Aspect	Policy /Methodology
	Environmental Criteria for Road Traffic Noise (EPA, 1999)
	Acoustics - Road traffic noise intrusion - Building siting and construction (Standards Australia, 1989, AS 3671-1989)
Rehabilitation	
	Managing Urban Stormwater: Soils & Construction (NSW Landcom, March 2004) - "The Blue Book"
Safety and Hazards	
	Electrical Safety Guidelines (Integral Energy)
Soils	
	Acid Sulfate Soil Manual (ASSMAC)
	Contaminated Sites: Sampling Design Guidelines (EPA, 1999)
Traffic & Transport	
	Guide to Traffic Engineering and Guide to Geometric Design of Rural Roads (Austroads, 2003, AP-G1/03)
	Guide to Traffic Generating Developments (RTA, 2002)
Urban Design, Cycleway/Pathway Design	
	Guidelines for the Design and Construction of Paths and Cycleways along Watercourses and Riparian Areas (Version 2) (DIPNR/DNR)
Water	
	Water quality guidelines for the protection of aquatic ecosystems for upland rivers. (ANZECC, 2000)
Floodplain	NSW Government Floodplain Development Manual - the Management of Flood Liable Land (DIPNR, 2005)
Groundwater	NSW State Groundwater Quality Protection Policy (DLWC, 1998, 0 7313 0379 2)
Stormwater	Managing Urban Stormwater: Soils & Construction (NSW Landcom, March 2004) - "The Blue Book"
Waterways	Waterways Crossing Design & Construction (Version 4 – DIPNR/DNR Draft Guidelines)
Climate Change	Floodplain Risk Management Guideline – Practical Consideration of Climate Change (DECC 25 October 2007)
EPBC Act	
FOR A CONTROLLED ACTION	Commonwealth Environment Protection and Biodiversity Conservation Act 1999: Guide to implementation in NSW: March 2007

APPENDIX B HSO (2001) Flora and Fauna Survey and Assessment Report

FLORA AND FAUNA ASSESSMENT

FOR

PROPOSED REZONING

OF

VARIOUS LOTS OFF
HENRY STREET
MORRISET PARK

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AUGUST 2001

EXECUTIVE SUMMARY

Flora, habitat and fauna assessments have been undertaken over various lots off Henry Street, Morriset Park, which are proposed to be partially rezoned to accommodate residential development and associated infrastructure / public areas. The study has aimed to identify ecological constraints and opportunities on the site with due reference to relevant environmental legislation so that due consideration can be given to such in the rezoning and subsequent design phases.

The majority of the site is known as the St. John of God Training Centre, which occupies the entirety of the Morriset Park peninsula. Some adjacent land to the north-west of the site that is currently zoned for residential development is also included in the area for consideration. These lands are largely cleared pasture, with some areas supporting remnant woodland vegetation. Other vegetation on site includes landscaped gardens surrounding the training centre buildings, and some riparian vegetation fringing the lakeside.

No threatened plant species were observed on site during fieldwork, and it is considered unlikely that any such plants would occur on site due to past clearance and ongoing grazing activity. Similarly, the vegetation associations (aside from some intact riparian areas supporting *Casuarina* forest / mangrove / salt marsh communities) are modified such that they are not considered floristically significant. It is recommended that the aforementioned riparian areas are retained intact on site, to both preserve the vegetation associations present, to continue their role as habitat (particularly for aquatic species), and to continue their function as a water quality filter and bank stabiliser.

Some specimens of the regionally significant tree *Eucalyptus robusta* (Swamp Mahogany) were found on site, and it has been recommended that these trees be retained within any proposal. If they have to be removed to accommodate the design, it is suggested that replacement plantings of this species occur within foreshore reserve areas to offset this loss.

Habitat assessment of the site revealed that the majority of the site offers little opportunity for native species other than those preferring open spaces or tolerant of modified areas. However, it was recognised that the aforementioned riparian vegetation had habitat value worth conserving, and that many of the remaining large trees on site support hollows of various sizes which could be potentially valuable to some guilds of native fauna.

The fauna survey undertaken revealed a fairly expectable suite of native fauna to be utilising the site. As was predicted by the habitat assessment, the species of note recorded on site all relate to the large hollow bearing trees present. These species were:

- East-coast Freetail-bat (*Mormopterus norfolkensis*). This is a threatened bat species that roosts in tree hollows, and consequently may be roosting on the site. As such, it is advised that hollow bearing trees be retained on site within the proposal to avoid potentially disrupting roost sites for this species. Little is known of the foraging requirements of this species, though given the open nature of much of the site, it is not foreseen that residential development would significantly diminish the quality or extent of suitable foraging habitat for this species in the locality.
- Squirrel Glider (*Petaurus norfolcensis*). This threatened species was not located during the fauna survey, but has been previously found caught on a barbed wire fence on the north-western boundary of the site. This species is known to be present in SRA areas to the west of the site. Protection of hollow bearing trees and habitat linkages afforded by contiguous riparian vegetation along the lake foreshore is recommended to minimise chances of deleterious effects upon this species if it is residing on site.

From evaluation of the habitat requirements for these species, and hence, important habitat features on the site, it is reiterated that the following attributes are potentially important:

- Mature trees bearing hollows.
- Riparian (lake edge) vegetation along the south-western foreshore providing connection off the site to proximate areas leading to the SRA to the west.

Other features that may be seen as having some additional conservation value include:

- All riparian vegetation on site.
- *Eucalyptus robusta* trees occurring on site.

The location of all of the above features are indicated on plans of the site which are designed to highlight potential ecological constraints that should be duly considered in the final design phase for any development ultimately proposed for the site. Also, tree retention in general is recommended where possible.

It should be noted that retaining these features would be a precautionary approach to greatly lessen any chance of a significant impact upon any threatened species resulting from development. It may still be possible to remove / modify any or all of these features and not have a significant effect, though such removal / modification would require appropriate scrutiny under the eight part test for potentially affected threatened species. This is particularly applicable to hollow bearing trees in this instance.

The site was also considered under the provisions of SEPP 44 – 'Koala Habitat Protection' and the Environment Protection and Biodiversity Conservation Act 1999. No constraints pertaining to these pieces of legislation were found to apply to the site.

CONTENTS

1.0 INTRODUCTION

It is proposed that various lots off Henry Street, Morriset Park be partially rezoned to accommodate residential development. This report is intended to indicate the likelihood of the proposed rezoning and subsequent development activity having a significant effect on threatened species, populations or ecological communities.

This report aims to recognise the relevant requirements of the Environmental Planning and Assessment 1979 (EP&A Act) as amended by the Environmental Planning and Assessment Amendment Act 1997 (EP&AA Act) and the Threatened Species Conservation Act 1995 (TSC Act). Assessment of the site under the requirements of State Environmental Planning Policy No. 44 (SEPP 44) – 'Koala Habitat Protection' is included. Consideration of the type of development proposed on this site has also been undertaken in relation to the Environment Protection and Biodiversity Conservation Act 1999 (EP&BC Act) (Commonwealth legislation).

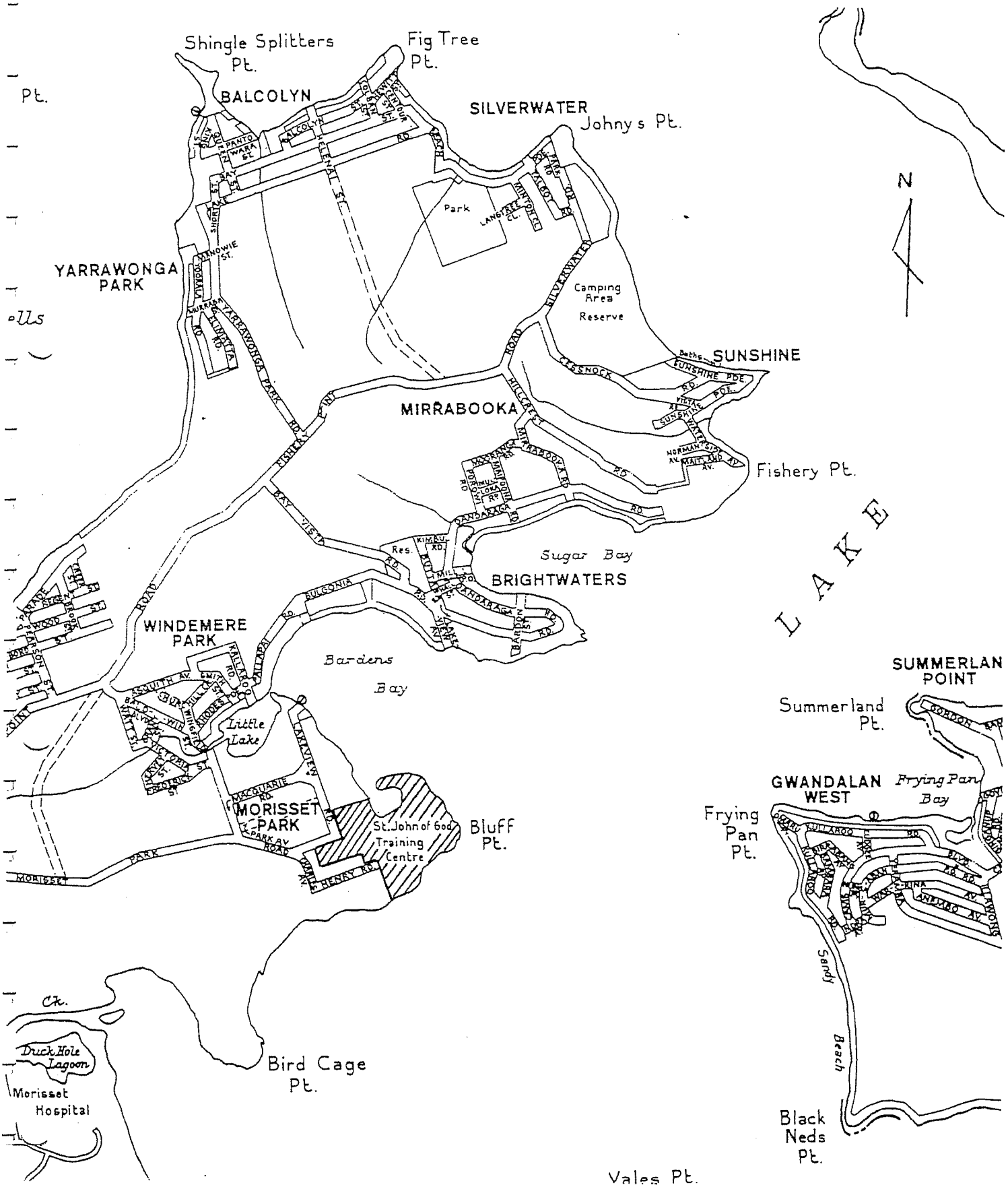
Consideration of these requirements at the rezoning stage will enable any ecological limiting factors to be identified, and duly considered in the design phase for any future DA so that the chances of a significant effect arising at that stage are minimised.

1.1 SITE PARTICULARS

- **Locality** – Morriset Park Peninsula, Lake Macquarie.
- **LGA** – Lake Macquarie.
- **Title(s)** – Lot 38 DP 755242, Lots 4-21 & 40-42 DP 5615, Lots 1-4 DP 7934.
- **Area** – approx. 21ha in total.
- **Zoning** – 5(a) – 'Special Uses' – St. John of God Training Centre, and 2(a) - Residential (western sector) as per the Lake Macquarie LEP 1984.
- **Boundaries** – Most of the site bounded by Lake Macquarie, other boundaries common with adjacent rural-residential properties and local roads.
- **Current Land Use** – St. John of God Training Centre buildings, associated facilities, open space, grazing, vacant lands.
- **Topography** – Generally gentle slopes away to the water on all sides from the central to southern plateau, which continues to rise off-site to the west. Southern portions of the site contain a steep drop-off to the water via a sandstone cliff face up to approx. 8m high.
- **Vegetation** – Largely cleared pasture, some areas supporting remnant woodland. Landscaped areas with exotics surrounding existing buildings. Some lakeside fringing riparian vegetation remains.
- **Other Features** – Several small constructed farm dams.

Figure 1 shows the locality of the site.

Figure 1 – Site Locality



1.2 DESCRIPTION OF PROPOSAL

This study has been prepared to provide baseline information for a partial rezoning proposal for the site. Whilst at this point in time there is no exact proposed zoning / development layout available, the conceptual use of the site is aiming at predominantly residential and associated infrastructure. Appropriate areas for Public Open Space, lake buffer setbacks and other community / environmental requirements are likely to be incorporated within the finalised layout. The extent and location of these differing components and landuses will be designed based on the findings and recommendations of this report, and opportunities / constraints studies being undertaken in a variety of other disciplines.

To provide initial planning direction, a conceptual layout of the proposal has been generated. This is presented herewith as **Figure 2.**

2.0 SCOPE OF THE STUDY

This study was designed to:

- identify as many plant species found on site as possible
- identify and map the vegetation communities
- assess the conservation status of the vegetation communities
- locate and map the occurrence of any threatened / regionally significant plant species and their habitat
- identify the various habitat types present
- assess the suitability of the habitat(s) present for native species in general
- assess the habitat(s) present against the specific requirements of threatened species known from the locality
- assess the habitat suitability of the site for Koalas as per the methods outlined in SEPP 44
- identify as many fauna species as possible that are utilising the site via application of targeted field survey techniques
- identify other fauna species, particularly threatened species, that may potentially utilise the site
- address the possibility of the site, or parts thereof, being significant for any threatened species, populations or ecological communities.
- provide appropriate recommendations on aspects of the proposal to enable a 'significant effect' to be avoided when the eight part test is ultimately undertaken for a finalised design.

This study has been structured on the guidelines laid down in the EP&A Act 1979, which requires consideration of the impact of the proposed development upon any protected (native) fauna but particularly on 'threatened' species (collective term for Schedule 1 – 'Endangered', and Schedule 2 – 'Vulnerable' species), Endangered Populations or Endangered Ecological Communities expected or occurring on the site.

The fieldwork was conducted under NSW National Parks and Wildlife Service Scientific Investigation Licence A2092, and under an Animal Research Authority (01/1142) issued by NSW Agriculture.

Whilst survey work has been undertaken wholly within the bounds of the site, consideration has been afforded to areas off the site to gain a wider appreciation of the context of the site.

3.0 METHODOLOGY

3.1 FLORA SURVEY

Vegetation was surveyed utilising a variety of methods, as outlined below.

Vegetation Mapping:

- Initial site inspection to ascertain the type and general extent of the community(s) present.
- Aerial Photograph Interpretation (API) to map the community(s) extent into definable map units.
- Confirmation of the community type(s) present (dominant species) via undertaking flora identification as described below.
- The conservation status of the derived vegetation communities was considered in light of the findings of the REMS Vegetation Mapping (NPWS, 2000).
- Consideration was given to the potential for the derived vegetation communities to constitute 'Endangered Ecological Communities' as listed within the TSC Act 1995.

Flora Identification:

- Identification of all vascular plant species encountered during fieldwork. Species were identified in the field, or appropriate samples taken for later examination if species identification was uncertain.
- The site was covered via application of the 'Random Meander Technique'. This involves walking in a random manner throughout the study site, visiting the full range of potential habitats and recording every plant seen (Cropper, 1993).
- Vegetation plots and transects were carried out (Appendix B) as per the requirements of the LMCC Flora and Fauna Guidelines (Forest Fauna Surveys *et al,* 1997).
- Targeted searches in areas of suitable habitat were undertaken for any threatened flora species previously reported in the locality.

A full list of vegetation species recorded during fieldwork is listed in Appendix A.

Any significant plants (i.e. threatened species, regionally significant species, significant hollow bearing trees etc.) were located via the use of a handheld Magellen 320 GPS and depicted on appropriate maps.

3.2 HABITAT SURVEY

From the results obtained in the vegetation survey phase, an assessment of the relative value of the habitat(s) present on site was undertaken. Whilst this assessment focused primarily on the identification of specific habitat types / resources that are known to be favoured by threatened species recorded from the region, the assessment also considered the potential value of the site (and surrounds) for all major guilds of native flora and fauna.

This assessment was based on the specific requirements of each species / guild in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements for fauna, and vegetation associations, topography, soil, light, hydrology and pollination mechanisms for flora species and assemblages.

3.3 FAUNA SURVEY

The fauna survey methodology adopted consisted of the production of an Expected Fauna Species List for the area (Appendix C), an assessment of the potential use of the site by Schedule 1 and 2 fauna species identified via literature and database searches, and confirmation and supplementation of the Expected Fauna Species List by observation and survey in the area as described below.

The requirements of the LMCC Flora and Fauna Survey Guidelines (Forest Fauna Surveys *et al,* 1997) were duly considered in the formulation of the methodologies outlined below.

3.3.1 TERRESTRIAL MAMMAL TRAPPING

Small mammals were targeted on the site via the use of Elliott Type 'A' traps (8x10x33cm). Fifteen (15) traps were employed, being in three separate traplines of five (5) traps. Given the paucity of groundcover on site due to the modified understorey present (largely cleared pasture), the traplines were placed to sample the only areas of the site considered likely to offer any viable habitat for small terrestrial mammals. The location of the traplines is depicted in **Figure 3.**

The traps were baited with a mixture of rolled oats and honey with a smear of peanut butter. The traps were checked early each morning, and where necessary, reset and rebaited. The traps were left out for four nights, giving a total of sixty (60) terrestrial trap nights.

No cage traps were set for larger native terrestrial mammals, as the site is not considered to offer any suitable habitat likely to be utilised by such species.

3.3.2 ARBOREAL MAMMAL TRAPPING

Arboreal mammals were targeted on the site via the use of Elliott Type 'B' traps (15x15.5x45cm). Ten (10) traps were placed on bracket mounted wooden supports attached to suitable trees throughout the site. Such trees were largely restricted to the southern and western portions of the site. Trees targeted were, where possible, those that had hollows, were flowering and/or had scratches on the bole. The location of the trap positions are depicted in **Figure 3.**

The traps were baited with a mixture of rolled oats and honey, with a smear of peanut butter and an aniseed ring (sugar coated sweet). Traps were also sprayed with a water and vanilla

essence mix to help mask the smell of humans. The traps were checked early each morning, and where necessary, reset and rebaited. The traps were left out for four nights, giving a total of forty (40) arboreal trap nights.

3.3.3 BAT CALL DETECTING

Bat echolocation calls were taped using an Anabat Detector within each of the habitat units across the site. Emphasis was placed on those areas deemed likely to provide potential hunting sites for bats, including flyways, ecotones, around well lit areas and over bodies of water. Given the accessibility of the site due to the largely cleared understorey, most parts of the site were visited during the mobile bat detecting survey, which was undertaken in conjunction with spotlighting. The location of the route followed is depicted on **Figure 3.**

Call recording was undertaken for 1.5 hours on site. The transformed calls were later analysed using an Anabat Zero Crossing Analysis Interface feeding into a computer and identified by comparison with sample bat calls supplied by the maunfacturer of the equipment and other sources.

3.3.4 AVIFAUNA SURVEY

The presence of avifauna on site was carried out via targeted diurnal and nocturnal surveys as well as incidental observations during all other phases of fieldwork.

For diurnal surveys, emphasis was placed on peak activity periods, i.e. dawn and dusk, to maximise chances of species encountered. Birds were identified by direct observation or by recognition of calls or distinctive features such as nests, feathers etc.

For nocturnal surveys, spotlighting attempted to identify any roosting birds, and similar methods were employed as per diurnal surveys. Additionally, pre-recorded calls of *Ninox strenua* (Powerful Owl), *N. connivens* (Barking Owl), *Tyto novaehollandiae* (Masked Owl), *T. tenebricosa* (Sooty Owl), and *T. capensis* (Grass Owl) were broadcast through an amplification system designed to project the sound for at least 1km under still night conditions. The calls were repeated in the four compass directions for five minutes from a central position, and replies were listened for for five minutes after broadcast, followed by short periods of spotlighting for owls that may have flown in following the calls.

The location of the broadcast position is shown on **Figure 3.**

3.3.5 HERPETOFAUNA SURVEY

Specific herpetofauna (frog and reptile) searches were carried out in each of the habitat units present. Both diurnal and nocturnal searches were made in areas of appropriate habitat. Such habitat included areas of thicker vegetation, in ground litter, near and under fallen timber, around piles of refuse, and wet / damp areas such as drainage lines, dams and areas of poor

infiltration capacity and / or periodic inundation.

Reptile searches were largely concentrated to the hottest part of the day (early afternoon). Frog searches were largely concentrated to nocturnal survey periods and/or periods of wet weather. Physical frog searches were augmented by call recognition. Any calls unable to be identified in the field were recorded for later comparison with commercially available recordings.

Opportunistic encounters during all other phases of fieldwork were also noted.

Specific attention was paid to the potential presence of *Crinia tinnula* (Wallum Froglet) on this site due to past records within 2km on the NPWS Database. As such, targeted searches were carried out in areas considered as offering potential habitat for this species.

3.3.6 SPOTLIGHTING AND STAGWATCHING

Spotlighting was undertaken for two (2) hours on site via the use of a 75 Watt hand-held spotlight, and where feasible, a 100 Watt car spotlight. This was undertaken within each of the habitat assemblages previously identified, with priority given to those areas that were deemed likely to contain nocturnal species, particularly arboreal and terrestrial mammals. The location of the route followed is depicted on **Figure 3.**

Stagwatching was also undertaken within the forested portion of the site at dusk. This involved identifying trees with potential nest hollows, and quietly observing cavity entries for emerging fauna. Given the large number of such trees on site, only a small proportion of such trees could be realistically covered in this manner. The stagwatching location is shown on **Figure 3.**

3.3.7 SECONDARY INDICATIONS AND INCIDENTAL OBSERVATIONS

Opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of resident fauna were noted. Searches were also conducted for whitewash, regurgitation pellets and prey remains from Owls, chewed *(Allo)Casuarina* cones from Black-Cockatoos, chewed fruit remains from frugivorous birds etc. Any scats unable to be positively identified in the field were collected for further evaluation, and scats of predator species containing fur / bones were sent for analysis if appropriate.

As previously noted, any other incidental observations of fauna were recorded during all phases of fieldwork.

3.4 SURVEY DATES, TIMES AND WEATHER CONDITIONS

Table 1: Survey Dates, Times & Weather Conditions

DATE	TIME	WEATHER CONDITIONS
14/6/01	1615 - 1650	Cool, windy, clear.
14/8/01	1200 - 1615 1745 - 1945	Warm, still. Fine, still.
15/8/01	0710 - 1015	Fine, early fog, becoming clear and warm.
16/8/01	0720 - 0825	Fine, warm.
17/8/01	0720 - 1045	Clear, cool, strong winds.
18/8/01	0715 - 1115	Fine, clear, cool, strong westerly winds.
24/8/01	0845 - 0900	Fine, clear, warm.
1/11/01	1245 - 0410	Fine, clear, hot.

4.0 RESULTS

4.1 FLORA SURVEY

A general description of the flora assemblages identified on site is given below. A full list of the flora species identified on site is included in Appendix A. Plot and transect data as per the LMCC Flora and Fauna Survey Guidelines (Forest Fauna Surveys *et al* 1997) is presented in Appendix B. **Figure 4** shows the relative distribution of the vegetation assemblages occurring on the site.

- (Note On Vegetation Map: A map of vegetation of any area seeks to describe the distribution of the plant species in that area by defining a number of vegetation units (assemblages or communities) which are relatively internally homogenous. Whilst such mapping is a convenient tool, it greatly oversimplifies the real situation. Plants rarely occur in well defined communities with distinct boundaries. Accordingly, vegetation units used for the accompanying map should be viewed as generalised plant species assemblages which gradually merge into each other. The assemblage boundaries shown on the map are indicative of their extent rather than being precise edges of communities.)

4.1.1 FLORA ASSEMBLAGES

For the purposes of this study, three (3) separate vegetation communities have been delineated on site, being:

- **Eucalypt Woodland**
- **Riparian Vegetation**
- **Open Pasture**

- **EUCALYPT WOODLAND**

Dominant Species:	*Eucalyptus tereticornis*	Forest Red Gum
	Eucalyptus floribunda	Rough-barked Apple
	Angophora costata	Smooth-barked Apple
	Eucalyptus haemastoma	Scribbly Gum

Understorey & Shrub Layers: Largely to wholly absent.

Herb Layer: Largely pasture. Mixture of native and introduced grasses & herbaceous weeds.

Comment: Mix of two remnant communities. *E. tereticornis / A. floribunda* community covers the south- central and eastern portions of the site. *A.costata / E.haemastoma* community located in the south-western portion and north-western portion. The north-western area also contains some specimens of *Eucalyptus robusta* (Swamp Mahogany), which may have once covered areas along drainage lines and flats on the site. Generally, the communities are only remnant trees with no understorey, shrub or intact native herb layers.

- **RIPARIAN VEGETATION**

Dominant Species:	*Eucalyptus tereticornis*	Forest Red Gum
	Eucalyptus floribunda	Rough-barked Apple
	Casuarina glauca	Swamp She-oak
	Avicennia marina var.*australasica*	Grey Mangrove
	Juncus kraussii	Sea Rush

Understorey:	Juvenile / Intermediate dominants	
Shrub Layers:	*Tetragonia tetragonioides*	New Zealand Spinach
	Juncus kraussii	Sea Rush
	Sarcocornia quinqueflora	Samphire
	Suaeda australis	Austral Seablite
	Sellieria radicans	
	Samolus repens	Creeping Brookweed
	Sporabilis virginicus	Sand Couch
	Zoysia macrantha	Coast Couch
	Apium prostratum var.*filiforme*	Sea Celery

Comment: Northern embayment fringed by a natural succession from the water's edge of Mangroves, Salt Marsh and ultimately Casuarina Forest. These three sub-communities of the riparian zone intergrade into each other, making sub-definition a difficult exercise. Vegetation from the northern point along the foreshore to a central point along the southern shoreline is largely the terminating intergrade of the prevailing *E. tereticornis / A. floribunda* community with the lakeside fringing *Casuarina glauca, Juncus kraussii* and associated species. A large portion of the southern shoreline contains little native vegetation of significance due to either past clearing and establishment of introduced plants, or due to the abrupt interface created by steep faced drop-offs of up to eight metres to the water. Vegetation is contiguous off-site to the west.

- **OPEN PASTURE**

Comment: This community is composed of a mixture of largely introduced grasses and herbaceous weeds, and contains no vegetation of any relative significance.

4.1.2 CONSERVATION STATUS OF VEGETATION COMMUNITIES

Examination of the REMS Vegetation Mapping (NPWS, 2000) shows that the site is considered to be cleared of native vegetation. However, aerial photograph interpretation and subsequent fieldwork has revealed that although the majority of the vegetation on site is cleared pasture or modified remnant vegetation, some small areas of native vegetation do remain on site.

These areas of native vegetation can be seen as being akin to the following REMS communities.

- **WOODLAND**

REMS MU #30 - Coastal Plains Smooth-barked Apple Woodland
REMS MU #38 - Redgum Rough-barked Apple Forest

The woodland community on site, whilst containing remnant mature trees indicating the likely past presence of these communities, has been modified to the extent that only the tree component remains. Juvenile trees are largely absent due to ongoing cattle grazing.

Both community types, and in particular the Redgum Rough-barked Apple Forest, have conservation significance when occurring as intact communities. However, in this instance the

vegetation modification that has occurred in the past due to landuse practices has eliminated most of the attributes, and hence values, of these communities.

- **RIPARIAN VEGETATION**

REMS MU #40 - Swamp Oak Rushland Forest
REMS MU #47 - Mangrove-Estuarine Complex
REMS MU #47a - Saltmarsh

Riparian Vegetation, whilst mapped as extending along the lake edge around the site, is mostly compose of linear remnant vegetation that has a modified understorey on the eastern and southern shorelines. The area on the northern shoreline of the site has less disturbed vegetation which extends further into the site, largely due to the relatively flat terrain.

This area contains portions of the above mentioned REMS communities in linear strips parallel to the shoreline, progressing from MU47 on the shoreline, to MU47a and finally to MU40 further back from the shoreline. All of these communities are considered of conservation significance, due to diminished representation, habitat value for aquatic species for their contribution to shoreline stability. Although disturbance by ongoing cattle intrusion is evident, the communities are still considered in a reasonable condition and could realistically recover well if cattle intrusion is eliminated.

Consideration was also given to the vegetation communities present constituting 'Endangered Ecological Communities' as listed within the TSC Act and as defined by the NSW Scientific Committee. Particular attention was paid to the two communities:

- Sydney Coastal Estuary Swamp Forest in the Sydney Basin Bioregion
- Sydney Coastal River-flat Forest in the Sydney Basin Bioregion

Neither community is present on site. The occurrence of a small number of specimens of *Eucalyptus robusta* may indicate that the former community was once present on parts of the site, but the vegetation modification is such that it is not possible that a vegetation assemblage that constitutes this community remains.

4.1.3 THREATENED / SIGNIFICANT FLORA SPECIES

No threatened flora species were found on the site during the flora survey, despite employment of the various methods outlined in Section 3.1. It is considered that the largely cleared and modified nature of the vegetation communities combined with cattle grazing activity would greatly limit any chances of such species occurring throughout the majority of the site.

It was recognised that some small fringe areas of the site (such as the *Casuarina glauca* dominated forest within the riparian strip) may offer some potential opportunity for some threatened / significant plants, though it is likely in most cases such areas will be retained intact within a foreshore reserve area.

As such, it is asserted that impacts on any threatened plants on this site are unlikely.

Further consideration of threatened plant species is given in Section 5.

*(It was noted that a specimen of Lilly Pilly is present within the landscaped gardens surrounding the St. John of God Centre. The species was unable to be positively identified, though it did appear consistent with the *Syzygium australe* grouping, which incorporates species such as *S. paniculatum* (Magenta Lilly Pilly), which is a threatened species. "Although rare, this species is commonly available (as a nursery plant)" (Wrigley & Fagg, 1998). Essentially, *S. paniculatum* is only considered significant if it is found growing naturally in its select habitat, being Littoral Rainforest.)

The Regionally Significant tree *Eucalyptus robusta* (Swamp Mahogany) was noted on the site. This species is considered significant as it is a winter flowering species that produces prolific nectar, which hence provides valuable forage resources for a number of bird and mammal species. It is also a prime Koala Feed Tree, and is indicative of Coastal Flat Areas which have been largely cleared in the past.

Eucalyptus robusta was noted as a single mature specimen in the southern central portion of the site, and also as a number of younger specimens in the north-western extent of the site. The retention of these trees is encouraged, or if they are required to be removed, then replacement plantings should be undertaken in areas such as the proposed foreshore reserve.

Further consideration of this species is given in Section 5.2.

4.2 HABITAT SURVEY

4.2.1 HABITAT DESCRIPTION AND DISTRIBUTION IN THE VICINITY

- **Terrestrial Mammals**

Little ground cover available over much of the site, aside from within riparian vegetation fringing the northern embayment. Suitable linkages to adjacent areas limited to small riparian connections. Probably only suitable for the most disturbance tolerant of terrestrial mammals.

- **Arboreal Mammals**

Suitable nest hollows present in many of the remaining trees. Species adaptable in foraging

may persist, though specialist feeders may be limited by minimal resources and linkages present. Koala feed trees present.

- **Bats**

Roosting habitat for tree hollow species present. Potential roosts may occur in some of the buildings on site. Little opportunity for foliage roosting bats, or for camp sites for mega bats. Site would offer suitable foraging habitat for several micro-bat species, and some seasonal foraging habitat for mega-bats.

- **Frogs**

Some habitat opportunity present, such as dams / gardens, largely for disturbance tolerant species. Habitat for specialist species largely absent or disturbed.

- **Reptiles**

Paucity of ground cover over the majority of the site would limit use by most reptile species. Some marginal opportunity for arboreal snakes etc. Prey species (particularly for snakes) unlikely to be bountiful.

- **Avifauna**

Trees offer seasonal / perennial foraging opportunities. Nesting potential, including hollows, present. Absence of understorey would deter many species. Open areas suitable for more common species. Dams etc. offer some common habitat opportunities. Waterbirds would favour areas immediately adjacent to the site, such as the northern embayment.

As with most sites, the habitat opportunities present for some species restrict / discourage use by many other species. Whilst the site has been largely cleared and / or modified to the detriment of many native species that would otherwise be expected to utilise similar forested habitat areas, the remaining presence of specific features / areas means the site (or parts thereof) does retain some habitat value. Features / areas such as large trees with hollows, riparian vegetation including Casuarina Forest, salt marsh and mangrove components, dams and a physical location on a terrestrial / estuarine interface all combine to contribute to a site containing some habitat value and opportunity for a variety of native species.