port Stephens Council
 Note: Seaward study area boundary defined by -2 metre (AHD) contour.



- Legend**
- Study Area
 - Freshwater Wetland Communities
 - Saltmarsh Communities
 - Swamp Oak Floodplain Forest
 - Swamp Sclerophyll

FIGURE 4.2
Endangered Ecological Communities

The population of koalas occurring in Hawks Nest and Tea Gardens is listed as an endangered population under part 2, Schedule 1 of the *TSC Act*. The endangered population occurs in the Great Lakes LGA, in the immediate vicinity of Hawks Nest and Tea Gardens extending in the south-east to the Yacaaba Headland and in the south-west to the peninsula west of Winda Woppa (NSW Scientific Committee 1999). It is considered that the population is in immediate danger of extinction, with the koala numbers having declined from 21 individuals in 1989 to only 12 in 1998 (NSW Scientific Committee 1999). This rapid decline in the population is the result of habitat destruction and fragmentation due to urban development, and also from koalas being killed by vehicles and domestic animals.

4.1.6 Aquatic Habitat

The Port Stephens Foreshore protects highly significant aquatic habitat features, the protection of which is not only important for biodiversity and ecosystem function, but also for recreational and commercial fishing, recreational and aesthetic values of the foreshore and consequently the economic value of tourism in Port Stephens.

One of the major aquatic habitat features of Port Stephens is the extensive seagrass beds, which occur along most foreshores of the Port (**Figure 4.3**). Amongst other functions, seagrass beds may be utilised as feeding grounds for the threatened dugong (*Dugong dugon*) and green turtle (*Chelonia mydas*). There has been some destruction of seagrass throughout the Port since human settlement, as it is damaged by boating activities, changes to water quality and other activities affecting the waterways. Despite this, seagrass habitats throughout the Port are largely in good condition

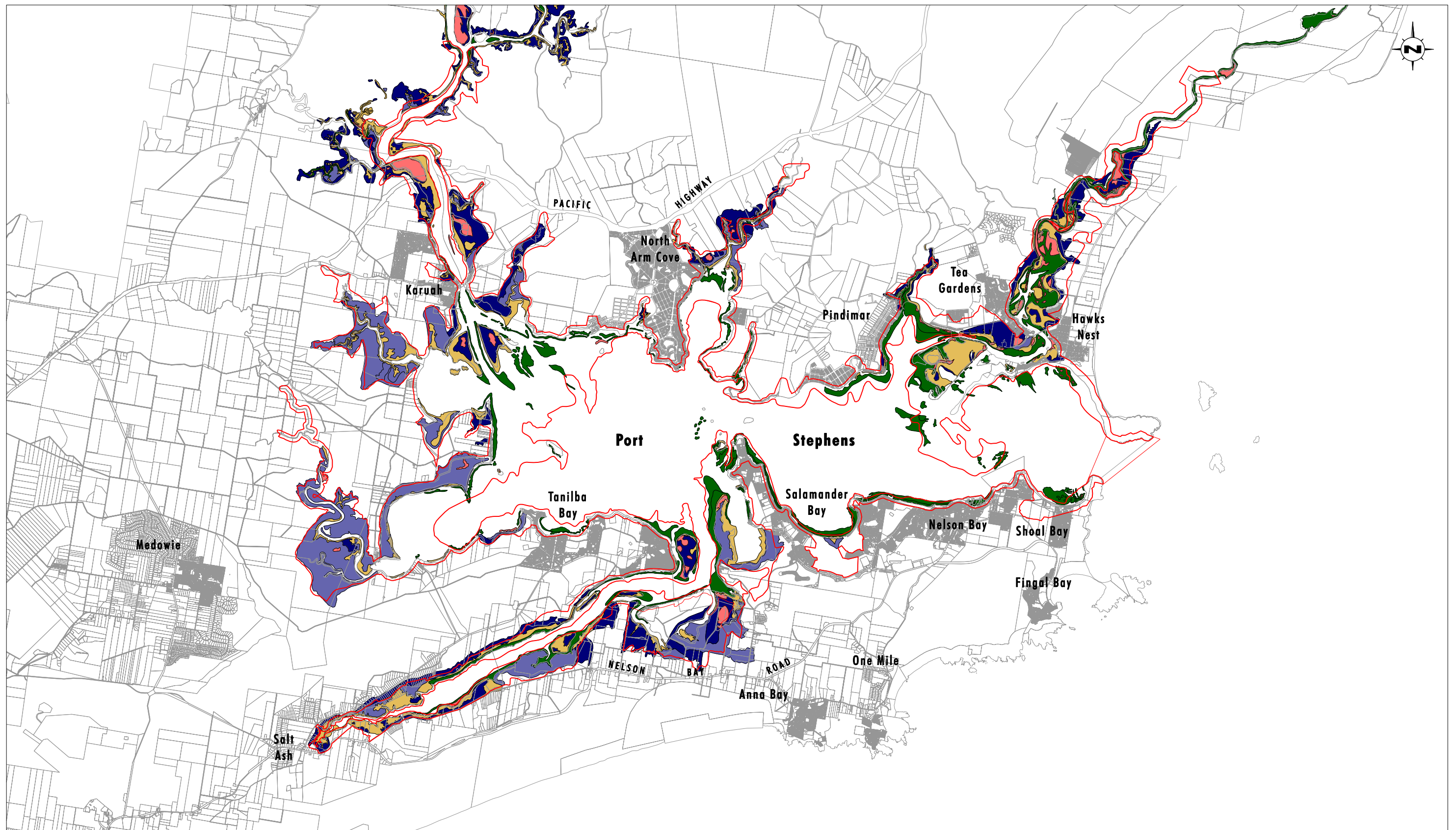
In addition to seagrass, mangrove and saltmarsh habitats also provide important breeding grounds for fish species and other marine organisms such as crustaceans and molluscs. A comparison between aquatic habitat mapping undertaken by NSW Fisheries in 1985, and revised mapping in 2004, shows that there has been very little change in the distribution of mangrove and saltmarsh habitats.

4.1.7 Corridors

The area included under this Management Plan encompasses a very narrow strip of the foreshore, which in itself does not provide any substantial corridor connections. However, the foreshore vegetation often adjoins larger, landward remnants which do contribute to the linkage of important habitats throughout the LGA.

Due to development occurring throughout the length of the southern foreshore, there is no continuous link of foreshore vegetation, rather a series of linear remnants which, in most instances, are dissected from landward remnants by busy roads such as Foreshore Drive, Victoria Parade, Shoal Bay Road and Soldiers Point Road. These roads would only be barriers to the less mobile species that travel between remnants on the ground such as koalas (*Phascolarctos cinereus*), brush-tailed possum (*Trichosurus vulpecula*), ring-tailed possum (*Pseudocheirus peregrinus*), reptiles and amphibian species including the threatened wallum froglet (*Crinia tinula*).

There is good connectivity between habitats of the northern foreshore, as the vegetation is more continuous, having few barriers to movement. There are some concentrations of development which may influence the movement of species, however, the majority of development within the northern foreshore occur on larger-style lots which retain a significant proportion of canopy vegetation, and therefore linkages between remnant bushland is somewhat maintained. However, there is often an absence in the understorey vegetation on private land, the lack of which creates barriers for less mobile species such as those listed above.



Source: LPI NSW (2000), Great Lakes Council, Port Stephens Council
 Note: Seaward study area boundary defined by -2 metre (AHD) contour.

0 2 4 6km
 1:120 000

- Legend**
- ▭ Study Area
 - ▭ Mangrove
 - ▭ Mangrove/Saltmarsh Communities
 - ▭ Saltmarsh Communities
 - ▭ Seagrass
 - ▭ Other

FIGURE 4.3
Aquatic Habitat

Future strategic land use planning for the foreshore should take into consideration connectivity between foreshore habitats and landward habitats, such that future developments do not lead to their further fragmentation.

4.1.8 SEPP 14 – Coastal Wetlands

Forty percent of the Port Stephens Foreshore management area is classified as SEPP 14 – Coastal Wetland. As shown on **Figure 4.4**, SEPP 14 wetland occurs throughout a large proportion of the study area, covering a total area of 4989.7 hectares. Each of the 14 Management Zones features SEPP 14 wetland, with the greatest area occurring in Management Zone F3, which supports 1213 hectares of SEPP 14 wetland.

4.1.9 SEPP 26 – Littoral Rainforest

Some scattered remnants of Littoral Rainforest occur in management zone F2 on the Yacaaba headland of Myall Lakes National Park (**Figure 4.4**) and also some very small areas within management zone A1, which lies within Tomaree National Park. SEPP 26 requires that the likely effects of any proposed development be thoroughly considered in an environmental impact statement. The policy applies to 'core' areas of littoral rainforest as well as a 100 metre wide 'buffer' area surrounding these core areas, except for residential land and areas to which SEPP No. 14 - Coastal Wetlands applies (Department of Planning 2006).

4.1.10 SEPP 44 – Koala Habitat

A total of 447 hectares of preferred koala habitat occurs within the Port Stephens Foreshore area within the Port Stephens LGA, in addition to 104 hectares of supplementary habitat, and 215 hectares of marginal habitat. These areas are mapped in the Port Stephens Council Comprehensive Koala Plan of Management. Any development application prepared within the Port Stephens and Great Lakes LGA will automatically trigger assessment under SEPP 44.

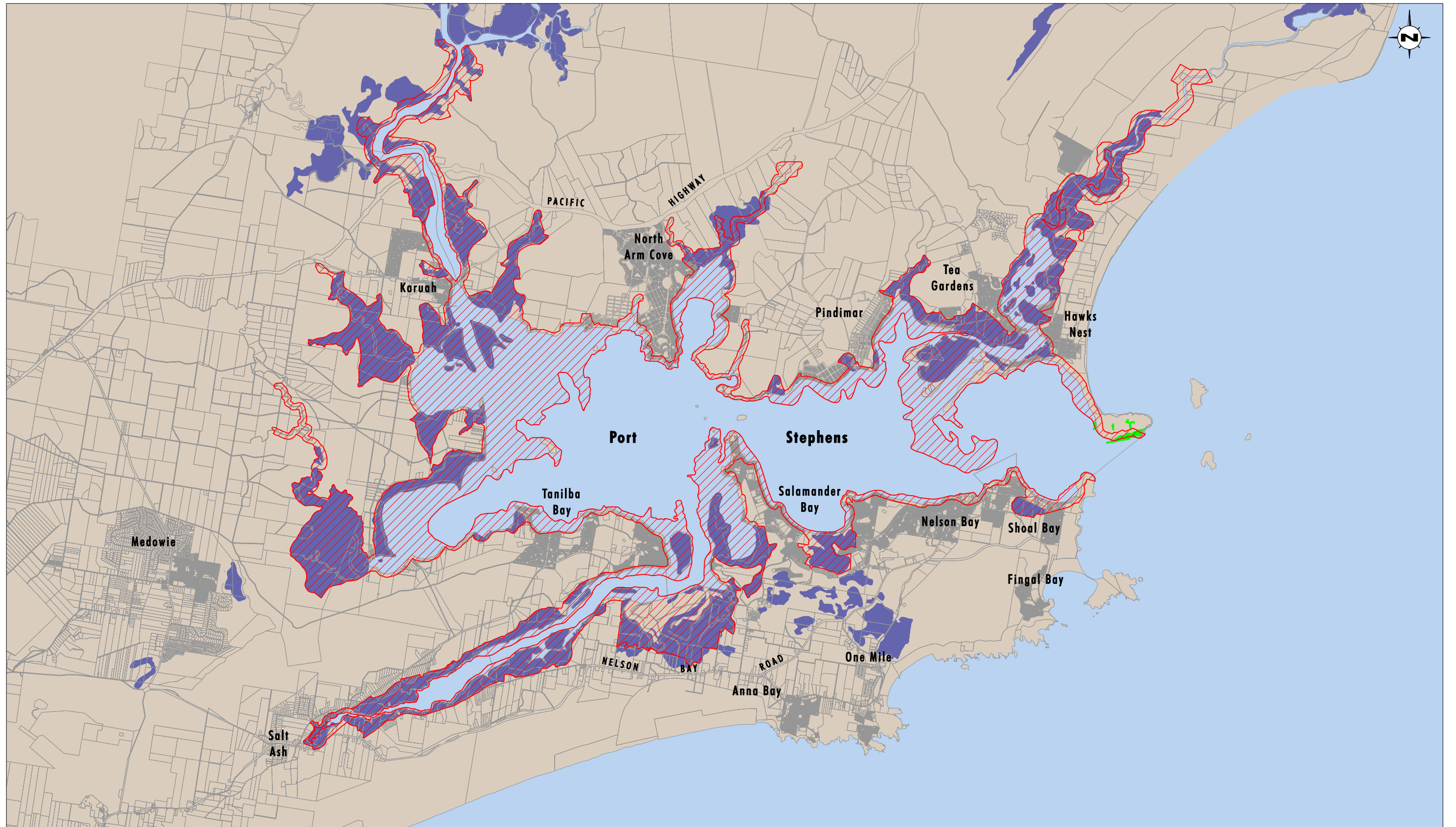
The vegetation of the Port Stephens Foreshore supports a number of known feed trees for koalas, including swamp mahogany (*Eucalyptus robusta*), forest red gum (*Eucalyptus tereticornis*), scribbly gum (*Eucalyptus signata*) and grey gum (*Eucalyptus punctata*).

A comprehensive Koala Plan of Management has not been prepared for the Great Lakes LGA.

4.1.11 Important Shorebird Habitat

Port Stephens is a highly significant area for shorebirds, providing large areas of important habitat for migratory and resident shorebirds, with 32 species being identified since the 1970s (Stuart 2004). Port Stephens is important all year round for larger shorebird species such as godwits, curlews and whimbrels, while a very large number of some smaller species of shorebirds occur in Port Stephens in winter. There are much fewer records for medium-sized shorebirds (Stuart 2004). Many of the shorebirds are migratory, returning annually to the northern hemisphere where they breed in the warmer climate.

Significant shorebird roosting locations include Jimmys Beach, Winda Woppa Point, Corrie Island, Pindimar Bay (amongst ship wrecks), Oyster leases off Tahlee, Karuah River, Wurrung Island, north of Swan Bay, oyster leases off Swan Bay, west of Tanilba Bay, oyster leases off Oyster Cove, Oyster Cove, Cromarty's Bay, Mud Point, east of Fenninghams Island, Mud Island Tilligerry Creek, the wetlands at Salamander Bay and Shoal Bay and north of Mud Island (Stuart 2004). Saltmarsh communities are a very important habitat component for shorebirds, as they provide a broad range of essential foraging resources.



Source: LPI NSW (2000), Great Lakes Council, Port Stephens Council
 Note: Seaward study area boundary defined by -2 metre (AHD) contour.

0 2 4 6 km
 1:120 000

Legend

- Study Area
- SEPP 14
- SEPP 26

FIGURE 4.4

SEPP 14 Wetlands and SEPP 26 Littoral Rainforest

The *Biology and Management of Waders in NSW* (Smith 1991) identifies Port Stephens as a Priority 2 site for NSW, the reasoning for this is as follows:

‘The most important NSW site for the whimbrels, and one of the two most important sites for the eastern curlew. Both these species and the pacific golden plover have been recorded in numbers over the 1% level. The estuary also supports a remnant population of bush stone-curlew. It is a large estuary which has only been partly covered in most surveys. Wader numbers may well be larger than indicated.’ (Smith 1991).

4.2 Key Threats to Foreshore Biodiversity

4.2.1 Land Clearing

Since settlement of Port Stephens, residential development has continually been encroaching on the foreshore environment, particularly around the southern foreshore. Land clearance and the filling of wetland habitats for the establishment of housing and associated infrastructure have seen the loss of a large proportion of the southern foreshore of Port Stephens, and are slowly encroaching on the northern foreshore areas. More recently, the rate of development of the foreshore has slowed, largely due to increased awareness of the environmental consequences of building close to the foreshore. However, there is concern for the areas of vegetation that remain, particularly on the northern foreshore of Port Stephens where there has been relatively little development to date.

The population of villages on the northern foreshore of Port Stephens, in the Great Lakes Council Area, is currently much lower than those on the southern foreshore. However, the signs for increasing pressure for urban development are clearly apparent in this area and can be expected to increase as travelling times to Sydney are reduced by improvements to the Pacific Highway (Umwelt 2003). Given that the majority of landholdings on the northern foreshore are private, the protection of high conservation values will be dependent upon future management decisions of private land holders.

4.2.2 Introduced Species

The vegetation of the Port Stephens area has been invaded by a large number of introduced flora, both terrestrial and aquatic species. Bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*), and lantana (*Lantana camara*) are considered to be the most significant terrestrial weed species, occurring extensively throughout the foreshore area. A number of aquatic weed species have been identified within wetland areas, including ludwigia (*Ludwigia longifolia*), water lettuce (*Pistia stratioides*), salvinia (*Salvinia molesta*), alligator weed (*Alternanthera philoxeroides*) and water hyacinth (*Eichhornia crassipes*).

The highly invasive nature of most of these weed species has resulted in a simplification of the ecosystems in which they have colonised, with many native species being out-competed for space.

The assessment of each individual zone for weed management issues was outside the scope of this project. However, it is likely that one or several introduced flora species would occur in all areas of remnant vegetation within the foreshore zone.

4.2.3 Threats to Koala Habitat

Historically, a major impact on koala populations of the Port Stephens LGA has been the clearing of habitat. This is still occurring to some extent, however the rate has slowed dramatically, and there is legislation in place which controls development in areas containing koala habitat. What remains is a patchy distribution of habitat remnants throughout the LGA, occurring amongst residential development. In this urban environment amongst which many remaining koala populations occur, the key threats include predation by domestic dogs and cats, fatality through vehicle collision, invasion of habitat by weed species, bushfires and bushfire protection measures.

The northern foreshore of Port Stephens has experienced less development than the southern foreshore, and therefore supports a greater area of continuous koala habitat. The future conservation of this habitat is dependent on future planning decisions made in regards to the use of private land.

4.2.4 Threats to EECs

The spread of urban development has greatly reduced the distribution of several communities within the Port Stephens foreshore area, consequently these communities have been listed as EECs to protect them from further development pressures. Many of the remaining areas of these EECs are highly fragmented from past clearing activities, and are further threatened by continuing fragmentation and degradation, impacts associated with urban stormwater, rubbish dumping, invasion of introduced species, clearing of understorey vegetation for bushfire protection, altered fire regimes and flood mitigation and drainage works.

4.2.5 Tree Poisoning

The poisoning of trees in foreshore areas by residents to retain water views is becoming a major issue along the majority of the southern foreshore of Port Stephens, on private, Crown and Council owned land. This is causing loss of mature trees important for habitat and foreshore stabilisation, as well as affecting the scenic amenity of the foreshore. Council is investigating innovative options to increase the success rate of prosecutions and discourage tree poisoning offences.

4.3 Current Management Actions – Protecting Foreshore Biodiversity

There is a number of existing management actions currently in place that aim to conserve the significant ecological values of the Port Stephens Foreshore. These management actions address many of the key threats identified in **Section 4.2**.

- Tree Preservation Orders;
- Port Stephens Council Bush Regeneration Program;
- Land Zoning;
- Port Stephens Comprehensive Koala Plan of Management;
- Protection within National Parks and Nature Reserves;
- Fly Point – Halifax Aquatic Reserve;

- Coastal Weeds Action Group;
- Wetland Identification and Prioritisation Study;
- Council and Crown reserve plans of management;
- Significant Tree Register;
- Recovery Plans and Threat Abatement Plans;
- Mambo Wetland Plan of Management; and
- Environmental Protection Legislation and Planning Controls.

The continued implementation of these existing management actions will play a significant role in the conservation of the important foreshore environment.

4.4 Identified Management Actions for High Priority Conservation Areas

Twelve areas of high conservation significance have been identified within the Port Stephens Foreshore area. These areas are considered to be of high significance because they support large, intact areas of significant ecological features such as EECs, habitat for threatened species, significant wetland areas (such as saltmarsh, seagrass, mangrove) or important roosting areas for shorebirds. Each of these high conservation significance areas are listed in **Table 4.2**, which provides a summary of the significant features, and identifies the current land zoning of these areas.

Some of these high conservation areas are already protected in a National Park, Nature Reserve or other NPWS estate, however there are some areas which remain in private ownership. In light of this, the conservation of the ecological values of these areas will be dependent on future planning decisions in relation to that land. These high conservation areas should be given special consideration in planning policies and development applications. Existing legislation already protects many of the features of high conservation areas, for example SEPP 14 protects significant wetlands, the *TSC Act* requires consideration be given to threatened species, populations and ecological communities and their habitat during the Environmental Assessment (EA) process and SEPP 44 provides protection to koalas and their habitats.

Although many of the ecological values of these high priority conservation areas are afforded protection under current management regimes, additional management actions have been identified to further protect these values. Identified management actions for each of the high priority conservation areas are provided in **Table 4.2**.

Table 4.2 – Management Recommendations for High Priority Conservation Areas

No.	High Priority Area	Foreshore Management Zone	Land Zoning	Key Features	Management Actions
1	Bagnalls Beach Reserve	A2	6(a)	<ul style="list-style-type: none"> – Swamp oak floodplain forest EEC. – Preferred koala habitat. – Seagrass beds. – Significant linear strip of foreshore vegetation connecting Corlette Point Reserve to Fly Point Reserve. 	<ul style="list-style-type: none"> – Consider rezoning/DCP (see Section 8.1.3). – Preparation of a Plan of Management to coordinate the undertaking of bush regeneration and habitat enhancement activities specific to this reserve. – Undertake regeneration activities to increase habitat values. – Manage maintenance and recreational uses to minimise disturbance to ecological values (see Section 4.5.2).
2	Fly Point Reserve	A2	6(a)	<ul style="list-style-type: none"> – Swamp Sclerophyll Forest EEC. – Preferred koala habitat. – Relatively large foreshore remnant in an otherwise developed area. 	<ul style="list-style-type: none"> – Consider rezoning/DCP (see Section 8.1.3). – Undertake regeneration activities to increase habitat values. – Manage maintenance and recreational uses to minimise disturbance to vegetation (see Section 4.5.2).
3	Mambo Wetlands Reserve	A3	7(a)	<ul style="list-style-type: none"> – SEPP 14 wetland. – One of few remnants of freshwater wetland EEC in Port Stephens. – Swamp Sclerophyll Forest EEC. – Significant wetland area. – Seagrass beds. 	<ul style="list-style-type: none"> – Continue to implement and monitor management actions set out in the Mambo Wetland Plan of Management. – Manage maintenance and recreational uses to minimise disturbance to vegetation (see Section 4.5.2).

Table 4.2 – Management Recommendations for High Priority Conservation Areas (cont)

No.	High Priority Area	Foreshore Management Zone	Land Zoning	Key Features	Management Actions
4	Stoney Ridge Reserve		6(a)	<ul style="list-style-type: none"> – Preferred koala habitat areas. – Swamp Sclerophyll Forest EEC. – Relatively large reserve protecting a continuous remnant of foreshore vegetation. 	<ul style="list-style-type: none"> – Consider rezoning/DCP (see Section 8.1.4). – Preparation of a plan of management to co-ordinate the undertaking of bush regeneration and habitat enhancement activities.
5	The entire foreshore of Cromarty's Bay	B1	1(a)	<ul style="list-style-type: none"> – SEPP 14 wetland. – Preferred koala habitat. – Coastal saltmarsh EEC. – Swamp Sclerophyll Forest EEC. – Significant areas of important shorebird roosting habitat. – Significant wetland habitat. 	<ul style="list-style-type: none"> – Rezoning/DCP and acquisition (see Section 8.1.4). – Alternatively, encourage private land owners to enter into conservation agreements to protect foreshore vegetation.
6	Foreshore of Mallabula including Mallabula Point	C1	6(a)	<ul style="list-style-type: none"> – Significant preferred koala habitat area. – Swamp Sclerophyll Forest EEC. – Important foreshore remnant in an area where much of the foreshore vegetation has been developed. 	<ul style="list-style-type: none"> – Manage maintenance and recreational uses to minimise disturbance to vegetation (see Section 4.5.2). – Undertake regeneration activities where appropriate to increase habitat values. – Preparation of a Plan of Management to co-ordinate the undertaking of bush regeneration and habitat enhancement activities specific to this reserve.

Table 4.2 – Management Recommendations for High Priority Conservation Areas (cont)

No.	High Priority Area	Foreshore Management Zone	Land Zoning	Key Features	Management Actions
7	Tilligerry Nature Reserve and Tilligerry Creek	B1, B2, B3	6(a), some of 1(a)	<ul style="list-style-type: none"> – SEPP 14 wetland. – Preferred koala habitat. – Coastal Saltmarsh EEC. – Significant areas of important shorebird roosting habitat. 	<ul style="list-style-type: none"> – Consider rezoning/DCP (see Section 8.1.4). – Implement management actions outlined in the Tilligerry Creek Catchment Management Plan.
8	The foreshore of Twelve Mile Creek	C2	Mostly 5(a) with small areas of 7(a). In the upper scattered 1.	<ul style="list-style-type: none"> – SEPP 14 wetland. – Preferred koala habitat. – Swamp Sclerophyll Forest EEC. – Coastal Saltmarsh EEC. – Areas of important shorebird roosting habitat. – Significant wetland habitat. 	<ul style="list-style-type: none"> – Implement management actions outlined in the Twelve Mile Creek Catchment Management Plan.
9	The foreshore of Reedy Creek (Worimi Nature Reserve)	C3	7(a) mostly, with 1(a) in upper parts	<ul style="list-style-type: none"> – SEPP 14 wetland. – Significant areas of saltmarsh and mangroves. 	<ul style="list-style-type: none"> – Encourage private owners to enter into conservation agreements to protect foreshore vegetation.
10	The entire area of the northern foreshore from Karuah to Hawks Nest.	C3, E, F2,	Largely 7(a), with some 2(a), 7(b), 8(a)	<ul style="list-style-type: none"> – Significant, continuous foreshore vegetation. – Significant areas of seagrass beds around foreshore. – Areas of SEPP 14 wetland. – Areas of coastal saltmarsh EEC. – Several threatened species records. – Significant areas of important shorebird roosting habitat. – Important koala habitat areas. 	<ul style="list-style-type: none"> – Consider rezoning/DCP and acquisition (see Section 8.1.5). – Encourage private land owners to enter into conservation agreements to protect foreshore vegetation. – Prepare a Koala Habitat Plan of Management for Great Lakes LGA.

Table 4.2 – Management Recommendations for High Priority Conservation Areas (cont)

No.	High Priority Area	Foreshore Management Zone	Land Zoning	Key Features	Management Actions
11	Corrie Island Nature Reserve.	F1	7(a)	<ul style="list-style-type: none"> – SEPP14 wetland. – Coastal Saltmarsh EEC. – Mangrove and saltmarsh habitat. 	<ul style="list-style-type: none"> – Currently protected and managed under NPWS estate – no further protection considered necessary at this point in time.
12	Myall Lakes National Park	F3 (and upstream)	8(a)	<ul style="list-style-type: none"> – SEPP 14 wetland. – Extensive areas of saltmarsh/mangrove habitat along the Myall River. – Important koala habitat areas. 	<ul style="list-style-type: none"> – Currently protected and managed under NPWS estate – no additional protection considered necessary at this point in time.

4.5 Management Actions for Protection of Biodiversity

Section 4.4 identifies management actions for specific areas of the Port Stephens foreshore. This section identifies those management activities which relate to the whole of foreshore, rather than specific areas. These management actions have been established with the view to encourage the ecological sustainable use of the foreshore, promote recreational activities whilst minimising the impact on the foreshore by community use.

4.5.1 Protection of Shorebird Roosting Habitat

As discussed in **Section 4.1.11**, disturbance to resting shorebirds by human activities is recognised as a major issue in the conservation of shorebirds (DEH 2005a), as it increases their energy expenditure. Given that a large proportion of the foreshore of Port Stephens is utilised by humans for recreation or other purposes, it is difficult to manage human disturbance. Although developments that have already occurred cannot be reversed, the location of important shorebird roosting habitat should be considered for any future developments in the Port Stephens Foreshore.

In Port Stephens, infrastructure associated with the derelict oyster leases provide important high tide roosts for shorebirds (Stuart 2004 – Survey of Shorebirds of Port Stephens). Due to their significance as habitat for shorebirds, old oyster leases and emergent posts should be retained until alternative roosting options are available.

A further threat to shorebird habitat is the invasion of mangroves into saltmarsh communities. This is occurring due to a number of factors such as changes to natural hydrology and also increases in sediment along the foreshore. It is important to recognise which areas around the Port are experiencing significant mangrove encroachment, and consequently undertake preventative and remediation measures where necessary. The removal of mangroves should only be undertaken after thorough analysis of the site, as it can cause foreshore erosion if not conducted properly. A program for removal of mangroves to protect the saltmarsh of Tilligerry Creek is set out in the Draft Tilligerry Creek Catchment Management Plan (Earth Tech 2006).

4.5.2 Tree Planting and Maintenance of Parks and Reserves

Many of the parks and reserves along the foreshores of Port Stephens currently support large, mature trees which provide both scenic and habitat values. In some areas there is no recruitment of younger trees occurring due to routine mowing of the understorey. Consequently, when the existing trees become old and dangerous and need to be removed, there will be no trees already established to take their place.

In order to plan for the future loss of scenic trees in foreshore parks and reserves, it is recommended that plantings of suitable canopy trees be undertaken in appropriate locations. The provision of trees for habitat should be a consideration in the selection and positioning of trees. Initiatives to encourage residents to plant local tree species on private land should also be considered.

Additionally, guidelines for the appropriate management and maintenance of Reserves by Council workers and community groups such as Landcare should be prepared. The suggested content of such guidelines is contained in **Appendix 4**.

4.5.3 Encourage Native Planting on Private Property

There are many areas of the Port Stephens foreshore which are privately owned, particularly along the northern foreshore. It is recommended that Council pursue initiatives to encourage

private land holders to establish native plant species, enhancing the habitat values of the foreshore.

In order to assist private land holders in choosing the right species, Council should develop a planting guide, detailing suitable species for planting in particular, environments, including foreshores. The planting guide should also provide information on local nurseries that supply locally native plant species. Additionally, Landcare groups, local nurseries and community groups such as the Tilligerry Habitat could be engaged to propagate plants for revegetation purposes.

4.5.4 Foreshore Stability

Foreshore erosion and perceived foreshore erosion in Port Stephens has generally been addressed using 'hard' engineering solutions such as seawalls, which provide no habitat value and often impact on nearshore seagrass beds. While the large scale removal of existing structures is not feasible, new structures in areas where the foreshore is still relatively natural should not be authorised (see **Section 10.5.2**). Native vegetation, which protects the foreshore against soil erosion and also provides important habitat, should be encouraged around the length of the foreshore.

4.5.5 Conservation Agreements

Conservation agreements allow for landholders to ensure the protection of important biodiversity features of their land, and to gain assistance with the management of these important features. There are a number of forms of conservation agreements, including Voluntary Conservation Agreements (VCAs), Wildlife Refuges and Property Vegetation Plans. These three types are discussed in further detail in the following sections. It is strongly recommended that Council seek to encourage and provide incentive for landholders of significant parcels of land to enter into a Conservation Agreement, particularly along the northern foreshore, where the majority of land is privately owned. It has been recommended that Council seek to acquire land on the northern foreshore, and rezone that land for conservation purposes. Where this is not an option, a Conservation Agreement on the private land may be an alternative to provide protection of foreshore biodiversity values.

A property vegetation plan has been prepared for Mambo Wetland Reserve, the agreement being between the CMA and Port Stephens Council. The plan protects the biodiversity values of the reserve, and has enabled funding to be sought for weed management.

4.5.5.1 Voluntary Conservation Agreements

A VCA is a joint agreement between landholders and the Minister for the Environment which provides permanent protection for special features of the land. The area under the agreement is registered on the title of the land ensuring that if the land is sold, the agreement and management requirements remain in place. Owners of freehold land, lessees of Crown land and local councils are eligible to enter into these agreements, and may be eligible for rate relief and tax deductions as an incentive for entering into the agreement. The agreement can apply to the whole of the land, or parts of the land that contain special features of significance.

Landholders of VCAs have access to assistance from the NPWS, who offer services such as property management planning advice, biodiversity surveying and assessment assistance, information and practical advice about conservation management strategies, links and contacts with like-minded people, notes and news on particular management issues and ecology, signs, access to education programs and activities and assistance programs to support implementation of management plans. Financial assistance may also be provided to assist with the implementation of actions outlined in the management plan for the VCA.

Voluntary agreements result in significant conservation outcomes on private land where management is often difficult to regulate and conservation cannot usually be certain. This ensures that significant biodiversity features are conserved in the future, and that important management actions are being implemented to protect and enhance these features.

4.5.5.2 Wildlife Refuges

Wildlife refuge declarations enable landholders to nominate part or all of a property where the land has native wildlife values and will be managed for this purpose. With whole property management, landholders can continue to include agricultural and other land uses with the conservation of wildlife.

With assistance from the NPWS staff, a property report and management plan is prepared outlining a scheme of operations. These plans are tailored for each property, ensuring that other property management objectives can be achieved while improving and maintaining native wildlife protection and conservation. A wildlife refuge declaration is free and has flexibility, with options enabling landholders to change the Wildlife Refuge status as required.

4.5.5.3 Property Vegetation Plans

A property vegetation plan is a voluntary but legally binding agreement, under the *Native Vegetation Act 2003*, between the landholder and the local CMA. A property vegetation plan will clarify what can be done with native vegetation on a property and give certainty that the agreement will continue for the period of the plan. The clearing provisions of a property vegetation plan last for up to 15 years.

A property vegetation plan has the following benefits:

- provides long term security so that native vegetation on a property can be better managed for both financial and environmental outcomes;
- provides clearing provisions that last up to 15 years, reducing the need for repeated development applications;
- provides the basis for providing financial support to farmers to improve the condition of native vegetation on their property;
- provides consistency between agreed management actions on a property and priorities in the local Catchment Action Plan; and
- provides clarification for existing use.