APPENDIX C
FLORA AND FAUNA SURVEY AND ASSESSMENT

OYSTER LEASE DREDGING, LEASE # 80 – 178,
WALLIS LAKE

PREPARED FOR:

TREVOR DENT

JULY 2006

GEOLYSE

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Report Title:	***Flora and Fauna Survey and Assessment***
Project:	**Oyster Lease Dredging, Lease # 80 – 178, Wallis Lake**
Client:	***Mr Trevor Dent***
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Geolyse Pty Ltd and the authors responsible for the preparation and compilation of this report declare that we do not have, nor expect to have a beneficial interest in the study area of this project and will not benefit from any of the recommendations outlined in this report.

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Introduction

1.1 BACKGROUND

Geolyse Pty Ltd has been commissioned by Mr. Trevor Dent to prepare a Flora and Fauna Survey and Assessment Report for the proposed dredging of an oyster lease and operation of a stockpile site.

It is proposed to re-establish the lease as a productive oyster growing area through the dredging of accumulated sands and fines. Ancillary to the dredging operation is the disposal of dredge spoil. It is proposed to pump the dredged material through a pressurised pipeline to a stockpile site and operate an extractive industry (*ie.* sell the sand to market in accordance with demand).

It is understood that this Flora and Fauna Survey and Assessment and Section 5A Assessment would be used as supporting documentation to the Development Application for the project. The Flora and Fauna Survey and Assessment Report should be read in conjunction with the main Environmental Assessment Report and the Section 5A Assessment.

1.2 SITE LOCATION

The project site can be divided into three distinct areas – the dredge area; the pipeline route; and the stockpile site. The location of the proposed development and the various components are shown in **Figures 1.1 and 1.2**.

1.2.1 DREDGE AREA

The dredge area is confined to the area of waterway covered by Oyster Lease 80 – 178 and is located approximately 3.3 km upstream of the Wallis Lake entrance, in the vicinity of where the Wallamba River enters the main body of Wallis Lake. The lease area is in the region of the estuary that is dominated by the flood-tide delta. The lease covers an area of approximately 8.5 ha, however, the area of dredging will cover approximately 8 ha of the lease area. It is proposed to dredge the area systematically, following a grid pattern that will direct the dredge operation from north to south across the lease area. The area of land occupied by the oyster lease is Crown land.

1.2.2 PIPELINE ROUTE

A pressurised pipeline will be used to transport dredged materials from the lease area to the stockpile site. The pipeline route will traverse the bed of the Wallamba River and privately-owned land to the stockpile site. On land, the pipeline route will traverse Lots 59, 101, and Lots 123 – 125 DP753207. The length of pipeline route is approximately 3.8 km (1.5 km Wallamba River, 2.3 km on land).

1.2.3 STOCKPILE SITE

The land that is proposed for the stockpile site is located approximately 2 km north of the oyster lease and 2 km north-west of the Tuncurry Central Business District. The site is predominantly cleared and currently used for low intensity cattle grazing.

The stockpile operations will be over Lots 59 and 101 DP 753207 and Lot 12 DP 816473. The stockpile site has frontage to a sealed road with direct access to Grey Gum Road which runs through the Tuncurry industrial area to The Lakes Way. The stockpile site working area will occupy an area of approximately 6 ha, which includes the settling ponds, stockpiles and general working area.

The northern boundary of the site is adjacent to privately-owned, partially-cleared undeveloped land, while the southern and western boundaries adjoin privately-owned vegetated lands. These lands are under one ownership. To the east, the site boundary adjoins a residential estate. The south eastern corner of the site has a frontage to Grey Gum Road in the Tuncurry industrial estate, opposite the entrance to Great Lakes Council works depot.

The dredged materials will be transported to a land-based depot where they will be pumped into a series of settling ponds and undergo separation of fines and sands. Sand material will be extracted from the settling ponds and stockpiled. Fines accumulated in the settling ponds will be extracted following completion of the operation. Stockpiled materials will then be available for sale to market, primarily as construction fill material.

1.3 PROJECT DESCRIPTION

A detailed description of the proposed project is provided in Section 2 of the main **Volume 1** Environmental Assessment Report. A précis of the proposal is provided here.

The project will occur in three stages, which will operate simultaneously.

1.3.1 STAGE ONE – DREDGING

This involves the removal of material from the bed of the oyster lease. Approximately 300 m^3/hr of dredge slurry will be removed. Based on this rate, the expected duration of the dredging operation is approximately 7 months (assuming continuous dredging). Delays arising from flood events, maintenance of equipment and extraction difficulties may extend this timeframe.

The dredged material will be pumped in a slurry form (approximately 33 % solids) via a new, flexible, 200 mm poly pipe (rated to 630 kPa, around double the booster pump output), approximately 3.8 km to the onshore treatment facility, located 2 km north of the lease area. Given this distance, four booster pumps will be required to transport the material form the dredge site to the settling ponds. Booster pumps will be located at approximately 800 – 900 m intervals along the pipe. One booster pump will be located on the Wallamba River, while the other three pumps will be located on land.

Maximum dredge extents will be 2.0 m below present bed level, at a depth equivalent to surrounding channels and previously dredge areas of adjacent oyster leases. Based on this, it is estimated that between 120,000 – 160,000 m^3 of material will be removed from the lease area.

1.3.2 STAGE TWO– TRANSPORT OF SPOIL MATERIAL

The dredged material will be transported approximately 3.8 km to the onshore facility via a new, flexible, 200 mm diameter poly pipe (10 mm walls), rated to 630 kPa. The pipeline will be floated on the surface in the vicinity of the dredger (first 200 m of pipe) and then be submerged (to maintain river navigability) until it emerges at the foreshore approximately 1.5 km upstream. This section of pipe is in a shallow, non-trafficable area of the river. From here, it will traverse existing cleared ground in a SEPP 14 wetland (# 590) and along previously cleared boundary fence alignments for a distance of 2.3 km to the settling ponds. The pipe will be laid on the ground and 'snake' its way through existing open space areas within the wetland and along the cleared boundary fence alignments. A small section (approximately 100 m) will traverse a vegetated saltmarsh area.

Another section of the pipe will traverse a small (75 m) vegetated patch of the SEPP 14 wetland along an internal boundary alignment that has not been cleared. While it will not be necessary to clear vegetation to lay the pipe in this area (the pipe will be fed through in one continuous section – no joins), the pipe will be inspected on foot periodically (every 4 weeks).

The pipeline will be assembled on shore and pulled through the wetland in 100 m sections using a winch and joined on site, with sections connected by 50 mm thick metal flanges. The pipeline and flange joins will be inspected regularly to check for the potential for pipe and join failure. Failure of the pipe, however, is considered extremely unlikely, given that the pipe will be new and rated to twice the pressure output of the booster pumps.

1.3.3 STAGE THREE– ONSHORE HANDLING OF SPOIL MATERIAL

Separation of Fines, Settlement and Dewatering

When it reaches the stockpile site, the slurry will be pumped into a series of settling ponds, where the coarse fraction will settle out quickly. The suspended fines (or supernatant) will be diverted into a series of separate fines sediment basins. Once settled, the excess waters will be returned to the Wallamba River via a return pipeline, after satisfying appropriate turbidity and pH requirements stipulated by the consent conditions. The dewatered sands and silts will then be stockpiled and sold to market on-demand.

Discharge of Return Waters

Following dewatering of the sediment and passage through various sediment management ponds, water would be returned to the Wallamba River via a pipeline adjacent to the incoming slurry pipe. The pipe would deviate directly to the Wallamba River at about the halfway point, to reduce pipe length and return times.

Stockpiling and sale of sand to market

Following the separation of fines and dewatering, the remaining material will be stockpiled and undergo further dewatering, when the dried sand and fines material will then be ready for sale to market. Front end loaders, excavators and trucks will be the principle source of machinery for moving and loading sand for hauling to market in accordance with demand.

The land proposed for the stockpile site and yard is currently used for low intensity cattle grazing. It is anticipated that an area of approximately 6 ha will be required for the on-land operation, which will include:

- Three settling ponds;
- Stockpile areas;
- Site office/staff facilities; and
- Machinery/equipment sheds.

Vegetation Clearing

The proposed construction of the settling ponds will require the removal of some regrowth vegetation on the site. The impacts of the removal of this vegetation are assessed in detail in this report. The clearing operations would be undertaken using either a bulldozer or an excavator. This clearing would be limited to the area required for the settling ponds.

Revegetation/rehabilitation

As the majority of the site is cleared at present and very minimal clearing is required, it is not proposed to revegetate any of the site following decommissioning (apart from re-sowing with pasture grasses). The areas to be cleared are of little to no habitat value, comprising young regrowth and isolated paddock trees.

The small section (75 m) of uncleared SEPP 14 that is traversed by the pipelines will be inspected to determine whether any revegetation would be required following decommissioning of the pipelines.

1.4 GEOLOGY AND TOPOGRAPHY

The ground surface of the lot on which it is proposed to operate the stockpile it relatively flat, which is typical of an area of Holocene-age beach ridge deposits (DMR, 1991). Elevation varies between 1 – 2 m AHD. The ground surface has been extensively modified, having been ploughed and sown with pasture grasses since the area was first settled and used as a dairy 80 – 90 years ago.

The site is underlain by Holocene beach and foredune sands, with the lower elevation western extents draped by a thin layer of organics and very fine intertidal (fluvially-derived) silts and muds (DMR, 1991). Natural soils on the site are classified as Podzolic, typical of a coastal dune environment. The area of Lot 59 proposed for use in the stockpile operations has been filled previously (15 years ago) with reworked dune sands excavated from the adjoining residential subdivision to the east of the site.

This area is up to 1.6 m above natural ground surface elevations. Tree cover in this area is sporadic, with trees having been left in place as the site ground levels were raised.

The area of the pipeline route from where it makes landfall to the lower extents of Lot 101 is underlain by intertidal estuarine deposits overlain by back barrier dune sands.

The lower extents of the subject site (pipeline route) are situated below Council's 1:100 year flood level of approximately 2.44 m AHD.

1.5 OBJECTIVES OF THE REPORT

The objectives of the Flora and Fauna Survey and Assessment Report are to:

- Determine native vegetation communities and flora across the subject site and immediate surrounds;
- Determine Threatened flora and fauna species and their habitats as well as Endangered Ecological Communities known or likely to occur within the subject site and immediate surrounds;
- Assess the direct and indirect impacts on protected and Threatened flora and fauna as a result of the proposed subdivision; and
- Recommend measures required to mitigate against potential adverse impacts on flora and fauna as a result of the proposed subdivision.

Issues surrounding aquatic ecology will be dealt with in a separate report. This report is restricted to assessing the impacts on the pipeline route and stockpile site.

1.6 STRUCTURE OF THE REPORT

The report has been structured to provide information consistent with requirements of the *Environmental Planning and Assessment Act 1979,* the *Threatened Species Conservation Act 1995* and the *Environmental Protection and Biodiversity Conservation Act 1999.* The report is structured as follows:

Section 2– Describes the desktop and survey methodologies undertaken for the project;

Section 3 – Details the results of the desktop and field survey work;

Section 4 – Identifies potential impacts of the proposed development on flora and fauna and summarises the results of Section 5A Assessments under the *EP&A Act 1979*;

Section 5 – Highlights measures to mitigate against predicted adverse impacts on flora and fauna and their habitats from the proposed project; and

Section 6 – Provides a conclusion to the report.

Study Methodology

2.1 DESKTOP REVIEW

A literature review was undertaken to determine previous records of flora and fauna species and Endangered Ecological Communities (EECs) listed under the NSW *Threatened Species Conservation Act* 1995 (*TSC Act*) previously recorded and known to occur in the locality of the study area and Great Lakes LGA. Sources of information that were drawn upon for the present study included:

- Cumberland Ecology (2006) *Proposed Aged Residential Housing, Lot 192 DP 1037212, Chapmans Road, Tuncurry – Species Impact Statement*;
- Department of Environment and Conservation (2005) *Darawank Nature Reserve – Fire Management Strategy*;
- EPBC Act 1999 online database search for Matters of Environmental Significance (http://www.deh.gov.au/erin/ert/epbc/index.html);
- Geolyse (2005*)* SEPP 44 Assessment for Proposed Aged Residential Housing. Lot 192 DP 1037212, Chapmans Road, Tuncurry
- Geolyse (2006*) Flora Survey of lands surrounding Darawank Nature Reserve*, Hallidays Point. Report being prepared for Mid Coast Water;
- Great Lakes Council (2002). Draft Forster/Tuncurry Conservation & Development Strategy. Great Lakes Council;
- Great Lakes Council (2004). Wallis Lake Waterbird Study. Great Lakes Council;
- Griffith, S.J. et al (2000) *Vegetation and flora of Booti Booti National Park and Yahoo Nature Reserve,* in Cunninghamia 6(3) 2000;
- Idyll Spaces Consultants (undated). *Vegetation Study – Banksia Gardens, Tuncurry* In Chapman Road and North Tuncurry LES – Volume 2 (2003);
- Kendall & Kendall, (2000). Fauna Survey for Draft Local Environmental Study "Banksia Gardens" Tuncurry. Kendall & Kendall Ecological Services Pty Ltd.
- Lawler, W., (1996). Guidelines for Management of Migratory Shorebirds Habitat in Southern East Coast Estuaries, Australia; and
- NPWS, (2006). DEC Atlas of NSW Wildlife (10 km radius search; March 2006).

2.2 SURVEY GUIDELINES

Desktop and field survey methodologies employed on the subject site were designed to inventory native taxa and vegetative communities and to target Threatened taxa potentially occurring within the proposed development area and adjoining habitats. The flora survey methodologies employed were generally consistent with the Draft DEC (2004) Threatened Biodiversity Survey and Assessment Guidelines.

The fauna survey methodologies employed however, varied from the guidelines as they were tailored to target the Threatened species potentially impacted by the proposed development. As only a small number of mature trees will be removed and no clearing will be undertaken in the undisturbed Swamp Sclerophyll communities it was considered that no live trapping methods were required. The other survey methods employed were undertaken generally in accordance with guidelines.

2.3 FLORA

2.3.1 AERIAL PHOTO INTERPRETATION

Preliminary stratification of the site vegetation into plant community polygons (photo types) was undertaken through Aerial Photo Interpretation (API) by reference to such diagnostic features such as colour, texture, crown architecture and aspect. API was undertaken using 1:10000 scale colour photography flown for Great Lakes Council.

2.3.2 BOTANICAL SURVEY

A plot based botanical survey was undertaken to inventory vascular taxa within the study area in March/April 2006. A total of twelve (12), 400 m^2 plots were sampled within the vegetation communities initially mapped from the API process. A minimum of one replicate plot was sampled within each vegetation type to account for structural and floristic variances with the exception of the Mangrove Woodland. All vascular taxa within and overhanging the plots were recorded on DEC field data sheets (used for CRA/RFA study) and assigned to one of six foliage cover classes (per Walker and Hopkins 1990) along with other bio-physiographic attributes such as vegetative structure, geology, soils, slope, aspect, morpho-terrain, location, time since last fire event and forms of disturbance other than fire.

The structural classification used for the community description follows Walker and Hopkins (1990). Subformation names for vegetation types follows the classification proposed by Beadle and Costin (1952). The subformation categories of Floyd (1990) are used for rainforests. Botanical nomenclature follows Harden (1st ed.1990-1993, 2nd ed. 2000, 2002), recent prescriptions of the NSW National Herbarium in botanical journals, the *PlantNet* and internationally recognised MOBOT Angiosperm Phylogeny websites. Assessment of the conservation status of the vegetation communities recorded on the site follows Griffith *et al.,* (2000; 2003), Griffith and Wilson (1996), Myerscough and Carolin (1986), undated NRAC data as well as Preliminary and Final Scientific Committee Determinations listed under the NSW *Threatened Species Conservation Act* 1995 (*TSC Act*).

The location of the twelve survey plots were positioned using a hand held Garmin GPS unit and are shown in **Figure 2.1.**

A floristic list was compiled for the study using the Microsoft Access Database program and is provided as **Appendix C1**.

2.3.3 VEGETATION MAPPING

Preliminary photo type boundaries, which are analogous to vegetation communities, were hand drawn onto 1:25 000 topographic map bases and were refined during and subsequent to the conduct of field surveys. Hand drawn base maps were subsequently digitised onto digital air photos using Corel Draw.

2.4 FAUNA

Field survey methodologies employed in the site were designed to target the Threatened species potentially occurring within the proposed development area and adjoining habitats. The location of the fauna survey sites is provided in **Figure 2.2.** A summary of the weather conditions experienced during the survey periods is provided in **Table 2.1.**

Table 2.1 - Weather Summary During the Surveys

Survey Type	Dates	Moon Phase	Min Temp °C	Max Temp °C	Wind at time of Survey	Daily Rainfall (mm)	Cloud Cover
Hair Trap Surveys	23/02/2006	¼ moon waning	19.5	28.2	Light	0	-
	24/02/2006		19.2	28.0	Light to Moderate	3.2	-
	25/02/2006		17.5	27.4	Light to Moderate	0	-
	26/02/2006		17.6	27.0	Light to Moderate	0	-
	27/02/2006		17.0	25.5	Light	3.6	-
	28/02/2006		19.5	25.0	Light	90	-
	01/03/2006	New Moon	19.5	26.5	Light	19	-
	02/03/2006		19.0	26.0	Light	38.6	-
	03/03/2006		22.0	25.5	Light	3.4	-
	04/03/2006		21.0	26.0	Moderate	1	-
	05/03/2006		21.5	26.0	Moderate	0	-
	06/03/2006		18.5	27.0	Light	0	-
	07/03/2006	¼ moon waxing	19.5	28.0	Light	0	-
	08/03/2006		22.0	26.0	Light	0	-
Anabat Surveys	14/03/2006	Full moon	19.5	28.5	Calm to Light	0	25 %
	30/03/2006	New	17.7	25.5	Calm to Light	0	50 %
	20/04/2006	¼ moon waning	18.0	26.0	Calm to Light	2.2	25 %
	21/04/2006	¼ moon waning	14.5	23.0	Calm to Light	3.2	25 %
Amphibian surveys	14/03/2006 (night)	Full moon	19.5	28.5	Calm to Light	0	25 %
		New	17.7	25.5	Calm to Light	0	50 %
	30/03/2006 (night)	¼ moon waning	18.0	26.0	Calm to Light	2.2, 0 during surveys	25 %
		¼ moon waxing	6.0	22.5	Calm to Moderate	0	-
	20/04/2006 (night)						
	10/05/2006						
Call Playback Surveys	14/03/2006	Full moon	19.5	28.5	Calm to Light	0	25 %
	30/03/2006	New	17.7	25.5	Calm to Light	0	50 %

Table 2.1 - Weather Summary During the Surveys

Survey Type	Dates	Moon Phase	Min Temp °C	Max Temp °C	Wind at time of Survey	Daily Rainfall (mm)	Cloud Cover
	20/04/2006 21/04/2006	¼ moon waning ¼ moon waning	18.0 14.5	26.0 23.0	Calm to Light Calm to Light	2.2, 0 during surveys 3.2, 0 during surveys	25 % 0 %
Avifauna Surveys	23/11/2005 23/02/2006 14/03/2006 (night) 7/4/2006	¼ moon waning ¼ moon waning Full Moon ¼ moon waxing	18.5 19.5 19.5 16.5	22.0 28.2 28.5 24.0	Light to Moderate Light Calm to Light Light	0.4 0 0 0	- - 25 % -
Spotlighting Surveys	14/03/2006 30/03/2006 20/04/2006	Full moon New ¼ moon waning	19.5 17.7 18.0	28.5 25.5 26.0	Calm to Light Calm to Light Calm to Light	0 0 2.2, 0 during surveys	25 % 50 % 25 %
Habitat assessment	23/02/2006 10/03/2006 10/05/2006	¼ moon waning ¼ moon waxing ¼ moon waxing	19.5 19.0 6.0	28.2 28.5 22.5	Light Calm to Moderate Light to Moderate	0 0 0	- - -
Fauna Transects	10/03/2006	¼ moon waxing	19.0	28.5	Calm to Moderate	0	-
Potential Koala Habitat Quadrats	10/03/2006	¼ moon waxing	19.0	28.5	Calm to Moderate	0	-
Koala Scat Searches	10/03/2006	¼ moon waxing	19.0	28.5	Calm to Moderate	0	-

2.4.1 SMALL MAMMAL TRAPPING

Hair Traps

Three (3) lines of 10 large hair traps spaced approximately 15 – 20 m apart were set on the ground for a period of 13 nights, giving a total of 130 large ground hair trap nights for each trap line (390 large ground hair trap nights for the entire site).

Three (3) lines of 10 large hair traps were attached to trees and spaced between approximately 10 to 25 m apart depending upon tree availability. These hair traps were also set for a period of 13 nights, giving a total of 130 large arboreal hair trap nights for each trap line (390 large arboreal hair trap nights for the entire site).

All hair samples collected were sent to a specialist consultant, Ms Barbara Triggs, (specialist analyst consultant) for identification.

Bait used

All hair traps were baited with a standard mixture of rolled oats, peanut butter, honey, and vanilla essence.

2.4.2 MICROCHIROPTERAN BAT SURVEYS

Anabat surveys

Microchiropteran Bat surveys were undertaken using two (2) Anabat II CF Storage ZCAIM systems for four (4) full nights. The Anabat units were located in likely flyways within the site, and set (call activated) at separate locations each night.

All recorded call sequences were sent to a specialist consultant, Dr Greg Richards for identification.

2.4.3 AMPHIBIAN SURVEYS

Amphibians were targeted during the spotlighting surveys, particularly around the stockpile site and edges of the swamp sclerophyll forest.

In addition, all species observed or heard calling incidentally during other surveys were recorded.

2.4.4 CALL PLAYBACK SURVEYS

Call playback surveys were undertaken at two sites within the study area. The call playbacks were undertaken on three (3) non-consecutive nights at each site in according to standard methods detailed below.

After an initial 5 minute listening period, calls were broadcasted for a period of 5 minutes, followed by a 5 minute listening period. After completion of the call playback surveys, the area was searched by spotlight for any species that approached the broadcast site without eliciting calls.

Species played were Powerful Owl (*Ninox strenua*), Barking Owl (*Ninox connivens*), Masked Owl (*Tyto novaehollandiae*), Grass Owl (*Tyto capensis*) and one arboreal species, the Squirrel Glider (*Petaurus norfolcensis*).

As rain was experienced in the days preceding the nocturnal surveys, the Wallum Froglet (and many other frog species) were calling upon the survey teams arrival at the site on at least two nights. As a result no call playbacks were required for the species.

2.4.5 AVIFAUNA SURVEYS

Although no specific avifauna surveys were undertaken, all species heard or observed during all site inspections and other survey types were recorded. This included the recording of all waders and shorebirds observed within the dredge area during the Aquatic Ecology assessments. Specific site visits were however undertaken to identify whether the salt marsh area was utilised by Waders and shorebirds as a high tide roost site. A total of three (3) inspections were undertaken in this area during periods of high tide between November 2005 and April 2005. These three diurnal inspections were supplemented by one nights spotlighting during March in the saltmarsh area which also coincided with high tide.

2.4.6 SPOTLIGHTING SURVEYS

Spotlighting surveys were undertaken over three non-consecutive nights by two personnel using 100-watt spotlights. The spotlighting surveys targeted arboreal and scansorial mammals, owl species and waders (refer **Section 2.4.5**) for a minimum of 60 minutes each night. In total approximately 12 person hours of spotlighting was undertaken within the study area during the surveys.

On one night a brief driving spotlighting transect was undertaken for approximately 15 minutes.

2.4.7 HABITAT ASSESSMENT

An assessment was undertaken to record site habitats that would be potentially utilised by locally occurring Threatened fauna. Features assessed included hollows, feed trees, rocky outcrops, aquatic habitats, groundcover nature and density, caves/drains or other structures suitable for roosting or denning purposes.

The habitat assessment also included specific Wallum Froglet (*Crinia tinnula*) habitat assessment within and adjoining the site.

2.4.8 FAUNA TRANSECT SURVEYS

Fauna transects searches were conducted through all habitat types occurring within and adjoining the site, targeting signs of fauna species including tracks, scats, nest sites and chewed *Allocasuarina* fruit. Species targeted during these surveys included the Glossy Black Cockatoo (*Calyptorhynchus lathami*), Square–tailed Kite (*Lophoictinia isura*), Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Koala (*Phascolarctos cinereus*), Squirrel Glider (*Petaurus norfolcensis*) and feral predators.

2.4.9 SEPP 44 ASSESSMENT

The objective of State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) is to encourage the conservation and management of habitat areas for Koalas to ensure their current distribution is maintained. A SEPP 44 assessment applies to any land located in an LGA that is listed in Schedule 1 of SEPP 44 and that is greater than 1 ha.

The site is greater than 1 ha, and is located in the Great Lakes LGA which is a listed LGA on Schedule 1 SEPP 44, and therefore a SEPP 44 assessment is required within the site. A SEPP 44 assessment involves the need for determination of *Potential* and *Core* Koala habitat within the subject site.

Potential Koala habitat is defined under SEPP 44 as “areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 % of the total number of trees in the upper or lower strata of the tree component.” **Core Koala Habitat** is defined by SEPP 44 as “an area of land with a

resident population of Koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historic records of a population."

The preparation of a **Koala Plan of Management** (KPoM) may be required as part of a proposed development if the SEPP 44 assessment determines that Core Koala habitat occurs on all or a portion of the subject site.

In accordance with SEPP 44, an assessment was undertaken to determine both the occurrence of Koala habitat and Koala activity levels within the site. A total of seven (7) quadrats (20 m x 20 m) were used to determine the occurrence of *Potential Koala habitat* within the study area. The tree species that comprised the upper and lower strata within each quadrat were documented and tallied. The percentage of each species within the upper and lower strata was then calculated to determine if at least 15 % of either strata level was comprised by feed trees listed under Schedule 2 of SEPP 44.

Specific Koala scat searches were undertaken within the site to evaluate the level of Koala activity. The scat searches were undertaken in general accordance with the Spot Assessment Technique as ascribed in Phillips, S. and Callaghan, J., (1995). The methodology involved searching the basal circumference of least 20 trees for Koala scats that are known to, or likely to be utilised by Koalas. Each tree was searched for two (2) to three (3) minutes, or until a Koala scat was found, whichever came first. A total of two (2) sample sites using this method were surveyed in the site. A total of 43 trees were searched for the occurrence of Koala scats around the base.

Results

3.1 DESKTOP REVIEW

The literature review identified the occurrence of a total of two (2) Threatened plant taxa, three (3) Endangered Ecological Communities (EECs) and 42 Threatened fauna species listed under the *TSC Act* and/or *EPBC Act* in the locality. In addition, a number of migratory shorebirds and wader species has been recorded in the locality (GLC, 2004).

The potential for occurrence of these Threatened Species, Endangered Ecological Communities and migratory species within the study area was investigated during the field investigations undertaken. The assessment of occurrence and potential for impact on these species and communities is detailed in Section 3.4

3.2 FLORA

3.2.1 VEGETATION COMMUNITIES

The botanical survey yielded a total of five (5) native vegetation communities supporting one hundred and seventeen (117) plant taxa from fifty six (56) families. A total of fifteen (15) exotics were recorded (12 % total).

The vegetation communities recorded within the study area represented three (3) TSC listed EECs, these being Coastal Floodplain Swamp Sclerophyll Forest, Coastal Floodplain Swamp Oak Forest and Coastal Saltmarsh. One recorded taxon, *Pultenaea blakelyi*, is considered to be locally/regionally significant due to its occurrence in the study area at its known northern limit of distribution in NSW. One recorded taxon, *Galium liratum*, is considered to be locally/regionally significant due to the paucity of records of this taxon in the north coast bioregion (I. Mamott *pers. obs*.).

No TSC listed taxa were recorded during the present study.

Summary descriptions of the vegetation communities recorded within the study area are provided below and in the vegetation map (**Figure 3.1**).

Vegetation Community No. 1

Broad leaved Paperbark (*Melaleuca quinquenervia*) – Swamp Mahogany (*Eucalyptus robusta*) Tall to Very Tall (Freshwater) Swamp Sclerophyll Forest.

This vegetation community was recorded to the west of the proposed stockpile site fringing a portion of the cleared dredge pipeline route in a low lying, open depression (broad swamp) on Quaternary sediments (estuarine alluvium/intertidal deposits). This community graded into a *Casuarina glauca* – *Melaleuca quinquenervia* swamp sclerophyll forest further to the west towards the Wallamba River as soil and groundwater salinity increased.

Griffith *et al.,* (2000) notes that this community is an example of a subtle shift in dominance from *Eucalyptus robusta* to *Melaleuca quinquenervia* over areas which are too small to separate at the mapping scale employed. It is expected that such shifts in dominance may be a response to changes in microtopography or drainage and that the two dominant canopy species often seem to co-occur (as they do on the site).

This community was also recorded along the southern perimeter of the proposed stockpile site.

Broad leaved Paperbark (*Melaleuca quinquenervia*) – Swamp Mahogany (*Eucalyptus robusta*) Swamp Sclerophyll Forest

Upper Stratum (up to 20 m height; projected foliage cover 40 – 70 %)

Eucalyptus robusta, Melaleuca quinquenervia, Livistona australis.

Mid Stratum (7 m height, projected foliage cover 20 %)

Melaleuca linariifolia, Callistemon salignus, Pultenea blakelyi

Lower stratum (1 m in height, projected foliage cover 60 – 80 %)

Gahnia clarkei, Blechnum indicum, Baloskion tetraphyllum subsp. meiostachyum, *Christella dentata, Calochlaena dubia, Pteridium esculentum, Histiopteris incisa, Baumea juncea, Baumea articulata, Baumea rubiginosa, Isachne globosa, Entolasia stricta, Entolasia marginata, Goodenia paniculata, Kennedia rubicunda, Commelina cyanea, Alternanthera denticulata, Stephania japonica var discolour, Viola hederacea, Blechnum camfieldii, Oplismenus imbecilis (*drier ecotype with wet soil)

*Carex appressa, Eleocharis equisitena, Alocasia brisbanensis (*wet ecotype – areas supporting deep permanent standing water*)*

Equivalent Vegetation Types

- Considered to be a composite of Forest Type 30 Swamp Mahogany and Forest Type 31 Paperbark (Forestry Commission NSW 1989);
- North Coast Vegetation Mapping Project Map Code 4098 *Eucalyptus robusta – Melaleuca quinquenervia* Swamp Sclerophyll Woodland/Forest (Griffith and Wilson 1996), considered a composite of Map Codes 4002 and 4003.

Extent of Disturbance

This community was recorded in a relatively undisturbed condition throughout its extent within the study area along the southern fringe of the proposed stockpile site. Some evidence of soil compaction and stock grazing was evident in these areas.

Highly modified areas of this community were recorded within and to the west and north of the proposed stockpile site. These areas essentially comprised the following four disturbance ecotypes of this community:

1. A significantly thinned upper stratum and partially slashed lower and mid strata (Woodland/Open Woodland);
2. An almost completely cleared section supporting only a regenerating lower stratum (Pasture Grassland – Sedgeland) with a small number of scattered juvenile canopy species and saplings;
3. A juvenile Low Woodland supporting a regenerating upper stratum of canopy saplings and juveniles to 4 metres in height with a regenerating lower stratum of sedges, grasses and ferns to 1 metre in height. This ecotype also contained a dense patch of weeds (mostly exotics) in one section of the Low Woodland; and
4. An Open Woodland with an exotic pasture grass lower stratum on imported fill material to the north of the proposed stockpile site.

Disturbance ecotypes 1,2 and 4 appear to be subject to continued and repeated stock grazing and slashing activity. Disturbance ecotype no. 3 has been fenced from grazing stock.

The extent of the four disturbance ecotypes are shown in the vegetation map produced for the study area (**Figure 3.1**).

Bioregional Conservation Status

Given that this community occurs on (formerly) intertidal deposits, it is considered to be representative of the Coastal Floodplain Swamp Sclerophyll Forest Endangered Ecological Community (EEC) listing under the NSW *Threatened Species Conservation Act* 1995 (*TSC Act*).

This composite swamp sclerophyll community is reserved locally within the bounds of the SEPP 14 Wetland (# 590) at Tuncurry and within Booti Booti NP (Griffith *et al.,* 2000; I. Mamott pers. obs.). The extant area of this community within the SEPP 14 wetland is unknown. The extant area of this community within Booti Booti NP is approximately 28 hectares for both its floodplain and sandplain occurrences (Griffith *et al*., 2000).

A similar composite swamp sclerophyll forest community on sandplain is reserved in many of the north coast bioregion conservation reserves on the large coastal sandmasses, including Broadwater NP, Bundjalung NP, Yuraygir NP, Hat Head NP, Myall Lakes NP, Moonee Beach NR, Limeburners Creek NR and Lake Innes NR (I. Mamott *pers. obs.;* Griffith *et al*., 2000; Myerscough and Carolin, 1986).

Vegetation Community No. 2

Broad leaved Paperbark (*Melaleuca quinquenervia*) – Swamp Oak (*Casuarina glauca*) Tall to Very Tall Swamp Sclerophyll Forest.

This vegetation community was recorded fringing the majority of the proposed dredge pipeline route between the proposed stockpile site westward to the Tuncurry Caravan Park. The community was recorded on Holocene (formerly) intertidal sediments associated with flats of Wallis Lake estuary where soils are partially saline or sub-saline. This community graded into a *Eucalyptus robusta* – *Melaleuca quinquenervia* swamp sclerophyll forest to the east towards the proposed stockpile site as soil and groundwater salinity decreased. The community also graded downslope into Saltmarsh Complex (Chenopod Shrubland/Tussock Grassland) on the tidal flats of the estuary and into *Casuarina glauca* Swamp Oak Forest where relatively higher soil and groundwater salinity levels precluded the presence of *Melaleuca quinquenervia*.

Griffith *et al.,* (2000) notes that this community is an example of a subtle shift in dominance from *Casuarina glauca* to *Melaleuca quinquenervia* over areas which are too small to separate at the mapping scale employed. It is expected that such shifts in dominance may be a response to changes in microtopography or hydrology and that the two dominant canopy species often seem to co-occur (as they do on the site).

Broad leaved Paperbark (*Melaleuca quinquenervia*) – Swamp Oak (*Casuarina glauca*) Tall to Very Tall Swamp Sclerophyll Forest.

Upper Stratum (up to 20 m height; projected foliage cover 40 – 70 %)

Casuarina glauca, Melaleuca quinquenervia, Livistona australis with *Eucalyptus robusta* (minor associate < 10 % cover).

Mid Stratum (6-8 m height, projected foliage cover 20 %)

Melaleuca linariifolia, Melaleuca styphelioides, Callistemon salignus

Lower stratum (1 m in height, projected foliage cover 60 – 100 %)

Gahnia clarkei, Blechnum indicum, Calochlaena dubia, Histiopteris incisa, Christella dentata, Baumea articulata, Baumea juncea, Entolasia marginata, Phragmites australis, Viola hederacea, Alternanthera denticulata, Bacopa monnieri (drier ecotype with wet soils)

Carex appressa, Eleocharis equesitina (wet ecotype - permanent deep standing water)

Epiphytes

Platycerium bifurcatum

Equivalent Vegetation Types

- Considered to be a composite of Forest Type 32 Swamp Oak and Forest Type 31 Paperbark (Forestry Commission NSW 1989);
- North Coast Vegetation Mapping Project Map Code 4099 *Casuarina glauca – Melaleuca quinquenervia* Swamp Sclerophyll Woodland/Forest (Griffith and Wilson, 1996), considered a composite of Map Codes 4005 and 4003.

Extent of Disturbance

This community was recorded in an undisturbed condition throughout the majority of its extent within the study area. One section of study area along the southern boundary of the Lakeside Caravan Park supported an 'Open Woodland' disturbance ecotype (2a) of this community with a significantly thinned upper stratum and heavily slashed mid and lower strata.

Bioregional Conservation Status

This community is considered to be a composite of two TSC-listed EECs, these being Coastal Floodplain Swamp Oak Forest and Coastal Floodplain Swamp Sclerophyll Forest and thus assumes State significance. This community also supports some elements of Lowland Floodplain Rainforest (*Archontophoenix – Livistona* suballiance of Floyd 1990) to the east of the Tuncurry Lakeside Caravan Park boundary fenceline.

This composite Swamp Sclerophyll Forest community is reserved locally within the bounds of the SEPP 14 Wetland (# 590) at Tuncurry and within Booti Booti NP and Yahoo NR (Griffith *et al*., 2000; I Mamott, *pers. obs*.). The extant area of this community within the SEPP 14 wetland is unknown. The extant area of this community within Booti Booti NP and Yahoo NR is approximately 18 hectares for both its floodplain and limited sedimentary bedrock occurrences (Griffith *et al*., 2000). Many of the unreserved stands of this composite community are protected in SEPP 14 Wetlands in the North Coast Bioregion (I Mamott, *pers. obs*.).

This composite swamp sclerophyll forest community is reserved in many of the north coast bioregion conservation reserves which sample vegetation on Quaternary sediments, including Bundjalung NP, Yuraygir NP, Hat Head NP, Myall Lakes NP, Moonee Beach NR, Limeburners Creek NR and Lake Innes NR (I Mamott, *pers. obs*.; Griffith *et al*., 2000; Myerscough and Carolin 1986). It is noted, however, that floodplain occurrences of this composite community have been largely cleared (I. Mamott *pers. obs.;* Griffith *et al*., 2000; Adam *et al*., 1985).

This community supported a small population of a locally/regionally significant herb, *Galium liratum*.

Vegetation Community No. 3

Swamp Oak (*Casuarina glauca*) Tall to Very Tall Swamp Sclerophyll Forest.

This vegetation community was recorded along the western side of the proposed dredge pipeline route on muddy estuarine sediments associated with flats of Wallis Lake estuary where soils are saline or sub-saline. This community graded upslope into a *Casuarina glauca – Melaleuca quinquenervia* Swamp Sclerophyll Forest further away from the estuary flats under less saline conditions. The community also graded downslope into Saltmarsh Complex (Chenopod Shrubland/Tussock Grassland/Rushland) on the tidal flats of the estuary (often forming a landward fringe to saltmarsh communities).

Swamp Oak (*Casuarina glauca*) Tall to Very Tall Swamp Sclerophyll Forest

Upper Stratum (up to 15 m height; projected foliage cover 30 – 50 %)

Casuarina glauca

Mid Stratum (6-8 m height, projected foliage cover 20 – 30 %)

Melaleuca styphelioides, Livistona australis, Myoporum acuminatumh

Lower stratum (1 m in height, projected foliage cover 60 – 100 %)

Entolasia marginata, Eustrephus latifolius, Isachne globosa, Viola hederacea, Cissus opaca, Parsonsia straminea, Lantana camara, Protasparagus aethiopicus**

Epiphytes

Platycerium bifurcatum

Equivalent Vegetation Types

- Forest Type 32 Swamp Oak (Forestry Commission NSW, 1989);
- North Coast Vegetation Mapping Project Map Code 4005 *Casuarina glauca* Swamp Sclerophyll Woodland/Forest (Griffith and Wilson, 1996).

Extent of Disturbance

The lower stratum of this community was moderately to heavily invaded by woody and herbaceous weeds in places (*eg*. *Lantana camara* and *Protasparagus aethiopicus*).

Bioregional Conservation Status

This community is considered to be representative of the EEC Coastal Floodplain Swamp Oak Forest.

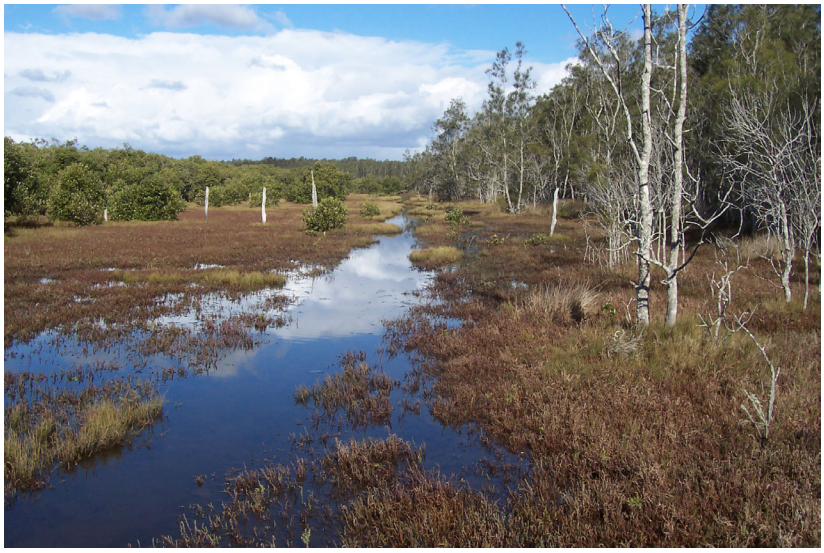
This swamp sclerophyll community is reserved locally within the bounds of the SEPP 14 Wetland (# 590) at Tuncurry and within Booti Booti NP and Yahoo NR (Griffith *et al*., 2000; I Mamott, *pers. obs*.). The extant area of this community within the SEPP 14 wetland is unknown. The extant area of this community within Booti Booti NP and Yahoo NR is approximately 46 hectares for both its floodplain and limited sedimentary bedrock occurrences (Griffith *et al*., 2000). Many of the unreserved stands of this composite community are protected in SEPP 14 Wetlands in the North Coast Bioregion (I Mamott, *pers. obs*.).

This composite swamp sclerophyll forest community is reserved in many of the north coast bioregion conservation reserves which sample vegetation on Quaternary sediments, including Bundjalung NP, Yuraygir NP, Hat Head NP, Myall Lakes NP, Moonee Beach NR, Limeburners Creek NR and Lake Innes NR and Khappinghat NP (I. Mamott pers. obs.; Griffith *et al*., 2000; Myerscough and Carolin 1986). It is noted, however, that floodplain occurrences of this composite community have been largely cleared (I Mamott, *pers. obs*.; Griffith *et al*., 2000; Adam *et al*., 1985).

Vegetation Community No. 4

Saltmarsh Complex (comprising *Sarcocornia quinqueflora subsp. quinqueflora – Sporobolus virginicus* Chenopod Shrubland/Tussock Grassland; *Juncus kraussii subsp. australiensis* Rushland)

This vegetation community was recorded along the proposed dredge pipeline route on muddy estuarine sediments associated with the mid to upper tidal flats of Wallis Lake estuary. This community complex graded upslope into a *Casuarina glauca* Swamp Sclerophyll Forest and downslope into a Mangrove Woodland in the lower intertidal zone. This community is subject to occasional tidal inundation typically at spring high tides.



***Sarcocornia quinqueflora subsp. quinqueflora – Sporobolus virginicus* Chenopod Shrubland/Tussock Grassland. The saltmarsh is fringed by a Mangrove Woodland to the left (east) and Swamp Oak Forest to the right (west). Note the inundated former horse trail (bare mudflat) that runs the length of the proposed dredge pipeline route through this community.**

Emergent Stratum (2-5 m in height, projected foliage cover < 5 %)

Casuarina glauca, *Avicennia marina* (scattered emergents)

Lower stratum (1 m in height, projected foliage cover 50 – 80 %)

Sarcocornia quinqueflora subsp. quinqueflora, Sporobolus virginicus, *Suaeda australis (*mid intertidal*)*, *Juncus kraussii subsp. australiensis* (upper intertidal)

Equivalent Vegetation Types

Composite of North Coast Vegetation Mapping Project Map Code 6102 *Sarcocornia quinqueflora subsp. quinqueflora - Sporobolus virginicus* Chenopod Shrubland/Tussock Grassland and Map Code 6502 *Juncus kraussii subsp. australiensis* Rushland (Griffith and Wilson, 1996).

Extent of Disturbance

This community was recorded in a relatively undisturbed condition throughout the majority of its extent within the study area. A former horse trail bisects a portion of the proposed dredge pipeline route through this community and is presently a bare mudflat approximately 1 metre wide.

Bioregional Conservation Status

This community is considered to be representative of the TSC listed EEC, Coastal Saltmarsh, and thus assumes State significance.

This community complex is reserved locally within the bounds of the SEPP 14 Wetland (# 590) at Tuncurry and within Booti Booti NP and Yahoo NR (Griffith *et al*., 2000; I. Mamott pers. obs.). The extant area of this community within the SEPP 14 wetland is unknown. The extant area of this community within Booti Booti NP and Yahoo NR is approximately 2 – 3 hectares (Griffith *et al*., 2000). Many of the unreserved stands of this community complex are protected in SEPP 14 Wetlands in the North Coast Bioregion (I. Mamott *pers. obs.*).

This community complex is reserved in many of the north coast bioregion conservation reserves which sample vegetation on Quaternary sediments, including Broadwater NP, Bundjalung NP, Yuraygir NP, Hat Head NP, Crowdy Bay NP, Myall Lakes NP, Moonee Beach NR, Limeburners Creek NR and Lake Innes NR (I. Mamott *pers. obs*.; Griffith *et al*., 2000; Myerscough and Carolin, 1986).

Vegetation Community No. 5
Grey Mangrove (Avicennia marina subsp. australasica) Woodland

This vegetation community was recorded along the proposed dredge pipeline route on muddy estuarine sediments associated with the lower tidal flats of Wallis Lake estuary. This community graded upslope into a Saltmarsh Complex in the mid to upper intertidal zone. This community is subject to daily tidal inundation.

Grey Mangrove Woodland with saltmarsh community and former horse trail (inundated) in the foreground

Upper Stratum (3 – 6 m in height, projected foliage cover 50 – 70 %)

Avicennia marina subsp. australasica, *Casuarina glauca* (scattered emergents)

Lower stratum (1 m in height, projected foliage cover 5 – 15 %)

Sporobolus virginicus

Equivalent Vegetation Types

Composite of North Coast Vegetation Mapping Project Map Code 2502 *Avicennia marina* Mangrove Woodland (Griffith and Wilson, 1996).

Extent of Disturbance

This community was recorded in a relatively undisturbed condition throughout the majority of its extent within the study area.

Bioregional Conservation Status

This community is reserved locally within the bounds of the SEPP 14 Wetland (# 590) at Tuncurry and within Booti Booti NP and Yahoo NR (Griffith *et al*., 2000; I. Mamott pers. obs.). The extant area of this community within the SEPP 14 wetland is unknown and its extent in Booti Booti is small (< 3 hectares, I. Mamott pers. obs.). Many of the unreserved stands of this community are protected in SEPP 14 Wetlands in the North Coast Bioregion (I. Mamott *pers. obs.*).

This community complex is reserved in many of the north coast bioregion conservation reserves which sample vegetation on Quaternary sediments, including Bundjalung NP, Yuraygir NP, Hat Head NP, Crowdy Bay NP, Myall Lakes NP, Moonee Beach NR, Limeburners Creek NR (I. Mamott *pers. obs*.; Griffith *et al*., 2000; Myerscough and Carolin, 1986).

Other Vegetation Types

The stock dam on the proposed stockpile site has been colonised to an extent by an aquatic native Forbland dominated by *Azolla pinnata* and *Ludwigia peploides ssp. montevidensis*. These taxa are characteristic of Coastal Floodplain Freshwater Wetlands, although their occurrence on the site is within an artificially created environment and hence is not listed as an EEC.

3.3 TERRESTRIAL FAUNA

3.3.1 TERRESTRIAL FAUNA HABITATS

Background

For the purpose of the fauna habitat assessment, the pipeline route is considered to be located in two general habitat types, namely the Swamp Sclerophyll Forest community and a Saltmarsh-Mangrove complex.

The stockpile site is to be located in a highly disturbed cleared paddock that is regularly grazed and slashed, and contains only a very small number of regrowth trees.

In the Swamp Sclerophyll Forest, the pipeline will be located along boundary fence lines and existing tracks. With the exception of approximately 75 m length through a SEPP 14 wetland, the fence lines and tracks are cleared. In the saltmarsh, the majority of the pipeline will be generally located along an existing cleared, worn track. A small section (approximately 100 m) will traverse a vegetated saltmarsh area.

As the majority of the pipeline route and stockpile site is cleared, the habitat resources available in these areas are minimal. Despite this, the pipeline and stockpile site are adjoined by a very large area of relatively intact Swamp Sclerophyll Forest and Saltmarsh communities that provide a variety of habitat resources for both protected and threatened fauna known to, or considered likely to occur within the locality. The habitat value of the adjoining vegetation communities has therefore been assessed as fauna utilising these may traverse the pipeline route and/or stockpile site.

In addition, the habitat value of the intertidal areas and estuarine environment (*eg*. proposed dredge site) for terrestrial species is also discussed in the following section. The habitat assessment for aquatic/marine species is provided in a separate aquatic ecology report.

3.3.2 SCLEROPHYLL/SWAMP SCLEROPHYLL FOREST COMMUNITIES

The vegetation occurring in the forested areas represent a very large area of potential foraging habitat for a variety of Threatened and protected species occurring within the locality. This community contains a variety of flowering tree species including Swamp Mahogany (*Eucalyptus robusta*), Blackbutt (*E. pilularis*), Flooded Gum (*Eucalyptus grandis*), Swamp Oak (*Casuarina glauca*), Broad-leaved Paperbark (*Melaleuca quinquenervia*), and Flax-leaved Paperbark (*Melaleuca linearifolia*). This community therefore contains a large amount of potential foraging habitat for nectivorous and insectivorous species including the Squirrel Glider (*Petaurus norfolcensis*), Brush-tailed Phascogale (*Phascogale tapoatafa*), Regent Honeyeater (*Xanthomyza phrygia*) and microchiropteran bats. In addition, the Grey-headed Flying-Fox (*Pteropus poliocephalus*) and the Little Red Flying-fox (*Pteropus scapulatus*) were observed foraging amongst this community during the surveys.

The Swamp Forest contains an abundance of fallen logs, timber, and leaf litter that represent foraging and shelter habitat for small mammals and reptiles, which in turn represent potential food resource for a number of species including Dasyurids, and a variety of diurnal and nocturnal birds. The swamp forest also supports an abundance of passerine birds and therefore contains potential foraging habitat for the Square-tailed Kite (*Lophoictinia isura*).

The swamp forest contains numerous hollow bearing trees that would provide potential breeding habitat for forest owls, gliders and hollow dependant microchiropteran bats. Some areas of the swamp forest are also considered to contain potential breeding habitat for the Eastern Grass Owl, particularly within the SEPP 14 wetland. In addition, the swamp forest is considered to contain potential roosting habitat for the Common Blossom Bat (*Syconycteris australis*).

It is considered unlikely that the Glossy Black-Cockatoo (*Calyptorhynchus lathami*) would utilise the hollows within the study area given that there were no feed trees (*Allocasuarina* sp.) observed in the swamp forest. There was also no potential denning habitat for the Spotted-tailed Quoll observed in the study area.

The swamp forest contains potential nesting habitat for the Square-tailed Kite and Osprey (*Pandion haliaetus*), however there were no nests of either species observed during the surveys.

The swamp forest provides a large area of breeding habitat amphibian for species and a variety of frog species, including the Wallum Froglet, which were detected in this community during the surveys.

A number of wetland birds such as the Black-necked Stork and Black Bittern are also considered likely to utilise some areas within the swamp forest, including the ecotone between the swamp forest and the saltmarsh where there are thickets of Swamp Oak.

Pipeline Route

As the only trees along the pipeline route are located in the northern portion of the SEPP 14 wetland, the pipeline route contains very limited resources for nectivorous species. Further, the pipeline route does not contain any potential denning, nesting, or roosting, habitat for fauna including the Squirrel Glider, Brush-tailed Phascogale, Square-tailed Kite, Osprey, forest owls, and hollow dependant microchiropteran bats.

The pipeline route contains some timber and logs that would provide a small amount of foraging resources for insectivorous species. In addition, small rodents and mammals including the Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*) are likely to traverse the pipeline route while utilising the Swamp Sclerophyll communities on either side of the pipeline route.

The pipeline route contains suitable foraging and breeding habitat for amphibian species including the Wallum Froglet. The Wallum Froglet was heard calling from within the pipeline route and this species was also captured within one area of the pipeline route. Calls from this species, however, were more frequent around the eastern section of the pipeline route (adjoining the stockpile site), and were not heard calling in the areas closer to the SEPP 14 wetland, where sub soils are mostly likely more saline (as reflected by changes in dominance of the adjoining swamp forest from Swamp Mahogany to Paperbarks and Swamp Oaks).

The Koala is likely to utilise the habitats adjoining the pipeline route due to the abundance of suitable feed trees in this area. Occasional feed trees were observed within the SEPP 14 wetland, however, the pipeline will snake through this area and no food trees will not be removed. The remaining areas of the pipeline route are cleared and therefore do not contain potential Koala feed trees.

The pipeline route represents potential foraging habitat for the Square-tailed Kite and Owl species including Powerful Owl (*Ninox strenua*) and Masked Owl (*Tyto novaehollandiae*). Despite this, the proposed pipeline route represents a small area of potential foraging habitat in relation to these species' mobility and home range. In addition, the habitat resources occurring in these areas are very limited as the majority of pipeline route is cleared.

The SEPP 14 wetland is considered to contain potential breeding habitat for the Eastern Grass Owl, however, this species was not detected, despite targeted surveys for this species

The section of pipeline through the SEPP 14 wetland represents a very small area of potential habitat for some wetland species such as the Black Bittern (*Ixobrychus flavicollis*) and Australasian Bittern (*Botaurus poiciloptilus*). This area of potential habitat for wetland species is however, considered negligible to the area of similar habitat adjoining the pipeline route and also occurring in the locality. In addition, this habitat will not be cleared for the proposal.

Stockpile Site

The stockpile site contains approximately 59 scattered regrowth trees, primarily comprised of Swamp Mahogany (*Eucalyptus robusta*) and Blackbutt (*Eucalyptus pilularis*). These trees would provide a small amount of foraging habitat for nectivorous and insectivorous species including the Squirrel Glider (*Petaurus norfolcensis*), Brush-tailed Phascogale (*Phascogale tapoatafa*), Regent Honeyeater (*Xanthomyza phrygia*) and microchiropteran bats. In addition, the Grey-headed Flying-Fox (*Pteropus poliocephalus*) were observed foraging amongst some of these trees during the surveys.

The scattered trees also represent suitable feed tree species for the Koala, however, the small number of potential feed trees within the stockpile site is negligible compared to the abundance of suitable feed trees within the adjoining Swamp Sclerophyll Forest.

The stockpile site represents potential foraging habitat for the Square-tailed Kite and Owl species including Powerful Owl (Ninox strenua) and Masked Owl (Tyto novaehollandiae), however, in relation to these species mobility and home range, this area of potential habitat is considered negligible. In addition, the habitat resources occurring in these areas are very limited as the majority of stockpile site is cleared and this habitat would constitute a negligible part of these species foraging range with the locality.

Only a small number of these trees (< 5) were observed to contain hollows, and these hollows were considered to be only appropriate for smaller sized fauna such as gliders and hollow-dependant microchiropteran bats. Some of these trees would represent potential nesting habitat for the Square-tailed Kite and Osprey, however, there were no nests of either species observed in any of these trees.

The proposed stockpile contains very limited leaf litter and timber as a result of current land use, and as such provides very limited foraging and shelter resources for reptiles and small mammals.

A constructed pond (approximately 0.24 ha surface area) occurs at the stockpile site and provides foraging habitat for water birds such as Ducks and Moorhens, however, it is unlikely that this pond would be an important area of habitat for any bird species. Although containing pest species Mosquito Fish (*Gambusia holbrooki*), this pond would provide suitable breeding habitat for amphibians. It is unlikely that this pond would provide suitable breeding habitat for the Wallum Froglet.

The heavily disturbed sedgeland habitats within the stockpile site contains an area of suitable breeding habitat for the Wallum Froglet which was heard calling from this area. This area is approximately 0.5 ha and is located at the north western corner of the stockpile site. This habitat, however, is considered negligible in relation to the large areas of relatively undisturbed wallum habitats adjoining the stockpile site to the west.

3.3.3 SALTMARSH – MANGROVE COMMUNITY

The saltmarsh community contains a large area of potential foraging habitat for a variety of Threatened and protected species occurring within the locality. This community contains vegetation species such as Grey Mangrove (*Avicennia marina*) that would provide potential foraging habitat for insectivorous bats and frugivorous species such as the Grey-headed Flying-Fox.

The intertidal areas represent suitable foraging habitat for a number wetland birds, shorebirds and waders including the Australian Bittern, Black Bittern and Black-necked Stork (*Ephippiorhynchus asiaticus*).

The saltmarsh area contains some timber and leaf litter that represent foraging and shelter habitat for small mammals and reptiles, which in turn represent potential food resource for a number of species including Dasyurids, and a variety of diurnal and nocturnal birds.

This community is utilised by some passerine birds and therefore contains potential foraging habitat for the Square-tailed Kite (*Lophoictinia isura*), however this is not considered typical foraging habitat for the species. Being a saline environment, this community provides limited breeding habitat for amphibians.

Pipeline

As the area that the pipeline traverses is primarily comprised of saltmarsh, the vegetation along this section of pipeline route contains very limited resources for nectivorous species. Further, this section does not contain any potential denning, nesting, or roosting, habitat for hollow dependant fauna.

Some sections of the pipeline route in this community represent a very small area of potential foraging habitat for a number of wetland birds, shorebirds and waders. This area is, however, considered negligible to the habitats adjoining the pipeline. Further, survey at high tides did not identify any utilisation by shorebirds or waders.

The pipeline route contains some timber and leaf litter that would provide a small amount of foraging resources for insectivorous species. Despite this, the amount of potential habitat for insectivorous species along this section of the pipeline route is considered negligible in relation to the adjoining habitats.

The pipeline route represents potential hunting habitat for Owl species including Powerful Owl (*Ninox strenua*) and Masked Owl (*Tyto novaehollandiae*), although this would constitute a negligible part of their nightly foraging range with the locality.

Dredge site

The dredge site does not represent potential breeding habitat for shore birds and waders, as it is inundated at high tide. As some areas are exposed at low tide, however, the dredge site represents potential foraging habitat for a number of shore birds such as the Little Tern (*Sterna albifrons*), Terek Sandpiper (*Xenus cinereus*) and Lesser Sand Plover (*Charadrius mongolus*). In addition, the Pied Oystercatcher (*Haematopus longirostris*), was observed foraging at the dredge site at low tide.

At high tide, the dredge site represents potential foraging habitat for the Osprey, and also the Green Turtle, both of which are known to forage in Wallis Lake. In addition, the Osprey was observed flying over the dredge site during the surveys.

While the dredge site is known habitat for Pied Oystercatcher and also represents potential foraging habitat for a variety of species (including those discussed), the area of habitat is considered negligible to the area of similar habitat associated with the estuarine environment of Wallis Lake.

3.3.4 FAUNA SURVEY RESULTS

A total of eight (8) threatened species were detected during the surveys. These are the Grey-headed Flying-fox (*Pteropus poliocephalus*), Wallum Froglet (*Crinia tinnula*), Osprey (*Pandion haliaetus*), Pied Oystercatcher (*Haematopus longirostris*), Little Bentwing-bat (*Miniopterus australis*), Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), Eastern Freetail-bat (*Mormopterus norfolkensis*), and Southern Myotis (*Myotis macropus*). The locations of Threatened fauna recorded during the surveys are shown in **Figure 3.2**.

Field surveys yielded a total of 52 vertebrate fauna species comprising 33 bird species, 10 frog species, one (1) snake species, one (1) freshwater turtle, and 22 mammal species including 14 Microchiropteran bat species. A list of all vertebrate fauna species detected within the site during the surveys is provided in **Appendix C2**.

Small Mammal Surveys

Hair Trap Surveys

No Threatened species were identified by the Hair trap surveys. The hair samples forwarded to Barbara Triggs were identified as probable *Canis familiaris* and *Trichosurus* sp, and one sample was identified as a *Rattus* sp.

Microchiropteran Bat Surveys

A total of 14 microchiropteran bat species were identified by the Anabat surveys, including 4 (four) species listed as Threatened under the TSC Act. In addition, one (1) species, the Large Forest Bat (*Vespadelus darlingtoni*), was tentatively identified from this analysis.

Amphibian Surveys

A total of 10 amphibian species were identified from calls and/or hand capture within the study area. One Threatened species, the Wallum Froglet, was heard calling from the stockpile site and the eastern section of the pipeline route. This species was also captured within one area of the pipeline route.

Spotlighting Surveys

Three species were observed during the spotlighting surveys, comprising one (1) amphibian species and three bird species. *Crinia signifera* was heard calling from within the site and also in the swamp habitat to the south of the site. A single Kookaburra, and also a group of three (3) Magpies were observed to be temporarily roosting within the site. A Tawny Frogmouth was observed perched on a fence near the pipeline route.

Call Playback Surveys

There was no response to the call playback surveys.

Fauna Transect Surveys

There were no nest sites of any Threatened fauna observed during the surveys. In addition, there were no chewed *Allocasuarina* fruit, Koala scats, v-notch incisions, owl pellets or any other evidence of Threatened species identified during fauna transect surveys.

3.3.5 SEPP 44 ASSESSMENT

Potential Koala Habitat Quadrat Results

The seven Koala habitat quadrats were located in the Swamp Sclerophyll forest, with some located in the ecotone between this community and the Saltmarsh community. Data presented in **Table 3.1** indicates that two (2) of the seven (7) Koala habitat quadrats were identified to contain Potential Koala habitat pursuant to SEPP 44. The two quadrats that contained potential Koala habitat were located near the stockpile site and eastern section of the pipeline that adjoins the stockpile site. The dominant tree species in these two quadrats were Swamp Mahogany (*E. robusta*) which is a listed feed tree on Schedule 2 of SEPP 44.

The dominant trees in the other five (5) quadrats were *Melaleuca quinquenervia* and *Casuarina glauca* and these not are listed on Schedule 2 of SEPP 44. These results demonstrate that not all areas within the Swamp Sclerophyll Forest community contain potential Koala habitat.

Table 3.1 – Results of Potential Koala Habitat Quadrats

Quadrat Number	Number of Trees In Quadrat	Tree Species	% of Trees Species in Upper Strata	% of Trees Species in Lower Strata	Potential Koala Habitat Pursuant to SEPP 44
Site 1	10	*Eucalyptus robusta* ^	**90**	-	**Yes**
		Melaleuca sieberi	10	-	
Site 2	14	*Eucalyptus robusta* ^	**85.7**		**Yes**
		Melaleuca quinquenervia	14.3		
Site 3	34	*Melaleuca quinquenervia*	50		No
		Casuarina glauca	32.4		
		Melaleuca sieberi	6		
		Livistona australis	11.8		
	22	*Melaleuca quinquenervia*		27.3	No
		Casuarina glauca		31.8	
		Melaleuca sieberi		13.6	
		Livistona australis		27.3	
Site 4	33	*Melaleuca quinquenervia*	15.2	-	No
		Livistona australis	18.2	-	
		Casuarina glauca	66.7	-	
	24	*Melaleuca quinquenervia*		25	No
		Livistona australis		29.2	
		Casuarina glauca		45.8	
Site 5	22	*E. pilularis*	9.1		No
		E. grandis	4.5		

Table 3.1 – Results of Potential Koala Habitat Quadrats

Quadrat Number	Number of Trees In Quadrat	Tree Species	% of Trees Species in Upper Strata	% of Trees Species in Lower Strata	Potential Koala Habitat Pursuant to SEPP 44
		E. robusta ^	4.5		
		Melaleuca quinquenervia	27.3		
		Casuarina glauca	54.5		
	12	*E. pilularis*		8.3	No
		E. grandis		8.3	
		Melaleuca quinquenervia		25	
		Casuarina glauca		58.3	
Site 6	19	*Livistona australis*	21.1		No
		Melaleuca quinquenervia	26.3		
		Melaleuca sieberi	36.8		
		E. saligna	5		
		Casuarina glauca	10.5		
	12	*Livistona australis*		25	No
		Melaleuca quinquenervia		16.7	
		Melaleuca sieberi		33.3	
		E. saligna		16.7	
		Casuarina glauca		8.3	
Site 7	15	*Casuarina glauca*	86.7		No
		Melaleuca quinquenervia	13.3		
	27	*Casuarina glauca*		92.6	No
		Melaleuca sieberi		7.4	

Spot Assessment Technique Results

During specific Koala scat searches using the Spot Assessment Technique, two (2) surveys sites, totalling 43 trees, were searched for Koala scratches and scats. The results of the Koala Spot Assessments are provided in **Table 3.2.**

None of the trees searched were found with Koala scats around the base.

Table 3.2 - Results of Koala Scat Searches

Spot Assessment Site Number	Tree Species	No. of Trees Searched At Spot Sample Site (a)	No. of Trees With Koala Scats (B)	Activity Levels (a/b)
Site 1	*Eucalyptus robusta*	21	0	0
Site 2	*Eucalyptus robusta*	22	0	0

3.4 IDENTIFICATION OF SUBJECT SPECIES, ENDANGERED POPULATIONS AND ENDANGERED ECOMMUNITIES

An assessment of the likelihood of occurrence of Threatened and significant flora and fauna species (listed under the EPBC Act and TSC Act) recorded within the locality and based on this, the determination of Subject Species is contained in **Table 3.2.** In addition, a number of other Threatened species not recorded in the locality have been considered given the habitats available within the study area and known distribution and habitat requirements of these species. Information regarding Endangered Ecological Communities (EEC's), their known habitat, and an assessment of their likely occurrence is provided in **Table 3.3.** The full list of Subject Species and Subject EEC's identified are provided in **Table 3.4.**

In total, 31 fauna species, two (2) flora species and three (3) EEC's were considered as Subject Species or Subject Communities. The assessment of significance in accordance with section 5A of the Environmental Planning and Assessment Act 1979 is contained in **Appendix C3**. Two of the subject fauna species, the Latham's Snipe and White Bellied Sea-Eagle, are not listed as Threatened under the *TSC Act or EPBC Act.* These species have been assessed for significant impact under the Administrative guidelines for Migratory species under the EPBC Act in **Appendix C4**.

Table 3.3 - Threatened Flora Species Previously Recorded and Known To Occur in Forster-Tuncurry Locality

Scientific Name & Common Name	TSC Act Status	EPBC Act Status	ROTAP	Ecology/Biology	Local Occurrence and Likelihood of Occurrence on the Site
White-flowered Wax Plant Cynanchum elegans	Endangered	Endangered	3ECi	A variable climber with underground suckering stems. Found on the edge of dry rainforest vegetation, and also associated with littoral rainforest, Coastal Tea Tree – Coastal Banksia coastal scrub; Forest Red Gum Eucalyptus tereticornis open forest and woodland, Spotted Gum Corymbia maculata open forest and woodland, and Bracelet Honeymyrtle Melaleuca armillaris scrub to open scrub. The species flowers between August and May (Plantnet, 2005).	Recorded in littoral rainforest at Black head and at Cape Hawk (Booti Booti NP). Low likelihood of occurrence on site given absence of suitable habitat.
Dwarf Heath Casuarina Allocasuarina defungens	Endangered	Endangered	2E	A straggly shrub to 2 m high. Found mainly in tall wet heath on sand, also found to occur on clay soils and sandstone. Extends on to hills nearby the coast and on headlands adjacent sandplains (DEC, 2005, Plantnet).	Recorded in intermediate dry heathland in Booti Booti National park (Griffith 2000). Reaches its southern distribution limit in Forster area. Low likelihood of occurrence – given absence of suitable habitat.
Nabiac Casuarina Allocasuarina simulans	Vulnerable	Vulnerable	2VCa	A straggly shrub 1-3 m high. Recorded from dry heathland on coastal sands.	Co-occurs with banksia aemula in dry heathland in Booti Booti National Park (Griffith 2000). Endemic to Forster and nabiac areas in vicnity of Wallis Lake (Griffith 2000; Harden 1990). Low likelihood of occurrence given absence of suitable habitat.

Table 3.3 - Threatened Flora Species Previously Recorded and Known To Occur in Forster-Tuncurry Locality

Scientific Name & Common Name	TSC Act Status	EPBC Act Status	ROTAP	Ecology/Biology	Local Occurrence and Likelihood of Occurrence on the Site
Sand Spurge Chamaesyce psammogeton	Endangered	Not Listed	-	A mat-forming herb that flowers in summer, with plant growth mainly occurring in spring and summer. It grows on exposed headlands and foredunes in Spinifex sericeus tussock grassland.	Recorded in Spinifex sericeus tussock grassland in Booti Booti National Park along The Lakesway. Low likelihood of occurrence given absence of suitable habitat.
Rainforest Cassia Senna acclinis	Endangered	Not Listed	3RC-	A shrub to 3 m tall. Grows in or on the edges of subtropical and dry rainforest	Recorded in Littoral Rainforest at Black Head and at Cape Hawk (Booti Booti NP). Low likelihood of occurrence given absence of suitable habitat.
Gonocarpus salsoloides	Not Listed	Not Listed	3RCa	A perennial herb to 40 cm high. Found in swampy areas on sand. Often recorded in herb rich wetland areas fringing Melaleuca quinquenervia swamp woodlands/forests (author's pers. notes). Co-ocurs with Lindernia alsinoides (author's pers. notes).	Recorded at Cattai Wetlands within or fringing swamp sclerophyll habitat (author's pers. notes). Moderate to High likelihood of occurrence within or fringing swamp sclerophyll habitats on the site.
Eucalyptus fergusonii subsp. fergusonii	Not Listed	Not Listed	3KC-	A tree to 25 m with persistent dark grey ironbark. Wet and dry sclerophyll forest on sedimentary bedrock.	Recorded as a co-dominant in dry and wet sclerophyll forest at Cape Hawk in Booti Booti National Park (Griffith et al 2000). This record is thought to be the northern limit of its known distribution. A dominant canopy species in dry sclerophyll

Table 3.3 - Threatened Flora Species Previously Recorded and Known To Occur in Forster-Tuncurry Locality

Scientific Name & Common Name	TSC Act Status	EPBC Act Status	ROTAP	Ecology/Biology	Local Occurrence and Likelihood of Occurrence on the Site
					forests of the Bungwahl, Smiths Lake locality on Carboniferous bedrock (author's pers. notes). Low likelihood of occurrence given absence of suitable habitat.
Trailing Woodruff Asperula asthenes	Vulnerable	Vulnerable	3VC-	A low, trailing, perennial herb. Typically found in swamp sclerophyll forest on floodplain alluvium (author's pers. notes).	Recorded in Nabiac lowlands and near Frogalla Swamp (Darawakh Creek/Wallamba River junction) in swamp sclerophyll habitats (author's pers. notes; pers. comm. Matt Bell). Also known to occur in swamp sclerophyll forest near Wallis Lake off The Lakesway at south Forster. High likelihood of occurrence
Noah's False Chickweed Lindernia alsinoides	Endangered	Not Listed	-	A herb to 15 cm high found in swampy sites in sclerophyll forest and coastal heath. Has been found in damp paperbark swamp with Melaleuca alternifolia and M. quinquenervia. Often recorded in herb rich wetland areas fringing Melaleuca quinquenervia swamp woodlands/forests (author's pers. notes). Co-ocurs with Gonocarpus salsoloides (author's pers. notes).	Recorded at South Forster at 'Berts Farm' and Bizahawk Quarry within regenerating swamp sclerophyll habitats (author's pers. notes). Also recorded on edge of swamp sclerophyll forest at Cattai Wetlands (author's pers. notes) and to the adjoining lands to the north (Idyll Spaces 2003). High likelihood of occurrence in/fringing swamp sclerophyll habitats.

Table 3.3 - Threatened Flora Species Previously Recorded and Known To Occur in Forster-Tuncurry Locality

Scientific Name & Common Name	TSC Act Status	EPBC Act Status	ROTAP	Ecology/Biology	Local Occurrence and Likelihood of Occurrence on the Site
Phaius australis	Endangered	Not Listed	3VCa	Terrestrial orchid found in swamp sclerophyll (Melaleuca quinquenervia) and wet sclerophyll forests north from Evans Head.	Although the author is unaware of records for this taxon on the lower North Coast, it cannot be discounted as a possibility within suitable swamp sclerophyll habitats within the study area. Low to Moderate likelihood of occurrence.
Swamp Lily Phaius tankervilleae	Endangered	Not Listed	-	Terrestrial orchid found in swamp sclerophyll (Melaleuca quinquenervia) and wet sclerophyll forests north from Hastings River.	Although the author is unaware of records for this taxon on the lower North Coast, it cannot be discounted as a possibility within suitable swamp sclerophyll habitats within the study area. Low to Moderate likelihood of occurrence.

Table 3.4 - Endangered Ecological Communities (Part 3 of Schedule 1 TSC Act) previously recorded and known to occur in Forster Tuncurry Locality

Endangered Ecological Community	Description	Habitat Distribution
Coastal Saltmarsh of the NSW North Coast, Sydney Basin and South East Corner bioregions	A community comprising chenopod shrubs and tussock grasses in the upper to mid intertidal zone of estuaries which become inundated only at spring high tides. Characteristic plants include *Juncus kraussii subsp australiensis, Sarcocornia quinqueflora, Sporobolus virginicus, Isolepis nodosa, Samolus repens and Suaeda australis.*	Occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea. One of the few vegetation communities that become more diverse floristically from the northern to the southern extent of its distribution. Occurs sporadically around Wallis Lake estuary in Booti Booti NP and Yahoo Nature Reserve (author's pers. notes; Griffith et al 2000). Potential habitat for this EEC exists on the foreshore of the lower reaches of the Wallamba River. High likelihood of occurrence within study area.
Freshwater Wetlands On Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	This ecological community is associated with periodic or semi-permanent inundation by freshwater, although there may be minor saline influence in some wetlands. The structure of the community may vary from sedgelands and reedlands to herbfields, and woody species of plants are generally scarce. Typically these wetlands form mosaics with other floodplain communities, and often they include or are associated with ephemeral or semi-permanent standing water (NSW NPWS 2004).	Generally occurs at less than 20 m elevation on silty muds or humic loams in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes but may also occur in backbarrier landforms where floodplains adjoin coastal sandplains (NSW NPWS 2004). Associated with coastal areas. Very small areas (<2 ha) of Freshwater Wetland habitat have been recorded around the Wallis Lake estuary in Booti Booti NP (Griffith et al 2000). Low likelihood of occurrence in study area.

Table 3.4 - Endangered Ecological Communities (Part 3 of Schedule 1 TSC Act) previously recorded and known to occur in Forster Tuncurry Locality

Endangered Ecological Community	Description	Habitat Distribution
Littoral Rainforest NSW North Coast, Sydney Basin and South East Corner bioregions	Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions is generally a closed forest, the structure and composition of which is strongly influenced by proximity to the ocean. The plant species in this ecological community are predominantly rainforest species with evergreen mesic or coriaceous leaves. Several species have compound leaves, and vines may be a major component of the canopy. These features differentiate littoral rainforest from sclerophyll forest or scrub, but while the canopy is dominated by rainforest species, scattered emergent individuals of sclerophyll species, such as *Angophora costata*, *Banksia integrifolia*, *Eucalyptus botryoides* and *E. tereticornis* occur in many stands.	Littoral Rainforest in NSW is found at locations along the entire NSW Coast. Found only on the coast on sand dunes and on soil derived from underlying rocks generally within 2 km of the ocean. Recorded in Booti Hill and Cape Hawke within Booti Booti National Park. Also recorded in Darawank NR at Black Head. Low likelihood of occurrence in study area.
Lowland Rainforest on Floodplain of the NSW North Coast Bioregion	A community that occurs on floodplain alluvium comprised of rainforest species with evergreen mesic or coriaceous leaves. Several species have compound leaves, and vines may be a major component of the canopy.	*Livistona australis* subtropical rainforest community recorded locally in Booti Booti NP and Yahoo NR is an element of this EEC. Moderate likelihood of occurrence in study area.
Subtropical Coastal Floodplain Forest NSW North Coast bioregion	A community that occurs on floodplain alluvium and typically lines major rivers and river flats of the north coast estuaries. This community essentially replaces River Flat Eucalypt Forest north of the Manning River. The structure of this community may vary from tall open forests to woodlands, although partial clearing may have reduced the canopy to scattered trees. The most widespread and abundant trees include *Eucalyptus*	The community is associated with clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplain and occupies central or marginal parts of floodplains. Occupies habitats where flooding is periodic and soils are rich in silt and sand, sometimes humic, and show little influence of saline ground water.

Table 3.4 - Endangered Ecological Communities (Part 3 of Schedule 1 TSC Act) previously recorded and known to occur in Forster Tuncurry Locality

Endangered Ecological Community	Description	Habitat Distribution
	tereticornis, E. siderophloia and *Corymbia intermedia.* Typically these forests and woodlands form mosaics with other floodplain forest communities and treeless wetlands, and often they fringe treeless floodplain lagoons or wetlands with semi-permanent standing water. This community	The community generally occurs below 50 m, but may occur on localised river flats up to 250 m elevation. Small remnants occur on the Wallamba River on the Nabiac lowlands (author's pers. notes). Low likelihood of occurrence in study area.
Swamp Oak Floodplain Forest NSW North Coast, Sydney Basin and South East Corner bioregions	A community is dominated by *Casuarina glauca* which may occur as pure stands or in association with *Acmena smithii, Glochidion spp.* and *Melaleuca spp.* The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. Typically these forests, woodlands, scrubs and reedlands form mosaics with other floodplain forest communities and treeless wetlands, and often they fringe treeless floodplain lagoons or wetlands with semi-permanent standing water.	The community generally occurs below 20 m (rarely above 10 m) elevation and is associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Recorded locally in Wallis Lake estuary in Booti Booti NP and Yahoo NR (Griffith et al 2000). High likelihood of occurrence in study area.
Swamp Sclerophyll Forest On Coastal Floodplains NSW North Coast, Sydney Basin and South East Corner bioregions	This community has an open to dense layer of eucalypts and paperbarks, with *Eucalyptus robusta* in association with *Melaleuca quinquenervia* being the most widespread and abundant trees north of Sydney. The structure of this community is typically open forest, although partial clearing may have reduced the canopy to scattered trees. In some areas the tree stratum is low and dense, so that the community takes on the structure of scrub. The community also includes some areas of fernland and tall	Associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains often on small floodplains or where the larger floodplains adjoin lithic substrates or coastal sand plains (NSW NPWS 2004). Generally occurs below 20 m (though sometimes up to 50 m) elevation. Reserved locally in Booti Booti NP (particulary near

Table 3.4 - Endangered Ecological Communities (Part 3 of Schedule 1 TSC Act) previously recorded and known to occur in Forster Tuncurry Locality

Endangered Ecological Community	Description	Habitat Distribution
	reedland or sedgeland, where trees are very sparse or absent. Typically these forests, scrubs, fernlands, reedlands and sedgelands form mosaics with other floodplain forest communities and treeless wetlands.	Green Point) and Yahoo NR (Griffith et al 2000; author's pers. notes). High likelihood of occurrence in study area.

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
Wallum Froglet Crinia tinnula	Vulnerable	n/a	The Wallum Froglet is restricted to coastal areas of south eastern Queensland and northern NSW where it occurs in fringing vegetation associated with wetlands with highly acidic, tannin stained waters that are usually dominated by paperbarks and tea trees (NPWS, 2005; Cogger, 2000).	The Wallum Froglet was detected in the Swamp Sclerophyll Forest within an adjoining the study area.	Yes
Green and Golden Bell Frog Litoria aurea	Endangered	Vulnerable	The Green and Golden Bell Frog occurs around large permanent swamps, lagoons, ponds and flood prone river flats with dense emergent vegetation such as bullrushes and spikerushes. They may also occur in farm	As the study area and adjoining habitats contain limited potential habitat for the Green and Golden Bell Frog, and the nearest record on the Atlas is over 20 km to the south near Bungwahl (NPWS, 2006),	No

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
			dams and ornamental ponds that are close to preferred habitat (NPWS, 2000; Robinson, 1998). The Green and Golden Bell Frog is found in eastern and south eastern NSW and far eastern Victoria, more often at low altitudes (Cogger, 2000).	this species is considered unlikely to occur within the study area.	
Green-thighed Frog Litoria brevipalmata	Vulnerable	n/a	The Green-thighed Frog is known from isolated localities around the coast of south eastern Queensland and northern NSW (Cogger, 2000). They have been recorded in rainforest, moist and dry eucalypt forest and heath, usually in areas where surface water pools after rain (NPWS, 1999). Breeding aggregations have been observed near grassy ephemeral pools and flood prone grassy areas (NPWS, 2000; NPWS, 2005).	The study area contains a small amount of potential breeding habitat for the Green-thighed Frog. It is however; unlikely that this species would occur within the study area given that there are only two records of this species within the LGA, with the closest of these records being located over 70 km to the west (NPWS, 2006). In addition, this species was not detected during the herpetofauna surveys undertaken within the study area.	No
Square-tailed Kite Lophoictinia isura	Vulnerable	n/a	Square-tailed Kites in open eucalypt forest, woodlands and sand plains of coastal and subcoastal mainland Australia. This species is sparsely distributed through even its preferred habitat and breeding pairs are known to occupy very large home ranges of at least 100 km^2 (1993; NPWS, 2000). Nests are a pile of sticks approximately 0.6 – 1 m in	The study area represents potential foraging habitat for the Square-tailed Kite, and the stockpile site contains a small number of potential nest trees. The Square-tailed Kite has been recorded within 12 km to north east (B. Campbell, pers. obs.) and is considered as likely to occur within the study area given this	Yes

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
			diameter, and are usually located in tall or emergent living trees that are near watercourses (NPWS, 2000; Schodde and Tidemann, 1993).	species high mobility and home range, and also occurrence of potential habitat within the study area.	
Osprey Pandion haliaetus	Vulnerable	n/a	The Osprey is thinly distributed around to coast of Australia where they forage for fish in fresh, brackish, or saline waters of rivers, lakes, estuaries and inshore coastal waters (Schodde and Tidemann, 1993; NPWS, 2000). Nests are usually located near a suitable area of foraging habitat and are a bulky structure made from piled sticks, often positioned in a tall dead tree or artificial structures such as telecommunication towers or poles (Schodde and Tidemann, 1993; NPWS, 2000). Breeding pairs defend breeding territory against other Ospreys, and active nests are usually more than 1 km apart (NPWS, 2005).	The Osprey is to known feed within Wallis Lake, and the stockpile site contains a small number of potential nest trees. In addition, the Osprey was observed flying over the dredge site during the surveys.	Yes
Australasian Bittern Botaurus poiciloptilus	Vulnerable	n/a	The Australasian Bittern occurs from southern Queensland to Tasmania and south eastern South Australia. In NSW this species has been recorded along the coast as well as inland wetlands and rivers (NPWS, 1999). The Australasian Bittern occurs in estuarine	The saltmarsh and intertidal areas around the dredge site represent potential habitat for the Australasian Bittern. In addition, this species is likely to utilise some areas of the swamp forest, particularly the SEPP 14 wetland and ecotone areas containing	Yes

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
			and freshwater wetlands with tall dense vegetation, including sedges, spike rushes, reeds and bulrush (NPWS, 2000; NPWS, 1999). Feeds mostly at night upon frogs, yabbies, spiders, insects, snails, small fish and mice (Schodde and Tidemann, 1993; NPWS, 2000).	Swamp Oak. This species has been recorded within 10 km of the study area and is therefore considered likely to occur within the study area and adjoining habitats (NPWS, 2006).	
Black Bittern Ixobrychus flavicollis	Vulnerable	n/a	The Black Bittern is distributed from southern NSW, north to Cape York and along the entire northern coast to the Kimberley Region. This species also occurs in the south western corner of WA (NPWS, 1999). This species occurs in dense vegetation, particularly amongst swamp she oaks and mangroves alongside streams, estuarine and terrestrial wetlands, tidal creeks and mudflats, and swamps. (NPWS, 2000; NPWS, 1999). This species forages mostly at night and amongst waterside vegetation, feeding upon fish amphibians, molluscs, insects and crustaceans (Schodde and Tidemann, 1993; NPWS, 2000).	The saltmarsh and intertidal areas around the dredge site represent potential habitat for the Black Bittern. This species has been recorded within 6 km of the study area and is therefore considered likely to occur within the study area and adjoining habitats (NPWS, 2006).	Yes
Australian Painted Snipe	Endangered	Vulnerable and Migratory	The Australian Painted Snipe is a small wader that is more often found in shallow inland wetlands that are both brackish and	The study area contains small areas of potential habitat for the Australian Painted Snipe. It is unlikely however, that the study	No

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
Rostratula benghalensis australis			freshwater. This species is also found among fringes of swamps, dams and marshy areas where there is a cover of grasses, low scrub or open timber (NPWS, 2000; DEH, 2005). The Australian Painted Snipe primarily occurs along the east coast from North Queensland to Eyre Peninsula in South Australia. This species nests on the ground among tall vegetation including grass tussocks or reeds (NPWS, 1999x).	area would be regularly utilised or contain an area of important habitat for the species. The nearest records on the Atlas are over 90 km to the south near Raymond Terrace (NPWS, 2005).	
Glossy Black Cockatoo Calyptorhynchus lathami	Vulnerable	n/a	The Glossy Black-Cockatoo primarily feeds upon the fruit cones of Allocasuarina species and are more often found in moist and dry coastal forests timbered watercourses and inland woodland (Schodde and Tidemann, 1993; NPWS, 2000). They are distributed in a wide coastal band on the east coast of Australia from central Queensland, south to Victoria. A separate population occurs on Kangaroo Island, SA (Schodde and Tidemann, 1993; NPWS, 2000). The Glossy Black-Cockatoo requires hollow bearing trees located within close proximity to good stands of feeding habitat for nesting (NPWS, 2000).	The study area does not contain potential feed trees and does not contain potential nesting habitat. The Glossy Black-Cockatoo has been recorded within 11 km of the study area and may traverse the site given the species high mobility. Despite this, the Glossy Black-cockatoo is not considered as a Subject species given the lack of suitable feed trees and nesting habitat within and adjoining the study area.	No

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
Lesser Sand Plover Charadrius mongolus	Vulnerable	Migratory	The Lesser Sand Plover breeds in Asia and migrates to the Australian coast between September and March where it occurs on mudlflats, white sandy beaches, estuaries and tidal areas in mangroves (NPWS, 2000).	The study area contains potential foraging habitat for the Lesser Sand Plover, and this species has been recorded within 2 km of the study area inside the entrance of Wallis Lake (NPWS, 2006).	Yes
Black-tailed Godwit (Limosa limosa)	Vulnerable	Migratory	The Black-tailed Godwit is a non-breeding migrant to Australia between spring and autumn (NPWS, 2000). Predominantly occurs in estuaries, sheltered bays, lagoons with extensive tidal mudflats or sandbars, ephemeral inland lakes (Morcombe, 2002).	The study area contains potential foraging habitat for the Black-tailed Godwit, and this species has been recorded within 2 km of the study area inside the entrance of Wallis Lake (NPWS, 2006).	Yes
Terek Sandpiper Xenus cinereus	Vulnerable	Migratory	The Terek Sandpiper is a non breeding migrant to Australia between September and May (NPWS, 2000). In Australia, this species is distributed around the east, north and west coasts of Australia (NPWS, 1999). The Terek Sandpiper occurs on tidal mudflats, estuaries, shores and reefs of offshore islands and coastal swamps (NPWS, 2000). The Terek Sandpiper feeds on a wide variety of invertebrates including crustaceans, worms, small shell fish and insect larvae (NPWS, 1999).	The study area contains potential foraging habitat for the Terek Sandpiper, and this species has been recorded within 2 km of the study area inside the entrance of Wallis Lake (NPWS, 2006).	Yes
Black-necked	Endangered	n/a	The Black-necked Stork is widely distributed	The Black-necked Stork is known to occur	Yes

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
Stork Ephippiorhynchus asiaticus			in northern Australia; however, this species is sparsely distributed in coastal eastern Australia from Queensland to southern NSW (NPWS, 2000). This species forages in wetlands, mangroves, swamps, mudflats, dry floodplains, irrigated land and occasionally open grassy woodland (NPWS, 2000; NPWS, 2005). The nest is a large flat pile of sticks, grass, and rushes place in a tree, usually near water (NPWS, 2000).	within Wallis Lake, and the saltmarsh and intertidal areas around the pipeline route represents potential foraging habitat for this species (NPWS, 2006).	
Sooty Oystercatcher Haematopus fuliginosus	Vulnerable	n/a	The Sooty Oystercatcher is distributed around the entire coastline and islands around Australia. Throughout its range, the Sooty Oystercatcher primarily occurs on rocky beaches, rocky shores, rocky headlands, rocky shelves and beaches, and offshore islands, and very rarely on sandy beaches and estuarine tidal flats (NPWS, 2000; Scodde & Tidemann, 1993). This species forages on exposed rock and coral at low tide for limpets, mussels, and crustaceans (NPWS, 2000). Nests are a shallow depression in sand above the high tide mark, or a cleft in rocks that may be built up with pebbles (NPWS, 2000; Scodde & Tidemann, 1993).	This species has been recorded within 3 km to the north east of the study area, however the study area and adjoining environs do not contain appropriate habitat for the Sooty Oystercatcher (NPWS, 2005x).	No

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
Pied Oystercatcher Haematopus longirostris	Vulnerable	n/a	The Pied Oystercatcher occurs around the entire coastline of Australia. Throughout its range, the Pied Oystercatcher favours beaches, intertidal flats and sand banks and occasionally rocky headlands (NPWS, 2000). Molluscs have been noted to be a staple food source, however, worms, crabs and small fish may be taken (NPWS, 2000; Scodde & Tidemann, 1993). Pied Oystercatchers primarily nest on coastal or estuarine beaches and occasionally use saltmarsh or grassy areas. Nests are shallow scrapes in the sand above the high tide mark or amongst low growth behind the beach (NPWS, 2000).	The Pied Oystercatcher is known to occur within Wallis Lake and the proposed dredge site is known habitat for the species.	Yes
Little Tern Sterna albifrons	Endangered	Migratory	The Little Tern occurs around the coast to Australia from mid WA, around northern and eastern Australia to the east coast of Tasmanian and around the Gulf of STR Vincent in SA (NPWS, 1999). Throughout its range, Little Terns prefer sheltered environments and are predominantly found in coastal waters, bays, shallow inlets, and salt or brackish lakes (NPWS, 1999, NPWS; 2000). Little Terns nest in small scattered colonies and nests are small scrapes,	The Little Tern is known to forage within Wallis Lake, and the study area contains potential foraging habitat for the species (NPWS, 2006).	Yes

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
			usually located on low dunes, or sandy beaches near the mouths of estuaries, or to adjacent coastal lakes and islands (NPWS, 1999; NPWS, 2000; Scodde & Tidemann, 1993). The Little Tern feeds upon small fish, crustaceans, insects, annelids and molluscs (NPWS, 1999).		
Regent Honeyeater Xanthomyza Phrygia	Endangered	Endangered and Migratory	The Regent Honeyeater is predominantly found along the western slopes of the Great Dividing Range, however it is often recorded along the eastern flank of this range. (Scodde & Tidemann, 1993; NPWS 1999; Environment Act, 2005). The Regent Honeyeater generally inhabits drier temperate woodlands and open forests with an abundance of nectar producing Eucalypts including Box-Ironbark woodland in the west and Eucalyptus robusta/Melaleuca quinquenervia forests on the coast (Environment ACT, 2005; NPWS, 2000). While nectar represents a major food source, insects, manna, lerps and fruit also comprise the diet of this species (NPWS, 1999; Scodde & Tidemann, 1993).	The Swamp Sclerophyll Forest represents potential habitat for the Regent Honeyeater. This species has been recorded within 15 km and is considered as likely to occur within the study area given this species high mobility and distribution, and occurrence of potential foraging habitat within the study area (NPWS, 2006).	Yes

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
Swift Parrot Lathamus discolor	Endangered	Endangered	The Swift Parrot breeds in Tasmania between spring and summer and migrate to the mainland during winter where they disperse widely across south eastern Australia (NPWS, 2000; Scodde & Tidemann, 1993). Swift parrots nest in tree hollows from a variety of Eucalypt species, and usually in old growth trees with a DBH of over 0.8 m. Swift Parrots forage in woodlands, riparian vegetation, and also remnant patches of mature eucalypts in agricultural areas where they feed on nectar and lerp and other insects from eucalypt foliage (NPWS, 2000; Swift Parrot Recovery Team, 2001). In coastal areas of northern NSW and southern Queensland, Swamp Mahogany, Spotted Gum and Red Bloodwood provide important nectar sources. This species has been also recorded on numerous occasions to be foraging amongst Blackbutts in the Wollongong area (Swift Parrot Recovery Team, 2001).	The Swamp Sclerophyll Forest contains potential habitat for the Swift Parrot. This species has been recorded within 15 km and is considered as likely to occur within the study area given this species high mobility and distribution, and occurrence of potential foraging habitat within the study area (NPWS, 2006).	Yes
Powerful Owl Ninox strenua	Vulnerable	n/a	The Powerful Owl is generally found on the east coast of Australia from south east Queensland through to south western	The study area and environs contains appropriate foraging habitat for the Powerful Owl. In addition, potential nesting	Yes

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
			Victoria (NPWS, 2005x). This species occurs in a range of habitats including open woodland, open forest, tall moist forest and rainforest (NPWS, 2000). The Powerful Owl has a very large home range of 800 to 1000 ha per breeding pair (NPWS, 2005). The Powerful Owl requires trees with large hollows that are at least 50 cm deep and 12 – 40 m above the ground (NPWS, 2000; Scodde & Tidemann, 1993). This species primarily preys upon terrestrial and arboreal mammals and birds; however, insects and flying foxes may be taken (NPWS, 1999; Scodde & Tidemann, 1993). Greater Gliders (Petauroides volans) and Possums have been noted as being an important food source (NPWS, 2000, Scodde & Tidemann, 1993; Hollands, 1991).	habitat occurs within the Swamp Sclerophyll forest adjoining the study area. The Powerful Owl has been recorded within 1 km of the study area and is therefore considered likely to occur within the study area and adjoining habitats (NPWS, 2006).	
Masked Owl Tyto novaehollandiae	Vulnerable	n/a	The Masked Owl is found around all coastal and subcoastal Australia (NPWS, 2000). The Masked Owl occurs in a range of habitats including dry eucalypt forest and woodlands, and commonly occurs on the fringes of urban bushland and farmland (NPWS, 2000; Hollands, 1991). Masked Owls have a large home range of between 800 and 1200 ha per	The study area and environs contains appropriate foraging habitat for the Masked Owl. In addition, potential nesting habitat occurs within the Swamp Sclerophyll forest adjoining the study area. The Masked Owl has been recorded within 1 km and is therefore considered likely to occur within the study area (NPWS, 2006).	Yes

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
			breeding pair (NPWS, 2005). The Masked Owl preys upon terrestrial and arboreal mammals, particularly rats (NPWS, 2000). The Masked Owl nests in hollow bearing trees located in tall living trees or stags (NPWS, 2005).		
Barking Owl Ninox connivens	Vulnerable	n/a	The Barking Owl can occur in a variety of habitats including eucalypt woodland, open forest, swamp woodlands and timber along water courses, however; the ideal habitat for the Barking Owl is open country with a good choice of large hollow trees for nesting. This species also has a distinct preference to be close water (Hollands, 1991; NPWS, 2000). Home ranges for this species may be between 30 and 200 hectares (NPWS, 2000; Schodde & Tidemann, 1993).	This species has been recorded approximately 8 km to the north west of the study area, however the study area and adjoining environs are not considered to represent suitable habitat for the Barking Owl (NPWS, 2006)	No
Eastern Grass Owl Tyto capensis	Vulnerable	n/a	The Eastern Grass Owl has been recorded in all mainland states of Australia, but are more commonly recorded in northern and north eastern Australia (NPWS, 2000). Eastern Grass Owls are mainly found in tall grass including tussock grasslands, grass tussocks in swampy areas, grassy plains, swamps, coastal dunes, cane grass and	The study area and environs contain appropriate foraging and breeding habitat for the Grass Owl. The Grass Owl has been recorded within 1 km and is therefore considered likely to occur within the study area and adjoining habitats (NPWS, 2006).	Yes

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
			other crops, tree lined creeks, and sedges on floodplains (NPWS, 2000; Garnett and Crowley, 2000). This species nests on the ground which may resemble a trampled platform in a large tussock or heavy growth (NPWS, 2000).		
Black-browed Albatross Thalassarche melanophris	Vulnerable	Vulnerable and Migratory	The Black-browed Albatross occurs around the world. In Australia, the Black-browed Albatross occurs along the east coast from Stradbroke Island, and south around the coast to Western Australia. This spends most of its time at sea and usually nests on small, vegetated sub-antarctic and antarctic islands (NPWS 1999). Feeds upon fish, crustaceans, offal and squid, but may also take refuse and carrion thrown out by sea vessels (NPWS, 1999; Scodde & Tidemann, 1993).	The Black-browed Albatross has been recorded within 3 km to the east of the study area (GLC, 2002). This species is primarily oceanic and is considered unlikely to utilise Wallis Lake. The Black-browed Albatross is therefore not considered as a Subject Species.	No
Gould's Petrel Pterodroma leucoptera leucoptera	Endangered	Endangered, Migratory	The Gould's Petrel is pelagic, recorded to predominantly forage within the Tasman Sea, feeding upon surface fish, squid and krill. This species has been observed to primarily breed on Cabbage tree Island which is located offshore from the entrance to Port Stephens (NPWS, 2000).	The Gould's Petrel has been recorded within 3 km to the east of the study area (GLC, 2002). This species is primarily oceanic and is considered unlikely to utilise Wallis Lake. The Gould's Petrel is therefore not considered as a Subject Species.	No

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
Latham's Snipe Gallinago hardwickii	Protected	Migratory	The Latham's Snipe primarily breeds in Japan and migrates to SE and NE Australia in summer. The Latham's Snipe typically occurs in low vegetation around wetlands in shallows, sedges, reeds, heaths, saltmarsh and irrigated crops (Morcombe, 2002).	The saltmarsh and intertidal areas within the study area represents potential habitat for the Latham's Snipe. This species has been recorded within the study area during previous surveys in the area (Cumberland Ecology, 2006).	Yes
White-bellied Sea-Eagle Haliaeetus leucogaster	Protected	Migratory	The White-bellied Sea-Eagle occurs through the coastline of Australia and lowland rivers and lakes. This species primarily forages over water, taking fish, tortoises, sea snakes, and waterfowl. This species occasionally forages on land taking carrion and rabbits.	The White-bellied Sea-Eagle is to known feed within Wallis Lake, and the stockpile site contains a small number of potential nest trees.	Yes
Eastern Pygmy-possum Cercartetus nanus	Vulnerable	n/a	The Eastern Pygmy-possum occurs in east coast of Australia from south east Queensland through to south eastern SA (NPWS, 2005). The Eastern Pygmy-possum can be found in rainforest, wet and dry sclerophyll forest, tree heath and teatree closed scrub (NPWS, 2005; Strahan, 1998). This species primarily feeds upon nectar and pollen from Banksias, Leptospermum, Eucalypts and Bottlebrushes, but may feed upon insects and soft fruits (Strahan, 1998; NPWS, 2005). The Eastern Pygmy-possum nests in a small spherical nest (60 mm	The study area and environs contain potential habitat for the Eastern Pygmy-possum, however no records occur in the locality. No areas of potential habitat is likely to be modified as a result of the proposal and therefore this species is not considered as a Subject species.	No

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
			diameter) made of shredded bark placed between the wood and bark of Eucalypts, in tree hollows, abandoned birds nests or in the forks of teatrees (Strahan, 1998).		
Spotted-tailed Quoll Dasyurus maculatus maculatus	Vulnerable	Endangered (SE Mainland)	The Spotted-tailed Quoll (Dasyurus maculatus maculatus) occurs along the east coast of Australia from south east Queensland to South Australia and Tasmania. Another sub-species Dasyurus maculatus gracilis occurs as a small isolated population in north Queensland (NPWS, 1999). The subspecies Dasyurus maculatus maculatus that occurs in mainland Australia is listed as an Endangered species under the EPBC act. The Spotted-tailed Quoll has been recorded in a wide range of habitat types including dry and moist sclerophyll forests and woodlands, rainforest, coastal heathland, and riparian forest. This species been occasionally sighted in treeless areas, rocky outcrops and grazing lands (NPWS, 1999; NPWS, 2000; Strahan, 1998). The Spotted-tailed Quoll shelters and dens in small caves, fallen logs with large hollows and tree hollows and may	The study area contains potential foraging habitat for the Spotted-tailed Quoll. The study area does not contain appropriate denning habitat for the species. This species has been recorded within 15 km to the south of the study area, however it is unlikely that this species would occur in the habitats that adjoin the study area as these records are located on the other side of Wallis Lake. Therefore, given the location of the nearest records of the species, and the small area of potential foraging habitat occurring in the study area, and that no potential denning habitat will be removed, the Spotted-tailed Quoll is not considered as a Subject Species for the proposal.	No

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
			utilise numerous dens within its home range which has been estimated to be between 800 ha to 20 km^2 (NPWS, 2000; NPWS in prep in NPWS, 1999). The Spotted-tailed Quoll is partly arboreal and feeds upon a variety of prey species including birds, rodents, lizards, small wallabies, and even insects. The Spotted-tailed Quoll is also known to scavenge and feed upon carrion, road kills including wild dogs, and litter (Strahan; 1998; NPWS; 2000).		
Brush-tailed Phascogale Phascogale tapoatafa	Vulnerable	n/a	The Brush-tailed Phascogale has a patchy distribution around the coast of mainland Australia (NPWS, 1999). The Brush-tailed Phascogale is a largely arboreal species that primarily occurs in dry forests and woodlands with a sparse ground cover of herbs, grasses shrubs and leaf litter (NPWS, 2000; NPWS, 1999). Males have a home range of up to 100 ha, while females occupy a home range of 20 to 60 ha (NPWS, 1999). This species feeds upon invertebrates such as spiders, beetles and cockroaches, and occasionally small vertebrates. Nectar from flowering	The study area and environs is known habitat for the Brush-tailed Phascogale (Cumberland Ecology, 2006).	Yes

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
			eucalypts is also an important dietary component (NPWS, 2000). The Brush-tailed Phascogale dens in hollow bearing trees and may utilise numerous hollows within its home range (NPWS, 2000; NPWS, 1999).		
Eastern Chestnut Mouse Pseudomys gracilicaudatus	Vulnerable	n/a	The Eastern Chestnut Mouse occurs from north eastern Queensland along the coast and ranges to central NSW (NPWS, 2000). In NSW, the Eastern Chestnut Mouse is more often found in heathland and is most common in wet heath and swampy areas, where it colonises regenerating areas of vegetation following a fire (Monamy and Fox, 2000). The Eastern Chestnut Mouse has been observed to reach maximum population density in heathland that is regenerating after fire (Strahan, 1998). Nests may be constructed of grass above ground, or be part of a burrow complex. Home ranges are generally less than 0.5 ha, however, some individuals have been known to move up to 250 m (Strahan, 1998; NPWS 2000).	The Swamp Sclerophyll Forest is considered to represent potential habitat for the Eastern Chestnut Mouse. The Eastern Chestnut Mouse has been recorded within 10 km to the south of the study area (NPWS, 2006).	Yes
Squirrel Glider Petaurus norfolcensis	Vulnerable	n/a	The Squirrel Glider is distributed in eastern Australia from northern Queensland, through eastern NSW to Victoria (NPWS, 2000). The	The study area and environs is known habitat for the Squirrel Glider (Cumberland Ecology, 2006).	Yes

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
			Squirrel Glider occurs in dry sclerophyll forest and woodland (Strahan, 1998). This species feeds upon nectar, pollen, flowers, insects, and sap of particular eucalypts (Strahan, 1998; NPWS, 1999). The Squirrel Glider dens in hollow bearing trees, and often dens in family groups (Strahan, 1998; NPWS, 2000). Home ranges have been estimated as between 0.65 to 8.55 ha, with movements tending to be greater for males (NPWS, 1999).		
Koala Phascolarctos cinereus	Vulnerable	n/a	The Koala occurs in eucalypt woodlands and forests throughout eastern Australia (NPWS, 2000). The Koala feeds almost exclusively on the foliage of particular eucalypts, and may prefer certain species within any local or regional area (Strahan, 1998; Callaghan et al, 2002).	The Swamp Sclerophyll Forest within and adjoining study area contains eucalypt species including Swamp Mahogany (Eucalyptus robusta) and Blackbutt (E. pilularis), and therefore contains suitable feed trees for the Koala. The Koala has been recorded within 2 km of the study area and is therefore likely to occur within the study area and adjoining habitats (NPWS, 2006).	Yes
Long-nosed Potoroo Potorous tridactylus	Vulnerable	Vulnerable (SE mainland)	The Long-nosed Potoroo occurs in a variety of habitats including subtropical and warm temperate rainforest, moist and dry forests, and coastal heathland (NPWS, 2005; NPWS,	The study area and environs contain a small area of potential habitat for the Long-nosed Potoroo. Despite this, given the nearest records of the species are over 30	No

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
tridactylus			2000; EPA, 2005; Strahan 1998). All vegetation types where this species has been recorded have a dense lower stratum with occasional open areas. The lower stratum may be comprised of grasses, vines, shrubs, sedges, or ferns, or a combination all these undercover vegetation types (NPWS, 2005; NPWS, 2000; EPA, 2005; Strahan 1998). In addition, the Long-nosed Potoroo is more often found in higher densities where the soil is a light sandy loam which is most likely associated with easier digging in such soil types (NPWS, 2000; EPA, 2005; Strahan 1998). The Long-nosed Potoroo forages for roots, tubers, fungi, fruit, insects, seeds; insect larvae, and other soft bodied soil biota (NPWS, 2000; EPA, 2005; Strahan 1998). The Long-nosed Potoroo sleeps during the day in nests made of grass and other vegetation that are placed below dense scrub, grass tussocks or grass trees (NPWS, 2005). Home ranges have been noted to be between 2 – 10 hectares (NPWS, 2005; NPWS, 2000).	km away, and the small area of potential habitat occurring in the study area, the Long-nosed Potoroo is not considered as a Subject species for the proposal.	
Grey-headed Flying-fox	Vulnerable	Vulnerable	The Grey-headed Flying-fox occurs in a range of habitats including subtropical and	The Grey-headed Flying-fox was observed within the study area during the surveys,	Yes

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
Pteropus poliocephalus			temperate rainforests, dry and wet sclerophyll forests, Banksia woodland, heaths and Melaleuca swamps (Duncan et al, 1999; NPWS, 2001). The Grey-headed Flying-fox is a frugivorous and nectivorous species that feeds upon a variety of flowering and fruiting plants, feeding upon the blossoms of Eucalypts, Angophoras, Tea-trees, and Banksias, and the fruits of figs and palms (Strahan, 1998). This species may travel hundreds of kilometres in response to food availability, and may often feed upon orchids and trees in urban gardens (NPWS, 2001). The Grey-headed Flying-fox roosts in large colonies of up the tens of thousands, often known as 'camps'. The camps are generally located within 20 km of a regular food source, and often situated in the exposed branches of emergent tree within riparian rainforest, and Paperbark or Casuarina Forest (Duncan et al, 1999; NPWS, 2001).	and there are numerous records of this species within the locality (NPWS, 2006).	
Common Blossom-bat Syconycteris australis	Vulnerable	n/a	The Common Blossom-bat occurs in coastal areas of north eastern NSW and eastern Qld (NPWS, 2000; Strahan, 1998). The Common Blossom-bat usually roosts in rainforest and	The study area and environs, particularly the Swamp Sclerophyll Forest, contains potential foraging habitat for the Common Blossom-bat. This species may roost in	Yes

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
			feeds upon nectar and pollen in adjacent heathland and paperbark swamps (NPWS, 2000).	Swamp Sclerophyll Forest, however this is not typical roosting habitat. This species has been recorded within 1 km of the study area and is therefore considered likely occur within the study area and adjoining habitats (Kendall and Kendall, 2000 in de Groot & Benson Pty Ltd, 2003).	
Eastern Freetail-bat Mormopterus norfolkensis	Vulnerable	n/a	The Eastern Freetail-bat occurs on the mid coast of NSW to south eastern Queensland (NPWS, 2000). While little is known about the biology of this species, the Eastern Freetail-bat has been mostly recorded in drier forest types east of the Great Dividing Range such as dry sclerophyll forest, woodland and coastal dune vegetation (NPWS, 2005). In addition, the Eastern Freetail-bat has been recorded to roost in tree hollows and also under bark and man made structures (Strahan, 1998; NPWS, 2005; DEC, 2005).	The Eastern Freetail-bat was detected within the study area during the surveys.	Yes
Yellow-bellied Sheathtail-bat Saccolaimus flaviventris	Vulnerable	n/a	The Yellow-bellied Sheathtail-bat occurs across northern Australia, north of the Tropic of Capricorn, extending south through eastern NSW to Victoria and SA. There are only a few scattered records of this species	The study area and environs contains potential foraging habitat for the Yellow-bellied Sheathtail-bat. In addition, potential roosting habitat occurs within the Swamp Sclerophyll Forest adjoining the study area.	Yes

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
			in NSW (NPWS, 2000). The Yellow-bellied Sheathtail-bat occurs in a wide range of habitats, and primarily roost in tree hollows, however is known to roost in abandoned Sugar Glider nests and have also been observed roosting on the walls of buildings in broad daylight (Churchill, 1998; Strahan, 1998).	While the nearest record of this species is over 35 km away, this species is considered as likely to occur within the study area given this species high mobility and distribution (NPWS, 2006). In addition, this species has been tentatively identified within the study area by analysis of Anabat data (Cumberland Ecology, 2006)	
Greater Broad-nosed Bat Scoteanax rueppelli	Vulnerable	n/a	The Greater Broad-nosed Bat occurs along the coast and coastal ranges of eastern Australia from north Queensland to southern NSW (NPWS, 2000; Duncan et al., 1999). The Greater Broad-nosed Bat occurs in a variety of habitats from woodland, moist and dry eucalypts forest and rainforest (NPWS, 2000; Duncan, 1999). This species feeds upon large flying insects, and is also known to feed upon other species of bats (NPWS, 2000; Strahan, 1998). While little is known about breeding habitat for this species, the Greater Broad-nosed Bat has been found roosting in tree hollows, cracks and fissures in the trunk and boughs of stags, under exfoliating bark, and roof spaces of buildings (Duncan et al., 1999; Strahan, 1998).	The study area and environs contains potential foraging habitat for the Greater Broad-nosed Bat. In addition, potential roosting habitat occurs within the Swamp Sclerophyll Forest adjoining the study area. This species has been recorded within 1 km of the study area and is therefore considered likely to occur within the study area and adjoining habitats (GLC, 2002).	Yes

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
Southern Myotis Myotis macropus	Vulnerable	n/a	The Southern Myotis is thought to have occurred along the east coast of Australia from south east Queensland to Victoria and South Australia, and also along inland waterways of the Murray and Darling River Systems (Duncan et al., 1999). This species are often found roosting near bodies of still or slowly moving water where they almost exclusively forage, catching aquatic insects and small fish by raking the surface with its specialised and relatively large claws (NPWS, 2000; Strahan, 1998; Duncan et al., 1999). This species roosts in colonies that may occur in tree hollows, caves, mines, tunnels, dense vegetation, and disused birds nests, or underneath bridges and buildings (NPWS, 2000; Duncan, 1999).	The study area and environs contains potential foraging habitat for the Southern Myotis. In addition, potential roosting habitat occurs within the Swamp Sclerophyll Forest adjoining the study area. This species has been recorded within 5 km of the study area and is therefore likely to occur within the study area and adjoining habitats (NPWS, 2006).	Yes
Little Bentwing-bat Miniopterus australis	Vulnerable	n/a	The Little Bentwing-bat occurs along the east coast of Australia from north eastern Queensland to the central coast of NSW (NPWS, 2000; NPWS, 2005). This species has been noted to predominantly forage between the canopy and the understorey within well timbered habitats including moist and dry sclerophyll forest, rainforest, Melaleuca swamps, dense coastal banksias	The study area and environs contains potential foraging habitat for the Little Bentwing-bat. This species has been recorded within 4 km of the study area and is therefore likely to occur within the study area and adjoining habitats (NPWS, 2006).	Yes

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
			(Strahan, 1998; NPWS, 2005; NPWS, 2000). This species roosts in colonies, primarily roosting in caves and tunnels, often sharing the roost with the Eastern Bentwing-bat (NPWS, 2005; NPWS, 2000; Strahan, 1998).		
Eastern Bentwing-bat Miniopterus schreibersii oceansis	Vulnerable	n/a	The Eastern Bentwing-bat occurs in eastern Australia from north Queensland to far south east SA In NSW they are found along the coast and western slopes, including high elevations of the Great Dividing Range (NPWS, 2000). This species predominantly forages above the tree canopy in well timbered valleys occurring in a range of forest and woodland types (Strahan, 1998; NPWS, 2000). This species roosts in colonies, roosting in caves, tunnels, and closed stormwater drains, and often shares the roost with the Little Bentwing-bat (NPWS, 2005; NPWS, 2000; Strahan, 1998).	The study area and environs contains potential foraging habitat for the Eastern Bentwing-bat. This species has been recorded within 5 km of the study area and is therefore likely to occur within the study area and adjoining habitats (NPWS, 2006).	Yes
Leathery Turtle Dermochelys coriacea	Vulnerable	Vulnerable and Migratory	The Leathery Turtle occurs in all coastal waters of Australia, with most sightings in temperate waters (Cogger, 2000). This species mostly feeds gelatinous organisms such as jellyfish, squid, salps, and siphonophores (DEH, 2005). Most of the	The estuarine environment of the study area is not considered to represent suitable habitat for the Leathery Turtle as this species is primarily oceanic. This species is not considered as a Subject species for the proposed development.	No

Table 3.5 - Threatened and Significant Fauna (TSC Act and EPBC Act) Recorded Within the Locality* and determination of Subject Species for the Proposal

Common Name and Species Name	Status		General Habitat Requirements and Behaviour	Likelihood of occurrence on the Study Area and Adjoining Habitats	Subject Species
	TSC Act	EPBC Act			
			nesting in Australia appears to be low density and there are no major nest sites recorded in Australia. Although nesting is mostly confined to tropical beaches, there are records of nests in northern NSW. (DEH, 2005; Cogger et al., 1993).		
Green Turtle Chelonia mydas	Vulnerable	Vulnerable and Migratory	The Green Turtle has been recorded in coastal waters of all Australian states; however, this species predominantly occurs in tropical and subtropical waters, with some individuals straying into temperate waters, including coastal waters of NSW north coast (Cogger et al., 1993; NPWS, 2000). The Green Turtle primarily feeds upon seagrass and algae, and may also consume fish egg cases, jellyfish and sponges (DEH, 2005, NPWS, 2000).	The Green Turtle is known to occur within Wallis Lake and therefore the proposed dredge site contains potential habitat for this species (GLC, 2002; NPWS, 2006).	Yes

Key: * - Locality is defined as within a 10 km radius of the study area

NPWS – National Parks and Wildlife Service, (2006). Atlas of NSW Wildlife

Geolyse – Geolyse Pty Ltd.

GLC– Great Lakes Council, (2002). Draft Forster/Tuncurry Conservation & Development Strategy.

Table 3.6 - Subject Species and Subject Ecological Communities

Common Name	Species name
Wallum Froglet	*Crinia tinnula*
Square-tailed Kite	*Lophoictinia isura*
Osprey	*Pandion haliaetus*
Australasian Bittern	*Botaurus poicilotilus*
Black Bittern	*Ixobrychus flavicollis*
Black-necked Stork	*Ephippiorhynchus asiaticus*
Pied Oystercatcher	*Haematopus longirostris*
Little Tern	*Sterna albifrons*
Regent Honeyeater	*Xanthomyza Phrygia*
Swift Parrot	*Lathamus discolor*
Lesser Sand Plover	*Charadrius mongolus*
Terek Sandpiper	*Xenus cinereus*
Black-tailed Godwit	*Limosa limosa*
Powerful Owl	*Ninox strenua*
Masked Owl	*Tyto novaehollandiae*
Eastern Grass Owl	*Tyto capensis*
Latham's Snipe	*Gallinago hardwickii*
White-bellied Sea-eagle	*Haliaeetus leucogaster*
Brush-tailed Phascogale	*Phascogale tapoatafa*
Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*
Squirrel Glider	*Petaurus norfolcensis*
Koala	*Phascolarctos cinereus*
Grey-headed Flying-fox	*Pteropus poliocephalus*
Common Blossom-bat	*Syconycteris australis*
Eastern Freetail-bat	*Mormopterus norfolkensis*

Table 3.6 - Subject Species and Subject Ecological Communities

Common Name	Species name
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*
Greater Broad-nosed Bat	*Scoteanax rueppelli*
Southern Myotis	*Myotis macropus*
Little Bentwing-bat	*Miniopterus australis*
Eastern Bentwing-bat	*Miniopterus schreibersii oceansis*
Green Turtle	*Chelonia mydas*
EECs	
Coastal Floodplain Swamp Oak Forest	
Coastal Floodplain Swamp Sclerophyll Forest	
Coastal Saltmarsh	
Flora	
Trailing Woodruff	*Asperula asthenes*
Noah's False Chickweed	*Lindernia alsinoides*

Discussion of Potential Impacts

4.1 FLORA

4.1.1 VEGETATION REMOVAL

The proposal will require minimal native vegetation removal, given that the majority of the proposed dredge pipeline route and stockpile site are cleared of native vegetation. Where the proposed dredge pipeline traverses through Saltmarsh and Swamp Sclerophyll Forest habitat (SEPP 14 wetland) for a distance of 75 m (**Figure 4.1**), the pipeline will be placed directly on the ground and pulled through the habitat via a winching process.

While this will not require any vegetation removal, some vegetation may be disturbed temporarily by this process. Given the temporary nature of the disturbance of the placement of the pipeline and the very small length (75 m) within this section of the SEPP 14 wetland, it is considered that the level of impact to this vegetation will be minimal and is acceptable in the context of the total area of this type of vegetation in the vicinity of the site and within the SEPP 14 wetland.

The only vegetation that will require removal is a 0.5 hectare area of highly modified swamp sclerophyll forest (Vegetation community no. 2 - *E. robusta – M. quinquenervia* Freshwater Swamp Forest) (**Figure 5.1**) within the areas proposed for settlement ponds no's 2 and 3 at the stockpile site. This area supports two distinct disturbance ecotypes of this vegetation community no. 2, these being an Exotic Pasture Grassland-Sedgeland with scattered juvenile trees and a Low Woodland. These areas are subject to continued and repeated disturbance through grazing and/or slashing and are heavily invaded with herbaceous and woody weeds in places.

The loss of these two disturbance Swamp Sclerophyll ecotypes is not considered to be significant, given the degree of their disturbance, small size and extant areas of relatively undisturbed freshwater Swamp Sclerophyll Forest habitat present in the immediate locality.

4.1.2 SOIL COMPACTION

The majority of the pipeline route through the SEPP 14 wetland is in a cleared horse track area and along cleared property boundary/fenceline alignments.

Where the pipelines traverse vegetated areas in the SEPP 14 wetland (approx. 100 m), the weight of the proposed dredge and return pipelines (carrying the slurry) on the muddy estuarine sediments and sand substrates would be expected, over time, to result in some degree of soil compaction and ultimately plant damage and death in the saltmarsh and swamp sclerophyll forest (SEEP 14 wetland) habitats. The potential for soil compaction is not considered to be significant given the localised nature of the disturbance (restricted to the narrow pipeline 'easement') and the extant areas of relatively undisturbed saltmarsh and swamp sclerophyll forested habitats in the immediate locality. The amount of saltmarsh that would be subject to compaction would be minimised (approx. 100 metres long and 1 metre wide) through the strategic placement of the proposed dredge pipeline within the horse trail that

runs along the majority of the length of saltmarsh habitat. The horse trail is essentially comprised of an area of bare mudflat subject to previous soil compaction.

Management measures are recommended in **Section 5** of this report to mitigate against any potential adverse impacts to the Saltmarsh and Swamp Sclerophyll Forested habitats.

4.1.3 ALTERED HYDROLOGICAL REGIMES

The proposed dredge and return pipelines will not act as a barrier to tidal inundation of the area, as tidal inundation will occur either side of the dredge pipeline. Consequently there will be no adverse impacts to the Saltmarsh and Swamp Sclerophyll Forest habitats.

4.1.4 INCREASED HUMAN ACTIVITY

The proposal would result in increased human activity within the Saltmarsh and Swamp Sclerophyll Forest habitats recorded within the study area during all phases of the project (commissioning, maintenance, decommissioning, restoration/rehabilitation). Increased human activity, particularly within the relatively undisturbed habitats, has the potential to trample and kill plants, compact soil and disperse weeds.

To minimise the potential for adverse impacts on flora habitats recorded, the proposal would minimise the need for vehicles within the relatively undisturbed Saltmarsh and Swamp Sclerophyll Habitats and would essentially rely upon foot traverses only (2 person teams) in these sensitive areas. The commissioning of the proposed pipelines has also been strategically designed to minimise the need for foot traverses through the small section (75 m) of uncleared SEPP 14 wetland (Swamp Sclerophyll Forest habitat) via a winching system and use of a continuous pipe length with no joins.

Additional management measures (*eg*. weed control) are recommended in **Section 5** of this report to mitigate against potential adverse impacts to the Saltmarsh and Swamp Sclerophyll Forest habitats as a result of increased human activity.

4.1.5 PIPELINE/SETTLEMENT POND LEAKAGE AND SPILLS

The proposal has the potential to result in the release of the estuarine sand/seawater slurry into Saltmarsh and Swamp Sclerophyll Forest habitats from possible pipe burst, join leaks and settlement pond overflow. It is stressed that this is highly unlikely, given the range of controls and safeguards that will be in place, including the use of new pipe and flange joiners, regular pipeline inspections and the excess pressure capacity of the pipe relative to the pumps outputs. Notwithstanding, the deposition of slurry into these habitats could result in the damage or death of plants from both smothering and an increase in salinity.

The proposed dredge pipeline has been strategically designed to avoid the need for jointed segments within the small area of uncleared SEPP 14 wetland habitat which would eliminate the likelihood of join leakage in this area.

Additional measures are recommended in **Section 5** of this report to minimise impacts on flora habitats from a leak or spill.

4.1.6 FLORA IMPACTS SUMMARY

Potential impacts on the three (3) EECs and two (2) plant taxa predicted to occur (though not recorded) within the study area have been assessed under Section 5A of the NSW *EP&A Act 1979* (**Appendix C3**), which determined that due to the limited clearing and proposed management procedures that the proposal will not have a significant impact on Threatened flora or Endangered occurring in the study area.

4.2 FAUNA HABITATS

4.2.1 GENERAL IMPACTS

The potential impact upon fauna and their habitat as a result of proposed development is considered to be low. No clearing will be required for the placement of the pipes and only a small number of sapplings (28) and mature trees (31) will be removed for the creation of the stockpile site. The trees proposed to be removed provide a very small amount of potential foraging resources for fauna known to occur or considered potentially occurring in the study area and locality.

The proposed clearing will reduce the availability of potential nesting habitat for some bird species. Despite this, the amount of potential nesting, denning, or roosting habitat proposed to be removed is considered negligible when compared to the available habitats in the adjoining Swamp Sclerophyll Forest and the locality in general.

There is the potential for injury or mortality to fauna that may be utilising the trees at the time of clearing. Despite this, the potential risk to fauna as a result of the clearing activity is considered to be low, given the limited number the limited number of trees or hollow resources to be removed. Mitigation measures provided in **Section 5** would reduce the potential impact to fauna during the clearing activity.

The existing artificially created pond area at the stockpile site will be removed for the creation of settling pond 1, however, this pond provides limited habitat for fauna. Notwithstanding, the settling ponds created at the proposed stockpile site would represent a larger area and quality of habitat once established.

Limited habitat resources are available along the cleared areas of the pipeline route, with impacts localised to disturbances to regenerating vegetation as a result of the installation and maintenance of the pipelines. These disturbances are unlikely to cause a significant impact to any species or their habitat and will be limited to the initial installation and foot traffic around the pipes from ongoing maintenance checks.

No clearing will occur for the 75 m section of pipeline proposed to be located through the uncleared section of SEPP 14 wetland. A small amount of ground cover vegetation in this wetland is, however, likely to be disturbed during the installation and routine checks of the pipes as discussed previously.

The stockpile site and some areas of the pipeline route currently contain a number of exotic perennial grass species including *Andropogon virginicus*, and *Setaria* sp. It is unlikely that the operations on the stockpile site and placement or operation of the pipeline will increase the amount of weeds occurring in the study area. The proposed maintenance of the pipeline may contribute weed invasion, however this would not be expected to be significant in these habitats. Weed management will be detailed in the overall Environmental Management Strategy for the project.

The proposed dredge area will remove up to 8 ha of sand flats of which, it is estimated that 7 ha of this area would be suitable for foraging for Waders and Shorebirds at low tide. The remaining area is unlikely to be utilised due to the depth of water covering this areas at low tide. During high tide the proposed dredge area may be used by other bird species such as the Little Tern or Osprey for fishing purposes however the dredging activity would only result in the modification of habitat, creating a deeper water hunting area for these species. This increase in the depth of water may also provide additional habitat for the Green Turtle.

4.2.2 FAUNA MOVEMENT

The pipes will be elevated slightly in sections to allow passage beneath in known Wallum Froglet habitat and also at sections surrounded by potential habitat for the Eastern Chestnut Mouse in the Swamp Sclerophyll Forest. The pipes would therefore not create a barrier to smaller fauna such as amphibians and rodents. The pipes are unlikely to create a barrier to larger terrestrial fauna such as the Koala and gilder species.

Mitigation Measures

5.1 MITIGATION MEASURES

5.1.1 FLORA

The following measures are recommended to minimise or mitigate potential impacts on flora habitats recorded within the study area:

- A vegetation monitoring program shall be established comprising a quarterly visual assessment of site vegetation (in part using comparison with data obtained from existing baseline plots) by a suitably qualified botanist to assess impacts on flora within the study area during all phases of the project. The survey and assessment shall document any changes that have occurred to vegetative structure, floristics, degree of disturbance and would note any changes in species and community distribution, abundance, health and vigour using existing baseline plot data and additional plot data where required. A quarterly report would be prepared as part of the program detailing monitoring methodology and results and would provide recommendations for adaptive management to minimise impacts where required.
- The area of Saltmarsh disturbed by the pipeline would be subject to restoration/rehabilitation works to facilitate a return to its former status following decommissioning of the pipeline. The works are likely to include the re-establishment/preparation of the topsoil layer and revegetation. Natural regeneration from local provenance and resprouters would also augment assisted rehabilitation over time. Specific and quantitative benchmarks would be established to enable an accurate assessment of the success of the restoration/rehabilitation;
- Geotextile or sediment control fabric aprons (*eg*. 2 m x 2 m) would be used underneath all pipeline joins within the Saltmarsh and along the cleared property boundary lines fringing the Swamp Sclerophyll Forest habitats west of the proposed stockpile site to facilitate sediment clean-up should a join leak occur. The aprons may result in some localised Saltmarsh plant damage and death due to smothering and absence of light, but would potentially protect adjoining Saltmarsh habitat in the unlikely event of a pipe leak. The aprons have also been shown in similar projects to result in far less arduous, manually intensive clean up tasks in these sensitive environments in the event of a spill (I. Mamott, *pers. obs*.). At this stage, it is not proposed to place any aprons within the SEPP 14 wetland (Swamp Sclerophyll Forest habitat) given the absence of pipe joins through this habitat (very low likelihood of pipe leak/burst). Further, procedures for clean up would be detailed in the Pipeline Management Plan which would form part of he EMS for the project; and
- A hygiene protocol for plant, vehicle and personnel would be established to minimise weed seed dispersal onto and off the site. The protocol would be detailed in the EMS for the project.

The above measures would be prepared by a suitably qualified botanist/ecologist and incorporated into an Environmental Management Strategy for the project.

5.1.2 FAUNA

While the potential impacts to fauna are considered to be low, the following mitigation measures have been formulated to reduce potential impacts of the proposed development.

Clearing Activity

The following mitigation measures aim to reduce the potential impact on fauna during the clearing operations.

Pre-clearing Surveys

It is recommended that pre-clearing surveys are undertaken to ensure that if any hollow-bearing trees are to be removed from the stockpile area that they are not being utilised by fauna including microchiropteran bats and arboreal mammals prior to clearing.

The pre-clearing surveys should include the use of an Anabat system on at least two nights to detect microchiropteran bats that may occur within any hollow-bearing trees at the time of clearing. The felling of any trees identified to contain a maternal colony of microchiropteran bats is to be postponed until the colony has vacated the hollow.

Clearing Supervision

Clearing supervision should be undertaken to minimise the potential impact on fauna during clearing activity. Any hollow-bearing trees required to be removed should be checked for injured wildlife upon felling. Any likely Koala feed trees required to be removed should be inspected on the morning of felling to check for Koalas that may have moved to a tree within the clearing area overnight.

Where possible, any injured fauna should be captured and taken to a local wildlife carer.

Operation of the Pipeline

The following mitigation measures aim to reduce the potential impact on fauna by the installation, operation and maintenance of the pipeline.

Raised sections of Pipeline.

The pipelines will need to be elevated slightly (10 – 15 cm) in the areas where the route traverses known and potential Wallum Froglet habitat and potential habitat for the Eastern Chestnut Mouse. The pipe should be elevated on timber blocks and be spaced approximately 15 m apart in these areas.

The raised areas should be checked during routine inspections of the pipe to ensure that a suitable gap is maintained for fauna movement underneath.

Minimal traverse of uncleared SEPP 14 area

As no joins will located along the section of pipes through the uncleared section of SEPP 14 wetland, it is recommended that the routine checks through this area be minimised, although they are not expected to be required as often as other sections of the pipe. This would reduce the potential impact of pipeline maintenance upon the SEPP 14 habitats (*eg.* through trampling underfoot and potential importation of weed seed).

Conclusions

6.1 CONCLUSION

With respect to the limited impacts associated with the proposed development and mitigation measures, it is considered that the proposal will not have a significant impact on Threatened species, populations or ecological communities or their habitats within the locality.

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Appendix C1

FLORISTIC LIST

Appendix C2

FAUNA SPECIES LIST

Appendix C3

SECTION 5A ASSESSMENT

Appendix C4

EPBC ACT ASSESSMENT