Department of
Environment and Conservation (NSW)

Conservation Assessment of Lands - South Wallarah Peninsula

1. Study Area Name: South Wallarah Peninsula

2. Assessed by:

Sharon Davern, Conservation Assessment Officer, Conservation Assessment and Data Unit, Environment Protection and Regulation Division

3. Previous Investigation:

A number of previous studies have been used in the preparation of this report and are listed in the reference section.

4. Background

The Wallarah Peninsula Alliance (WPA) is a coalition of community and environmental groups (including the NPA) which is proposing the establishment of a national park on the Wallarah Peninsula which would link Wallarah National Park in the north, Munmorah State Conservation Area (SCA) to the south and Lake Macquarie SCA to the south-west. The area was first recommended as a State Park in 1969 by the Hunter-Manning National Parks Association and there is a well-documented history of support for its protection.

The subject site is located approximately 25km south of Newcastle on the Wallarah Peninsula, Lake Macquarie. The site incorporates approximately 1850ha of a wide range of landscapes including large areas of intact bushland, former mine sites, coastal frontage to the Pacific Ocean and frontage to Lake Macquarie.

The majority of the subject lands are within the boundary of former Consolidated Coal Lease 706 and are now primarily in the ownership of two coal mining companies (Coal and Allied Ltd and Coal Operations Australia Ltd (COAL)), and Rosecorp (a development company which purchased land from COAL in 2002). Additional landholders include Darkinjung Local Aboriginal Land Council, NSW Government (Crown Land) and Wycob. A mine rehabilitation plan has been adopted for restoration of disturbed areas of the coal lease.

To the immediate north of the subject area lies the 180 ha Wallarah National Park, a reserve created as part of the proposed development of the North Wallarah Peninsula by Lensworth Pty Ltd. The development of the 600ha North Wallarah site has focussed attention on the remaining natural lands on the peninsula. Until 2001 the ownership of the majority of the South Wallarah Peninsula was divided between two coal mining companies Coal Operations Australia Limited (COAL, owned by BHP

Billiton) and Coal and Allied (Rio Tinto). Approximately 365ha of COALs landholdings were then sold to a company whose primary shareholder (80%) is Sydney based development company Rosecorp Pty Ltd.

While no large scale development has been formally proposed for the southern section of the peninsula, a development application on the lands owned by Rosecorp in the vicinity of Catherine Hill Bay has been received by Lake Macquarie City Council. The local community and conservation groups are extremely nervous about the potential for larger scale development proposals for the area.

5. Reasons for investigation:

This conservation assessment has been undertaken to provide a broad assessment of the conservation values of the South Wallarah Peninsula. There is currently no master planning process for the study area and individual rezoning and subsequent development proposals submitted over time have the potential for incremental loss of biodiversity values resulting in a significant cumulative impact.

The DEC recognises this potential threat and the Minister for the Environment has requested that the Minister for Infrastructure, Planning and Resources initiate a planning process for the South Wallarah Peninsula to ensure that a strategic approach to proposed development is taken for the land. This conservation assessment will assist any future strategic planning activities undertaken for the peninsula.

The assessment will undertake a brief audit of existing data for the site and where possible consider the conservation value of the site in a regional context.

It should be noted that this report has been prepared using existing data. There has been no field inspection to assess the level of degradation across the site.

6. Approximate size:

1850 hectares

7. Location:

South Wallarah Peninsula between Caves Beach and Pinny Beach in the north, to Lake Munmorah in the south and Chain Valley Bay in the west.

Electorates: Swansea, Milton Orkopoulos

LGA: Lake Macquarie
Wyong

County: Northumberland
Parish: Wallarah
IBRA Bioregion: Sydney Basin
IBRA Subregion: SB6 Wyong
NPWS Area: Lakes Area
NPWS Region: Central Coast Hunter Range

An airphoto of the study area is shown in Fig 1.

Figure 1

South Wallarah Study Area
NPWS Reserves

South Wallarah Study Area

Department of Environment and Conservation (NSW)

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8. Tenure and planning framework:

The site consists of the following lots and DPs and respective tenures. A map of land tenure is also shown in Fig 2. Areas (ha) given below are approximate only.

COAL	Coal and Allied	Darkinjung LALC	Rosecorp	Wycob	Crown
1/549905 2/549905 465/755266 1/226133	16/755266 22/593154 27/222943 1/938223 200/702669 12/854197 5/736170 6/746077 1/588793 57/755266 29/755266 16/755266 2030/841175	646/1027231 643/1027231 644/1027231 7064-3070	2031/841 175 2/809795 6/774923 2/809795 5/774923	2/249281 3/249281 4/249281 5/249281 6/249281 7/249281 11/598580 12/598580 13/598580	642/1027231 354-3070 648/1027231 647/1027231 649/1027231 645/1027231 531/755266 532/755266 512/755266 511/755266 141/755266 493/755266 145/755266

- ***Lake Macquarie LEP***

A new LEP for Lake Macquarie Council was gazetted in March 2004. The 920ha (approx) of the peninsula which lies within lake Macquarie City Council area is divided into 5 zonings.

The South Wallarah site is predominantly zoned:

7(1) Conservation (Primary)
with the remainder of the site zoned:
7(4) Environmental (Coastline)
6(1) Open Space
5 Infrastructure *(corridor for existing Pacific Hwy)*
9 Natural Resources

Details on controls that apply to lands within each zone can be obtained from Lake Macquarie City Council.

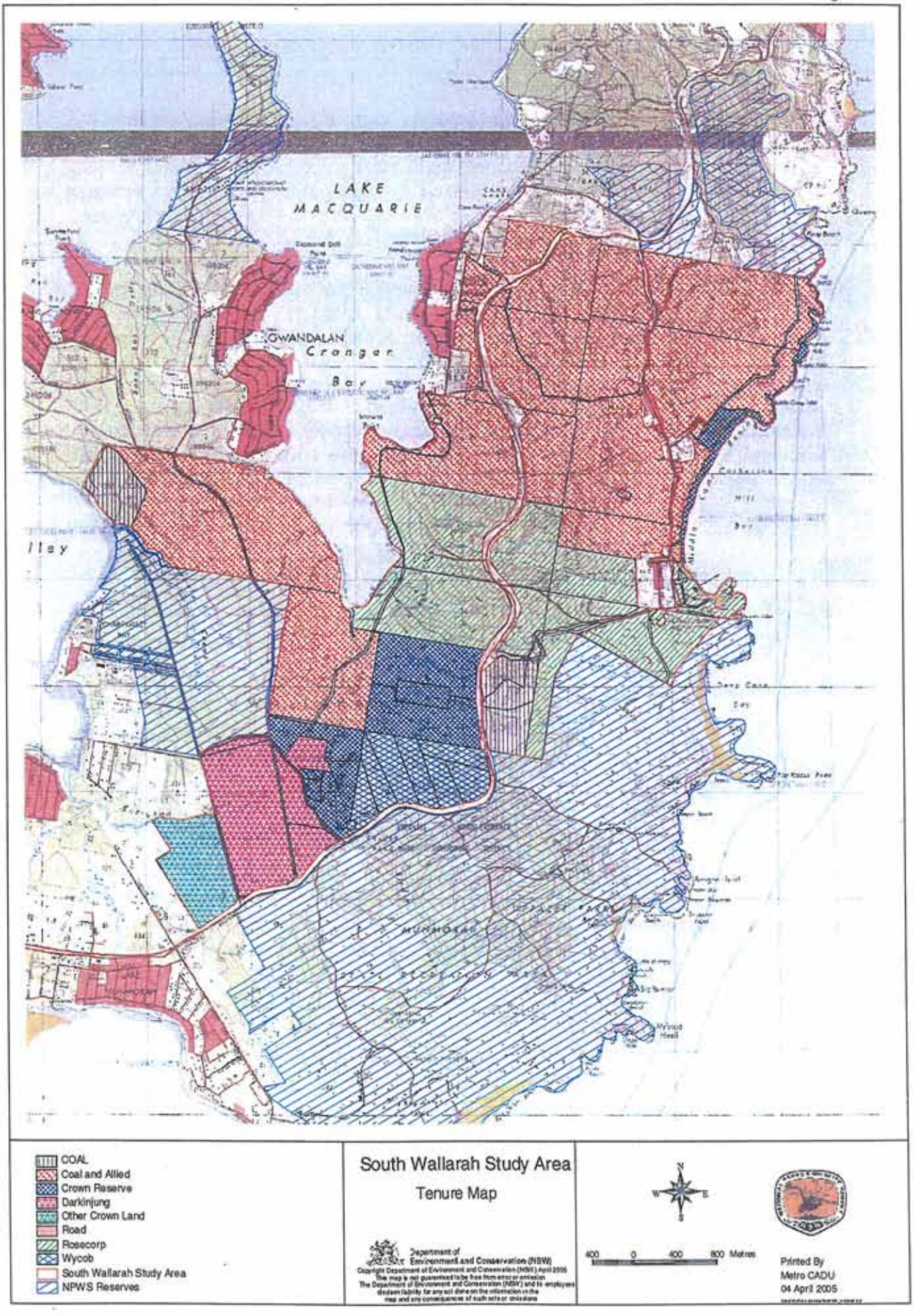
- ***Wyong Council LEP***

The Southern section of the study area lies within Wyong Shire. Wyong LEP 1991, details the zoning for the southern section of the study area and covers approximately 930 ha of the South Wallarah Peninsula.

Zonings within Wyong Shire are:

7(a) Conservation
7(b) Scenic Protection
7(e) Coastal Land Acquisition
7(g) Wetlands Management
6(a) Open Space and Recreation
5(a) Special Use (Power Station)

Figure 2


LAKE
MACQUARIE
GWANDALAN
Cronger
Bay
COAL
Coal and Allied
Crown Reserve
Darkinjung
Other Crown Land
Road
Rosecorp
Wycob
South Wallarah Study Area
NPWS Reserves
South Wallarah Study Area
Tenure Map
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Details on Controls which apply to lands within each zone can be obtained from Wyong Council.

The majority of the site is also covered by Consolidated Coal Lease 706. Underground mining as part of the lease ceased in 2002. Rehabilitation of disturbed areas is to be undertaken as part of a Mine Rehabilitation Plan that is currently being prepared by Lakecoal. It is expected that sections of the lease will be revoked as rehabilitation is completed.

9. Natural Values

The South Wallarah Peninsula study area together with Munmorah and Lake Macquarie SCAs and Wallarah National Park is the largest area of coastal vegetation between the Hawkesbury River in the south and the Hunter River in the north (See Figure 3). Its significance lies in the connection between the coast and Lake Macquarie and the connection it provides between the three conservation reserves. The majority of the site supports good quality vegetation cover with some areas of high disturbance associated with past mining activity and ongoing quarries and mine rehabilitation. The site supports a number of Endangered Ecological Communities, contains wetlands of state and regional significance as well as habitat for a number of threatened plant and animal species.

9.1 Physical Features

The site is located approximately 4 kilometres south of Swansea. It lies immediately north of the Lake Munmorah township and abuts the townships of Gwandalan and Nords Wharf in the west and surrounds Catherine Hill Bay to the east The site straddles the Pacific Highway and lies between the Pacific Ocean to the east and Lake Macquarie to the west. Topography varies from low lying drainage depressions, the fringe of Lake Macquarie and the coastal cliffs and beaches to the central ridges of the eastern section of the site which supports the highest point at 96m asl.

9.1.1 Geology

The South Wallarah study area is comprised of four landscape units dominated by Erosional landscapes of the Awaba and Doyalson soil landscapes.

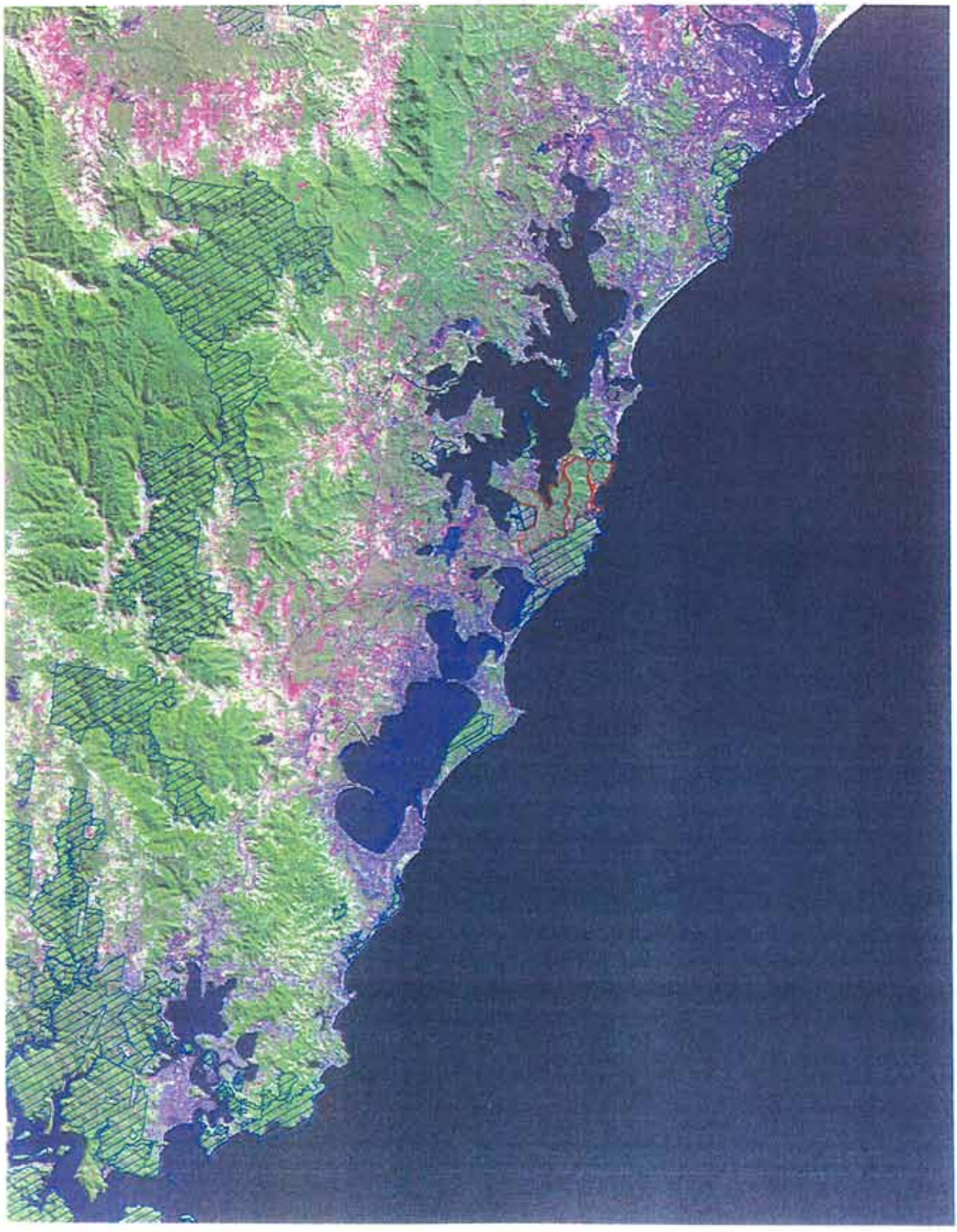
- ***Awaba Soil Landsape***

This soil landscape is defined by low rolling hills on predominantly coarse-grained sediments of the Narabeen Group and Newcastle Coal Measures. It dominates the eastern half of the site between Wallarah National Park and Munmorah SCA and predominantly supports coastal heaths and woodlands.

- ***Doyalson Soil Landscape***

Doyalson soil landscapes generally support open eucalypt forest and are found as gently undulating rises on Munmorah Conglomerate. This landscape unit surrounds the edges of Lake Macquarie and dominates the western section of the study area between Gwandalan and Lake Munmorah.

Figure 3



South Wallarah Study Area
NPWS Reserves

Regional Location

South Wallarah Study Area

Department of Environment and Conservation (NSW)

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- ***Wyong Soil Landscape***

Pockets of the Alluvial Wyong Soil Landscape occur across the study area and are represented as broad poorly drained deltaic floodplains and alluvial flats of Quaternary sediments. These areas are subject to flooding and seasonal waterlogging and are located around the fringe of the lake with smaller occurrences on the coast.

- ***Norah Head Soil Landscape***

The Aeolian Norah Head soil landscape occurs as elevated undulating sandsheet dunefields and plains on coastal headlands within the study area and support heathland and some areas of woodland.

- ***Narrabeen Soil Landscape***

The Narrabeen is a Beach Landscape and occurs within the study area at Catherine Hill Bay. While normally devoid of vegetation, spinifex grassland/herblands and closed scrub can occur on this landscape.

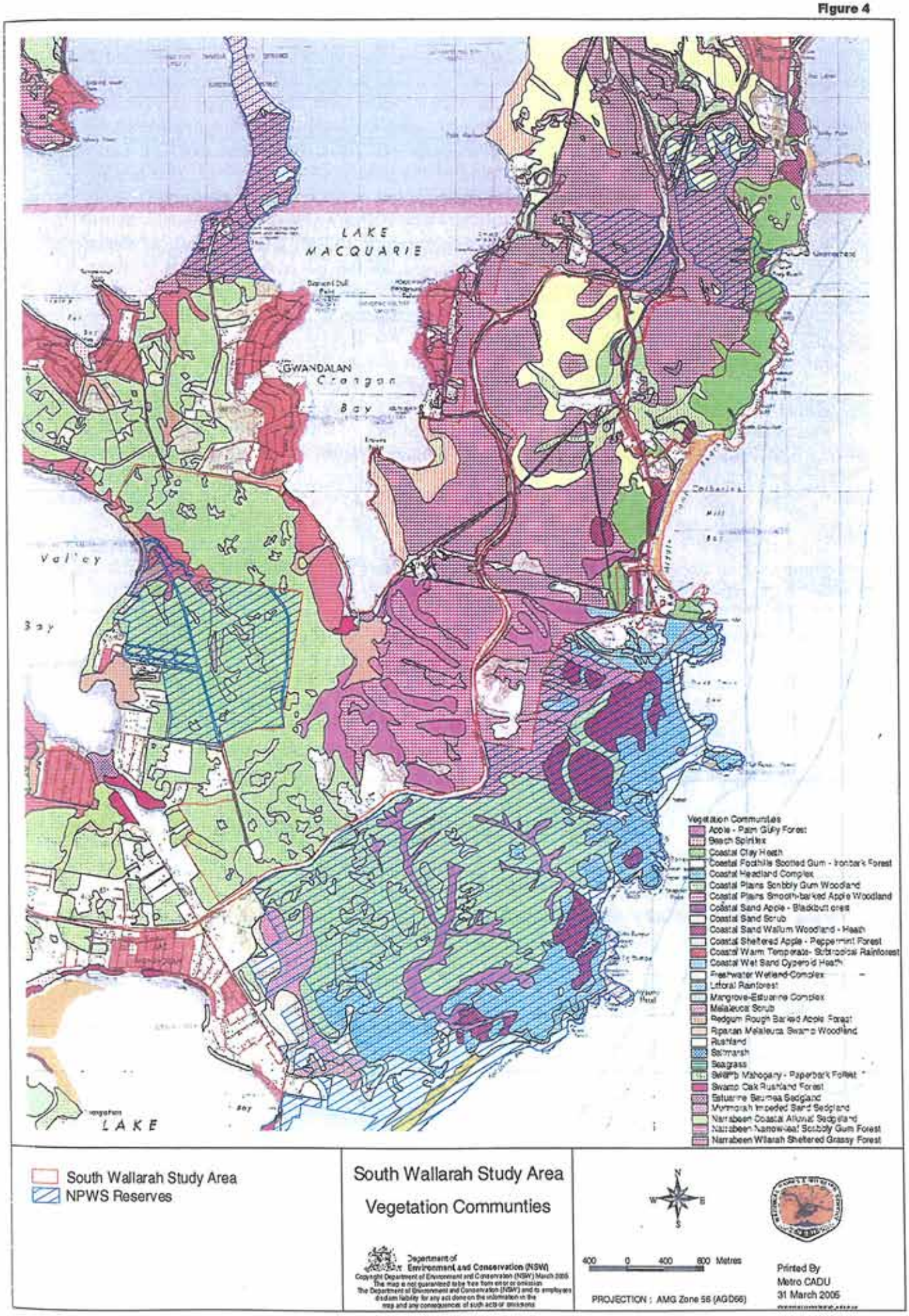
9.2 Vegetation communities

Vegetation communities across the study area have been mapped within two separate programs. The Natural Vegetation of the Wyong Local Government Area (Bell 2002) is mapped at a scale of 1:4000 and covers the southern section of the study area which falls within Wyong LGA. Within the study area it identifies 14 vegetation communities dominated by Narrabeen Doyalson Coastal Woodland (336 ha), and Narrabeen Wallarah Sheltered Grassy Forest (230 ha), and includes Munmorah Palm Apple Dry Drainage Line Forest (108 ha) and Narrabeen Impeded Wet Heath (56 ha). Full descriptions of the vegetation communities can be found in Bell 2002.

The entire site was mapped in 2000 by the DEC (formerly NPWS) as part of the Lower Hunter and Central Coast Regional Environmental Management Strategy (LHCCREMS). This mapping, broadly undertaken at a scale of 1:25,000, was undertaken at a regional level and while it is extremely useful in identifying regional vegetation priorities, where reliable finer scale mapping is available it is preferred. As the Wyong vegetation mapping is at a scale of 1:4000 it has been used for the Wyong portion of the study area. The LHCCREMS mapping has been used to identify vegetation communities within Lake Macquarie LGA. It identifies 14 vegetation communities across the section of the site within Lake Macquarie LGA which varies from the dominant Coastal Plains Smooth - barked Apple Woodland (497ha) to Coastal Clay Heath (92ha) and Swamp Mahogany – Paperbark Forest (47ha). Full descriptions of the vegetation communities can be found in NSW NPWS (2000).

Bell (2002) has undertaken an assessment of vegetation communities in the Wyong report against those in the NPWS (2000) report, to identify which communities clearly align in both reports and which do not. A Conservation Significance assessment was also completed for Wyong communities to identify those under greatest threat and those which are poorly represented in the conservation reserve system. An assessment of clearing levels and reservation status has also been undertaken for the communities identified in NPWS (2000).

Figure 4


LAKE MACQUARIE
GWANDALAN
Cragan
Bay
Valley
Bay
LAKE
Vegetation Communities
Apple - Palm Gully Forest
Beach Spinifex
Coastal Clay Heath
Coastal Foothills Spotted Gum - Ironbark Forest
Coastal Headland Complex
Coastal Plains Scribbly Gum Woodland
Coastal Plains Smooth-barked Apple Woodland
Coastal Sand Apple - Blackbutt Forest
Coastal Sand Scrub
Coastal Sand Wallum Woodland - Heath
Coastal Sheltered Apple - Peppermint Forest
Coastal Warm Temperate- Subtropical Rainforest
Coastal Wet Sand Cyperoid Heath
Freshwater Wetland Complex
Littoral Rainforest
Mangrove-Estuarine Complex
Melaleuca Scrub
Redgum Rough Barked Apple Forest
Riparian Melaleuca Swamp Woodland
Rushland
Saltmarsh
Seagrass
Swamp Mahogany - Paperbark Forest
Swamp Oak Rushland Forest
Estuarine Baumea Sedgeland
Myrmecia Impeded Sand Sedgeland
Narrabeen Coastal Alluvial Sedgeland
Narrabeen Narrow-leaf Scribbly Gum Forest
Narrabeen Wilsons Sheltered Grassy Forest
South Wallarah Study Area
NPWS Reserves
South Wallarah Study Area
Vegetation Communties
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Within the study area 19 vegetation communities have been identified. (A map of vegetation communities across the site is contained at Figure 4.) The following section outlines the amount of each vegetation community within the study area and an assessment of its reservation status. For NPWS (2000) communities which only occur in Lake Macquarie LGA (6 communities), regional reservation and clearing figures are presented. For communities which occur in NPWS (2000) and in Bell (2002) for which there is a clear alignment (8 communities), regional figures are also presented. For communities which only occur within Wyong LGA or for which clear alignment with NPWS (2000) communities does not occur (5 communities), local clearing and reservation figures within Wyong LGA are used.

- ***Coastal Plains Smooth-barked Apple Woodland 497 ha (NPWS MU 30)***

Within the LHCCREMS Region this community has the second highest area extant of all the vegetation communities. It has experienced relatively low levels of clearing with 68% of the pre 1750 distribution remaining. However, despite such high levels of extant area of the community still remaining, only 6% of pre 1750 and 8% of extant area is represented in the reserve system.

- ***Coastal Plains Scribbly Gum Woodland 409 ha (NPWS Mu 31, Bell Comm 23,31)***

Coastal Plains Scribbly Gum Woodland has the second highest area contained within the South Wallarah study site. This community has experienced 44% clearing within the LHCCREMS Region but has low levels of reservation at 3% of pre 1750 and 5% of extant area present in the conservation reserve system.

- ***Narrabeen Wallarah Sheltered Grassy Forest 230 ha (Bell Comm 33)***

This community has some affinity with NPWS Mu 30 but is not directly aligned. Within Wyong Shire this community has experienced limited amounts of clearing (8%) however it is only predicted to have covered approximately 400ha pre 1750. Within Wyong Shire this community has less than 1% represented in the reserve system.

- ***Apple – Palm Gully Forest 122 ha (NPWS MU 39, Bell Comm 25)***

Within the LHCCREMS Region this community is restricted to the eastern side of Lake Macquarie in the Catherine Hill Bay Area. Due to the localised nature of this community, the finer scale mapping of the Wyong area has identified a higher number of extant examples of this community than in the REMS mapping. The South Wallarah study area contains 44% of the extant area of this community. At a regional level this community has 63% present in conservation reserves, however this is an over estimate due to the more detailed mapping in Wyong which has shown that more examples of the community occur. Re-calculations based on the finer scale mapping indicate that 47% of the community is present in conservation reserves.

- ***Coastal Foothills Spotted Gum – Ironbark Forest 98 ha (NPWS MU 15)***

Within the LHCCREMS Region this community has undergone relatively high levels of clearing with only 38% of the pre 1750 distribution of the community remaining. It is only moderately represented in the conservation reserve system with 7% of pre 1750 and 11% of extant area conserved.

- ***Coastal Clay Heath 92 ha***

(NPWS MU 48)

Within The LHCCREMS Region 71% of the pre 1750 modelled distribution of this community remains. It is well conserved with 28% of pre 1750 and 40% of the extant area of the community present in conservation reserves.

- ***Swamp Mahogany - Paperbark Forest 47 ha***

(NPWS MU 37)

This community forms part of the *Swamp Sclerophyll Forest on Coastal Floodplains Endangered Ecological Community* (EEC). Within the LHCCREMS Region it has undergone high levels of clearing with only 35% of pre 1750 distribution remaining. It is poorly conserved with only 3% of pre 1750 and 9% of extant area protected in conservation reserves.

- ***Narrabeen Narrow-leaf Scribbly Gum Forest 45 ha***

(Bell Comm 32)

This community has alliances with NPWS Mu 31 Coastal Plains Scribbly Gum Woodland however the dominant Scribbly Gum differs. Within Wyong Shire this community has experienced high levels of loss with 64% of the pre 1750 distribution cleared. It is also poorly conserved with only 0.05% of extant area reserved.

- ***Redgum Rough Barked Apple Woodland 35 ha***

(NPWS MU 38)

This community forms part of the *River-Flat Eucalypt Forest on Coastal Floodplains EEC* . It has experienced high levels of clearing with only 34% of pre 1750 distribution remaining. As with most EECs it is also poorly conserved with 1% of pre 1750 and 2% of extant distribution reserved.

- ***Coastal Headland Complex 29 ha***

(NPWS MU 51, Bell Comm 13)

Due to the exposed rocky nature of this community it has undergone fairly low levels of clearing throughout the LHCCREMS Region. 81% of the pre 1750 distribution of this community remains with 71% pre 1750 present in conservation reserves.

- ***Riparian Melaleuca Swamp Woodland 26 ha***

(NPWS MU 42, Bell Comm 26)

This community forms part of the *Swamp Sclerophyll Forest on Coastal Floodplains EEC*. 49% of the community has been cleared within the REMS area however 14% of the remaining area is present within conservation reserves.

- ***Coastal Sand Wallum Woodland – Heath 16 ha***

(NPWS MU 34, Bell Comm 7a)

Within the study area this community occurs on coastal headlands east of Lake Macquarie. 41% of the pre 1750 distribution of the community has been cleared and of the remaining area 20% occurs within conservation reserves in the REMS Region.

- ***Coastal Sheltered Apple – Peppermint Forest 7 ha***

(NPWS MU 11, Bell Comm 29)

This community occurs in sheltered gullies in north eastern and northern rises behind Lake Macquarie. It has experience very high levels of clearing with only 28% of the pre 1750 distribution of the community remaining. It is also poorly reserved with only 2% of pre 1750 and 6% of extant area conserved.

- ***Munmorah Impeded Sand Sedgeland 6 ha***

(Bell Comm 21)

This community identified in Wyong in the vicinity of Munmorah SCA has affinities with NPWS Map Unit 44 Coastal Wet Sand Cyperoid Heath but is not a direct community equivalent. This community forms part of the *Freshwater Wetlands on Coastal Floodplains EEC*. Within Wyong Shire this community has a limited distribution but due to its location has experienced little clearing with 92% of the pre 1750 distribution remaining. The community is also well conserved with 73% in the reserve system.

- ***Narrabeen Coastal Alluvial Sedgeland 5 ha***

(Bell Comm 22)

This community also has affiliations with NPWS MU 44 Coastal Wet Sand Cyperoid Heath. Within Wyong Shire it is found in a few small occurrences in the Chain Valley Bay area. The community has experienced 33% clearing of its pre 1750 distribution and has low levels of reservation with only 2% of pre 1750 distribution conserved.

- ***Swamp Oak Rushland Forest 3 ha***

(NPWS MU 40, Bell Comm 3)

This community forms part of the *Swamp Oak Floodplain Forest EEC* and has undergone high levels of clearing. Only 36% of the pre 1750 distribution remains and of this only 13% is present in reserves. This equates to only 5% reservation of pre 1750 distribution within the REMS Region.

- ***Beach Spinifex 2 ha***

(NPWS 53)

No real attempt was made to accurately map this community within the LHCCREMS mapping due to its highly localised and variable location. Within the region good examples of the community occur within Munmorah SCA and Wyrrabalong NP.

- ***Estuarine Baumea Sedgeland 1 ha***

(Bell Comm 1)

This community falls within the *Coastal Saltmarsh EEC* occurring on alluvial silt and mud in close proximity to coastal estuaries. Within Wyong Shire the mapping of this community indicates that all pre 1750 examples still remain. Only small amounts are reserved however given the limited extent of the community this equates to 16 % of the original community distribution.

- ***Mangrove Estuarine Complex 0.7 ha***

(NPWS MU 47, Bell Comm 2)

Within the LHCCREMS Region this community has experienced 28% clearing of pre 1750 distribution. The community is well conserved however through inclusion in reserves such as Kooragang Island Nature Reserve with 28% of pre 1750 and 38% of extant reserved.

9.3 Significant Flora

The South Wallarah Study Area is known to support populations of at least four plant species listed on Schedule 2 of the *Threatened Species Conservation Act 1996*. Given the large area and diversity of habitats it is likely that detailed survey would reveal additional species. Locations of Threatened Plants within the study area is shown at Figure 5.

- ***Tetratheca juncea***

There are 44 known locations of T. juncea within the study area. Tetratheca juncea is restricted to coastal environments from Gosford to Great Lakes. Lake Macquarie represents a stronghold for this species which is listed as vulnerable under the NSW TSC Act (1995) and under the Commonwealth Environment Protection and Biodiversity Conservation Act (1999). Detailed information on the species is contained within the *Lake Macquarie Tetratheca juncea Conservation Management Plan* (Payne 2000).

The Plan states that both the North Wyong and Lake Macquarie LGA's are considered to be the stronghold area of the species, with the major areas in Lake Macquarie where the species is known to occur being the coastal ridgelines between Munmorah and Swansea, and Belmont and Charlestown.

The species is currently conserved in Munmorah State Conservation Area, Glenrock SCA, Lake Macquarie SCA, Wallarah National Park and Awabakal Nature Reserve. It is thought that 45 out of the 239 known sub-populations of the species are protected within these reserves. A zoning analysis was undertaken as part of this plan and this showed that 22% of the sub-populations within the LGA were within open space zones (including national park estate) and approximately 14% were within environmental protection zonings. It should be noted that these figures were based on the previous LEP. A new LEP has recently been adopted for Lake Macquarie City, however, it is unlikely that these percentages will have changed significantly. The Plan describes the main threat to the continued survival of the species as being continued urban and industrial development in the Lake Macquarie and Wyong LGA's.

- ***Diuris praecox***

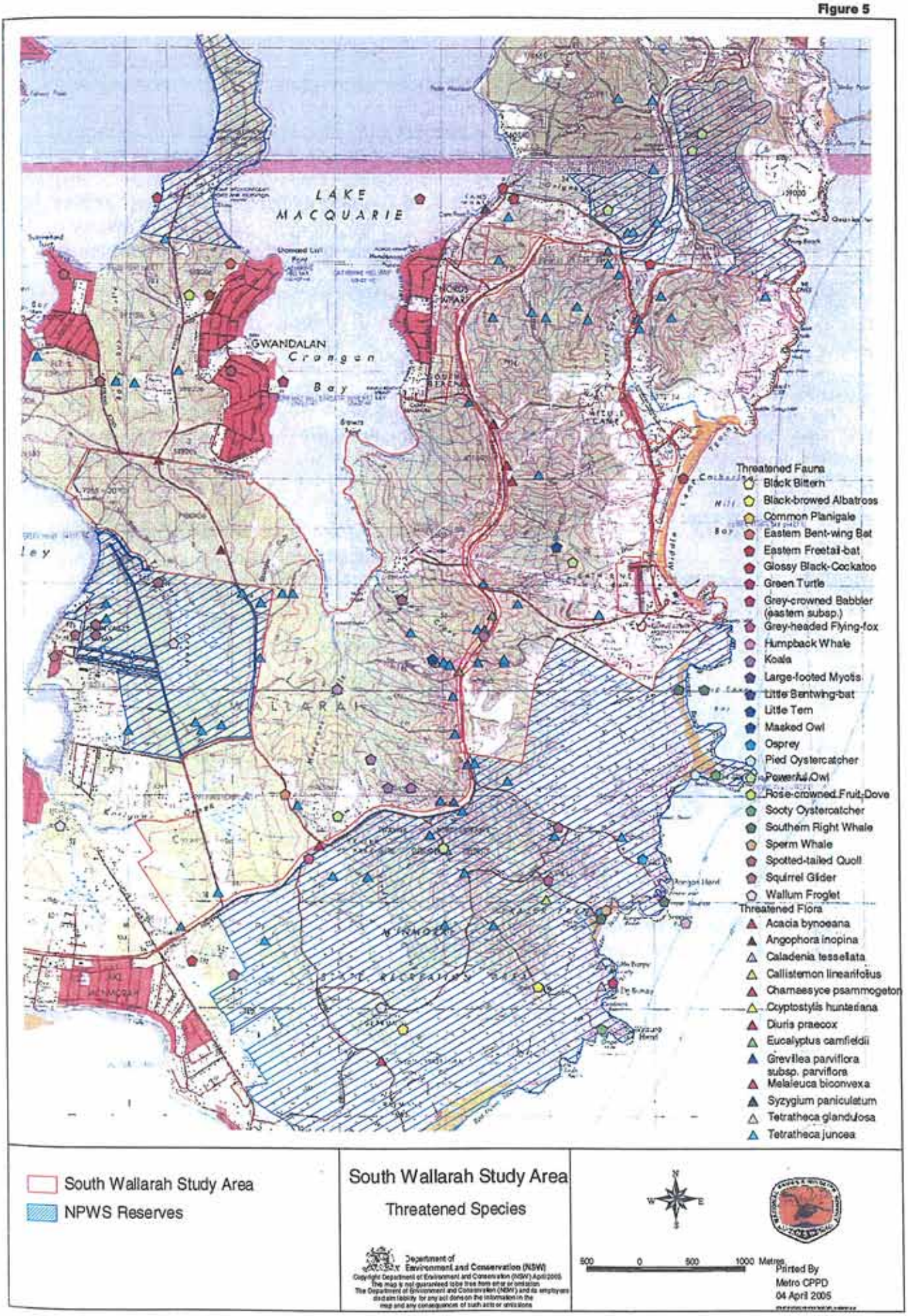
This orchid species is listed as Vulnerable under the TSC Act and occurs between Ourimbah and Nelson Bay. It grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. Due to the fact that it exists as underground tubers for most of the year, producing leaves and flower stems only in winter, means that it is difficult to locate and is vulnerable to disturbance.

Four locations of *Diuris praecox* are known from the study area with all sites in close proximity to the Pacific Hwy. This may indicate that further sampling away from the Hwy would reveal more locations of the species.

- ***Eucalyptus camfieldii***

This eucalypt species generally occurs as a mallee but can occur as a tree up to 9m high. It is found from Royal NP in the south to the Karuah area in the north. It is know from three records within the study area to the west of the Hwy in the vicinity of Crangan Creek.This species has very irregular flowering and is susceptible to too frequent fire.

Figure 5



South Wallarah Study Area

NPWS Reserves

South Wallarah Study Area

Threatened Species

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- ***Angophora inopina***

Angophora inopina is endemic to the Central Coast of NSW and while it has been recorded from Toronto in the south to Karuah in the north the main stronghold for the species is in the Wyong-south Lake Macquarie area. It is known from two sites within the study area adjacent to Kanangra Drive, north of Lake Macquarie SCA.

This species is susceptible to fire as even though it resprouts from lignotubers, fire is known to suppress flowering and therefore seed production. Changes to the watertable and hydrological processes due to residential and industrial developments and mine subsidence is also known to be a threat to this species.

9.4.1 Endangered Ecological Communities

There are five Endangered Ecological Communities which are mapped to occur across the study area. There has been no field validation of these communities within the South Wallarah Peninsula but are based on the vegetation mapping of communities which fall within the definition of the EECs as stated in the final determinations of the NSW Scientific Committee. Distribution of EECs across the site is mapped at Figure 6.

- ***Coastal Saltmarsh in the Sydney Basin Bioregion EEC***

Within the study area one vegetation community falls within this EEC. One hectare of Estuarine Baumea Sedgeland (Bell Comm 1) is mapped as occurring. This EEC occurs in the intertidal zone on the shores of estuaries and lagoons along the NSW Coast. It is frequently found as a zone landward of mangrove stands. Threats to this community include infilling, modified tidal flow, weed invasion, altered fire regime and human disturbance.

- ***Swamp Oak Floodplain Forest of the Sydney Basin Bioregion EEC***

This EEC is associated with grey-black clay loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. The community structure may vary from open forests to low woodlands, scrubs or reedlands with scattered trees.

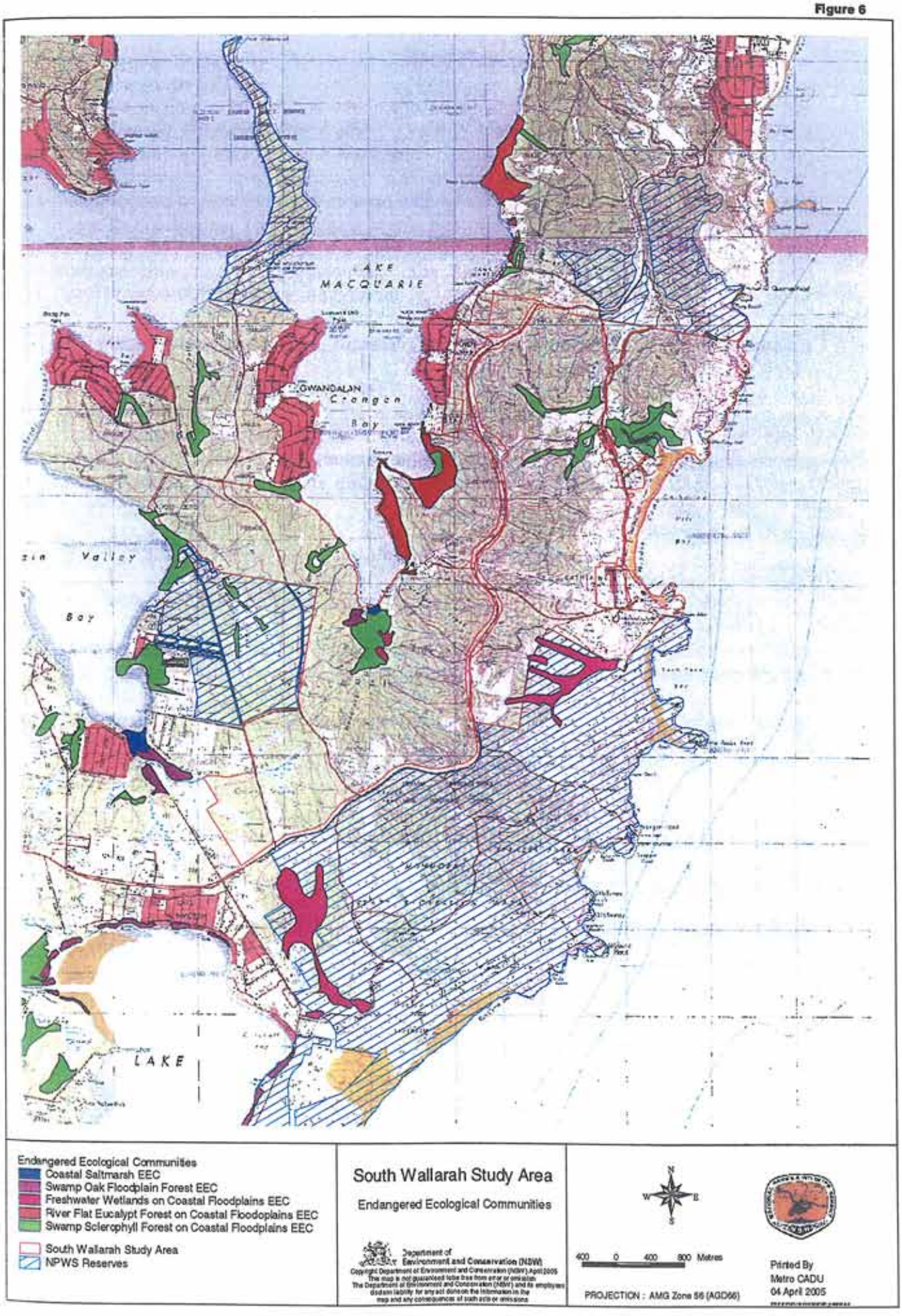
Within the study area 3 ha of Swamp Oak Rushland Forest (NPWS MU 40, Bell Comm 3) falls within the definition of this community. Swamp Oak Floodplain Forest is threatened by fragmentation and degradation, flood mitigation works, land filling and earthworks associated with urban and industrial development, pollution from runnoff, weed invasion, trampling and rubbish dumping.

- ***River-Flat Eucalypt Forest on Coastal Floodplains of the Sydney Basin Bioregion EEC***

Redgum Rough Barked Apple Woodland (NPWS MU 38) is mapped across 35ha of the study area. This community falls within the EEC determination which states that the EEC is associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. The community may vary from tall open forests to woodlands, however in some areas clearing may have reduced the canopy to scattered trees.

Remaining examples of this EEC are threatened by clearing and fragmentation, flood mitigation and drainage works, land filling and earthworks associated with urban and industrial development, pollution from runoff, weed invasion, removal of dead wood and rubbish dumping.

Figure 6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Endangered Ecological Communities
Coastal Saltmarsh EEC
Swamp Oak Floodplain Forest EEC
Freshwater Wetlands on Coastal Floodplains EEC
River Flat Eucalypt Forest on Coastal Floodplains EEC
Swamp Sclerophyll Forest on Coastal Floodplains EEC
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- ***Swamp Sclerophyll Forest on Coastal Floodplains of the Sydney Basin Bioregion EEC***

Two vegetation communities within the study area fall within the definition of this Endangered Ecological Community. Swamp Mahogany – Paperbark Forest 47 ha (NPWS MU 37) and Riparian Melaleuca Swamp Woodland 26 ha (NPWS MU 42, Bell Comm 13) are associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. The structure of this community is typically open forest however clearing may have reduced the canopy to scattered trees. Land clearing is the greatest threat to this EEC along with other forms of disturbance primarily associated with urban and industrial development.

- ***Freshwater Wetlands on Coastal Floodplains of the Sydney Basin Bioregion***

One vegetation community falls within this determination, Munmorah Impeded Sand Sedgeland (Bell Comm 21). This EEC typically occurs on silts, muds and humic loams in depressions, flats, drainage lines, backswamps, lagoons and lakes associated with coastal floodplains. This community can vary from sedgelands and reedlands to herbfields and are threatened by fragmentation and degradation, flood mitigation and drainage works and filling associated with development.

9.4.2 Regionally Significant Vegetation Communities

- ***Rare Vegetation Communities***

The National Forest Policy Statement (1992) identified nationally agreed criteria for the protection and conservation of forests in Australia. The Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia (JANIS Criteria) set out targets for the conservation of forest ecosystems. The JANIS criteria define a rare ecosystem as being one where its geographic distribution involves:

- A total range generally less than 10,000 ha
- A total area of generally less than 1,000 ha; or
- Patch size of generally less than 100 ha, where such patches do not aggregate to form significant areas.

Twenty vegetation communities within the REMS area have an extant distribution of less than 1000ha in the region. It is difficult to determine the distribution of these communities across their entire range, for some it is likely that they do occur outside the region, however the extent to which they do is uncertain. For the purposes of this study all communities which have an extant distribution less than 1000ha in the REMS region are considered to be rare vegetation communities.

Within the South Wallarah Peninsula six vegetation communities are considered rare:

Coastal Headland Complex;
Apple – Palm Gully Forest;
Coastal Sheltered Apple – Peppermint Forest;
Redgum Rough Barked Apple Forest
Coastal Clay Heath; and
Beach Spinifex.

- ***Under Reserved Vegetation Communities***

The JANIS criteria set targets for the conservation of each forest ecosystem or vegetation community. The primary criteria are:

- 15%of the pre 1750 distribution of each forest ecosystem;
- 60% of the existing distribution of each forest type if vulnerable;
- 60% of the existing old growth forest;
- 90% or more of high quality wilderness forests; and
- all remaining occurrences of rare and endangered forest ecosystems including rare old growth.

The criteria are guidelines rather than mandatory targets, designed to deliver good conservation outcomes based on the principles of a comprehensive, adequate and representative reserve system. The capacity to apply the criteria however is dependent on the available data. In this assessment pre 1750 distribution is only available within the REMS region, not across all community distributions.

In the absence of full pre1750 distribution mapping of vegetation communities which occur in the study area, the threshold which has been set to identify under reserved communities is 30% reservation of extant vegetation. (ie which communities have less than 30% of extant area contained within NPWS reserves within the REMS region).

Within the current study area under reserved vegetation communities are:

Swamp Oak Rushland Forest;
Coastal Sand Wallum Woodland – Heath;
Coastal Plains Scribbly Gum Woodland;
Riparian Melaleuca Swamp Woodland;
Coastal Sheltered Apple – Peppermint Forest;
Coastal Foothills Spotted Gum - Ironbark Forest;
Coastal Plains Smooth-barked Apple Woodland;
Swamp Mahogany – Paperbark Forest;
Redgum Rough Barked Apple Forest;
Coastal Wet Sand Cyperoid Heath; and
Beach Spinifex.

- ***Wyong Vegetation Communities***

Within the Wyong Shire vegetation mapping (Bell 2002) there are several communities which have been mapped which do not directly align with regionally identified communities. As assessment of conservation significance of all Wyong vegetation communities has been undertaken within the Vegetation Report (Bell 2002) and three additional communities have been identified as being of conservation significance within Wyong Shire. These communities all have a restricted distribution, primarily within the current study area, have high threat levels and limited representation in the conservation reserve system.

Within Wyong Shire significant vegetation communities include:

Narrabeen Coastal Alluvial Sedgeland;
Narrabeen Narrow-leaf Scribbly Gum Forest; and
Narrabeen Wallarah Sheltered Grassy Forest.

9.4 Significant Fauna

While few detailed fauna surveys have been carried out within the subject lands a number of threatened species are known to utilise the site and many more are likely to occur. Species which have been recorded on site, or in the immediate vicinity include Squirrel Glider, Powerful Owl, Masked Owl, Eastern Bent-wing bat, Little bent-wing bat, Eastern Freetail Bat, Greater Broad-Nosed Bat, Glossy Black Cockatoo and Wallum Froglet. Other threatened species considered likely to occur include Black Bittern, Little Tern, Regent Honey Eater and Swift Parrot. Locations of Threatened Fauna are shown at Figure 5.

9.5 Fauna Habitat

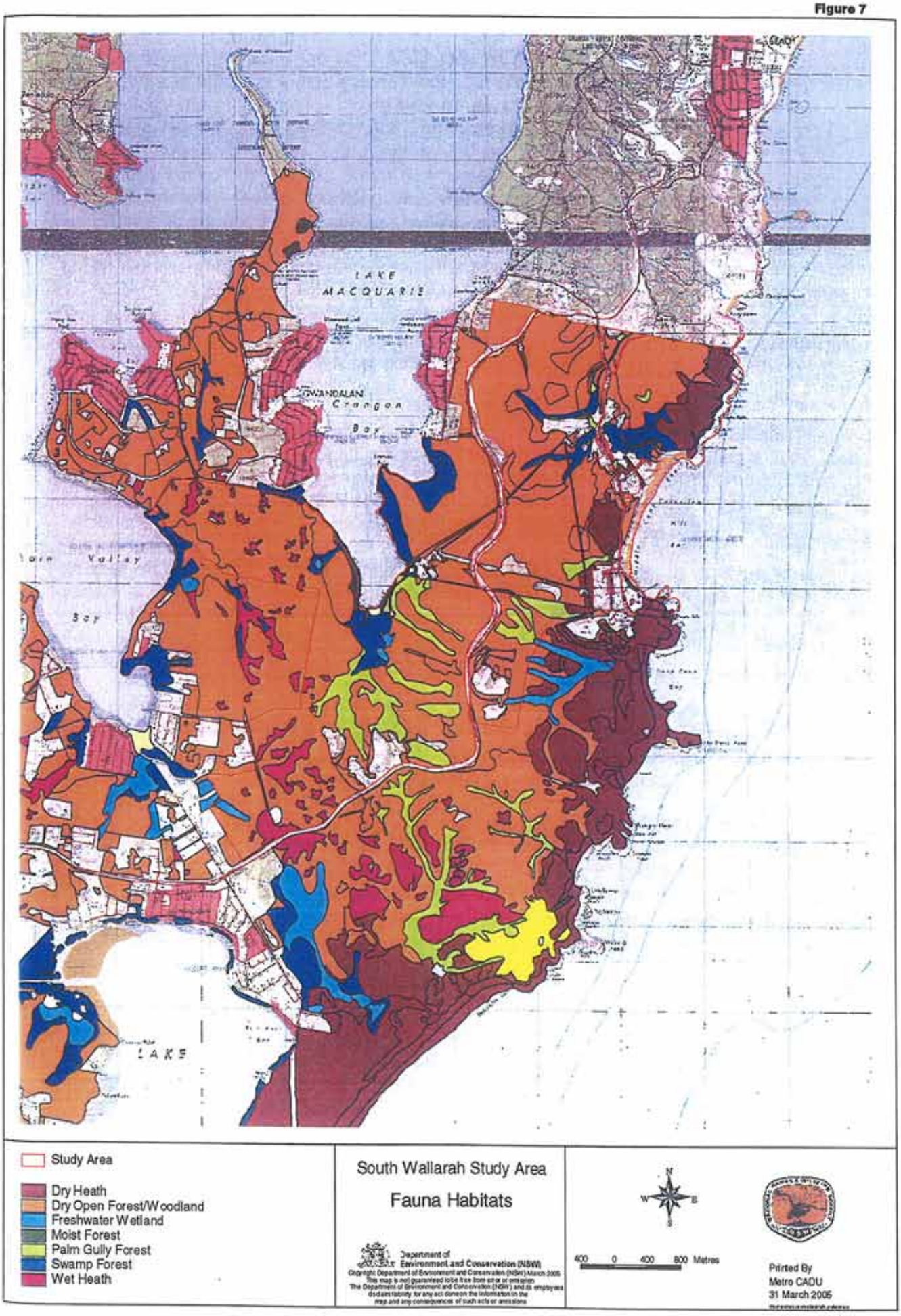
While there has been a number of fauna habitat studies of various levels of detail covering the South Wallarah Peninsula, none have covered the entire area and the majority are around 10 years old. There has been no systematic assessment of the fauna and fauna habitats of the study area. However, information contained in older reports and more recent information such as Wildlife Atlas records and fauna modelling help to identify the various fauna habitats and the known and potential areas of significance for fauna across the site.

The main significance of the site for fauna is the size. In addition to adjacent areas the study site supports a large area of vegetation which provides linkages between three conservation reserves and habitats which vary from the coast to the lake fringe. Tunra (1995) in conjunction with Fly By Night Bat Surveys undertook a fauna habitat investigation into the section of the South Wallarah Peninsula within Lake Macquarie LGA which also included the north Wallarah Peninsula. The assessment broadly defined the site into seven fauna habitats which include Dry Open Forest/Woodland, Moist Forest, Palm Gully Forest, Heath, Wet Heath, Swamp Forest, Freshwater Wetlands and Cleared/degraded areas. A similar assessment has been undertaken within Wyong Shire (Smith et al, 2002) The fauna habitats within the Wyong section of the study area can also be defined within these categories. Fauna habitats are shown in Figure 7.

The general trend across the site is of habitats running in north south bands. The coastal band is approximately 500m to 1km wide and supports mainly dry heath with smaller interspersed areas of wet heath. These heath communities provide an important foraging resource when flowering for a variety of nectivorous birds and small mammals.

The central part of the site between Munmorah SCA and Wallarah National Park comprises large areas of Dry Open Forest/Woodland which occurs in the more elevated sections of the site or on exposed slopes with shallow soils. It is the dominant habitat type within the study area. Within the Wyong section of the study area the larger drainage lines and sheltered gullies surrounded by Dry Open Forest/Woodland support Palm Gully Rainforest which is a significant community providing a fruit source for species such as the Grey Headed Flying Fox and rainforest pigeons. The vegetation mapping for the northern section of the site does not indicate Palm Gully Rainforest in the drainage lines and sheltered gullies to the same extent as in the southern section. As the vegetation mapping in the northern section is at a coarser scale and is based on modelling rather than ground truthing or air photo interpretation, it would be expected that more detailed mapping would reveal the presence of this rainforest community in gullies and drainage lines as in the southern section of the site.

Figure 7



Study Area

Dry Heath
Dry Open Forest/Woodland
Freshwater Wetland
Moist Forest
Palm Gully Forest
Swamp Forest
Wet Heath

South Wallarah Study Area

Fauna Habitats

Department of Environment and Conservation (NSW)

N
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400 0 400 800 Metres

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Between Munmorah SCA and Lake Macquarie SCA to the north west, the dominant habitat type is also Dry Open Forest/Woodland however the change in topography and geology from the eastern rolling hills on Awaba Soil Landscapes to the gentle undulating rises of the Doyalson Soil Landscapes mean that the deeper drainage lines and sheltered gullies are replaced by more gentle drainage depressions. Within this section of the site these depressions support Wet Heath habitats. In combination with the surrounding dry woodlands these habitats are of high importance to aquatic fauna such as the Wallum Froglet and the combination of the summer flowering eucalypts and the winter flowering banksias provides an important habitat for nectar feeding animals such as the Squirrel Glider.

The Swamp Forest and Wetland habitats are present throughout the study area however the Swamp Forests which are of high significance are primarily located around the foreshore of Lake Macquarie and in a central section of the site around Middle Camp.

Across the number of studies which include the study area, two habitats consistently arise as being of highest significance. The first is based on a keystone food resource, the Swamp Mahogany and Forest Redgum which are the main Winter flowering eucalypts on the NSW coast. These species are within the Swamp Forest habitats and are particularly important for nectivorous birds such as the Swift Parrot (*Lathamus discolor*) and Regent Honeyeater (*Xanthomyza phrygia*) as well as smaller mammals such as possums and gliders. This resource, in addition to a variety of Banksias is also critical for the Squirrel Glider. Coastal habitats are now considered the stronghold of the Squirrel Glider in NSW and the population of Squirrel Gliders (*Petaurus norfolcensis)* in the northern Wyong and Southern Lake Macquarie area is the largest known one in the state (Smith, 2002).

The other significant resource is the Apple-Palm Gully Forests where the two dominant species are the Cabbage Palm and the Soft Corkwood. These species produce hard seeded fruits with a succulent endocarp which are a food resource in April/May for the rainforest pigeons, in particular the Topknot Pigeon.

There has been limited systematic fauna survey across the study area. Further detailed sampling effort would be required to gain a better overall picture of the fauna habitats and species present, particularly for those species affected by seasonal variation. The limited survey which has been done has revealed various degrees of past disturbance from logging and fire in particular and the history of these disturbances has greatly influenced the availability of habitat components such as tree hollows and ground cover.

9.6 Corridors

In addition to the size of the study area, the level of landscape connectivity it provides is of great significance. The site provides connections between Munmorah SCA, Lake Macquarie SCA and Wallarah National Park. It also provides connections between the coast and the lake system and encompasses a unique area which supports a distinct vegetation assemblage related to the underlying geology and the change in topography from the undulating Coastal Plain to the rolling Awaba Hills.

Figure 8

Fauna Corridors
South Wallarah Study Area
NPWS Reserves

South Wallarah Study Area

Fauna Corridors

Department of Environment and Conservation (NSW)

N
W E
S

500 0 500 1000 Metres

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The need to maintain connectivity between habitats is an underlying principle of conservation ecology. The level of habitat fragmentation within an area will strongly influence ecosystem components and processes. The landscapes of the South Wallarah Peninsula are heterogeneous and currently exhibit high levels of interconnectivity. In order to maintain a viable landscape it is essential that fragmentation of the area be limited and the high level of connectivity be maintained.

Due to the orientation of the site there are broad patterns of connectivity which must be maintained (Figure 8). The first is a north-south connection between Munmorah SCA in the south and Wallarah NP in the north. The hard physical barrier of the Pacific Hwy which bisects the site requires that two north-south linkages are required either side of the Hwy. This will ensure that the habitats within the currently fragmented Wallarah National Park will remain linked to other larger areas and limit the potential impact of edge effects such as invasion by weed and pest species, altered physical conditions such as run off, and exposure to wind and salt spray.

The second critical linkage is an east –west linkage from the ocean to the lake which transverses the highway. While the hard barrier created by the road corridor may restrict movement of some fauna species, those considered to be more mobile such as birds and even Squirrel Gliders will cross roads to move from one habitat to another (Smith, 2002). The habitats between Munmorah and Lake Macquarie SCAs and generally between Chain Valley Bay and Crangan Bay are considered to be of highest significance to the Squirrel Glider and Masked Owl (Smith et al 2002). The linkage of this area to pockets of Swamp Forest on the fringes of Lake Macquarie between Browns Point and South Beach is also considered of high significance as it maintains access to the winter flowering Red Gums and Ironbarks which are crucial for the Squirrel Glider.

10. Cultural Heritage

The traditional people of the Wallarah Peninsula were the Awabakal people. The site lies within the Bahtabah and Darkinjung Local Aboriginal Land Council areas. Very limited archaeological investigations have been undertaken in the vicinity of the study area. An archaeological assessment was undertaken of the adjoining Pinny Beach development site in 1988 and again in 1994, however due to the high degree of past surface disturbance limited sites were located (Navin Officer, 1994). No archaeological assessment of the study area has been undertaken and within the entire 1850ha area only four sites are recorded on the DEC Aboriginal Sites Register.

It is predicted that due to the high resource potential of the area with close proximity to the coast, coastal lakes and varied vegetation types that the area would have had high utilisation by the Aboriginal Community. Within the Lake Macquarie region known Aboriginal sites include coastal and estuarine shell middens, open campsites distinguishable by surface scatters of stone artefacts, axe grinding grooves, burials, quarries and scarred trees. Middens are the most commonly occurring site type (Navin Officer 1994).

10.1 Aboriginal Sites

While only four sites have been recorded within the study area approximately 80 have been recorded within a 5 kilometre distance from the centre of the site (Figure 9). These sites are primarily shell middens with artefacts and earth mounds, however scarred trees, stone and ochre quarries and an Aboriginal Ceremonial and Dreaming site have also been recorded.

The Aboriginal heritage values of the subject land have been heavily impacted upon by previous development and other activities, such as coal mining and mineral. In many places these activities have destroyed the archaeological context of the material, and will have damaged organic materials associated with these sites, such as bones, shell etc. Given that some areas of the site have experienced minimal disturbance they have the potential to contain undisturbed archaeological material.

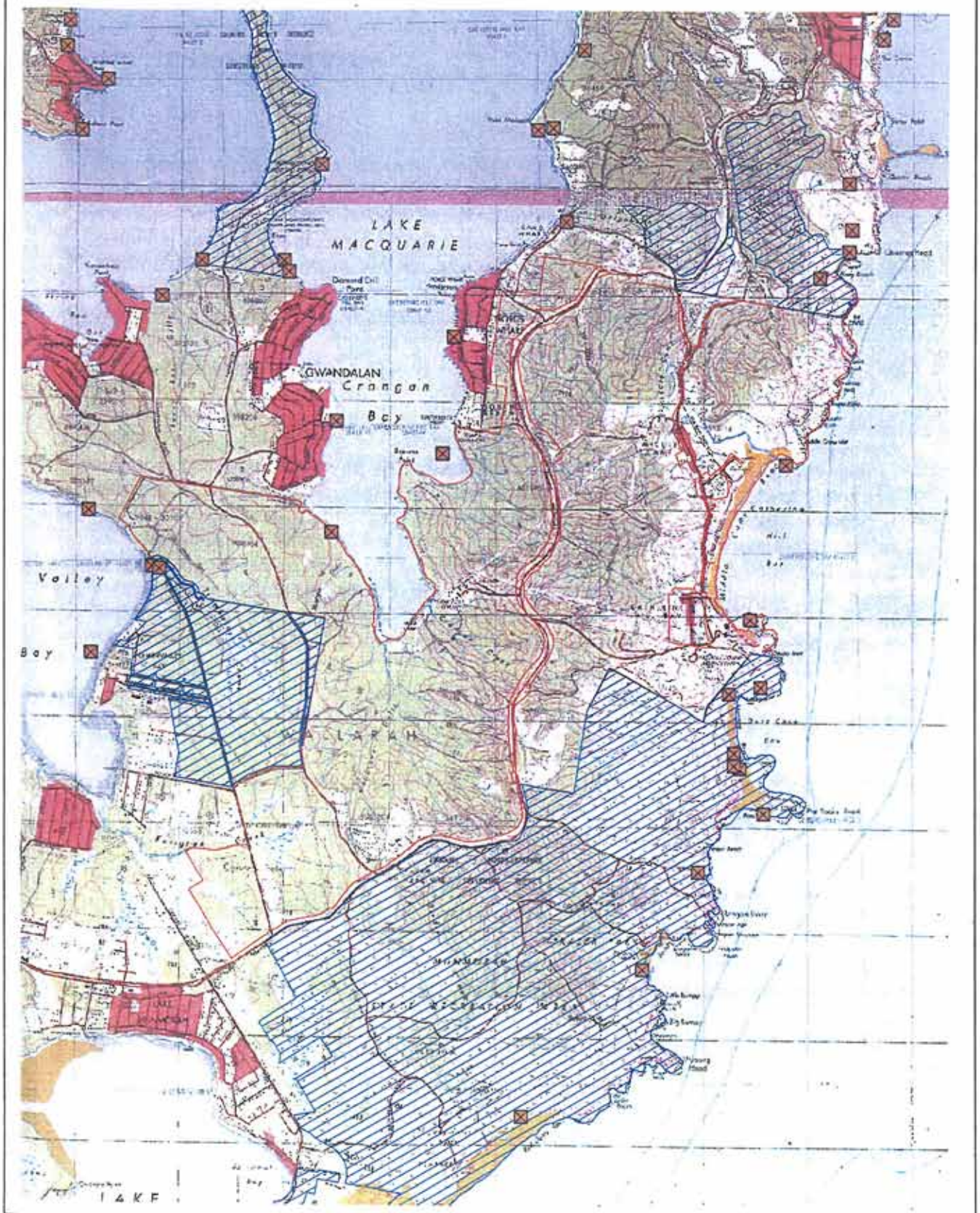
DEC Site reference	Site Name	Site Type	Status (as at 1995)
45-7-0177	Camp Kanangra;	Artefact, Earth Mound, Shell Midden	Lambert, Newton
45-7-0018	Middle Camp;	Artefact, Earth Mound, Shell Midden	ASRSYS
45-7-0016	Catherine Hill Bay;	Artefact, Earth Mound, Shell Midden	Stockton
45-7-0079	Crangan Bay; Stranger Gully;	Artefact, Earth Mound, Shell Midden	ASRSYS

Further assessment would be required to determine the significance of recorded sites within the study area and a more detailed assessment of the archaeological potential of the study area is also required. The cultural significance of these sites to the Aboriginal community is not known, nor is it known whether the study area contains other areas or places of cultural significance. Consultation with the local Aboriginal community/s would be required to determine the cultural significance of the study area.

10.2 European Historic Values

The Wallarah Peninsula Alliance has summarised the European History in section 1.6.2 of the Nomination of the Wallarah Peninsula as a National Park document. The history of the area is based on coal mining which dates between 1873 and 2002. While past mining has resulted in surface disturbance in some parts of the site including mine heads and coal washpiles, it is this history which has resulted in the preservation of the site to date. The cessation of mining in 2002 and the disposal of surface areas to development companies by at least one mining entity has placed new pressures on the study area which are likely to escalate in the coming years.

Figure 9



Aboriginal Heritage Sites
South Wallarah Study Area
NPWS Reserves

South Wallarah Study Area

Aboriginal Heritage Site Locations

Department of Environment and Conservation (NSW)

400 0 400 800 Metres

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11 Conservation Value

11.1 Rarity

The South Wallarah site contains habitat for a number of threatened plant and animal species. Four threatened plant species have been recorded on the site, and the site contains known habitat for nine threatened fauna species and provides potential habitat for at least seven more. Four state listed endangered ecological communities occur across the study area and five of the vegetation communities occurring on the site are considered to be naturally rare (ie. less than 1000ha extant within the Lower Hunter and Central Coast REMS Region).

11.2 Naturalness

The study area is large and while it has a long history of coal mining this has been underground. There area some areas of high disturbance particularly associated with the Wallarah Colliery at Moonee, and a rubbish tip, dirt bike track and several quarries along the Pacific Highway. The areas in the immediate vicinity of Catherine Hill Bay and Middle Camp have experienced clearing and disturbance associated with development, however the majority of the site supports native vegetation cover in good condition. While disturbance factors such as fire, logging, and weed invasion have occurred across the site no detailed field investigation has been undertaken to determine the extent or intensity of these impacts. Airphoto interpretation indicates that much of the site appears to be in good condition with some tracks and trails evident.

Rehabilitation of areas of the site subject to past mining disturbance are to be undertaken in accordance with the mine rehabilitation plan which is currently in preparation.

11.3 Diversity

The site is approximately 1850 ha in size. Vegetation mapping has identified at least 19 different vegetation communities which can be grouped into 7 main fauna habitats ranging from wetlands to swamp forest, dry open forests and woodlands and heath. The site is extremely diverse and includes habitats from coastal cliffs and beaches to the foreshore of Lake Macquarie and incorporates altitudinal variation from 90m asl to sea level. Much of the diversity within the site can be attributed to its location at the junction of the Coastal Plain and the Awaba Hills. This juxtaposition of geologies and landscapes has created a highly varied area which supports a high diversity of vegetation communities. Although there has not been any significant fauna survey effort for the site, the small amount of survey effort already undertaken has identified a high diversity of bird species, and small to medium mammals including two species of bandicoot (TUNRA, 1995).

The high diversity of small to medium sized mammals is considered highly significant given the location of the study area between two large urban centres. Typically, introduced predators and habitat modification heavily impact on these animals.

11.3 Representativeness

Of the 19 vegetation communities located in the study area only 5 are considered to be adequately conserved at both the local and regional scale. While most of the other 14 vegetation communities present are represented to some degree in conservation reserves in the region, they are not considered to be well replicated or adequately conserved in the reserve system.

11.4 Viability

The study area is approximately 1850 hectares and joins three existing conservation reserves containing an additional 1925 hectares of vegetation. In addition to several other vegetated areas the study site forms part of a large (over 4000ha) patch of contiguous native vegetation. The study area is large enough to support a diversity of habitats and it forms part of a broad link of coastal vegetation between Wallarah National Park, and Munmorah and Lake Macquarie SCAs. As part of this regional linkage, which together comprises a wide variety of communities and habitats, the South Wallarah site has both catchment values as well as corridor values for wildlife movement.

The long term viability of an area is influenced by a number of interrelated factors such as location within the broader landscape, nature of surrounding vegetation and land-uses, and interconnectivity. The persistence of a high diversity of birds and small to medium sized mammals in the area is a good indicator of the viability of the site. However increasing pressure from current and likely future development has the potential to result in incremental fragmentation and loss of habitat.

12. DEC Position

Due to the long term use of the South Wallarah study area primarily for underground coal mining there has been limited development pressure on the land. Land tenure was stable for many years with the majority of the site in the ownership of two mining companies and the surface lands covered by Consolidated Coal Lease (CCL) 706. The profile and potential significance of the site was raised in the mid to late 1990s and early 2000 with the proposed development of the northern end of the peninsula and the cessation of coal mining in 2002.

In February 2000 DEC (formerly NPWS) wrote to the CEOs of both Coal Operations Australia Limited and Coal and Allied regarding the significance of lands within CCL 706. DEC highlighted that in the context of increasing development in the Central Coast/Lower Hunter region that large tracts of forested lands are extremely significant and that the habitats contained within the area are not well represented in the conservation reserve system.

This position still stands, and the information contained within this report highlights that even with the limited amount of detailed survey which has been undertaken in the area the site is highly significant. The site is extremely diverse, supports habitat for a number of threatened plants, animals and vegetation communities, provides connectivity between three existing conservation reserves and contains 19 vegetation communities, 14 of which are poorly represented in the conservation reserve system. Due to the restricted and localised nature of many of these communities and habitats within the site there are limited opportunities elsewhere to ensure their adequate protection and management into the future.

It is the position of the DEC that the South Wallarah study area is of extremely high conservation value and that development opportunities across the site are limited due to the potential for incremental habitat loss and fragmentation. While some existing disturbed areas may be suitable for development without severe risk to the integrity of the remainder of the site, others will need to be rehabilitated to ensure the long term viability of the corridor network, particularly the north-south linkage on the eastern side of the highway.

Limited development opportunities are provided for within current land zonings in the Wyong and Lake Macquarie Local Environment Plans which cover the area, and the DEC supports the approach taken by both Councils to recognise the conservation significance of this area in their planning instruments.

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