



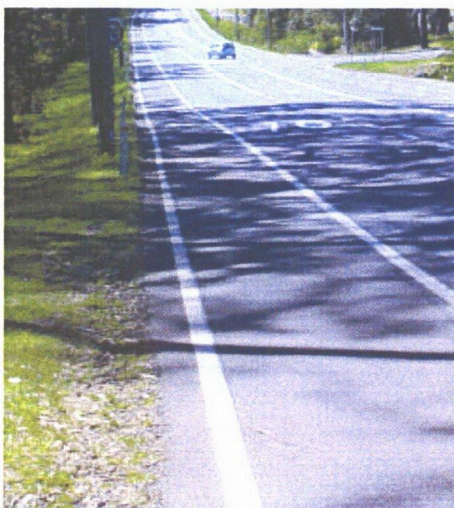
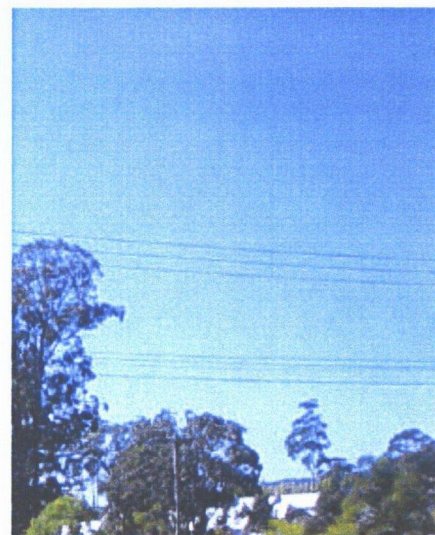
Proposed upgrade of Avoca Drive, Green Point

Preliminary Environmental Investigation

February 2005

Prepared by:

RTA Operations
Environmental Technology Branch
Level 5 Pod D, 99 Phillip St
Parramatta NSW 2150
Ph: 88370592
Fx: 8837 0053
Nicholas_francesconi@rta.nsw.gov.au



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Person(s) managing this document	Person(s) writing this document
Nicholas Francesconi / Mathew Taylor	Nicholas Francesconi / Mathew Taylor

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Ray Stafford Operations Technical Services Hunter Region 47 Darby Street Newcastle NSW 2301	Environmental Technology RTA Operations Directorate Level 5, Pod D, 99 Phillip Street Parramatta NSW 2150 T: 02 8837 0597 F: 02 8837 0053 E: Mathew_taylor@rta.nsw.gov.au

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I Introduction and Methodology

The NSW Roads and Traffic Authority (RTA) proposes to upgrade Avoca Drive between Bayside Drive and Sun Valley Road and link Asca Drive to Koolang Road at Green Point (the Proposal). The Proposal would involve widening the pavement of Avoca Drive to allow for two travel lanes in each direction, the construction of a central median, 1.5m cycle-ways and several bus bays.

This Preliminary Environmental Investigation (PEI) has been prepared to identify environmental constraints or potential issues that may need additional investigation, specialist studies, design consideration or environmental safeguards.

The method in which this document has been prepared is as follows:

1. A site visit was held on the 21 September 2004 to assess the site.
2. Consultation was undertaken with the following agencies and RTA personnel:
 - Environmental Adviser, RTA Hunter; and
 - Aboriginal Program Consultant (APC) Central Coast Region.
3. A search was conducted on the following databases to identify any potential issues:
 - Australian Heritage Database;
 - NSW Heritage Office State Heritage Register and State Heritage Inventory;
 - National Native Title Claims Search;
 - DEC Aboriginal Heritage Information Management System (AHIMS);
 - DEC Atlas of NSW Wildlife - Threatened Flora and Fauna Records;
 - DEH Protected Matters (EPBC Act) Database; and
 - DIPNR Acid Suphate Soils Risk Map.
4. A literature review and review of documentation was undertaken to determine issues relating to:
 - Flora and fauna;
 - Local Environmental Plans;
 - State Environmental Planning Policies; and
 - Regional Environmental Plans.
5. As part of the environmental investigation, two specialist studies were undertaken to identify proposal constraints and to provide environmental safeguards to avoid and minimise potential impacts. Specialist studies included a terrestrial ecological investigation and an indigenous heritage investigation. Details and findings from the specialist studies are discussed in section 4.1.4 (Flora), 4.1.5 (Fauna), and 4.1.7 (Indigenous Heritage) of this PEI and a copy of each specialist study is provided in Appendix C and Appendix D.

2 Background

2.1 Local Government Area

Gosford.

2.2 Location

The Proposal would be undertaken on the Central Coast of NSW approximately 50km north of Sydney and 75km south of Newcastle. The Proposal would be undertaken on Avoca Drive, in the suburb of Green Point, which is located approximately 3.5km south east of Gosford CBD, on the eastern foreshore of Brisbane Water.



Figure 2.1 Location of the proposed works. (Map courtesy of the Land Information Centre)

2.3 General Description of the Study Area

For the purposes of this investigation, the study area is defined as Avoca Drive between Bayside Drive and Sun Valley Road and the land extending 20m beyond the edge of the road seal. Also included in the study area is a corridor of land approximately 50m wide extending from the eastern most section of Asca Drive through to the intersection of Koolang Road and Avoca Drive (Refer to Figure 2.2).

The study area experiences warm to hot summers and cool to mild winters. Details from Gosford meteorological station, which is located approximately 7km northwest of the study area, are considered to be indicative of the study area. The study area has an annual average rainfall of approximately 1320mm, with the summer and autumn months experiencing more rainfall than the spring and winter months. The temperatures range from a mean daily maximum temperature of 27.5°C in January to a mean daily minimum temperature of 4.5°C in July (BOM 2004).

Avoca Drive is a busy arterial road that connects East Gosford to North Avoca, and serves as an important route for commuters travelling to the Gosford CBD or connecting to the F3 Freeway at west Gosford. Within the study area Avoca Drive is a single carriageway road with one travel lane in each direction, narrow shoulders and a number of bus bays. Traffic count figures from 2001 indicate that in the study area, Avoca Drive experiences an AADT of 24,795 vehicles (RTA 2001).

Land use adjoining Avoca Drive varies from areas of bushland to residential and commercial areas. Generally, the land immediately to the southeast of Avoca Drive is characterised by residential development, whereas the land on the northwest of Avoca Drive is characterised by areas of bushland fronting Brisbane Water.

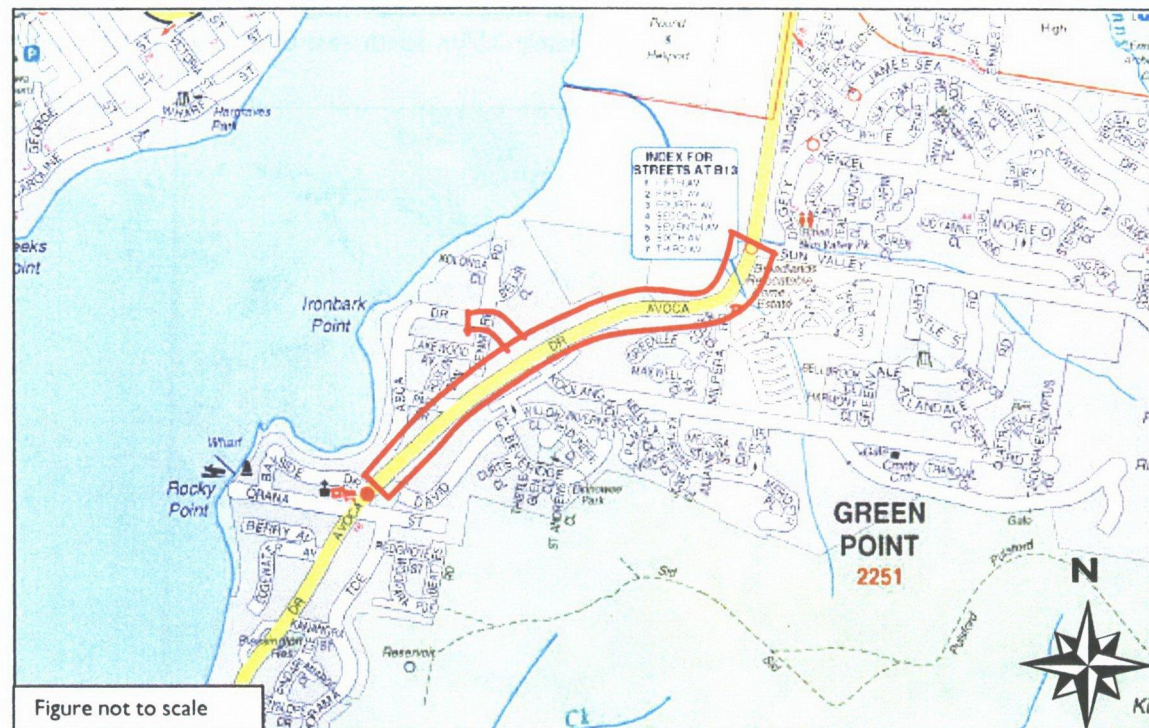


Figure 2.2. The Proposal's study area. (UBD map extract under licence by Sensis Pty Ltd)

The study area belongs to the Erina Soil Landscape Group, which consists of rolling hills and foot slopes of the Erina Hills. The topography of the Erina Soil Landscape Group consists of undulating to rolling rises and low hills with local relief less than 60m and slopes less than 25%. The study area is situated on the Terrigale Formation of the Narrabeen Group, consisting of lithic and quartz sandstone and siltstone, minor sedimentary breccia, claystone and conglomerate. The soils of the Erina Soil Landscape Group consist of Yellow Podzolisc, Yellow Earths and Structured Loams, which have a high localised mass movement hazard, low fertility, high soil erosion hazard, and are naturally strongly acidic (Murphy 1993).

Drainage in the study area is characterised by roadside catch drains and an urban stormwater system. The natural landform of the study area slopes from east to west. There are two unnamed drainage lines and one wetland located within the Green Point Reserve on the western side of Avoca Drive. These drainage lines are fed by runoff from the urban environment of Green Point and flow in a northwesterly direction into Brisbane Water. The drainage lines are vegetated by a dense layer of weeds and native rushes. Approximately 150m south of Sun Valley Road, a concrete stormwater channel with a box cell culvert collects stormwater and directs it beneath Avoca Drive before discharging into the bushland on the western side of Avoca Drive. Only some parts of Avoca Drive has kerb and gutters, as the majority of road runoff appears to flow undirected into the bushland on the western side of Avoca Drive. Drainage ditches and grassed roadside depressions are present on

the eastern side of Avoca Drive and on either side of Koolang Road. Stormwater channels and drainage works appear to be more prevalent in the northern end of the study area than in the southern end of the study area. The road verges of Avoca Drive have been cleared for regular maintenance, the installation of transmission lines, and for drainage works.

The area of undisturbed vegetation to the northwest of the proposed roundabout consists of three native vegetation communities. These are Coastal Sand Apple-Blackbutt Forest, Melaleuca Swamp Forest, and Coastal Wet Gully Forest. The remainder of the study area, along Avoca Drive is cleared land, sparsely vegetated with some native (endemic and non-endemic) and exotic plantings on the road verges.

Avoca Drive meanders its way over the gently rolling hills and crests on the eastern foreshore of Brisbane Water. Dense stands of native vegetation up to 20m in height occur on the western side of Avoca Drive that provides motorists and residents with a pleasant bushland setting. It is considered that the visual amenity of the study area for motorists travelling along Avoca Drive would be moderate.

2.4 Proposal

The Proposal would involve:

- Widening Avoca Drive to four lanes between Bayside Drive and Sun Valley Road;
- Constructing a central concrete median on Avoca Drive between Bayside Drive and Sun Valley Road;
- Extending the eastern end of Asca Drive to meet the intersection of Koolang Road and Avoca Drive;
- Constructing a roundabout at the intersection of Koolang Road, Avoca Drive, and the proposed link road between Avoca Drive and Asca Drive;
- Constructing 1.5m cycle-ways on the shoulders of Avoca Drive; and
- Constructing a number of bus bays on the shoulder of Avoca Drive.

3 Investigation Results

3.1 Background and Database Searches

The following results were obtained from desktop database searches conducted for the study area. The information below provides a summary of the search results and potential impacts are discussed further in Section 4. Copies of all the search results are provided in Appendix B.

3.1.1 Australian Heritage Database

A search of the Australian Heritage Database was undertaken on 7 October 2004 for sites within the Gosford LGA. A total of 38 items are listed on the Australian Heritage Database for Gosford LGA (24 registered sites, 1 destroyed site and 13 indicative sites). None of the heritage items occur within the study area, although the nearest heritage item to the study area is Mulholland Farm approximately 2km south of the study area.

3.1.2 NSW Heritage Office State Heritage Register / Inventory

A search of the NSW State Heritage Register and Inventory was undertaken on 7 October 2004 for sites at Green Point, Gosford. A total of two items are listed on the State Heritage Register and two items are listed on the State Heritage Inventory in Green Point. None of the heritage items occur within the study area, although the nearest heritage item to the study area is Mulholland Farm approximately 2km south of the study area.

3.1.3 RTA Heritage and Conservation Register (s170)

A search of the RTA Heritage and Conservation Register was undertaken on 7 October 2004 for items of heritage significance in the Hunter Region. A total of 25 heritage items are listed on the RTA Heritage and Conservation Register for the Hunter Region, however none of those items occur within the study area.

3.1.4 DEC Aboriginal Heritage Information Management System (AHIMS)

A search of the DEC AHIMS database was undertaken on 8 October 2004 for records of known Aboriginal sites or objects within 5km of the study area. A total of 26 known Aboriginal sites occur within 5km of the Proposal site. None of the recorded Aboriginal sites occur within the study area, although the nearest site is approximately 300m northwest of the intersection of Sun Valley Road and Avoca Drive.

3.1.5 Native Title Register

A search of the National Native Title Tribunal was undertaken on 23rd September 2004 for claims in the Gosford LGA. There are no registered National Native Title Claims or Indigenous Land Use Agreements in Gosford LGA.

3.1.6 DEC Wildlife Atlas Flora and Fauna Records

A search of the DEC Atlas of NSW Wildlife was undertaken on 7 October 2004 for threatened flora or fauna species previously recorded within 5km of the study area. A total of 33 threatened fauna species (15 birds, 2 frogs, 14 mammals and 2 reptiles) and four threatened flora species have been previously recorded within 5km of the study area.

None of the threatened flora or fauna species have been recorded in the study area, the majority of records are from the bushland areas to the west of the Brisbane Water, where large areas of natural bushland is present. The nearest record of a threatened fauna species was from 1km south of the study area. The nearest known threatened flora species was recorded approximately 2km north east of the study area.

3.1.7 DEH Protected Matters (EPBC Act) Database

A search of the EPBC Act database was undertaken on 7 October 2004 for listed matters of National Environmental Significance (NES) potentially occurring within 10km of the study area. A summary of the results is provided below:

Threatened Species:	48 found
Migratory Species:	32 found
Commonwealth Lands:	Four found
Places on the Register of the National Estate:	14 found
Listed Marine Species:	52 found
State and Territory Reserves:	Seven found
Regional Forest Agreements:	1 found (Lower North East NSW RFA)

The seven listed State and Territory Reserves are all located more than 4km from the study area, and would not be impacted as a result of the Proposal. The nearest Reserve is Rileys Island Nature Reserve, 4km south, southwest from the study area.

The Lower Northeast NSW Regional Forest Agreement is a 20-year plan for the conservation and sustainable management of Australia's natural forests. The agreements provide certainty for forest-based industries, forest-dependent communities and conservation. They are the results of years of scientific study, consultation and negotiation covering a diverse range of interests. The area surrounding the Proposal is marked as Freehold land, Crown land, and Other Tenures.

3.1.8 DIPNR Acid Sulphate Soil Risk Map

A search of the DIPNR Acid Sulphate Soil Risk Maps was undertaken 30 August 2004 for areas of known Acid Sulphate Soils within 2km of the study area. All of Brisbane Water and the land fronting it has a high probability of the Acid Sulphate Soil occurrence. The northern end of the study area from approximately 50m south of Milpera Road to Sun Valley Road has been identified as having a high probability of Acid Sulphate Soil occurrence. The area of high probability roughly corresponds with an existing drainage line that runs beneath Avoca Drive and drains into Brisbane Water.

3.2 Consultation

3.2.1 RTA Regional Environmental Adviser

The REA for the Hunter region was contacted initially and mentioned that the main issues of concern would be flora/fauna and archaeology. As an initial concern, the REA for the Hunter Region also mentioned that there may be possible statutory planning issues as to whether the Proposal would be classified as a Part IV or a Part V, and expressed interest in seeing the draft specialist studies when they came in.

3.2.2 RTA Aboriginal Programs Consultant

The Aboriginal Programs Consultant (APC) for the Central Coast region was contacted on 6 October and informed of the proposed works. The APC accompanied the archaeologist and members of the LALC on a site visit on 18 October 2004. No evidence of relics, artefacts or scarred trees were identified on site. Refer to section 4.1.6 for more discussion of Indigenous Heritage

3.3 Statutory Planning

3.3.1 Local Environmental Plan

The Proposal is located within the Gosford LGA. Gosford City Council regulates land use within this LGA through Gosford Planning Scheme Ordinance, 1968 (including amendments to January 2003) and the interim Development Order No 122, 1979 (including amendments to January 2003).

The following table illustrates the relevant zones within the study area.

Table 3.1: Land zones within the study area of the Proposal.

Location	Zoning
Avoca Drive road reserve	Unzoned
Adjacent zones	2(a) Residential 3(a) Business (General) 3(b) Business (Special) 5(a) Special Uses 6(b) Open Space (Special Purposes) 7(a) Conservation and Scenic Protection (Conservation) 7(c3) Conservation and Scenic Protection (Tourist Accommodation)

The objectives of each land zoning listed above and whether the Proposal is permitted in that zone is provided in the table below.

Table 3.2: Land Zonings within the study area (taken from Gosford Planning Scheme Ordinance, 1968)

Zoning	Objectives	Whether Proposal is permitted
2(a) Residential	<ul style="list-style-type: none">To make provision for the orderly and economic development of suitable land for a variety of low density housing forms which are essentially domestic in scale and which have private gardens; andTo provide for other uses, but only where they are compatible with a low density residential environment and afford services to residents at a local level, and are unlikely to adversely affect residential amenity or place demands on services beyond the level reasonably required for low scale housing.	Yes, with consent.
3(a) Business (general)	<ul style="list-style-type: none">To provide for the development of retail and commercial centres which make provision for the shopping and service needs of the community at the regional, district or neighbourhood level (or at 2 or more of these levels).	Yes, with consent.

3(b) Business (special)	<ul style="list-style-type: none"> ▪ To provide for the development of commercial centres which make provision for the service needs of the community; and ▪ To allow residential or other ancillary development but only where it is unlikely to significantly prejudice the supply of commercial floor space within the City of Gosford. 	Yes, with consent.
5(a) Special Uses	<ul style="list-style-type: none"> ▪ To provide for the development of some miscellaneous public facilities; and ▪ To provide for other land uses if they do not affect the usefulness of the land for the purpose for which it is zoned. 	Yes, with consent.
6(b) Open Space (special purposes)	<ul style="list-style-type: none"> ▪ To identify land for open space purposes, being land that is not able to be appropriately included in other open space zones. 	Yes, with consent.
7(a) Conservation and scenic protection (Conservation)	<ul style="list-style-type: none"> ▪ The conservation and rehabilitation of areas of high environmental value; ▪ The preservation and rehabilitation of areas of high visual and scenic quality in the natural landscape; ▪ The provision and retention of suitable habitats for flora and fauna; ▪ The prohibition of development on or within proximity to significant ecosystems, including rainforests and estuarine wetlands; ▪ The provision and retention of areas of visual contrast within the city, particularly the "backdrop" created by the retention of the ridgelines in their natural state; ▪ The provision of opportunities for informal recreational pursuits, such as bushwalking and picnic, in appropriate locations; ▪ The minimisation or prohibition of development so that the environmental and visual qualities of the natural areas are not eroded by the cumulative impact of incremental, individually minor developments; and ▪ The minimisation or prohibition of development in areas that are unsuitable for development by virtue of soil erosion, land slip, slope instability, coastal erosion or bushfire hazard. 	Yes, with consent
7(c3) Conservation and Scenic Protection (scenic protection-tourist accommodation)	<ul style="list-style-type: none"> ▪ To enable a limited range of development, including tourist accommodation, on land between the Somersby Plateau and the ocean which has been identified as possessing significant aesthetic or conservation value, and where: ▪ It can be demonstrated that the development can be carried out in a manner which will not significantly prejudice the aesthetic or conservation quality of the land within the zone; ▪ The development is unlikely to have a significant detrimental effect on the growth of native plant communities, the survival of native wildlife populations or the provision and quality of habitats for both indigenous and migratory species; and ▪ The development will not place undue demands on existing infrastructure. 	Yes, with consent.

The proposed widening of Avoca Drive would be within the designated road reserve, and adjacent to land zoned 2(a) Residential, 3(a) Business (General, 3(b) Business (Special), 5(a) Special Uses, 6(b) Open space (special Uses), 7(a) Conservation and Scenic Protection (Conservation) and 7(c3)

Conservation and Scenic Protection (Scenic Protection-Tourist Accommodation).

The proposed new link road would be situated mainly within land zoned 5(a) Special Uses, and also within land zoned 2(a) Residential, the unzoned road reserve.

Works undertaken within the unzoned road reserve, the proposed widening of Avoca Drive, would be permissible with consent from Council. However, the works are for the purposes of a classified road (Main Road 504), Clause 11C of SEPP 4 operates to remove consent requirements for road works associated with the widening of Avoca Drive within the road reserve. This Proposed widening is adjacent to land zoned 2(a) Residential, 3(a) Business (General), 3(b) Business (Special), 5(a) Special Uses, 6(b) Open Space (Special Purposes), 7(a) Conservation and Scenic Protection and 7(c3) Conservation and Scenic Protection (Tourist Accommodation), and would be permissible without Council consent.

Works associated with the proposed new link road are not incorporated under SEPP 4 and would require Council consent, as it is an unclassified road in an area zoned for Special Uses such as public facilities. However clause 8 of Schedule 1 of the Environmental Planning and Assessment Model Provisions 1980 (EPAMP) applies to this proposed road, as it would be a development in connection to a new road. Therefore Council consent would not be required for the proposed link road between Asca Drive and Avoca Drive. For further information regarding SEPP 4, refer to Section 3.3.3 of this report. It is noted that the Proposed new link road would exist in the centre of a parcel of land zoned 5(a) Special Uses, and the objectives of this zone are to provide for public facilities. Depending on the concept design for this road, although permissible without consent, it should be designed to ensure it is within the objectives of this zone.

3.3.2 Regional Environmental Plans

Sydney Regional Environmental Plan No. 6 - Gosford Coastal Areas

Sydney REP No. 6 applies to land to which the Gosford Planning Scheme Ordinance and Interim Development Order No 122 – Gosford applies. The aim of this plan is to provide for the development of land within the Erina – Terrigal area for residential, community, commercial and open space purposes and for public utilities essential to serve the area, encourage more efficient use of land in residential zones, provide opportunities for rural-residential development and tourist accommodation in rural areas, and strengthen controls to protect the natural environment.

The Proposal would not compromise the aims and objectives of REP No. 6 and in the long term the Proposal would be used to provide information for the construction of additional public transport facilities that would benefit the residential community of Gosford.

3.3.3 State Environmental Planning Policies

SEPP4 - Development without consent and Miscellaneous Exempt and Complying Development

Clause 11C(2) states: *'This clause applies to road work on classified roads or proposed classified roads, that, in the absence of this clause, may be carried out only with development consent. Road work to which this clause applies may be carried out without development consent'.*

As the proposed widening works would be for the purposes of a scheduled road (MR504) under the *Roads Act 1993*, SEPP 4 would apply to works within the following zones:

- 2(a) Residential;
- 3(a) Business (General);
- 3(b) Business (Special);
- 5(a) Special Uses; and

- 7(c3) Conservation and Scenic Protection (Tourist Accommodation).

Clause 4(2)b of SEPP 4 states that the Policy does not apply to zones that are reserved exclusively for the purposes open space, a public place or a public reserve. As the land zoned 6(b) Open Space (Special Purposes) and 7(a) Conservation and Scenic Protection (Conservation) is reserved exclusively for these purposes, SEPP 4 would not apply and Council consent would be required.

Therefore, consent from Gosford Council would not be required for proposed widening road works within the land zoned 2(a) residential, 3 (a) Business (General), 3 (b) Business (Special) and, 7(c3) Conservation and Scenic Protection (Tourist Accommodation). SEPP 4 does not apply to the proposed new link road between Asca Drive and Avoca Drive, but clause 8 of schedule 1 in the model provisions of the Environmental Planning and Assessment Model Provisions (EPAMP) does apply and council consent would not be required.

SEPP 44 – Koala Habitat Protection

The Gosford LGA is identified within the Schedules of SEPP 44 (Koala Habitat Protection) as a LGA in which Koalas are known to occur. While the requirements of the SEPP do not technically apply to this Proposal, as it is not subject to Council consent, it is the RTA's practice to consider SEPP 44 criteria in its EIA process. These criteria relate to the percentages of feed tree cover, particularly trees listed under *Schedule 2 - Known Feed Trees*. The assessment criteria consider the percentage cover of known feed trees, and whether these are greater or less than 15% of the total tree canopy.

During field investigations undertaken as part of the ecological study, there was no indirect evidence found for the existence of Koalas in the study area. One known feed tree species from Schedule 2 of SEPP 44, Red Mahogany (*Eucalyptus robusta*) was identified. Within the study area, this species constitutes less than 15% of the entire tree canopy. Another tree species in the study area, Red Mahogany is listed in the *Draft Recovery Plan for the Koala* as a secondary feed tree in the central coast region. As a result of there being a low density of known feed trees and a low density of secondary feed trees, the eucalypt woodland being fragmented, and the Koala having an average home range of 80-90 ha (NPWS 2003), the study area is not considered to be either core or potential Koala habitat.

4 Potential Risks

4.1.1 Geology, Soils and Landform

Existing Environment

The study area is situated in the Erina Hills Soil Landscape Group, which is characterised by undulating to rolling rises and low hills on the Terrigale Formation. Residential areas and Kincumba Mountain Reserve to the east of the study area rise up to 145m in height. The topography of the study area itself is generally characterised by gently sloping hills and crests. Avoca Drive is built on areas of fill, some areas of Avoca Drive has earth batters approximately 2m to 3m high that slope into the adjacent road reserve.

The soils of the Erina Hills Soil Landscape Group are considered to have a high-localised mass movement hazard, high soil erosion hazard, be naturally strongly acidic and have low fertility.

Searches of the DIPNR Acid Sulphate Soil Risk Map indicate that there is a high probability of Acid Sulphate Soils occurring in the northern end of the study area on both sides of Avoca Drive from approximately 50m south of the Milpera Road/Avoca Drive junction to Sun Valley Road. An Acid Sulphate soils risk map for the area of study is provided in Appendix B.

Potential Impacts

Although the topography of the land in the study area is characterised by gently to moderately sloping hills and crests, the soils of the study area have a high erosion hazard. During the construction stage there would be potential for land clearing and construction works to lead to soil erosion, the sedimentation of drainage lines, and pollution to the wetland and to the adjoining Brisbane Water.

There is the potential for excavation works to disturb the naturally acidic soils within the study area. Water draining into Brisbane water via the Proposal area would need to be carefully managed to ensure that the surrounding waters are not adversely affected as a result of the Proposal.

There is a high probability that the proposed works in the northern end of the study area would disturb areas of Acid Sulphate Soils. This would need to be investigated during the REF stage when detailed plans showing drainage works and cross section levels are provided for the proposed works. To mitigate potential Acid Sulphate Soil risks, it is recommended that road works towards the northern end of the study area are designed to minimise the amount of excavation works.

4.1.2 Water Quality and Hydrology

Existing Environment

Drainage in the study area is characterised by earthen ditches in the road shoulder of Avoca Drive and two drainage lines that flow east to west towards Brisbane Water. One of the drainage lines is present at the northern end of the study area opposite Milpera Road, while the other drainage line is situated on the western side of Avoca Drive approximately 100m north of Koolang Road. This drainage line leads into an unnamed wetland that drains into Brisbane Water. This wetland occurs approximately 50m northwest of Avoca Drive opposite Koolang Road. Dense weeds and urban runoff affect both of these drainage lines and it is considered that the water quality of these drainage lines would reflect their largely urban catchment. Because the drainage lines are only shallow, and the gradient of the land is low, during times of heavy rain, the land to the west of Avoca Drive may have a wide flood channel where water is running off the surrounding land surface and discharging into Brisbane Water.

Potential Impacts

The proposed upgrade of Avoca Drive would have the potential to impact the water quality of drainage lines in the study area and Brisbane Water through:

- Erosion, particularly of exposed batters and stockpiles;
- Sediment laden runoff entering nearby waterways; and
- Spillages of chemicals during construction works and during the operational stage.

The Proposal would have the potential to cause an increase in sediment and increase turbidity in the drainage lines and nearby wetland of the study area, these drainage lines are already heavily disturbed by their urban catchment and the affect of the Proposal on these drainage lines should be carefully controlled to ensure that the impact on these drainage features is kept to a minimum both during and post construction.

4.1.3 Air Quality

Existing Environment

Gosford LGA is situated on the NSW Central Coast, and the existing air pollution is not considered to be as dramatic as other parts of NSW. The National Pollutant inventory (NPI) was searched on the 11th of November 2004, for the area encompassed by Postcode 2251. The facility is located approximately 5km southeast of the study area. The population of Gosford has a high level of private vehicle use and subsequently motor vehicle emissions account for approximately 27% of the total air pollution emissions (DEH 2004). Lawn mowing, backyard incinerators, and domestic and commercial solvents and aerosols contribute 40% of the pollutant emissions.

Residential areas in the vicinity of Avoca Drive could experience a localised decrease in air quality from vehicles using Avoca Drive, however it is expected that such pollution would be minimal and only occur during congested conditions when there is no sea breeze to disperse vehicle fumes. Congested conditions would occur less frequently by the Proposal installing an extra lane in each direction.

Potential Impacts

During the construction stage there would be an increased risk of dust from areas of disturbed land and emissions from construction equipment causing a localised decrease in air quality. However, it is not anticipated that the proposed works would involve clearing large areas of land that would be a potential dust source. Although there would be additional emissions from work machinery on site, it is considered that the additional emissions from these vehicles would not be noticeable at nearby residential areas.

In the long-term operation stage, it is expected that the Proposal would result in an increase in traffic using Avoca Drive, which would result in an increase in vehicle emissions. However the Proposal would improve traffic flow and reduce congestion. The improvement in traffic flow would reduce the necessity for vehicles to stop and start, an action that is known to result in increased vehicle emissions.

4.1.4 Flora

Existing Environment

A Terrestrial Ecological (Flora and Fauna) Assessment was prepared by Lesryk Environmental Consultants as part of the preparation of this PEI. The results of this study are summarised below, and the full report is included in Appendix C of this report.

There are three native vegetation communities within the study area, one of which, the Sydney Coastal Estuary Swamp Forest Complex (Melaleuca Swamp Forest in the study area), is listed as an

Endangered Ecological Community (EEC) under the *Threatened Species Conservation Act 1995*. This community has recently been included in a new EEC Preliminary Determination "Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions".

The three native vegetation communities are:

- Open Forest (Coastal Sand Apple-Blackbutt Forest);
- Tall Forest/Closed Forest (Coastal Wet Gully Forest); and
- Melaleuca Swamp Forest (Swamp Mahogany – Paperbark Forest).

There is also another vegetation community within the study area, identified as a 'Disturbed Environment', which exists on the eastern side of Avoca Drive, adjacent to the residential developments. This community consists of a mixture of remnant native vegetation, planted exotic and native species, and weeds. These four vegetation communities are further described in detail below.

Open-Forest (Coastal Sand Apple-Blackbutt Forest) (*Eucalyptus pilularis* – *Angophora costata* – *Corymbia gummifera*)

Conservation Status: Represented in regional conservation reserves. Not listed as an EEC.

Occurrence: Occurs throughout the majority of the study area on the western side of Avoca Drive.

Structure: The species composition of this community is variable, depending on soil moisture levels. Trees are up to 20m in height forming a moderate foliage cover. The shrub layer is sparse to dense adjacent to drains and watercourses with shrubs up to 4m in height being present. The groundcover consists of a variable layer of grasses and herbs. On drier sites away from drainage lines, Smooth-barked Apple (*Angophora costata*) and Red Bloodwood (*Corymbia gummifera*) are common. On wetter sites Blackbutt (*Eucalyptus pilularis*) is common, with Swamp Mahogany (*E. robusta*) and Red Mahogany (*E. resinifera*) less common.

Tall Forest / Closed Forest (Coastal Wet Gully Forest) (*Syncarpia glomulifera* – *Angophora costata*)

Conservation Status: May be represented in regional conservation reserves. Not listed as an EEC.

Occurrence: This community occurs at the Asca Drive end of the proposed new road.

Structure: Trees up to 20m in height forming a moderate to dense foliage cover. The shrub layer is sparse to dense with shrubs up to 4m tall. The groundcover consists of a dense layer of ferns, grasses, herbs and vines. Climbers are common in this community. The community forms an intergrade between the Open-forest and a Closed-forest (rainforest) community, with species common to both being present.

Melaleuca Swamp Forest (Swamp Mahogany – Paperbark Forest) (*Melaleuca stypheloides* – *M. decora*)

Conservation status: Represented in Cockle Bay Nature Reserve. This community is included in the Sydney Coastal Estuary Swamp Forest Complex EEC.

Occurrence: Occurs adjacent to the proposed new road on the Avoca Drive side of the study area.

Structure: Tall shrubs and small Melaleuca trees up to 10m in height, with emergent Eucalypts up to 20m high. The shrub layer consists of dense sedges up to 2m in height. The groundcover consists of sparse ferns, grasses and herbs.

Disturbed Environment

Conservation Status: This community does not have any conservation value apart from as a potential habitat linkage for flying fauna and tolerant ground traversing animals. Not listed as an EEC.

Occurrence: Occurs adjacent to the eastern side of Avoca Drive.

Structure: Trees up to 15m in height with shrubs and grass cover plants. Many trees and shrubs are roadside landscape plantings and the grass layer is composed of exotic lawn species. This is an urban landscape environment with some remnant native trees.

Two weeds listed as noxious in the Gosford LGA have been identified as existing within the study area. These species include Blackberry (*Rubus fruticosus*) and Crofton weed (*Ageratina adenophora*). Both of these are listed as Weed Control Category 3, which means that the weed must be prevented from spreading and its numbers and distribution reduced. Crofton weed was recorded in association with all drainage lines and moist areas.

The following map indicates the distribution of the vegetation communities within the study area.

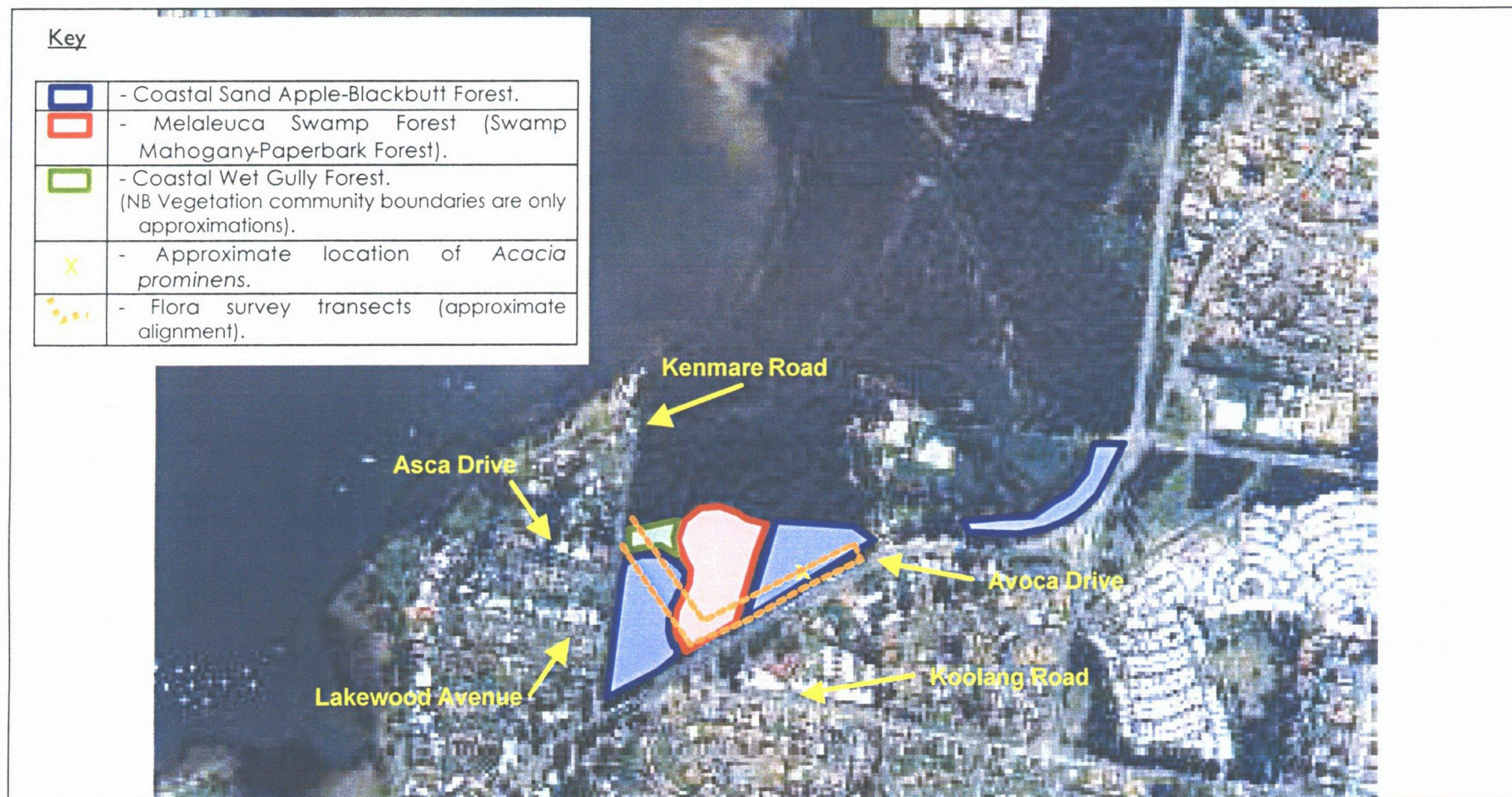


FIGURE 4.1: Locations of vegetation communities.

Source: Department of Infrastructure, Planning and Natural Resources,
(Not to Scale)

↑
NORTH

Potential Impacts:

The Coastal Sand Apple-Blackbutt Forest Community is quite common in the Gosford region, and although it does not have any specific botanical conservation value, the loss of any large areas of native vegetation from an area of increasing urbanisation should be avoided. The section of the Proposal to widen Avoca Drive is unlikely to result in the removal of a significant area of this vegetation type from the roadside.

Gosford City Council has a rainforest protection policy, and the proposed new road linking Asca Drive to Avoca Drive is adjacent to Council's Green Point Reserve, which contains rainforest remnants, sedgelands and reedlands. At the time of writing, a weed eradication and bushland regeneration project is being undertaken in this reserve.

The proposed new road would run through the central portions of the Swamp Mahogany–Paperbark community, removing a substantial portion of this EEC. The likely alignment of the new road may result in a significant impact on the Swamp Mahogany- Paperbark Forest, thereby may require further detailed assessment when detailed concept designs are available.

The proposed new road has the potential to change the existing drainage characteristics of the wide flood channel that occurs in the area, adversely affecting the two vegetation communities and the sedgelands and reedlands that occur next to the Green Point Reserve. Consideration should be given to relocating the proposed road to avoid the flood channel and the vegetation communities that are associated with it. If the proposed road is to be located within the corridor surveyed, further botanical survey would be need to be undertaken when detailed concept designs are available.

The widening of Avoca Drive would result in increased runoff, potentially having adverse impacts on the Swamp Mahogany – Paperbark and Coastal Wet Gully Forests, sedgelands and reedlands. The drainage design should aim at minimising increases in flow volumes and velocities into the downstream environments.

There were no plants of regional, state, or national conservation significance located within or adjacent to the study area during the field survey. However, the regionally restricted Gosford Wattle, (*Acacia prominens*) was located in bushland adjacent to the western side of Avoca Drive. Eight individuals of the species were located in close proximity to one another. The Gosford Wattle species are located approximately 200m northeast of the intersection between Avoca Drive and Koolang Road. Refer to Figure 4.1 on the previous page for a map showing the location of this plant. This species is not presently listed as threatened (Briggs and Leigh, 1996), but it had previously been listed as a Rare or Threatened Australian Plant (ROTAP) in 1988. The removal of the eight plants located on the vegetation edge along Avoca Drive should be avoided.

4.1.5 Fauna

Existing Environment:

There are three habitat types identified as being available for use by native fauna species in the study area:

- A disturbed environment;
- A eucalypt woodland; and
- An aquatic environment.

Descriptions of the location, structure, the value of each habitat type for native species, and a consideration of their overall ecological value is presented below.

Disturbed Environment

This environment exists either side of Avoca Drive, along the road reserve. Of the native trees present within this environment (some of which were up to 15m in height), none were observed to be supporting any hollows suitable for the life cycle needs of any hollow dependent native fauna. This environment was observed to be utilised by a range of urban tolerant native and exotic birds, reptiles and frogs within, adjacent to, and beyond the limits of the study area. These tolerant species are quite abundant in this habitat type and are considered to be common throughout their distribution ranges. Referring to the life cycle needs of these species, no major components of their necessary habitat types are present within the disturbed environments. Due to its degraded condition, the disturbed environment has been identified as having low ecological value, and as such, the disturbed environment offers opportunities for the undertaking of a Proposal within the area surveyed.

Eucalypt Woodland

This vegetation community exists on the northwestern side of Avoca Drive (between Kenmare Road and 250m west of Milpera Road), and extends northwards beyond the limits of the study area. On the western side of Avoca Drive, this habitat type occurs adjacent to the disturbed environment, the disturbed environment being approximately 3m wide. The local Land Care group working in the Green Point Reserve, removing introduced plant species has permitted the natural regeneration of some species of native plants.

This woodland supports mature trees up to 20m in height, with a continuous canopy within and beyond the study area. Several of the trees support hollows up to 200mm wide, and are suitable for the roosting and breeding requirements of native hollow dependent fauna. The middle storey consists of a medium dense layer of native trees up to 8m in height. The understorey is up to 3m in height and supports native saplings, exotic vines and weeds. The understorey ranges from a medium to sparse density depending on the location within the study area. The groundcover consists of native and exotic grasses, vines, forbs and ferns up to 1m in height and it has a medium to high density. Common throughout the eucalypt woodland are leaf litter accumulations, ground debris and fallen logs and branches.

The eucalypt woodland provides opportunities for the north-south dispersal of native species. The woodland currently provides a link between Kincumba Mountain Regional Reserve to the south, and Rumbalara Reserve to the north. As a result of the surrounding established urban infrastructure, this corridor would only be used by flying animals, or those species tolerant of negotiating urban areas (eg. the rodents, possums and several reptiles). From the perspective of the dispersal and interbreeding needs of these species, the widening of Avoca Drive is not considered to result in any increase in the widths of any fauna barriers, or the further isolation of their necessary habitat areas. For those species that are occupying Green Point Reserve, the construction of a new road would present a barrier to the movement patterns of these animals, and would result in the isolation of the southern portion of the woodland.

The eucalypt woodlands have a habitat structure that is suitable for the life cycle requirements of a range of native species, offering sheltering, breeding and foraging opportunities. The connectivity of the canopy would also permit the dispersal of native fauna. As this is the case, the eucalypt woodland is considered to be of moderate to high ecological significance. There is the potential that locally viable populations of several of the animals listed on the commonwealth EPBC Act and the TSC Act may be recorded in association with this habitat type. Based on the habitat assessments conducted during the field investigations, the animals most likely to be present would be the hollow dependent species, these including the microchiropterans (insectivorous bats), Squirrel glider (*Petaurus norfolkensis*) and threatened owls. Based on a precautionary approach, it is considered that locally viable populations of these species are present in association with the eucalypt woodland, and that the disturbance of this habitat type may have an adverse impact on the viability of these animals. Whilst beyond the scope of the preliminary field investigations, it is expected that an assessment of the significant disturbance of this habitat type (using the criteria provided under Section 5A of the

Environmental Planning and Assessment Act 1979), would indicate that a Species Impact Statement would need to be prepared.

Based on fauna habitat modelling prepared for the Gosford LGA, the eucalypt woodland stand that occurs within the study area has been identified as a "Preliminary Conservation Area" for the Squirrel glider, Spotted-tailed Quoll (*Dasyurus maculates*) and Powerful Owl (*Ninox strenua*) (LHCCREMS, 2004). Based on a consideration of the quality of the woodland, it is likely that viable populations of the Squirrel glider would be present, while the site is expected to be too small for the needs of the Spotted-tailed Quoll and Powerful Owl.

Aquatic Environment

The aquatic environment recorded in the study area encompasses two unnamed drainage lines and one wetland. The two freshwater creek lines flow under Avoca Drive, the northern drainage line adjacent to Milpera Road and the southern drainage line 200m north of Koolang Road. During the field investigation, the southern drainage line was flowing, whilst the northern consisted of a few small stagnant pools, and is therefore considered to be ephemeral. The riparian vegetation of these creeks is a product of their surrounding land uses, the northern drainage line consists of a disturbed environment and the southern drainage line consists of eucalypt woodland. These aquatic environments would provide habitats for freshwater aquatic species of fauna that would otherwise not have a suitable habitat in the local area.

The southern drainage line is 3m wide, channelled under Avoca Drive via a 1m wide circular concrete culvert. The banks of this creek are earthen, and the substrate of the creek is sand. Submerged aquatic vegetation is common. The water depth within the creek is between 100 and 300mm, with snags such as logs and branches present. Sandstone boulders occur within the drainage line, up to 50cm in diameter. The tree canopy over the drainage line is closed.

The northern drainage line is essentially a grassed swale, channelling runoff under Avoca Drive via two large box culverts (2m by 0.8m in size). This drainage line consists of a series of small stagnate pools, the largest being 2m by 3m in size. The drainage line is vegetated by exotic grasses and weeds, as the area is being regularly mown. The channel is approximately 2m wide, its alignment appearing to be artificial.

The wetland is dominated by a high-density layer of emergent reeds that are up to 2m in height. Vines and ferns are also common. The wetland is roughly circular in shape, and approximately 50m in diameter. The natural wetland is unlikely to be directly affected by the road proposed to be constructed between Avoca and Asca Drives. Similarly, given its location, it is unlikely to be affected by the widening of Avoca Drive. Whilst this is the case, indirect impacts due to polluted runoff and sedimentation could arise.

The following diagram illustrates the distribution of the fauna habitats within the study area.

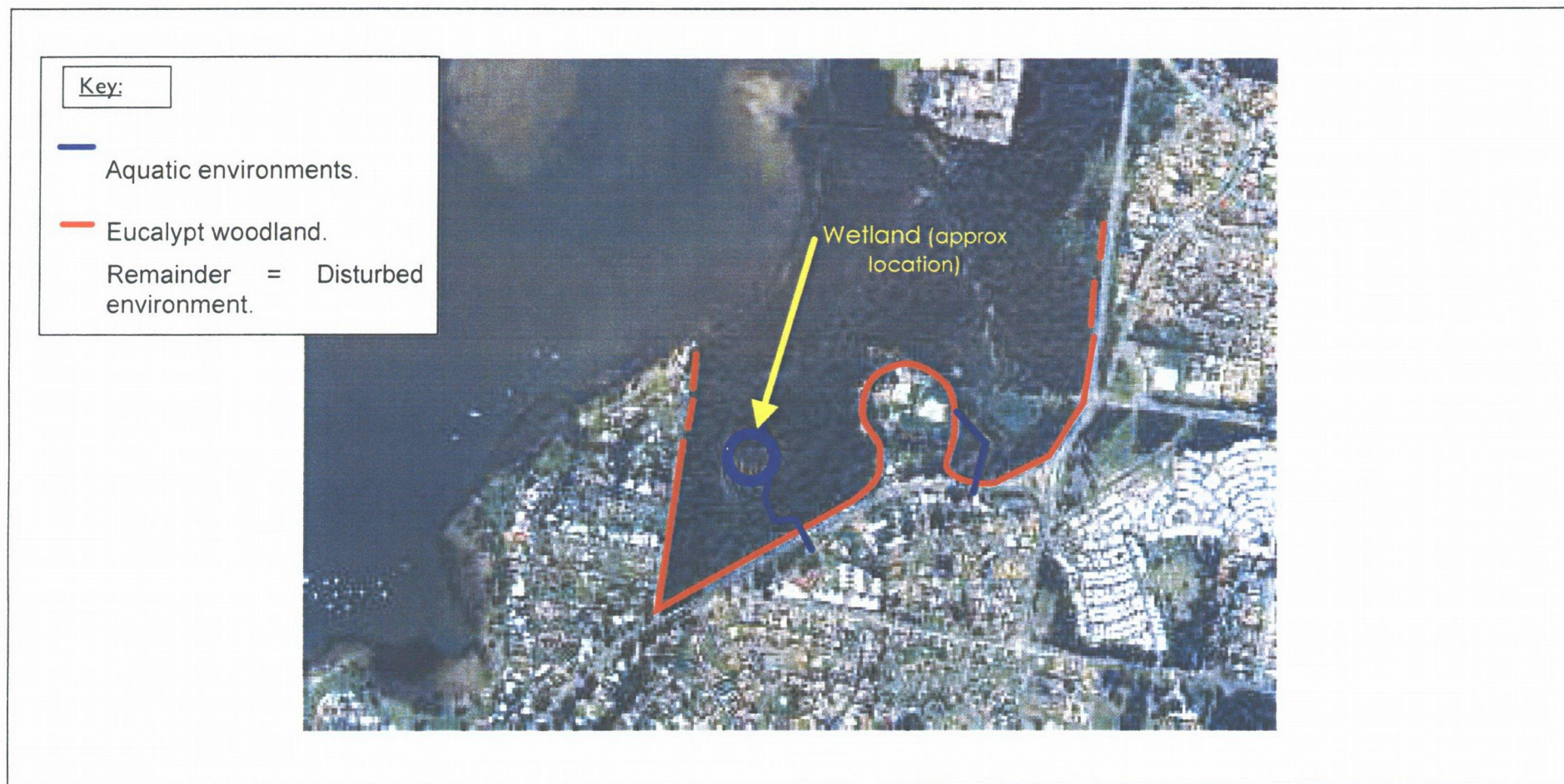


FIGURE 4.2: Locations of fauna habitats.

Source: Department of Infrastructure, Planning and Natural Resources, iplan, LandView.
(Not to scale)



Potential Impacts

As a result of the "disturbed environment" having a low ecological value, it is expected that a consideration of any development Proposal in light of the assessment criteria provided both under Section 5A of the EP&A Act and within the EPBC Act, would identify that the further short and/or long term disturbance of this habitat type would not have a significant impact on any threatened species, their populations, ecological communities or habitats. Therefore the development of this habitat type would not trigger the need to prepare a Species Impact Statement (SIS) or require referral to the Federal Minister for the Environment and Heritage.

As the disturbed environment exists either side of Avoca Drive, along the road reserve, it is considered that the Proposed widening of Avoca Drive between Sun Valley Road and Bayside Drive within the road reserve could proceed. An assessment of the likely impacts of the works on this habitat type, through reference to the eight-part test, is not likely to indicate that a SIS or further field work would be required. The further development of the disturbed environment could proceed as proposed without requiring any further ecological assessments or considerations.

The eucalypt woodlands are identified as being a constraint to the proposed development of this portion of the study area. Giving consideration to the assessment criteria provided under Section 5A of the EP & A Act, it is likely that the proposed development of this habitat type would have adverse impacts. Although this is the case, based on the results of a more detailed field investigation, targeting the presence or absence of those state listed species potentially occurring, and the development of a suitable road design, it may be possible to construct a road between Asca Drive and Koolang Road without having a significant impact on any populations of native fauna. Given that no species listed under the EPBC Act are expected to rely upon the eucalypt woodland, it is unlikely that the removal of the eucalypt woodland would require referral to the Federal Minister for the Environment and Heritage.

The habitat resources provided by the drainage lines are already considered to have been compromised due to the urban setting of the site. The further disturbance of these environments would not threaten the presence of any native fauna. No state or nationally listed species are considered to be dependent upon this habitat type, and the drainage lines are not identified as being constraints to the undertaking of the proposed works.

Due to the reclamation and removal of wetland environments throughout the region, this habitat type is identified as a constraint. The wetland offers resources for a number of species, and should therefore be retained. A Proposal that includes appropriate filtration and drainage works, including the use of existing urban runoff affected creek lines would ensure that no indirect issues relating to the discharge of polluted runoff arise, and this habitat would therefore not be indirectly affected.

In relation to the species recorded during the current investigations, they would be regularly recorded in the surrounding region, none being solely reliant on the habitats present within the study area. None of the species recorded would be considered a constraint to the undertaking of the proposed works.

There are 33 fauna species that are state or nationally listed on the EPBC Act and/or the TSC Act that have the potential to occur within, adjacent, or in close proximity to the study area. These animals have specific habitat requirements, such as rock outcrops, rocky foreshores and oceanic environments; no components of which are present within the study area. As a result, no locally viable populations of these species are likely to be present within or adjacent to the study area. It is not considered that the undertaking of the Proposal within the study area would have an adverse impact on these species or their populations. Through reference to the *Administrative Guidelines on Significance* (including those relevant to migratory species) provided under the EPBC Act, it is unlikely that the Proposed works would require referral to the Federal Minister for the Environment and Heritage.

Of the 32 migratory species identified as potentially occurring within a 10km radius of the study area, from a desktop search of the EPBC Act database, there is the potential for two of these species to occur in the nearby wetland. The Japanese Snipe (*Gallinago hardwickii*), and the Painted Snipe (*Rostratula benghalensis s lat.*) are identified as migratory wetland bird species potentially occurring in the region. The wetland is outside of the Proposal, and may be affected through increased sedimentation and pollution as a result of construction of the Proposal. During the REF stage of the Proposal, when precise concept designs and construction details are available, careful consideration of sediment controls would be addressed to ensure that the wetland is not adversely impacted upon as a result of the Proposal.

4.1.6 Socio-economic Considerations Including Landuse

Existing Environment

Avoca Drive is a two lane single carriageway with a posted speed limit of 70km/h that is an important link for the growing population of the Central Coast region. Avoca Drive lacks formalised bicycle facilities or passing lanes, which significantly reduces the level of service (LOS) of the road during peak hour periods. In the study area bus bays and pedestrian footpaths are present at various locations.

It is expected that the majority of the proposed road upgrade works would occur within the existing road reserve of Avoca Drive, although some property acquisition would be required as part of the extension to Asca Drive. This property is currently owned by the Education Department.

Green Point Reserve is located between Asca Drive and Avoca Drive and supports an area of dense woodland vegetation to approximately 20m in height. Green Point Bushcare Group is currently undertaking bush regeneration within the reserve. The reserve has formed pathways, installed benches, and education posts. It is considered that Green Point Reserve would be an important community focal point and a passive recreation resource.

Potential Impacts

During the construction stage there would be potential for construction works and altered traffic conditions to disrupt traffic flow along Avoca Drive, especially during peak hour periods. This would be an inevitable disruption that would be managed through a Traffic Management Plan (TMP) and community consultation. In the long term, the increased travel lanes on Avoca Drive would improve traffic flow and improve safety conditions. The formation of a link road between Asca Drive and Koolang Road would improve local access safety and reduce traffic flow and traffic congestion on local roads at Green Point west of Avoca Drive.

At present, access to Park Crescent (located between Koolang Road and Bayside Drive) from Avoca Drive is available to vehicles travelling either direction along Avoca Drive, however the Proposal would involve installing a centre median that would prevent traffic travelling south along Avoca Drive from turning into Park Crescent. The Proposal would also involve restricting Park Crescent to left in left out only.

The construction of a link road between Asca Drive and Koolang Road would affect Green Point Reserve and may be opposed by community groups (such as the Green Point Bushcare Group) due to the loss of passive recreational land.

4.1.7 Indigenous Heritage

Existing Environment

An Aboriginal Heritage Assessment was undertaken as part of the preparation of this PEI to take into consideration the likely impacts of the Proposal on Aboriginal heritage and cultural values, including impact on Aboriginal objects, sites, and places. The assessment was undertaken by Archaeological & Heritage Management Solutions Pty Ltd (AHMS) and the results of this study are summarised below. The full study report is included in Appendix D of this report.

Avoca Drive is situated between 100m and 500m southeast of Brisbane Water, an estuarine embayment. For the purposes of the assessment, the proposed works are discussed in two sections. Section 1 is described as the widening of Avoca Drive 20m either side of the existing roadway from Sun Valley Road to Bayside Drive, Green Point. This is to accommodate the widening of Avoca Drive, constructing a roundabout at the intersection of Avoca Drive and Koolang Road, constructing 1.5m cycle-ways and a number of bus bays on the shoulder of Avoca Drive. Section 2 is a corridor of land 50m wide, where the proposed construction of a new roadway extending Asca Drive and linking it up with Avoca Drive opposite Koolang Drive would exist.

The archaeology of the Gosford-Wyong region has been documented through a number of academic and impact assessment investigations over the past 30 years. The majority of these investigations have been archaeological surveys; only a small number of archaeological excavations have been undertaken, particularly within the coastal zone. The dominant Aboriginal site types in the region include rock shelters with midden deposits, rock shelters with art, rock engravings, middens and axe grinding grooves. Burials, open artefact scatters, scarred trees and stone arrangements are less common.

Dallas and Bell (1989) made a number of findings about site location patterns in the area through their study of regional archaeology of the Gosford LGA. They divided the area into landform units, where the current study area is part of the 'Lakes and Lagoons' unit. Within this unit, the study predicted that open middens, campsites and burials could be expected on undisturbed Quaternary deposits (alluvium, sands and gravels) adjacent to Brisbane Water.

Aboriginal shell middens, artefact scatters, rock shelters, burials, art and mythological/ceremonial sites are commonly found along the coastal fringe. Environmental and topographical factors strongly influenced Aboriginal occupation patterns, which has in turn affected archaeological site location patterning. Sites are most commonly found within close proximity to freshwater sources, stone sources, and within range of resource-rich environments such as coastal foreshores, estuaries and lagoons.

Based on information compiled within the Department of Environment and Conservation (DEC) Aboriginal Heritage Information Management System (AHIMS), and background archaeological data reviewed, there are five types of sites that may be expected to occur within the study area. These are:

- *Open artefact Scatters* - the cultural activity represented by these sites may be associated with hunting or gathering activities, domestic camps, or the manufacture and maintenance of stone tools;
- *Middens* - Aboriginal middens are deposits of discarded shellfish and the remains of fish, bird or animal bones. Midden sites are distinguished from natural shell deposits by the predominance of larger edible shellfish, the dark soil matrix with a high pH, charcoal and cultural artefacts included in the deposit. These sites occur along the coastal/estuarine margins and represent locations that were used for consuming and discarding shellfish.

Burials often occurred in middens and for this reason they must be treated as potentially very culturally sensitive areas;

- *Aboriginal Burials* – These sites can occur anywhere in the landscape and in many cases are parts of burial complexes. Burials are often found within sandy or loose soils and shell middens, particularly along the coastal fringe;
- *Isolated Finds* – Occur anywhere in the landscape and may represent the random loss, deliberate discard or abandonment of artefacts, or the remains of dispersed artefact scatters; and
- *Scarred / Carved Trees* – Aboriginal people used trees in many ways and in many environments. Bark was removed from trees to make artefacts, vessels, shelters and medicines. IN the case of carved trees, tree trunks were carved with shapes and patterns that had mythological symbolism. Carved trees are specifically associated with Bora Grounds or initiation ceremony sites. Carved trees are very rare and important sites.

The topography and distribution of natural resources near the study area indicates a potential for the site types mentioned above. In particular, the study area has a potential for:

- Midden deposits, particularly near the margins of Brisbane Water;
- Open artefact scatter sites within areas that contain original topsoils, particularly slightly elevated, flat locations adjacent to natural drainage lines. Some midden material may also be present;
- Scarred or carved trees within areas of remnant forest containing old growth trees (ie. older than 100 years);
- Isolated finds anywhere across the landscape; and
- Aboriginal burials within deep midden deposits or in soft substrates such as sand.

Surveys along the NSW coast indicate a high density of sites along the estuarine fringe, especially in association with freshwater drainage lines. The availability of freshwater in combination with estuarine and terrestrial resources would have facilitated Aboriginal occupation and associated social and economic activities within the study area.

The diversity of locally available resources indicates the study area is located within a resource intersection zone. It has been discussed by Aitken (1985) and Hynes & Chase (1982) that Aboriginal campsites were preferentially located at resource intersection zones in order to capitalise on a broader range of resources. This would suggest that the study area was a favourable location for Aboriginal camping. The proximity of ceremonial initiation sites at Dunlops Hill to the south of the study area indicates the broader area had spiritual importance to Aboriginal people.

The potential for Aboriginal sites within the study area would largely depend on past land use and disturbance. In-situ sites would only be found in areas that retain original topsoils. Where original topsoils have been stripped by erosion or past land use, there would be no in-situ Aboriginal sites or objects.

Potential Impacts

Within the boundaries of the survey for Section I, Avoca Drive and the land extending 20m either side of it between Sun Valley Road and Bayside Drive, no Aboriginal sites, objects or potential archaeological deposits (PAD's) were identified. The original ground has been either cut or filled on either side of Avoca Drive along the majority of the current road alignment.

The potential for any Aboriginal sites or objects within Section 1 is very low.

Section 2 of the survey, was at the location of the proposed link road between Asca Drive and Avoca Drive, connecting to Avoca Drive at the current intersection with Kooloang Road. No Aboriginal sites or objects were found during the survey, probably due to the very low effective survey coverage (see Appendix D for details). The survey unit comprises remnant forest within a gully, currently part of Green Point Reserve. There was no evidence of erosion or disturbance of soil within the gully.

Due to the proximity of Section 2 to the rich estuarine resources of Brisbane Water and locally available sources of freshwater, intact soils within Section 2 are considered potential archaeological deposits (PAD's) that may contain intact Aboriginal sites and objects including stone artefacts and middens.

A number of large eucalypt trees were inspected for evidence of scarring or carving in Section 2. Although the age of these trees was not determined, no evidence of scarring or carving was found.

Aspects of cultural significance include both people's traditional and contemporary links with a given site or landscape as well as an overall concern by Aboriginal people for sites and their continued protection. The cultural significance of the study area is a matter for the local Aboriginal community.

The following outcomes have been raised by the Darkinjung Local Aboriginal Land Council (DLALC) in regards to the proposed works associated with this PEI:

- The DLALC are concerned about the on-going effects of development in the local area on Aboriginal sites. The Gosford region is an important cultural landscape to the local Aboriginal community;
- Proposed Avoca Drive widening (Section 1) will be within the areas of disturbed (cut or filled) ground;
- DLALC have requested detailed plans of the proposed link road, (Section 2); and
- DLALC have recommended archaeological test excavation within the area of development impact in Section 2 because of the high probability of artefacts and/or middens in this area.

Implementation of Section 2 would require establishment of a new road corridor which may exist within the Green Point Reserve, a remnant bushland reserve currently owned by Gosford City Council and zoned for Open Space and Recreation.

An examination of soil profiles and past disturbance of original ground during the archaeological survey indicated the Section 1 development area is unlikely to contain any Aboriginal sites or objects.

In matters relating to Aboriginal consultation, it is recommended that liaison that has been established with the *Darkinjung Local Aboriginal Land Council* (DLALC) should be maintained during the development planning process until all issues arising in relation to management of Aboriginal cultural heritage have been resolved. The DLALC requests that they be provided with development design plans once the options are finalised. If the RTA does decide to proceed with the Section 2 Proposal, DLALC requests to be invited to participate in archaeological test excavations to ensure that Aboriginal community views are represented.

Archaeological Management:

No further archaeological investigations are warranted for the Section 1 development, being the proposed widening of Avoca Drive between Sun Valley Road and Bayside Drive. It is considered highly unlikely that road widening would disturb or destroy Aboriginal sites or objects.

The assessment concluded that the Section 2 proposed development area contains potential archaeological deposits (PAD's). Any development works across remnant bushland within Green Point Reserve that involves disturbance of current ground or excavation of original soils may disturb or destroy Aboriginal objects. Therefore development work within this area may require a Section 90 permit from DEC under the NPW Act.

In order to consider an application for a Section 90 permit, DEC will require archaeological test excavation in accordance with Section 87 of the NPW Act to establish the presence, nature, extent and significance of Aboriginal cultural heritage that may be impacted by the Section 2 development.

The application would need to be prepared by a suitably qualified archaeologist and include archaeological test excavation within areas of the proposed Section 2 development. The methodology would be designed to sample, through controlled manual excavation, the range of terrain or 'topo-sequence' within the Green Point bushland reserve.

Adequate time and budgetary allocations would need to be made for:

- An application to DEC for a Section 87 permit, 'Permits relating to Aboriginal objects';
- Archaeological test excavation within areas of development impact in partnership with DLALC;
- Preparation of an excavation report documenting the results of test excavation and significance of the deposits;
- Liaison with DLALC and DEC to prepare an Aboriginal heritage mitigation strategy, and if appropriate, an application for a Section 90 'Destruction etc of Aboriginal objects or Aboriginal places' to DEC;
- Implementation of mitigation measures prior to commencement of development works, which may include additional archaeological salvage excavation in partnership with DLALC; and
- Preparation of an additional report on the results of environmental safeguards and recommendations for appropriate site interpretation.

If any Aboriginal burials are found during archaeological excavation, at any time during the development process, excavation work must cease immediately. DLALC and DEC would be notified and advice sought before work can re-commence. It would be noted that Section 87 and Section 90 permits do not allow the excavation and/or removal of Aboriginal burials.

If Section 2 is the preferred option, then two copies of the final Aboriginal Heritage Assessment (AHA) report should be sent to the DEC Central Aboriginal Heritage Unit (CAHU) together with the Section 87 and Section 90 permit application form.

4.1.8 Visual Amenity and Landscape

Existing Environment

Motorists travelling on Avoca Drive over the gently rolling hills and crests of the study area are provided with views of bushland to the west of Avoca Drive and vegetated hills to the east. It is considered that the visual amenity value of the study area for motorists travelling along Avoca Drive would be moderate.

Residential areas on the elevated hills to the east of Avoca Drive have views over the Proposal site to the bushland areas adjoining Brisbane Water. It is considered that the views from these residential areas would have moderate visual amenity value.

Residences on Kenmare Road have unobstructed views of the dense bushland in Green Point Reserve and the adjoining bushland. Although the edge of the bushland is showing signs of weed growth it is considered that the visual amenity value of the bushland to these residential homes would be moderate to high.

Potential Impacts

During the construction stage, clearing and the use of machinery have the potential for impacts to the visual amenity of the study area for motorists as they travel along Avoca Drive. Currently an area of bushland that provides motorists with moderate visual amenity values, could be reduced to low or negative values as they would be driving past a site of vegetation being cleared.

It is considered unlikely that the homes on the elevated hills to the east of the study area would have their views affected by construction works on Avoca Drive. Although these residences may overlook Avoca Drive, their view of the bushland to the west of Avoca Drive and Brisbane Water in the distance would not be affected by the proposed works.

The proposed construction of the access road linking Asca Drive to Koolang Road would affect the views that residences on Kenmare Road have of the bushland in Green Point Reserve. The proposed construction of the access road in Green Point Reserve would require clearing a corridor of vegetation (15m wide) that would substantially alter the views and reduce the visual amenity value of the area.

4.1.9 Noise and Vibration

Existing Environment

Avoca Drive is a busy arterial road that connects East Gosford to North Avoca, and serves as an important route for commuters travelling to Gosford CBD or connecting to the F3 Freeway. Traffic count figures from 2001 indicate that Avoca Drive experiences an AADT of 24,795 vehicles in the study area (RTA 2001). During the site inspection, it was noted that the ambient noise levels in the study area were moderate and the dominant noise source was vehicle traffic on Avoca Drive. A number of homes (approximately 40) are in close proximity (within 15m) to the existing travel lanes of Avoca Drive, particularly the section to the south of Koolang Road.

Potential Impacts

There are approximately 40 private residences that are within 15m of the Avoca Drive road reserve within the study area and on Kenmare Road, within 20m of the proposed new road. These residences are sensitive noise recipients. The Green Point Reserve is a sensitive land use in the study area, it is located at the corner of Avoca Drive and Kenmare Road.

Construction:

During the construction stage there would be potential for the operational noise from machinery and equipment to increase the ambient noise levels in the Proposal site and affect residential homes in the vicinity of Avoca Drive. This risk would be highest in the areas to the south of Koolang Road where residential properties occur in close proximity to Avoca Drive and the proposed works.

The proposed construction of a road linking Asca Drive and Koolang Road through Green Point Reserve would require importing considerable amounts of fill and clearing a corridor of vegetation. These activities would have the potential to lead to an increase in the ambient noise level of the study area may result in adverse comments from nearby residents.

There would be a potential risk that the proposed widening works could result in increases in operational road traffic noise for residential properties in the vicinity of Avoca Drive. This would be a particular risk where the alignment of Avoca Drive is shifted closer to residential properties or

where bus bays are proposed in the vicinity of residential homes. This would need to be investigated in more detail when concept designs are available and the locations of bus bays is finalised.

Based on the Australian Standard 'Acoustics-Description and measurement of environmental noise', part 3, the estimated existing background A-weighted sound pressure level for the study area would be 40 dB(A) ($L_{A90,T}$) at night and 50 dB(A) ($L_{A90,T}$) during the day. This has been determined since the neighbourhood is an area with medium density transportation, as Avoca Drive is an arterial road. As this is a PEI, and exact construction details are not known at this point, assessment procedures for noise associated with construction works, and noise from stationary sources is based on the Rating Background Level (RBL). DEC recommends that the free-field LA10 (15 minute) noise levels arising from a construction site (or works) and measured in the general vicinity of any noise sensitive premises should not exceed:

- Background plus 20dB(A) for a cumulative period of noise exposure not exceeding four weeks;
- Background plus 10dB(A) for a cumulative period of noise exposure between four weeks and 26 weeks; and
- Background plus 5dB(A) for a cumulative period of exposure greater than 26 weeks.

The following is a guide of the typical noise levels of construction plant items in dB(A) from 7 metres:

Table 4.1.9. Typical noise levels of construction plant items dB(A) at 7m. Source: RTA Environmental Noise Management Manual

Construction Plant Item	Typical noise level at 7m (dB(A))
Scraper	86
Bulldozer	85
Grader	84
Front-end Loader	86
Vibrating roller	82
Backhoe	83
Excavator	80
Compressor	75
Concrete vibrator	87
Concrete pump	84
Dump Truck	83
Water tanker	84
Compactor	85
Concrete saw	93

Topography has the ability to alleviate noise levels from a roadway. If receivers (eg. residents) are located above, or below the level of the road, then the noise levels received can be less than they would be from the same distance on a flat surface. The surrounding area of the Proposal has a low gradient and so topography would not significantly decrease noise levels received by nearby residents from the roadway.

During construction there is the potential to increase vibration levels. The impacts associated with the Proposal would be addressed in the REF stage when precise details of the construction equipment used are available. If the likely criteria would be exceeded during construction, then when construction details are available, environmental safeguards would be able to be implemented.

Operation

During operation of the Proposal, when the construction is completed, there are road noise criteria for sensitive land uses. For passive recreation, such as the Green Point Reserve, the maximum noise levels must not exceed 55 $L_{Aeq(1hr)}$. For places of worship, the maximum noise levels during operation must not exceed 40 $L_{Aeq(1hr)}$. These figures are taken from the RTA's Environmental Criteria for Road Traffic Noise.

4.1.10 Contaminated Lands

Existing Environment

A search of the DEC Contaminated Lands Record was undertaken on 8 April 2004 for contaminated sites in Gosford LGA. Although there are two recorded sites in Gosford LGA, neither occurs in the study area and the proposed works would affect neither. Gosford City Council was contacted on 28 October 2004 in regards to any known or potentially contaminated sites at Green Point. No known or potentially contaminated sites are known to occur adjacent to Avoca Drive at Green Point. The nearest contaminated land site is the former Green Point Waste Disposal Area approximately 1.5km east of Avoca Drive.

The Acid Sulphate Soil Risk Map was searched for areas potentially affected by Acid Sulphate Soils. There is a high probability that the soils at the northern end of the study area (from approximately 50m south of the Milpera Road / Avoca Drive junction to Sun Valley Road) are affected by Acid Sulphate Soils. A map of the Acid Sulphate Soils risk is provided in Appendix B.

Potential Impacts

It is considered that the risk of the proposed road works affecting contaminated land in the study area is very low. No known contaminated sites or areas recognised as being potentially contaminated occur in the study area.

There would be potential that the proposed roadworks could affect Acid Sulphate Soils near the intersection of Sun Valley Road. This would need to be investigated during the REF stage when detailed plans showing drainage works and cross section levels are provided for the proposed works. To mitigate potential Acid Sulphate Soil risks, it is recommended that roadworks toward the northern end of the study area are designed to minimise the amount of excavation works.

5 Conclusion

The Proposal would have a generally high impact on the environment. The major environmental aspects and impacts identified for the Proposal include:

- A high probability of disturbing Acid Sulphate Soils in the northern end of the study area, near the intersection of Sun Valley Road;
- Potential to change the existing drainage characteristics of the wide flood channel that occurs in the area, adversely affecting the two vegetation communities and the sedgelands and reedlands that occur adjacent to the Green Point Reserve. If the proposed road is to be located within the corridor surveyed during the ecological assessment, further botanical survey would need to be undertaken to accurately determine the impact on vegetation communities when the concept designs have been produced and the exact location is known;
- There were eight individuals of the regionally restricted Gosford Wattle (*Acacia prominens*) identified in the bushland adjacent to the western side of Avoca Drive. Although not listed as threatened, it has previously been listed as a Rare or Threatened Australian Plant (ROTAP) in 1988;
- The Melaleuca Swamp Forest is included in the Sydney Coastal Estuary Swamp Forest Complex, which is an Endangered Ecological Community. The likely alignment of the new road is expected to result in a significant impact on the Melaleuca Swamp Forest, thereby triggering the need to prepare a Species Impact Statement (SIS) for the link road component of the Proposal;
- The eucalypt woodlands are considered a constraint to the Proposal. It is likely that the Proposed development of this fauna habitat type would trigger the need for a SIS;
- The wetland environment is identified as a constraint, offering resources for a number of species, and should be retained;
- Potential for disrupted traffic flow along Avoca Drive as a result of construction works and altered traffic conditions during the construction stage, especially during peak hour periods;
- Any development works across remnant bushland within Green Point Reserve that involves the disturbance of current ground or excavation of original soils may disturb or destroy Aboriginal objects. The intact soils within the location of the Proposal have potential archaeological deposits (PAD's) that may contain Aboriginal sites and objects, therefore development work within this area may require a Section 90 permit from the Department of Environment and Conservation (DEC);
- During the construction stage, clearing and the use of machinery would have the potential for impacts to the visual amenity of the study area for motorists driving along Avoca Drive;
- Residents along Kenmare Road would have views of the bushland in Green Point Reserve affected. The proposed construction of a 15m wide road through vegetation would substantially alter the views and reduce the visual amenity value of the area;
- The noise associated with construction has the potential to increase ambient noise levels, affecting nearby residents. The risk is expected to be highest in the areas to the south of Koolang Road, where the residential properties are in close proximity (within 15m) to Avoca Drive and the proposed works; and
- Potential that the proposed widening of Avoca Drive could result in increases in operational traffic noise for nearby residents. This would be a particular risk where the alignment of Avoca Drive is shifted closer to residential properties or where bus bays are

proposed in the vicinity of residential homes. This would need to be investigated in more detail when concept designs are available and the locations of bus bays is finalised.

The development of the concept design would aim to avoid or minimise these impacts. Where such impacts cannot be avoided, specific safeguards would be required including the implementation of standard environmental management measures.

Several environmental benefits would occur as a result of the Proposal:

- The additional public transport facilities would benefit the residential community of Gosford;
- The 1.5m wide cycle-ways along either side of Avoca Drive would provide safer recreational riding facilities for the local residents of the surrounding area;
- The Proposal would improve traffic flow and reduce congestion, minimising the necessity for vehicles to stop and start, thereby reducing vehicle emissions;
- In the long term, the increased number of travel lanes on Avoca Drive would improve traffic flow and improve safety conditions; and
- The formation of a link road between Asca Drive and Koolang Road would improve local access and reduce traffic flow and congestion on local roads at Green Point, west of Avoca Drive.

It is recommended that the following actions be undertaken:

- Consideration should be given to relocating the proposed road to avoid the flood channel and the vegetation communities that are associated with it;
- The removal of the eight Gosford Wattles (*Acacia prominens*) located adjacent to the roadside of Avoca Drive should be avoided;
- The developed Proposal should include appropriate filtration and drainage works, including the use of existing urban runoff affected drainage lines. This would ensure that no indirect issues relating to the discharge of polluted runoff arise, and this aquatic habitat is therefore not indirectly affected;
- The drainage design should aim at minimising increases in flow volumes and velocities into the downstream environments;
- A Traffic Management Plan be implemented and community consultation be undertaken to manage the potential traffic flow disruptions during the construction stage;
- That archaeological test excavation within the area of development impact of the Proposal be undertaken prior to any works commencing;
- In order to consider an application for a Section 90 permit, DEC would require archaeological test excavation in accordance with Section 87 of the *National Parks and Wildlife Act (NP&W Act)* to establish the presence, nature, extent and significance of Aboriginal cultural heritage that may be impacted by the Proposal. The application would be prepared by a suitably qualified archaeologist and would include archaeological test excavation within areas of the Proposal, and the methodology would be designed to sample, through controlled manual excavation, the range of terrain or 'topo-sequence' within the Green Point Reserve;
- To mitigate potential Acid Sulphate Soil risks, it is recommended that roadworks towards the northern end of the study area are designed to minimise the amount of excavation works; and
- Consultation with Gosford City Council would be initiated regarding the appropriate suppression of the noxious weeds recorded.

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APPENDIX A

Photographs of the Study Area



Plate 1: Intersection of Koolang Road and Avoca Drive looking South.



Plate 2: Avoca Drive looking north, with the intersection with Koolang Road in the distance. Green Point Reserve is the bushland on the left in the image.



Plate 3: The site of the proposed new roundabout, at the intersection of Koolang Road and Avoca Drive. The Bushland of the Green Point Reserve in the background is the location of the Proposed new link road joining Asca Drive to Avoca Drive.

APPENDIX B

Database Search Results

Australian Heritage Database

Search Results

[edit search](#) | [new search](#) | [about the Australian Heritage Database](#) | [Heritage home](#) | [Australian Heritage Council home](#)

38 results found.

Blackwall Mount Ornithological Area	Kitchener Av	Blackwall, NSW	(Indicative Place) Register of the National Estate
Bouddi National Park (1981 boundary)	Hawke Head Dr	Killcare, NSW	(Registered) Register of the National Estate
Bouddi National Park Marine Section		Killcare Heights, NSW	(Registered) Register of the National Estate
Brisbane Water County Council Building (former)	50 Mann St	Gosford, NSW	(Indicative Place) Register of the National Estate
Brisbane Water National Park (1981 boundary)	Pacific Hwy	Gosford, NSW	(Registered) Register of the National Estate
Broken Bay Entrance Foreshores		Ettalong, NSW	(Indicative Place) Register of the National Estate
Cottages	Dark Corner	Patonga, NSW	(Indicative Place) Register of the National Estate
Creighton Funeral Parlour	37 Mann St	Gosford, NSW	(Indicative Place) Register of the National Estate
Dharug National Park (1978 boundary)	Wisemans Ferry Rd	Spencer, NSW	(Registered) Register of the National Estate
Gosford Courthouse	45 Mann St	Gosford, NSW	(Registered) Register of the National Estate
Gosford Hills Landscape Conservation Area		Gosford, NSW	(Indicative Place) Register of the National Estate
Gosford Showground	Showground Rd	Gosford, NSW	(Indicative Place) Register of the National Estate
Great Northern Road - Extension	Great Northern Rd	Wollombi, NSW	(Registered) Register of the National Estate
Hawkesbury River Rail Bridge		Brooklyn, NSW	(Registered) Register of the National Estate
Holy Cross Catholic Church and Graveyard	Humphreys Rd	Kincumber South, NSW	(Registered) Register of the National Estate
Howe Aboriginal Area	Grants Rd	Somersby, NSW	(Registered) Register of the

<u>Indigenous Place</u>	Calga, NSW	National Estate (Registered) Register of the National Estate
<u>Indigenous Place</u>	Daleys Point, NSW	(Registered) Register of the National Estate
<u>Indigenous Place</u>	Kariong, NSW	(Registered) Register of the National Estate
<u>Indigenous Place</u>	Narara, NSW	(Registered) Register of the National Estate
<u>Indigenous Place</u>	St Albans, NSW	(Registered) Register of the National Estate
<u>Indigenous Place</u>	Woy Woy Bay, NSW	(Registered) Register of the National Estate
<u>Lion Island Nature Reserve</u>	Pearl Beach, NSW	(Registered) Register of the National Estate
<u>Lone grave of Frances Peat</u> Pacific Hwy	Mooney Mooney, NSW	(Indicative Place) Register of the National Estate
<u>Lower Hawkesbury Wesleyan Chapel</u> 969 Wisemans Ferry Rd	Wisemans Ferry, NSW	(Indicative Place) Register of the National Estate
<u>MacDonald Valley / Wollombi Valley Area</u>	St Albans, NSW	(Indicative Place) Register of the National Estate
<u>Mooney Mooney Aboriginal Area</u> Pacific Hwy	Somersby, NSW	(Registered) Register of the National Estate
<u>Mooney Mooney Creek Site</u> Pacific Hwy	Calga, NSW	(Registered) Register of the National Estate
<u>Mulholland Farm</u> 9 Pixie Av	Green Point, NSW	(Indicative Place) Register of the National Estate
<u>Rileys Island and Pelican Island Nature Reserves</u>	Woy Woy, NSW	(Registered) Register of the National Estate
<u>Somersby Geological Site</u>	Somersby, NSW	(Destroyed) Register of the National Estate
<u>Spectacle Island Nature Reserve</u>	Mooney Mooney, NSW	(Registered) Register of the National Estate
<u>St Josephs Educational and Spiritual Centre</u> 8 Humphreys Rd	Kincumber South, NSW	(Indicative Place) Register of the National Estate
<u>St Pauls Anglican Church</u> Empire Bay Dr	Kincumber, NSW	(Registered) Register of the National Estate
<u>The Grange</u> Renwick St	Wyoming, NSW	(Registered) Register of the

Wamberal Lagoon Nature Reserve Ocean View Dr	Wamberall, NSW	National Estate (Registered) Register of the National Estate
Warre Warren Aboriginal Place (proposed)	Mangrove Mountain, NSW	(Registered) Register of the National Estate
Wyoming Cottage and Helys Grave Pacific Hwy	Wyoming, NSW	(Registered) Register of the National Estate

Report Produced: Thu Oct 7 16:14:06 2004



NSW
Heritage
Office

Listing Heritage Items

› State Heritage Inventory Search Results

Statutory Listed Items

Information and items listed in the State Heritage Inventory come from a number of sources. This means that there may be several entries for the same heritage item in the database. For clarity, the search results have been divided into two sections.

- Section 1. contains items listed by the **Heritage Council** under the NSW Heritage Act. This includes listing on the State Heritage Register, an Interim Heritage Order or protected under section 130 of the NSW Heritage Act. This information is provided by the NSW Heritage Office.
- Section 2. contains items listed by **Local Councils & Shires and State Government Agencies**. This section may also contain additional information on some of the items listed in the first section.

Section 1. Items listed under the NSW Heritage Act.

The search results can be re-sorted by clicking on the **(sort)** option at the top of each column.

Item Name (sort)	Address (sort)	Suburb (sort)	LGA (sort)	State Heritage Register
Foreshore land and structures	9 Pixie Avenue	Green Point	Gosford	Yes
Mulholland's Farm	9 Pixie Avenue	Green Point	Gosford	Yes

There were **2** records in this section matching your search criteria.

Section 2. Items listed by Local Government and State agencies.

Item Name (sort)	Address (sort)	Suburb (sort)	LGA (sort)	Information Source (sort)
Green Point Wharf Site	End of Lexington Parade	Green Point	Gosford	LGOV
Mulholland's House	9 Pixie Avenue	Green Point	Gosford	LGOV

There were **2** records in this section matching your search criteria.

There was a total of **4** records matching your search criteria.

Key:

LGA = Local Government Area

GAZ = NSW Government Gazette (statutory listings prior to 1997), HGA = Heritage Grant Application, HS = Heritage Study, LGOV = Local Government, SGOV = State Government Agency.

Note: The Heritage Office seeks to keep the State Heritage Inventory (SHI) up to date, however the latest listings in Local and Regional Environmental Plans (LEPs and REPs) may not yet be included. Always check with the relevant Local Council or Shire for the most recent listings.



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Hunter region

[Home](#) > [Environment](#) > [Heritage](#) > [Heritage and conservation register](#) > [Hunter region](#)

Hunter Region

Barrington Bridge over Barrington River	4300161
Beckers Bridge over Webbers Creek, Gresford West	4300128
Bulga Bridge over Wollombi Brook	4300181
Clarencetown Bridge over Williams River	4301039
Cooreei Bridge over Williams River	4300177
Dawson River Bridge	4309522
Dunmore Bridge over the Paterson River	4301091
Elderslie Bridge over Hunter River	4301691
Fitzgerald Bridge over Hunter River	4301692
Gostwyck Bridge over the Paterson River, The	4301676
Hexham Bridge	4301049
Hinton Bridge over Paterson River	4301090
Kayuga Bridge over Hunter River	4301657
Luskintyre Bridge over Hunter River	4301667
Martin Bridge over the Manning River	4300300
Masonry Retaining Walls, Harpers Hill	4302672
Middle Falbrook Bridge over Glennies Creek	4300131
Monkerai Bridge over Karuah River	4300133
Mooney Mooney Bridge	4301680
Morpeth Bridge over the Hunter River	4301092
Muswellbrook Bridge	4301316
Paterson Bridge over Paterson River	4301688
Redbournberry Bridge over Hunter River	4301690
Vacy Bridge over Paterson River	4301025
Yarrawa Bridge over Goulburn River	4300170

In This Section

- [Hunter region](#)
- [Northern region](#)
- [South West region](#)
- [Southern region](#)
- [Sydney region](#)
- [Western region](#)

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Legend

- ★ AHIMS Sites
- ✕ Site of Works



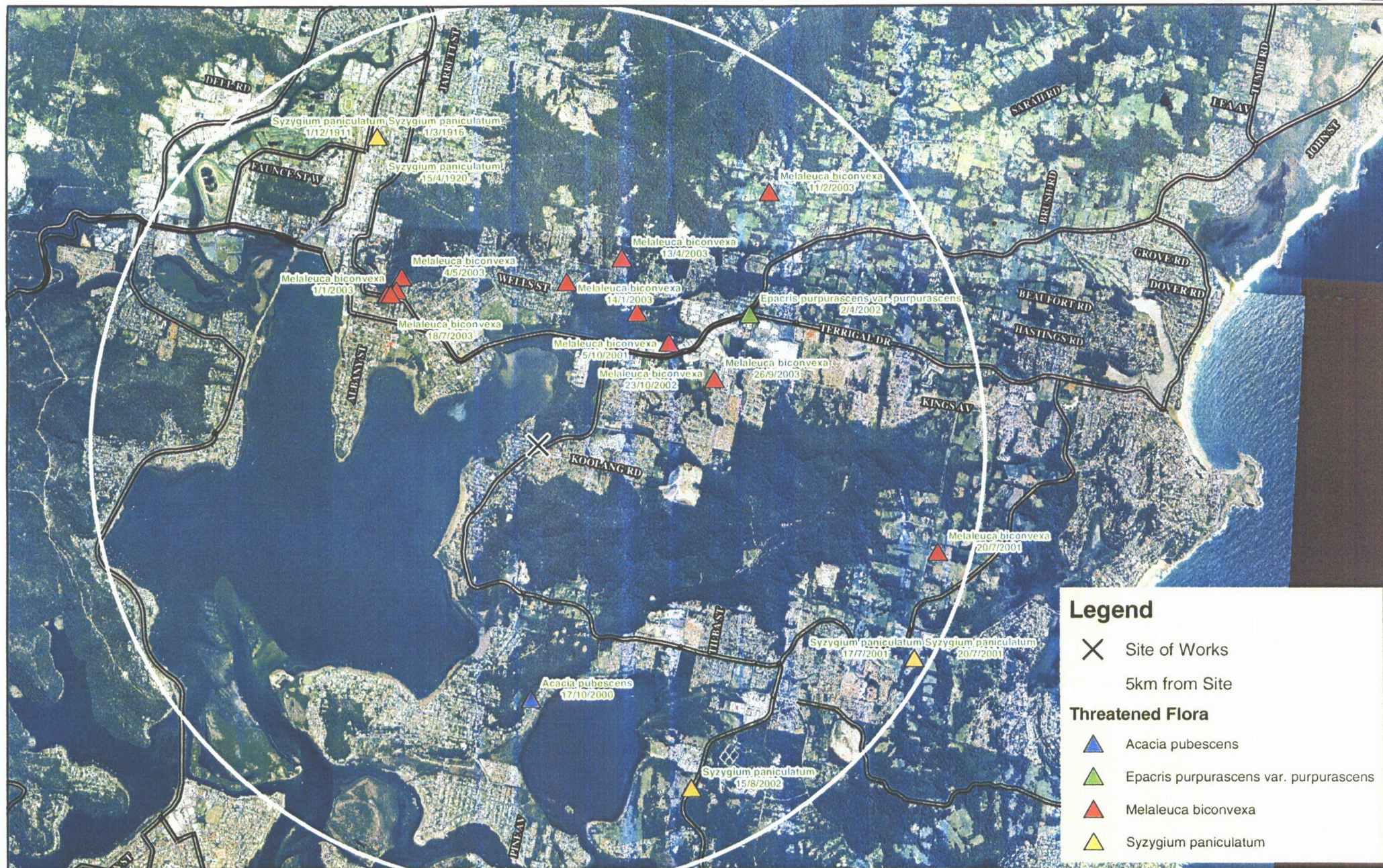
Avoca Drive Geotech
AHIMS Sites

0 0.5 1 2 3 Kilometers



Map produced by RTA Environmental Technology Branch
Date: 30 August 2004

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Legend

- ✕ Site of Works
5km from Site

Threatened Flora

- ▲ *Acacia pubescens*
- ▲ *Epacris purpurascens* var. *purpurascens*
- ▲ *Melaleuca biconvexa*
- ▲ *Syzygium paniculatum*

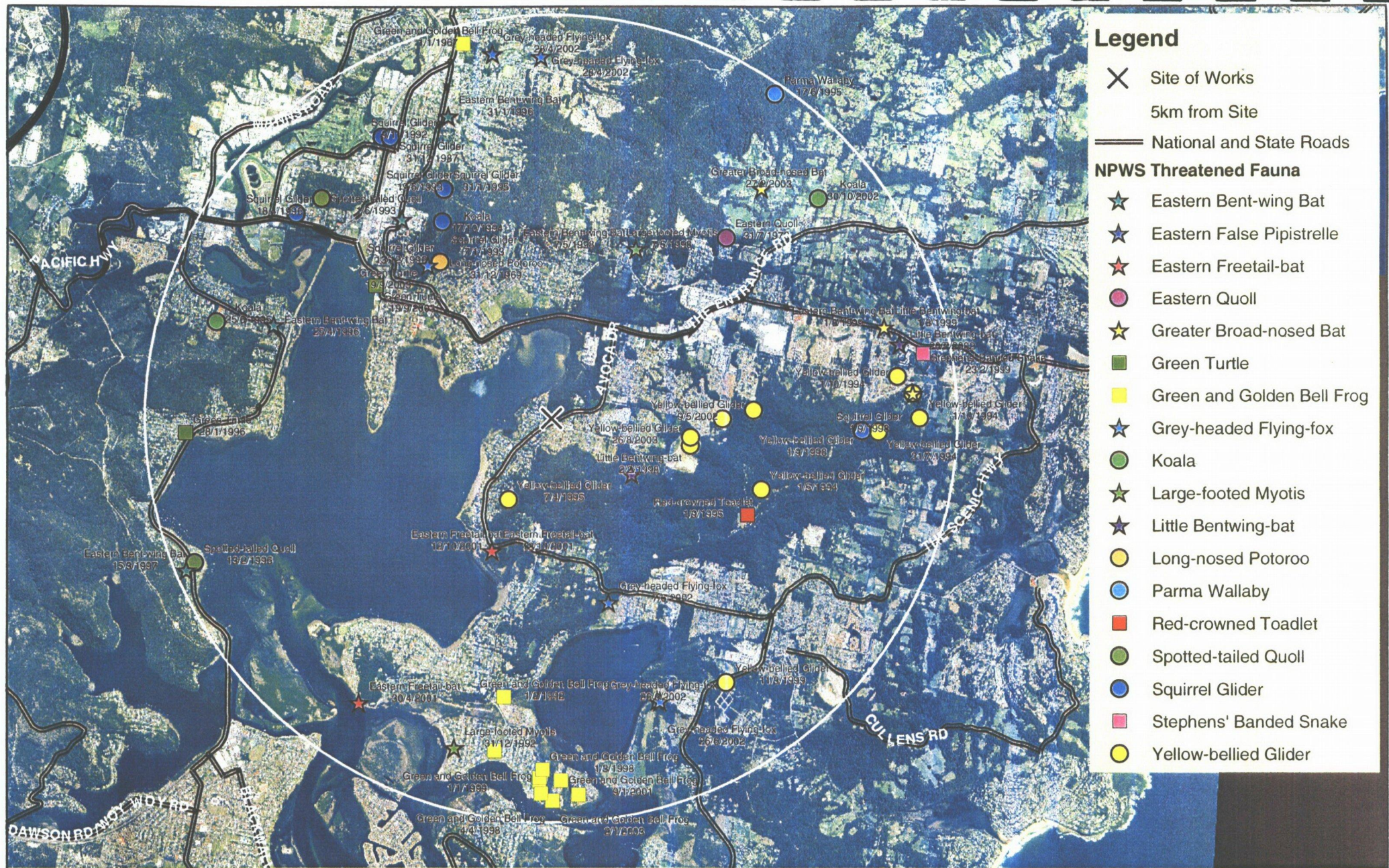
Map produced by RTA Environmental Technology Branch
Date: 7 October 2004

Avoca Drive Geotech
NPWS Threatened Flora

0 0.5 1 2 3 4 5 Kilometers

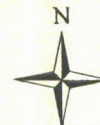


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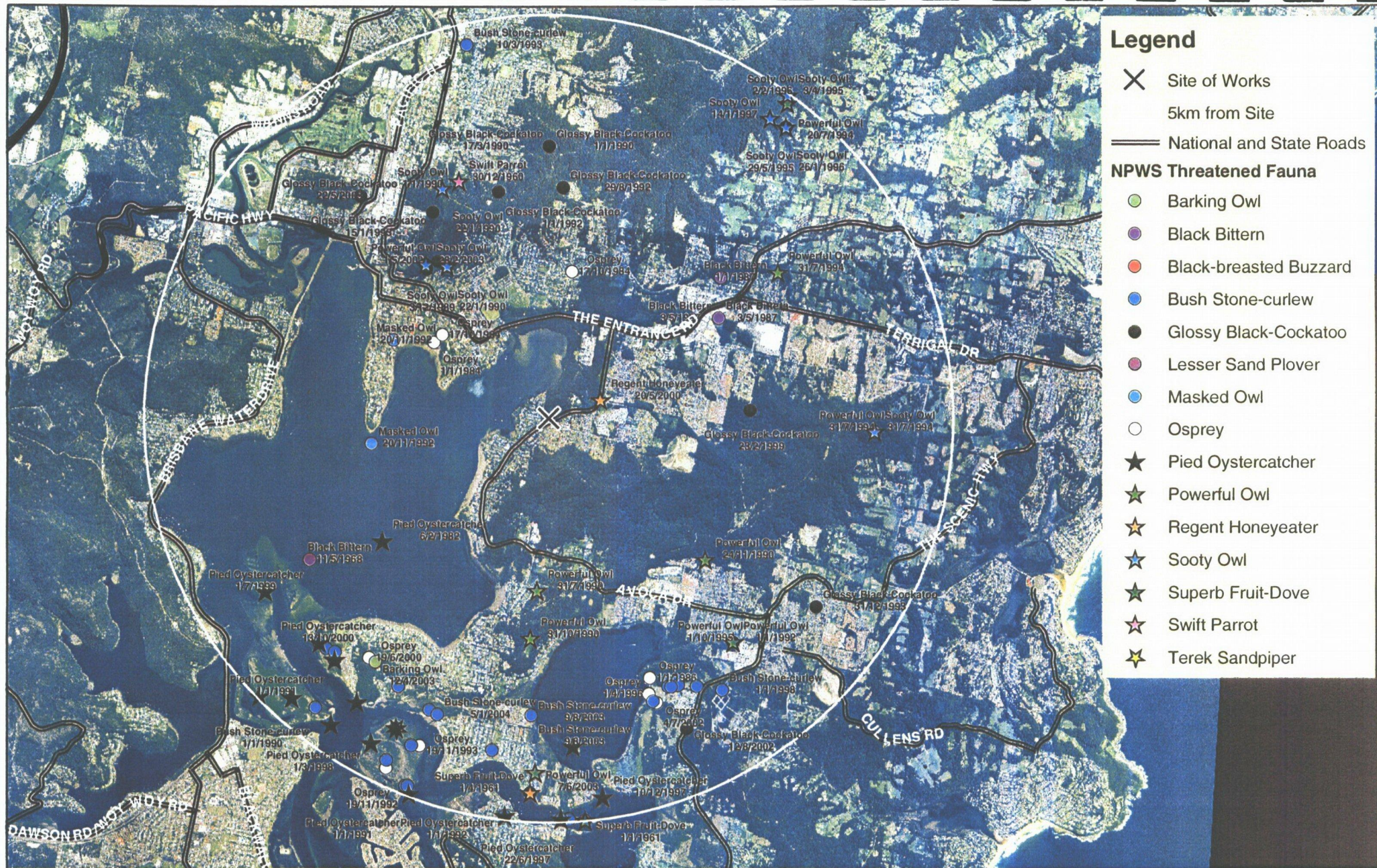
Avoca Drive Geotech NPWS Threatened Fauna: Amphibia, Mammalia, and Reptilia

0 0.5 1 2 3 4 5 Kilometers



Map produced by RTA Environmental Technology Branch
Date: 30 August 2004

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Australian Government
Department of the Environment and Heritage

Protected Matters Search Tool

You are here: [DEH Home](#) > [EPBC Act](#) > [Search](#)

7 October 2004 16:20

EPBC Act Protected Matters Report

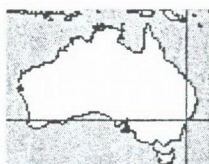
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at <http://www.environment.gov.au/atlas> may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.deh.gov.au/epbc/assessmentsapprovals/index.html>



Search Type: Point
Buffer: 10 km
Coordinates: -33.4482,151.36540



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see <http://www.deh.gov.au/epbc/assessmentsapprovals/guidelines/index.html>.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	None
Commonwealth Marine Areas:	Relevant
Threatened Ecological Communities:	None
Threatened Species:	48
Migratory Species:	32

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at <http://www.deh.gov.au/heritage/index.html>.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species,

whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at <http://www.deh.gov.au/epbc/permits/index.html>.

Commonwealth Lands:	4
Commonwealth Heritage Places:	None
Places on the RNE:	14
Listed Marine Species:	52
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	7
Other Commonwealth Reserves:	None
Regional Forest Agreements:	1

Details

Matters of National Environmental Significance

Commonwealth Marine Areas [[Dataset Information](#)]

Approval may be required for a proposed activity that is likely to have a significant impact on the environment in a Commonwealth Marine Area, when the action is outside the Commonwealth Marine Area, or the environment anywhere when the action is taken within the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Within 3 Nautical Mile Limit

Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
<i>Diomedea amsterdamensis</i> Amsterdam Albatross	Endangered	Species or species habitat may occur within area
<i>Diomedea antipodensis</i> Antipodean Albatross	Vulnerable	Species or species habitat may occur within area
<i>Diomedea dabbenena</i> Tristan Albatross	Endangered	Foraging may occur within area
<i>Diomedea exulans</i> Wandering Albatross	Vulnerable	Species or species habitat may occur within area
<i>Diomedea gibsoni</i> Gibson's Albatross	Vulnerable	Species or species habitat may occur within area
<i>Lathamus discolor</i> Swift Parrot	Endangered	Species or species habitat may occur within area

<u>Macronectes giganteus</u> Southern Giant-Petrel	Endangered	Species or species habitat may occur within area
<u>Macronectes halli</u> Northern Giant-Petrel	Vulnerable	Species or species habitat may occur within area
<u>Pterodroma leucoptera leucoptera</u> Gould's Petrel	Endangered	Species or species habitat may occur within area
<u>Pterodroma neglecta neglecta</u> Kermadec Petrel (western)	Vulnerable	Species or species habitat may occur within area
<u>Rostratula australis</u> Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche bulleri</u> Buller's Albatross	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche cauta</u> Shy Albatross	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche impavida</u> Campbell Albatross	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche salvini</u> Salvin's Albatross	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche steadi</u> White-capped Albatross	Vulnerable	Species or species habitat may occur within area
<u>Xanthomyza phrygia</u> Regent Honeyeater	Endangered	Species or species habitat likely to occur within area
Fishes		
<u>Macquaria australasica</u> * Macquarie Perch	Endangered	Species or species habitat may occur within area
Frogs		
<u>Heleioporus australiacus</u> * Giant Burrowing Frog	Vulnerable	Species or species habitat likely to occur within area
<u>Litoria aurea</u> * Green and Golden Bell Frog	Vulnerable	Species or species habitat likely to occur within area
<u>Litoria littlejohni</u> * Littlejohn's Tree Frog, Heath Frog	Vulnerable	Species or species habitat likely to occur within area
<u>Mixophyes balbus</u> * Stuttering Frog, Southern Barred Frog (in Victoria)	Vulnerable	Species or species habitat likely to occur within area
<u>Mixophyes iteratus</u> * Southern Barred Frog, Giant Barred Frog	Endangered	Species or species habitat likely to occur within area
Mammals		
<u>Balaenoptera musculus</u> * Blue Whale	Endangered	Species or species habitat may occur within area
<u>Chalinolobus dwyeri</u> Large-eared Pied Bat, Large Pied Bat	Vulnerable	Species or species habitat may occur within area
<u>Dasyurus maculatus maculatus</u> (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	Endangered	Species or species habitat likely to occur within area
<u>Eubalaena australis</u> *	Endangered	Species or species habitat may

Southern Right Whale		occur within area
<i>Megaptera novaeangliae</i> *	Vulnerable	Species or species habitat may occur within area
Humpback Whale		
<i>Potorous tridactylus tridactylus</i>	Vulnerable	Species or species habitat may occur within area
Long-nosed Potoroo (SE mainland)		
<i>Pteropus poliocephalus</i>	Vulnerable	Species or species habitat likely to occur within area
Grey-headed Flying-fox		
Reptiles		
<i>Chelonia mydas</i> *	Vulnerable	Species or species habitat may occur within area
Green Turtle		
<i>Dermochelys coriacea</i> *	Vulnerable	Species or species habitat may occur within area
Leathery Turtle, Leatherback Turtle, Luth		
<i>Hoplocephalus bungaroides</i> *	Vulnerable	Species or species habitat likely to occur within area
Broad-headed Snake		
Sharks		
<i>Carcharias taurus</i> (east coast population)	Critically Endangered	Species or species habitat may occur within area
Grey Nurse Shark (east coast population)		
<i>Carcharodon carcharias</i>	Vulnerable	Species or species habitat may occur within area
Great White Shark		
<i>Rhincodon typus</i>	Vulnerable	Species or species habitat may occur within area
Whale Shark		
Plants		
<i>Acacia bynoeana</i> *	Vulnerable	Species or species habitat likely to occur within area
Bynoe's Wattle, Tiny Wattle		
<i>Bothriochloa biloba</i>	Vulnerable	Species or species habitat likely to occur within area
Lobed Blue-grass		
<i>Caladenia tessellata</i>	Vulnerable	Species or species habitat likely to occur within area
Thick-lipped Spider-orchid, Daddy Long-legs		
<i>Cryptostylis hunteriana</i>	Vulnerable	Species or species habitat may occur within area
Leafless Tongue-orchid		
<i>Eucalyptus camfieldii</i>	Vulnerable	Species or species habitat likely to occur within area
Camfield's Stringybark		
<i>Grevillea shiressii</i>	Vulnerable	Species or species habitat likely to occur within area
<i>Melaleuca biconvexa</i>	Vulnerable	Species or species habitat likely to occur within area
Biconvex Paperbark		
<i>Melaleuca deanei</i>	Vulnerable	Species or species habitat may occur within area
Deane's Melaleuca		
<i>Prostanthera askania</i>	Endangered	Species or species habitat likely to occur within area
Tranquillity Mintbush		
<i>Prostanthera junonis</i>	Endangered	Species or species habitat likely to occur within area
Somersby Mintbush		
<i>Syzygium paniculatum</i>	Vulnerable	Species or species habitat likely to occur within area
Magenta Lilly Pilly, Magenta Cherry, Pocket-less Brush Cherry, Scrub Cherry, Creek Lilly Pilly, Brush Cherry		
<i>Tetratheca glandulosa</i>	Vulnerable	Species or species habitat likely to

Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
<i>Hirundapus caudacutus</i> White-throated Needletail	Migratory	Species or species habitat may occur within area
<i>Monarcha melanopsis</i> Black-faced Monarch	Migratory	Breeding may occur within area
<i>Myiagra cyanoleuca</i> Satin Flycatcher	Migratory	Breeding likely to occur within area
<i>Rhipidura rufifrons</i> Rufous Fantail	Migratory	Breeding may occur within area
<i>Xanthomyza phrygia</i> Regent Honeyeater	Migratory	Species or species habitat likely to occur within area
Migratory Wetland Species		
Birds		
<i>Gallinago hardwickii</i> Latham's Snipe, Japanese Snipe	Migratory	Species or species habitat may occur within area
<i>Rostratula benghalensis s. lat.</i> Painted Snipe	Migratory	Species or species habitat may occur within area
Migratory Marine Birds		
<i>Diomedea amsterdamensis</i> Amsterdam Albatross	Migratory	Species or species habitat may occur within area
<i>Diomedea antipodensis</i> Antipodean Albatross	Migratory	Species or species habitat may occur within area
<i>Diomedea dabbenena</i> Tristan Albatross	Migratory	Foraging may occur within area
<i>Diomedea exulans</i> Wandering Albatross	Migratory	Species or species habitat may occur within area
<i>Diomedea gibsoni</i> Gibson's Albatross	Migratory	Species or species habitat may occur within area
<i>Macronectes giganteus</i> Southern Giant-Petrel	Migratory	Species or species habitat may occur within area
<i>Macronectes halli</i> Northern Giant-Petrel	Migratory	Species or species habitat may occur within area
<i>Pterodroma leucoptera leucoptera</i> Gould's Petrel	Migratory	Species or species habitat may occur within area
<i>Thalassarche bulleri</i> Buller's Albatross	Migratory	Species or species habitat may occur within area
<i>Thalassarche cauta</i> Shy Albatross	Migratory	Species or species habitat may occur within area
<i>Thalassarche impavida</i> Campbell Albatross	Migratory	Species or species habitat may occur within area
<i>Thalassarche melanophris</i>	Migratory	Species or species habitat may

Black-browed Albatross		occur within area
<i>Thalassarche salvini</i> Salvin's Albatross	Migratory	Species or species habitat may occur within area
<i>Thalassarche steadi</i> White-capped Albatross	Migratory	Species or species habitat may occur within area

Migratory Marine Species

Mammals

<i>Balaenoptera edeni</i> Bryde's Whale	Migratory	Species or species habitat may occur within area
<i>Balaenoptera musculus</i> * Blue Whale	Migratory	Species or species habitat may occur within area
<i>Caperea marginata</i> Pygmy Right Whale	Migratory	Species or species habitat may occur within area
<i>Eubalaena australis</i> * Southern Right Whale	Migratory	Species or species habitat may occur within area
<i>Megaptera novaeangliae</i> * Humpback Whale	Migratory	Species or species habitat may occur within area
<i>Orcinus orca</i> Killer Whale, Orca	Migratory	Species or species habitat may occur within area

Reptiles

<i>Chelonia mydas</i> * Green Turtle	Migratory	Species or species habitat may occur within area
<i>Dermochelys coriacea</i> * Leathery Turtle, Leatherback Turtle, Luth	Migratory	Species or species habitat may occur within area

Sharks

<i>Carcharodon carcharias</i> Great White Shark	Migratory	Species or species habitat may occur within area
<i>Rhincodon typus</i> Whale Shark	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
<i>Apus pacificus</i> Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
<i>Ardea alba</i> Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
<i>Ardea ibis</i> Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
<i>Calonectris leucomelas</i> Streaked Shearwater	Listed	Species or species habitat may occur within area
<i>Catharacta skua</i>	Listed	Species or species habitat may occur

Great Skua		within area
<i>Diomedea amsterdamensis</i> Amsterdam Albatross	Listed	Species or species habitat may occur within area
<i>Diomedea antipodensis</i> Antipodean Albatross	Listed	Species or species habitat may occur within area
<i>Diomedea dabbenena</i> Tristan Albatross	Listed	Foraging may occur within area
<i>Diomedea exulans</i> Wandering Albatross	Listed	Species or species habitat may occur within area
<i>Diomedea gibsoni</i> Gibson's Albatross	Listed	Species or species habitat may occur within area
<i>Gallinago hardwickii</i> Latham's Snipe, Japanese Snipe	Listed - overfly marine area	Species or species habitat may occur within area
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
<i>Hirundapus caudacutus</i> White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area
<i>Lathamus discolor</i> Swift Parrot	Listed - overfly marine area	Species or species habitat may occur within area
<i>Macronectes giganteus</i> Southern Giant-Petrel	Listed	Species or species habitat may occur within area
<i>Macronectes halli</i> Northern Giant-Petrel	Listed	Species or species habitat may occur within area
<i>Merops ornatus</i> Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
<i>Monarcha melanopsis</i> Black-faced Monarch	Listed - overfly marine area	Breeding may occur within area
<i>Myiagra cyanoleuca</i> Satin Flycatcher	Listed - overfly marine area	Breeding likely to occur within area
<i>Rhipidura rufifrons</i> Rufous Fantail	Listed - overfly marine area	Breeding may occur within area
<i>Rostratula benghalensis s. lat.</i> Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area
<i>Thalassarche bulleri</i>	Listed	Species or species habitat may occur

Buller's Albatross		within area
<i>Thalassarche cauta</i> Shy Albatross	Listed	Species or species habitat may occur within area
<i>Thalassarche chlororhynchos</i> Yellow-nosed Albatross, Atlantic Yellow-nosed Albatross	Listed	Species or species habitat may occur within area
<i>Thalassarche impavida</i> Campbell Albatross	Listed	Species or species habitat may occur within area
<i>Thalassarche melanophris</i> Black-browed Albatross	Listed	Species or species habitat may occur within area
<i>Thalassarche salvini</i> Salvin's Albatross	Listed	Species or species habitat may occur within area
<i>Thalassarche steadi</i> White-capped Albatross	Listed	Species or species habitat may occur within area
Fishes		
<i>Acentronura tentaculata</i> Hairy Pygmy Pipehorse	Listed	Species or species habitat may occur within area
<i>Festucalex cinctus</i> Girdled Pipefish	Listed	Species or species habitat may occur within area
<i>Filicampus tigris</i> Tiger Pipefish	Listed	Species or species habitat may occur within area
<i>Heraldia nocturna</i> Upside-down Pipefish	Listed	Species or species habitat may occur within area
<i>Hippichthys penicillus</i> Beady Pipefish, Steep-nosed Pipefish	Listed	Species or species habitat may occur within area
<i>Hippocampus abdominalis</i> Eastern Potbelly Seahorse, New Zealand Potbelly, Seahorse, Bigbelly Seahorse	Listed	Species or species habitat may occur within area
<i>Hippocampus whitei</i> White's Seahorse, Crowned Seahorse, Sydney Seahorse	Listed	Species or species habitat may occur within area
<i>Histiogamphelus briggsii</i> Briggs' Crested Pipefish, Briggs' Pipefish	Listed	Species or species habitat may occur within area
<i>Lissocampus runa</i> Javelin Pipefish	Listed	Species or species habitat may occur within area
<i>Maroubra perserrata</i> Sawtooth Pipefish	Listed	Species or species habitat may occur within area
<i>Notiocampus ruber</i> Red Pipefish	Listed	Species or species habitat may occur within area
<i>Phyllopteryx taeniolatus</i> Weedy Seadragon, Common Seadragon	Listed	Species or species habitat may occur within area
<i>Solegnathus spinosissimus</i> Spiny Pipehorse, Australian Spiny Pipehorse	Listed	Species or species habitat may occur within area
<i>Solenostomus cyanopterus</i> Blue-finned Ghost Pipefish, Robust Ghost Pipefish	Listed	Species or species habitat may occur within area
<i>Solenostomus paradoxus</i> Harlequin Ghost Pipefish, Ornate Ghost	Listed	Species or species habitat may occur within area

Pipefish

Stigmatopora argus
Spotted Pipefish

Listed Species or species habitat may occur within area

Stigmatopora nigra
Wide-bodied Pipefish, Black Pipefish

Listed Species or species habitat may occur within area

Syngnathoides biaculeatus
Double-ended Pipehorse, Alligator Pipefish

Listed Species or species habitat may occur within area

Trachyrhamphus bicoarctatus
Bend Stick Pipefish, Short-tailed Pipefish

Listed Species or species habitat may occur within area

Urocampus carinirostris
Hairy Pipefish

Listed Species or species habitat may occur within area

Vanacampus margaritifer
Mother-of-pearl Pipefish

Listed Species or species habitat may occur within area

Reptiles

Chelonia mydas *
Green Turtle

Listed Species or species habitat may occur within area

Dermochelys coriacea *
Leathery Turtle, Leatherback Turtle, Luth

Listed Species or species habitat may occur within area

Pelamis platurus
Yellow-bellied Seasnake

Listed Species or species habitat may occur within area

Whales and Other Cetaceans [[Dataset Information](#)]

Status Type of Presence

Balaenoptera acutorostrata
Minke Whale

Cetacean Species or species habitat may occur within area

Balaenoptera edeni
Bryde's Whale

Cetacean Species or species habitat may occur within area

Balaenoptera musculus *
Blue Whale

Cetacean Species or species habitat may occur within area

Caperea marginata
Pygmy Right Whale

Cetacean Species or species habitat may occur within area

Delphinus delphis
Common Dolphin

Cetacean Species or species habitat may occur within area

Eubalaena australis *
Southern Right Whale

Cetacean Species or species habitat may occur within area

Grampus griseus
Risso's Dolphin, Grampus

Cetacean Species or species habitat may occur within area

Lagenorhynchus obscurus
Dusky Dolphin

Cetacean Species or species habitat may occur within area

Megaptera novaeangliae *
Humpback Whale

Cetacean Species or species habitat may occur within area

Orcinus orca
Killer Whale, Orca

Cetacean Species or species habitat may occur within area

Stenella attenuata
Spotted Dolphin, Pantropical Spotted Dolphin

Cetacean Species or species habitat may occur within area

Tursiops aduncus
Spotted Bottlenose Dolphin

Cetacean Species or species habitat likely to occur within area

Tursiops truncatus s. str.

Cetacean Species or species habitat may occur

Bottlenose Dolphin within area

Commonwealth Lands [[Dataset Information](#)]

Communications, Information Technology and the Arts - Australian Postal Corporation

Communications, Information Technology and the Arts - Telstra Corporation Limited

Defence

Defence - Defence Housing Authority

Places on the RNE [[Dataset Information](#)]

Note that not all Indigenous sites may be listed.

Historic

[Gosford Courthouse NSW](#)

[Holy Cross Catholic Church and Graveyard NSW](#)

[St Pauls Anglican Church NSW](#)

[The Grange NSW](#)

[Wyoming Cottage and Helys Grave NSW](#)

Indigenous

[Bulgandry Aboriginal Site NSW](#)

[Daleys Point Area NSW](#)

[Narara Area NSW](#)

[Staples Lookout Area NSW](#)

Natural

[Bouddi National Park \(1981 boundary\) NSW](#)

[Bouddi National Park Marine Section NSW](#)

[Brisbane Water National Park \(1981 boundary\) NSW](#)

[Rileys Island and Pelican Island Nature Reserves NSW](#)

[Wamberal Lagoon Nature Reserve NSW](#)

Extra Information

State and Territory Reserves [[Dataset Information](#)]

Bouddi National Park, NSW

Brisbane Water National Park, NSW

Cockle Bay Nature Reserve, NSW

Pelican Island Nature Reserve, NSW

Rileys Island Nature Reserve, NSW

Wamberal Lagoon Nature Reserve, NSW

Wambina Nature Reserve, NSW

Regional Forest Agreements [[Dataset Information](#)]

Note that all RFA areas including those still under consideration have been included.

Lower North East NSW RFA, New South Wales

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the *Environment Protection and Biodiversity Conservation Act 1999*. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under "type of presence". For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the migratory and marine provisions of the Act have been mapped.

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgments

This database has been compiled from a range of data sources. Environment Australia acknowledges the following custodians who have contributed valuable data and advice:

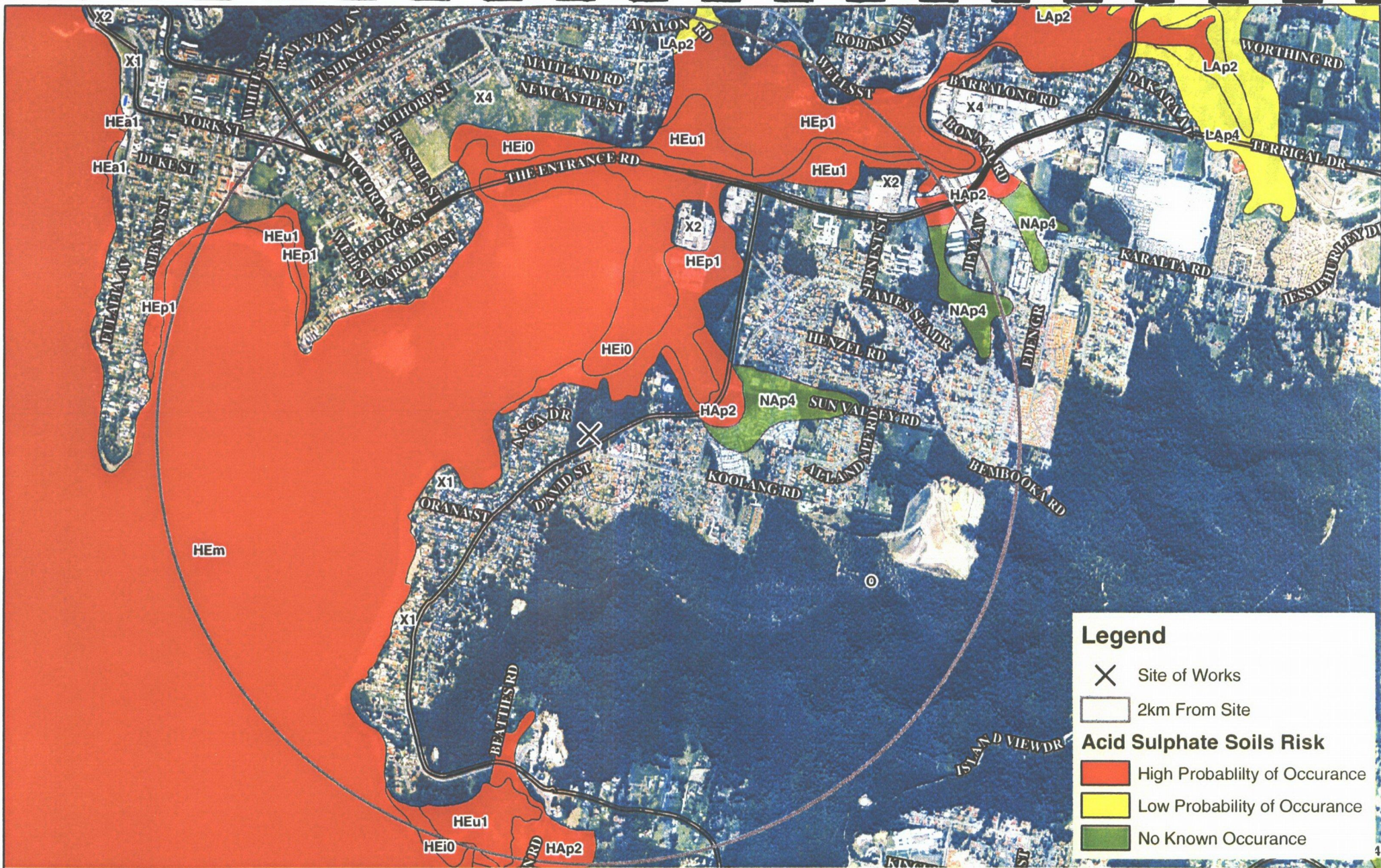
- [New South Wales National Parks and Wildlife Service](#)
- [Department of Sustainability and Environment, Victoria](#)
- [Department of Primary Industries, Water and Environment, Tasmania](#)
- [Department of Environment and Heritage, South Australia Planning SA](#)
- [Parks and Wildlife Commission of the Northern Territory](#)
- [Environmental Protection Agency, Queensland](#)
- [Birds Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- [Natural history museums of Australia](#)
- [Queensland Herbarium](#)
- [National Herbarium of NSW](#)
- [Royal Botanic Gardens and National Herbarium of Victoria](#)
- [Tasmanian Herbarium](#)
- [State Herbarium of South Australia](#)
- [Northern Territory Herbarium](#)
- [Western Australian Herbarium](#)
- [Australian National Herbarium, Atherton and Canberra](#)
- [University of New England](#)
- Other groups and individuals

ANUCLIM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Last updated:

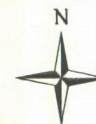
[Department of the Environment and Heritage](#)
GPO Box 787 Canberra ACT 2601 Australia
Telephone: +61 (0)2 6274 1111

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Avoca Drive Geotech Acid Sulphate Soils

0 0.5 1 2 3 Kilometers



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Map produced by RTA Environmental Technology Branch
Date: 30 August 2004



[Home](#) » [Farm management](#) » [Pest and weeds management](#) » [Weeds management](#) » [Noxious weed declarations](#) »

Noxious weed declarations in NSW

Gosford

The following weeds are declared noxious in the Gosford control area. The 'details' link on each listing provides information on the legal requirements of the weed's listing and any variation in status within the local control list of all weeds in all control areas is also available as a PDF document.

Common name	Scientific name	Category	
African boxthorn	<i>Lycium ferocissimum</i>	W2	details
Alligator weed	<i>Alternanthera philoxeroides</i>	W1	details
Bathurst Noogoora Californian Cockle burrs	<i>Xanthium spp.</i>	W3	details
Bitou bush Boneseed	<i>Chrysanthemoides monilifera</i>	W3	details
Black knapweed	<i>Centaurea nigra</i>	W1	details
Blackberry	<i>Rubus fruticosus (agg. spp.)</i>	W3	details
Broomrape	<i>Orobanche spp.</i>	W1	details
Cabomba	<i>Cabomba spp.</i>	W4g	details
Columbus grass	<i>Sorghum x alnum</i>	W2	details
Crofton weed	<i>Ageratina adenophora</i>	W3	details
Dodder	<i>Cuscuta campestris</i>	W2	details
Giant Parramatta grass	<i>Sporobolus fertilis syn. Sporobolus indicus var. major</i>	W2	details
Gorse	<i>Ulex europaeus</i>	W2	details
Green cestrum	<i>Cestrum parqui</i>	W2	details
Groundsel bush	<i>Baccharis halimifolia</i>	W2	details
Harrisia cactus	<i>Harrisia spp.</i>	W4f	details
Hawkweed	<i>Hieracium spp.</i>	W1	details
Horsetail	<i>Equisetum spp.</i>	W1	details
Johnson grass	<i>Sorghum halepense</i>	W2	details
Karoo thorn	<i>Acacia karroo</i>	W1	details
Kochia	<i>Kochia scoparia</i>	W1	details
Lagarosiphon	<i>Lagarosiphon major</i>	W1	details
Ludwigia	<i>Ludwigia peruviana</i>	W2	details
Mexican feather grass	<i>Nassella tenuissima syn Stipa tenuissima</i>	W1	details
Miconia	<i>Miconia spp.</i>	W1	details
Mistflower	<i>Ageratina riparia</i>	W2	details
Pampas grass	<i>Cortaderia spp.</i>	W2	details
Parthenium weed	<i>Parthenium hysterophorus</i>	W1	details
Pellitory	<i>Parietaria judaica</i>	W2	details

Prickly pears	<i>Opuntia spp.</i>	W4f	details
Rhus tree	<i>Toxicodendron succedaneum</i>	W2	details
Salvinia	<i>Salvinia molesta</i>	W2	details
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	W1	details
Siam weed	<i>Chromolaena odorata</i>	W1	details
Spiny burrgrass	<i>Cenchrus longispinus</i>	W2	details
Spiny burrgrass	<i>Cenchrus incertus</i>	W2	details
Spiny emex	<i>Emex australis</i>	W2	details
Spotted knapweed	<i>Centaurea maculosa</i>	W1	details
St John's wort	<i>Hypericum perforatum</i>	W2	details
Water hyacinth	<i>Eichhornia crassipes</i>	W2	details
Water lettuce	<i>Pistia stratiotes</i>	W1	details
Willows	<i>Salix spp.</i>	W4g	details

[Return to start page](#)

The information contained in this web page is based on knowledge and understanding at the time of writing. However, in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to che information with the appropriate officer of NSW Department of Primary Industries or the user's independent adviser.

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Emission Report

You are here: [NPI Home](#) > [NPI Database](#)

11 October 2004 15:53

Substance Emissions - All Sources : Postcode 2251

The NPI holds data reported by larger industrial facilities, and aggregated emission data for smaller facilities and mobile and non-industrial sources, collected by participating jurisdictions. Accuracy of data varies along with estimation techniques - see [explanation of data](#) below. The [listed substances](#) span a wide range of toxicities, and a small amount of a highly toxic substance may be of more concern than a larger emission of a less toxic substance. This report includes data for industrial facilities and aggregated emission data (if available for this area).

Reporting Year: 2002 - 2003 (for facilities only)

Data Source: All sources - Reporting Facilities + Aggregated Emission Data
([click](#) to exclude Aggregated Emission Data)



This report includes:

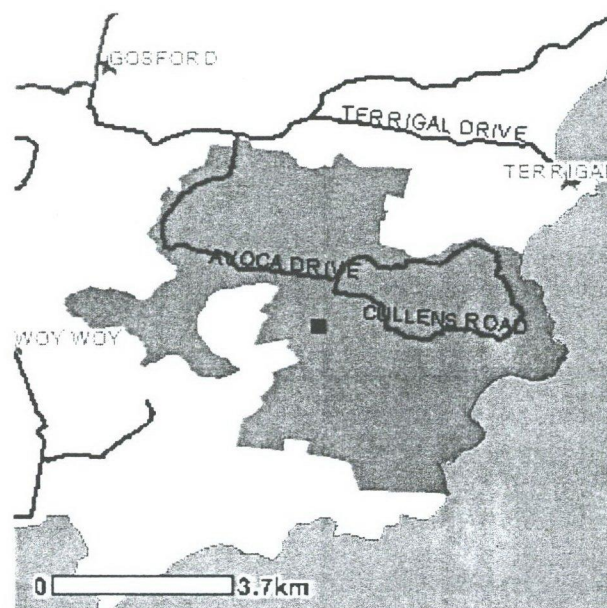
- [Summary](#) of emission sources for this area - **Postcode 2251**.
- [Top sources](#) for each substance, and amounts emitted.
- [Explanation](#) of data and calculations.

See also other reports on:

- [Facility](#) emission details for this area (new window).

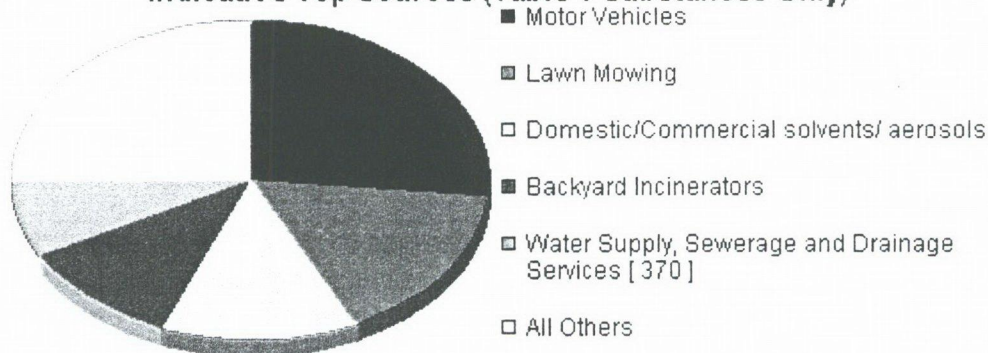
Source Summary - Postcode 2251

- 26 substances from 12 sources were found.
- One facility reported to the NPI.
- Additional aggregated emission data was collected for 11 sources.
- Indicative top sources for this region are shown in the pie chart. Note that only substances listed on [Table 1](#) were used in the calculation - these substances were required to be reported for the first three reporting years.



Map of Postcode 2251:

NPI facilities are shown as ■





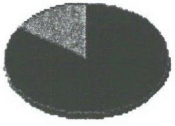


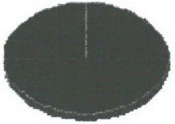

Indicative Top Sources (Table 1 Substances Only)

The indicative top sources, a broad snapshot of all emissions reported in this area, are derived by converting each emission into proportional units, and then pooling those proportional units. This calculation does not account for any variation in toxicity or ground level concentration of these substances - see further [explanation](#) below. For more accurate information, refer to individual substance information in the table below under Top Sources By Substance.

Top Sources by Substance - Postcode 2251

The table shows emissions of all substances in this area, and the top sources for each substance. All emission amounts have been rounded to two significant figures. Note that totals may differ from the sum of the individual amounts because of this rounding. Source names for reporting facilities are shown as ANZSIC Groups; source names for any aggregated emission data are marked with *. See [explanation](#) for information on NPI data, or click on the source name.

Substance (sort by total emission)	Total Emissions (kg)	Emission Sources		
		Distribution (pie chart)	Name (Aggregated Data Source * or ANZSIC Group)	Sub-total (kg)
Acetone (Table 1)	720		Motor Vehicles *	520
			Motor Vehicle Refinishing *	120
			Burning(fuel red., regen., agric.)/ Wildfires *	72
Arsenic & compounds (Table 1)	0.0018		Backyard Incinerators *	0.0018
Benzene (Table 1)	9,100		Motor Vehicles *	7,900
			Lawn Mowing *	530
			Solid fuel burning (domestic) *	380
			Service stations *	250
			Burning(fuel red., regen., agric.)/ Wildfires *	95
1,3-Butadiene (vinyl ethylene) (Table 1)	69		Lawn Mowing *	67
			Backyard Incinerators *	1.6

Cadmium & compounds (Table 1)	0.045		Backyard Incinerators *	0.032
			Solid fuel burning (domestic) *	0.013
Carbon monoxide (Table 1)	2,300,000		Motor Vehicles *	2,200,000
			Solid fuel burning (domestic) *	41,000
			Lawn Mowing *	32,000
			Burning(fuel red., regen., agric.)/ Wildfires *	9,600
			Backyard Incinerators *	3,100
Chromium (VI) compounds (Table 1)	0.15		Lawn Mowing *	0.14
			Backyard Incinerators *	0.016
			Solid fuel burning (domestic) *	0.00012
Cobalt & compounds (Table 1)	0.14		Lawn Mowing *	0.14
			Backyard Incinerators *	0.0055
Ethylene glycol (1,2-ethanediol) (Table 1)	130		Domestic/Commercial solvents/ aerosols *	110
			Architectural Surface Coatings *	20
Lead & compounds (Table 1)	1.3		Lawn Mowing *	1.3
			Backyard Incinerators *	0.026
			Service stations *	0.0014
Mercury & compounds (Table 1)	0.0067		Backyard Incinerators *	0.0067
Methanol (Table 1)	1,900		Domestic/Commercial solvents/ aerosols *	1,900
Methyl ethyl ketone (Table 1)	570		Motor Vehicle Refinishing *	400
			Domestic/Commercial solvents/ aerosols *	140

			Solid fuel burning (domestic) *	31
Methyl isobutyl ketone (Table 1)	73		Motor Vehicle Refinishing *	52
			Domestic/Commercial solvents/ aerosols *	21
Nickel & compounds	0.15		Lawn Mowing *	0.14
			Backyard Incinerators *	0.0091
Oxides of Nitrogen (Table 1)	300,000		Motor Vehicles *	300,000
			Solid fuel burning (domestic) *	520
			Burning(fuel red., regen., agric.)/ Wildfires *	230
			Lawn Mowing *	160
			Backyard Incinerators *	56
Particulate Matter 10.0 um (Table 1)	23,000		Motor Vehicles *	16,000
			Solid fuel burning (domestic) *	4,100
			Burning(fuel red., regen., agric.)/ Wildfires *	1,900
			Backyard Incinerators *	340
			Lawn Mowing *	230
Polycyclic aromatic hydrocarbons (Table 1)	130		Solid fuel burning (domestic) *	96
			Lawn Mowing *	28
			Burning(fuel red., regen., agric.)/ Wildfires *	5
Sulfur dioxide (Table 1)	11,000		Motor Vehicles *	11,000
			Solid fuel burning (domestic) *	96
			Burning(fuel red., regen., agric.)/ Wildfires *	38
			Lawn Mowing *	12
Tetrachloroethylene (Table 1)	500		Dry Cleaning *	500
			Motor Vehicles *	17,000

Toluene (methylbenzene) (Table 1)	20,000		Domestic/Commercial solvents/ aerosols *	1,200
			Lawn Mowing *	890
			Service stations *	770
			Motor Vehicle Refinishing *	650
Total Nitrogen (Table 1)	200,000		Water Supply, Sewerage and Drainage Services [370]	200,000
Total Phosphorus (Table 1)	91,000		Water Supply, Sewerage and Drainage Services [370]	91,000
Total Volatile Organic Compounds	330,000		Motor Vehicles *	260,000
			Domestic/Commercial solvents/ aerosols *	22,000
			Solid fuel burning (domestic) *	16,000
			Lawn Mowing *	9,400
			Service stations *	8,900
Trichloroethylene (Table 1)	1.3		Domestic/Commercial solvents/ aerosols *	1.3
Xylenes (individual or mixed isomers) (Table 1)	19,000		Motor Vehicles *	16,000
			Service stations *	750
			Lawn Mowing *	650
			Domestic/Commercial solvents/ aerosols *	560
			Motor Vehicle Refinishing *	490

Explanation of Data and Calculations

The NPI reports on emissions of chemical substances and where and from what sources they are generated. The ultimate fate of these substances and therefore exposure to humans and the environment as pollution cannot be determined from the NPI. Numerous factors such as height of emission (high stacks versus ground level vehicle exhausts), nature of receiving environment, chemical reactivity of the substance and prevailing meteorological conditions determine whether an emission is felt as ground level pollution. Since NPI does not attempt to collect these parameters, the data can only reflect pollutant generation at source.

The NPI holds emission data reported by industrial facilities, and aggregated emission data

collected by participating jurisdictions. Industrial facilities are required to report emissions to the NPI if they use more than a certain amount of one or more substances on the NPI reporting list, or consume more than a specified amount of fuel or electric power, or emit more than a certain amount of nitrogen or phosphorus to water. Aggregated data include smaller facilities that are not required to report, and mobile and non-industrial sources such as transport, domestic activities and for water catchments and land use type (see [further details](#) on NPI data).

The techniques used to estimate emissions in the NPI have been variously approved by Commonwealth, State and Territory environment agencies but it is important to note that the accuracy of these estimates is likely to vary according to the technique used. For the aggregated emissions data in particular, comparative analysis of the data may be misleading, because jurisdictions may have used different approved estimation techniques. Industrial facilities estimate emissions using a technique described in an appropriate NPI handbook, or else otherwise approved.

The listed substances span a wide range of toxicities. A small number may not necessarily imply an insignificant emission; for example, a small emission of a highly toxic substance may be of more concern than a larger emission of a substance of relatively lower toxicity. All emission amounts reported here have been rounded to two significant figures - totals may differ from the sum of the individual amounts on these reports because of this rounding. Some minor discrepancies may also occur with catchment and airshed data, particularly when queried at a fine spatial resolution such as a postcode. This is because these data are collected at varying spatial resolutions.

Indicative top sources are derived by converting each emission into proportional units - this provides an equal weighting for each substance, and does not consider any variation in hazard or possibility of exposure to substances. The following worked example illustrates the calculation of equivalent percentage units in a queried area: If the total emission of Chromium (VI) compounds is 4.4kg, and motor vehicles emit 3.7kg, the proportional units for motor vehicles for Chromium (VI) compounds are calculated as $(3.7/4.4) \times 100 = 80.8$. Similarly, if the total reported emission for Benzene is 30,000kg, and motor vehicles emit 28,000kg, the proportional units for motor vehicles for Benzene $(28,000/30,000) \times 100 = 94.1$. This calculation is repeated for each substance/source combination, and the proportional units for a source are then summed to provide a total contribution of that source to the emission profile for this area.

Substance	Total Emissions	Motor Vehicles		Repeat for all sources
		Emission	Proportional Emission Units [(Emission/Total)*100]	...
Benzene	30,000kg	28,000kg	$(28,000/30,000) \times 100 = 94.1$...
Chromium (VI) compounds	4.4kg	3.7kg	$(3.7/4.4) \times 100 = 80.8$...
Repeat for all substances
Total proportional units			Sum for each source	

The [disclaimer](#) has further information about the use of NPI data.

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Department of the Environment and Heritage
GPO Box 787 Canberra ACT 2601 Australia
Telephone: (02) 6274 1111

APPENDIX C

Terrestrial Ecological Assessment

Flora and fauna constraints study.



Avoca Drive,
Green Point.

January 2005

lesr_uk
ENVIRONMENTAL
CONSULTANTS

Report prepared on behalf of:
The NSW Roads and Traffic Authority
by

LesryK Environmental Consultants
PO BOX 3001
BUNDEENA NSW 2230

Telephone: (02) 9523 2016
Mobile: 0408 25 8129
Facsimile: (02) 9544 1835

Email: admin@lesryk.com.au
www.lesryk.com.au

Please note that, given the dynamic nature of the relevant pieces of environmental legislation considered in this report, the authors consider that this report only has a 'shelf life' of six months. If a development application, review of environmental factors or statement of environmental effect is not submitted to a determining authority for consideration within this time frame, it is recommended that this report be reviewed and revised where required in light of any relevant legislative listings or changes.

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PART A INTRODUCTION, SETTING AND BACKGROUND

I. Introduction.

At the request of the New South Wales (NSW) Roads and Traffic Authority (RTA), an “opportunities and constraints” investigation targeting those terrestrial vascular flora and native fauna species that are present, or could potentially occur, within the stands of vegetation that occur in the vicinity of Avoca Drive, Green Point, NSW, has been undertaken.

The survey has been conducted as the RTA is investigating options for the:

- Widening of the pavement along Avoca Drive between Sun Valley Road and Bayside Drive to allow for the construction of a central medium, a 1.5 metre (m) wide cycleway and several busbays; and
- The construction of a new road between Asca Drive and the intersection of Avoca Drive and Koolang Road.

The investigation is being undertaken as part of the RTA's *Road Safety 2010* framework to half the road toll by 2010. For reference, the study location and areas surveyed are identified in Figure 1.

For the purpose of the current investigation, the study area refers to all the lands that occur along Avoca Drive between Sun Valley Road and Bayside Drive, and 20m either side of this. The study area also includes a 50m wide corridor of land that occurs between the eastern end of Asca Drive to the intersection of Avoca Drive and Koolang Road. For ease of reference, unless a specific component of this area is referred to, the areas surveyed will be referred to as the 'study area', whilst the surrounding lands for a distance of approximately 10 square kilometres (km) will be referred to as the 'study region'.

The field investigations have been undertaken to highlight any areas of high, moderate and/or low ecological value that occur within or in close proximity to the study area. By identifying these areas, sites of ecological significance can be highlighted, thereby identifying locations where constraints to the undertaking of any development proposal(s) are present. Conversely, sites of low ecological value can also be identified, these providing opportunities for the undertaking of the road works. Where areas of low, high or moderate ecological value have been highlighted, consideration has been given (where applicable) to the obligations of the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), *NSW Threatened Species Conservation Act 1995* (TSC Act) and Section 5A of the *NSW Environmental Planning and Assessment Act 1979*. Sites of moderate ecological significance are identified due to the presence or potential for species of state and/or national conservation concern, the overall implications of these areas being determined through the reference to the relevant environmental legislations, the ultimate proposal design, and the undertaking of more detailed field surveys that target those species considered as present based on a precautionary approach.

To achieve the aims of the opportunities and constraints investigation, a general survey of the study area has been undertaken. During the field surveys, the structure and diversity of those vegetation communities and fauna habitats present were identified. By identifying the structure, health and character of those vegetation communities and fauna habitats present, their value for native plants and animals, particularly those listed as threatened under the Schedules to the EPBC and TSC Acts, can be identified. In line with the overall objectives of this study, when identifying any areas that present an ecological constraint to the undertakings of the works, particularly in regards to the presence of any native animals or those plants that would not be visible at this time of year, a precautionary approach has been adopted. The precautionary approach assumes that, based on the identification of those fauna habitats and vegetation communities recorded, these animals and plants are present until such times as detailed surveys are conducted to negate or confirm their presence.

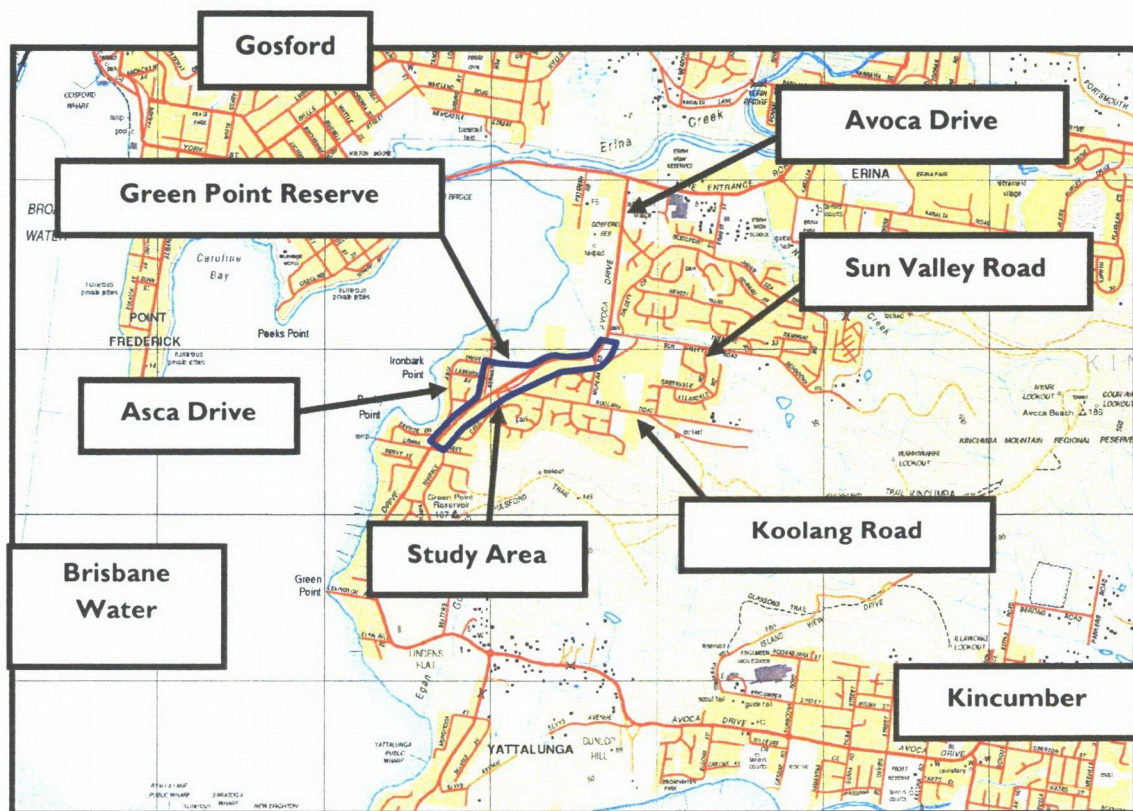


FIGURE 1: Study area and location.

Source: RTA 2004.

(Not to scale)



The observations made during the field investigation have been combined with a literature review of previous studies undertaken in both the region and the Gosford Local Government Area, the consultation of standard databases and the consideration of the objectives of the EPBC Act, the NSW Environmental Planning and Assessment Act 1979, NSW National Parks and Wildlife Act 1974, NSW TSC Act, and any relevant State Environmental Planning Policies (SEPP) (e.g. SEPP 44 – Koala habitat protection).

It is noted that no detailed designs for any of the road works or associated infrastructure are available, the opportunities and constraint investigation aimed at assisting the RTA to develop these in line with the principals of ecologically sustainable development.

2. Environmental setting.

The area surveyed is located within the Gosford Local Government Area, within the suburb of Green Point. The area of the current investigation is dominated by stands of native vegetation, open space areas and residential properties. In the region, land uses that occur are mainly urban areas and open spaces.

It is noted that, due to the influences of the current and previous road works activities and the adjacent residential properties, that Avoca Drive's road verges have been cleared and are regularly maintained. Portions of the study area have also been affected through the establishment of transmission lines, drainage works and infrastructure associated with the construction and ongoing maintenance of Avoca Drive. For reference, a photographic record of the study area has been provided.

PHOTOGRAPHIC RECORD OF STUDY AREA



Photo 1: Avoca Drive – looking south towards Koolang Drive.



Photo 2: Avoca Drive – looking towards the eucalypt woodland.

PHOTOGRAPHIC RECORD OF STUDY AREA



Photo 3: Structure of the southern drainage line that occurs within the eucalypt woodland.



Photo 4: Within the eucalypt woodland – looking towards the wetland.

The study area is characterised by a landform of gently undulating rises. Natural elevations within the survey area are around 10m Australian Height Datum. The annual average rainfall in the region is around 1320.8 millimetres (mm) with the greatest falls being experienced during the summer months (Bureau of Meteorology 2004). Average temperatures range between a summer high of 27.5°C to a winter low of 4.5°C (Bureau of Meteorology 2004).

Two drainage lines and one wetland are present within the area surveyed, each of which is unnamed. In relation to the creek lines, these generally flow in a north westerly direction, eventually draining into Brisbane Water north of Kenmare Road (Figure 1). Brisbane Water is located approximately 400m northwest of the study area, this being a tidally influenced estuary that includes stands of mangroves. The wetland occurs approximately 50m northwest of Avoca Drive opposite Koolang Road. It is noted that each of the aquatic environments present is fed by runoff from an urban catchment.

Conservation reserves, and other protected areas, occurring close to the study area include Green Point and Kincumba Mountain Regional Reserves, and Brisbane Waters. In regards to these, the proposed new road between Asca and Avoca Drives would be constructed near a section of Green Point Reserve, located to the north of the proposed new road alignment. Brisbane Water (this covering an area of 11501ha) and Bouddi National Parks (1532ha) are located within the surrounding region, these being present to the west and south of the study area respectively. Additional conservation areas include, Cockle Bay (44 ha), Pelican Island (40ha) and Rileys Island (46ha) Nature Reserves these all being located approximately 5km south of the study area.

Through reference to the listings provided under the TSC Act, it is noted that no areas of critical habitat for any flora or fauna species, populations or communities occurs within, or in the vicinity of, the study area. Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities, none being present within, or in close proximity to, the study area.

3. Literature review and field guides.

To assist with the development on the opportunities and constraints study, combined with the field surveys, a literature and database search was undertaken. These searches were carried out to identify the diversity of native plants and animals that have been previously recorded, or could potentially occur in, the study region. When combined with the results of the field surveys, based on a consideration of the documented life cycle requirements and habitat needs of those native plants and animals previously recorded within this part of the Gosford Local Government Area (particularly those listed under the Schedules to the EPBC and TSC Acts), their potential to occur within those communities identified within the study area can be determined. By identifying the possible presence of these animals and plants, the development of an ecological constraints study can be undertaken.

The studies, reports and databases drawn upon included:

- Previous ecological studies conducted in the region (LesryK Environmental Consultants 1998a, LesryK Environmental Consultants 1998b, LesryK Environmental Consultants 2003);
- Gosford's City Council's State of the Environment Report (Gosford City Council 2000, Gosford City Council 2003);
- The Lower Hunter and Central Coast fauna habitat modelling (LHCCREMS 2004);
- The Department of Environment and Heritage (DEH) Online Database (DEH 2004);
- The Department of Environment and Conservation's (DEC) Atlas of NSW Wildlife (DEC 2004a); and
- The Australian Museum database (Australian Museum 2004).

Other reports and documents referred to are provided within the bibliography section of this report.

When accessing the DEH and DEC databases, the search area specified was ten square kilometres centred on the study area. The search area specified for the Australian Museum database was the Gosford 1:100,000 topographic map.

All these databases and reports were reviewed and drawn upon where relevant. Particular attention was paid to identifying records of species listed under the Schedules to the *EPBC* and *TSC Acts*, animals, plants and vegetation communities that have been recorded in the region and may be present within, or in the vicinity of, the study area.

Field guides and standard texts used during the site inspection were:

- Harden (1992, 1993, 2000 and 2002) – for the identification of plants;
- Cogger (1992) – reptiles and frogs;
- Simpson and Day (1999) – birds;
- Strahan (1995) – mammals; and
- Triggs (1996) – identification of scats, tracks and markings.

The naming of those species recorded or known for the region follows the nomenclature presented in these texts or as described on the Schedules to the *EPBC* and *TSC Acts*.

The conservation significance of plants and animals recorded is made with reference to:

- The *EPBC* and *TSC Acts*;
- Gosford City Council's State of the Environment Report (2000);
- The Natural Vegetation of the Gosford Local Government Area (Bell 2004); and
- The publication *Rare or Threatened Australian Plants (ROTAP)* (Briggs and Leigh 1996).

PART B BOTANICAL CONSIDERATIONS

4. Field survey methods.

A survey of both the study area and its adjacent habitats was undertaken by John Speight (B.Sc.) on the 29th of October 2004. During the field survey the majority of the vegetation that occurs adjacent to Avoca Drive was inspected, while it is noted that only two transects were walked along the proposed road alignment, due to the density of the vegetation and the preliminary nature of the current study.

The survey employed the 'Random Meander Method' described by Cropper (1993). This method is considered the most effective for detecting plant species of conservation significance, and involves walking randomly throughout the study area while ensuring that the full range of habitats present are surveyed, and recording every plant species seen (Cropper 1993). The survey continues until no new species are detected. By the completion of the field survey, approximately 3 hours of searching had been accumulated.

5. Flora species recorded, known or potentially occurring within the study region.

A list of plants recorded within the study area during the survey is provided in Appendix I. This is not an exhaustive list and only represents those identified during the preliminary overview of the study area.

During the field survey, one regionally restricted species was located. This species, Gosford Wattle *Acacia prominens*, was located along the vegetation edge adjacent to Avoca Drive, approximately 200m northeast of the proposed Asca and Avoca Drive intersection (at Easting 348163; Northing 6297715) (Figure 2). At this site, eight individuals of this plant were recorded.

By the completion of the study, no threatened species listed on the Schedules to either the *EPBC* and/or *TSC Acts* had been recorded.

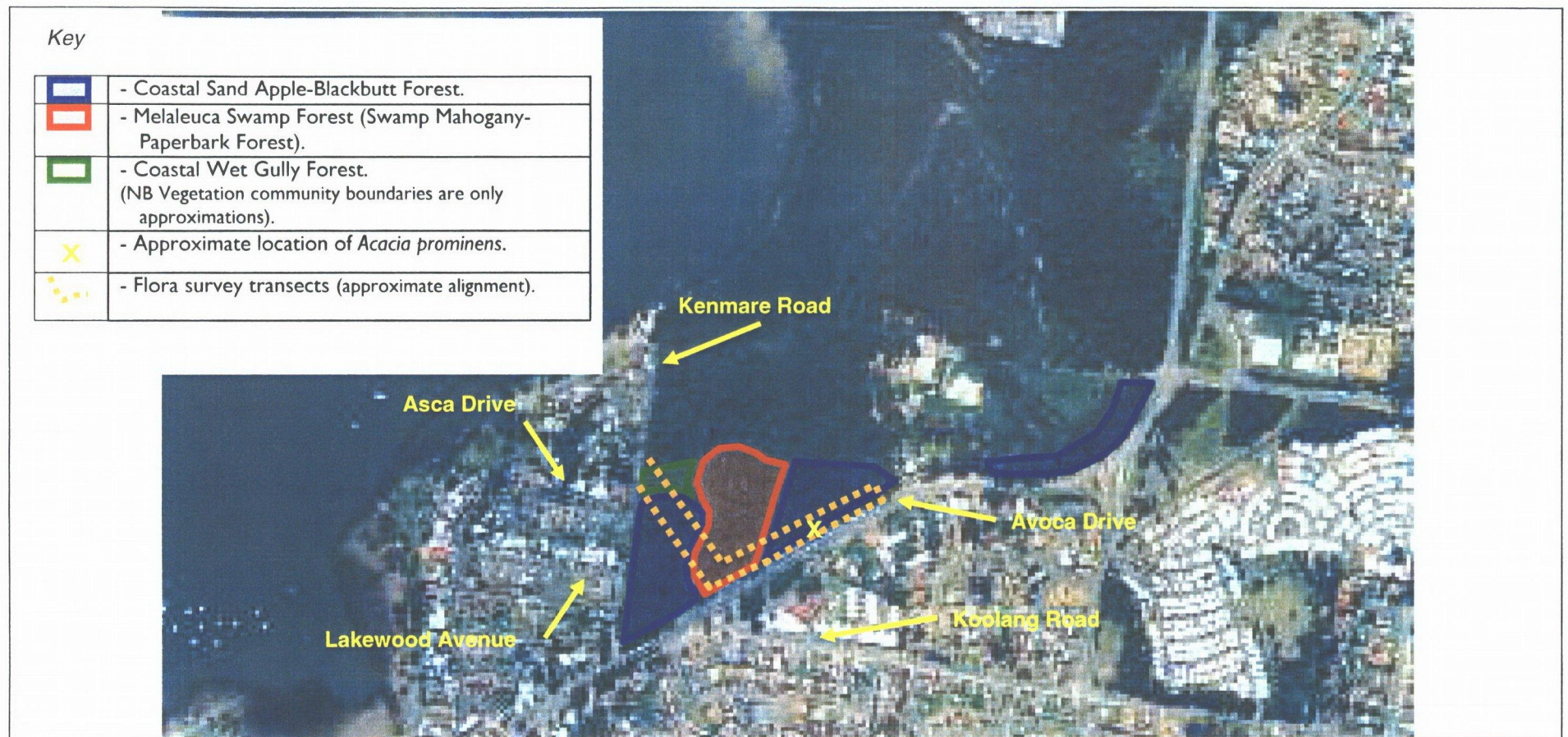


FIGURE 2: Locations of vegetation communities.

Source: Department of Infrastructure, Planning and Natural Resources, iplan, LandView.
(Not to Scale)

↑
NORTH

Through consultation of the DEC Wildlife Atlas database (DEC 2004a) and the DEH Online Database (DEH 2004), 29 plant species of conservation significance listed under the EPBC and/or TSC Acts were identified as having been previously recorded within the Gosford Local Government Area. Based on the habitat preferences of these species, only 6 were considered to potentially occur in those vegetation communities that are present in the study area. These species are listed in Table 1, along with the habitats in which they are known to occur. During the survey none of these plants were recorded within the study area, and all of the native species recorded are considered to be common within similar habitats throughout the study region.

TABLE 1: Plant species of conservation significance potentially occurring within the study area.

SPECIES AND CONSERVATION STATUS	HABITAT AND OCCURRENCE
<i>Epacris purpurascens</i> var. <i>purpurascens</i> (Epacridaceae) Vulnerable TSC Act.	Periodically poorly drained soils in scrub eg. with <i>Melaleuca thymifolia</i> and <i>M. decora</i> (Benson and McDougall 1995).
<i>Grevillea shiressii</i> (Proteaceae). Vulnerable TSC Act.	A tall spreading shrub with broad leaves (2 to 4 cm) up to 16 cm long and pale mauve flowers. Moist open-forest eg. with <i>Eucalyptus deanei</i> , <i>Syncarpia glomulifera</i> , <i>Angophora floribunda</i> ; usually along banks of streams with sandy soils on Hawkesbury sandstone. Distribution is restricted to creeks in the Brisbane Water National Park, Gosford (Benson and McDougall 2000).
<i>Leptospermum deanei</i> (Myrtaceae). Vulnerable EPBC Act.	Woodland on lower hill slopes or near creeks. Riparian scrub eg. with <i>Tristaniopsis laurina</i> and <i>Baeckea myrtifolia</i> (Benson and McDougall 1998).
<i>Melaleuca biconvexa</i> (Myrtaceae). Vulnerable TSC Act.	Shrub to small tree with papery bark growing in damp places. Occurs in coastal NSW from Jervis Bay to Port Macquarie, but the main concentration of records are from the Gosford–Wyang area (Benson and McDougall 1998).
<i>Prostanthera askania</i> (Lamiaceae). Endangered TSC Act, EPBC Act.	Sheltered gullies in Gosford–Ourimbah area. Moist eucalypt forest eg. with <i>Duboisia myoporoides</i> and <i>Trochocarpa laurina</i> (Benson and McDougall 1997).
<i>Syzygium paniculatum</i> (Myrtaceae). Vulnerable TSC Act.	Shrub or small tree with flakey bark, glossy leaves and purple fruit. Grows in subtropical and littoral rainforest on sandy soils or stabilised dunes near the sea, in widely separated localities between Bulahdelah and Jervis Bay (Harden 1991).

5.1 Noxious weeds.

During the field survey, Crofton Weed (*Ageratina adenophora*) was recorded, this being listed as a noxious within the Gosford Local Government Area. This is a Class 3 weed, thereby requiring that it be prevented from spreading and its numbers and distribution be reduced. Crofton Weed was recorded in association with all drainage lines and moist areas.

6. Vegetation communities.

Four Endangered Ecological Communities listed on the Schedules to the EPBC and/or TSC Acts occur in the Gosford Local Government Area. These are:

- Sydney Coastal River-flat Forest;
- Sydney Coastal Estuary Swamp Forest Complex;
- Sydney Freshwater Wetlands; and
- Sydney Turpentine - Ironbark Forest.

One of these, Sydney Coastal Estuary Swamp Forest Complex (Melaleuca Swamp Forest in the study area), is present within the study area, this being located along the alignment of the proposed road between Asca and Avoca Drives. This Endangered Ecological Community has recently been included in a new EEC Preliminary Determination "Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions".

The vegetation of the Gosford area has been mapped by Benson (1986) on the Gosford – Lake Macquarie 1:100,000 map sheet. Bell (2004) refined these broad community descriptions and classifications for the Gosford Local Government Area. The community descriptions employed by Bell have been used in this report.

By the completion of the field survey, three native vegetation communities had been identified within the study area, these being:

- Open-Forest (Coastal Sand Apple-Blackbutt Forest);
- Tall Forest/Closed Forest (Coastal Wet Gully Forest); and
- Melaleuca Swamp Forest (Swamp Mahogany - Paperbark Forest).

The equivalent mapped communities by Benson (1986) and Bell (2004) are given in the detailed community descriptions below. For reference, the approximate locations of the vegetation communities recorded are mapped on Figure 2.

In addition to these communities, the eastern side of Avoca Drive, adjacent to the existing residential developments is vegetated by a mixture of remnant native vegetation, planted native and exotic species and weeds. This vegetation is identified as a "Disturbed Environment".

A detailed description of each of the communities recorded is given below, whilst their locations are mapped on Figure 2.

6.1 Open-Forest (Coastal Sand Apple-Blackbutt Forest) (*Eucalyptus pilularis* – *Angophora costata* – *Corymbia gummifera*).

Mapping:

Map Unit 9k Open-forest (Benson 1986), Map Unit E33a Coastal Sand Apple-Blackbutt Forest (Bell 2004).

Conservation Status:

Represented in regional conservation reserves. Not listed as an Endangered Ecological Community.

Occurrence:

Occurs throughout the majority of the study area on the western side of Avoca Drive (refer to Figure 2).

Structure:

The species composition of this community is variable, depending on soil moisture levels. Trees are up to 20m in height forming a moderate foliage cover. The shrub layer is sparse to dense adjacent to drains and watercourses with shrubs up to 4m in height being present. The groundcover consists of a variable layer of grasses and herbs. On drier sites away from drainage lines, Smooth-barked Apple *Angophora costata* and Red Bloodwood *Corymbia gummifera* are common. On wetter sites Blackbutt *Eucalyptus pilularis* is common, with Swamp Mahogany *E. robusta* and Red Mahogany *E. resinifera* less common.

Common Species:

Trees:

Smooth-barked Apple *Angophora costata*, Red Bloodwood *Corymbia gummifera*, Blackbutt *Eucalyptus pilularis*, Swamp Mahogany *E. robusta* and Red Mahogany *E. resinifera*. The small trees Forest Oak *Allocasuarina littoralis* and Blueberry Ash *Eleocarpus reticulatus* are also common.

Shrubs:

Tea-tree *Leptospermum* spp., Narrow-leaved Geebung *Persoonia linearis*, Cheese Tree *Glochidion ferdinandi*, Handsome Flat-pea *Platylobium formosum*, Wattle *Acacia irrorata*, Common Hopbush *Dodonaea triquetra*, Pomaderris *Pomaderris intermedia* and Graceful Bush-pea *Pultanea flexilis*.

Groundcovers:

Common groundcover species include Spiny Mat-rush *Lomandra longifolia*, Bladey Grass *Imperata cylindrica*, Bracken Fern *Pteridium esculentum*, Rice Flower *Pimelea linifolia*, and Kangaroo Grass *Themeda australis*. In wetter areas Gristle Fern *Blechnum cartilagineum* is common.

Weed species are common but in low densities away from the immediate roadside, and include Lantana *Lantana camara*, Small-leaved Privet *Ligustrum sinense*, Camphor Laurel *Cinnamomum camphora* and Blackberry *Rubus fruticosus*.

6.2 Tall Forest / Closed Forest (Coastal Wet Gully Forest) (*Syncarpia glomulifera* - *Angophora costata*).

Mapping:

Map Unit 8a Closed-forest (Benson 1986), Map Unit E1 Coastal Wet Gully Forest (Bell 2004).

Conservation Status:

May be represented in regional conservation reserves. Not listed as an Endangered Ecological Community.

Occurrence:

This community occurs at the Asca Drive end of the proposed new road (refer to Figure 2).

Structure:

Trees up to 20m in height forming a moderate to dense foliage cover. The shrub layer is sparse to dense with shrubs up to 4m tall. The groundcover consists of a dense layer of ferns, grasses, herbs and vines. Climbers are common in this community. The community forms an intergrade between the Open-forest and a Closed-forest (rainforest) communities, with species common to both being present.

Common Species:

Trees:

Turpentine *Syncarpia glomulifera* and Smooth-barked Apple *Angophora costata*. Swamp Mahogany *Eucalyptus robusta*, Large-fruited Red Mahogany *E. scias* and Cabbage Palm *Livistona australis* also occur. The small tree Blueberry Ash *Eleocarpus reticulatus* is also common.

Shrubs:

Tea-tree *Leptospermum* spp., Cheese Tree *Glochidion ferdinandi*, Melaleuca spp., Wattle *Acacia irrorata* and Grey Myrtle *Backhousia myrtifolia*.

Climbers:

Wonga Vine *Pandorea pandorana*, White Supplejack *Ripogonum album*, Wombat Berry *Eustrephus latifolius*, Water Vine *Cissus hypoglauca*, Jasmine Morinda *Morinda jasminoides* and Golden Guinea Flower *Hibbertia scandens*.

Groundcovers:

Common groundcover species include Spiny Mat-rush *Lomandra longifolia*, Bladey Grass *Imperata cylindrica*, Bracken Fern *Pteridium esculentum*, False Bracken *Calochlaena dubia*, Gristle Fern *Blechnum cartilagineum* and White Root *Pratia purpurascens*, as well as the vines and climbers mentioned above.

Weed species include Lantana *Lantana camara*, Small-leaved Privet *Ligustrum sinense* and Wandering Jew *Tradescantia albiflora*.

6.3 Melaleuca Swamp Forest (Swamp Mahogany-Paperbark Forest) (*Melaleuca stypheloides* – *M. decora*).

Mapping:

Map Unit 27a Open Forest (Benson 1986), Map Unit E37 Swamp Mahogany - Paperbark Forest (Bell 2004).

Conservation Status:

Represented in Cockle Bay Nature Reserve. This community is included in the Sydney Coastal Estuary Swamp Forest Complex Endangered Ecological Community.

Occurrence:

Occurs adjacent to the proposed new road on the Avoca Drive side of the study area (refer to Figure 2).

Structure:

Tall shrubs and small *Melaleuca* trees up to 10m, with emergent *Eucalypts* up to 20m high. The shrub layer consists of dense sedges up to 2m in height. The groundcover consists of sparse ferns, grasses and herbs.

Common Species:

Trees:

Prickly-leaved Paperbark *Melaleuca stypheloides* and White Feather Honey-myrtle *M. decora*, with emergent Swamp Mahogany *Eucalyptus robusta* and Cabbage Palm *Livistona australis*.

Shrubs:

Saw Sedge *Gahnia* spp. and Tea-tree *Leptospermum* spp.

Groundcovers:

White Root *Pratia purpurascens*, Native Violet *Viola hederacea*, Bladey Grass *Imperata cylindrica*, False Bracken *Calochlaena dubia* and Gristle Fern *Blechnum cartilagineum*.

Weed species are uncommon and in low densities away from the immediate Avoca Drive area. Where present these include *Lantana camara*.

6.4 Disturbed Environment

Mapping:

Map Unit C Cleared (Benson 1986), Map Unit Xr Disturbed (Bell 2004).

Conservation Status:

This community does not have any conservation value apart from potential habitat linkage for flying fauna and tolerant ground traversing animals. Not listed as an Endangered Ecological Community.

Occurrence:

Occurs adjacent to the eastern side of Avoca Drive (refer to Figure 2).

Structure:

Trees up to 15m in height with shrubs and grass cover plant. Many trees and shrubs are roadside landscape plantings and the grass layer is composed of exotic lawn species. This is an urban landscape environment with some remnant native trees.

Common Species (* = exotic species):

Trees:

Blackbutt *Eucalyptus pilularis*, Bangalay *E. botryoides* and River She-oak *Casuarina cunninghamiana*.

Shrubs:

Bottlebrush *Callistemon* spp. and *Platanus* sp.*.

Groundcovers:

Kikuyu *Pennisetum clandestinum**, Bladey Grass *Imperata cylindrica*, Buffalo Grass *Stenotaphrum secundatum** and Mother-of-millions *Bryophyllum delagoense**.

Weed species are very common and are the dominant plants on this side of the road.

7. Conservation value of the vegetation and likely impacts.

One of the communities occurring in the study area: Melaleuca Swamp Woodland, conforms to the description of the *Sydney Coastal Estuary Swamp Forest Complex* Endangered Ecological Community as listed under the TSC Act.

The Coastal Wet Gully Forest community is also uncommon due to past development pressures. Farming activities were concentrated on the wet eucalypt and rainforests of the alluvial soils (Benson 1986), with later residential development close to Gosford further reducing the area of these vegetation communities.

Gosford City Council has a rainforest protection policy, and the Avoca Drive to Asca Drive connecting road is adjacent to Council's Green Point Reserve, which contains rainforest remnants, sedgelands and reedlands. A weed eradication and bushland regeneration project is currently being undertaken in this Reserve.

The Coastal Sand Apple-Blackbutt Forest community is fairly common in the Gosford area and while it does not have any specific botanical conservation value, the loss of any large areas of native vegetation from an increasingly urban area should be avoided. The Proposal to widen Avoca Drive is unlikely to result in the removal of a significant area of this vegetation type from the roadside.

The proposed new road would cut through the central portions of the Swamp Mahogany - Paperbark Forest community, thereby removing a substantial portion of this Endangered Ecological Community. Based on the application of the Precautionary Principal, the likely alignment of the new road is expected to cause a significant impact on the Swamp Mahogany - Paperbark Forest, thereby triggering the need to prepare a Species Impact Statement for this component of the project.

The proposed new road is also expected to remove some of the Coastal Wet Gully Forest community.

The proposed new road could also change the existing drainage characteristics of the wide flood channel that occurs in the area, adversely affecting the two communities and the sedgelands and reedlands that occur adjacent to the alignment in Green Point Reserve. Consideration should be given to relocating the proposed road to avoid the flood channel and the vegetation communities that are associated with it. If the proposed road is to be located within the corridor surveyed, further botanical survey would need to be undertaken.

Increases in road runoff from the widening of Avoca Drive would also have adverse impacts on the Swamp Mahogany - Paperbark and Coastal Wet Gully Forests, sedgelands and reedlands but cannot be assessed at this stage without details of the proposed widening or drainage designs. However, the drainage design should aim at minimising increases in flow volumes and velocities into the downstream environments.

During the field survey, no plants of state, national or regional conservation significance were located within or adjacent to the study area. The regionally restricted Gosford Wattle *Acacia prominens* was located in bushland adjacent to the western side of Avoca Drive (approximately 200m northeast of the proposed Asca and Avoca Drive intersection [Easting 348163; Northing 6297715] [Figure 2]). Although Gosford Wattle is not listed as a threatened species or included on the ROTAP listings (Briggs and Leigh 1996), the species had been previously listed as a ROTAP plant in 1988. Benson (1986) considered the species to be of conservation importance in the Gosford area but that it is

probably conserved in Wollemi and Gosford National Parks, and that a separate population in the Hurstville / Bankstown area is extinct (Benson and McDougall 1996). The removal of the eight plants located on the vegetation edge along Avoca Drive should be avoided if possible.

PART C FAUNA CONSIDERATIONS

8. Field survey methods.

A survey of the study area was undertaken by Deryk Engel ^(B.Env.Sc.HONS) and Peter Hawkins ^(B.Env.Eng.) on the 29th of October 2004. The weather conditions experienced during the field investigation were overcast skies (3/8 cloud cover), warm temperatures (25°C) and light southerly breezes. The field investigation was conducted to identify the diversity of those fauna habitats present within the area surveyed, thereby identifying their value for native species, particularly those listed under the *EPBC* and *TSC* Acts. The investigation endeavored to identify the locations of these habitats and ascertain the range of native animals most likely to occur in conjunction with them. For the purposes of this investigation, no targeted, species-specific fauna surveys (i.e. spotlighting or echolocation detection) were undertaken, a precautionary approach being adopted if suitable habitats for any species likely to be identified through use of these methods was located within the study area.

The strategy employed for the field investigation was to traverse the entire study area by foot, with detailed habitat assessments/searches being conducted in bushland areas that had the potential to be of value for native species. While undertaking the field surveys, efforts were made to document the diversity, structure and value of the habitats present within the area surveyed for those protected, as defined under the *NSW National Parks and Wildlife Act 1974*, and threatened, species recorded or expected to occur based on past studies and known distribution patterns. This involved assessing the structure of the vegetation associations and fauna habitats present and determining their significance for native species, particularly any that are of national and/or state conservation significance. Whilst conducting the habitat assessments, efforts were made to identify features such as known feed trees, mature trees with hollows, connectivity of fauna corridors, wetlands, other suitable aquatic environments and other habitat features important to the life cycle requirements of those threatened species known or likely to occur in the study region. By identifying the areas that are, or could potentially be, significant for these animals, these sites can be highlighted as constraints to any road proposal.

In addition to identifying the diversity of those habitats present, limited direct and indirect identifications of those fauna species present were conducted. During the field survey, the methods employed to identify those animals present were:

- The direct observation of those fauna species present within, adjacent to, or flying over the study area;
- Limited litter and ground debris searches for reptiles and frogs;
- Diurnal call identifications; and
- The identification of indirect evidence, such as tracks, scratchings and scats.

These methods were employed to identify the main assemblages of fauna species present, these animals (based on the consultation of their necessary habitat requirements and the identification of those habitats present) being used to identify the range of other native species that could potentially occur. The identification of the habitats present combined with an indication of those species utilising these thereby assists with determining the likely occurrence of other native species, particularly those that are of conservation concern.

By the completion of the site inspections, 6 person hours of active searches had been accumulated, active searches being defined as the time spent actively assessing the quality of those habitats present and/or searching for observations/evidence of fauna species. Considering the objectives of this study, and the physical condition and size of the study area, this length of survey time is considered more than adequate when endeavouring to determine the diversity of fauna habitats present, a representative suite of resident native species and the conservation status of both of these.

Given the open nature of the site, access to all parts of the study area was good to above average, with moderate to high visibility in each of the habitat types present. When endeavouring to identify the diversity of fauna habitats present, no limitations were encountered.

9. Habitat types available for native fauna species.

By the completion of the field investigation, three habitat types available for use by native fauna species had been recorded, these being:

- A disturbed environment;
- A eucalypt woodland; and
- An aquatic environment.

Descriptions of the location, structure and value of each of these habitat types for native species are provided below, as is a consideration of their overall ecological value. The following descriptions should be read in reference to the photographic record provided, the habitats also being mapped on Figure 3.

9.1 Disturbed environment.

The disturbed environment is present either side of Avoca Drive. The majority of this habitat type supports exotic grasslands, these areas include a number of weeds and plants. Where not mown, the exotic grasslands are of a high density and up to 0.5m in height. Within the disturbed environment, a range of remnant and/or horticulturally produced native plants are present, as are a suite of exotic species. In relation to those native trees present, these are up to 15m in height, none of which were observed to support any hollows suitable for the life cycle needs of any hollow dependant native fauna. The exotic and native shrubs are up to 4m in height, these plants, along with those trees observed, occurring as either isolated specimens or clumps of plantings.

In association with several of the residential properties, the disturbed environments incorporate landscape gardens and lines of planted trees and shrubs. In regards to these species, their age and structure varies depending on the maintenance regimes undertaken and the time since planting.

The disturbed environment was observed to be utilised by a range of urban tolerant native and exotic birds, reptiles and frogs, these species also being observed adjacent to, and beyond the limits of the study area. Given the tolerance of these animals to urban environments, they are quite abundant to this habitat type and are considered to be common throughout their distribution ranges. In regards to the life cycle requirements of these species, no major components of their necessary habitat types are present within the disturbed environments, the further development of this area not expected to result in the local displacement or extinction of any of these animals. Post development, all the species recorded would again be detected both within, and adjacent to, the area surveyed.

Giving consideration to those native species recorded during the field investigation, or likely to be present (particularly any that are listed, or are currently being considered for listing, under the Schedules to either the *EPBC* and/or *TSC Acts*) none would be dependant upon the disturbed environment for any component of their life cycle requirements. Due to its degraded condition, the disturbed environment has been identified as having low ecological value. As such, the disturbed environment offers opportunities for the undertaking of a Proposal within the area surveyed.



FIGURE 3: Locations of fauna habitats.

Source: Department of Infrastructure, Planning and Natural Resources, iplan, LandView.

(Not to scale)



NORTH

Given the low ecological value of the disturbed environment, it is expected that a consideration of any development Proposal in light of the assessment criteria provided under both Section 5A of the *Environmental Planning and Assessment Act 1979* (these commonly referred to as the "eight part test") and within the Commonwealth *EPBC Act* Administrative Guidelines on Significance (including those relevant to migratory species), would identify that the further short and/or long term disturbance of this habitat type would not have a significant impact on any threatened species, their populations, ecological communities or habitats. Therefore, the development of this habitat type would not trigger the need to prepare a Species Impact Statement or require the referral of the matter to the Federal Minister for the Environment.

Given the low ecological value of the disturbed environment, it is considered that the widening of Avoca Drive between Sun Valley Road and Bayside Drive could proceed as planned, these works not requiring the undertaking of any additional fauna surveys or legislative considerations/assessments.

9.2 Eucalypt woodlands.

The eucalypt woodland is present on the north western side of Avoca Drive (between Kenmare Road and 250m west of Milpera Road), and extends northwards beyond the limits of the study area (refer to Figure 3). On this side of Avoca Drive this habitat type occurs adjacent to the disturbed environment, the disturbed environment being approximately 3m wide. The eucalypt woodland supports mature trees that are up to 20m in height, the tree canopy being continuous within, and beyond the limits of, the study area. A number of those trees present within the woodlands support hollows suitable for the roosting and breeding requirements of native hollow dependant fauna, these hollows having diameters that are up to 200mm wide. The middle storey comprises of a medium dense layer of native trees up to 8m in height. The understorey supports native saplings, exotic vines and weeds, these being up to 3m in height and ranging from a medium to sparse density depending on the location within the study area. It is noted that the woodland fringes support higher densities of exotic species, these densities decreasing further into the woodland stand. The ground cover consists of native and exotic grasses, vines, forbs and ferns, these being up to 1m in height and having a medium and high density. Ground debris, leaf litter accumulations, fallen logs and branches are common throughout the woodland. A small amount of urban refuse does occur within the woodland, this mainly being limited to the roadside fringes.

It was noted that, in association with Green Point Reserve (north of the likely alignment for the proposed new road) that a local land care group is actively undertaking bush regeneration of this site. This group is actively involved in removing a number of exotic species and establishing picnic facilities and walking trails. The removal of introduced species has permitted the natural regeneration of some species of native plants.

The eucalypt woodland provides opportunities for the north – south dispersal of native species. The woodland currently provides a link between Kincumba Mountain Regional Reserve to the south, and Rumbalara Reserve to the north. Whilst this is the case, given the extent of residential expansion undertaken in the study area and the establishment of associated urban infrastructure, this corridor would only be used by flying animals, or those species tolerant of negotiating urban areas (e.g. the rodents, possums and several reptiles). From the perspective of the dispersal and interbreeding needs of these species, the widening of Avoca Drive is not considered to result in any increase in the widths of any fauna barriers, or the further isolation of their necessary habitat areas.

For those species that are occupying Green Point Reserve, the construction of a new road would present a barrier to the movement patterns of these animals, and would result in the isolation of the southern portion of the woodland at this site (i.e. east of Lakewood Avenue [refer to Figure 2]).

The eucalypt woodlands have a habitat structure that is suitable for the life cycle requirements of a range of native species, this habitat type offering sheltering, breeding and foraging opportunities. The connectivity of the canopy would also permit the dispersal of native fauna. As such, the eucalypt woodland is considered to be of moderate to high ecological significance. Giving consideration to those species previously recorded in this region, particularly those listed under the *EPBC* and/or *TSC* Acts, there is the potential that locally viable populations of several of the state listed animals may be recorded in association with this habitat type. Based on the habitat assessments conducted during the

field investigation, the animals most likely to be present would be the hollow dependant species, these including the microchiropterans (insectivorous bats), Squirrel Glider (*Petaurus norfolkensis*) and threatened owls, all of which have been recorded within similar woodland stands to the east of the study area (LHCCREMS 2004). Based on a precautionary approach, it is considered that locally viable populations of these species are present in association with the eucalypt woodland, and that the significant disturbance of this habitat type would have an adverse impact on the viability of these animals. As such, the eucalypt woodlands are identified as being a constraint to the development of this portion of the study area. Whilst beyond the scope of the current study, it is expected that an assessment of the significant disturbance of this habitat type (using the criteria provided under Section 5A of the *Environmental Planning and Assessment Act 1979*), would indicate that a Species Impact Statement would need to be prepared. Although this is the case, based on the results of a more detailed field investigation, particularly one that targets the presence or absence of those state listed species potentially occurring, combined with development of a suitable road design, it may be possible to construct a road between Asca Drive and Koolang Road without having a significant impact on any populations of native fauna.

Given that no species listed under the *EPBC Act* are expected to rely upon the eucalypt woodland, based on a consideration of the Administrative Guidelines on Significance (including those relevant to migratory species) provided in association with this Act, it is unlikely that the removal of the eucalypt woodland would require referral to the Federal Minister for the Environment.

It is noted that, within fauna habitat modelling prepared for the Gosford Local Government Area, the eucalypt woodland stand that occurs within the study area has been identified as a "Preliminary Conservation Area" for the Squirrel Glider, Spotted-tailed Quoll (*Dasyurus maculates*) and Powerful Owl (*Ninox strenua*) (LHCCREMS 2004). Based on a consideration of the quality of the eucalypt woodland, it is likely that viable local populations of the Squirrel Glider would be present, the site expected to be too small for the needs of the Spotted-tailed Quoll and Powerful Owl.

9.3 Aquatic environment.

The aquatic environment recorded in the study area encompasses two unnamed drainage lines and one wetland. For reference, descriptions of each of these follow.

The two freshwater creek lines flow under Avoca Drive, the northern adjacent to Milpera Road and the southern 200m north of Koolang Road. During the field investigation, it was noted that the southern creekline was flowing, whilst the northern only consisted of a few small stagnate pools (this creek line is therefore considered to be ephemeral, only flowing during periods of heavy rain). As noted, the two creek lines flowing in a north westerly direction, eventually draining into Brisbane Water. The riparian vegetation of these creeks is a product of the land uses in which they are located, the northern being the disturbed environment and the southern the eucalypt woodland.

The southern drainage line is 3m wide, this being channelled under Avoca Drive via a 1m wide circular concrete culvert. The banks of this creek are earthen, and the substrate of the creek is sand. Submerged aquatic vegetation is common. The water depth within the creek is between 100 and 300mm, with snags such as logs and branches being present. Sandstone boulders occur within the creekline, these being up to 50cm in diameter. The tree canopy over the creekline is closed. It is noted that the exotic Mosquito fish, *Gambusia holbrooki* was observed within this creek line during the field survey.

The northern drainage line is essentially a grassed swale, this channelling runoff under Avoca Drive via two large box culverts [these being 2m by 0.8m in size]. This drainage line consists of a series of small stagnate pools, the largest being 2 by 3m in size. The drainage line is vegetated by exotic grasses and weeds, the area being regularly mown. The channel is approximately 2m wide, its alignment appearing to be artificial.

The wetland is dominated by a high density layer of emergent reeds that are up to 2m in height. Vines and ferns are also common. The wetland is roughly circular in shape, and approximately 50m in diameter. The wetland is unlikely to be directly affected by the road proposed to be constructed between Avoca and Asca Drives. Similarly, given its location (refer to Figure 3), it is unlikely to be

affected by the widening of Avoca Drive. Whilst this is the case, indirect impacts due to polluted runoff could arise, the extent of this depending on the scope of works proposed, and the mitigation measures implemented.

Within the survey area, the two drainage lines are considered to be of low value. The habitat resources provided by these features are already considered to have been compromised due to the urban setting of the site. The further disturbance of these environments would not threaten the presence of any native fauna. Similarly, no state or nationally listed species are considered to be dependant upon this habitat type such that its removal or disturbance would have an adverse impact on the viability of a local population of these species. As such, the drainage lines are not identified as being constraints to the undertaking of the Proposal.

Due to the reclamation and removal of wetland environments throughout the region, this habitat type is identified as a constraint. The wetland offers resources for a number of species, and should therefore be retained. The development of a road proposal that includes appropriate filtration and drainage works would ensure that this habitat type is not indirectly affected.

10. Fauna species recorded, known or potentially occurring within the study region.

Based on the results of the field survey, combined with those of the literature review, it was identified that forty seven (47) native mammals, one hundred and sixty six (166) native birds, twenty eight (28) reptiles and eighteen (18) frogs have been recorded within either the study area, or surrounding region (Appendix 2). Of those species previously recorded:

- Thirteen (13) are listed as migratory under the *EPBC Act*, one of these also being listed under the Schedules to the *TSC Act* (Table 2);
- Seven (7) are listed as threatened under both the *EPBC* and *TSC Acts* (Table 2);
- Twenty six (26) are solely listed under the Schedules to the *TSC Act* (Table 2); and
- One (1), the Gang-Gang Cockatoo *Callocephalon fimbriatum*, is currently being considered for listing under the *TSC Act*.

In relation to the species recorded during the current investigation, it is noted that these are all considered to be common to abundant throughout their distribution ranges. These species would be regularly recorded in the surrounding region, none being solely reliant upon those habitats present within the study area. None of the species recorded would be considered a constraint to the undertaking of the works, a development proposal not considered to isolate, fragment or remove any significant portions of their necessary habitats.

Based on the consideration of the habitat needs of those native species recorded during the field survey, combined with the identification of those habitats present within the study area, it is expected that, of those state and nationally listed threatened species previously recorded in the study region (as listed in Table 2), 34 have the potential to be present within, or in close proximity to, the study area (Table 3). For reference, the main habitat requirements of these likely animals, and the habitats they would be recorded in if present, are provided in Table 3.

In relation to the additional threatened species listed in Table 2, though previously recorded within the study region, it is noted that these animals have specific habitat requirement (e.g. rock outcrops, rocky foreshores and oceanic environments) no components of which are present within the study area. As such, no locally viable populations of these species would be present within or adjacent to the study area. Therefore, as no locally viable populations of these animals would be present, it is not considered that the undertaking of a development proposal within the study area would have an adverse impact on these species or their populations. As such, the additional threatened species previously recorded in the study region are not identified as constraints to the undertaking of any developments within the study area.

TABLE 2. Threatened fauna species previously recorded in the study region.**Key**

EPBC Act M – listed as migratory under the EPBC Act.

TSC Act P – species being considered for listing under the TSC Act.

Common Name	Scientific Name	Legislation
MAMMALS		
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	EPBC Act and TSC Act
Eastern Quoll	<i>Dasyurus viverrinus</i>	TSC Act
Koala	<i>Phascolarctos cinereus</i>	TSC Act
Eastern Pygmy Possum	<i>Cercartetus nanus</i>	TSC Act
Yellow-bellied Glider	<i>Petaurus australis</i>	TSC Act
Squirrel Glider	<i>Petaurus norfolkensis</i>	TSC Act
Long-nosed Potoroo	<i>Potorous tridactylus</i>	EPBC Act and TSC Act
Parma Wallaby	<i>Macropus parma</i>	TSC Act
Grey-headed Flying Fox	<i>Pteropus poliocephalus</i>	EPBC Act and TSC Act
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	TSC Act
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	TSC Act
Little Bentwing-bat	<i>Miniopterus australis</i>	TSC Act
Eastern Bent-wing Bat	<i>Miniopterus schreibersii</i>	TSC Act
Large-footed Myotis	<i>Myotis adversus</i>	TSC Act
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	TSC Act
Eastern Freetail Bat	<i>Mormopterus norfolkensis</i>	TSC Act
BIRDS		
Cattle Egret	<i>Ardea ibis</i>	EPBC Act M
Great Egret	<i>Ardea alba</i>	EPBC Act M
Black Bittern	<i>Ixobrychus flavicollis</i>	TSC Act
Eastern Curlew	<i>Numenius madagascariensis</i>	EPBC Act M
Grey-tailed Tattler	<i>Heteroscelis brevipes</i>	EPBC Act M
Common Greenshank	<i>Tringa nebularia</i>	EPBC Act M
Bush-stone Curlew	<i>Burhinus grallarius</i>	TSC Act
Pied Oystercatcher	<i>Haematopus longirostris</i>	TSC Act
Caspian Tern	<i>Sterna caspia</i>	EPBC Act M
Common Tern	<i>Sterna hirundo</i>	EPBC Act M
Osprey	<i>Pandion haliaetus</i>	EPBC Act M and TSC Act
Black-breasted Buzzard	<i>Hamirostra melanosternon</i>	TSC Act
White-bellied Sea-eagle	<i>Haliaeetus leucogaster</i>	EPBC Act M
Superb Fruit-dove	<i>Ptilinopus superbis</i>	TSC Act
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	TSC Act
Gang-Gang Cockatoo	<i>Callocephalon fimbriatum</i>	TSC Act P
Swift Parrot	<i>Lathamus discolor</i>	EPBC Act and TSC Act
Powerful Owl	<i>Ninox strenua</i>	TSC Act
Barking Owl	<i>Ninox connivens</i>	TSC Act
Sooty Owl	<i>Tyto tenebricosa</i>	TSC Act
Masked Owl	<i>Tyto novaehollandiae</i>	TSC Act
White-throated Needletail	<i>Hirundapus caudacutus</i>	EPBC Act M
Regent Honeyeater	<i>Xanthomyza phrygia</i>	EPBC Act and TSC Act
Rufous Fantail	<i>Rhipidura rufifrons</i>	EPBC Act M
Satin Flycatcher	<i>Myiagra cyanoleuca</i>	EPBC Act M
Black-faced Monarch	<i>Monarcha melanopsis</i>	EPBC Act M
REPTILES		
Heath Monitor	<i>Varanus rosenbergi</i>	TSC Act
Stephen's Banded Snake	<i>Hoplocephalus stephensii</i>	TSC Act
AMPHIBIANS		
Red-crowned Toadlet	<i>Pseudophryne australis</i>	TSC Act
Green and Golden Bell Frog	<i>Litoria aurea</i>	EPBC Act and TSC Act

TABLE 3. Fauna species of conservation significance potentially occurring in the study area.

* - habitat requirements were generally extracted from Frith (1997), Cogger (1992), Strahan (1995), NPWS (1999) and the NSW Scientific Committee (2004), with other references used being identified in the bibliography.

Common and Scientific Name	Habitat Requirements*	Likely location(s) within study area if present
MAMMALS		
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	The Spotted-tailed Quoll occurs within a variety of habitats including wet and dry sclerophyll forests through to rainforests. The Quoll is nocturnal and shelters in tree hollows, dense undergrowth, hollow logs or under rock outcrops. Home range sizes for this species are known to be considerably large (between 3 and 15 km ² /night).	Eucalypt woodland.
Koala <i>Phascolarctos cinereus</i>	The Koala occupies areas of acceptable food trees in open eucalypt forests and woodlands. Areas of preferred feed trees appear to be restricted to sites that support high nutrient soils, areas that have historically been converted to farmland.	Eucalypt woodland. No indirect evidence was found during the field survey. Due to the limited number of food trees, the isolated nature of the study area, and the large home range of Koala's, this species is not considered to occur.
Yellow-bellied Glider <i>Petaurus australis</i>	The Yellow-bellied Glider is restricted to areas of tall, mature eucalypts. This species occupies tree hollows during the day and feeds at night predominantly on the sap that is collected from incisions that are gnawed into the trunks of specific species of eucalypts. The Yellow-bellied Glider occupies a home range area that is between 30 and 64 hectares in size. This arboreal possum is a highly mobile species that is able to glide across open space areas that are in the order of 70 to 100m.	Eucalypt Woodland.
Squirrel Glider <i>Petaurus norfolcensis</i>	Inhabits woodlands and dry sclerophyll forests, usually in diverse stands of shrubs and trees. Shelters and breeds in tree hollows, and is primarily an insectivorous animal but, has also been known to ingest plant exudates. Family groups occupy a home range of 2 - 4ha. Where trees are up to 20m in height, this species is known to traverse across open space areas 40m wide.	Eucalypt woodland.
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	A canopy-feeding frugivore, blossom-eater and nectarivore which inhabits a variety of habitats. Roosts and breeds communally in 'camps', with these camps containing between 500 to 5,000 individuals. Individuals generally exhibit a high fidelity to traditional camps and return annually to give birth and rear offspring. Foraging occurs opportunistically on both native and exotic plants, often at distances between 30 and 70 km from camps.	Eucalypt woodland. Note, no active or historic flying-fox colonies were detected within this habitat type during the field survey.
Yellow-bellied Sheath-tail-bat <i>Saccolaimus flaviventris</i>	Widespread in Australia, except in the very arid inland areas, the Yellow-bellied Sheath-tail Bat roosts in large hollow trees or tree sprouts. The Yellow-bellied Sheath-tail Bat is normally a solitary rooster, although groups of two to six individuals have been found. This species preys on insects, that are collected well above the forest canopy. This species habit of flying high above the forest canopy results in few captures or detection's and this appears to account for the species' apparent rarity.	Eucalypt woodland.

Common and Scientific Name	Habitat Requirements*	Likely location(s) within study area if present
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>	Usually roosts in hollow trunks of eucalypt trees although they have also been known to roost in caves and buildings. They usually inhabit sclerophyll woodlands with insect attracting plants, a relatively continuous canopy. They prefer wet habitats with trees of more than 20m. They eat a variety of invertebrates including moths, weevils and ants. They tend to fly within or just below the canopy. They have been known to forage 12km from roosting sites.	Eucalypt woodland.
Little Bentwing-bat <i>Miniopterus australis</i>	This species is a cave-dwelling bat. Occurs in a variety of habitats and roosts in caves, storm water channels, mines and houses. Feeds on insects caught on the wing from within eucalypt woodlands and forests.	Eucalypt woodland. Note, no caves were recorded during the field survey as such this species could only be using the site for foraging purposes.
Eastern Bentwing-bat <i>Miniopterus schreibersii oceanensis</i>	This species is the dominant cave-dwelling bat in south-eastern Australia. It occurs in a variety of habitats and roosts in caves, storm water channels, mines and houses. Feeds on insects caught on the wing from within eucalypt woodlands and forests.	Eucalypt woodland. Note, no caves were recorded during the field survey as such this species could only be using the site for foraging purposes.
Large-footed Myotis <i>Myotis adversus</i>	The Large-footed Myotis is generally found where there is permanent and/or flowing water. This species roosts in caves, disused tunnels, tree hollows and dense riparian foliage, nearly always in the vicinity of suitable water bodies. The Myotis emerges at dusk to feed on aquatic insects "raked" off the waters surface.	Eucalypt woodland.
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i>	Preferring habitats which range from rainforests through to woodlands, this species usually roosts in tree hollows, though some individuals have been found in the roof spaces of old buildings. Feeding on large insects such as beetles, and is also known to take small vertebrates such as mice and other small bats.	Eucalypt woodland.
Eastern Freetail Bat <i>Mormopterus norfolkensis</i>	This species is known to predominantly roost during the day in tree hollows. Emerging after dusk to feed on flying insects, the Eastern Freetail-bat hawks through the forest canopy, or in clearings at its edge.	Eucalypt woodland.
BIRDS		
Cattle Egret <i>Ardea ibis</i>	The Cattle Egret is a communal bird that forages mainly within wet pastures in groups of two to twenty plus. This bird feeds on a variety of insects and, occasionally, small aquatic animals. The Cattle Egret rests and nests colonially in trees and shrub that line waterways.	Disturbed environment where suitable foraging resources are present. Note, no Egret breeding colonies were recorded during the field surveys.

Common and Scientific Name	Habitat Requirements*	Likely location(s) within study area if present
Great Egret <i>Ardea alba</i>	The Great Egret is a solitary and territorial waterbird that forages within waters up to 30cm deep. The Great Egret is found throughout Australia in association with lakes, swamps, rivers and dams. Though listed under the international migratory bird agreement, the Great Egret is a sedentary bird that does not migrate northwards during the winter months. Breeding between the months of October and December and March to May, the Great Egret constructs a stick nest within trees at a height of up to 15m.	Disturbed environment where suitable foraging resources are present. Note, no Egret breeding colonies were recorded during the field surveys.
Black Bittern <i>Ixobrychus flavicollis</i>	The Black Bittern occupies terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. This bird feeds at dusk and during the night on invertebrates, reptiles, fish and so on. Roosts during the day in trees or on the ground amongst dense reeds. Builds its nests on a branch overhanging water. When not breeding, generally solitary.	Eucalypt woodland and aquatic environments. Note, that whilst this Bittern could potentially be present, during the field survey, no nesting sites were observed within the shrubland.
Eastern Curlew <i>Numenius madagascariensis</i>	The Eastern Curlew favours habitats such as estuaries, mud-flats, mangroves and sandspits.	May traverse over the study area on occasion, due to the close proximity of mangroves and mud flats to the north.
Grey-tailed Tattler <i>Heteroscelis brevipes</i>	The Grey-tailed Tattler inhabits estuaries, mangroves, rocky coasts, reefs, mudflats and beaches.	May traverse over the study area on occasion, due to the close proximity of mangroves and mud flats to the north.
Common Greenshank <i>Tringa nebularia</i>	The Common Greenshank prefers coastal lagoons, estuaries and bays that are sheltered sandy and muddy. Also found on fresh marshes near streams, dams and sewage farms. Sometimes found at inland lakes.	May traverse over the study area on occasion, due to the close proximity of mud flats to the north.
Pied Oystercatcher <i>Haematopus longirostris</i>	Found along beaches and estuaries of Australia feeding on molluscs. Nests on sandy beaches well above the high water mark. Found throughout Australian waters	May traverse over the study area on occasion, due to the close proximity of mangroves and mud flats to the north.
Caspian Tern <i>Sterna caspia</i>	The Caspian Tern inhabits coastal areas, sometimes found at inland watercourses and saline or brackish lakes. It breeds in small colonies or individually on beaches near salt water. This bird patrols at 20-40m above the coast and lagoons.	May traverse over the study area on occasion, due to the close proximity of Brisbane Water to the north and east.
Common Tern <i>Sterna hirundo</i>	The Common Tern is found at oceans, coastal lagoons and inshore waters.	May traverse over the study area on occasion, due to the close proximity of Brisbane Water to the north and east.
Osprey <i>Pandion haliaetus</i>	A fish eating raptor, the Osprey inhabits mainly coastline areas. Nests are usually constructed in a large, dead tree, though rocky outcrops and artificial structures are also known to be used. This bird is usually loyal to its nesting sites. Within NSW only 60 breeding pairs are known to occur.	May traverse over the study area on occasion, due to the close proximity of Brisbane Water to the north and east. Note, no Osprey nests were recorded during the field survey.

Common and Scientific Name	Habitat Requirements*	Likely location(s) within study area if present
White-bellied Sea-eagle <i>Haliaeetus leucogaster</i>	The White-bellied Sea-eagle is associated with coastal areas and bays all around Australia, and inland areas of large rivers, lakes and swamps. It spends most of its time soaring above these water bodies hunting for fish, tortoises, sea snakes, waterfowl and sometimes rabbits on land.	May traverse over the study area on occasion, due to the close proximity of Brisbane Water to the north. Note, no Sea-eagle nests were recorded during the field survey.
Gang-Gang Cockatoo <i>Callocephalon fimbriatum</i>	The Gang-gang Cockatoo is distributed from southern Victoria through to south and central eastern NSW. During summer, the Gang-gang Cockatoo prefers the higher altitude tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, the Gang-gang Cockatoo occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. This species has also been observed within urban areas including gardens and parklands. During breeding, the Gang-gang Cockatoo utilises tree hollows that are located within the trunks or limbs of large trees, close to water. The primary food source of this Cockatoo includes fruits of native shrubs and trees, although they have been known to take fruits off exotic trees.	Eucalypt woodland.
Swift Parrot <i>Lathamus discolor</i>	The Swift Parrot breeds in Tasmania but migrates to mainland Australia to feed on winter blossoms during the winter months. On the mainland, this species occurs in a wide variety of habitats, depending on where there are flowering blossoms. Feeds either alone or in parties within the topmost branches of eucalypts. Winter flocks are nomadic in response to availability of food sources, but, where suitable resources are present, may remain in one place for a while.	Eucalypt woodland due to presence of several winter flowering species. Note that the summer timing of the study would reduce the potential of detecting this bird if present.
Powerful Owl <i>Ninox strenua</i>	The Powerful Owl favours wet to dry eucalypt forests with a dense understorey. Nesting in large hollows, nearly always in the trunk or top of a mature eucalypt. When not breeding, this bird will roost during the day within the shelter provided by a dense understorey, such as a bushy eucalypt or vine forest.	Eucalypt woodland.
Barking Owl <i>Ninox connivens</i>	The Barking Owl inhabits the timbered hills, forests and savanna woodlands of coastal and subcoastal eastern and northern Australia. Hunts within the woodlands, picking arboreal and small ground dwelling mammals from the air. Usually always found in pairs occupying a range of between 30 and 200 hectares year round. Within their territories, numerous roosts may be used during the day.	Eucalypt woodland.
Sooty Owl <i>Tyto tenebricosa</i>	Inhabits tall, wet, old-growth forests on fertile soils with a dense understorey. Has a home range area of between 200 to 800 hectares in which a permanently bonded pair occurs. Breeds in the trunks of mature Eucalypts and appears to be loyal to nest sites. Roosts apart by day on a number of set perches throughout their territory. Prey species include mainly arboreal mammals.	Eucalypt woodland.

Common and Scientific Name	Habitat Requirements*	Likely location(s) within study area if present
Masked Owl <i>Tyto novaehollandiae</i>	The Masked Owl inhabits heavily timbered forests, woodlands and watercourses, never more than 300km from the coast. Has a large home range area of 500 to 1000ha per pair. Roosts and breeds in big hollows in trees, these usually being 40-500cm deep and around 10-30m above the ground. Pairs are permanently bonded and hold same territory all year round (and occasionally over successive years). Can also nest on bare sand, cliff crevices or in limestone caves. Preys on small to medium sized mammals and birds, as well as some insects.	Eucalypt woodland.
White-throated Needletail <i>Hirundapus caudacutus</i>	The White-throated Needletail breeds in the northern hemisphere and arrives in Australia in October. Most commonly associated with the east coast highlands, coastal plains and the hinterlands of arid inland Australia. Within this are, becomes locally nomadic in response to local weather changes. Drinks and feeds on insects while on the wing. Roost during the night in trees in forests.	Due to its nomadic nature and ability to traverse over a variety of habitat types, this species could be present throughout all portions of the study area.
Rufous Fantail <i>Rhipidura rufifrons</i>	The Rufous Fantail occurs within mangroves, fringing vine scrubs, rainforests and wet sclerophyll forests. This species forages within scrubby understorey and take insects and spiders. This species migrates in March/April to northern Queensland and New Guinea and returns September/October.	May traverse through study area on occasion, due to the close proximity of mangroves to the north.
REPTILES		
Heath (Rosenberg's) Goanna <i>Varanus rosenbergi</i>	The preferred habitat of the Heath Monitor includes wet and dry sclerophyll forests, woodlands and heath lands particular those that occur on sandy or calcareous soils. This species is known to move over large home range areas, travelling many kilometres in a few days. The Heath Monitor is mostly a terrestrial species, shelter in burrows, hollow logs and rock crevices. The Heath Monitor forages on insects, smaller reptiles and their eggs, spiders, small mammals, bird eggs and chicks.	Eucalypt woodland.
Stephen's Banded Snake <i>Hoplocephalus stephensii</i>	Distributed along the coast and ranges of southern Queensland through to the Gosford district of NSW, Stephens' Banded Snake is an inhabitant of rain or wet sclerophyll forests. Little is known on the habit of this species, except that it is predominantly an arboreal species which feeds on lizards, birds and small mammals. Although not identified within the literature, it is assumed that this species faces decline through clearing of rain and sclerophyll forests.	Eucalypt woodland.
AMPHIBIANS		
Green and Golden Bell Frog <i>Litoria aurea</i>	The Green and Golden Bell Frog's habitat requirements include water bodies with a lack of well developed emergent vegetation, free of chemical contamination and no introduced fish species. The Green and Golden Bell Frog has several specific habitat requirements including the presence of diurnal shelter, basking sites and refuge sites for hibernation over winter (non-mown areas or other dense vegetation in which to shelter), feeding areas, aquatic breeding and spawning areas.	Aquatic environments – wetland.

The National Parks and Wildlife Service has recently established recovery plans for the Koala *Phascolarctos cinereus*, Yellow-bellied Glider *Petaurus australis*, Bush-stone Curlew *Burhinus grallarius* and Barking Owl *Ninox connivens*, these species having been previously recorded within the study region. As part of these recovery plans certain objectives have been established. As long as the recommendation proposed in Section 13 of this report are implemented, it is not considered that the undertaking of a development proposal within the study area would breach any of these objectives.

11. Constraints consideration.

Through reference to the documented life cycle histories of those species listed in Table 3, combined with the results of the habitat identifications made during the field investigation, there is the potential for several of these animals to occur within the woodland portions of the study area. Due to the presence of hollow bearing stags, ground debris, insect attracting plants, wetlands and relatively continuous woodland corridors, the species most likely to occur as locally viable resident populations (if present) would be the hollow dependant microchiropterans, Squirrel Glider and threatened Owls. Given that these species have the potential to be recorded in the woodlands, and that they are known to occur to the east of the study area, without conducting additional fauna studies, this habitat type is identified as being a constraint to the undertaking of this portion of the Proposal.

The identification of the eucalypt woodland as an ecological constraint conforms to the habitat modelling prepared for the Gosford Local Government Area, this indicating that this portion of the study area is of conservation value for several state listed threatened fauna.

Given the reduced number of wetlands in the surrounding region due to reclamation for urban developments, this habitat type is also identified as a constraint to the undertaking of the works. Whilst this is the case, this feature is expected to occur downstream of the proposed road alignment, and would therefore not be directly affected. The adoption of appropriate drainage works, which would include the use of the existing urban runoff affected creek lines, would ensure that no indirect issues due to the discharge of polluted runoff arise.

Giving consideration to the documented habitat associations and life cycle needs of those species presented in Table 3, it is not considered that any would occur or be solely reliant upon the disturbed environment. The further disturbance of this habitat type would not have a significant impact on any of the species listed in Table 3, their populations, ecological communities or habitats. An assessment of the likely impacts of the works on these habitat types, through reference to the eight part test, would not indicate that a Species Impact Statement or further field work would be required. The further development of the disturbed environment could proceed as planned without requiring any further ecological assessments or considerations.

It is recommended that species specific surveys be undertaken within the eucalypt woodland to target the presence of the hollow dependant microchiropterans, Squirrel Glider and threatened owls. Until such times as the residential status of these species is identified, these animals are identified as a constraint to the significant development of the eucalypt woodland.

The undertaking of any component of the Proposal is not expected to have a significant impact on any species that are of national conservation concern. Therefore, through reference to the Administrative Guidelines on Significance provided under the EPBC Act, the works would not require referral to the Federal Minister for the Environment.

The Gosford Local Government Area is identified under Schedule 1 – Local Government Areas of SEPP 44. This Policy seeks to encourage the proper conservation and management of areas that provide habitat for Koalas. Within the area surveyed, four eucalypts were recorded, these being Swamp Mahogany (*Eucalyptus robusta*), Southern Mahogany (*E. botryoides*), Blackbutt (*E. pilularis*) and Red Mahogany (*E. resinifera*), of which Swamp Mahogany is listed as a Koala Feed tree under Schedule 2 of SEPP 44. Within the study area, this species constitutes less than 15% of the entire tree canopy, and therefore, in accordance with the assessment criteria listed under SEPP 44, the study area is not considered to be either potential or core Koala habitat. Therefore, if the proposed road works were to proceed as planned, it is not considered that the preparation of a Plan of Management for the conservation and management of areas of Koala habitat would be required.

It is noted that *E. resinifera* is listed within the Draft Recovery Plan for the Koala (NPWS 2003) as a secondary food tree within the central coast region. Given that there is a low density of primary feed trees (*E. robusta*) and low density of available secondary feed trees, that the eucalypt woodland is already fragmented and that the Koala has an average home range of 80-90ha (NPWS 2003), it is not considered that the Koala would be utilising the study area.

PART D CONCLUSIONS AND RECOMMENDATIONS

12. Identification of opportunities and constraints.

Based on the results obtained by the completion of the flora and fauna survey, combined with the results of the vegetation community identifications, habitat assessments and literature reviews, one broad constraint, this being the bushland to the northwest of Avoca Drive, was identified within the study area (Table 4). This bushland has been identified as a constraint due to:

- a) Its listing as an Endangered Ecological Community under the *TSC Act*;
- b) Its potential to support locally viable populations of state listed fauna;
- c) The presence of a regionally restricted plant; and
- d) The presence of an uncommon vegetation community within the Gosford region.

Due to these constraints, it is expected that any significant disturbance of this bushland would result in the significant impact on a threatened species, ecological community and their habitats. The undertaking of an eight part test is likely to indicate that a Species Impact Statement would be required.

Depending on the scope of works proposed, combined with the results of targeted surveys, the impact of the Proposal within the eucalypt woodland may be reduced, thereby negating the need to prepare a Species Impact Statement.

The further modification of the disturbed environment could proceed as planned this not expected to trigger the need to prepare a Species Impact Statement or requiring the referral of the matter to the Federal Minister for the Environment. No additional field work would be required within this habitat type. As such, further detailed assessment using the eight part test is likely to identify that the widening of the pavement along Avoca Drive between Sun Valley Road and Bayside Drive could proceed in this habitat type without having an adverse impact on any populations of native plants or animals, or on any of their vegetation communities and fauna habitat types.

13. Recommendations.

The following recommendations are provided to ensure that any road works proposal is undertaken in an ecologically sustainable manner.

- The adoption/alignment of the proposed road that links Avoca and Asca Drives should be reconsidered due to the high ecological value of the bushland through which it is proposed to be located.
- If the development of the proposed road is to proceed, additional species specific surveys should be undertaken within the eucalypt woodlands. These surveys should endeavour to determine the diversity of resident populations present, particularly in regards to those species listed under the *TSC Act*.
- As far as possible, the widening of Avoca Drive should utilise as much of the already cleared area that occurs on the southern side of this road, as well as the highly disturbed portions that are present on the northern side.

TABLE 4. Flora and fauna constraints identifications.

Issue	Development opportunity or constraint ¹	Reason why	Legislative implications if the development was to proceed
GENERAL			
Disturbed environments.	Opportunity.	Low ecological value. No likelihood of viable populations of any threatened plants, animals or endangered ecological communities.	Flora and fauna - None. Development of this environment can proceed with out additional field work or legislative considerations being undertaken.
FLORA			
Melaleuca Swamp Forest (Swamp Mahogany - Paperbark Forest).	Constraint	Community listed as an Endangered Ecological Community under the TSC Act.	Significant disturbance likely to result in the need to prepare a Species Impact Statement.
Open-forest (Coastal Sand Apple-Blackbutt Forest).	Opportunity	Community common in the Gosford area.	None.
Tall Forest/Closed forest (Coastal Wet Gully Forest).	Constraint	Uncommon in region due to past development pressures.	None. Community not listed under the TSC or EPBC Acts.
Gosford Wattle <i>Acacia prominens</i>	Constraint	Regionally restricted plant.	None. Species not listed under the TSC or EPBC Acts, or as a ROTAP.
FAUNA			
Eucalypt woodland / Open-Forest.	Constraint	Moderate ecological value. Provides habitat resources for a variety of native species. Potential to provide habitat for state listed threatened fauna.	If viable populations are present, and the proposal significant, the preparation of a Species Impact Statement may be required.
Aquatic environment – creek lines.	Opportunity	Degraded and disturbed within study area.	None.
Aquatic environment – wetland.	Constraint	Limited resources in region.	None, none of the threatened species previously recorded in the region are reliant upon this habitat type.
Potentially occurring nationally listed species.	Opportunity	The habitats present within the study area are either unsuitable, or not significant for, the life cycle needs of these species.	None.
Potentially occurring state listed threatened species.	Constraint	Constraint due to the detection of habitats suitable for a variety of state listed fauna. Due to the precautionary approach it is considered that these species are present within the study area.	Based on limited field surveys to date it is expected that a significant disturbance of the eucalypt woodland would trigger the need to prepare a Species Impact Statement.
Koalas (<i>Phascolarctos cinereus</i>).	Opportunity	No Koala populations present within the study area.	None.

¹ - identified as a constraint based on a precautionary approach. May be revised based on the outcomes of detailed field investigations and a clear indication of the scope of works proposed.

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- Within the disturbed environment, an alignment for the proposed widening of Avoca Drive should be designed such that the extent of tree removal is minimised. As such, an alignment to the south of Avoca Drive is recommended.
 - Similarly, the extent of vegetation disturbance should be restricted to the minimum necessary for the safe construction and operation of the Proposal.
 - The stand of *Acacia prominens* that occurs adjacent to Avoca Drive should be avoided. During the course of the construction activity, this stand should be temporarily fenced.
 - The location of the *Acacia prominens* stand should be clearly identified both on site, and within any design plans, to ensure that the works contractors do not indirectly affect its viability through the placement or storage of vehicles and machinery.
 - Consultation with Gosford City Council should be entered into regarding the appropriate suppression of those noxious weeds recorded.
 - No vehicles or machinery should be stored in the bushland areas that occur to the north of Avoca Drive.
 - All works compounds should be located within the disturbed environments, thereby negating the removal of any native vegetation.
 - As part of the project, suitable erosion and sedimentation controls should be implemented to ensure that the aquatic areas downstream of the works are not indirectly affected. Similarly, no drainage works should be developed that permit the discharge of unfiltered water into the wetland environment. The use of the existing storm water system should be adopted, these environments are already expected to have been degraded by upslope urban developments and populated runoff.
 - Any creek crossing should not further affect the movement patterns of aquatic species. The works should similarly not influence the water quality or flow regimes of those creek lines present within the study area.

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Appendix I: Flora species recorded within the study area.

Key

* Introduced (weed) species.

Planted native species.

FAMILY	GENUS	SPECIES
Filicopsida		
Adiantaceae	<i>Adiantum</i>	<i>aethiopicum</i>
Blechnaceae	<i>Blechnum</i>	<i>cartilaginum</i>
		<i>indicum</i>
		<i>Doodia aspera</i>
		<i>Nephrolepis cordifolia</i> *
Cyatheaceae	<i>Cyathea</i>	<i>australis</i>
Dennstaedtiaceae	<i>Hypolepis</i>	<i>muelleri</i>
	<i>Pteridium</i>	<i>esculentum</i>
Dicksoniaceae	<i>Calochlaena</i>	<i>dubia</i>
Lindsaeaceae	<i>Lindsaea</i>	<i>microphylla</i>
Sinopteraceae	<i>Pellaea</i>	<i>falcata</i>
CONIFEROPSIDA		
Pinaceae	<i>Pinus</i>	<i>sp.</i> *
PALMAE		
Arecaceae	<i>Livistona</i>	<i>australis</i>
	<i>Phoenix</i>	<i>canariensis</i> *
Magnoliopsida – Magnoliidae		
Apiaceae	<i>Centella</i>	<i>asiatica</i>
	<i>Hydrocotyle</i>	<i>bonariensis</i>
Apocynaceae	<i>Parsonsia</i>	<i>straminea</i> var. <i>straminea</i>
Araliaceae	<i>Polyscias</i>	<i>sambucifolia</i>
Asteraceae	<i>Ageratina</i>	<i>adenophora</i> *
	<i>Bidens</i>	<i>pilosa</i> *
	<i>Conyza</i>	<i>bonariensis</i> *
	<i>Coreopsis</i>	<i>lanceolata</i> *
	<i>Ozothamnus</i>	<i>diosmifolium</i>
	<i>Senecio</i>	<i>madagascariensis</i> *
	<i>Sonchus</i>	<i>oleraceus</i> *
	<i>Taraxacum</i>	<i>officinale</i> *
Bignoniaceae	<i>Pandorea</i>	<i>pandorana</i>
Caprifoliaceae	<i>Lonicera</i>	<i>japonica</i> *
Casuarinaceae	<i>Allocasuarina</i>	<i>littoralis</i>
	<i>Allocasuarina</i>	<i>torulosa</i>
Dilleniaceae	<i>Hibbertia</i>	<i>scandens</i>
Eleocarpaceae	<i>Eleocarpus</i>	<i>reticulatus</i>
Epacridaceae	<i>Leucopogon</i>	<i>lanceolatus</i>
Euphorbiaceae	<i>Breynia</i>	<i>oblongifolia</i>
	<i>Glochidion</i>	<i>ferdinandi</i>
Fabaceae: Faboideae	<i>Glycine</i>	<i>clandestina</i>
	<i>Oxylobium</i>	<i>ilicifolium</i>
	<i>Platylobium</i>	<i>formosum</i>
	<i>Pultenaea</i>	<i>flexilis</i>
	<i>Trifolium</i>	<i>repens</i> *
Fabaceae: Mimosoideae	<i>Acacia</i>	<i>floribunda</i>
	<i>Acacia</i>	<i>implexa</i> (?)
	<i>Acacia</i>	<i>irrorata</i> ssp. <i>irrorata</i>
	<i>Acacia</i>	<i>longifolia</i>
	<i>Acacia</i>	<i>prominens</i>
	<i>Acacia</i>	<i>ulicifolia</i>

FAMILY	GENUS SPECIES
Fabaceae: Caesalpinioideae	<i>Senna coluteoides</i> *
Goodeniaceae	<i>Goodenia heterophylla</i> var. <i>heterophylla</i>
Lauraceae	<i>Cinnamomum camphora</i> *
Malvaceae	<i>Pavonia hastata</i> *
Menispermaceae	<i>Stephania japonica</i> var. <i>discolor</i>
Myrtaceae	<i>Angophora costata</i>
	<i>Callistemon salignus</i>
	<i>Callistemon</i> sp. #
	<i>Corymbia gummifera</i>
	<i>Eucalyptus botryoides</i>
	<i>Eucalyptus pilularis</i>
	<i>Eucalyptus resinifera</i>
	<i>Eucalyptus saligna</i>
	<i>Eucalyptus scias</i>
	<i>Eucalyptus robusta</i>
	<i>Leptospermum trinervium</i>
	<i>Leptospermum polygalifolium</i>
	<i>Melaleuca decora</i>
	<i>Melaleuca ericifolia</i>
	<i>Melaleuca stypheloides</i>
	<i>Syncarpia glomulifera</i>
Ochnaceae	<i>Ochna serrulata</i> *
Oleaceae	<i>Ligustrum lucidum</i> *
	<i>Ligustrum sinense</i> *
	<i>Notolaea longifolia</i>
Oxalidaceae	<i>Oxalis corniculata</i>
Phytolaccaceae	<i>Phytolacca octandra</i> *
Pittosporaceae	<i>Billardiera scandens</i>
	<i>Pittosporum undulatum</i>
Plantaginaceae	<i>Plantago lanceolata</i> *
Proteaceae	<i>Banksia spinulosa</i>
	<i>Persoonia laevis</i>
	<i>Persoonia linearis</i>
Rhamnaceae	<i>Pomaderris intermedia</i>
Rosaceae	<i>Cotoneaster</i> sp. *
	<i>Rubus rosifolius</i>
	<i>Rubus ulmifolius</i> *
Rubiaceae	<i>Morinda jasminoides</i>
Santalaceae	<i>Exocarpos cupressiformis</i>
Sapindaceae	<i>Dodonaea triquetra</i>
Solanaceae	<i>Solanum nigrum</i> *
Thymelaceae	<i>Pimelea linifolia</i>
Verbenaceae	<i>Lantana camara</i> *
	<i>Verbena bonariensis</i> *
Vitaceae	<i>Cissus antarctica</i>
	<i>Cissus hypoglauca</i>
Magnoliopsida – Liliidae	
Asparagaceae	<i>Myrsiphyllum asparagoides</i> *
Commelinaceae	<i>Commelina cyanea</i>
	<i>Tradescantia albiflora</i> *
Cyperaceae	<i>Caustis pentandra</i>
	<i>Gahnia clarkei</i>
Iridaceae	<i>Patersonia sericea</i>
Liliaceae	<i>Watsonia</i> sp. *
Lomandraceae	<i>Lomandra longifolia</i>
Philesiaceae	<i>Eustrephus latifolius</i>

FAMILY	GENUS	SPECIES
	<i>Geitonoplesium</i>	<i>cymosum</i>
Phormiaceae	<i>Dianella</i>	<i>caerulea</i> var. <i>producta</i>
Poaceae	<i>Andropogon</i>	<i>virginicus</i> *
	<i>Avena</i>	<i>fatua</i> *
	<i>Briza</i>	<i>minor</i> *
	<i>Cynodon</i>	<i>dactylon</i>
	<i>Austrodanthonia</i>	sp.
	<i>Dichelachne</i>	sp.
	<i>Entolasia</i>	<i>stricta</i>

Appendix 2: Fauna species recorded or known to occur in the vicinity of the study area.

Source of Records

- 1 = Species recorded during present study.
 2 = DEC (2004a).
 3 = LesryK Environmental Consultants (1998a).
 4 = LesryK Environmental Consultants (1998b).

Key

- A - indicates species listed under the EPBC Act.
 F - migratory Family listed under the EPBC Act.
 M - Species listed as migratory listed under the EPBC Act.
 B - indicates species listed under the TSC Act.
 E - Species is Endangered.
 V - Species is Vulnerable.
 P - species being considered for listing (i.e. a Preliminary Determination has been made) under the TSC Act.
 * Introduced species.

A	B	COMMON NAME	FAMILY AND SCIENTIFIC NAME	1	2	3	4
		MAMMALS					
			Ornithorhynchidae				
		Platypus	<i>Ornithorhynchus anatinus</i>		x		
			Tachyglossidae				
		Short-beaked Echidna	<i>Tachyglossus aculeatus</i>		x		
			Dasyuridae				
V	V	Spotted-tailed Quoll	<i>Dasyurus maculatus</i>		x		
	E	Eastern Quoll	<i>Dasyurus viverrinus</i>		x		
		Yellow-footed Antechinus	<i>Antechinus flavipes</i>		x		
		Brown Antechinus	<i>Antechinus stuartii</i>		x		
		Dusky Antechinus	<i>Antechinus swainsonii</i>		x		
			Peramelidae				
		Northern Brown Bandicoot	<i>Isodon macrourus</i>		x		
		Long-nosed Bandicoot	<i>Perameles nasuta</i>		x		
			Phascolarctidae				
	V	Koala	<i>Phascolarctos cinereus</i>		x		
			Vombatidae				
		Common Wombat	<i>Vombatus ursinus</i>		x		
			Burramyidae				
	V	Eastern Pygmy Possum	<i>Cercartetus nanus</i>		x		
			Petauridae				
	V	Yellow-bellied Glider	<i>Petaurus australis</i>		x		
		Sugar Glider	<i>Petaurus breviceps</i>		x		
	V	Squirrel Glider	<i>Petaurus norfolcensis</i>		x		
			Pseudocheiridae				
		Greater Glider	<i>Petauroides volans</i>		x		
		Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>	x	x		
			Acrobatidae				
		Feathertail Glider	<i>Acrobates pygmaeus</i>		x		
			Phalangeridae				
		Mountain Brushtail Possum	<i>Trichosurus caninus</i>		x		
		Common Brushtail Possum	<i>Trichosurus vulpecula</i>		x	x	

A	B	COMMON NAME	FAMILY AND SCIENTIFIC NAME	1	2	3	4
			Potoroidae				
V	V	Long-nosed Potoroo	<i>Potorous tridactylus</i>		x		
			Macropodidae				
	V	Parma Wallaby	<i>Macropus parma</i>		x		
		Red-necked Wallaby	<i>Macropus rufogriseus</i>		x		
		Swamp Wallaby	<i>Wallabia bicolor</i>		x	x	x
			Pteropodidae				
V	V	Grey-headed Flying Fox	<i>Pteropus poliocephalus</i>		x		
			Emballonuridae				
	V	Yellow-bellied Sheath-tailbat	<i>Saccolaimus flaviventris</i>		x		
			Rhinolophidae				
		Eastern Horseshoe Bat	<i>Rhinolophus megaphyllus</i>				
			Vespertiliidae				
		Gould's Wattled Bat	<i>Chalinolobus gouldii</i>		x		
		Chocolate Wattled Bat	<i>Chalinolobus morio</i>		x		
	V	Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>		x		
	V	Little Bentwing-bat	<i>Miniopterus australis</i>		x		
	V	Eastern Bent-wing Bat	<i>Miniopterus schreibersii</i>		x		
	V	Large-footed Myotis	<i>Myotis adversus</i>		x		
		Lesser Long-eared Bat	<i>Nyctophilus geoffroyi</i>		x		
		Gould's Long-eared Bat	<i>Nyctophilus gouldi</i>		x		
	V	Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>		x		
		Eastern Broad-nosed Bat	<i>Scotorepens orion</i>		x		
		Large Forest Bat	<i>Vespadelus darlingtoni</i>		x		
		Eastern Forest Bat	<i>Vespadelus pumilus</i>		x		
		Southern Forest Bat	<i>Vespadelus regulus</i>		x		
		Little Forest Bat	<i>Vespadelus vulturnus</i>		x		
			Molossidae				
	V	Eastern Freetail Bat	<i>Mormopterus norfolkensis</i>		x		
		Eastern Freetail Bat	<i>Mormopterus</i> sp. 2		x		
		Freetail Bat	<i>Mormopterus</i> sp. 1		x		
		White-striped Freetail Bat	<i>Nyctinomus australis</i>		x		
			Muridae				
		* House Mouse	<i>Mus musculus</i>		x		
		Bush Rat	<i>Rattus fuscipes</i>		x	x	
		Swamp Rat	<i>Rattus lutreolus</i>		x		
		* Black Rat	<i>Rattus rattus</i>		x		
			Canidae				
		Dingo	<i>Canis lupus dingo</i>		x		
		* Fox	<i>Vulpes vulpes</i>		x		
		* Dog	<i>Canis familiaris</i>		x	x	
			Felidae				
		* Feral Cat	<i>Felis catus</i>		x		
			Leporidae				
		* Rabbit	<i>Oryctolagus cuniculus</i>		x	x	
			Equidae				
		* Horse	<i>Equus caballus</i>		x		
		BIRDS					

A	B	COMMON NAME	FAMILY AND SCIENTIFIC NAME	1	2	3	4
			Megapodiidae				
		Australian Brush Turkey	<i>Alectura lathami</i>		x		
			Pelecanidae				
		Australian Pelican	<i>Pelecanus conspicillatus</i>	x	x		
			Phalacrocoracidae				
		Pied Cormorant	<i>Phalacrocorax varius</i>		x		
		Little Pied Cormorant	<i>Phalacrocorax melanoleucos</i>		x	x	
		Great Cormorant	<i>Phalacrocorax carbo</i>		x		
		Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>		x		
F			Anatidae				
		Pacific Black Duck	<i>Anas superciliosa</i>		x	x	
		Grey Teal	<i>Anas gracilis</i>		x	x	
		Chestnut Teal	<i>Anas castanea</i>		x	x	
		Australian Wood (Maned) Duck	<i>Chenonetta jubata</i>		x	x	
			Rallidae				
		Buff-banded Rail	<i>Gallirallus philippensis</i>		x		
		Lewin's Rail	<i>Rallus pectoralis</i>		x		
		Spotless Crake	<i>Porzana tabuensis</i>		x		
		Dusky Moorhen	<i>Gallinula tenebrosa</i>		x	x	
		Purple Swamphen	<i>Porphyrio porphyrio</i>		x	x	
		Eurasian Coot	<i>Fulica atra</i>		x		
			Ardeidae				
		White-faced Heron	<i>Egretta novaehollandiae</i>	x	x	x	
M		Cattle Egret	<i>Ardea ibis</i>		x	x	
M		Great Egret	<i>Ardea alba</i>		x		
		Striated Heron	<i>Butorides striatus</i>		x		
	V	Black Bittern	<i>Ixobrychus flavicollis</i>		x		
			Threskiornidae				
		Australian White (Sacred) Ibis	<i>Threskiornis molluca</i>		x	x	
		Straw-necked Ibis	<i>Threskiornis spinicollis</i>		x		
		Royal Spoonbill	<i>Platalea regia</i>		x		
F			Scolopacidae				
M		Eastern Curlew	<i>Numenius madagascariensis</i>		x		
M		Grey-tailed Tattler	<i>Heteroscelis brevipes</i>		x		
M		Common Greenshank	<i>Tringa nebularia</i>		x		
			Burhinidae				
	E	Bush-stone Curlew	<i>Burhinus grallarius</i>		x		
			Haematopodidae				
	V	Pied Oystercatcher	<i>Haematopus longirostris</i>		x		
F			Charadriidae				
		Masked Lapwing	<i>Vanellus miles</i>	x	x	x	
			Laridae				
		Silver Gull	<i>Larus novaehollandiae</i>	x	x	x	
M		Caspian Tern	<i>Sterna caspia</i>		x		
M		Common Tern	<i>Sterna hirundo</i>		x		
F			Accipitridae				
		Pacific Baza	<i>Aviceda subcristata</i>		x		
		Black-shouldered Kite	<i>Elanus axillaris</i>		x		

A	B	COMMON NAME	FAMILY AND SCIENTIFIC NAME	1	2	3	4
M	V	Osprey	<i>Pandion haliaetus</i>		x		
	V	Black-breasted Buzzard	<i>Hamirostra melanosternon</i>		x		
		Whistling Kite	<i>Haliastur sphenurus</i>		x		
M		White-bellied Sea-eagle	<i>Haliaeetus leucogaster</i>		x	x	
		Little Eagle	<i>Hieraaetus morphnoides</i>		x		
		Brown Goshawk	<i>Accipiter fasciatus</i>		x	x	
		Collared Sparrowhawk	<i>Accipiter cirrhocephalus</i>		x		
		Grey Goshawk	<i>Accipiter novaehollandiae</i>		x		
		Swamp Harrier	<i>Circus approximans</i>		x		
F			Falconidae				
		Peregrine Falcon	<i>Falco peregrinus</i>		x		
		Australian Hobby	<i>Falco longipennis</i>		x		
		Brown Falcon	<i>Falco berigora</i>		x		
		Nankeen Kestrel	<i>Falco cenchroides</i>		x		
			Columbidae				
	V	Superb Fruit-dove	<i>Ptilinopus superbus</i>		x		
		Topknot Pigeon	<i>Lopholaimus antarcticus</i>		x		
		White-headed Pigeon	<i>Columba leucomela</i>		x	x	
		* Rock Dove	<i>Columba livia</i>				
		* Spotted Turtle-dove	<i>Streptopelia chinensis</i>	x	x	x	x
		Brown Cuckoo-dove	<i>Macropygia amboinensis</i>	x	x	x	
		Emerald Dove	<i>Chalcophaps indica</i>		x		
		Crested Pigeon	<i>Ocyphaps lophotes</i>	x	x	x	
		Wonga Pigeon	<i>Leucosarcia melanoleuca</i>		x		
			Cacatuidae				
	V	Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>		x		
		Yellow-tailed Black Cockatoo	<i>Calyptorhynchus funereus</i>		x		
		Gang-Gang Cockatoo ^P	<i>Callocephalon fimbriatum</i>		x		
		Galah	<i>Eolophus roseicapilla</i>		x	x	
		Long-billed Corella	<i>Cacatua tenuirostris</i>		x		
		Little Corella	<i>Cacatua sanguinea</i>		x		
		Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	x	x	x	
			Psittacidae				
		Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	x	x	x	x
		Musk Lorikeet	<i>Glossopsitta concinna</i>	x			
		Scaly-breasted Lorikeet	<i>Trichoglossus chlorolepidotus</i>		x		
		Australian King Parrot	<i>Alisterus scapularis</i>		x		
E	E	Swift Parrot	<i>Lathamus discolor</i>		x		
		Crimson Rosella	<i>Platycercus elegans</i>	x	x	x	
		Eastern Rosella	<i>Platycercus eximius</i>	x	x	x	
		Red-rumped Parrot	<i>Psephotus haematotus</i>		x		
			Cuculidae				
		Pallid Cuckoo	<i>Cuculus pallidus</i>		x		
		Brush Cuckoo	<i>Cuculus variolosus</i>		x		
		Fan-tailed Cuckoo	<i>Cuculus flabelliformis</i>		x		
		Horsfield's Bronze-Cuckoo	<i>Chrysococcyx basalis</i>		x		
		Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>		x		
		Channel-billed Cuckoo	<i>Sthrops novaehollandiae</i>		x		

A	B	COMMON NAME	FAMILY AND SCIENTIFIC NAME	1	2	3	4
		Common Koel	<i>Eudynamys scopopacea</i>	x			
			Centropodidae				
		Pheasant Coucal	<i>Centropus phasianinus</i>		x		
			Strigidae				
	V	Powerful Owl	<i>Ninox strenua</i>		x		
		Southern Boobook	<i>Ninox novaeseelandiae</i>		x		
	V	Barking Owl	<i>Ninox connivens</i>		x		
			Tytonidae				
	V	Sooty Owl	<i>Tyto tenebricosa</i>		x		
	V	Masked Owl	<i>Tyto novaehollandiae</i>		x		
		Barn Owl	<i>Tyto alba</i>		x		
			Podargidae				
		Tawny Frogmouth	<i>Podargus strigoides</i>		x		
			Caprimulgidae				
		White-throated Nightjar	<i>Eurostopodus mysticalis</i>		x		
			Aegothelidae				
		Australian Owlet-nightjar	<i>Aegotheles cristatus</i>		x		
			Apodidae				
M		White-throated Needletail	<i>Hirundapus caudacutus</i>		x		
			Alcedinidae				
		Azure Kingfisher	<i>Alcedo azurea</i>		x		
		Laughing Kookaburra	<i>Dacelo naxaeguineae</i>	x	x	x	x
		Sacred Kingfisher	<i>Todiramphus sanctus</i>	x	x		
			Coraciidae				
		Dollarbird	<i>Eurystomus orientalis</i>		x		
			Pittidae				
		Noisy Pitta	<i>Pitta versicolor</i>		x		
			Menuridae				
		Superb Lyrebird	<i>Menura novaehollandiae</i>		x		
			Neosittidae				
		Varied Sittella	<i>Daphoenositta chrysoptera</i>		x		
			Climacteridae				
		White-throated Treecreeper	<i>Cormobates leucophaeus</i>		x	x	x
		Red-browed Treecreeper	<i>Climacteris erythrops</i>		x		
			Maluridae				
		Superb Fairy-wren	<i>Malurus cyaneus</i>	x	x	x	x
		Variegated Fairy-wren	<i>Malurus lamberti</i>		x		
			Pardalotidae				
		Spotted Pardalote	<i>Pardalotus punctatus</i>		x		
		Striated Pardalote	<i>Pardalotus striatus</i>		x		
		Large-billed Scrubwren	<i>Sericornis magnirostris</i>		x		
		White-browed Scrubwren	<i>Sericornis frontalis</i>		x	x	
		Yellow-throated Scrubwren	<i>Sericornis citreogularis</i>		x		
		Chestnut-rumped Heathwren	<i>Hylacola pyrrhopygia</i>		x		
		Weebill	<i>Smicrornis brevirostris</i>		x		
		White-throated Gerygone	<i>Gerygone olivacea</i>		x	x	
		Brown Gerygone	<i>Gerygone mouki</i>		x	x	
		Mangrove Gerygone	<i>Gerygone levigaster</i>		x		

A	B	COMMON NAME	FAMILY AND SCIENTIFIC NAME	1	2	3	4
		Brown Thornbill	<i>Acanthiza pusilla</i>		x	x	
		Yellow Thornbill	<i>Acanthiza nana</i>		x		
		Striated Thornbill	<i>Acanthiza lineata</i>	x	x	x	
		Buff-rumped Thornbill	<i>Acanthiza reguloides</i>		x		
		Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>		x		
			Meliphagidae				
		Red Wattlebird	<i>Anthochaera carunculata</i>	x	x	x	x
		Little (Brush) Wattlebird	<i>Anthochaera chrysoptera</i>	x	x	x	
		Noisy Friarbird	<i>Philemon corniculatus</i>	x	x	x	
ME	E	Regent Honeyeater	<i>Xanthomyza phrygia</i>		x		
		Bell Miner	<i>Manorina melanophrys</i>	x	x	x	
		Noisy Miner	<i>Manorina melanocephala</i>	x	x	x	
		Lewin's Honeyeater	<i>Meliphaga lewinii</i>	x	x	x	x
		Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>		x		
		White-eared Honeyeater	<i>Lichenostomus leucotis</i>		x		
		Fuscous Honeyeater	<i>Lichenostomus fuscus</i>		x		
		White-naped Honeyeater	<i>Melithreptus lunatus</i>	x	x		
		White-cheeked Honeyeater	<i>Phylidonyris nigra</i>		x		
		New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>		x		
		Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>	x	x	x	
		Scarlet Honeyeater	<i>Myzomela sanguinolenta</i>		x		
			Orthonychidae				
		Eastern Whipbird	<i>Psophodes olivaceus</i>	x	x	x	
			Cinclosomatidae				
		Spotted Quail-thrush	<i>Cinclosoma punctatum</i>		x		
			Petroicidae				
		Rose Robin	<i>Petroica rosea</i>		x		
		Eastern Yellow Robin	<i>Eopsaltria australis</i>	x	x	x	
		Jacky Winter	<i>Microeca fascians</i>		x		
			Pachycephalidae				
		Crested Shrike-tit	<i>Falcunculus frontatus</i>		x		
		Grey Shrike-thrush	<i>Colluricincla harmonica</i>		x	x	
		Golden Whistler	<i>Pachycephala pectoralis</i>		x	x	
		Rufous Whistler	<i>Pachycephala rufiventris</i>		x		
			Dicruridae				
		Grey Fantail	<i>Rhipidura fuliginosa</i>	x	x	x	x
M		Rufous Fantail	<i>Rhipidura rufifrons</i>		x		
		Willie Wagtail	<i>Rhipidura leucophrys</i>	x	x	x	
		Leaden Flycatcher	<i>Myiagra rubecula</i>		x		
M		Satin Flycatcher	<i>Myiagra cyanoleuca</i>		x		
		Restless Flycatcher	<i>Myiagra inquieta</i>		x		
M		Black-faced Monarch	<i>Monarcha melanopsis</i>		x		
		Magpie Lark	<i>Grallina cyanoleuca</i>	x	x	x	
		Spangled Drongo	<i>Dicrurus bracteatus</i>		x		
			Oriolidae				
		Olive-backed Oriole	<i>Oriolus sagittatus</i>	x	x		
		Figbird	<i>Specothebes viridis</i>		x		
			Ptilonorhynchidae				

A	B	COMMON NAME	FAMILY AND SCIENTIFIC NAME	1	2	3	4
		Green Catbird	<i>Ailuroedus crassirostris</i>		x	x	
		Satin Bowerbird	<i>Ptilonorhynchus violaceus</i>		x		
		Regent Bowerbird	<i>Sericulus chrysocephalus</i>	x	x		
			Campephagidae				
		Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	x	x	x	x
		Cicadabird	<i>Coracina tenuirostris</i>		x		
			Artamidae				
		White-breasted Woodswallow	<i>Artamus leucorhynchus</i>		x		
		Grey Butcherbird	<i>Cracticus torquatus</i>	x	x	x	
		Pied Butcherbird	<i>Cracticus nigrogularis</i>		x		
		Australian Magpie	<i>Gymnorhina tibicen</i>	x	x	x	x
		Pied Currawong	<i>Strepera graculina</i>	x	x	x	x
			Corvidae				
		Australian Raven	<i>Corvus coronoides</i>		x	x	x
			Hirundinidae				
		Welcome Swallow	<i>Hirundo neoxena</i>	x	x	x	x
			Passeridae				
		* House Sparrow	<i>Passer domesticus</i>		x	x	x
			Ploceidae				
		Red-browed Finch	<i>Neochmia temporalis</i>		x		
			Dicaeidae				
		Mistletoebird	<i>Dicaeum hirundinaceum</i>		x		
			Zosteropidae				
		Silvereye	<i>Zosterops lateralis</i>		x	x	x
			Pycnonotidae				
		* Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>		x	x	
F			Muscicapidae				
		Bassian (Ground) Thrush	<i>Zoothera lunulata</i>		x		
		Russet-tailed Thrush	<i>Zoothere heinei</i>				
		* Common Blackbird	<i>Turdus merula</i>	x	x		
		* Song Thrush	<i>Turdus philomelus</i>				
			Sturnidae				
		* Common Starling	<i>Sturnus vulgaris</i>		x	x	
		* Common Myna	<i>Acridotheres tristis</i>	x	x	x	
		REPTILES					
			Chelidae				
		Eastern Snake-necked Turtle	<i>Chelodina longicollis</i>		x		
			Gekkonidae				
		Southern Leaf-tailed Gecko	<i>Phyllurus platurus</i>		x		
			Pygopodidae				
		Burton's Snake-lizard	<i>Lialis burtonis</i>		x		
		Common Scaly-foot	<i>Pygopus lepidopodus</i>		x		
			Agamidae				
		Jacky Lizard	<i>Amphibolurus muricatus</i>		x		
		Eastern Water Dragon	<i>Physignathus lesueurii</i>	x	x		
			Varanidae				
V		Heath (Rosenberg's) Goanna	<i>Varanus rosenbergi</i>		x		
		Lace Monitor	<i>Varanus varius</i>		x		

A	B	COMMON NAME	FAMILY AND SCIENTIFIC NAME	1	2	3	4
			Scincidae				
		Wall Skink	<i>Cryptoblepharus virgatus</i>		x		
		Copper-tailed Skink	<i>Ctenotus taeniolatus</i>		x		
		Land Mullet	<i>Egernia major</i>		x		
		Eastern Water Skink	<i>Eulamprus quoyii</i>		x		
		Grass Skink	<i>Lampropholis delicata</i>	x	x	x	x
		Garden Skink	<i>Lampropholis guichenoti</i>		x		
		Weasel Skink	<i>Saproscincus mustelinus</i>		x		
		Eastern Blue-tongued Lizard	<i>Tiliqua scincoides</i>	x	x		x
		Three-toed Skink	<i>Saiphos equalis</i>		x		
			Boidae				
		Diamond Python	<i>Morelia spilota spilota</i>		x		
			Colubridae				
		Common Tree Snake	<i>Dendrelaphis punctulata</i>		x		
			Elapidae				
		Krefft's Dwarf Snake	<i>Cacophis krefftii</i>		x		
		Golden Crowned Snake	<i>Cacophis squamulosus</i>		x		
		Yellow-faced Whip Snake	<i>Demansia psammophis</i>		x		
		White-lipped Snake	<i>Drysdalia coronoides</i>		x		
		Red-naped Snake	<i>Furina diadema</i>		x		
		Black-bellied Swamp Snake	<i>Hemiaspis signata</i>		x		
V		Stephen's Banded Snake	<i>Hoplocephalus stephensii</i>		x		
		Red-bellied Black Snake	<i>Pseudechis porphyriacus</i>		x		
		Eastern Brown Snake	<i>Pseudonaja textilis</i>		x		x
		AMPHIBIANS					
			Myobatrachidae				
		Common Eastern Froglet	<i>Crinia signifera</i>		x	x	
		Eastern Banjo Frog	<i>Limnodynastes dumerilii</i>		x		
		Striped Marsh Frog	<i>Limnodynastes peronii</i>		x		
V		Red-crowned Toadlet	<i>Pseudophryne australis</i>		x		
		Smooth Toadlet	<i>Uperoleia laevigata</i>		x		
		Tyler's Toadlet	<i>Uperoleia tyleri</i>		x		
			Hylidae				
V	E	Green and Golden Bell Frog	<i>Litoria aurea</i>		x		
		Green Tree Frog	<i>Litoria caerulea</i>		x		
		Red-eyed Tree Frog	<i>Litoria chloris</i>		x		
		Bleating Tree Frog	<i>Litoria dentata</i>		x		
		Eastern Dwarf Tree Frog	<i>Litoria fallax</i>		x		
		Jervis Bay Tree Frog	<i>Litoria jervisiensis</i>		x		
		Broad-palmed Frog	<i>Litoria latopalmata</i>		x		
		Leseur's Tree Frog	<i>Litoria lesueuri</i>		x		
		Peron's Tree Frog	<i>Litoria peronii</i>		x	x	
		Leaf Green Tree Frog	<i>Litoria phyllochroa</i>		x		
		Tyler's Tree Frog	<i>Litoria tyleri</i>		x		
		Verreaux's Tree Frog	<i>Litoria verreauxii</i>		x		

APPENDIX D

Aboriginal Heritage Assessment

AVOCA DRIVE UPGRADE

GREEN POINT, NSW

ABORIGINAL HERITAGE ASSESSMENT



AERIAL PHOTOGRAPH OF GREEN POINT SHOWING THE AVOCA DRIVE STUDY AREA (MARKED RED). THE PHOTOGRAPH ABOVE SHOWS THE PROXIMITY OF AVOCA DRIVE TO THE BRISBANE WATER ESTUARY, WHICH WOULD HAVE BEEN A RICH SOURCE OF FOOD AND TRADITIONAL RESOURCES FOR ABORIGINAL PEOPLE IN THE PAST. FRESH WATER IS ALSO AVAILABLE IN STREAMS THAT CROSS AVOCA DRIVE. THE COMBINATION OF LOCALLY AVAILABLE FRESH WATER AND THE RICH RESOURCES OF BRISBANE WATER WOULD HAVE MADE THE STUDY AREA A FAVOURABLE LOCATION FOR ABORIGINAL OCCUPATION AND USE IN THE PAST. THE ARCHAEOLOGICAL SURVEY FOUND THAT THE LAND CORRESPONDING WITH AVOCA DRIVE AND ADJACENT ROAD RESERVE HAS BEEN SIGNIFICANTLY DISTURBED BY PAST ROAD BUILDING ACTIVITY AND THE LIKELIHOOD OF ANY INTACT ABORIGINAL SITES IS VERY LOW. THE BUSHLAND RESERVE TO THE NORTH-WEST OF AVOCA DRIVE IS LARGELY UNDISTURBED AND MAY CONTAIN INTACT ABORIGINAL STONE ARTEFACT SCATTER AND MIDDEN SITES.

Jim Wheeler

on behalf of

AHMS

**ARCHAEOLOGICAL &
HERITAGE MANAGEMENT
SOLUTIONS PTY LTD**

122c Percival Road
Stanmore
NSW 2048

ACN 088 058 388 ABN 45 088 058 38

**NSW ROADS & TRAFFIC
AUTHORITY**

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Appendix 2 - DEC AHIMS Recording Form

1.0 INTRODUCTION

1.1 PREAMBLE

The NSW Roads & Traffic Authority (RTA) engaged *Archaeological and Heritage Management Solutions (AHMS) Pty Ltd* to undertake an Aboriginal heritage assessment for preliminary investigations into the proposed upgrade of Avoca Drive at Green Point, NSW. RTA are considering an option to widen a section of Avoca Drive between Sun Valley Rd and Bayside Drive. RTA are also considering an option to construct a new section of road between Asca Drive and Avoca Drive. This report presents an assessment of Aboriginal heritage constraints for these options.

1.2 SITE IDENTIFICATION

The study area includes a 1.2 kilometre section of Avoca Drive between Sun Valley Road (to the north) and Bayside Drive (to the south), and the land extending 20m either side of it. The study area also includes the alignment of a new section of road being considered by RTA that would connect Asca Drive with Avoca Drive. This area is currently owned by Gosford City Council and comprises a bushland reserve zoned for Open Space and Recreation.

The study area is located within the suburb of Green Point, approximately 3 kilometres south of Gosford, on the central coast of NSW. Avoca Drive is situated between 100 metres and 500 metres south-east of Brisbane Water, an estuarine embayment. The study area is surrounded by low-density housing development and a remnant bushland reserve between Asca Drive and Avoca Drive. Figure 1.1 overleaf shows the location of the study area.

1.3 REASON FOR THE CURRENT STUDY

The Aboriginal heritage assessment was prepared in accordance with provisions of the *Environmental Planning and Assessment Act 1979* which require that in reaching a decision to grant development consent, a consent authority should take into consideration the likely impacts of development on Aboriginal

heritage values, including impact on Aboriginal objects, sites and places. This objective is achieved by:

1. Undertaking an Aboriginal archaeological survey and assessment of the study area in accordance with *National Parks & Wildlife Service (NPWS) Guidelines for Archaeological Survey and Reporting (1997)*; and
2. Assessing the impact of the proposed road upgrade options upon Aboriginal heritage values.

The assessment is also necessary to ensure that any future upgrade works will not disturb, destroy, deface or desecrate Aboriginal objects without the consent of the Director-General of DEC, as required by Section 90 of the *National Parks & Wildlife Act 1974*.

1.4 STATUTORY CONTROLS

1.4.1 Statutory Protection

The *National Parks & Wildlife Act (1974)* and the *Environmental Planning and Assessment Act (1979)* provide the statutory tools for Aboriginal cultural heritage management in New South Wales. The *Aboriginal and Torres Strait Islander Heritage Protection Act (1984)* is also relevant to the current study.

The implications of these statutes for the proposal are outlined below.

1.4.2 National Parks & Wildlife Act 1974 (Amended 2001)

The provisions of the *NP & W Act (1974)* provide blanket protection for Aboriginal objects (material evidence of indigenous occupation) and Aboriginal places (areas of cultural significance to the Aboriginal community). The following sections are particularly pertinent:

- Section 91 states that anyone who discovers an Aboriginal object is obliged to report the discovery to the DEC.
- Section 90 states that it is an offence to destroy, deface, damage or desecrate, or cause or permit the destruction, defacement, damage or desecration of, an Aboriginal object or Aboriginal place.



Figure 1.1 – Location Plan (Study Area is Marked in Blue). Source:: Gosford 1:25,000 topographic map.

- Section 86 and 87 state that it is an offence to collect or disturb objects or excavate, or in any way disturb land for the purpose of discovering objects without a permit authorised by the Director-General DEC.
- Section 84 makes provision for protection of 'Aboriginal Places' or locations of special significance to Aboriginal culture.

In practical terms, the provisions of the Act require an archaeological assessment of any land where there is potential that Aboriginal sites or objects may be impacted by development. Aboriginal archaeological assessments are governed by the *NPWS Guidelines for Archaeological Survey and Reporting* (1997). These guidelines require consultation with Aboriginal communities and relevant representative bodies such as Local Aboriginal Land Council's (LALCs) and Traditional Owner groups. This includes Aboriginal community participation in all archaeological survey and excavation work and consideration of the Aboriginal cultural significance of sites and places.

In accordance with *Section 90* of the *NP & W Act 1974*, all Aboriginal objects are protected and cannot be destroyed or disturbed without a *Section 90 Heritage Impact Permit* from DEC. Protection is provided irrespective of both the level of significance of the objects and issues of land tenure.

1.4.3 Environmental Planning & Assessment Act 1979

The *EP & A Act 1979* requires that environmental and heritage impacts are considered by consent authorities prior to granting development approvals. Under *Part IV* of the Act, specific approval from state agencies may be required in certain circumstances. This mechanism is known as an 'integrated development application' or IDA.

The DEC is an approval body in the IDA process when a development will impact on an Aboriginal object or place, and thereby require a *S.90 Heritage Impact Permit* from DEC to allow the destruction or disturbance of a registered site. In this situation, consent must be granted by DEC prior to a development being approved.

1.4.4 Federal Legislation

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* was enacted at a Federal level to preserve and protect areas (particularly sacred sites) and objects of particular significance to Aboriginal Australians from damage or desecration. Steps necessary for the protection of a threatened place are

outlined in a gazetted *Ministerial Declaration* (Sections 9 and 10). This can include the prevention of development.

As well as providing protection to areas, it can also protect objects by *Declaration*, in particular Aboriginal skeletal remains (Section 12). Although this is a Federal Act, it can be invoked on a State level if the State is unwilling or unable to provide protection for such sites or objects.

1.5 PROPOSED DEVELOPMENT

RTA are considering two sections .

1.5.1 Section 1

Section 1 involves widening the existing two lane carriageway of Avoca Drive between Sun Valley Road and Bayside Drive. These works would require cut and fill outside the margins of the current road alignment within the road reserve.

1.5.2 Section 2

Section 2 involves construction of a new section of road between Asca Drive and Avoca Drive. The road would link up with Avoca Drive at the current intersection with Koolang Road. Implementation of Section 2 would require establishment of a new road corridor through Green Point Reserve, a remnant bushland reserve currently owned by Gosford City Council and currently zoned for Open Space and Recreation. Works would include clearance of vegetation within the road corridor and cut and fill to establish required levels.

Chapter 8 of this report includes an assessment of the archaeological impact of the development sections described above.

1.6 PROJECT SCOPE AND OBJECTIVES

The objective of the study was to undertake an Aboriginal archaeological and cultural heritage impact assessment of the study area in partnership with the local Aboriginal community to:

- Determine the archaeological and cultural heritage significance of the study area; and
- Assess the potential impacts of the development sections.

Specific aims of the study were as follows:

- Assess the potential composition, extent and significance of Aboriginal sites and objects within the development area;
- Assess the potential impact of development on Aboriginal heritage;
- Consult with the local Aboriginal community to assess the cultural significance of the study area; and
- Provide management recommendations that ensure any future development complies with the requirements of State and Federal heritage legislation.

The assessment was undertaken in accordance with the:

- Legislative requirements of the *NSW National Parks and Wildlife Act, 1974*; and
- Procedures for Aboriginal heritage assessments and management outlined in the Aboriginal Cultural Heritage Standards and Guidelines Kit (*National Parks and Wildlife Service, 1997*); and

The assessment required completion of the following tasks:

1.6.1 Aboriginal Community Consultation

- Consultation with the local Aboriginal community to determine the cultural significance of the area. The *Darkinjung Local Aboriginal Land Council* (DLALC) represents the local Aboriginal community regarding management of Aboriginal cultural heritage in the Gosford area. DLALC were consulted in regards to the current study and heritage management of the site; and
- Incorporate the views and recommendations of DLALC into the assessment report.

1.6.2 Research

- Search the DEC *Aboriginal Heritage Information Management System* (AHIMS) in order to determine the type and distribution of Aboriginal sites that have been recorded in the Green Point area;
- Review previous archaeological investigations and studies carried out in the Green Point and Brisbane Water area; and
- Prepare a predictive model of the “archaeological potential” of the study area, including prediction of the potential for unrecorded Aboriginal sites to occur.

1.6.3 Field Survey

- Record any Aboriginal objects or sites within the study area;
- Identify any locations within the study area that have archaeological potential based on the results of field survey, predictive modelling and previous investigations in the area; and
- Determine the degree to which previous development and landscape modification has disturbed original soils, and assess its implications for preservation of archaeological deposits.

1.6.4 Reporting

- Prepare a report for RTA, detailing the results of the assessment and Aboriginal community consultation, in accordance with the requirements of the *NSW NPWS Aboriginal Cultural Heritage Standards & Guidelines Kit* (1997); and
- Recommend appropriate options for management of Aboriginal objects and mitigation of potential heritage impacts, in accordance with the requirements of the *National Parks & Wildlife Act 1974*. Management recommendations incorporate the views of the local Aboriginal community.

1.7 REPORT OUTLINE

This remainder of the report presents the following:

- Description of the environmental context of the study area (Section 2.0).
- Review of Aboriginal ethno-history for the region using early documentary records (Section 3.0).
- Review of the local and regional Aboriginal archaeological context, including predictions regarding types of Aboriginal archaeological evidence that may be present in the development area (Section 4.0).
- Description of the archaeological field survey results (Section 5.0).
- Results of Aboriginal community consultation (Section 6.0).
- Assessment of *Aboriginal heritage significance* (Section 7.0).
- Assessment of the impact of proposed development on potential archaeological sites or objects (Section 8.0).
- Management recommendations (Section 9.0).

1.8 AUTHORSHIP

This report was written by archaeologist Jim Wheeler.

1.9 ACKNOWLEDGEMENTS

The author acknowledges the assistance provided by Mr Nicholas Francesconi (Environmental Officer) and Mr Steven Knight (Aboriginal Programs Consultant) of RTA. We would also like to acknowledge the assistance and valuable input provided by Mr David Pross and Ms Jodi Cameron of the *Darkinjung Local Aboriginal Land Council*.

2.0 ENVIRONMENTAL CONTEXT

2.1 BACKGROUND

Archaeological assessment reports include information about the environmental context of study areas because of the important role environmental characteristics played in influencing the types of archaeological sites in any given area. Physical environments influenced both the type and availability of natural resources and the types of cultural activities that were carried out in the past. As a result, this also influenced the types of archaeological sites that may be found.

A determination of the former environmental context is essential to develop accurate models of cultural activity, site distribution patterns and the archaeological potential of any given area. The environmental setting of Green Point is discussed below.

2.2 LANDSCAPE

The *Soil Landscapes of Gosford-Lake Macquarie 1:100,000 Sheet*¹ indicates the local soil landscape interleaves between the 'Erina' erosional landscape and the 'Wyang' alluvial landscape. The Erina landscape dominates the study area and is defined by footslopes adjacent to Brisbane Water. The Wyong landscape is found within the low-lying valley-floors of two drainage lines that cross the study area from south to north.

Landforms within the Erina landscape are characterised by undulating rolling rises, low hills and gently incised footslopes². Slopes are gently to moderately inclined and valleys are moderately narrow (300 – 800 metres wide).

The Wyong landscape includes broad, poorly drained deltaic floodplains and alluvial flats³. Slope gradients are less than 3 % and local relief less than 10 metres.

¹ Murphy 1993

² Murphy 1993: 52

³ Murphy 1993: 81

2.3 GEOLOGY

The underlying geology of the Erina landscape comprises Narrabeen Group stones. The local 'Terrigal' formation of the Narrabeen Group consists of lithic and quartz sandstone and siltstone, minor sedimentary breccia, claystone and conglomerate. Rock outcropping is rare, although it can be seen exposed below current ground levels in road cuttings on Avoca Drive.

Underlying parent material of the low-lying Wyong landscape comprises sand, silt, gravel and clay quaternary sediments.

2.4 SOILS

Soils of the Erina landscape are moderately deep (100 - 200 cm thick) yellow and red podzolic soils. Characteristics of the Erina soils include low pH and sheet erosion where original vegetation has been cleared. These soils typically have the following stratigraphy on lower foot-slopes, such as are found in the study area⁴:

- A brownish-black fine sandy loam A1 horizon topsoil. Small sandstone fragments are sometimes present throughout this horizon. Charcoal fragments and roots are common; overlying
- A hard setting yellowish-brown sandy clay loam A2 horizon soil. Small shale and sandstone rock fragments are common and are often concentrated as stone lines at the base of the horizon. Charcoal fragments and roots are often present; overlying
- B horizon subsoils comprising strongly pedal clays ranging from yellow-red in colour.

Soils of the Wyong landscape are deep (greater than 200 cm thick) yellow and brown podzolic soils. Soil pH is low and erosion limited to stream bank erosion on higher order drainage lines. Wyong soils typically have the following stratigraphy:

- A brownish-black pedal loam A horizon topsoil. Roots are common but charcoal and rock fragments are absent; overlying
- A mottled brownish grey plastic clay B horizon subsoil. It is often waterlogged and anaerobic at depth.

⁴ Murphy 1993: 53

2.5 VEGETATION

Original vegetation was cleared from most of the study area during the historic period. A small pocket of gully forest has survived to the west of Avoca Drive within Green Point Reserve. Here vegetation consists of tall open forest on side slopes including a variety of casuarinas, blackbutt, turpentine, angophoras and eucalypts. Vegetation on the poorly drained gully floor, adjacent to an ephemeral drainage line, includes a variety of casuarinas, melaleucas, eucalypts and a suite of ferns and sedges. The soils and vegetation are un-disturbed, however it is unclear whether the trees are a remnant old growth community. This will be assessed by a separate flora and fauna study currently being undertaken on behalf of RTA.

The remainder of the study area is cleared land and is currently sparsely vegetated with some endemic trees along with exotic and non-endemic native plantings on road verges. Understorey has been completely cleared and ground cover now comprises a suite of grasses, weeds and shrubs.

3.0 ABORIGINAL & EUROPEAN HISTORY

3.1 PREAMBLE

This section presents a history of Aboriginal use and occupation of the study area. The discussion is based on documentary evidence and ethnographic records.

3.2 THE TRADITIONAL OWNERS

While we know little about Aboriginal population numbers and social organization prior to white settlement, at the time of first contact in 1788, Governor Philip described the Aborigines of Broken Bay as 'friendly' and 'very numerous'⁵. Prior to European settlement, the Brisbane Waters area, including the modern suburb of Green Point, appears to have been part of either *Guringai* or *Darkinjung* traditional land. There is considerable debate about the nature, territory and range of the pre-contact Aboriginal language groups in the Brisbane Waters area. This is largely because by the time colonial diarists and missionaries began making detailed records of Aboriginal people in the 19th Century, Aboriginal groups had been reduced in number and dispersed by European settlement activity.

3.3 LIFESTYLE OF THE TRADITIONAL OWNERS

By studying accounts of early British settlers, we can reconstruct aspects of traditional Aboriginal lifestyle. Early observers indicate that the subsistence and economy of Aboriginal groups depended largely on the environment in which they lived. While coastal groups exploited marine and estuarine resources, hinterland groups relied on freshwater and terrestrial animals and plants. A distinction between the two lifestyles is clearly made in early European accounts. During a trip along the Hawkesbury-Nepean during 1791, Watkin Tench wrote that hinterland people:

⁵ HRA, 1(2): 125

'depend but little on fish, as the river yields only mullets, and that their principal support is derived from small animals which they kill, and some roots (a species of wild yam chiefly) which they dig out of the earth'.

In contrast, Collins wrote that for coastal people:

'Fish is their chief support...the woods, exclusive of the animals which they occasionally find in their neighbourhood, afford them but little sustenance; a few berries, the yam and fern root, the flowers of the different Banksia, and at times some honey, make up the whole vegetable catalogue'

Tench also noted the importance of marine foods in the economy of coastal groups. According to Tench, the task of fishing was divided between husband and wife, the woman using a hook and line and the man using a fish gig (spear)⁶. Bark canoes were often used by both men and women for fishing and fires were commonly placed in the middle of these canoes. When fish were scarce or the weather was foul, coastal groups turned their attention to gathering shellfish, hunting reptiles and small animals, digging fern roots, or gathering berries⁷.

Although early observations have provided much useful information about Aboriginal society at contact, archaeological investigations have shown clear deficiencies. Archaeological excavations along the NSW coast have clearly shown that coastal people exploited a wide range of hinterland terrestrial resources, which sits in contradiction to early records that coastal people were almost exclusively 'fishers' and inland people were 'hunters'. The contradiction is probably accounted for by the visibility of fishing and gathering activities on and near the water as opposed to the relative invisibility of hunting and foraging activities in the hinterland.

From early records it is clear that quite large populations were supported along the coast. One such account comes from Tench and is worth quoting in full:

"... on the north west arm of Botany Bay stands a village which contains more than a dozen houses and perhaps five times that number of peopleGovernor Phillip, when on an excursion between the head of the harbour and that of Botany Bay, once fell in with a party which consisted of more than 300 persons" ⁸.

⁶Tench, W 1996: pp.258-260

⁷Ibid

⁸Tench, W 1996: 58

This account suggests the existence of large and probably semi-sedentary coastal groups, although Tench does say that the typical social arrangement was that, "*the Indian families confine their society and connections within their own pale*"⁹. Matthew Lynch, an early settler in the Illawarra district, recalled a battle fought at Fairy Meadow in 1830 between the Wollongong and the Bong Bong Aborigines which included "*several hundred men on each side*"¹⁰. These accounts suggest coastal Aboriginal populations were substantial.

Aboriginal groups living in the Hawkesbury sandstone region made extensive use of the natural rock overhangs and caverns that are characteristic of the area. George Barrington observed that "*Those who build bark huts are very few compared to the whole. Generally speaking, they prefer the ready made habitations they find in the rocks*".

Tench described how native huts were constructed by laying pieces of bark together in the form of an 'oven'. The end result consisted of a low shelter, which was opened at one end and sufficient to accommodate one person lying down¹¹. Tench¹² goes on to conclude "*there is reason, however, to believe that they depend less on them (huts) for shelter than on the caverns with which the rocks abound*".

Plant management practices that bear remarkable similarity to those reported in northern Australia were also conducted along the NSW coast. For instance, there is good evidence that Aboriginal groups carried out fire-stick farming in and around Sydney, a practice that probably extended throughout New South Wales. When the first fleet arrived in Sydney, Captain John Hunter found an environment where

"the trees stand very wide of one another, and have no underwood; in short the woods ... resemble a deer park, as much as if they had been intended for such a purpose".

This is the classic result of Aboriginal firing of the landscape. Ethnographic evidence from Northern Australia suggests that the systematic burning of the landscape was carried out for a variety of reasons. 'Fire-stick farming' opened up access to land and created pockets of early succession vegetation that increased the amount of important plant foods. Early regrowth vegetation, particularly grasses, attracted animals, which in turn made them easier to hunt.

⁹Ibid

¹⁰Quoted in Organ, M 1990: 158

¹¹Tench, W. 1996: 53

¹²Ibid

Aboriginal firing of the landscape was an important tool in manipulating the environment to increase food sources.

Plant management was not just restricted to the manipulation of the environment though. Plant processing also figured prominently and enabled Aboriginal groups to broaden their range of food sources. Hunter provides an interesting account of trying to eat a poisonous yam (probably *Dioscorea bulbifera*) and getting violently sick. Hunter had seen Aborigines digging this same yam and concluded, "They no doubt have some way of preparing these roots, before they can eat them".

According to George Washington Walker's journal of 1836, the Illawarra Aborigines processed *Zamias*. Walker recorded that the Aborigines,

*"either roast them, and pound them into a paste, steeping them in water to get rid of their acrid and hurtful properties, or get rid of these by longer period of steeping in water, so as to render them fit to be eaten in a raw state"*¹³.

Such plant management and processing practices were an important part of the economies of Aboriginal groups.

Ceremonial and mythological sites were important places in the cultural landscape, as sites of initiation, learning and spirituality. A series of ceremonial sites were documented in 1890 by John Service, grand-nephew of James Dunlop who settled on Brisbane Waters in 1842. Service recalled initiation ceremonies undertaken on Dunlop's 'Boora Boora' property during the 19th century. The ceremonies were carried out on three hills behind Dunlop's house, probably at the modern 'Dunlops Hill', 2 kilometres south of the current study area. Service noted that:

*The ceremony of making youths into young men was, naturally enough considered of great importance. It was performed on the three hills behind Dunlop's house. On one hill was a fire, on the second sat the chief, while on the third stood the humble candidate for honours of manhood. He was put through several trying tests, but the chief of these was to trample out the fire without wincing and to have one of his front teeth knocked out with a stone. When the girl became a gin or wife she had her little finger struck with a tomahawk'.*¹⁴

¹³Quoted in Organ, M. 1990: 208

¹⁴ Service, 1890: 201-202

3.4 ABORIGINAL CONTACT HISTORY AFTER 1788

The traditional life of the Aboriginal people was broken through the course of the early 19th century. The impact of smallpox and influenza decimated the Aboriginal population, with individual epidemics killing large numbers of people. Early white settlement of traditional hunting lands deprived Aboriginal groups of sources of food and access to camping and ceremonial sites. This forced individuals to either relocate into the potentially hostile lands of neighbouring Aboriginal groups, partially integrate into colonial society as fringe dwellers or to resist. White settlers and the colonial administration often met resistance by Aboriginal groups with retaliatory action. A combination of these factors led to the demise of traditional lifestyles and a decrease in the Aboriginal population.

Many of the traditional groups broke up and scattered or re-aligned themselves by the time that colonial diarists, missionaries and early visitors to the area made detailed records of the Aboriginal inhabitants. The various 'tribes' referred to by colonists in the 19th Century were the result of major post-Contact social reorganisation. The displacement & dislocation from traditional lands that occurred soon after European settlement meant that remnant Aboriginal bands were forced to combine to 'to provide mutual protection and to maintain viable social and economic units'.¹⁵ Some researchers have argued that by as early as the 1820s, the pre-contact clans and bands no longer existed as identifiable groups.¹⁶ Census data collected in 1827 indicates that there were five tribes within the Brisbane Water district at that time. The tribes listed were the *Broken Bay Tribe*, the *Tuggera Beach Tribe*, the *Wyong Tribe*, the *Narara Tribe* and the *Erina Tribe* accounting for a total population of 65 individuals.¹⁷ This number is relatively high when compared to Aboriginal population numbers in the settled areas about Sydney and may reflect the relative isolation of the area in the 1820s.¹⁸

Aboriginal people who stayed in settled areas during the early to mid-1800s tended to live on the fringes of white society and became increasingly dependent on welfare. Government allocations of blankets and slop clothing, bartering of fish and game for sugar, flour and alcohol reflect the changes that occurred in Aboriginal culture and lifestyle.

¹⁵ Kohen, 1985; Ross, 1988: 49

¹⁶ Attenbrow, 2002: 56;

¹⁷ Sainty & Johnson, 1980: 15

¹⁸ By 1820 it was reported that there were only twenty Aboriginal people left in the whole of the Liverpool Police District which included the Georges River and Botany Bay areas.

While many people moved on, there are some records of individual Aborigines who stayed in their traditional lands well into the 19th century. Mahroot for example, one of a number of people described as the 'last of the Botany Bay Tribe' in the 1850s, summed up the Aboriginal situation in the mid 19th century during a Colonial Government investigation into the 'condition of Aborigines' in 1845:

*'Well mister...all blackfella gone! All this my country! Pretty place! Little Pickaninny, I run about here. Plenty blackfellow then: corrobory; great fight; all canoe about. Only me left now...'*¹⁹

¹⁹ Mahroot's evidence to the NSW Legislative Council's Select Committee on Aborigines, 1845 – presented in Waugh, 2001: 32-40

4.0 ARCHAEOLOGICAL CONTEXT

4.1 REGIONAL ARCHAEOLOGICAL CONTEXT

For the purposes of determining settlement and site location patterns, archaeologists examine regional and local trends in the distribution of known sites in relation to environment and topography. This provides evidence about economic and social systems in the past and also assists archaeologists in predicting likely site types and locations in any given area.

The study area is located on the northern rim of the Sydney Basin, and for the purposes of discussing regional archaeological patterning, the study area is considered to fall within the Gosford-Wyong region. Aboriginal occupation in the region dates back into the Pleistocene period. This evidence comes from calibrated Radiocarbon dates retrieved from an excavated rockshelter site called 'Loggers' (c. 13,015 years before present [BP]²⁰). This site is located in the Upper Mangrove Creek catchment, approximately 30 kilometres to the northwest of the current study area.

The vast majority of sites in the Gosford Wyong region are less than 5,000 years old. It has been argued that this is a result of increased populations and 'intensification', during this period. The prevalence of sites dating to the last 5000 years may also be a result of the last significant rise in sea level, approximately 6000 years ago. The sea level rise submerged many of the older sites along the coastal fringe and forced Aboriginal groups westward to the current coastline.

The archaeology of the Gosford-Wyong region has been documented through a number of academic and impact assessment investigations over the past 30 years. The majority of these investigations have been archaeological surveys; only a small number of archaeological excavations have been undertaken, particularly within the coastal zone. In excess of 1,200 Aboriginal sites have been recorded and registered with the DEC Aboriginal Sites Register (AHIMS) within the Gosford City local government area²¹.

²⁰ Attenbrow 2003: 22 (Lab # SUA-931)

²¹ Dallas and Bell 1989: 34

The dominant site types are rock shelters with midden deposit, rock shelters with art, rock engravings, middens and axe grinding grooves²². Burials, open artefact scatters, scarred trees and stone arrangements are less common²³.

The distribution, density and size of sites is largely dependent on environmental context. For instance, middens are found in close proximity to marine, estuarine and less often, freshwater bodies. Rock shelters are only found in areas of exposed sandstone escarpment and grinding grooves are found in areas of exposed flat beds of sandstone, particularly along creek lines.

A study of the regional archaeology of Gosford LGA by Dallas and Bell²⁴ made a number of findings about site location patterns in the area. The study was commissioned by Gosford City Council for future planning and management of Aboriginal heritage. Dallas and Bell found that Aboriginal sites are located throughout the LGA on all major landforms. The study demonstrated a greater density of sites in the uplands and on the fringes of lakes and lagoons than on the coastal plains and hills. Predictions about the nature and distribution of sites within the Gosford LGA were based on:

- The location, quantity and nature of the known resource;
- The degree of land disruption due to previous and current land use; and
- The environmental resource zones present within the LGA known to be utilized in Aboriginal adaptive strategies.

In accordance with Dallas and Bell's division of landform units, the current study area falls within the 'Lakes and Lagoons' unit. Within this unit, the study predicted that open middens, campsites and burials can be expected on undisturbed Quaternary deposits (alluvium, sands and gravels) adjacent to Brisbane Water, particularly on the margins of Cockle Creek, Cockle Bay, Cockle Channel and the Woy Woy peninsula²⁵. It was also predicted that a considerable number of sites in this unit have been destroyed or disturbed by urban development on the fringes of Brisbane Water.

The abundance and diversity of marine and estuarine resources on the coast resulted in more intensive Aboriginal settlement than areas further inland. This explains the present concentration of archaeological sites along the coastal strip

²²Attenbrow 2002: 49

²³ibid

²⁴Dallas & Bell 1989

²⁵Dallas & Bell 1989, 57

as indicated by Vinnicombe's 1980 regional study of the central coast. Vinnicombe calculated coastal site density at 11.5 sites per square km, compared to 5.6 sites per square km in the hinterland²⁶.

Sites along the coast are often large and complex with a range of features suggesting relatively dense populations engaged in a diverse social and economic life. Aboriginal shell middens, artefact scatters, rock shelters, burials, art and mythological/ceremonial sites are commonly found along the coastal fringe. Environmental and topographical factors strongly influenced Aboriginal occupation patterns, which has in turn affected archaeological site location patterning. Sites are most commonly found within close proximity to fresh water sources, stone sources, and within range of resource-rich environments such as coastal foreshores, estuaries and lagoons.

Aboriginal stone artefacts are an important source of archaeological information because stone is preserved for long periods of time whereas organic materials such as bone, shell, wood and plant fibres decay. Stone artefacts provide valuable information about technology, economy, cultural change through time and settlement patterning. Stone has also been used for 'relative' dating of sites where direct methods such as Carbon dating cannot be applied. A technological sequence for stone artefacts for the region was first described in the late 1940s by Fred McCarthy and has since been refined over time. Known as the 'Eastern Regional Sequence' (ERS) it was based on direct dating of excavated sequences. Some debate about the precise nature and significance of the technological changes described still continues²⁷, therefore the ERS should be regarded only as a general guide to technological change. The ERS phases are as follows:

- Capertian - is distinguished by large uniface pebble tools, core tools, horsehoof cores, scrapers and hammerstones. Backed artefacts occasionally present. Generally dates to before 5,000 years before present (BP).
- Early Bondaian - Aspects of the Capertian assemblage continue, but backed artefacts and ground-edged artefacts increase. Artefacts during this period were predominantly made from fine-grained silicious stone such as silcrete and tuff. Generally dated from 5,000 BP to 2,800 BP.

²⁶ Vinnicombe 1980, Table 16

²⁷ Hiscock & Attenbrow 2002; Hiscock & Attenbrow 1988

- Middle Bondaian – Characterised by backed artefacts, particularly Bondi Points and ground-edged artefacts. Artefacts made from silicious materials, however quartz becomes more frequent. Generally dated from 2,800 BP to 1,600 BP.
- Late Bondaian – characterised by bipolar technology, eloueras, ground-edged artefacts, and bone and shell artefacts. Bondi points are virtually absent and artefacts are predominantly made from Quartz. Generally dated from 1,600 BP to contact.

Aboriginal art sites in the form of rock engravings, paintings, drawings and stencils are found along the coast, particularly in areas of outcropping bedrock. Within rockshelter sites, dry pigment drawings, paintings and engravings have been found. Pigment images were made with black charcoal, white pipeclay, red ochre or yellow ochre. Pigments were mixed with combinations of fat, ashes and blood to create a durable medium²⁸.

Scarred and carved trees are also found within areas of old growth remnant forest on the coast and in the hinterland. Aboriginal people took bark from trees (particularly eucalypt and melaleuca species) for making shelters, canoes, shields and a variety of vessels for carrying food and equipment. Trees were also carved for ceremonial and mythological reasons, often in association with initiation or 'bora' sites, where trees surrounding the ceremonial ground were carved with symbolic patterns and designs.

4.2 AHIMS SEARCH RESULTS

A search of the DEC Aboriginal Heritage Information Management System (AHIMS) for a five kilometre area surrounding the study area was undertaken to identify previously recorded sites in and around Green Point. A total of 17 sites have been recorded within the search area, encompassing the following site types and frequencies:

- Midden – 12
- Shelter with Midden – 3
- Rock Shelter with Deposit – 1
- Rock Shelter with Art – 1

²⁸Campbell in Attenbrow 2002: 147

Although no sites have been recorded within the immediate study area, an analysis of the search results provides an indication of local site patterning. The AHIMS search results show a predominance of middens and a variety of rock shelter sites. Rock shelters are all found in areas of sandstone outcropping. Midden sites are found in greatest number on the margins of the coast and estuary. It should be noted that the site types described above are more visible during archaeological survey. Other site types that are less visible during survey may also be present within the study area. These include:

- Open artefact scatters – either visible on the surface in areas of ground exposure, or buried below ground surfaces within original topsoils;
- Scarred Trees – within areas of remnant old growth forest containing trees greater than 100 years in age; and
- Rock engravings and axe grinding grooves – on areas of exposed flat-bedded sandstone.

As previously discussed, 19th century records indicate a series of ceremonial initiation sites known as ‘bora’ grounds, were located approximately 2 kilometres south of the current study in the locality of ‘Dunlops Hill’. At the time of writing these sites have not been registered with the DEC AHIMS.

4.3 LOCAL ARCHAEOLOGICAL CONTEXT

A small number of archaeological studies have been undertaken near Green Point, particularly over the past 15 years. Archaeological investigations have been primarily surveys for development and environmental impact assessments. This section provides a review of studies in the local area as a means of determining site types and site distribution in the local area, and the nature of the archaeological resource.

4.3.1 Gosford City Aboriginal Heritage Planning Study 1989

As discussed in section 4.1, Dallas and Bell undertook a large scale Aboriginal heritage planning study for Gosford City Council in 1989. The study indicates that no surveys had been undertaken at Green Point in 1989²⁹. No Aboriginal sites or objects were recorded within or near Green Point in 1989³⁰. As part of the study, Dallas and Bell identified areas of potential archaeological sensitivity based on predictive modelling, environmental context and past disturbance history. Map 16 and 17 indicate the current study area falls outside the zone of

²⁹ Dallas & Bell 1989, Map 4

³⁰ Dallas & Bell 1989, Map 5

sensitivity. Sensitive areas are shown immediately adjacent to Brisbane Water on the estuarine margins³¹.

4.3.2 Archaeological Assessment, Willesee Cres, Kincumber - 2001

Jo McDonald Cultural Heritage Management Pty Ltd undertook a survey and assessment for proposed development on the margins of Cockle Broadwater, approximately 2 kilometres south-east of the current study area³². No Aboriginal sites or objects were identified within the development site, probably due to the high level of past land use disturbance. The assessment recommended Land Council monitoring of development excavation works to ensure no Aboriginal objects were disturbed by development.

4.3.3 Archaeological Assessment, Caroline Bay, East Gosford - 1992

Brayshaw McDonald Pty Ltd undertook a survey and assessment for a proposed arts centre at Caroline Bay on Brisbane Water, approximately 1.5 kilometres north-west of the current study area³³. No Aboriginal sites or objects were found during the survey. The proposed development site had been cleared and grassed, as a result survey coverage was variable. The potential for Aboriginal sites was assessed as low due to the low lying, poorly drained topography that would have been unfavourable for Aboriginal occupation in the past.

4.3.4 Gosford Regional Sewerage Scheme - 1991

As part of the Gosford Regional Sewerage Scheme, Dallas undertook a survey and assessment of proposed reticulation sewers, rising mains and pump stations between Umina Beach and Patonga³⁴. While a number of sites were identified near the areas of proposed works, Dallas found that no Aboriginal sites would be affected by the proposal.

4.3.5 Aboriginal Heritage Assessment – Avoca Drive - 2004

A section of Avoca Drive between Dalgety Crescent and Sun Valley Road was surveyed by Chris Lewczak of Biosis Research Pty Ltd during August 2004³⁵. Their study area was immediately to the north of the current study area. The final road alignment and report are still being finalised, however, the survey did not locate any Aboriginal objects or sites within the proposed road corridor.

³¹ Dallas & Bell 1989, Map 16 and 17

³² McDonald 2001

³³ Brayshaw McDonald 1992

³⁴ Dallas 1991

³⁵ Chris Lewczak pers. comm..

4.3.6 Aboriginal Heritage Assessment - Entrance Road and Avoca Drive Intersection Upgrade - 2003

Vanessa Hardy of Biosis Research Pty Ltd undertook a survey and assessment of a proposed intersection upgrade, to the north of the current study area³⁶. The study was commissioned by Sinclair Knight Merz. No Aboriginal sites, objects or potential archaeological deposits (PADs) were found within the area of proposed works. Extensive disturbance caused by past land use and road development has disturbed, destroyed or removed any Aboriginal cultural material that may have originally been present.

4.4 PREDICTIVE MODELLING

4.4.1 Site Types

Based upon information compiled within the *DEC AHIMS*, and background archaeological data reviewed above, the types of sites that may be expected to occur within the boundaries of the subject land are described below.

Open Artefact Scatter

Occur almost anywhere that Aborigines travelled in the past. The cultural activity represented by these sites may be associated with hunting or gathering activities, domestic camps, or the manufacture and maintenance of stone tools. The density of artefacts present in these scatters can vary dramatically and may relate to either transient or short stay camps, or base camps of long term and/or repeated occupation. These types of sites are commonly referred to as 'open campsites'.

Midden

Aboriginal middens are deposits of discarded shellfish and the remains of fish, bird or animal bones. Midden sites are distinguished from natural shell deposits by the predominance of larger edible shellfish, the dark soil matrix with a high pH, charcoal and cultural artefacts included in the deposit. These sites occur along the coastal/estuarine margins and represent locations that were used for consuming and discarding shellfish. Midden sites vary considerably in size from small scatters of charcoal and shellfish up to large dense deposits that may be half a metre thick and cover a large area. Many larger middens were important campsites and the focus for large coastal populations. Burials often occurred in middens and for this reason they must be treated as potentially very culturally sensitive sites.

³⁶ Biosis 2003

Aboriginal Burials

These sites can occur anywhere in the landscape and in many cases are parts of burial complexes. A number of burial methods were used by Aboriginal groups including cremation, exposure, stretched burial inhumation and flexed burial inhumation. Burials are often found within sandy or loose soils and shell middens, particularly along the coastal fringe.

Isolated Find

Occur anywhere in the landscape and may represent the random loss, deliberate discard or abandonment of artefacts, or the remains of dispersed artefact scatters.

Scarred / Carved Tree

Aboriginal people used trees in many ways and in many environments. Bark was removed from trees to make artefacts, vessels, shelters and medicines. Bark was removed both as sheets, for shaped artefacts such as canoes, and fibre for twine. In the case of carved trees; tree trunks were carved with shapes and patterns that had mythological symbolism. Carved trees are specifically associated with Bora grounds or initiation ceremony sites. Carved trees are very rare and important sites. Scarred and Carved trees are found within areas of old growth remnant vegetation.

4.4.2 Site Predictions

The topography and distribution of natural resources near the study area indicates a potential for the site types described above. In particular, the study area has a potential for:

- Midden deposits, particularly near the margins of Brisbane Water;
- Open artefact scatter sites within areas that contain original topsoils, particularly slightly elevated, flat locations adjacent to natural drainage lines. Some midden material may also be present;
- Scarred or carved trees within areas of remnant forest containing old growth trees (ie. older than 100 years);
- Isolated finds anywhere across the landscape; and

- Aboriginal burials within deep midden deposits or in soft substrates such as sand;

Surveys along the NSW coast, indicate a high density of sites along the estuarine fringe, especially in association with fresh water drainage lines. The proximity of the study area to Brisbane Water indicates estuarine resources such as shell fish, fish and mangrove vegetation within close range of the study area. Natural drainage lines crossing the study area would have provided sources of fresh water. The availability of fresh water in combination with estuarine and terrestrial resources would have facilitated Aboriginal occupation and associated social and economic activities within the study area.

The diversity of locally available resources indicates the study area is located within a resource intersection zone. It has been argued³⁷ that Aboriginal camp sites were preferentially located at resource intersection zones in order to capitalise on a broader range of resources. This would suggest the study area was a favourable location for Aboriginal camping.

The proximity of ceremonial initiation sites at Dunlops Hill to the south of the study area, indicates the broader area had spiritual importance to Aboriginal people.

The potential for Aboriginal sites within the study area will largely depend on past land use and disturbance. In-situ sites, where artefacts are in primary deposition (ie. where they were placed or discarded by Aboriginal people in the past), will only be found in areas that retain original topsoils. Where original topsoils have been stripped by erosion or past land use, there will be no in-situ Aboriginal sites or objects.

³⁷ Aitken 1985; Hynes & Chase 1982

5.0 SURVEY RESULTS

5.1 SURVEY DETAILS

The archaeological survey was carried out on 18th of October 2004 by archaeologist Jim Wheeler of AHMS Pty Ltd in partnership with David Pross and Jodi Cameron of DLALC. Steven Knight, Aboriginal Programs Officer with the RTA also participated in the survey. The survey covered Section 1 (widening of Avoca Drive) and Section 2 (link road between Asca Drive and Avoca Drive).

The objectives of the survey were to identify any Aboriginal sites, objects or potential archaeological deposits (PAD's). The investigation also assessed the extent to which past land-uses may have affected the natural soil profiles. This information was used to assess the depth and potential integrity (intactness) of natural soil profiles across the study area and the likely archaeological impact of the proposed options.

5.2 SURVEY METHODOLOGY

The study area was traversed on foot, with the aim of locating and examining any areas of ground surface visibility. Areas of erosion and ground exposure were examined for archaeological evidence such as stone artefacts, charcoal and shell. Ground surfaces were also examined to determine the degree of soil disturbance, erosion and potential for archaeological deposits below current ground. Old trees were examined for evidence of scarring or carving.

5.3 SURVEY COVERAGE

Effective coverage is calculated by multiplying the % ground exposure (or visibility for detecting artefacts) by the % survey coverage (or actual area surveyed). The calculation of effective coverage shows the effectiveness of the surface survey in detecting archaeological sites and accordingly, how much weight ought to be put on the results.

For the purposes of detailing survey coverage data, the study area was divided into 2 survey units based on options under consideration by RTA (refer to Figure 5.1). The units were as follows:

- 1) Section 1 – Widening Avoca Drive;
- 2) Section 2 – Link Road from Asca Drive;

Table 5.1 sets out the survey coverage data and shows that effective coverage was generally low. The data indicates that across the majority of the study area, the surface survey was ineffective.

Table 5.1 Effective Survey Coverage

Survey Unit	Ground Exposure %	Survey Coverage %	Degree of Soil Disturbance	Estimate of Effective Coverage %
1 – Avoca Drive	5 %	80 %	Moderate-High	4 %
2 – Link Rd	1 %	100 %	Low	1 %

5.4 RESULTS OF THE SITE SURVEY

5.4.1 Survey Unit 1 – Avoca Drive

Survey Unit 1 comprised the road verge approximately 20 metres either side of Avoca Drive between Sun Valley Road and Bayside Drive. This is the zone of potential road widening under consideration (Section 1). No Aboriginal sites, objects or potential archaeological deposits (PADs) were identified in Survey Unit 1.

Original ground has been either cut or filled on either side of Avoca Drive along the majority of the current road alignment (refer to Figures 5.2 and 5.3). Small portions of the road verge are on original ground, however soils in these locations have been significantly disturbed by past land use, erosion and road works (refer to Figure 5.4).

The potential for any Aboriginal sites or objects within survey unit 1 is very low.

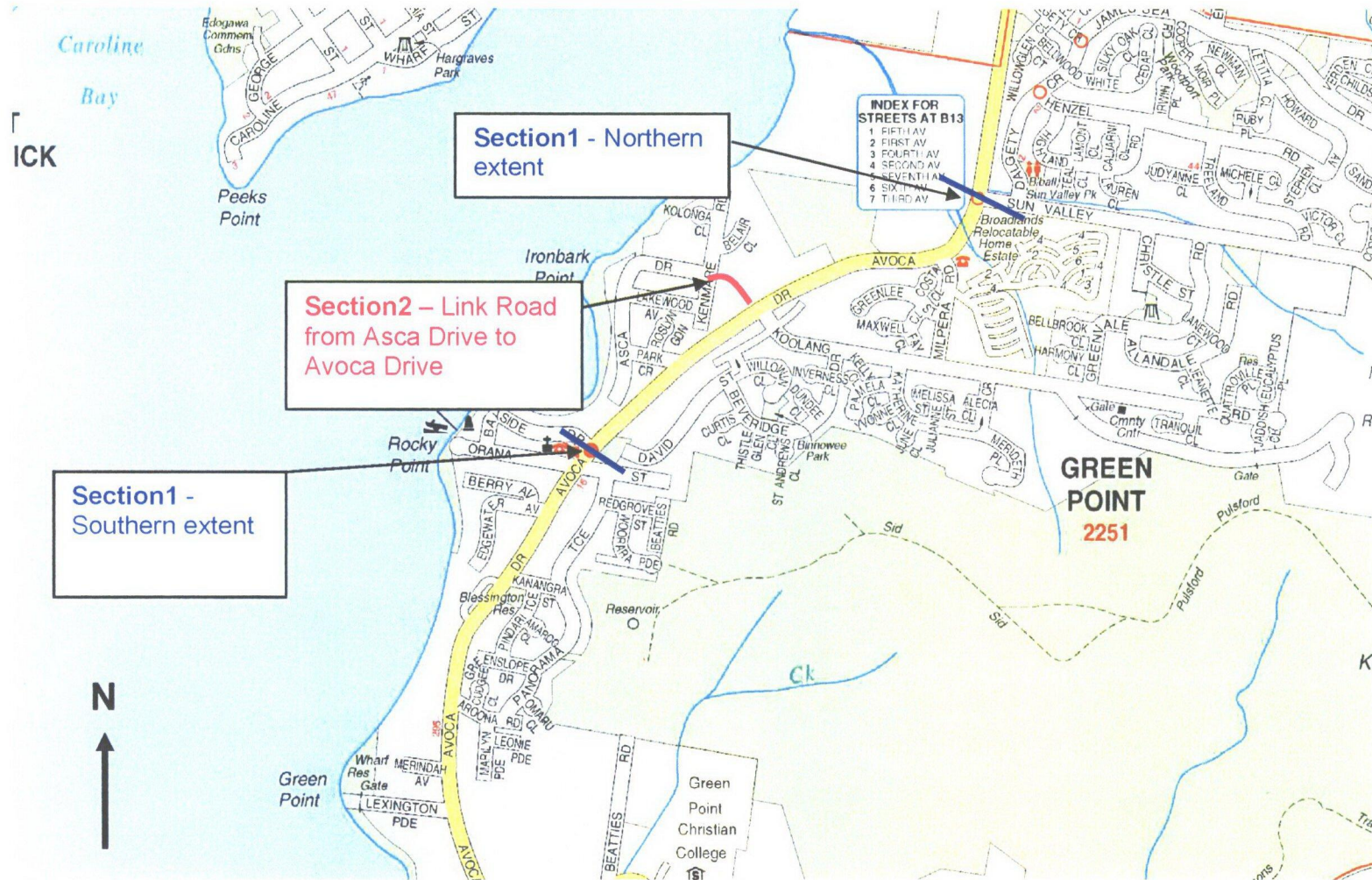


Figure 5.1 - Survey Units. Figure not to scale. Source -UBD Street Directory, 2001.



Figure 5.2 - Fill on western side of Avoca Drive. Original ground has been covered by more than 2 metres of fill.



Figure 5.3 - Road cutting on the eastern side of Avoca Drive. Original soils have been excavated and removed from this area.



Figure 5.4 - Erosion on original ground to the west of Avoca Drive near intersection with David Street. Original topsoils have been stripped from this area exposing B horizon subsoil.

5.4.2 Survey Unit 2 – Link road from Asca Drive to Avoca Drive

Survey Unit 2 was located on the proposed alignment of Section 2, comprising a link road between Asca Drive and Avoca Drive. The link road would connect with Avoca Drive at the current intersection with Koolang Road. No Aboriginal sites or objects were found during the survey, probably due to the very low effective survey coverage. The survey unit comprises remnant forest within a gully, currently part of Green Point Reserve (refer to Figure 5.5). There was no evidence of erosion or disturbance of soil within the gully. Due to the proximity of survey unit 2 to the rich estuarine resources of Brisbane Water (approx 200 metres to the north and west) and locally available sources of fresh water, intact soils within Survey Unit 2 are considered potential archaeological deposits (PADs). Because ground surfaces are covered by shrubs and vegetation, test excavation would be required to determine whether any Aboriginal sites or objects are present within topsoils (refer to Figure 5.6).

A number of large Eucalypt trees were inspected for evidence of scarring or carving in Survey Unit 2. Although the age of these trees was not determined, no evidence of scarring or carving was found.



Figure 5.5 – Remnant forest in Survey Unit 2, looking west from Avoca Drive.



Figure 5.6 – Vegetation covering ground surfaces in Survey Unit 2 limited the effectiveness of the survey.

6.0 ABORIGINAL COMMUNITY CONSULTATION

6.1 DEVELOPMENT OF CONSULTATION

The *Darkinjung Local Aboriginal Land Council* (DLALC) were consulted about the proposed development and invited to participate in the assessment. Site survey was undertaken in partnership with Mr David Pross and Ms Jodi Cameron of DLALC.

The recommendations of this report have been developed in consultation with DLALC. DLALC have provided written endorsement of our management recommendations (refer to Appendix 1).

6.2 OUTCOMES OF CONSULTATION

The outcomes that have emerged as a result of consultation with DLALC regarding the proposed sections, include the following:

- I. The Gosford region is an important cultural landscape to the local Aboriginal community, it contains ceremonial sites, sources of food, shelter and tool making materials, occupation sites and thoroughfares;
- II. DLALC are concerned about the on-going effects of development in the local area on Aboriginal sites. Many important sites, especially middens, have been destroyed since European settlement;
- III. Proposed Avoca Drive road widening (Section 1) will be within areas of disturbed (cut or filled) ground;
- IV. DLALC have requested detailed plans of the proposed link road and an adjacent proposed sub-division (Section 2);
- V. DLALC have recommended that a fauna and flora assessment be commissioned within the Section 2 area to ensure that no endangered or rare species habitat is damaged or lost during development; and

- VI. DLALC have recommended archaeological test excavation within the area of development impact in Section 2 because of the high probability of artefacts and/or midden in this area.

7.0 SIGNIFICANCE ASSESSMENT

7.1 BASIS FOR SIGNIFICANCE ASSESSMENT

Aboriginal sites are assessed in terms of three significance criteria: Archaeological (scientific), Cultural (Aboriginal) and Public Significance. These criteria recognise that Aboriginal sites are valuable in a number of ways. Namely:

- To the Aboriginal community as an aspect of their cultural heritage and as part of continuing traditions;
- To the broader community, for educational, historical and cultural enrichment values; and
- To the scientific community for potential research value.

The guidelines outlined in the *NSW National Parks and Wildlife* publication *Aboriginal Cultural Heritage: Standards and Guidelines Kit* provide the basis and background for the following discussion regarding evaluation of site significance.

7.2 ABORIGINAL CULTURAL SIGNIFICANCE

This area of assessment concerns the relationship and importance of sites to the Aboriginal community. Aspects of cultural significance include both people's traditional and contemporary links with a given site or landscape as well as an overall concern by Aboriginal people for sites and their continued protection.

Unmodified natural features in the landscape can signify sacred sites/places of significance. As such they are archaeologically invisible and can only be identified with the aid of Aboriginal interpretation. If such sites are known they may hold particular cultural significance to contemporary Aboriginal communities. Furthermore, sites of significance are not restricted to the period prior to contact with Europeans. Often events related to the Contact-period may be so important to local Aboriginal communities that they have become significant. If these events relate to a specific place in the landscape, then that place (i.e. the site) may become sacred or highly significant to the local Aboriginal communities.

The cultural (Aboriginal) significance is a matter for the local Aboriginal community. Please refer to section 9.2 for a summary of Aboriginal consultation undertaken and Appendix 1 for correspondence received from DLALC regarding the importance of the study area, their views with respect to the proposed development and their views regarding management of Aboriginal heritage during the development process.

7.3 PUBLIC SIGNIFICANCE

This category concerns a site's potential to educate people about the past. It also relates to the heritage value of particular sites as being representative examples of past lifestyles, why they are important, and why they should be preserved.

At present, no Aboriginal sites or objects have been identified within the study area. If they are present below current ground, such sites and objects are likely to have public significance as a demonstration of past Aboriginal life on the fringe of Brisbane Water.

7.4 SCIENTIFIC SIGNIFICANCE

The objective of undertaking scientific significance assessment for a site is to determine its research potential in terms of contribution to knowledge about the past. Criteria used to evaluate scientific potential include condition/integrity, representativeness and rarity.

At present, no Aboriginal sites or objects have been identified within the study area. If they are present below current ground, such sites and objects may have scientific significance. An assessment of scientific significance would be based on the results of test excavation and would take into account the condition, integrity, representativeness and rarity of such finds. In short, the scientific significance would be based on archaeological research potential.

8.0 DEVELOPMENT IMPACT

8.1 PREAMBLE

The results of the site survey and predictive modelling indicate the Section 1 development area, comprising widening of Avoca Drive, is unlikely to contain Aboriginal sites and objects. The development area within Section 2 contains potential archaeological deposits that may contain intact Aboriginal sites and objects including stone artefacts and midden.

The following sections provide a description of the proposed development options and an assessment of development impact on Aboriginal heritage. This information is critical in determining the approach to managing Aboriginal heritage during future development.

8.2 PROPOSED DEVELOPMENT

The RTA is in the early stages of feasibility planning for two development options. The results of heritage, environmental and engineering assessments will be considered prior to decisions about whether either option will be implemented.

The detailed design of the development options has not been prepared; however, in general terms they would require the following works.

8.2.1 Section 1

Section 1 involves widening the existing two lane carriageway of Avoca Drive between Sun Valley Road and Bayside Drive. Road widening may involve works up to 20 metres either side of the current road. These works would require cut and fill outside the margins of the current road alignment within the road reserve.

8.2.2 Section 2

Section 2 involves construction of a new section of road between Asca Drive and Avoca Drive. The road would link up with Avoca Drive at the current intersection with Koolang Road. Implementation of Section 2 would require establishment of a new road corridor through Green Point Reserve, a remnant bushland reserve currently owned by Gosford City Council and zoned for Open

Space and Recreation. Works would include clearance of vegetation within the road corridor and cut and fill to establish required levels.

8.3 IMPACT ASSESSMENT

The impact assessment for the principal elements of the development options is set out below.

8.3.1 Section 1

An examination of soil profiles and past disturbance of original ground during the archaeological survey indicated the Section 1 development area is unlikely to contain any Aboriginal sites or objects. Works associated with widening of Avoca Drive are considered unlikely to disturb or destroy Aboriginal sites or objects.

8.3.2 Section 2

The assessment concluded that the Section 2 development area contains potential archaeological deposits (PADs). The Section 2 development area, which comprises the area of PAD, is highlighted in purple on Figure 5.1. Any development works across remnant bushland within Green Point Reserve that involves disturbance of current ground or excavation of original soils may disturb or destroy Aboriginal objects.

9.0 RECOMMENDATIONS

9.1 BASIS FOR RECOMMENDATIONS

The following recommendations are based upon:

- Legal requirements of the *National Parks and Wildlife Act of 1974 (as amended 2001)*; in conjunction with
- Results of the archaeological investigations documented in this report;
- Views and recommendations of the local Aboriginal community; and
- Analysis of the impact of development options.

9.2 ABORIGINAL CONSULTATION

It is recommended that:

- I. Liaison established with the *Darkinjung Local Aboriginal Land Council* (DLALC) should be maintained during the development planning process until all issues arising in relation to management of Aboriginal cultural heritage have been resolved;
- II. DLALC should be provided with development design plans once the options are finalised;
- III. If RTA proceed with Section 2, DLALC should be invited to participate in archaeological test excavations to ensure that Aboriginal community views are represented; and
- IV. A copy of this report should be forwarded to the DLALC at the following address:

Darkinjung LALC

ATTN: Jodi Cameron (Cultural and Heritage Officer)

PO BOX 401

WYONG, NSW 2259

9.3 ARCHAEOLOGICAL MANAGEMENT

Recommendations for management of Aboriginal heritage during the development process are set out below. The recommended strategy has been endorsed by the *Darkinjung Local Aboriginal Land Council* (Refer to Appendix 1 for letter of support from DLALC).

- I. No further archaeological investigations are warranted for Section 1 development, being proposed widening of Avoca Drive between Sun Valley Road and Bayside Drive. Given past disturbances of original soils observed in this area, it is considered highly unlikely that road widening would destroy or disturb Aboriginal sites or objects;
- II.
 - a) Any development that may impact Aboriginal sites or objects will require a *Section 90 Heritage Impact Permit* from the *Department of Environment & Conservation* (DEC). The assessment, which is the subject of this report, found that the Section 2 development area contains potential archaeological deposits (PADs). Therefore development work within this area may disturb or destroy Aboriginal objects and may require a *Section 90* permit from DEC.
 - b) In order to consider an application for a *Section 90* permit, DEC will require archaeological test excavation in accordance with *Section 87* of the *NP & W Act 1974* to establish the presence, nature, extent and significance of Aboriginal cultural heritage that may be impacted by Section 2 development. Following the completion of feasibility studies, if the RTA decide to proceed with Section 2, the RTA should arrange for an application to DEC for a *Section 87 Preliminary Research Permit*.
 - c) The application should be prepared by a suitably qualified archaeologist and should include archaeological test excavation within areas of the proposed Section 2 development impact. The excavation methodology should be designed to sample, through controlled manual excavation, the range of terrain or 'topo-sequence' within the Green Point bushland reserve. Approval by the DEC may take up to 8 weeks and there is a \$100 fee for the application;
- III. Test excavation stemming from implementation of the above recommendation (II) should be included as a discrete component of the developments Critical Path. In addition, sufficient time and budgetary allocations should be made for:

- a) An application to DEC for a Section 87 permit, which may take up to 8 weeks processing time;
 - b) Archaeological test excavation within areas of development impact in partnership with DLALC. It is estimated that test excavation will take approximately 1 to 2 weeks to complete;
 - c) Preparation of an excavation report documenting the results of test excavation and significance of the deposits;
 - d) Liaison with DLALC and DEC to prepare an Aboriginal heritage mitigation strategy, and if appropriate, an application for a Section 90 Heritage Impact Permit to DEC;
 - e) An application to DEC for a Section 90 permit, which would allow development to proceed in accordance with an agreed mitigation strategy. DEC processing time may take up to 8 weeks;
 - f) Implementation of mitigation measures prior to commencement of development works, which may include additional archaeological salvage excavation in partnership with DLALC; and
 - g) Preparation of an additional report on the results of mitigation measures and recommendations for appropriate site interpretation.
- IV. If any Aboriginal burials are found during archaeological excavation, or at any time during the development process, excavation work must cease immediately. DLALC and DEC should be notified and advice sought before work can re-commence. It should be noted that both Section 87 and Section 90 permits do not allow the excavation and removal of Aboriginal burials; and
- V. Two copies of this report should be sent to the DEC Central Aboriginal Heritage Unit (CAHU). DEC CAHU address is:

DEC Central Aboriginal Heritage Unit
PO BOX 1967,
Hurstville, NSW 2220.

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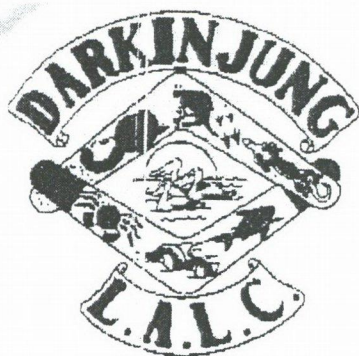
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APPENDICES

Appendix 1 – Darkinjung LALC Correspondence

Appendix 2 – DEC AHIMS Recording Form

Appendix 1 - Darkinjung LALC Correspondence.



ABORIGINAL HERITAGE SITE SURVEY

Survey Report For Proposed New Road at Green Point

Introduction

The Darkinjung Local Aboriginal Land Council was contracted by RTA to accompany them on a survey of a proposed new road area that will be constructed within a proposed new subdivision. The purpose of the road will be to connect Avoca Drive to Kenmare Road and will be used for access to the proposed new subdivision also. This survey is in accordance with the Environmental Planning Assessment Act (EPA) 1979, and Gosford City Councils requirements on land prior to development under the Local Government Act 1993.

Aim

The aim of the survey is to determine if any sites of Aboriginal significance are located within the survey area.

Aboriginal sites of significance include:

- Cave and Shelter sites (which may contain art work and/or artefact scatter)
- Scar and marked trees
- Middens
- Open campsite
- Artefact scatter
- Burial sites
- Rock engravings
- Grinding grooves

Methodology

The survey of the proposed new road area was conducted on the 18th October 2004 by Steve Knight of the RTA, Jim Wheeler, Archaeologist for AHMS, David Pross sites officer for DLALC and Jodi Cameron sites officer for DLALC.

The survey was carried out on foot by way of visual inspection. Areas targeted in the survey area were old growth trees, open exposed rock surfaces, creek lines and rock shelters.

The survey participants walked over the survey area in a criss-cross manner. The surrounding area was looked at to ascertain how much of the landscape has been built up for road and residential use.

Survey Location

The proposed new subdivision and road area is located on a block of land bounded by Avoca Drive and Kenmare Rd, Green Point. The proposed new road area is directly ~~opposite Koolang Drive, Green Point and extends through to Kenmare Rd. It was~~ difficult to ascertain exactly the roads boundary as there were only about 50mtr of the area marked by surveyors.

Area Description

Green Point area is located north east of Gosford and is in a geological formation known as the Terrigale formation. This area is characterised by high hilltops of Narrabeen and Hawkesbury sandstones, quartzite's and clay stones and narrow valleys with coastal swampy estuarine environments that creek and gully systems flow into and drain eventually into the Gosford broad water. The typical dry to moist sclerophyll forest contain species such as, Angophora (rough and smooth) grey and blue gums, casuarinas, iron bark, turpentine's, climbing vines, wattles, with palms and coach wood and other similar rainforest species in the moist and sheltered areas.

Aboriginal Occupation

The Green Point area falls within the boundaries of the Darkinjung Local Aboriginal Land Council.

~~The boundary extends from the Hawkesbury River in the south, Lake Macquarie in the north, the Mc Donald River and Wollombi to the west and the Pacific Ocean in the east.~~

Previous archaeological studies in the area indicate occupation for at least 30,000 years or longer.

The survey area would have been occupied by Aboriginal people it is located in an area that is close to the shores of the Gosford broad water and a relatively short walk to Kincumber Mt (which is a traditional women's area). Both these areas would have contained good sources of food, shelter and tool making materials, and were thoroughfares and destination points for the local people

At the close of this report the writer is still waiting for the NPWS Aboriginal Heritage sites report that would give the location of registered sites within a 5km radius of the survey area.

Site Findings

The survey area is located on a block that is slightly undulating and sloping in the direction of the bay.

The road areas around the block appear to have been built up with fill.

The block abuts a crown reserve that appears to be well used by the locals of the area.

The local garden club have created a few walking trails and picnic tables within the reserve.

As there were no clear markers or boundary lines it was unclear where the reserve and the survey block started and ended. The boundary of the survey area was estimated from a very general map obtained by the archaeologist.

The survey block appears to be well vegetated with trees, shrubs and weed growth on it. Visibility of the ground was difficult due to the thick leaf litter and lantana growth.

Two older growth trees were checked for markings or scars. No markings were found.

There were no open areas or rock platforms or caves and no obvious creek line.

The area has a high potential for artefact or midden sites because of its proximity to the water and its location in relation to other well-used areas and walkways.

Recommendations

- That a fauna and flora study be carried out (if not already done) to determine that no endangered or rare species habitat will be damaged or lost.
- That the proposed plans of development for the subdivision and road be made available for viewing by the DLALC and the RTA, as the layout of these was unclear as to how they would be fitted onto the block.
- Because of the high probability of the area to yield artefacts or midden material I suggest that prior to any works taking place on the block, an archaeological test dig be carried out in strategic places within the proposed road and development area.

Darlingjung Local Aboriginal Land Council strongly advocates that the above recommendations be used.

This report has been written and prepared by Jodi Cameron Cultural Officer for the DLALC. Should you have any queries in regard to this report please contact me on (02) 4351 2930.

Appendix 2 – DEC AHIMS Site Recording Form.



Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

New Recording ☒ Additional

information ☐

SITE IDENTIFICATION

Site name	Green Point Reserve PAD	NPWS Site Number	
Owner/manager	Gosford City Council		
Owner Address	PO BOX 21 GOSFORD, NSW, 2250		

LOCATION

Location	Green Point Reserve. Bushland between Avoca Drive to the south-east and Kenmare Road to the west.				
How to get to the site	Access off Avoca Drive or Kenmare Road as described above.				
1:250,000 map name	Sydney		NPWS map code		
AMG Zone	56	AMG Easting	347968	AMG Northing	6297671
Method for grid reference	Topographic map	Map scale (if method = map)	1:25,000	Map name	Gosford
NPWS District				NPWS Zone	Sydney Zone
Portion no.				Parish	

SITE DESCRIPTION

Site type(s)	potential archaeological deposit (PAD)	Site type code (NPWS use only)	
Description of site and contents CHECKLIST: eg. length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock. DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types. ART: area of decorated surface, motifs, colours, wet/dry pigment, engraving technique, no. of figures, sizes, patination. BURIALS: number & condition of bone, position, age, sex, associated artefacts. TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth. QUARRIES: rock type, debris, recognisable artefacts, percentage quarried	Potential archaeological deposits within intact original topsoils.		

Version: June 1998

Data entered by:

Date entered:



Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

SITE ENVIRONMENT						
Land form	gully		Aspect	n/a	Slope	gentle slope
Mark position of the site						
Local rock type	sand, silt, gravel and clay quaternary sediments of the "Wyang" soil landscape.		Land use/effect	Currently bushland reserve with mature vegetation.		
Distance from drinking water	within area of PAD		Source	Ephemeral drainage line runs north - south through PAD area.		
Resource zone (eg. estuarine, river, forest)	estuarine		Vegetation	tall open forest		
Edible plants	variety of food plants		Faunal resources (include shellfish)	estuarine shellfish/fish in Brisbane Water to the west and terrestrial hinterland resources		
Other exploitable resources (eg. ochre)	none observed					
Are there other sites in the locality	Yes	Are they in the Sites Register	Yes	Other site types include	open artefact scatters, midden and mythological/ceremonial.	
SITE MANAGEMENT						
Site condition	Unknown		PAD only			
Management recommendations	Section 87 application for subsurface test excavation prior to any development works to determine whether Aboriginal sites or objects are present. If present, significance assessment of Aboriginal cultural material should be used to determine future management.					
Have artefacts been removed from site	No		When			
By whom			Deposited at			
Consent applied for	<input type="checkbox"/>		Consent issued	<input type="checkbox"/>		
Date of issue			Consent number			
SITE INSPECTION AND RECORDING						
Reason for investigation	Aboriginal heritage assessment for an RTA option for a link road between Asca Drive and Avoca Drive.					
Were local Aborigines contacted or present for the recording	<input type="checkbox"/> Not contacted <input checked="" type="checkbox"/> Contacted and present <input type="checkbox"/> Contacted but not present		Names and addresses	Darkinjung LALC PO BOX 401 WYONG NSW 2259		
Is the site important to local Aborigines	If Aboriginal sites are present within PAD, they will have cultural significance to the local Aboriginal community.					
Verbal/written reference	Refer to Appendix 1 of AHA report			ASR report	C-	



Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

sources		number(s)	C-
Photographs taken	Yes	No of Photos attached	none
Site recorded by	Jim Wheeler	Date of recording	18 October, 2004
Address/institution	Archaeological & Heritage Management Solutions Pty Ltd 122c Percival Rd STANMORE, NSW, 2048		