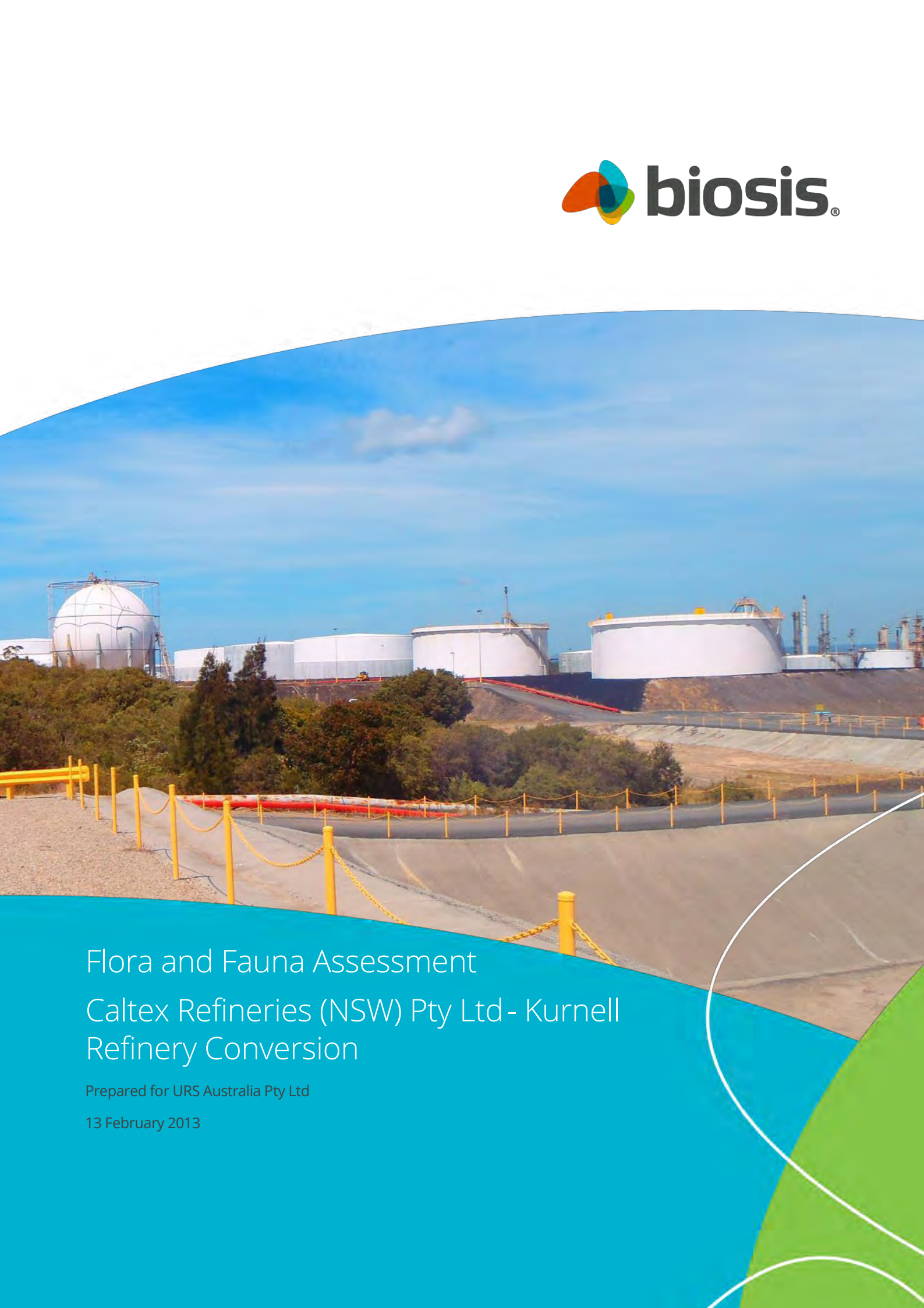


## Ecology Impact Assessment



# Flora and Fauna Assessment Caltex Refineries (NSW) Pty Ltd - Kurnell Refinery Conversion

Prepared for URS Australia Pty Ltd

13 February 2013

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- James Shenherd, GIS mapping

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## Summary

Biosis Pty Ltd was commissioned by URS Australia Pty Ltd to undertake a flora and fauna assessment at the Kurnell Refinery (the site) within an area of land proposed for modifications to the existing operations, with the aim to convert the Kurnell Refinery to a working finished product terminal (the Project). The project description, describing works can be found in Chapter 4 of the Environmental Impact Statement.

The Project Area (Figure 1) is located at Kurnell Peninsula within the Sutherland Shire Local Government Area (LGA), approximately 15km south of Sydney's CBD and is bounded by other parts of the Kurnell Refinery, Botany Bay National Park, residential areas, light industrial areas and roads.

### Ecological values

The Project Area within the site was identified as being highly disturbed with minimal areas for flora and fauna habitation, foraging and usage. The site has been active since 1953 as a refinery and includes an amalgamation of hundreds of tanks of all shapes and sizes, which store a range of petroleum based products. Between the tank areas the majority of the land is hard stand, non-permeable road networks, workshops, car parks and buildings. Presence of flora, fauna and general habitat for ecology is lacking in most parts. However ecological values identified within the Project Area include:

- 0.6 hectares (ha) of native 'planted/regenerated' vegetation in the north-east corner;
- 0.55 ha of native vegetation, classed as disturbed *Coastal Sand Apple-Bloodwood Forest*, at the mid point of the eastern boundary of the Project Area;
- Potential dispersal habitat for the threatened Green and Golden Bell Frog and Wallum Froglet; and
- Perch points for large birds on the built infrastructure within the Project Area.

### Government legislation and policy

An assessment of the Project against key biodiversity related legislation and policy is provided and summarised below (Table 1).

**Table 1: Project Related Legislation Assessment**

Legislation / Policy	Relevant ecological feature on site	Permit / Approval required	Notes
<b>Environment Protection Biodiversity Conservation Act 1999 (EPBC Act)</b>	No EPBC Act listed matters found within the site	No	N/A
<b>EPBC Act listed Key threatening processes potentially triggered</b>	Anthropogenic climate change	No	N/A
<b>Threatened Species Conservation Act 1995 (TSC Act)</b>	No TSC Act listed matters found within the site	No	N/A
<b>TSC Act listed Key threatening processes potentially triggered</b>	Invasion of native plant communities by <i>Chrysanthemoides</i>	No	N/A

Legislation / Policy	Relevant ecological feature on site	Permit / Approval required	Notes
	<i>monilifera</i> (bitou bush and boneseed); Invasion and establishment of exotic vines and scramblers; and, Anthropogenic climate change		
<b>Fisheries Management Act 1994 (FM Act)</b>	No FM Act listed matters found within the site	No	N/A
<b>Environmental Planning &amp; Assessment Act 1979 (EP&amp;A Act)</b>	Potential Green and Golden Bell Frog and Wallum Froglet dispersal habitat	Overall Project Approval required under Part 4, project constitutes State Significant Development (SSD)	Assessments prepared for these species (Appendix 4 & 5) conclude that a significant impact as a result of the proposal is unlikely
<b>Native Vegetation Act 1993 (NV Act)</b>	No removal of native vegetation required	No	N/A
<b>National Parks and Wildlife Act, 1974 (NPWS Act)</b>	No removal of threatened species habitat.	No	N/A
<b>Noxious Weeds Act 1993 (NW Act)</b>	Noxious weeds	No	Duty to control noxious weeds as per NW Act control requirements for each noxious weed found on site
<b>State Environmental Planning Policy No. 14 – Coastal Wetlands (SEPP 14)</b>	No SEPP 14 coastal wetlands on site, nor in the vicinity or storm water discharge areas.	No	N/A
<b>State Environmental Planning Policy (Kurnell Peninsula)</b>	Project would continue the use of the land as a liquid fuel depot, the Project is deemed permissible under the land use zones in this SEPP.  Key objective of the SEPP is to ' <i>conserve the natural environment of the Kurnell Peninsula and ensure that development is managed having regard to the environmental, cultural and economic significance of the area to the nation,</i>	No	N/A



Legislation / Policy	Relevant ecological feature on site	Permit / Approval required	Notes
	<i>State, region and locality.</i>  This report and the EIS outline how the Project has achieved this objective.		
<b>State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44)</b>	No Koala habitat found on site	No	N/A
<b>State Environmental Planning Policy No. 62 – Sustainable Aquaculture (SEPP 62)</b>	There are no expected impacts on water quality in Botany Bay as a result of the Project likely to adversely affect the local aquaculture industry.  Refer to Appendix D Human Health and Ecological Risk Assessment of the EIS for an assessment of off site impacts.	No	N/A
<b>State Environmental Planning Policy No. 71 – Coastal Protection (SEPP 71)</b>	SEPP 71 is not directly relevant to the Project, however the EIS includes reference to this SEPP to ensure that the coastal zone is managed in accordance with the principles of ecologically sustainable development.	No	N/A

## Recommendations

The primary measure for the Project to avoid impacts to ecological values on the site is to ensure there is no clearance to the 1.15 Ha of above listed vegetation areas. It was advised by Caltex staff that these areas are set for retention and would not be impacted.

No disturbance to tall tower infrastructure (Refinery infrastructure or redundant tanks) is proposed as part of the Project. Any future dismantling should consider the loss of these potential perch sites for large birds including the threatened Osprey.

Stop work procedure on the chance encounter of any dispersing frogs during works, should be implemented to avoid death or injury to frogs dispersing across the Project Area. Should threatened frogs, Green and Golden Bell

Frog or Wallum Froglet be identified, active searching should be undertaken by a qualified zoologist experienced in the identification and management of the Green and Golden Bell Frog and Wallum Froglet.

When open trenching/digging/excavating, Caltex should ensure that trenches/holes are not left open overnight. This should be vigilantly maintained all seasons of the year given the active season for the Green and Golden Bell Frog extends from September to April and the Wallum Froglet peak activity period occurs during the colder months. Trenches should be either back-filled daily or covered with metal plates and gaps filled. All trenches should be inspected prior to works each morning. Any frogs that become trapped within trenches should be assessed by a suitably qualified ecologist or veterinarian and then released into the nearest suitable habitat if uninjured.

All construction workers on site should be provided with threatened frog species information sheets attached in Appendix 6.

Caltex should establish controls for the three Class 4 noxious weeds, listed by NSW DPI for the Sutherland Shire Council listed under the *Noxious Weed Act 1993* (NW Act). Control of Class 4 noxious weeds to include:

- *'the growth of the plant must be managed in a manner that reduces its numbers, spread and incidence and continuously inhibits its reproduction.'*

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# 1. Introduction

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## 1.1 Project background

Biosis Pty Ltd was commissioned by URS Australia Pty Ltd (URS) to undertake a flora and fauna assessment of the Kurnell Refinery for Caltex Refineries (NSW) Pty Ltd (hereafter referred to as Caltex).

It is understood that the proposed works involve the conversion of the site to a finished fuel terminal facility (the Project). As the Project meets the criteria to be assessed as State Significant Development (SSD) and would be subject to the requirements of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), an Environmental Assessment is required to be undertaken in order to develop a Environmental Impact Statement (EIS).

## 1.2 Scope of assessment

The objectives of this flora and fauna assessment are to:

- Determine ecological impacts or risks that may result due to the proposed Project;
- Undertake background research to determine the likelihood for NSW and/or Commonwealth threatened biota to be present onsite;
- Describe the flora and fauna present within the Project Area and understand its general condition;
- Map native vegetation and other habitat features within the Project Area (rocky outcrops, noxious weeds, water bodies, hollow-bearing trees, etc.);
- Determine presence or absence of threatened NSW and Commonwealth listed threatened biota, listed under the TSC Act, FM Act or EPBC Act considered with the potential to occur. From prior site/area experience the target species will likely include threatened flora, frogs and birds;
- Identify potential implications of the proposed works and provide recommendations to assist with development design; and
- Recommend any further assessments of the site that may be required.

## 1.3 Location of the Project Area

The Project Area (Figure 1) is located at Kurnell Peninsula within the Sutherland Shire Local Government Area (LGA), approximately 15km south of Sydney's CBD and is bounded by Botany Bay National Park, residential areas, light industrial areas and roads. The Project Area encompasses 67.10 Ha of Caltex owned land.

The Project Area also falls within the:

- Sydney Basin Bioregion;
- Hawkesbury Nepean Catchment Management Authority (CMA) following its merger with Sydney Metro CMA; and
- Sutherland Shire LGA.

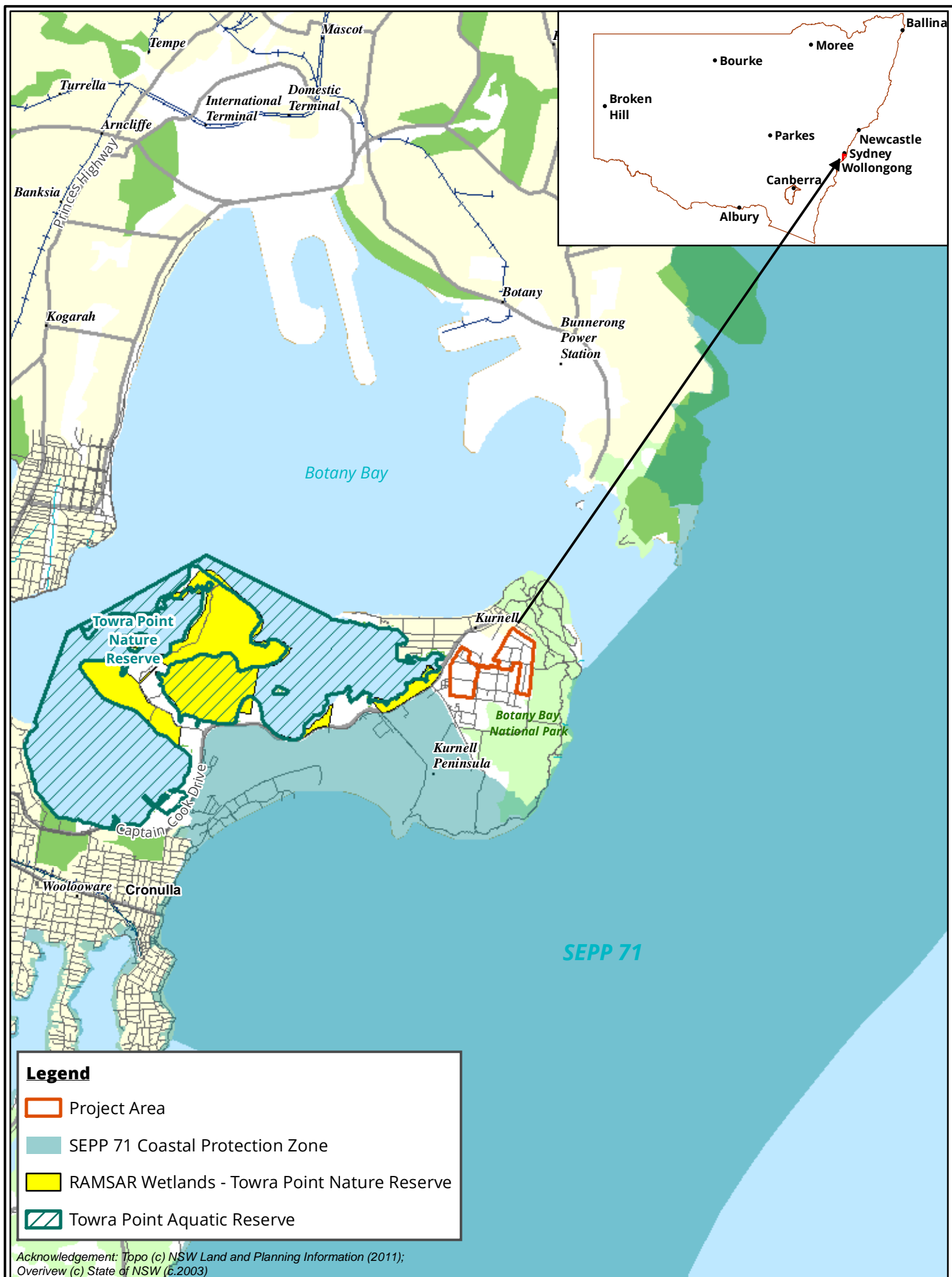


Figure 1: Location of the Project Area - Kurnell, New South Wales

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## 2. Methods

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### 2.1 Literature and database review

In order to provide a context for the Project Area, information about flora and fauna from within 5km of the Project Area (the 'local area') was obtained from relevant public databases. Records from the following databases were collated and reviewed:

- Protected Matters Search Tool of the Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) for matters protected by the EPBC Act;
- Department of Primary Industries (DPI) Threatened & Protected Species – Records Viewer for Sydney Metro CMA and Hawkesbury Nepean CMA;
- NSW Bionet Atlas of NSW Wildlife, Office of Environment and Heritage (OEH);
- PlantNET for Rare or Threatened Australian Plant information (The Royal Botanic Gardens and Domain Trust, 2012); and
- BirdLife Australia, the New Atlas of Australian Birds 1998-2012 (BA).

Other sources of biodiversity information:

- Relevant vegetation mapping, including:
  - *Ocean Shores to Desert Dunes: Vegetation of NSW and the ACT* (Keith, 2004); and
  - *Native Vegetation of the Sydney Metropolitan CMA Area, Sydney Metropolitan* (CMA, 2009).

The following reports were also reviewed:

- Vegetation Monitoring Program Final Report - Caltex Refineries Towra Point (Eco Logical, 2011);
- Flora and Fauna Biodiversity Survey & Weed Management Plan for Caltex Oil Refinery, Kurnell (Urban Bushland Management Consultants Pty Ltd, 2006);
- The Effects of the New Biological Treatment Process at the Caltex Refinery on Sub-tidal Fauna in the Vicinity of Yena Gap (Centre for Research on Ecological Impacts of Coastal Cities, 2006);
- Environmental Sampling at the Caltex 72" Outfall (Botany Bay, NSW) (Institute of Marine Ecology, University of NSW, 2006);
- Stormwater Management Plan, Environmental Protection Licence #837 Condition U10.1 PRP U 24.1 (Caltex 2011);
- Marton Park Wetland Management Plan (Molino Stewart, 2009);
- Weed Management Plan for Native Bushland, Caltex Refineries (NSW) Kurnell (UBM Ecological Consultants Pty Ltd, 2012);
- Biodiversity Study: flora and fauna investigations for native bushland at the Caltex Oil Refineries, Captain Cook Drive, Kurnell (UBM Ecological Consultants Pty Ltd, 2012); and
- Flora and Fauna Assessment for a Proposed Development at the Caltex Oil Refinery, Kurnell (Urban Bushland Management Consultants Pty Ltd, 2006a).

## 2.2 Definitions of significance

### 2.2.1 Species and ecological communities

Significance of a species or community is determined by their listing as rare or threatened under Commonwealth or State legislation. The sources used to categorise significance of species and communities in this report are summarised below in Table 2.

**Table 2: Criteria for determining significance of species & ecological communities**

Significance	
<b>Commonwealth</b>	Listed as threatened (critically endangered, endangered, vulnerable or presumed extinct) under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
<b>State</b>	Listed as threatened (critically endangered, endangered, vulnerable or presumed extinct) species, in NSW under the <i>Threatened Species Conservation Act 1995</i> and/or the <i>Fisheries Management Act 1994</i> .

## 2.3 Likelihood of occurrence

The likelihood of occurrence is a broad categorisation used by Biosis to indicate the potential for a species to occur within the site: it is based on expert opinion and implies the relative value of a site for a particular species.

The likelihood of species occurring within the site is ranked as negligible, low, moderate or high. The rationale for the rank assigned is provided for each species in Appendix 2 (flora) and Appendix 3 (fauna).

Species which have a medium or higher likelihood of occurrence are given further consideration in this report. The need for targeted survey for these species is also considered.

## 2.4 Site investigation

### 2.4.1 Flora assessment

The flora assessment was undertaken on 30 October 2012, by qualified and appropriately licenced botanist who traversed the entire site using a combination of random meanders (Cropper, 1993) to identify vegetation association (Specht, 1970), and transects to determine the vegetation assemblage and the relevant classification, present within the Project Area.

A list of flora species was compiled for the Project Area. The general condition, structure and connectivity of native vegetation was observed, as well as the effects of current seasonal conditions. Notes were made on specific issues such as noxious weeds, evidence of management works and general impacts. Habitat features were also searched for including; hollow-bearing trees, coarse woody debris, waterbodies, etc.

Targeted surveys were undertaken for the threatened Coast Groundsel *Senecio spathulatus* (endangered, TSC Act) to determine whether it was present onsite, or whether suitable habitat exists for the species, based on the OEH record (Appendix 2).

### 2.4.2 Fauna assessment

The fauna assessment was undertaken on 30 October 2012, by qualified and appropriately licenced zoologist to determine the site values for fauna. These were determined primarily on the basis of the types and qualities of habitat(s) present. All species of fauna observed during the assessment were noted and active searching for fauna was undertaken. This included direct observation, searching under rocks, woody

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debris and artificial debris, examination of tracks and scats and identifying calls. Particular attention was given to searching for significant species and their habitats. Fauna species were recorded with a view to characterising the values of the site. The investigation was not intended to provide a comprehensive survey of all fauna that could potentially utilise the site over time.

The field inspection aimed to identify potential habitat for threatened fauna species however no targeted surveys were undertaken during this investigation. The details of the site surveyed and the methods utilised are outlined in Appendix 1. Fauna records will be submitted to OEH for incorporation into the Wildlife Atlas.

### **2.4.3 Permits and Licenses**

The flora and fauna assessment was conducted under the terms of Biosis' Scientific Licence issued by the Office of Environment and Heritage under the *National Parks and Wildlife Act* (SL100758, expiry date 31 March 2013). Fauna survey was conducted under approval 11/355 from the NSW Animal Care and Ethics Committee.

## **2.5 Qualifications**

Ecological surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species will be detected at a site during survey, such as species dormancy, seasonal conditions, ephemeral status of waterbodies and migration and breeding behaviours of some fauna. In many cases these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

The current flora and fauna assessment was conducted in spring which is an optimal time to survey for most species. No targeted surveys were undertaken for frogs, bats or fish and this assessment is based on available potential habitats within the Project Area and previous surveys undertaken on the Kurnell Peninsula. Despite this the survey effort was sufficient to assess the general values of the Project Area.

Database searches, and associated conclusions on the likelihood of species to occur within the Project Area, are reliant upon external data sources and information managed by third parties.

Note: Guidance provided in this report does not constitute legal advice.

## **2.6 Legislation and policy**

The following key pieces of biodiversity legislation and policy were reviewed and the implications for the project were assessed accordingly:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Environmental Planning and Assessment Act 1979* (EP&A Act), including:
  - State Environmental Planning Policy No. 17 – Kurnell Peninsula (SEPP 17);
  - State Environmental Planning Policy No. 14 – Coastal Wetlands (SEPP 14);
  - State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44);
  - State Environmental Planning Policy No. 62 – Sustainable Aquaculture (SEPP 62); and
  - State Environmental Planning Policy No. 71 – Coastal Protection Zone (SEPP 71).
- *Threatened Species Conservation Act 1995* (TSC Act);

- 
- *Fisheries Management Act 1994* (FM Act);
  - *Native Vegetation Act 2003* (NV Act);
  - *Noxious weeds Act 1993* (NW Act); and
  - Sutherland Shire Local Environment Plan 2006 – Sutherland Shire LEP.

## 2.7 Mapping

URS supplied aerial photography and Project Area information (Figure 4-1 Site Layout 43177836.001 A4).

Mapping was conducted using hand-held (uncorrected) GPS units (WGS84) and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the GPS units (generally  $\pm 7$  metres) and dependent on the limitations of aerial photo rectification and registration.

Locations of pest species and/or areas of ecological sensitivity were recorded using hand-held (uncorrected) GPS units (generally  $\pm 7$  metres accuracy).

Mapping has been produced using a Geographic Information System (GIS). Electronic GIS files which contain our flora and fauna spatial data are available to incorporate into design concept plans. However this mapping may not be sufficiently precise for detailed design purposes.



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## 3. Results

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The ecological features of the Project Area (Figure 2) are described below and mapped accordingly (Figures; 3, 4, 5, 6).

Species recorded during the flora and fauna assessment are listed in Appendix 2 (flora) and Appendix 3 (fauna). A list of NSW and Commonwealth threatened species recorded (Figure 4 and 5) or predicted to occur in the local area is also provided in those appendices, along with an assessment of the likelihood of the species occurring within the Project Area.

### 3.1 Vegetation and fauna habitat

The vegetation and fauna habitat throughout the majority of the Project Area has been highly modified by past and current disturbance related to the Kurnell Refinery, since its development in 1953. The majority of the Project Area is devoid of vegetation and associated habitat due to the highly modified nature of the site. What vegetation remains is also significantly degraded, providing limited value for native fauna. Across the Project Area amongst the tanks and bunded areas, hard stand areas, roads and pipeline easements a range of weeds and exotic grasses could be seen growing in numerous crevices (Plate 1).

76 flora species were recorded within the Project Area including 28 native species and 48 exotic species of which three were classed as noxious weeds. No threatened flora species, ecological communities or Rare or Threatened Australian Plants (ROTAP) were recorded. A total of 20 fauna species were recorded within the Project Area comprising 19 bird species and one reptile. Three of the birds recorded were introduced species.

**Plate 1: Project Area Vegetation**

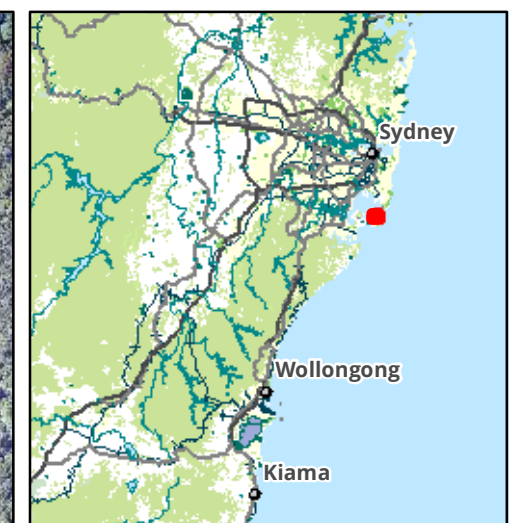


The Project Area does however support three small patches of vegetation (Figure 6):

1. North West Corner Planting;
2. Eastern Boundary Disturbed Native Vegetation; and
3. North East Corner Revegetation.

These patches of vegetation are discussed below.





**Legend**

Project Area

**Figure 2: Extent of the Project Area**

0 50 100 150 200 250  
Metres

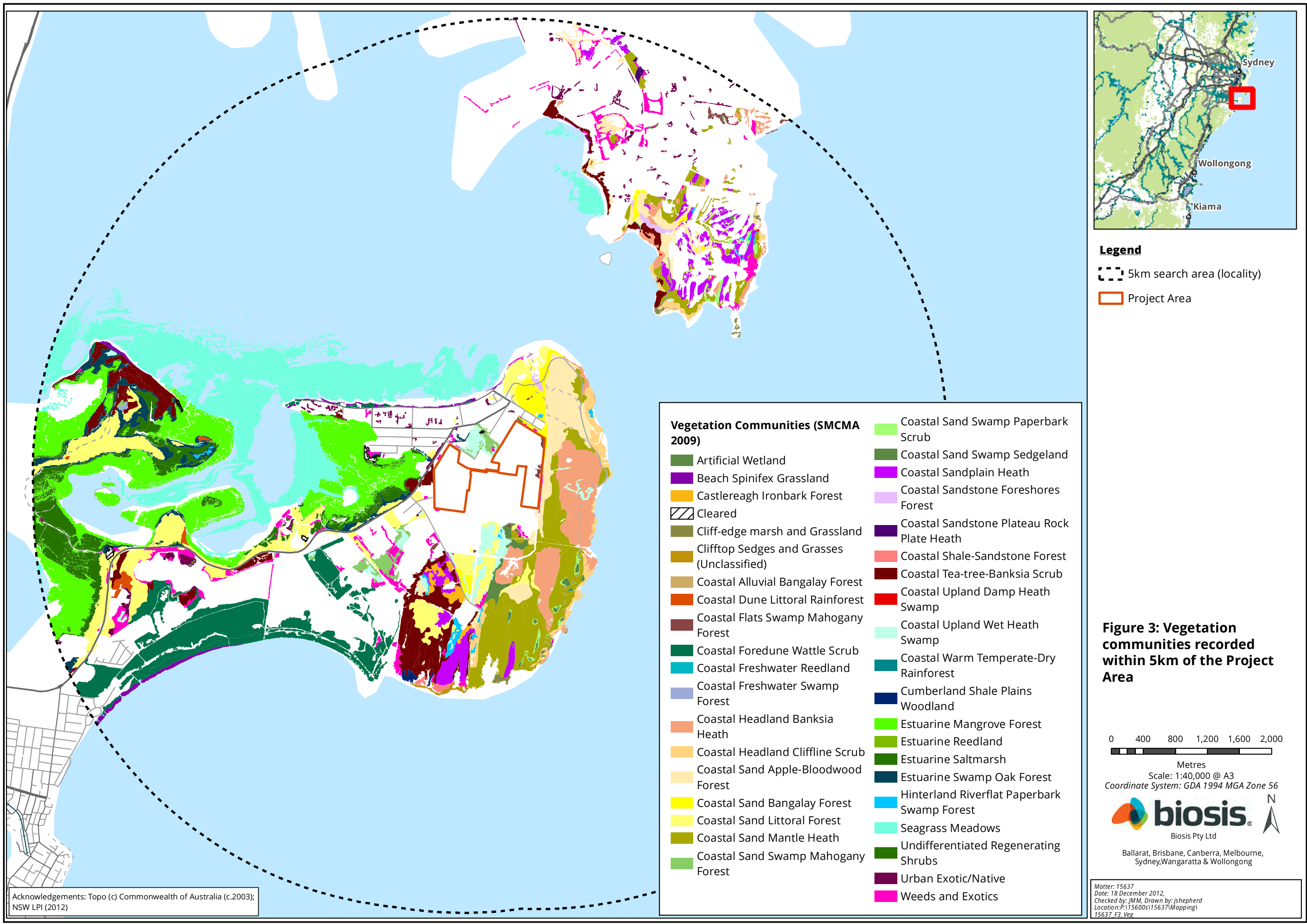
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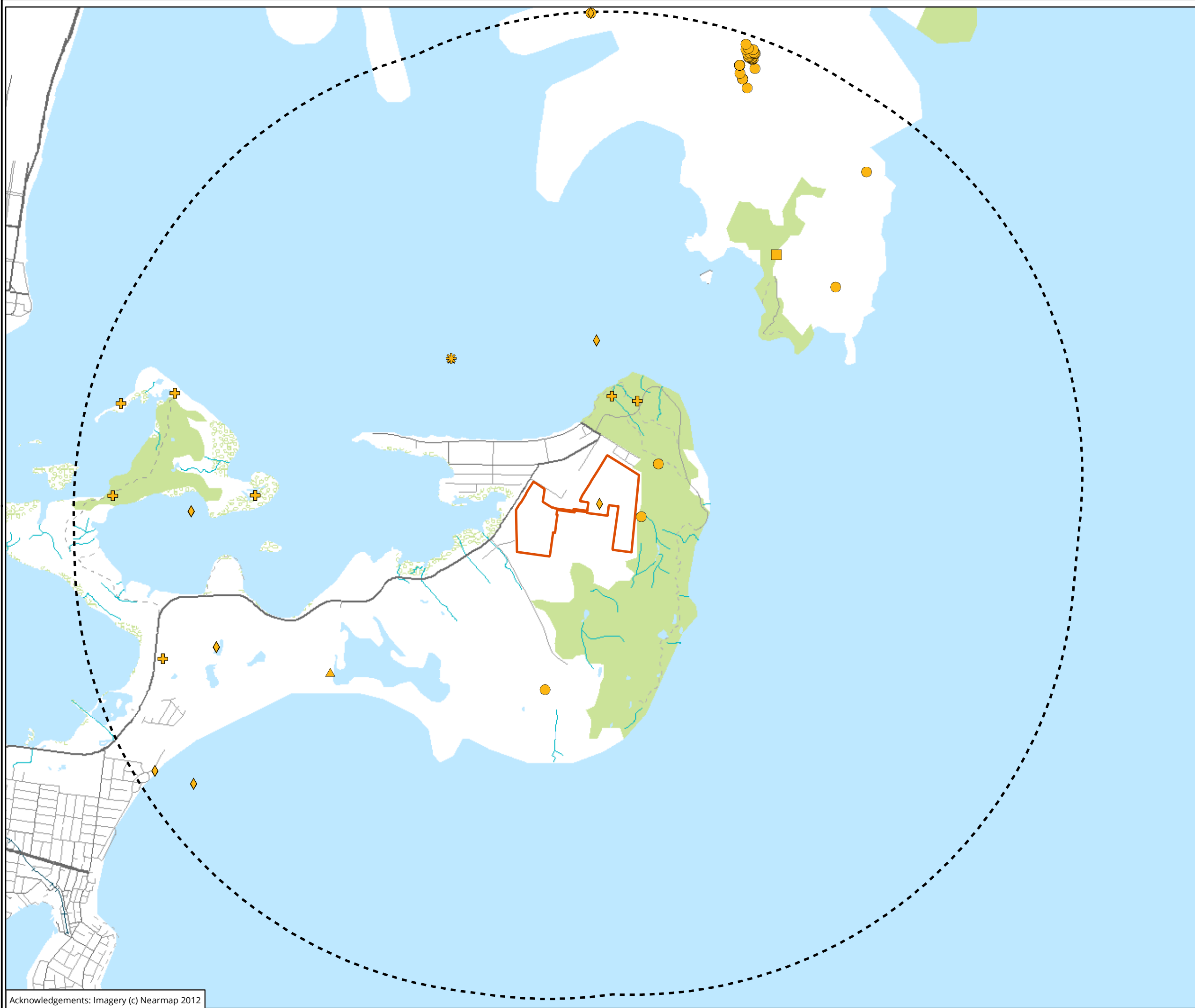


Ballarat, Brisbane, Canberra, Melbourne,  
Sydney, Wangaratta & Wollongong

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Date: 08 November 2012,  
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#### Legend

##### Threatened Flora

- *Acacia terminalis* subsp. *terminalis*
- *Callistemon linearifolius*
- ▲ *Coprosma baueri*
- ★ *Pterostylis* sp. *Botany Bay*
- ◆ *Senecio spathulatus*
- ✚ *Syzygium paniculatum*
- ✱ *Thelymitra atronitida*

⋯ 5km search area (locality)

▭ Project Area

Disclaimer: Species data is displayed using coordinates as supplied from the NSW OEH species database. These datasets are known to contain numerous errors and inaccuracies. Biosis accepts no responsibility for errors or inaccuracy in record display location.

**Figure 4: Threatened flora recorded within 5km of the Project Area**

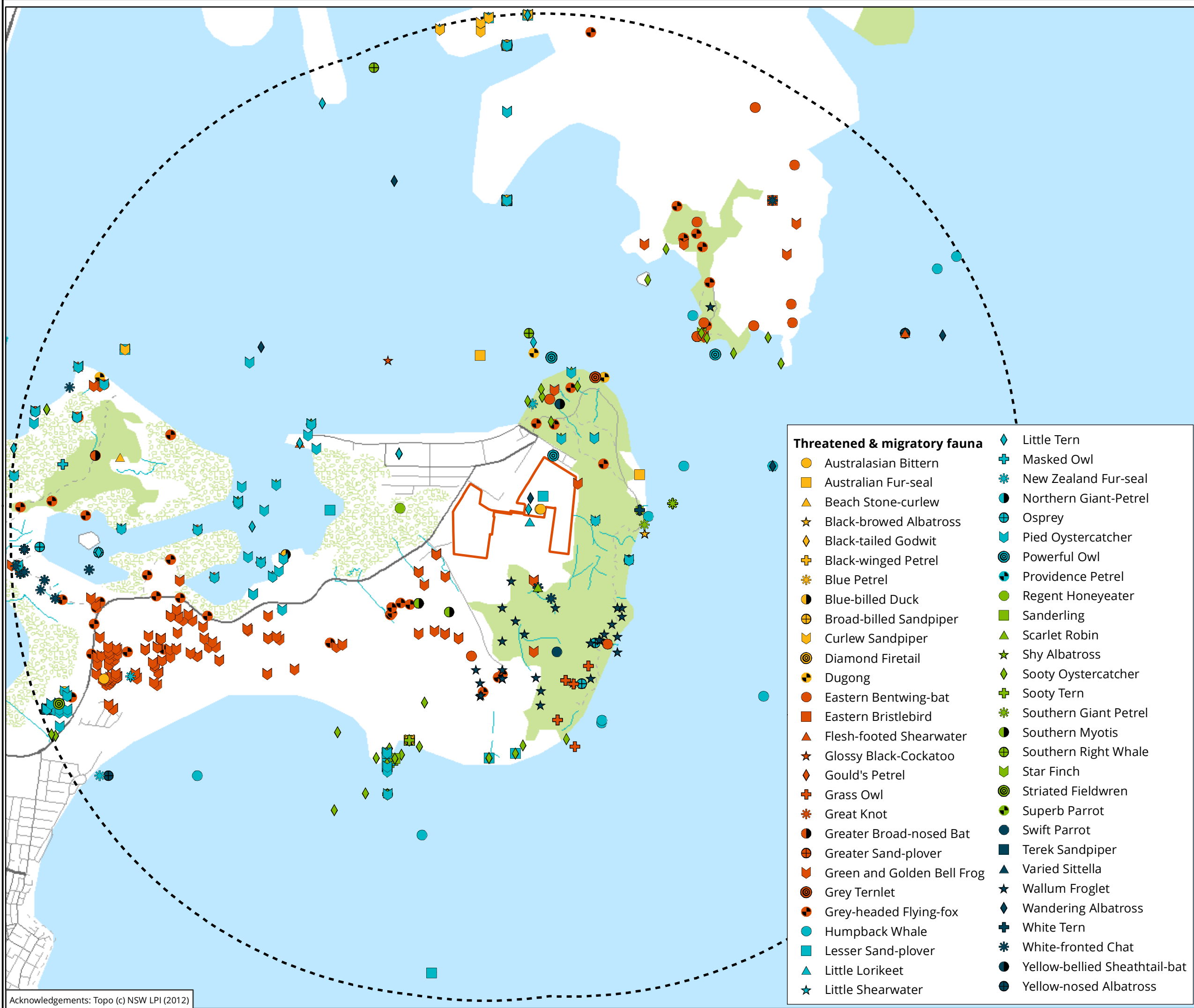
0 400 800 1,200 1,600 2,000  
Metres

Scale: 1:40,000 @ A3  
Coordinate System: GDA 1994 MGA Zone 56



Ballarat, Brisbane, Canberra, Melbourne,  
Sydney, Wangaratta & Wollongong

Matter: 15637  
Date: 08 February 2013,  
Checked by: Drawn by: jshepherd  
Location: P:\15600s\15637\Mapping\15637\_F4\_ThreatenedFlora



#### Legend

- 5km search area (locality)
- Project Area

Disclaimer: Species data is displayed using coordinates as supplied from the NSW OEH species database. These datasets are known to contain numerous errors and inaccuracies. Biosis accepts no responsibility for errors or inaccuracy in record display location.

**Figure 5: Threatened and migratory fauna recorded within 5km of the Project Area**

0 400 800 1,200 1,600 2,000  
Metres

Scale: 1:40,000 @ A3  
Coordinate System: GDA 1994 MGA Zone 56



Ballarat, Brisbane, Canberra, Melbourne,  
Sydney, Wangaratta & Wollongong

Matter: 15637  
Date: 08 February 2013,  
Checked by: JMM, Drawn by: jshepherd  
Location: P:\15600s\15637\Mapping\15637\_F5\_ThreatenedFauna





Project Area

#### Noxious weeds

- *Chrysanthemoides monilifera* subsp. *rotunda*
- *Lantana camara*
- ▲ *Ricinus communis*

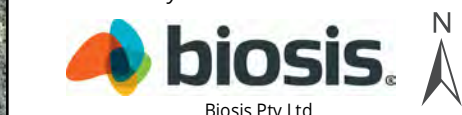
#### Vegetation

- Eastern boundary disturbed native vegetation
- North-east corner revegetation
- North-west corner planting

**Figure 6: Vegetation communities and noxious weeds within the Project Area**

0 50 100 150 200 250  
Metres

Scale: 1:5,000 @ A3  
Coordinate System: GDA 1994 MGA Zone 56



Ballarat, Brisbane, Canberra, Melbourne, Sydney, Wangaratta & Wollongong

Matter: 15637  
Date: 19 November 2012,  
Checked by: JMM, Drawn by: jshepherd  
Location: P:\15600s\15637\Mapping\15637\_F5\_VegandWeeds



### 3.1.1 North West Corner Planting

This patch of vegetation (NWCP) exists in the north-west corner of the Project Area adjacent to the existing Waste Water Treatment Plant (WWTP) (Chapter 4, Figure 4-1 Site layout). This vegetation is 0.17 Ha in size and comprises planted trees; Radiata Pine *Pinus radiata*, Oleander *Nerium Oleander* and Swamp Paperbark *Melaleuca ericifolia* over managed (mown) exotic grasses and weeds such as Asparagus Fern *Asparagus africanus* (Plate 2, Figure 6). The north west corner vegetation lacks ground and mid story vegetation supporting only highly mobile fauna species which move through the Project Area on occasion such as the Red Wattlebird *Anthochaera carunculata*, Black-faced Cuckoo-shrike *Coracina novaehollandiae* and the introduced Spotted-turtle Dove *Streptopelia chinensis*.

**Plate 2: North West Corner Planting**



### 3.1.2 North East Corner Revegetation

This patch of vegetation (NECR) exists in the north eastern corner of the Project Area and is approximately 0.60 Ha in size (Plate 3, Figure 6). This area looks to have been revegetated during the last 1-2 years and is currently showing good resilience, most likely due to the sandstone nature of the low nutrient and acidic soils and its favourability to support native species. Within this vegetation, sporadic weeds such as pasture weeds were seen around the edges including NSW DPI and Sutherland Shire Council listed noxious weed, Bitou Bush *Chrysanthemoides monilifera* subsp. *rotunda* (Appendix 2, Figure 6).

This sandy exposed area of establishing regeneration provides ideal habitat for small reptiles to bask and shelter. Lying at the boundary of the refinery land, this area is close to the adjacent Botany Bay National Park and may be utilised by mobile reptiles such as Jacky Dragon *Amphibolurus muricatus* and potentially amphibians.

**Plate 3: North East Corner Revegetation**



### 3.1.3 Eastern Boundary Disturbed Native Vegetation

This patch of vegetation (EBDNV) exists mid way along the eastern boundary of the Project Area and is approximately 0.55 Ha in size (Plate 4, Figure 3). The vegetation is bounded on all sides by refinery roadways, tanks and hard stand areas and is disturbed by nature given such edge impacts. The vegetation is likely to once have formed part of the habitats within the closely adjoining Botany Bay National Park SMCMA (2009) mapped, *Coastal Sand Apple-Bloodwood Forest* given the presence of diagnostic tree, shrub and ground cover species, as described by the SMCMA (2009). This community does not match SMCMA (2009) mapped, *Coastal Flats Swamp Mahogany Forest* (Figure 3), discussed further in Section 3.5 of this report.

The vegetation composition included the following Coastal Sand Apple-Bloodwood Forest SMCMA (2009) related tree species; Sydney Red Gum *Angophora costata* and Coastal Banksia *Banksia integrifolia*, shrub species; Heath-leaved Banksia *Banksia ericifolia*, Coastal Wattle *Acacia longifolia* subsp. *longifolia*, Sweet Wattle *Acacia suaveolens*, Prickly Moses *Acacia ulicifolia* and Variable Bossiaea *Bossiaea heterophylla* as well as ground cover species; Blue Flax Lily *Dianella caerulea*, Bracken *Pteridium esculentum*, Matt rush *Lomandra longifolia*, Blady Grass *Imperata cylindrica* and Variable Sword-sedge *Lepidosperma laterale*. This disturbed native vegetation, whilst containing various outlined native species was highly disturbed, given the presence of a range of weeds (Appendix 2) and the low diversity and overall lack of canopy and ground cover species.

The EBDNV vegetation, with dense midstory provides good cover for small woodland birds such as the Yellow Thornbill *Acanthiza nana* and Superb Fairywren *Malurus cyaneus* recorded on site. Located on the eastern boundary of the Project Area, this vegetation is disconnected from the adjacent Botany Bay National Park vegetation by a hard surfaced drainage channel approximately 10 meters in width.

#### Plate 4: Eastern Boundary Disturbed Native Vegetation



### 3.1.4 Fauna habitat features within the Project Area

The three vegetation patches on site form the primary fauna habitat in the Project Area. Other potential fauna habitat or foraging related assets include; perch structures (i.e. tower infrastructure, plate 1) for birds of prey and debris, such as concrete blocks in areas around the edges of the Project Area providing sheltering sites for common reptiles and potentially amphibians.

No natural water bodies occur within the Project Area. As such aquatic habitat was limited to a single reservoir of water located at Chisholm Drive at the western extent of the Project Area near Captain Cook Drive (plate 5). This reservoir has sheer exposed sides, negligible aquatic habitat and does not provide culvert roosting opportunities for microbats. Other water bodies include concrete stormwater drainage channels and pipelines (plate1).



Connectivity across the Project Area is limited however given that the adjoining Botany Bay National Park surrounds a large portion of the Project Area, some dispersal across the site is possible. The Project Area is largely devoid of vegetation with localised patches of sparse vegetation remaining at the periphery of the site. Most drainage across the site occurs across hard surfaces. Drainage is managed according to the surrounding use of the catchment as described in the Caltex Stormwater Management Plan (Caltex 2011). Stormwater collected from roof tops, vegetated areas, unpaved 'clean' areas, roadways and pipeways is directed into the storm water system. Any contaminated areas will have surface water diverted into the waste water treatment plant on site (Caltex 2011). The drainage channels and pipelines which capture and direct stormwater may provide dispersal passage for mobile fauna. The catchments within the Project Area which filter contaminated water however may not provide tolerable habitat for highly sensitive amphibian species. Piles of debris and rubble on site (plate 5) may provide temporary refuge for frogs if they are traversing the Project Area to access adjacent areas of preferred habitat, however these areas are often localised and not well connected leaving large exposed areas to be traversed without refuge opportunities.

**Plate 5: Habitat features**



The following habitat resources were searched for during the survey effort, however were found to not be present within the Project Area:

- Hollow bearing trees;
- Coarse woody debris;
- Natural Water bodies; and
- Rock outcrops.

The remainder of the Project Area has been substantially modified and is of negligible habitat value except for common native and introduced fauna species.

### 3.2 Site context

Whilst the Caltex refinery has been present since 1953 the Project Area is in close proximity to other areas of significant ecological value (Figure 1) including;

- Botany Bay;
- SEPP 14 Wetlands;
- SEPP 17 Kurnell Peninsula;
- SEPP 71 Coastal Protection Zone;

- Towra Point Nature Reserve (Ramsar wetland);
- Towra Point Aquatic Reserve;
- Marton Park Wetland (a Groundwater Dependent Ecosystem); and
- Botany Bay National Park.

**Botany Bay** is a shallow bay covering 4600ha located approximately 10km south of the Sydney City Central Business District (CBD). It is used to access Sydney's main commercial port (Port Botany). The Bay is designated a Special Port Area, and as such there are a number of controls regarding the management of the waters and waterside lands (Sydney Ports, 2012). There are a number of competing economic, recreational and ecological interests related to the aquatic environment within the Bay, including aquatic ecosystems, primary industries such as aquaculture, recreation and aesthetics interests (such as fishing) and cultural and spiritual values (SMCMA, 2007). Botany Bay and its catchment waterways are subject to ongoing threats due to nutrient and sediment-laden run-off from various non-agricultural land uses. A substantial part of the catchment is highly developed with almost 40% of its area used for urban, industrial or commercial purposes. Particular pollutants of concern are nitrogen, phosphorus, and total suspended solids (SMCMA, 2012).

**SEPP14 - Coastal Wetlands** aims to protect and conserve coastal wetlands by ensuring: *that the coastal wetlands are preserved and protected in the environmental and economic interests of the state*. SEPP 14 provides guidance for consent authorities (consent authorities being the council of the LGA in which the proposed development is to be carried out), in terms of issues to consider when determining whether there is potential for a listed wetland to be affected by a Project. The provisions of this SEPP are not directly relevant to the Project, as this SEPP was not found to be present within 5km of the Project Area, or to coincide with the Towra Point Nature Reserve Ramsar site or Marton Park Wetland.

**SEPP 17 – Kurnell Peninsula** aims to conserve the natural environment of the Kurnell Peninsula and ensure that development is managed having regard to the environmental, cultural and economic significance of the area to the nation, State, region and locality. SEPP (Kurnell Peninsula) applies to the land within the Sutherland Shire, known as Kurnell Peninsula, and adjacent waterways. The provisions of the SEPP (Kurnell Peninsula) cover the zoning of land and land use conflict.

The SEPP (Kurnell Peninsula) provides for the land use and zoning in the area. Pursuant to the SEPP, the Site falls within zone 4(c1) (Special Industrial (Oil Refining) Zone). The objectives of zone 4 (c1) are to recognise land used for oil refinery, liquid fuel depot and liquefied petroleum gas extraction purposes, and to ensure that development has regard to environmental safety planning principles. As the Project would continue the use of the land as a liquid fuel depot, the Project is deemed permissible under the land use zones in this SEPP.

The SEPP (Kurnell Peninsula) states five general aims and objectives and nine environmental planning aims and objectives. A number of these aims and objectives relate to the consideration and protection of the ecological resources found on and close to Kurnell. Ecological resources that are specifically mentioned include national parks, nature reserves, wetland areas, areas of ecological significance and the aquatic environment.

This report and key sections of the EIS for the Project outline how the proposed works would meet these aims and objectives.

**SEPP 71 - Coastal Protection** aims to protect and manage the natural, cultural, recreational and economic attributes of the New South Wales coast through the preservation of a range of coastal assets. The policy aims to ensure that development in the NSW coastal zone is appropriate and suitably located, to ensure that there is a consistent and strategic approach to coastal planning and management and to ensure there

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is a clear development assessment framework for the coastal zone. Although the provisions of this SEPP will not be directly relevant to the Project, the EIS will have regard to the aims and matters that relate to the SEPP, which ensure that the coastal zone is managed in accordance with the principles of ecologically sustainable development.

**Groundwater Dependent Ecosystem - Marton Park Wetland** The online Groundwater Dependent Ecosystems Atlas (funded by National Water Commission and hosted by the Bureau of Meteorology) was accessed to determine the proximity of the Project to potential GDEs. As outlined in Chapter 9 Soil, Groundwater and Contamination (including Figure 9-1 and 9-2), a vegetation related GDE, noted as 'previously identified within a previous desktop study' is located adjacent to the Project Area. This GDE is the Marton Park Wetland, a freshwater wetland which includes fringing TSC Act listed *Swamp Oak Floodplain Forest*. According to the Marton Park Wetland Management Plan (Molino Stewart Pty Ltd, 2009) the wetland is currently a freshwater wetland with limited tidal influence. The wetland plays an important role in the drainage of the surrounding area, including the eastern portion of Kurnell, part of the Caltex Oil Refinery and the Botany Bay National Park. Much of the Caltex site is bunded and surface runoff is treated onsite before discharging directly to Botany Bay, however, surface runoff from the non-industrial components of the refinery (e.g. the administration center and car parks) flows into this wetland. Marton Park Wetland is recharged by ground water seepage through the sandy bed during dry periods. Although not directly identified as a GDE within the Management Plan (Molino Stewart Pty Ltd, 2009), the interaction between the surface water and the ground water is acknowledged to be high given the sandy nature of the soil allowing any potential contaminants to move through the groundwater relatively quickly.

**Towra Point Nature Reserve (Ramsar Wetland)** consists of approximately 603 ha of wetlands that lie on the mouth of the Georges River on the southern shores of Botany Bay, and located approximately 16km from the Sydney CBD (DECCW, 2010). The Reserve is bounded by the Kurnell Headland, Botany Bay, and Dolls Point. The most eastern extent of the Ramsar listed portion of the site is approximately 200m west of the Project Area. The Project Area results in stormwater discharge to Quibray Bay, adjacent to the Towra Point Nature Reserve Ramsar site, and based on historical flooding events, there is potential for Project Area storm-water to enter the Towra Point Nature Reserve. In response to historical incidents Caltex has invested in improving its on stormwater system performance and Stormwater Management Plan (Caltex, 2011) which should alleviate the possibility of future incidents occurring. The proposal should not result in any direct disturbance to the Towra Point Nature Reserve through the conversion of the refinery to a fuels terminal.

### **Towra Point Aquatic Reserve**

Towra Point Aquatic Reserve surrounds Towra Point and covers an area of approximately 1,400 ha. The reserve is managed by the NSW Department of Primary Industries (DPI). The reserve is considered to support high levels of aquatic biodiversity.

**Botany Bay National Park** extends north south along the eastern coastline of Kurnell Peninsula bound by Botany Bay marine waters and borders the Project Area. The northern extent of Botany Bay National Park is location along the southern coast of La Perouse headland and is disjunct from the Kurnell Peninsula. The total area of the National Park occupies approximately 492ha across both headlands and supports a diversity of natural resources including threatened species and ecological communities and is recognised for its significant cultural heritage values (OEH, 2012a; NSW NPWS, 2002).

### 3.3 Significant species

#### 3.3.1 EPBC Act & TSC Act listed species

Lists of significant species recorded or predicted to occur within 5km of the Project Area are provided in Appendix 2 (flora, Figure 4) and Appendix 3 (fauna, Figure 5). An assessment of the likelihood of these species occurring in the Project Area and an indication of where within the site (i.e. which habitats or features of relevance to the species) is included. A summary of those species recorded or with a moderate or higher likelihood of occurring in the Project Area is provided in Table 3.

**Table 3: Summary of significant species most likely to occur in the Project Area**

Species name	Project Area Relationship
<b>EPBC Act</b>	
<b>Green and Golden Bell Frog</b>	This species has the potential to be found throughout the Project Area on occasion during dispersal, however is more likely to be found within the eastern boundary vegetation patch and the north-east vegetation area based on their proximity to the adjacent Botany Bay NP where historical records occur.
<b>TSC Act</b>	
<b>Green and Golden Bell Frog</b> <b>Wallum Froglet</b>	These species have the potential to be found within the Project Area on occasion during dispersal, however are more likely to be found within the eastern boundary vegetation patch and the north-east vegetation area (Figure 6) based on their proximity to the adjacent Botany Bay NP where historical records occur.
<b>Powerful Owl</b>	The Powerful Owl may forage across the Project Area however the primary areas which may support prey species occur at the three vegetated patches identified within Figure 6.
<b>Eastern Grass Owl</b>	No breeding or preferred foraging resources occur within the Project Area. Given that this species was recorded approximately 1.5km south of the Project Area within Botany Bay NP as recently as 2010, it is possible that this species will move through the Project Area to forage, particularly the eastern and north-eastern vegetation patches identified within Figure 6.
<b>White-fronted Chat</b>	No breeding or preferred foraging habitat occurs within the Project Area. The closest records approximately 500m south within Botany Bay NP, however the most recent of these records dates from 1988. More recent records occur within Towra Point Nature Reserve 5km east of the Project Area. Although unlikely, if individuals from this population were to enter the Project Area it would most likely be associated with the three vegetation patches identified within Figure 6.

Species name	Project Area Relationship
<b>Striated Field Wren</b>	No breeding or preferred foraging habitat occurs within the Project Area. The closest records approximately 5km east dating from 2002 (Bird Life Australia data). Although unlikely, if individuals from this population were to enter the Project Area it would most likely be associated with the three vegetation patches identified within Figure 6.
<b>Osprey</b>	The Osprey was recorded as recently as 2011, 5km to the east of the Project Area. No foraging or breeding sites occur within the Project Area. However the Project Area contains tall infrastructure suitable as perching habitat for large birds such as the Osprey (plate 1).
<b>Eastern Bentwing-bat</b>	The Eastern Bentwing-bat has been recorded as recently as 2010, less than 1 km north of the Project Area. A reservoir of water occurs at Chisholm Drive at the western extent of the Project Area near Captain Cook Drive (plate 5). This reservoir had sheer exposed sides and does not provide roosting opportunities for microbats. Although the Project Area does not provide preferred foraging habitat, the Eastern Bentwing-bat may forage within the Project Area on occasion within the three vegetated areas identified within Figure 6.
<b>Southern Myotis</b>	The Southern Myotis has been recorded as recently as 2009, less than 1 km south west of the Project Area. A reservoir of water occurs at Chisholm Drive at the western extent of the Project Area near Captain Cook Drive (plate 5). This reservoir had sheer exposed sides and does not provide roosting opportunities. Although it is unlikely to support an abundance of prey, the Southern Myotis may forage over this water body on occasion.
<b>Coast Groundsel <i>Senecio spathulatus</i></b>	Although <i>Senecio spathulatus</i> has been recorded within the Project Area recently, the accuracy of the record is ~1km and given the lack of suitable habitat it is considered likely that the record was located in the adjacent Botany Bay NP.
<b><i>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner (SSFCF)</i></b>	Although a threatened ecological community (TEC) equating to the SSFCF has been previously mapped at 3 separate patches within the Project Area, ground truthing of these areas identified one as being unvegetated and the remaining two not consistent with the final determination of the TEC. Outside of these areas, no potential habitat for SSFCF was identified within the Project Area. For these reasons the proposal is not considered to have a significant impact on this TEC.

### 3.3.2 Aquatic Fauna habitat features within the Project Area

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Database searches have indicated that no known threatened freshwater fish species listed under the FM Act and/or EPBC Act have been recorded within the Sydney Metropolitan CMA (DPI Fisheries Database). Since the initial Draft report, the Sydney Metropolitan CMA has recently been merged with the Hawkesbury Nepean CMA. Therefore further searches were undertaken, with the following threatened freshwater fish being recorded within the broader Hawkesbury Nepean CMA;

- Macquarie Perch *Macquaria australasica*;
- Trout Cod *Maccullochella macquariensis*;
- Murray Cod *Maccullochella peelii peelii*; and,
- Silver Perch *Bidyanus bidyanus*.

Database searches indicated that threatened marine species (Appendix 3, Table 13) listed under the EPBC Act have known potential habitat in Botany Bay, however, within the Project Area aquatic habitats were limited to a single reservoir of water at Chisholm Drive lacking connectivity and in a highly degraded condition. Hence marine and aquatic species have been identified, however did not form the focus of the flora and fauna assessment due to the proposal not having the likelihood to result in any direct disturbance to the receiving waters of Botany Bay (refer to Appendix D Human Health and Ecological Risk Assessment and Appendix E Water Management Report of the EIS).



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### 3.4 Noxious Weeds

Three noxious weeds, listed by NSW DPI for the Sutherland Shire Council listed under the *Noxious Weed Act 1993* (NW Act) were recorded in the Project Area (Figure 6), including:

- Bitou Bush *Chrysanthemoides monilifera* subsp. *rotunda* (Plate 6);
- Oleander *Nerium oleander*; and
- Lantana *Lantana camara*.



**Plate 6: Bitou Bush *Chrysanthemoides monilifera* subsp. *rotunda***

These are all listed as Class 4 noxious weeds by NSW DPI. The requirements for the control of Class 4 noxious weeds, under the NW Act include:

- 'the growth of the plant must be managed in a manner that reduces its numbers, spread and incidence and continuously inhibits its reproduction'; and
- 'the plant must not be sold propagated or knowingly distributed', the latter is not relevant to Caltex.

The locations of noxious weeds within the Project Area are shown in Figure 6.

### 3.5 Threatened ecological communities

No NSW or Commonwealth threatened ecological Communities (TEC) were found within the Project Area, however the SMCMA (2009) mapping (Figure 3) identifies the following community, *Coastal Flats Swamp Mahogany Forest* as occurring within the Project Area, in three separate patches along the eastern boundary. This SMCMA community, by definition aligns with TSC Act listed TEC, *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions*.

The SMCMA mapping, however, as outlined through the associated SMCMA (2009) Technical Report, identifies the vegetation in question as not having been ground truthed/surveyed and had been interpreted by aerial photograph imagery only. Based on this knowledge, the field survey assessed the potential for the vegetation, in the two patches (as only 2 patches exist, not three as depicted in the SMCMA mapping) on the eastern boundary (NECR and EBDNV) to comprise of the TEC.

It was determined that the vegetation did not comprise the TEC however, aligned instead closer with the adjoining Botany Bay National Park SMCMA (2009) mapped, *Coastal Sand Apple-Bloodwood Forest* (Figure 3) given the presence of diagnostic tree, shrub and ground cover species, as described by the SMCMA (2009) and discussed in Section 3.1 of this report.

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Based on the DECC (2007) identification guidelines, final determination (OEH, 2011) and profile information (OEH, 2012) for the TSC Act listed TEC, *Swamp Sclerophyll Forest on Coastal Floodplains*, the NECR and ENDNV vegetation patches do not comprise the associated stratum nor associated required habitat. *Swamp Sclerophyll Forest on Coastal Floodplains* is characterised by several layers of vegetation, including wetland plants and is generally found close to standing water on waterlogged soils or periodically inundated soils. However, the NECR and ENDNV vegetation found within the site is dominated by the shrubby stratum, with low species diversity on dry sandy soils. Further, the vegetation does not have enough key indicator or characteristic species in the, shrub (one only) and ground cover (two only) layers and contains none of the canopy tree category listed key indicator or characteristic species. Therefore, this vegetation community does not constitute the TEC, *Swamp Sclerophyll Forest on Coastal Floodplains* under TSC Act.



## 4. Biodiversity Legislation and Government Policy

This section provides an assessment of the project against key biodiversity legislation and government policy.

Where available, links to further information are provided. This section does not describe the legislation and policy in detail and guidance provided here does not constitute legal advice.

### 4.1 Commonwealth

#### 4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (NES) protected under the Act.

Further information including a guide to the referral process is available at: <http://www.environment.gov.au/epbc/index.html>

Matters of NES relevant to the project are summarised in Table 4. It includes an assessment against the EPBC Act policy statements published by the Australian Government which provide guidance on the practical application of EPBC Act.

**Table 4: Assessment of the project against the EPBC Act**

Matter of NES	Project specifics	Assessment against Guidelines
<b>Wetlands of international importance (Ramsar sites).</b>	The Project Area is identified as being within the catchment of the Towra Point Nature Reserve Ramsar site.	The Project Area results in stormwater discharge to Quibray Bay, adjacent to the Towra Point Nature Reserve Ramsar site, and based on historical flooding events, there is potential for Project Area storm-water to enter the Towra Point Nature Reserve Ramsar site. A Significant Impact Criteria assessment has been prepared (Appendix 6) which concluded that the development is <b>not likely</b> to result in a significant impact to the Ramsar site.
<b>Vulnerable species</b>	The Green and Golden Bell Frog has been recorded adjacent to the Project Area (Figure 5) and may traverse the Project Area on	Although no breeding or foraging habitat occurs within the Project Area, this species has the potential to be found throughout the Project Area on

Matter of NES	Project specifics	Assessment against Guidelines
	occasion during dispersal.	occasion during dispersal. A Significant Impact Criteria assessment has been prepared (Appendix 6) which concluded that the development is <b>not likely</b> to result in a significant impact to the Green and Golden Bell Frog.
<b>Migratory species</b>	Fifty-five migratory species have been recorded or predicted to occur in the project search area (Appendix 3).	While some of these species would be expected to pass over the Project Area on occasions, and some of them may do so regularly or may be resident in the adjacent Botany Bay National Park, Marton Park Wetland or Towra Point Nature Reserve, the Project Area <b>does not</b> provide important habitat for an ecologically significant proportion of any of these species, hence no significant impact criteria assessments were undertaken, refer to Appendix 3 for more detail.
<b>Key threatening process:</b> <i>Anthropogenic climate change</i>	<p>This KTP is listed under both the TSC and EPBC Acts. The final determination for this KTP lists some impacts as:</p> <ul style="list-style-type: none"> <li>a) Affect current fire regimes;</li> <li>b) Affect the current distribution of most species, populations and communities; and</li> <li>c) Affect evolutionary processes.</li> </ul>	<p>The Project plans to result in an overall reduction in greenhouse gas emissions being released into the atmosphere and therefore a decrease the operation of this KTP.</p> <p>Greenhouse gas emissions would result from increased traffic to, from and within the site during Project works, however there will be a net overall loss in overall traffic movements for the finished product facility.</p> <p>The key potential greenhouse gas emissions from the Project are nitrous oxide (N<sup>2</sup>O) and carbon dioxide (CO<sup>2</sup>).</p>
<b>Key threatening process:</b> <i>Competition and grazing by the feral European rabbit (Oryctolagus cuniculus)</i>	<p>This KTP is listed under both the TSC and EPBC Acts. The final determination for this KTP lists some impacts as:</p> <ul style="list-style-type: none"> <li>d) Increasing the prevalence of introduced predators such as the Feral Cat, Red Fox and Wild Dog;</li> <li>e) Increase competition for resources with indigenous species;</li> <li>f) Causing changes to the structure, composition of vegetation and increasing land degradation;</li> <li>g) Reducing the survival and recruitment of threatened plant species and ecological communities; and</li> <li>h) Increase erosion through the removal of vegetation.</li> </ul>	Rabbit scats were observed on site during the site inspection. However the proposal is <b>unlikely</b> to increase the prevalence of Rabbits within the Project Area and should not contribute to the increase of this KTP.

Separately to the above mentioned relevant EPBC matters, no critical habitat listed under the EPBC Act, was located nor of relevance to the Project.

On the basis of criteria outlined in the relevant *Significant Impact Guidelines* it is considered unlikely that a significant impact on any of the above outlined Matters of National Environmental Significance would result from the proposed action.

## 4.2 State

### 4.2.1 Threatened Species Conservation Act 1995

The TSC Act provides for the protection and conservation of biodiversity in NSW through the listing of threatened species, populations and communities; key threatening processes; and critical habitat for threatened species, populations and communities.

Native vegetation within the Project Area does not constitute a listed TEC nor was the site found to contain threatened flora or fauna species, or habitat for them. Impacts to the threatened species, populations and communities must be assessed through the Assessment of Significance (AOS) process under Section 5A of the EP&A Act (refer to Section 4.2.2 below).

Habitat critical to the survival of an endangered or critically endangered species, population or ecological community can be identified under the TSC Act and listed on the Register of Critical Habitat kept by the OEH. The Project Area does not contain declared 'critical habitat'.

Key Threatening processes (KTPs) relevant to the Project, under the TSC Act have been addressed in Table 5 and Appendix 7. More information regarding KTPs can be found:

<http://www.environment.nsw.gov.au/threatenedspecies/KeyThreateningProcessesByDoctype.htm>

**Table 5: Key Threatening Processes relevant to the Project**

Key Threatening Process	Project specifics	Assessment against Guidelines
<b>Anthropogenic climate change</b>	The key potential greenhouse gas emissions from the Project are nitrous oxide (N <sub>2</sub> O) and carbon dioxide (CO <sub>2</sub> ).  Greenhouse gas emissions would also result from increased traffic to, from and within the site.	The Project will likely result in green house gas emissions being released into the atmosphere based on higher than normal construction related Project works. However once the Project has been finalised the overall net greenhouse gas emissions will be reduced from the current situation.
<b>Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed)</b>	Bitou Bush <i>Chrysanthemoides monilifera</i> subsp. <i>rotunda</i> was recorded within the Project Area during the site investigation. The Project has the potential to increase the presence of Bitou Bush during construction and operation of the Project, through the movement of vehicles and increased disturbance within the Project Area.	The Project therefore has the potential to cause the spread of this species off site, through wind and water seed dispersal.

Key Threatening Process	Project specifics	Assessment against Guidelines
<b><i>Invasion and establishment of exotic vines and scramblers</i></b>	Construction of the Project has the potential to increase the spread and establishment of exotic vines and scramblers through the disturbance of soils and the spread of seeds.	Where exotic vines and scramblers are already present within the Project Area, there is potential for these species to be spread via construction vehicles and natural dispersal into cleared and disturbed areas.

#### 4.2.2 Environmental Planning and Assessment Act 1979

The EP&A Act was enacted to encourage the proper consideration and management of impacts of proposed development or land-use changes on the environment (both natural and built) and the community. The Act is administered by the NSW Department of Planning and Infrastructure.

Sections of the EP&A Act of primary relevance to the natural environment are considered further below in relation to the current proposal.

**Table 6: Potential for impacts to threatened species listed on the TSC Act**

Name	EPBC Act	TSC Act	Habitat Values within Project Area	Potential Impacts on Threatened Species			Impact Assessment Required?
				Adversely affect stages of the lifecycle of the species?	Loss or disturbance of limiting foraging or breeding resources?	Fragmentation of limiting habitat?	
Flora species							
Coast Groundsel		E1	None, however prior mapped record (~1km accuracy)	No	No	No	Yes, due to record (Figure 4).
Fauna species							
Green and Golden Bell Frog	VU	E1	No vegetated water bodies occur on site. Storm water across the site is channeled through hard surfaces with extraction of oils and pollutants via hay stack filtration. No suitable habitat occurs within the Project Area to sustain foraging or breeding activities. However, given the proximity of records immediately adjacent to the Project Area it is possible that individuals may move across the site during dispersal.	No	No	No	Yes, given the potential for frogs to move through the Project Area during dispersal.
Wallum Froglet		V	No vegetated water bodies occur on site. Storm water across the site is channeled through hard surfaces with extraction of oils and pollutants via hay stack filtration. No suitable habitat occurs within the Project Area to	No	No	No	Yes, given the potential for frogs to move through the Project Area during dispersal.

Name	EPBC Act	TSC Act	Habitat Values within Project Area	Potential Impacts on Threatened Species			Impact Assessment Required?
				Adversely affect stages of the lifecycle of the species?	Loss or disturbance of limiting foraging or breeding resources?	Fragmentation of limiting habitat?	
			sustain foraging or breeding activities. However, given the proximity of records immediately adjacent to the Project Area it is possible that individuals may move across the site during dispersal.				
<b>Osprey</b>		V	No foraging or breeding sites occur within the Project Area. However, the Project Area contains infrastructure suitable as perching habitat for large birds such as the Osprey (Plate 1).	No	No	No	No
<b>Powerful Owl</b>		V	The Powerful Owl may forage across the Project Area however the primary areas which may support prey species occur at the three vegetated patches identified within Figure 6.	No	No	No	No
<b>Grass Owl</b>		V	No breeding or preferred foraging resources occur within the Project Area. Given that this species was recorded approximately 1.5km south of the Project Area within Botany Bay NP as recently as 2010, it is possible that this species will move through the Project Area to forage, particularly the	No	No	No	No

Name	EPBC Act	TSC Act	Habitat Values within Project Area	Potential Impacts on Threatened Species			Impact Assessment Required?
				Adversely affect stages of the lifecycle of the species?	Loss or disturbance of limiting foraging or breeding resources?	Fragmentation of limiting habitat?	
			eastern and north-eastern vegetation patches identified within Figure 6.				
<b>White-fronted Chat</b>		V E2	No breeding or preferred foraging habitat occurs within the Project Area. The closest records approximately 500m south within Botany Bay NP, however the most recent of these records dates from 1988. More recent records occur within Towra Point Nature Reserve 5km east of the Project Area. Although unlikely, if individuals from this population were to enter the Project Area it would most likely be associated with the three vegetation patches identified within Figure 6.	No	No	No	No
<b>Striated Fieldwren</b>		E1	No breeding or preferred foraging habitat occurs within the Project Area. The closest records approximately 5km east dating from 2002 (Bird Life Australia data). Although unlikely, if individuals from this population were to enter the Project Area it would most likely be associated with the three vegetation patches identified within Figure 6.	No	No	No	No

Name	EPBC Act	TSC Act	Habitat Values within Project Area	Potential Impacts on Threatened Species			Impact Assessment Required?
				Adversely affect stages of the lifecycle of the species?	Loss or disturbance of limiting foraging or breeding resources?	Fragmentation of limiting habitat?	
<b>Eastern Bentwing-bat</b>		V	The Eastern Bentwing-bat has been recorded as recently as 2010, less than 1km north of the Project Area. A reservoir of water occurs at Chisholm Drive at the western extent of the Project Area near Captain Cook Drive (Plate 5). This reservoir had sheer exposed sides and does not provide roosting opportunities for microbats. Although the Project Area does not provide preferred foraging habitat, the Eastern Bentwing-bat may forage within the Project Area on occasion within the three vegetated areas identified within Figure 6.	No	No	No	No
<b>Southern Myotis</b>		V	The Southern Myotis has been recorded as recently as 2009, less than 1km south west of the Project Area. A reservoir of water occurs at Chisholm Drive at the western extent of the Project Area near Captain Cook Drive (Plate 5). This reservoir had sheer exposed sides and does not provide roosting opportunities. Although it is unlikely to support an abundance of	No	No	No	No



Name	EPBC Act	TSC Act	Habitat Values within Project Area	Potential Impacts on Threatened Species			Impact Assessment Required?
				Adversely affect stages of the lifecycle of the species?	Loss or disturbance of limiting foraging or breeding resources?	Fragmentation of limiting habitat?	
			prey, the Southern Myotis may forage over this water body on occasion.				
<b>Threatened Ecological Communities</b>							
<b>Coastal Flats Swamp Mahogany Forest Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner.</b>		E3	None, however given the prior SMCMA (2009) mapping (Figure 3).	No	No	No	Yes, due to SMCMA (2009) record.

Definitions: E1 – endangered (Part 1, Schedule 1, TSC Act), E2 – endangered (Part 2, Schedule 1, TSC Act), E3 – endangered ecological community (Part 3, Schedule 1, TSC Act), V1 – vulnerable (Part 1, Schedule 2, TSC Act), VU – Vulnerable (EPBC Act)

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Four AOS have been developed for this Project (Appendix 4) to cover potentially present threatened biota (Table 6), for which all conclusions determined that no significant impact was likely, hence a Species Impact Statement is not required for the following:

1. Green and Golden Bell Frog *Litoria aurea*;
2. Wallum Froglet *Crinia tinnula*;
3. Coast Groundsel *Senecio spathulatus*; and
4. Coastal Flats Swamp Mahogany Forest *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner*.

#### **4.2.2.1 State Environmental Planning Policies (Part 3 Division 2)**

State Environmental Planning Policies (SEPPs) outline policy objectives relevant to state wide issues. The SEPPs and the relationship with the project are outlined in Section 3.2.

#### **4.2.3 Fisheries Management Act 1994**

The FM Act provides for the protection and conservation of aquatic species and their habitat through NSW. Impacts to threatened species, populations and communities listed under the FM Act must be assessed through the AOS process under Section 5A of the EP&A Act. Database searches have indicated that no known threatened freshwater fish species listed under the FM Act have been recorded within the Sydney Metropolitan CMA area (DPI Fisheries Database). Key Threatening Processes (KTPs) under the FM Act, associated with the project have been addressed within Appendix 7.

#### **4.2.4 Native Vegetation Act 2003**

The NV Act provides for, encourages and promotes the management of native vegetation on a regional basis. Under the NV Act no clearing of native vegetation is allowed except in accordance with prior development consent from the relevant Council approved by the relevant Catchment Management Authority.

None of the identified native vegetation patches are proposed to be cleared for the Project.

#### **4.2.5 Noxious Weeds Act 1993**

The NW Act was enacted to provide for the identification, classification and control of noxious weeds. Declared noxious weeds identified in the Project Area are listed in Appendix 2 (Table 8, Figure 6). An occupier (other than a public authority or a local control authority) must take all reasonable steps to eradicate state prohibited weeds and comply with the requirements in the Noxious Weeds Act 1993 for a notifiable weed for restricted plants. As an area within Sutherland Shire Council, the occupier must also take all reasonable steps to eradicate regionally prohibited weeds; fully and continuously suppress and destroy regionally controlled weeds; and prevent the growth and spread of locally controlled weeds.

## 5. Ecological Constraints and Recommendations

This section identifies the potential implications of the proposed Project on the ecological values of the Project Area and includes recommendations to assist Caltex to design a development to minimise impacts on biodiversity.

A summary of potential implications of development of the Project Area and recommendations to minimise impacts during the design phase of the project is provided in Table 7.

**Table 7: Project Implications and recommendations to minimise ecological impact**

Ecological feature	Implications of development	Recommendations
<b>Native vegetation including trees</b>	No native or planted vegetation will be removed as a result of the development.	Maintain design to ensure no need for removal of native vegetation. Fence the two eastern vegetation patches on the borders of construction areas to limit access or damage to these areas from construction equipment/vehicles.
<b>Noxious Weeds</b>	Noxious weeds (Figure 6); Bitou Bush <i>Chrysanthemoides monilifera</i> subsp. <i>rotunda</i> , Oleander <i>Nerium oleander</i> , and Lantana <i>Lantana camara</i> are not in planned construction areas, however, will need to be removed as part of the Caltex weed removal ongoing works.	Control of the three Class 4 noxious weeds, listed by NSW DPI for the Sutherland Shire Council listed under the Noxious Weed Act 1993 (NW Act). Control of the three identified Class 4 noxious weeds includes: <i>the growth of the plant must be managed in a manner that reduces its numbers, spread and incidence and continuously inhibits its reproduction (NSW DPI).</i>
<b>Frog dispersal habitat occurs across the Project Area</b>	The primary measures to avoid impacts during the construction phase are to avoid and minimise impacts to potential frog habitat as a result of the proposed works.	Stop work procedure on the chance encounter of any dispersing frogs during works should be implemented to avoid death or injury to frogs dispersing across the Project Area. Should threatened frogs, Green and Golden Bell Frog or Wallum Froglet be identified, active searching should be undertaken by a qualified zoologist experienced in the identification and management of the Green and Golden Bell Frog and Wallum Froglet. When open trenching/digging or excavating, ensure trenches/holes are not left open overnight. This should be vigilantly maintained all seasons of the year given the active season for the Green and Golden Bell Frog extends from September to April and the Wallum Froglet peak activity period occurs during the colder months. Trenches should be either back-filled daily or covered with metal plates and gaps filled. All trenches should be inspected prior to works each morning. Any frogs that

Ecological feature	Implications of development	Recommendations
		<p>become trapped within trenches should be assessed by a suitably qualified ecologist or veterinarian and then released into the nearest suitable habitat if uninjured.</p> <p>Provide all construction workers on site with the threatened frog species information sheets attached in Appendix 6.</p>
<b>Perch Points</b>	The primary measures to avoid impacts during the construction phase are to avoid and minimise impacts to tall tower structures, which may currently be frequented as perch points for large birds/birds of prey.	No disturbance to tall tower infrastructure is proposed as part of the current works. Any future dismantling should consider the loss of these potential perch sites for large birds including the threatened Osprey.

The principal means to reduce impacts on biodiversity values within the Project Area will be to; limit removal of native vegetation, educate workers and keep a watch for threatened frog dispersal and control a small amount of noxious weeds.

The results of this flora and fauna assessment should therefore be used to inform design of the Project. The design phase of the project is key to determining specifics of how ecological values will be incorporated and managed. It is also the time during which requirements for infrastructure and services must be forecast and allowance made within the design plan for all construction works to be sited away from native vegetation areas so they will be treated as no-go zones and not be encroached upon as construction progresses.

Prescriptions for mitigation of potential impacts of construction activities on retained native vegetation and habitat should be addressed in a site-specific Construction Environmental Management Plan.

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## Appendices

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## Appendix 1: Survey Methods

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### A1.1 Flora Survey Methods

The flora assessment was conducted under the terms of Biosis's Scientific Licence issued by the Office of Environment and Heritage under the *National Parks and Wildlife Act* (SL100758, expiry date 31 March 2013). Standard practices were used to collect data relating to flora as outlined below.

#### **Vascular Flora**

##### **Random Meander and Traverses**

Given the highly disturbed nature of the Project Area, vascular plant species were recorded via detailed traverse and random meander (Cropper 1993) methods, excluding only the inner bund areas for major tanks. All vascular plant species (ferns, conifers and flowering plants) observed were identified and recorded across the Project Area. Voucher specimens of unknown species were collected and later identified using nonclementure provided with various botanical reference books.

Information on vegetation structure, vegetation condition, site aspect and topography and any other information considered to be informative for the description of the vegetation was recorded.

##### **Targeted Threatened Species**

Given the prior record of the TSC Act listed Coast Groundsel *Senecio spathulatus* within 1km accuracy within the Project Area (Appendix 2), suitable habitat for this species was sought out and assessed to determine the potential for presence of the species.

##### **Noxious Weeds**

All noxious weed declarations for the Sutherland Shire Council area, as declared by NSW Department of Primary Industries were targeted during the Project Area traverses and random meander and any located species were recorded by a hand held GPS.



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## A1.2 Fauna Survey Methods

The fauna assessment was conducted under the terms of Biosis 's Scientific Licence issued by the Office of Environment and Heritage under the *National Parks and Wildlife Act* (SL100758, expiry date 31 March 2013). Fauna survey was conducted under approval 11/355 from the NSW Animal Care and Ethics Committee.

### Fauna surveys

Active searching for fauna species was undertaken on a single day, 30 October 2012 as part of this assessment. This included direct observation of species within the Project Area boundary and flying overhead. Active, searching under rocks, logs and artificial debris throughout the Project Area was undertaken excluding the bund areas surrounding the tanks. No scats were found on site to be analysed and tracks left in the sandy substrates were recorded and identified where possible. Calls of bird species were identified during the site inspection. No frogs were calling during the morning of the survey. Information on habitat complexity, artificial and natural barriers to movement and drainage connectivity throughout the Project Area as well as any other information considered to be informative for the description of the fauna habitats was recorded.

### Targeted Threatened Species

Given the prior records of threatened species within 5km accuracy within the Project Area (Appendix 2), suitable habitat for these species was sought out and assessed to determine the potential for presence of any of these species.

Biosis Pty Ltd conducts fauna survey within Standard Operating Procedures (SOPs) approved by the Wildlife and Small Institutions Animal Ethics Committee of the Department of Primary Industries (Biosis Research 2010). A copy of these SOPs is available on request.

### Aquatic habitat surveys

The standardised aquatic habitat assessment was based on the presence and condition of the following features:

- Pool substrate characterisation;
- Pool variability;
- Channel flow status;
- Bank stability and vegetation; and
- Epifaunal substrate / available cover.

The artificial reservoir at Chisholm Drive was not found to exhibit the above natural aquatic features.

## Appendix 2: Flora

Notes to tables:

<b>Australian status (EPBC Act):</b>  <b>CR - Critically Endangered</b>  <b>EN - Endangered</b>  <b>VU - Vulnerable</b>	<b>New South Wales status (TSC Act):</b>  C1 – critically endangered  CE – critically endangered ecological communities (Part 2, Schedule 1A)  E1 – endangered (Part 1, Schedule 1)  E2 – endangered (Part 2, Schedule 1)  E3 – endangered ecological community (Part 3, Schedule 1)  E4 – presumed extinct (Part 4, Schedule 1)  V1 – vulnerable (Part 1, Schedule 2)  V2 – vulnerable ecological communities (Part 2, Schedule 2)
<b># - Native species outside natural range</b>  <b>** - noxious weed species declared under the Noxious Weeds Act</b>	<b>Noxious weed status:</b>  SP State prohibited species (Class 1)  RP Regionally prohibited species (Class 2)  RC Regionally controlled species (Class 3)  RR Regionally restricted species (Class 4)  R Restricted plant (Class 5)
<b>OEH: Species recorded by Atlas of NSW Wildlife</b>  <b>2012: Species recorded during current survey</b>	

## A2.1 Flora species recorded from the Project Area

**Table 8: Flora species recorded by Biosis, 30.12.12 from the Project Area**

Status	Scientific name	Common name	Project Area	Planted Sp.
<b>Indigenous species:</b>				
	<i>Acacia longifolia</i> subsp. <i>Longifolia</i>	Coastal Wattle	NWCP EBDNV	+
	<i>Acacia suaveolens</i>	Sweet Wattle	NECR EBDNV	+
	<i>Acacia ulicifolia</i>	Prickly Moses	NECR EBDNV	+
	<i>Actinotus helianthi</i>	Flannel Flower	NECR EBDNV	+
	<i>Angophora costata</i>	Sydney Red Gum	EBDNV	
	<i>Banksia ericifolia</i> ,	Heath-leaved Banksia	EBDNV	
	<i>Banksia integrifolia</i>	Coastal Banksia	NECR	+
	<i>Baumea juncea</i>	Bare Twigrush	NECR	+
	<i>Bossiaea heterophylla</i>	Variable Bossiaea	EBDNV	
	<i>Casuarina glauca</i>	Swamp She-oak	EBDNV	
	<i>Cynodon dactylon</i>	Common Couch	+	
	<i>Dianella caerulea</i>	Blue Flax Lilly	EBDNV	
	<i>Dichelachne</i> sp.	Plumegrass	+	
	<i>Imperata cylindrical</i>	Blady Grass	EBDNV	
	<i>Kunzea ambigua</i>	Tick Bush	EBDNV	
	<i>Lepidosperma laterale</i>	Variable Sword- sedge	NECR	+
	<i>Leptospermum lavegatum</i>	Coastal Tee Tree	NECR	+
	<i>Lomandra longifolia</i>	Matt Rush	NECR EBDNV	+
	<i>Macrozamia communis</i>	Burrawang	NECR	+
	<i>Melaleuca ericifolia</i>	Swamp Paperbark	NWCP	+
	<i>Omalthus populifolius</i>	Bleeding Heart	EBDNV	
	<i>Pelargonium austral</i>	Common Stork's Bill	NECR	+

Status	Scientific name	Common name	Project Area	Planted Sp.
	<i>Persoonia lanceolata</i>	Lance-leaf geebung	NECR	+
	<i>Pimelea linifolia</i>	Slender Rice Flower	NECR	+
	<i>Pteridium esculentum</i>	Bracken	NECR EBDNV	
	<i>Smilax glycyphylla</i>	Sweet Sarsaparilla	NECR	+
	<i>Themeda australis</i>	Kangaroo Grass	NECR	+
	<i>Wahlenbergia stricta</i>	Bluebell	+	
<b>Introduced species:</b>				
	<i>Ageratum adenophora</i>	Crofton Weed	+	
	<i>Anagallis arvensis</i>	Scarlet pimpernel	+	
	<i>Andropogon virginicus</i>	Whiskey Grass	EBDNV	
	<i>Anthoxanthum ordatum</i>	Sweet Vernal Grass	+	
	<i>Arrhenatherum elatius</i>	Oat Grass	+	
	<i>Asparagus africanus</i>	Asparagus Fern	NWCP	
	<i>Atropa belladonna</i>	Deadly Nightshade	+	
	<i>Bidens pilosa</i>	Bidens	+	
	<i>Brassica sp.</i>	Wild Mustard	+	
	<i>Briza maxima</i>	Quaking Grass	+	
	<i>Bromus catharticus</i>	Prairie Grass	+	
	<i>Cenchrus echinatus</i>	Mossman River Grass	+	
	<i>Chloris gayana</i>	Rhodes Grass	+	
* N.E Corner	<i>Chrysanthemoides monilifera</i> subsp. <i>rotunda</i>	Bitou Bush	+	
	<i>Conyza bonariensis</i>	Fleabane	+	
	<i>Cupaniopsis anacardioides</i>	Tuckeroo	EBDNV	
	<i>Cyperus eragrostis</i>	Umbrella sedge	+	

Status	Scientific name	Common name	Project Area	Planted Sp.
	<i>Dactylis glomerata</i>	Cocksfoot	+	
	<i>Echinochloa sp.</i>		+	
	<i>Ehrharta erecta</i>	Panic Veldt Grass	+	
	<i>Eragrostis curvula</i>	African Love Grass	+	
	<i>Gamochaeta calviceps</i>	Cud Weed	+	
	<i>Gazania linearis</i>	Treasure Flower		
	<i>Hordeum Leporinum</i>	Barley Grass	+	
	<i>Hydrocotyle bonariensis</i>	Hydrocotyle	EDBNV	
	<i>Ipomoea indica</i>	Morning Glory		
*	<i>Lantana camara</i>	Lantana		
	<i>Lolium sp.</i>		+	
	<i>Melinis repens</i>	Red Natal Grass	+	
	<i>Nerium Oleander</i>	Oleander	+	
	<i>Paspalum dilatatum</i>	Paspalum	+	
	<i>Phalaris angusta</i>	Swamp Canary Grass	+	
	<i>Pinus radiata</i>	Radiata Pine	NWCP	
	<i>Plantago lanceolata</i>	Ribwort	+	
	<i>Pseudognaphalium luteoalbum</i>	Cud Weed	+	
*#	<i>Ricinus communis</i>	Caster Oil	+	
	<i>Senecia linearifolius</i>			
	<i>Sida Rhombifolia</i>	Paddys Lucerne	+	
	<i>Sonchus oleraceus</i>	Common Sowthistle	+	
	<i>Sporobolus africanus</i>	Parramatta Grass	+	
	<i>Stenotaphrum secundatum</i>	Buffalo Grass	+	
	<i>Taraxacum Officinalis</i>	Dandelion	+	

Status	Scientific name	Common name	Project Area	Planted Sp.
	<i>Trifolium sp.</i>	Clover	+	
	<i>Typha orientalis</i>	Bull Rush	+	
	<i>Urochloa panicoides</i>	Liverseed Grass	+	
	<i>Verbena bonariensis</i>	Purpletop	+	
	<i>Vicia sativa</i>	Common vetch	+	
	<i>Vulpia sp.</i>	Tufted Grass	+	

# seedlings

\*Noxious Weed DPI (Class 4)

NWCP - North West Corner Planting

NECR – North East Corner Revegetation

EBDNV – Eastern Boundary Disturbed Native Vegetation

## A2.2 Significant flora species and threatened ecological communities

Includes national and state significant species from the following sources:

- Protected Matters Search Tool of the Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPac) for matters protected by the EPBC Act (accessed on 25.10.12).
- NSW National Parks and Wildlife Service (NPWS) Wildlife Atlas © The State of New South Wales, Office of Environment and Heritage (OEH) (accessed on 25.10.12).
- Species specific habitat and ecological information is has been sourced from OEH species profiles.

Likelihood of occurrence	Potential criteria
<b>High</b>	<ul style="list-style-type: none"> <li>• Have a high incidence of previous records in the Project Area and locality</li> <li>• Populations are known in the Project Area or locality</li> </ul>
<b>Moderate</b>	<ul style="list-style-type: none"> <li>• There are infrequent recorded for the species in the Project Area and locality</li> <li>• Preferential habitats of the species are present in the Project Area but these are mainly in a poor or modified condition</li> <li>• Are cryptic flowering flora species that were not seasonally targeted during survey</li> </ul>
<b>Low</b>	<ul style="list-style-type: none"> <li>• Have not been recorded previously in the Project Area or locality and the Project Area is beyond the known distribution or range</li> <li>• Are dependant on a narrow range or specific habitats that do not or are not likely to occur in the Project Area</li> <li>• Are considered locally extinct</li> <li>• Are a non-cryptic perennial flora species that were targeted during field surveys</li> <li>• Are flora species that have a very limited range and highly specific dispersal mechanisms</li> </ul>
<b>Negligible</b>	<ul style="list-style-type: none"> <li>• Habitat not present on site</li> <li>• Habitat present but sufficient targeted survey has been conducted at an optimal time of year and species wasn't recorded</li> </ul>

**Table 9: Significant flora species recorded / predicted to occur within 5km of the Project Area**

Scientific Name	Common Name	Conservation status		Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC					
<b><i>Cryptostylis hunteriana</i></b>	Leafless Tongue Orchid	VU	V	#		Negligible	No suitable habitat found. Not located in Project Area.	This species typically grows in swamp-heath on sandy soils chiefly in coastal districts but has also been recorded on steep bare hillsides. Within the Central Coast bioregion, this species has been recorded within Coastal Plains Smooth-barked Apple Woodland and Coastal Plains Scribbly Gum Woodland. This species does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by <i>Eucalyptus sclerophylla</i> , <i>E. sieberi</i> , <i>Corymbia gummifera</i> and <i>Allocasuarina littoralis</i> ; appears to prefer open areas in the understorey of this community and is often found in association with the <i>Cryptostylis subulata</i> . It occurs in the following Catchment Management Regions Hawkesbury/Nepean, Hunter/Central Rivers, Northern Rivers and Southern Rivers. Inconsistent flowering times Dec-February
<b><i>Melaleuca biconvexa</i></b>	Biconvex Paperbark	VU	V	#		Negligible	No suitable habitat found (damp areas or soils). Not located in Project Area.	Biconvex Paperbark is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Catchment regions include: Hunter/Central Rivers, Hawkesbury/Nepean, Southern Rivers, and Northern River Catchments. Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Flowering occurs over just 3-4 weeks in September and October.
<b><i>Pimelea curviflora</i> var. <i>curviflora</i></b>		VU	V	#		Negligible	No suitable habitat found	Occurring in Hawkesbury/Nepean and Sydney Metropolitan Catchment Authority Areas. Confined to the coastal area of Sydney



Scientific Name	Common Name	Conservation status		Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC					
							(soils or vegetation association). Not located in Project Area.	between northern Sydney in the south and Maroota in the north-west. Occurs on lateritic soils and shale-sandstone transition soils on ridge tops in woodland. Associated with Dry Sclerophyll forests and Coastal valley grassy woodlands. Has an inconspicuous cryptic habit as it is fine and scraggly and often grows amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots. Flowers October to May.
<b><i>Thesium australe</i></b>	Austral Toadflax	VU	V	#		Negligible	No suitable habitat found (soils or vegetation association).	Found in very small to large populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. <i>Thesium australe</i> is a root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass. It is often found in damp sites in association with <i>Themeda australis</i> , but also found on other grass species at inland sites. Occurs on clay soils in grassy woodlands or coastal headlands.
<b><i>Caladenia tessellata</i></b>	Thick Lip Spider Orchid	VU	E1	#		Negligible	No suitable habitat found (soils or vegetation association).	<i>Caladenia tessellata</i> is found in the following Catchment Management Regions Sydney Metropolitan, Southern Rivers, Hawkesbury/Nepean, and Hunter/Central Rivers. Currently known from three disjunct areas: Braidwood on southern tablelands, Ulladulla on the south coast and three populations in Wyong area on the Central Coast. It is generally found in grassy, dry sclerophyll forests/woodland, particularly those associated with clay loam, or sandy soils. However, there is one population at Braidwood in lowland on stony soil. This species only grows in very dense shrubbery in coastal areas. Flowers appear between September and

Scientific Name	Common Name	Conservation status		Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC					
								November, but generally late September or early October in extant southern populations.
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	VU	E1	2011/#		Negligible	No suitable habitat found (vegetation association).	Subtropical and littoral rainforest on sandy soils or stabilised dunes near the sea. Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State Forest. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities. The species occurs in the following Catchment Authority Regions - Hunter/Central Rivers, Hawkesbury/Nepean, Sydney Metropolitan, and Southern Rivers.
<i>Acacia terminalis</i> subsp. <i>Terminalis</i>	Sunshine Wattle	EN	E1	2008/#		Negligible	Present outside the Project Area, nearby, however, no suitable habitat found within the site.	Occurs in the Sydney Metropolitan Catchment Authority Region. It has very limited distribution between Botany Bay to the northern foreshore of Port Jackson. <i>Acacia terminalis</i> subsp. <i>terminalis</i> occurs in Coastal scrub and Dry Sclerophyll.
<i>Pterostylis</i> sp. <i>Botany Bay</i>	Botany Bay Bearded Orchid	EN	E1	1998/#		Negligible	No suitable habitat found (vegetation association).	Restricted to the Sydney region where it is known from a small number of sites within Botany Bay National Park on the Kurnell Peninsula. The species was first collected at Maroubra in 1908, although it has not been recorded at Maroubra since that time. Occupies moist level sites on skeletal sandy soils derived from

Scientific Name	Common Name	Conservation status		Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC					
								sandstone. Associated vegetation is coastal heath dominated by <i>Melaleuca nodosa</i> and <i>Baeckea imbricata</i> . Occurs in small localised populations, usually in areas within the heath where the canopy allows filtered light to reach the ground.
<b><i>Coprosma baueri</i></b>	Coastal Coprosma	EN		1952		Negligible	Only records now exist on Norfolk Island	Shrub or small tree. Norfolk Island, prior Central Coast records.
<b><i>Streblus pendulinus</i></b>	Sia's Backbone, Siah's Backbone, Isaac Wood	En		#		Negligible	No suitable habitat found (vegetation association and altitude).	Sia's Backbone is a tree/large shrub that occurs from Cape York Peninsula to Milton, south-east New South Wales (NSW), as well as Norfolk Island. On the Australian mainland, Siah's Backbone is found in warmer rainforests, chiefly along watercourses. The altitudinal range is from near sea level to 800 m above sea level. The species grows in well developed rainforest, gallery forest and drier, more seasonal rainforest.
<b><i>Callistemon linearifolius</i></b>	Netted Bottle Brush		V	2011		Negligible	No suitable habitat found (vegetation association and altitude).	Occurs chiefly from Georges River to the Hawkesbury River where it grows in dry sclerophyll forest, open forest, scrubland or woodland on sandstone. Found in damp places, usually in gullies.
<b><i>Thelymitra atronitida</i></b>	Black-hooded Sun Orchid		E4A	1988		Negligible	No suitable habitat found (vegetation association and soils).	In New South Wales, <i>Thelymitra atronitida</i> is known from two highly disjunct localities, Cape Solander in Botany Bay National Park in southern Sydney, and Bago State Forest south of Tumut. At Cape Solander this species is recorded from shallow black peaty soil in coastal heath on sandstone.

Scientific Name	Common Name	Conservation status		Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC					
								The size of the Cape Solander population is not known with certainty but it is known to be very small.
<i>Senecio spathulatus</i>	Coast Groundsel		E1	2008		Moderate	A record (2008) exists, however is noted as having a 1km accuracy, which could locate the record beyond the Project Area.	Found in Sydney Metropolitan, Hunter/Central Rivers and Southern Rivers Catchment Management Authority Regions on coastal due areas. More specifically in Nadgee Nature Reserve (Cape Howe) and between Kurnell in Sydney and Myall Lakes National Park (with a possible occurrence. □

**Table 10: Significant threatened ecological communities recorded / predicted to occur within 5km of the Project Area.**

Scientific Name	Common Name	Conservation status		Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC					
<b>Blue Gum High Forest in the Sydney Basin Bioregion</b>	Blue Gum High Forest in the Sydney Basin Bioregion	CE	E4B			Negligible	Vegetation community not recorded within the locality	Blue Gum High Forest is dominated by a tall canopy of eucalypts that may exceed 30m in height. Its understorey is typically multi-layered with a midstorey of mesophyllous shrubs and small trees and a diverse ground layer of herbs, ferns and some grasses. Most stands of the community are in a state of regrowth after past clearing or logging activities, and consequently trees may be shorter,

Scientific Name	Common Name	Conservation status		Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC					
								less dense or more dense than less disturbed stands and is typically found on upper slopes.
<b>Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion</b>	Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion		V2			Negligible	Vegetation community not recorded within the locality	Castlereagh Scribbly Gum Woodland occurs almost exclusively on soils derived from Tertiary alluvium, or on sites located on adjoining shale or Holocene alluvium (Tozer 2003). It is most often found on sandy soils and tends to occur on slightly higher ground. In the Sydney Basin Bioregion occurs within the local government areas of Bankstown, Blacktown, Campbelltown, Hawkesbury, Liverpool and Penrith (James 1997), but may occur elsewhere within the Sydney Basin Bioregion.
<b>Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</b>	Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		E3			Negligible	Project area too far away from saline influence	Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions is frequently found as a zone landward of mangrove stands. Occasional scattered mature <i>Avicennia marina</i> trees occur through saltmarsh at some sites, and <i>Avicennia</i> (and less frequently <i>Aegiceras corniculatum</i> ) seedlings may occur throughout saltmarsh. In brackish areas dense stands of tall reeds ( <i>Phragmites australis</i> , <i>Bulboschoenus spp.</i> , <i>Schoenoplectus spp.</i> , <i>Typha spp.</i> ) may occur as part of the community.
<b>Cumberland Plain Woodland in the Sydney Basin Bioregion</b>	Cumberland Plain Woodland in the Sydney Basin	CE	E4B			Negligible	Vegetation community not recorded within the	Cumberland Plain Woodland is the name given to the ecological community in the Sydney Basin bioregion associated with clay soils derived from Wianamatta Group geology, or more rarely alluvial substrates, on the Cumberland Plain, a rainshadow area to the west of Sydney's Central Business District. The mean annual rainfall of

Scientific Name	Common Name	Conservation status		Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC					
	Bioregion						locality	this area is typically in the range of 700-900 mm, and is generally lower than that received on more elevated terrain that partially surrounds the Plain. The community typically occurs on flat to undulating or hilly terrain up to about 350 m elevation but may also occur on locally steep sites and at slightly higher elevations.
<b>Duffys Forest Ecological Community in the Sydney Basin Bioregion</b>	Duffys Forest Ecological Community in the Sydney Basin Bioregion		E3			Negligible	Vegetation community not recorded within the locality	Duffys Forest Ecological Community is the accepted name for the ecological community that occurs on the ridgetops, plateaus, upper slopes and occasionally mid slopes on Hawkesbury sandstone geology, typically in association with laterite soils and soils derived from shale and laminite lenses. It has the structural form predominantly of open-forest to woodland. The Duffys Forest Ecological Community has been reported from the Warringah, Pittwater, Ku-ring-gai, Hornsby and Manly Local Government Areas
<b>Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion</b>	Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion	E	E3			Negligible	Vegetation community not recorded within the Project Area vicinity	The Eastern Suburbs Banksia Scrub represents the plant communities occurring in Sydney's eastern and south-eastern suburbs that has the structural form of sclerophyllous heath or scrub occasionally with small areas of woodland, forest or wetland vegetation. Predominantly a sclerophyllous heath or scrub community although, depending on site topography and hydrology, some remnants contain small patches of woodland, low forest or limited wetter areas. Common species include <i>Banksia aemula</i> , <i>B. ericifolia</i> , <i>B. serrata</i> , <i>Eriostemon australasius</i> , <i>Lepidosperma laterale</i> , <i>Leptospermum laevigatum</i> , <i>Monotoca elliptica</i> and <i>Xanthorrhoea resinifera</i> . The plant community grows on nutrient poor sand deposits in the eastern and south eastern suburbs of Sydney. It has

Scientific Name	Common Name	Conservation status		Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC					
								a structural form predominately of sclerophyllous heath or scrub occasionally with small areas of woodland or low forest. The community is now restricted to less than 1% of its original area and currently exists only as a number of remnants (DSEWPac 2012). Although this TEC may be present within 5km of the Project Area, no suitable habitat occurs within the Project Area.
<b>Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</b>	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		E3			Negligible	Vegetation community not recorded within the locality	Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is the name given to the ecological community associated with periodic or semi-permanent inundation by freshwater, although there may be minor saline influence in some wetlands. They typically occur on silts, muds or humic loams in depressions, flats, drainage lines, backswamps, lagoons and lakes associated with coastal floodplains.
<b>Kurnell Dune Forest in the Sutherland Shire and City of Rockdale</b>	Kurnell Dune Forest in the Sutherland Shire and City of		E3			Negligible	Vegetation community not recorded within the Project Area immediate	The Kurnell Dune Forest is a low open sclerophyll forest community with a distinct mesophyll element found on sand, often in association with areas of sclerophyll heath and scrub.

Scientific Name	Common Name	Conservation status		Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC					
	Rockdale						surrounds	
<b>Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</b>	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	CE	E3			Negligible	Vegetation community not recorded within the locality	The ecological community represents a complex of rainforest and coastal vine thickets, including some that are deciduous, on the east coast of Australia. Typically, the ecological community occurs within two kilometres of the coast or adjacent to a large salt water body, such as an estuary and, thus, is influenced by the sea. It is naturally distributed as a series of disjunct and localised stands occurring on a range of landforms derived from coastal processes that can include dunes and flats, cheniers, berms, cobbles, headlands, scree, seacliffs, marginal bluffs, spits, deltaic deposits, coral rubble and islands. As a result, the ecological community is not associated with a particular soil type and can occur on a variety of geological substrata. The community is very rare and occurs in many small stands. Although this community has been previously recorded on Kurnell headland within Botany Bay National Park and Towra Point Nature Reserve no potential suitable habitat exists for this TEC within the site.
<b>River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South</b>	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast,		E3			Negligible	Vegetation community not recorded within the locality	River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is the name given to the ecological community associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. Floodplains are level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream



Scientific Name	Common Name	Conservation status		Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC					
<b>East Corner Bioregions</b>	Sydney Basin and South East Corner Bioregions							flow.
<b>Shale gravel Transition Forest in the Sydney Basin Bioregion</b>	Shale gravel Transition Forest in the Sydney Basin Bioregion	CE	E3			Negligible	Vegetation community not recorded within the locality	<p>Mainly found in the northern section of the Cumberland Plain, western Sydney, in the Richmond, Marsden Park and Windsor districts. Also appears in the Liverpool/ Holsworthy area, and there are small occurrences at Bankstown, Yennora and Villawood and the Kemps Creek area. There are 1,721 ha remaining intact. Good examples can be seen at Windsor Downs Nature Reserve and Kemps Creek Nature Reserve.</p> <p>Occurs primarily where shallow deposits from ancient river systems overlay shale soils, but also associated with localised concentrations of iron-hardened gravel.</p>
<b>Shale/Sandstone Transition Forest</b>	Shale/Sandstone Transition Forest	E	E3			Negligible	Vegetation community not recorded within the locality	Shale/Sandstone Transition Forest (SSTF) is the name given to the plant community, which occurs on areas transitional between the clay soils derived from Wianamatta Shale and the sandy soils derived from Hawkesbury Sandstone on the margins of the Cumberland Plain.
<b>Southern Sydney sheltered forest on transitional</b>	Southern Sydney sheltered		E3			Negligible	Vegetation community not recorded	The community typically has an open forest structure, although disturbance may result in local manifestations as woodland or scrub. The community is typically associated with sheltered heads

Scientific Name	Common Name	Conservation status		Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC					
<b>sandstone soils in the Sydney Basin Bioregion</b>	forest on transitional sandstone soils in the Sydney Basin Bioregion						within the locality	and upper slopes of gullies on transitional zones where sandstone outcrops may exist, but where soils are influenced by lateral movement of moisture, nutrients and sediment from more fertile substrates, such as shale/ironstone caps or dolerite dykes, in adjacent areas.
<b>Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</b>	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		E3			Negligible	Vegetation community recorded in the surrounding 5km broader area	Swamp Oak Floodplain Forest is found on the coastal floodplains of NSW. It has a dense to sparse tree layer in which <i>Casuarina glauca</i> (swamp oak) is the dominant species northwards from Bermagui. 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. Generally occurs below 20 m (rarely above 10 m) elevation. The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees (OEH Bionet, 2012). Although this TEC may be present within 5km of the Project Area, however there was no presence of this community within the Project Area.
<b>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North</b>	Swamp Sclerophyll Forest on Coastal Floodplains of the New		E3	2009 SMCMA		Moderate (due to SMCMA mapping)		This swamp community has an open to dense tree layer of eucalypts and paperbarks although some remnants now only have scattered trees as a result of partial clearing. The trees may exceed 25 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality where the tree stratum is low and dense. For example, stands dominated by <i>Melaleuca</i>

Scientific Name	Common Name	Conservation status		Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC					
<b>Coast, Sydney Basin and South East Corner Bioregions</b>	South Wales North Coast, Sydney Basin and South East Corner Bioregions							<p><i>ericifolia</i> typically do not exceed 8 m in height. The community also includes some areas of fernland and tall reedland or sedgeland, where trees are very sparse or absent.</p> <p>The community is further characterised by several layers of vegetation, including wetland plants and is generally found close to standing water on waterlogged soils or periodically inundated soils.</p>
<b>Sydney Freshwater Wetlands in the Sydney Basin Bioregion</b>	Sydney Freshwater Wetlands in the Sydney Basin Bioregion		E3			Negligible	Vegetation community not recorded within the locality	Sydney Freshwater Wetlands are restricted to freshwater swamps in swales and depressions on sand dunes and low nutrient sandplain sites in coastal areas. These areas are generally on the sands of the Warriewood and Tuggerah Soil Landscapes (Chapman & Murphy 1989).
<b>Sydney Turpentine-Ironbark Forest</b>	Sydney Turpentine-Ironbark Forest	CE	E3			Negligible	Vegetation community not recorded within the locality	<p>The structure of the community was originally forest, but may now exist as woodland or as remnant trees.</p> <p>Characteristic tree species in the STIF are <i>Syncarpia glomulifera</i>, <i>Eucalyptus globoidea</i>, <i>Eucalyptus resinifera</i>, <i>Eucalyptus paniculata</i>, <i>Angophora costata</i> and <i>Angophora floribunda</i>.</p> <p>STIF occurs within the local government areas Ashfield, Auburn, Canterbury, Concord, Drummoyne, Leichhardt, Marrickville, Bankstown, Ryde, Hunters Hill, Baulkham Hills, Ku-ring-gai, Hornsby, Parramatta, Bankstown, Rockdale, Kogarah, Hurstville, Sutherland. The area is within the County of Cumberland and entirely within the</p>

Scientific Name	Common Name	Conservation status		Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC					
								Sydney Basin Bioregion.
<b>Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions</b>	Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	CE	E3			Negligible	Vegetation community not recorded within the Project Area immediate surrounds	Themeda grassland on seacliffs and coastal headlands in NSW is an ecological community described by Adam et al. (1989). The community is found in the NSW North Coast, Sydney Basin and South East Corner Bioregions, on seacliffs and coastal headlands. The structure of the community is typically closed tussock grassland, but may be open shrubland or open heath with a grassy matrix between the shrubs. The community belongs to the Maritime Grasslands vegetation class of Keith (2004).

The most recent record relates to:

- # species predicted to occur by the DSEWPac database (not recorded on other databases)
- ## species predicted to occur based on natural distributional range and suitable habitat despite lack of records in the databases searched
- Year recorded on databases listed above

## Appendix 3: Fauna

Below is a list of fauna species recorded from the Project Area during the present assessment and a list of significant fauna species recorded or predicted to occur within 5km of the Project Area.

### Notes to tables:

#### Australian status (EPBC Act):

**EX - Extinct**

**CR - Critically Endangered**

**EN - Endangered**

**VU - Vulnerable**

**CD - Conservation dependent**

#### New South Wales status (TSC Act):

C1 – critically endangered

E1 – endangered (Part 1, Schedule 1)

E2 – endangered (Part 2, Schedule 1)

E4 – presumed extinct (Part 4, Schedule 1)

V1 – vulnerable (Part 1, Schedule 2)

**\* - introduced species**

Fauna species in these tables are listed in alphabetical order within their taxonomic group.

## A3.1 Fauna species recorded from the Project Area

Fauna species in these tables are listed in alphabetical order within their taxonomic group.

**Table 11: Vertebrate fauna recorded from the Project Area (present assessment)**

Status	Scientific Name	Common Name	Observation type
<b>Aves</b>			
*	<i>Columba livia</i>	Rock Dove	O
*	<i>Streptopelia chinensis</i>	Spotted Turtle-Dove	OH
*	<i>Passer domesticus</i>	House Sparrow	OH
M	<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	O
	<i>Anas castanea</i>	Chestnut Teal	O
	<i>Grallina cyanoleuca</i>	Magpie-lark	OH
	<i>Gymnorhina tibicen</i>	Australian Magpie	OH
	<i>Strepera graculina</i>	Pied Currawong	OH
	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	OH
	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	OH
	<i>Corvus coronoides</i>	Australian Raven	OH
	<i>Rhipidura leucophrys</i>	Willie Wagtail	OH
	<i>Hirundo neoxena</i>	Welcome Swallow	O
	<i>Malurus cyaneus</i>	Superb Fairy-wren	H
	<i>Anthochaera carunculata</i>	Red Wattlebird	H
	<i>Acanthiza nana</i>	Yellow Thornbill	O
	<i>Pardalotus punctatus</i>	Spotted Pardalote	H
	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	OH
	<i>Sturnus vulgaris</i>	Common Starling	OH
<b>Reptiles</b>			
	<i>Amphibolurus muricatus</i>	Jacky Lizard	O

M = Migratory species listed under a provision of the EPBC Act.

## A3.2 Significant fauna species

The table below includes national and state significant species from the following sources:

- Protected Matters Search Tool of the Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPac) for matters protected by the EPBC Act (accessed on 25.10.12).
- Department of Primary Industries (DPI) Threatened & Protected Species – Records Viewer for Sydney Metro CMA.
- BirdLife Australia, the New Atlas of Australian Birds 1998-2012 (BA).
- NSW National Parks and Wildlife Service (NPWS) Wildlife Atlas © The State of New South Wales, Office of Environment and Heritage (OEH) (accessed on 25.10.12). Species specific habitat and ecological information is has been sourced from OEH species profiles.

Likelihood of occurrence	Potential criteria
<b>High</b>	<ul style="list-style-type: none"> <li>• Have a high incidence of previous records in the Project Area and locality</li> <li>• Preferentially use habitats that are present in the Project Area which are abundant and/or in good condition</li> <li>• Resident populations are known in the Project Area or locality</li> <li>• Are known to regularly use habitats of the site or locality or are highly likely to visit the site during seasonal dispersal or migration</li> </ul>
<b>Moderate</b>	<ul style="list-style-type: none"> <li>• There are infrequent recorded for the species in the Project Area and locality</li> <li>• Preferential habitats of the species are present in the Project Area but these are mainly in a poor or modified condition</li> <li>• May use or occur in habitats within the Project Area opportunistically during seasonal migration but are unlikely to be present on permanent basis as a populations or vagrant individuals</li> </ul>
<b>Low</b>	<ul style="list-style-type: none"> <li>• Have not been recorded previously in the Project Area or locality and the Project Area is beyond the known distribution or range</li> <li>• Are dependant on a narrow range or specific habitats that do not or are not likely to occur in the Project Area</li> <li>• Are considered locally extinct</li> </ul>
<b>Negligible</b>	<ul style="list-style-type: none"> <li>• Habitat not present on site</li> <li>• Habitat present but sufficient targeted survey has been conducted at an optimal time of year and species wasn't recorded</li> </ul>

**Table 12: Significant fauna species recorded, or predicted to occur, within 5km of the Project Area**

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
Aves									
<i>Anthochaera phrygia</i>	Regent Honeyeater	EN	E4A		1977	-	Low	No preferred foraging or breeding habitat occurs on site. No recent records of this species occur within the locality.	A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests . Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises: <i>E. microcarpa</i> , <i>E. punctata</i> , <i>E. polyanthemus</i> , <i>E. mollucana</i> , <i>Corymbia robusta</i> , <i>E. crebra</i> , <i>E. caleyi</i> , <i>C. maculata</i> , <i>E. mckieana</i> , <i>E. macrorhyncha</i> , <i>E. laevopinea</i> and Angophora floribunda. Nectar and fruit from the mistletoes <i>A. miquelii</i> , <i>A. pendula</i> , <i>A. cambagei</i> are also eaten during the breeding season. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and sheoaks. Also nest in mistletoe haustoria. An open cup-shaped nest is constructed of bark, grass, twigs and wool by the female.
<i>Ardenna carneipes</i>	Flesh-footed Shearwater	-	V		2001	-	Low	No preferred foraging or breeding habitat for this oceanic species occur within the Project Area.	The Flesh-footed Shearwater is an oceanic species usually found beyond the edge of the continental shelf.



Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
<i>Botaurus poiciloptilus</i>	Australasian Bittern	EN	E1		2007/#		Low	Despite two records of this species occurring within the Project Area, no foraging or breeding habitat for this species occur within the Project Area. The records within the Project Area date from 1985 and 1940.	The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation including Typha spp. and Eleocharis spp. Typically this bird forages at night on frogs, fish and invertebrates, and remains inconspicuous during the day. The breeding season extends from October to January with nests being built amongst dense vegetation on a flattened platform of reeds.
<i>Calamanthus fuliginosus</i>	Striated Fieldwren		E1		2002		Low	No suitable habitats for this species occur within the Project Area.	The Striated Fieldwren is found in coastal swamp heaths and tussock fields of south-eastern NSW, into southern Victoria and the south-east of South Australia. It is also found in Tasmania. There are no recent records for the northern Blue Mountains (Bilpin) or Botany Bay, where small and isolated subpopulations were last recorded in the 1970s, nor any recent reports north of the main subpopulations in Morton National Park and Ben Boyd National Park/Nadgee Nature Reserve.
<i>Calidris alba</i>	Sanderling		V		2011		Low	No suitable habitat occurs within the Project Area.	Occurs on the coast mostly on open sand beaches exposed to open sea-swells.

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
<i>Calidris ferruginea</i>	Curlew Sandpiper		E1		2009		Low	No suitable habitat occurs within the Project Area.	Inhabits sheltered intertidal mudflats. Also non-tidal swamps, lagoons and lakes near the coast. Infrequently recorded inland.
<i>Calidris tenuirostris</i>	Great Knot		V		2009/#		Low	No suitable habitat occurs within the Project Area.	Mainly found on intertidal mudflats, sandflats and sandy beaches.
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo		V, E2		1990		Low	No breeding or foraging resources occur within the Project Area for this species.	Inhabits forest with low nutrients, characteristically with key Allocasuarina species. Tends to prefer drier forest types. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead.
<i>Charadrius leschenaultii</i>	Greater Sand-plover		V		2004		Low	No suitable habitat occurs within the Project Area.	Entirely coastal in NSW, foraging on intertidal sand and mudflats in estuaries and roosting during high tide on sandy beaches or rocky shores. Individuals have been recorded on inshore reefs, rock platforms, small rocky islands and sand cays on coral reefs, within Australia. Occasional sightings have also occurred on near-coast saltlakes, brackish swamps, shallow freshwater wetlands and grassed paddocks.
<i>Charadrius mongolus</i>	Lesser Sand-plover		V		2009/#		Low	No suitable habitat occurs within the Project Area.	In Australia, the species is known to favour coastal environs including beaches, mudflats and mangroves. Within NSW, individuals have been observed on intertidal sand and mudflats in estuaries or roosting on sandy beaches or rocky shores at high tide .

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
<i>Daphoenositta chrysoptera</i>	Varied Sittella		V		1943		Low	No suitable habitat occurs within the Project Area for this species. No recent records of this species occur within the locality.	The Varied Sittella is a sedentary species which inhabits a wide variety of dry eucalypt forests and woodlands, usually with either shrubby understorey or grassy ground cover or both, in all climatic zones of Australia. Usually inhabit areas with rough-barked trees, such as stringybarks or ironbarks, but also in mallee and acacia woodlands, paperbarks or mature Eucalypts. The Varied Sittella feeds on arthropods gleaned from bark, small branches and twigs. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	EN	E1		#/1921		Low	No suitable habitat occurs within the Project Area for this species. No recent records of this species occur within the locality.	Found in coastal woodlands, dense scrub and heathlands, particularly where it borders taller woodlands}.
<i>Diomedea exulans</i>	Wandering Albatross	VU	E1		2004		Negligible	No habitat available on site for this exclusively pelagic species. Despite a recent record of this species occurring	A marine, pelagic and aerial species. Versatile feeders in pelagic and shelf waters. Breed on subantarctic and antarctic islands.

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
								from the Project Area. This record is likely to be of an individual flying over the site as this species would not be dependent on resources within the Project Area.	
<b><i>Diomedea exulans amsterdamensis</i></b>	Amsterdam Albatross	EN			#		Negligible	No habitat available on site for this exclusively pelagic species	A marine pelagic species.
<b><i>Diomedea exulans antipodensis</i></b>	Antipodean Albatross	VU	V		#		Negligible	No habitat available on site for this exclusively pelagic species	A marine pelagic species rarely visiting Australia .
<b><i>Diomedea exulans exulans</i></b>	Tristan albatross	EN			#		Negligible	No habitat available on site for this exclusively pelagic species	<i>Diomedea exulans exulans</i> is a newly defined species and its 'at sea' range is yet to be defined. Currently, only one definitive record of this species exists; on Gough Island and was recaptured 4 years later off Wollongong.
<b><i>Diomedea gibsoni</i></b>	Gibson's Albatross	VU	V		#		Negligible	No habitat available on site for this exclusively	A marine pelagic species which breeds on the Auckland islands, New Zealand.

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
								pelagic species	
<i>Epthianura albifrons</i>	White-fronted Chat		V, E2		2011		Moderate	<p>No preferred habitats occur within the Project Area given the very sparse vegetation present on site.</p> <p>The White-fronted Chat is found in damp open habitats, particularly wetlands containing saltmarsh areas that are bordered by open grasslands or lightly timbered lands. Along the coastline, they are found in estuarine and marshy grounds with vegetation less than 1 m tall. The species is also observed in open grasslands and sometimes in low shrubs bordering wetland areas. Inland, the species is often observed in open grassy plains, saltlakes and salt pans that are along the margins of rivers and waterways.</p> <p>Nests are built in low vegetation and in the Sydney region nests have also been observed in low isolated mangroves.</p> <p>An Endangered Population occurs in the Sydney Metropolitan CMA area, at Newton Nature Reserve near Homebush and at Towra Point Nature</p>	<p>Sydney Metropolitan CMA: The White-fronted Chat occupies foothills and lowlands below 1000 m above sea level. In NSW it occurs mostly in the southern half of the state, occurring in damp open habitats along the coast, and near waterways in the western part of the state .</p>

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
									Reserve.
<i>Erythrotriorchis radiatus</i>	Red Goshawk	VU	E4A		#		Low	No historical records of this species occur within the locality.	Occur in forest and woodland habitat near permanent water. In NSW prefer Melaleuca swamp forest and open eucalypt woodland. Require greater than 20 m tall trees for nesting.
<i>Esacus magnirostris</i>	Beach Stone-curlew		E4A		2010		Low	The Project Area does not support undisturbed habitat suitable for this species to regularly inhabit.	Occurs on open, undisturbed beaches, islands, reefs and estuarine intertidal sand and mudflats.
<i>Fregetta grallaria grallaria</i>	White-bellied Storm-Petrel	VU	V		#		Negligible	No habitat available on site for this pelagic species	A marine pelagic species.
<i>Glossopsitta pusilla</i>	Little Lorikeet		V		2002		Low	No tree hollows required for breeding or mature Eucalypt trees providing foraging resources occur within the Project Area to support this species.	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
<i>Gygis alba</i>	White Tern		V		1981		Negligible	No habitat available on site for this exclusively pelagic species	The extreme west of this species range touches the mid-east coast of Australia, where it may be occasionally observed during the breeding season foraging over reefs. Otherwise this pelagic species only comes to land to breed which occurs exclusively on Lord Howe and Norfolk Islands.
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher		V		2012		Low	Despite the density of records occurring along the headland no preferred foraging or breeding resources occur within the Project Area.	The Sooty Oystercatcher is found on undisturbed tidal rocks on ocean shores and islands. Occasionally it is observed on sandspits and mudflats. It forages on exposed rock or coral at low tide for limpets and mussels. The Sooty Oystercatcher breeds in spring and summer almost exclusively offshore or on isolated promontories.
<i>Haematopus longirostris</i>	Pied Oystercatcher		E1		2012		Low	Despite the density of records occurring along the headland no preferred foraging or breeding resources occur within the Project Area.	An intertidal forager found on undisturbed sandy beaches and spits, tidal mudflats and estuaries. Its food supply (beach macroinvertebrates) have been negatively affected by human impact. The Pied Oystercatcher is restricted to the littoral zone of beaches and estuaries, nesting on the ground above the tideline. A pair will re-nest in the same spot each year, rarely shifting their territory. Occasionally the Pied Oystercatcher is found in paddocks near the coast.
<i>Halobaena caerulea</i>	Blue Petrel	VU			1954		Negligible	No habitat	A marine species, usually pelagic but sometimes

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
								available on site for this pelagic species	observed over shallow waters. A regular visitor to southern Australian waters.
<i>Lathamus discolor</i>	Swift Parrot	EN	E1		1975/#		Low	No breeding or foraging habitats occur within the Project Area. No recent records of this species occur within the locality.	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees include Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> . This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.
<i>Limicola falcinellus</i>	Broad-billed Sandpiper		V		1988/#		Low	No recent records of this species occur within the locality.	Occurs in sheltered parts of coasts, such as estuaries, harbours, embayments and lagoons, which have shell or sandbanks nearby.
<i>Limosa limosa</i>	Black-tailed Godwit		V		2006/#		Low	No preferred habitats occur within the Project Area	Mainly coastal, usually in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats.



Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
<i>Macronectes giganteus</i>	Southern Giant Petrel	EN	E1		2011/#		Negligible	No habitat available on site for this exclusively pelagic species	The Southern Giant-Petrel is a marine species found throughout the Antarctic to subtropical waters occasionally venturing to inshore waters.
<i>Macronectes halli</i>	Northern Giant-Petrel	VU	V		3#/1983		Negligible	No habitat available on site for this exclusively pelagic species	Marine, pelagic species found mainly in subantarctic waters.
<i>Neochmia ruficauda</i>	Star Finch	EN	E4		1986		Low	No preferred habitats (i.e. swamps, tall grass or rivers) occur within the Project Area. This species has not been recently recorded within the locality.	Found in tall grass next to swamps and rivers.
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	CE	E4A		#		Low	No breeding or foraging habitats occur within the Project Area. No recent records of this species occur within the locality.	A single breeding population of fewer than 200 individuals occurs in a narrow coastal strip of south-west Tasmania. Adult birds depart Tasmania for the mainland in February. The first adults begin leaving the mainland for Tasmania in September with the last birds having departed by November. It is a coastal species inhabiting saltmarshes, sedgeplains, coastal dunes, pastures, shrublands and moorlands, generally within 10 km of the coast. Critical winter

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
									habitat for the species includes natural saltmarshes dominated by <i>Sarcocornia quinqueflora</i> (Beaded Glasswort) and <i>Sclerostegia arbuscula</i> (Shrubby Glasswort), as well as the associated grassy or weedy pastures. Historical records indicate that the Orange-bellied Parrot was formerly more abundant and widespread in NSW than it is now, however the species' distribution continues to extend into south-eastern NSW where suitable habitat is still available.
<b><i>Ninox strenua</i></b>	Powerful Owl		V		2003		Moderate	No tree hollows occur on site to support breeding for this species. Given the proximity of records of this species large territories individuals may forage adjacent to the Project Area on occasion.	The Powerful Owl occupies wet and dry eucalypt forests and rainforests. It may inhabit both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully area. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm. It has a large home range of between 450 and 1450 ha.
<b><i>Onychoprion fuscata</i></b>	Sooty Tern		V		2009		Low	The Project Area does not support breeding or foraging resources for this pelagic	The Sooty Tern is a pelagic species found over tropical waters where it feeds offshore far away from land. It breeds off the coast of WA and QLD rarely venturing to the south-east of Australia.

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
								species.	
<i>Oxyura australis</i>	Blue-billed Duck		V		1990		Low	The Project Area does not support large permanent waterbodies suitable to sustain this species.	Almost wholly aquatic, preferring deep water in large, permanent wetlands with an abundant aquatic flora.
<i>Pandion cristatus</i>	Osprey		V		2011		Medium	The Osprey may fly over the Project Area whilst foraging in adjacent coastal waters. The high infrastructure within the Project Area provides potential perching and nesting locations that this species may use on occasion.	Found in coastal waters, inlets, estuaries and offshore islands. Occasionally found 100 km inland along larger rivers. It is water-dependent, hunting for fish in clear, open water. The Osprey occurs in terrestrial wetlands, coastal lands and offshore islands. It is a predominantly coastal species, generally using marine cliffs as nesting and roosting sites. Nests can also be made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.
<i>Petroica boodang</i>	Scarlet Robin		V		1943		Low	No breeding or foraging habitats occur within the Project Area. No recent records of	During the breeding season the Scarlet Robin is found in eucalypt forests and temperate woodlands, often on ridges and slopes. During autumn and winter it moves to more open and cleared areas. It has dispersive or locally migratory seasonal

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
								this species occur within the locality.	movements. The Scarlet Robin forages amongst logs and woody debris for insects which make up the majority of its diet. The nest is an open cup of plant fibres and cobwebs, sited in the fork of a tree (often a dead branch in a live tree, or in a dead tree or shrub) which is usually more than 2 m above the ground . It is conspicuous in open and suburban habitats.
<i>Polytelis swainsonii</i>	Superb Parrot	VU	V		1995		Low	No tree hollows occur on site to support breeding for this species. No suitable foraging habitats (grassy woodlands) occur within the Project Area.	Found mainly in open, tall riparian River Red Gum forest or woodland. Often found in farmland including grazing land with patches of remnant vegetation. Breeds in hollow branches of tall Eucalypt trees within 9 km of feeding areas.
<i>Procelsterna cerulea</i>	Grey Ternlet		V		1986		Low	No recent records of this species occur within the locality. No preferred habitats occur within the Project Area.	Occurs on tropical or subtropical islands and roosts on rock stacks and cliffs. Usually found in near shore waters. Breeds on cliffs and occasionally on beaches.
<i>Pterodroma leucoptera</i>	Gould's Petrel	EN	V		#/1988		Negligible	No habitat available on site	The Gould's Petrel is a marine species which only comes to shore to breed. It breeds exclusively on

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
<i>leucoptera</i>								for this exclusively pelagic species	Cabbage Tree Island, 1.4 km offshore from Port Stephens and on nearby Boondelbah Island. The first arrival of Gould's petrel on cabbage tree Island occurs from mid to late September. Fledglings depart the island from late March to early May.
<i>Pterodroma neglecta neglecta</i>	Kermadec Petrel (west Pacific subspecies)	VU	V		#		Negligible	No habitat available on site for this exclusively pelagic species	Marine pelagic, in subtropical and tropical waters. They breed on islands, atolls and rock cliff where they nest on the ground or in rock crevices under ferns, shrubs or trees. Forage far away from breed sites.
<i>Pterodroma nigripennis</i>	Black-winged Petrel		V		1964		Negligible	No habitat available on site for this exclusively pelagic species	The Black-winged Petrel is a pelagic marine species rarely coming closer to shore than the continental shelf. It breeds on Lord Howe and Norfolk islands.
<i>Pterodroma solandri</i>	Providence Petrel		V		1973		Negligible	No habitat available on site for this exclusively pelagic species	The Providence Petrel is a pelagic marine species which rarely comes closer to the Australian mainland than the continental shelf. It breeds exclusively on Lord Howe and Phillip Islands since suffering extinction in 1800 on the larger Norfolk Island .
<i>Puffinus assimilis</i>	Little Shearwater		V		1988		Low	No recent records of this species occur within the locality.	The Little Shearwater is pelagic marine species found in subantarctic and subtropical (occasionally tropical) waters and often seen in continental shelf waters. It breeds on subtropical and subantarctic islands.

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
<i>Rostratula australis</i>	Australian Painted Snipe	VU	E1		#		Low	No historical records of this species occur within the locality. Standing waters within the Project Area are not preferred by this species	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, ephemeral or permanent, although they have been recorded in brackish waters.
<i>Stagonopleura guttata</i>	Diamond Firetail		V		2003		Low	No watercourses or wooded vegetation occur within the Project Area to sustain this species on site.	Found in a range of habitat types including open eucalypt forest, mallee and acacia scrubs}. Often occur in vegetation along watercourses.
<i>Sternula albifrons</i>	Little Tern		E1		2010/#		Low	Despite a recent record of this species occurring from the Project Area. This record is likely to be of an individual flying over the site as this species would not be dependent on resources	The Little Tern favours sheltered coasts, harbours, bays, lakes, inlets, estuaries, coastal lagoons and ocean beaches especially with sand-spits and sand islets. It forages over shallow waters close inshore or over sandbars and reefs.

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
								within the Project Area.	
<i>Sternula nereis nereis</i>	Fairy Tern	VU			#		Low	No historical records of this species occur within the locality. No suitable habitats occur within the Project Area for this species.	A small piscivorous (fish-eating) bird, the Fairy Tern is approximately 22–27 cm in length, 70 g in weight and has a wingspan of 44–53 cm. The Fairy Tern is bulky and round bodied. Within Australia, the Fairy Tern occurs along the coasts of Victoria, Tasmania, South Australia and Western Australia; occurring as far north as the Dampier Archipelago near Karratha. The subspecies has been known from New South Wales (NSW) in the past, but it is unknown if it persists there.
<i>Thalassarche bulleri</i>	Buller's Albatross	VU			#		Negligible	No habitat available on site for this exclusively pelagic species	A marine pelagic species rarely visiting Australia.
<i>Thalassarche cauta</i>	Shy Albatross	VU	V		2011		Negligible	No habitat available on site for this exclusively pelagic species	The Shy Albatross is a marine pelagic species inhabiting sub-antarctic and subtropical waters, spending the majority of their time at sea. Occasionally it is observed in continental shelf waters in bays and harbours.
<i>Thalassarche cauta cauta</i>	Shy Albatross	VU	V		#		Negligible	No habitat available on site for this exclusively pelagic species	The Shy Albatross is a marine pelagic species inhabiting sub-antarctic and subtropical waters, spending the majority of their time at sea. Occasionally it is observed in continental shelf waters in bays and harbours.

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
<i>Thalassarche chlororhynchos</i>	Yellow-nosed Albatross	VU			2011		Negligible	No habitat available on site for this exclusively pelagic species	A marine pelagic species which visits the south-east coast of Australia .
<i>Thalassarche melanophris</i>	Black-browed Albatross	VU	V		2011/#		Negligible	No habitat available on site for this exclusively pelagic species	Inhabits Antarctic, subantarctic and subtropical waters. Although generally pelagic the species also occurs on the continental shelf and can be seen from land.
<i>Thalassarche melanophris impavida</i>	Campbell albatross	VU			#		Negligible	No habitat available on site for this exclusively pelagic species	Inhabits Antarctic, subantarctic and subtropical waters.
<i>Thalassarche salvini</i>	Salvin's Albatross	VU			#		Negligible	No habitat available on site for this exclusively pelagic species	An exclusively pelagic species.
<i>Thalassarche steadi</i>	White-capped Albatross	VU			#		Negligible	No habitat available on site for this exclusively pelagic species	An exclusively pelagic species.
<i>Tyto longimembris</i>	Eastern Grass Owl		V		2010		Moderate	No preferred breeding or foraging habitat occurs within the Project Area.	Occurs mainly in open tussock grassland, usually in treeless areas. Can also occur in marshy areas with tall dense tussocks of grass. Occasionally occurs in densely vegetated agricultural lands such as sugarcane fields.



Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
								Based on the proximity of recent records this species may move across the site on occasion.	
<i>Tyto novaehollandiae</i>	Masked Owl		V		2006		Low	No suitable hollows for breeding or vegetated areas to support prey species are found within the Project Area. A single record of this species was recorded at Towra Point Nature Reserve approximately 5km to the west of the Project Area.	The Masked Owl may be found across a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting. It has mostly been recorded in open forests and woodlands adjacent to cleared lands. They nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometimes dead. The nest hollows are usually located within dense forests or. Masked Owls prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet. It has a large home range of between 500 to 1000 ha.
<i>Xenus cinereus</i>	Terek Sandpiper		V		2003/#		Low	No preferred breeding or foraging habitat occurs within the Project Area for	Mainly found on saline intertidal mudflats in sheltered estuaries, embayments, harbours and lagoons.

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
								this species.	
<b>Reptiles</b>									
<i>Caretta caretta</i>	Loggerhead Turtle	EN	E1		#		Negligible	No habitat available on within the Project Area for this exclusively marine species.	In Australia, the Loggerhead Turtle occurs in the waters of coral and rocky reefs, seagrass beds and muddy bays throughout eastern, northern and western Australia. While nesting is concentrated in southern Queensland and from Shark Bay to the North West Cape in Western Australia, foraging areas are more widely distributed. Small Loggerhead Turtles live at or near the surface of the ocean and move with the ocean currents. In eastern Australia, there is evidence that they spend around 15 years or more in the open ocean, with much of their feeding in the top 5 m of water, before recruiting to their chosen inshore or neritic feeding area. Loggerhead Turtles choose a wide variety of tidal and sub-tidal habitat as feeding areas and show fidelity to both their foraging and breeding areas.
<i>Chelonia mydas</i>	Green Turtle	VU	V		#		Negligible	No habitat available on within the Project Area for this exclusively marine species.	Marine species with a pan-tropical distribution throughout the world. More abundant along the tropical coasts of Australia and the Great Barrier Reef. Green Turtles spend their first five to ten years drifting on ocean currents. During this pelagic (ocean-going) phase, they are often found in

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
									association with driftlines and rafts of Sargassum (a floating marine plant that is also carried by currents). Once Green Turtles reach 30 to 40 cm curved carapace length, they settle in shallow benthic foraging habitats such as tropical tidal and sub-tidal coral and rocky reef habitat or inshore seagrass beds. The shallow foraging habitat of adults contains seagrass beds or algae mats on which Green Turtles mainly feed}.
<i>Dermochelys coriacea</i>	Leathery Turtle	EN	V		#		Negligible	No habitat available on within the Project Area for this exclusively marine species.	Marine species usually sighted along the eastern seaboard often in bays, estuaries and rivers. No major nesting has been recorded in Australia, although scattered isolated nesting (one to three nests per annum) occurs in southern Queensland and the Northern Territory. Some nesting has occurred in northern NSW near Ballina. However, no nesting has occurred in Queensland or NSW since 1996. Diet is dominated by gelatinous organisms such as jellyfish, salps, squid and siphonophores.
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	VU			#		Negligible	No habitat available on within the Project Area for this exclusively marine species.	Hawksbill Turtles spend their first five to ten years drifting on ocean currents. During this pelagic (ocean-going) phase, they are often found in association with rafts of Sargassum (a floating marine plant that is also carried by currents). Once Hawksbill Turtles reach 30 to 40 cm curved carapace length, they settle and forage in tropical tidal and

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
									sub-tidal coral and rocky reef habitat. They primarily feed on sponges and algae. They have also been found, though less frequently, within seagrass habitats of coastal waters, as well as the deeper habitats of trawl fisheries. Major nesting of Hawksbill Turtles in Australia occurs at Varanus Island and Rosemary Island in Western Australia, and in the northern Great Barrier Reef and Torres Strait.
<i>Natator depressus</i>	Flatback Turtle	VU			#		Negligible	No habitat available on within the Project Area for this exclusively marine species.	The Flatback Turtle has a low domed, fleshy carapace (shell) with reflexed margins and is grey, pale grey-green or olive in colour. The Flatback Turtle is found only in the tropical waters of northern Australia, Papua New Guinea and Irian Jaya and is one of only two species of sea turtle without a global distribution. Nesting is confined to Australia and four genetic stocks are recognised, Eastern Queensland, Western Australia, Northern Territory and Torres Strait and Gulf of Carpentaria.
<b>Amphibians</b>									
<i>Crinia tinnula</i>	Wallum Froglet		V		2010		Moderate	No breeding or foraging habitat occurs within the Project Area. Given	The Wallum Froglet is a coastal species, confined to acid, paperbark swamps and sedge swamps of the "wallum" country. The species occurs from near Noosa in southern Queensland south to the central

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
								the proximity of the resident population at Kurnell, dispersal across the site is highly unlikely however possible.	coast of NSW, with a disjunct population on Kurnell Peninsula}. The species is a late winter breeder and males call in choruses from within sedge tussocks or at the water edge .
<b><i>Heleioporus australiacus</i></b>	Giant Burrowing Frog	VU	V		#		Low	No historical records of this species occur within the locality. No preferred habitats occur within the Project Area.	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creek. Can also occur within shale outcrops within sandstone formations. Known from wet and dry forests and montane woodland in the southern part range. Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water. Spends the majority of its time in non-breeding habitat 20-250m from breeding sites.
<b><i>Litoria aurea</i></b>	Green and Golden Bell Frog	VU	E1		2010/#		Moderate	No preferred breeding habitats occur within the Project Area. Dispersal across the site is highly unlikely however possible.	Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern VI. The species is found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as



Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
									vegetation or rocks,, although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 10-12 weeks to develop, feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species.
<i>Mixophyes iteratus</i>	Giant Barred Frog	EN	E1		#		Negligible	No suitable habitat occurs within the Project Area or surrounds. No historical records of this species occur within the locality.	Occurs along coast and ranges from south-eastern Queensland to the Hawkesbury River in NSW. Found in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000 m, often hiding in leaf litter near permanent fast-flowing streams. Females lay eggs onto moist creek banks or rocks above water level, from where tadpoles drop into the water when hatched. When not breeding the frogs disperse hundreds of metres away from streams.
<b>Mammals</b>									
<i>Arctocephalus forsteri</i>	New Zealand Fur-seal		V		2008		Negligible	No habitat available on site for this exclusively marine species	This is a marine species.
<i>Arctocephalus pusillus doriferus</i>	Australian Fur-seal		V		2008		Negligible	No habitat available on site for this exclusively	This is a marine species.

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
								marine species	
<i>Balaenoptera musculus</i>	Blue Whale	EN	E1		#		Negligible	No habitat available on site for this exclusively marine species	An oceanic species, which can be recorded in Australian waters.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	VU	V		#		Low	No historical records of this species occur within the locality. No breeding habitat occurs within the Project Area and only limited foraging habitat is available.	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley. Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands. Forages on small, flying insects below the forest canopy. Roosts in colonies of between three and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months. The only known existing maternity roost is in a sandstone cave near Coonabarabran.
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	EN			#		Low	No historical records of this species occur within the locality. No denning or breeding sites or refuge are found within the Project	Occurs along the east coast of Australia and the Great Dividing Range. Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests. Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless area. Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
								Area.	of food and an area of intact vegetation in which to forage. Seventy per cent of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage. The home range of a female is between 180 and 1000 ha, while males have larger home ranges of between 2000 and 5000 ha. Breeding occurs from May to August.
<i>Dugong dugon</i>	Dugong		E1		1993/#		Negligible	No habitat available on site for this exclusively marine species	Dugongs were sighted in coastal and estuarine waters around Wallis Lake, Port Stephens, Lake Macquarie and Brisbane Water in the summer of 2002/2003. These areas are associated with some of the largest seagrass beds in NSW, some of which contain the <i>Halophila</i> species preferred by Dugongs. The presence of Dugongs in these areas at this time coincided with warm water temperatures (>18°C).
<i>Eubalaena australis</i>	Southern Right Whale	EN	E1		2001/#		Negligible	No habitat available on site for this exclusively marine species	A marine species with a circumpolar distribution in the southern hemisphere.
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern)	EN	E1		#		Low	No historical records of this species occur within the locality. No potential	This species prefers sandy soils with scrubby vegetation and/or areas with low ground cover that are burn from time to time. A mosaic of post fire vegetation is important for this species.

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
								habitats for this species occur within the Project Area.	
<b><i>Megaptera novaeangliae</i></b>	Humpback Whale	VU	V		2009/#		Negligible	No habitat available on site for this exclusively marine species	A marine species that has a worldwide distribution. It has a circumpolar distribution in the Southern Hemisphere.
<b><i>Miniopterus schreibersii oceanensis</i></b>	Eastern Bentwing-bat		V		2010		Moderate	No breeding caves are present within the Project Area. Roosting opportunities and foraging resources are also of limited quality being highly disturbed within the Project Area however may be used on occasion.	Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways.
<b><i>Myotis macropus</i></b>	Southern Myotis		V		2009		Moderate		Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
									streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws, and also catch flying insects.
<b><i>Petrogale penicillata</i></b>	Brush-tailed Rock-wallaby	VU	E1		#		Low	No historical records of this species occur within the locality. No rock overhangs or cliffs to support this species occur within the Project Area.	Occurs along the Great Dividing Range south to the Shoalhaven, and also occurs in the Warrumbungles and Mt Kaputar. Habitats range from rainforest to open woodland. It is found in areas with numerous ledges, caves and crevices, particularly where these have a northerly aspect. Individuals defend a specific rock shelter, emerging in the evening to forage on grasses and forbs, as well as browse in drier months. Home sizes range from 2-30 ha.
<b><i>Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)</i></b>	Koala	VU	V		#		Low	No historical records of this species occur within the locality. No stands of preferred feed trees occur within the Project Area.	In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region. Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Primary feed trees include <i>Eucalyptus robusta</i> , <i>E. tereticornis</i> , <i>E. punctata</i> , <i>E. haemostoma</i> and <i>E. signata</i> . They are solitary with varying home ranges. In high quality habitat home ranges may be 1-2 ha and overlap, while in semi-arid country they are usually discrete and around 100 ha.
<b><i>Potorous tridactylus tridactylus</i></b>	Long-nosed Potoroo	VU	V, E2		#		Low	No historical records of this species occur within the locality.	Occurs from Queensland to Victoria, normally within 50 km of the coast. Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires



Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
								No preferred habitats occur within the Project Area.	relatively thick ground cover where the soil is light and sandy. Known to eat fungi, arthropods, fleshy fruit, seeds and plant tissue. It is solitary and sedentary, but tends to aggregate in small groups. It has two breeding seasons, one in late winter-early spring and the other in late summer. This species appears to benefit from a lack of recent disturbance .
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	VU			#		Low	No historical records of this species occur within the locality. No preferred habitats occur within the Project Area.	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. The home range of the New Holland Mouse can range from 0.44 ha to 1.4 ha. The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals. The species is nocturnal and omnivorous, feeding on seeds, insects, leaves, flowers and fungi, and is therefore likely to play an important role in seed dispersal and fungal spore dispersal. It is likely that the species spends considerable time foraging above-ground for food, predisposing it to predation by native predators and introduced species. Breeding typically occurs between August and January, but can extend into autumn.

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	VU	V		2010/#		Low	No roost camps were detected during the site investigation and no significant foraging resources were detected within the Project Area.	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies (camps), commonly in dense riparian vegetation. Bats commute daily to foraging areas, usually within 15km of the day roost although some individuals may travel up to 70 km.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat		V		2000		Low	No hollow-bearing trees were found to occur within the Project Area. Potential foraging resources are limited given the lack of vegetation across the Project Area.	Found throughout NSW. They have been reported from southern Australia between January and June. Reported from a wide range of habitats throughout eastern and northern Australia, including wet and dry sclerophyll forest, open woodland, acacia shrubland, mallee, grasslands and desert. They roost in tree hollows in colonies of up to 30 (but more usually two to six) and have also been observed roosting in animal burrows, abandoned Sugar Glider nests, cracks in dry clay, hanging from buildings and under slabs of rock. Its high-flying, making it difficult to detect. It forages above the canopy of eucalypt forests, but comes lower to the ground in mallee or open country.
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat		V		2006		Low	No hollow-bearing trees were found to occur within the Project Area.	Occurs along the Great Dividing Range, generally at 500 m but up to 1200 m, and in coastal areas. Occurs in woodland and rainforest, but prefers open habitats or natural or human-made openings

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
								Potential foraging resources are limited given the lack of vegetation across the Project Area.	in wetter forests. Often hunts along creeks or river corridors. Flies slowly and directly at a height of 30 m or so to catch beetles and other large, flying insects. Also known to eat other bats and spiders. Roosts in hollow tree trunks and branches.
<b>Fish</b>									
<i>Carcharias taurus</i>	Grey nurse shark	CE		CE	#		Negligible	No habitat occurs within the Project Area for this exclusively aquatic species.	This is a marine species.
<i>Carcharodon carcharias</i>	Great white shark	CE		VU	#		Negligible	No habitat occurs within the Project Area for this exclusively aquatic species.	This is a marine species.
<i>Epinephelus daemeli</i>	Black cod	VU		VU	#		Negligible	No habitat occurs within the Project Area for this exclusively aquatic species.	This is a reef dwelling marine species.
<i>Pristis zijsron</i>	Green sawfish	VU			#		Negligible	No habitat occurs within the Project Area for this	This is a marine species.

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
								exclusively aquatic species.	
<i>Prototroctes maraena</i>	Australian Grayling	VU			#		Negligible	No habitat occurs within the Project Area for this exclusively aquatic species.	The Australian Grayling occurs in streams and rivers on the eastern and southern flanks of the Great Dividing Range from Sydney southwards to the Otway Ranges in Victoria, and Tasmania. Australian grayling do not occur in the inland Murray–Darling Basin system. Grayling is a diadromous species; migrating between freshwater streams and the ocean. This species has been found in clear, gravel-bottomed streams with alternating pools and riffles, and granite outcrops, and also in muddy-bottomed, heavily silted habitats.
<i>Rhincodon typus</i>	Whale shark	VU			#		Negligible	No habitat occurs within the Project Area for this exclusively aquatic species.	Whale sharks have a broad distribution in tropical and warm temperate seas, usually between latitudes 30°N and 35°S. They are known to inhabit both deep and shallow coastal waters and the lagoons of coral atolls and reefs. Sightings have been confirmed at Eden (on the NSW south coast).
<i>Macquaria australasica</i>	Macquarie Perch	EN		EN		Hawkesbury Nepean CMA records	Negligible	No habitat occurs within the Project Area for this exclusively aquatic species.	It is thought that there may be at least two forms contained within Macquarie perch, one of which occurs in the western rivers (the Murray–Darling form) and one in eastern or coastal rivers (the Shoalhaven and Hawkesbury–Nepean systems) (the coastal form). This freshwater species has declined dramatically. Most of the remaining populations are

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
									<p>relatively small and isolated.</p> <p>Generally, spawning occurs from October to December, in shallow upland streams or flowing rivers with fish from lakes moving into tributaries to spawn. The species requires riffle over cobble and gravel substrates in which to spawn deposit eggs. The spawning sites are located at the foot of pools and the eggs drift downstream and lodge amongst gravel and cobble in riffles.</p> <p>Macquarie perch feed on shrimp, molluscs and small benthic aquatic insect larvae, particularly mayflies, caddisflies and midges.</p> <p>Deep rock pools, overhanging vegetation and snags provide refuge habitat for this species.</p>
<i>Bidyanus bidyanus</i>	Silver Perch			VU		Hawkesbury Nepean CMA records	Negligible	<p>No habitat occurs within the Project Area for this exclusively aquatic species.</p>	<p>Silver perch are found in lowland, turbid and slow-flowing freshwater rivers. They prefer fast-flowing, open waters, particularly those containing rapids and races. However, they also inhabit warm, sluggish water with cover provided by large woody debris and reeds.</p> <p>They spawn in spring and summer after an upstream migration, when large schools often form. Whilst spawning can occur during non-flood conditions, spawning activity can significantly increase during floods and/or environmental water</p>



Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
									<p>releases.</p> <p>Silver perch are omnivorous. The diet contains aquatic plants, molluscs, earthworms and green algae, shrimp and aquatic insect larvae. Adults migrate upstream in spring and summer to spawn. Juveniles also sometimes move upstream in response to rising water temperatures and levels.</p>
<b><i>Maccullochella peelii peelii</i></b>	Murray Cod	EN				Hawkesbury Nepean CMA records	Negligible	No habitat occurs within the Project Area for this exclusively aquatic species.	<p>Murray cod generally associated with deep holes in freshwater rivers, preferring habitats with instream cover such as rocks, stumps, fallen trees or undercut banks. A 'sit-and-wait' predator, its diet contains fish, crayfish and frogs. Murray cod undertake upstream spawning migrations. The species matures at 4 to 5 years of age and 500-600mm total length, and spawns in spring and early summer when water temperatures exceed about 15°C. Larvae drift downstream for 5-7 days, particularly by night in spring and summer (late-October-mid-January, peaking from mid-November-mid-December).</p>
<b><i>Maccullochella macquariensis</i></b>	Trout Cod	EN		EN		Hawkesbury Nepean CMA records	Negligible	No habitat occurs within the Project Area for this exclusively aquatic species.	<p>There are now only three self-sustaining populations of Trout cod remaining in the wild (freshwater). The largest is in the Murray River between Yarrawonga and Barmah (approximately 200 km of river) the others are small translocated populations present in Cataract Dam, and in the</p>

Scientific Name	Common Name	Conservation status			Most recent record	Other sources	Likely occurrence in Project Area	Rationale for likelihood ranking	Habitat description
		EPBC	TSC	FM					
									<p>Sevens Creek near Euroa in Vic.</p> <p>The species is usually associated with deeper water (pools) and instream cover such as logs and boulders. In the Murray River Trout Cod occupy slightly faster-flowing locations. Spawning occurs in late spring (mid-October-mid-November). Eggs are deposited on hard substrates such as logs and rocks.</p> <p>The diet includes fish, yabbies, aquatic insect larvae, shrimp and freshwater prawns.</p>

The most recent record relates to:

- # species predicted to occur by the DSEWPac database (not recorded on other databases)
- ## species predicted to occur based on natural distributional range and suitable habitat despite lack of records in the databases searched
- Year recorded on databases listed above

## A3.2 Migratory and Marine species (EPBC Act listed)

Includes records from the following sources:

- Atlas of NSW Wildlife (refer to Section 2.1);
- DSEWPac database (accessed on 25.10.2012); and
- Current survey.

**Table 13: Migratory and Marine fauna species recorded or predicted to occur within 5km of the Project Area**

Scientific Name	Common Name	Migratory	Marine	Most recent record
<b>Birds</b>				
<i>Actitis hypoleucos</i>	Common Sandpiper	yes	yes	2005/#
<i>Anous stolidus</i>	Common Noddy	yes		1954
<i>Apus pacificus</i>	Fork-tailed Swift	yes	yes	2007/#
<i>Ardea ibis</i>	Cattle Egret	yes	yes	2009/#
<i>Ardea alba</i>	Great Egret		yes	#
<i>Ardea modesta</i>	Eastern Great Egret	yes		2011/#
<i>Ardenna grisea</i>	Sooty Shearwater	yes		1988
<i>Ardenna pacificus</i>	Wedge-tailed Shearwater	yes		2009
<i>Ardenna tenuirostris</i>	Short-tailed Shearwater	yes		2010
<i>Arenaria interpres</i>	Ruddy Turnstone	yes	yes	2012
<i>Calidris alba</i>	Sanderling		yes	#
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	yes	yes	2009/#
<i>Calidris canutus</i>	Red Knot	yes	yes	2011/#
<i>Calidris ferruginea</i>	Curlew Sandpiper		yes	#
<i>Calidris ruficollis</i>	Red-necked Stint	yes	yes	2012
<i>Calidris subminuta</i>	Long-toed Stint		yes	#
<i>Calidris tenuirostris</i>	Great Knot		yes	#

Scientific Name	Common Name	Migratory	Marine	Most recent record
<i>Calonectris leucomelas</i>	Streaked Shearwater		yes	#
<i>Catharacta skua</i>	Great Skua		yes	#
<i>Chalcophaps indica</i>	Emerald Dove	yes		1960
<i>Charadrius bicinctus</i>	Double-banded Plover	yes	yes	2009
<i>Charadrius leschenaultia</i>	Greater Sand Plover		yes	#
<i>Charadrius mongolus</i>	Lesser Sand Plover		yes	#
<i>Charadrius ruficapillus</i>	Red-capped Plover		yes	#
<i>Charadrius veredus</i>	Oriental Plover	yes	yes	1982
<i>Chlidonias leucopterus</i>	White-winged Black Tern	yes		2010
<i>Chlidonias niger</i>	Black Tern	yes		1990
<i>Diomedea amsterdamensis</i>	Amsterdam Albatross		yes	#
<i>Diomedea antipodensis</i>	Antipodean Albatross		yes	#
<i>Diomedea daddenena</i>	Tristan Albatross		yes	#
<i>Diomedea exulans</i>	Wandering Albatross		yes	#
<i>Diomedea gibsoni</i>	Gibson's Albatross		yes	#
<i>Egretta sacra</i>	Eastern Reef Egret	yes		2012
<i>Fregata ariel</i>	Lesser Frigatebird	yes		1980
<i>Gallinago hardwickii</i>	Latham's Snipe	yes	yes	2011/#
<i>Gallinago megala</i>	Swinhoe's Snipe		yes	#
<i>Gallinago stenura</i>	Pin-tailed Snipe		yes	#
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	yes	yes	2012 –Recorded overhead during current survey
<i>Heteroscelus brevipes</i>	Grey-tailed Tattler		yes	#

Scientific Name	Common Name	Migratory	Marine	Most recent record
<i>Heteroscelus incanus</i>	Wandering Tattler		yes	#
<i>Himantopus himantopus</i>	Black-winged Stilt		yes	#
<i>Hirundapus caudacutus</i>	White-throated Needletail	yes	yes	2010/#
<i>Hydroprogne caspia</i>	Caspian Tern			2011
<i>Lathamus discolor</i>	Swift Parrot		yes	#
<i>Limicola falcinellus</i>	Broad-billed Sandpiper		yes	#
<i>Limosa lapponica</i>	Bar-tailed Godwit	yes	yes	2010/#
<i>Limosa limosa</i>	Black-tailed Godwit		yes	#
<i>Macronectes giganteus</i>	Southern Giant Petrel		yes	#
<i>Macronectes halli</i>	Northern Giant Petrel		yes	#
<i>Merops ornatus</i>	Rainbow Bee-eater	yes	yes	#
<i>Monarcha melanopsis</i>	Black-faced Monarch	yes	yes	#/1992
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	yes	yes	#
<i>Neophema chrysogaster</i>	Orange-bellied Parrot		yes	#
<i>Numenius madagascariensis</i>	Eastern Curlew	yes	yes	2012/#
<i>Numenius minutus</i>	Little Curlew	yes	yes	#
<i>Numenius phaeopus</i>	Whimbrel	yes	yes	2010/#
<i>Oceanites oceanicus</i>	Wilson's Storm-Petrel	yes		1963
<i>Phaethon lepturus</i>	White-tailed Tropicbird	yes		1978
<i>Philomachus pugnax</i>	Ruff	yes		1971
<i>Plegadis falcinellus</i>	Glossy Ibis	yes		2006
<i>Pluvialis dominicus</i>	American Golden Plover	yes		2009
<i>Pluvialis fulva</i>	Pacific Golden Plover	yes	yes	2012/#



Scientific Name	Common Name	Migratory	Marine	Most recent record
<i>Pluvialis squatarola</i>	Grey Plover	yes	yes	2012/#
<i>Procellaria westlandica</i>	Westland Petrel	yes		1959
<i>Puffinus gavia</i>	Fluttering Shearwater	yes		2011
<i>Puffinus leucomelas</i>	Streaked Shearwater	yes		#
<i>Recurvirostra novaehollandiae</i>	Red-necked Avocet		yes	#
<i>Rhipidura rufifrons</i>	Rufous Fantail	yes	yes	2006/#
<i>Rostratula benghalensis</i>	Painted Snipe		yes	
<i>Stercorarius parasiticus</i>	Arctic Jaeger	Yes		2007
<i>Stercorarius pomarinus</i>	Pomarine Jaeger	Yes		2009
<i>Sterna albifrons</i>	Little Tern		Yes	#
<i>Sterna hirundo</i>	Common Tern	Yes		2009
<i>Sula leucogaster</i>	Brown Booby	Yes		2009
<i>Thalassarche bulleri</i>	<i>Buller's Albatross</i>		Yes	#
<i>Thalassarche cauta (sensu stricto)</i>	<i>Shy Albatross</i>		Yes	#
<i>Thalassarche impavida</i>	<i>Campbell Albatross</i>		Yes	#
<i>Thalassarche melanophris</i>	<i>Black-browed Albatross</i>		Yes	#
<i>Thalassarche salvini</i>	<i>Salvin's Albatross</i>		Yes	#
<i>Thalassarche steadi</i>	<i>White-capped Albatross</i>		Yes	#
<i>Tringa brevipes</i>	Grey-tailed Tattler	Yes		2012/#
<i>Tringa glareola</i>	Wood Sandpiper	Yes		1982
<i>Tringa incana</i>	Wandering Tattler	Yes		2012
<i>Tringa nebularia</i>	Common Greenshank	Yes		2010

Scientific Name	Common Name	Migratory	Marine	Most recent record
<i>Tryngites subruficollis</i>	Buff-breasted Sandpiper	Yes		1965
<i>Xenus cinereus</i>	Terek sandpiper		Yes	#
Reptiles				
<i>Caretta caretta</i>	Loggerhead Turtle		Yes	#
<i>Chelonia mydas</i>	Green Turtle		Yes	#
<i>Dermochelys coriacea</i>	Leatherback Turtle		Yes	#
<i>Eretmochelys imbricate</i>	Hawksbill Turtle		Yes	#
<i>Natador Depressus</i>	Flatback Turtle		Yes	#
<i>Pelamia platurus</i>	Yellow-bellied Seasnake		Yes	#
Mammals				
<i>Arctocephalus forsteri</i>	New Zealand Fur-seal		Yes	#
<i>Arctocephalus pusillus</i>	Australian Fur-seal		Yes	#
<i>Balaenoptera acutorostrata</i>	Minke Whale	Yes	Yes	#
<i>Balaenoptera edeni</i>	Bryde's Whale	Yes	Yes	#
<i>Balaenoptera musculus</i>	Blue Whale		Yes	#
<i>Caperea marginata</i>	Pygmy Right Whale	Yes	Yes	#
<i>Delphinus delphis</i>	Common dolphin		Yes	#
<i>Dugong dugon</i>	Dugong		Yes	#
<i>Eubalaena australis</i>	Southern Right Whale		Yes	#
<i>Grampus griseus</i>	Risso's Dolphin		Yes	#
<i>Lagenorhynchus obscurus</i>	Dusky Dolphin	Yes		#
<i>Megaptera novaeangliae</i>	Humpback Whale		Yes	#

Scientific Name	Common Name	Migratory	Marine	Most recent record
<i>Orcinus orca</i>	Killer Whale	Yes		#
<i>Lamna nasus</i>	Porbeagle, mackerel shark	Yes		#
Fish				
<i>Acentronura tentaculata</i>	Shortpough Pygmy Pipehorse		Yes	#
<i>Festucalex cinctus</i>	Girdled Pipefish		Yes	#
<i>Filicampus tigris</i>	Tiger Pipefish		Yes	#
<i>Heraldia nocturna</i>	Upside-down Pipefish		Yes	#
<i>Hippichthys penicillus</i>	Beady Pipefish		Yes	#
<i>Hippocampus abdominalis</i>	Bigbelly Seahorse		Yes	#
<i>Hippocampus whitei</i>	White's seahorse		Yes	#
<i>Histiogamphelus briggsii</i>	Crested Pipefish		Yes	#
<i>Lissocampus runa</i>	Javelin Pipefish		Yes	#
<i>Maroubra perserrata</i>	Sawtooth Pipefish		Yes	#
<i>Notiocampus ruber</i>	Red Pipefish		Yes	#
<i>Phyllopteryx taeniolatus</i>	Weedy Seadragon		Yes	#
<i>Solegnathus spinosissimus</i>	Spiny Pipehorse		Yes	#
<i>Solenostomus cyanopterus</i>	Robust Ghostpipefish		Yes	#
<i>Solenostomus paradoxus</i>	Ornate Ghostpipefish		Yes	#
<i>Stigmatopora argus</i>	Spotted Pipefish		Yes	#
<i>Stigmatopora nigra</i>	Widebody Pipefish		Yes	#

Scientific Name	Common Name	Migratory	Marine	Most recent record
<i>Syngnathoides biaculeatus</i>	Double-end Pipehorse		Yes	#
<i>Trachyrhamphus bicoarctatus</i>	Bentstick Pipefish		Yes	#
<i>Urocamups carinirostris</i>	Hairy Pipefish		Yes	#
<i>Vanacampus margaritifer</i>	Red Pipefish other-of-pearl Pipefish		Yes	#

# Species predicted to occur by the DSEWPac database (not recorded on other databases)

## Appendix 4: Assessments of Significance

The following section provides for AOS according to the factors outlined under the *Threatened Species Assessment Guidelines – The assessment of significance* (DECC, 2007) for all species listed as requiring assessment based on potential impact to habitat or connectivity as outlined in Table 6. AOS' have been prepared for these species as a matter of ecological due diligence for species with a moderate likelihood or greater in Appendix 2 and 3. AOS' have been conducted below for:

1. Coast Groundsel *Senecio spathulatus*;
2. Coastal Flats Swamp Mahogany Forest Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner;
3. Green and Golden Bell Frog *Litoria aurea*; and
4. Wallum Froglet *Crinia tinnula*.

### Coast Groundsel *Senecio spathulatus*

*Senecio spathulatus* is listed as Endangered on the TSC Act. *S.spathulatus* is a low-growing smooth-stemmed daisy, often forming hummocks to 30cm tall. It has short (1 to 5cm long) fleshy, entire or sometimes divided leaves with toothed margins and large fleshy yellow flower heads. The yellow flowers consist of 8 to 16 ray florets (with petals) to 13 mm long and up to 70 disc florets (in the central section of the flower). Coast Groundsel occurs in Nadgee Nature Reserve (Cape Howe) and between Kurnell in Sydney and Myall Lakes National Park (with a possible occurrence at Cudmirrah).

Ten records of *S.spathulatus* are located within the 5km locality of the Project Area, one of which was located within the Project Area, dating from 2008. *S.spathulatus* is historically recorded and likely to occur within the Karmay Botany Bay National Park (KBBNP). Given the close proximity of the Project Area to the KBBNP, the 1 km accuracy for this particular record and the lack of potential habitat within the Project Area, it is likely that the species was actually recorded in the adjacent Botany Bay NP.

***In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.***

Despite habitat assessment and targeted surveys for this species within the Project Area *S.spathulatus* was not recorded in the recent site assessment. The species is not a cryptic species and as such should have been recorded if present.

The proposed activity will not involve the direct removal of individuals or habitat. The Project Area is heavily disturbed and comprised predominantly of hard standing, not offering potential habitat for *S.spathulatus* colonisation. For these reasons it is considered unlikely the proposed activities would result in the disruption of the lifecycle of this species.

***In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction***

Not relevant as this species is not an endangered population.

***In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:***

- I. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- II. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Not relevant as this species is not an endangered ecological community.

***In relation to the habitat of a threatened species, population or ecological community:***

- I. the extent to which habitat is likely to be removed or modified as a result of the action proposed,**
- II. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- III. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,**

No habitat for *S.spathulatus* occurs within the Project Area. The two vegetated areas within the Project Area, NECR and EBDNV, are not considered potential habitat due to the managed nature of these areas and a dense canopy allowing limited light into the understory. The areas with the greatest potential for *S.spathulatus* are the bundled sections surrounding the tanks, however these are subject to regular herbicide applications for weed control.

The Project Area has been subject to various forms of disturbance including removal of native vegetation, soil profile disturbance, industrial development, introduction of non-native species and weed control. The proposal is unlikely to compound the effects of the current disturbance regimes.

No potential habitat for *S.spathulatus* was identified within the Project Area. Botany Bay NP does provide potential habitat for the species and it is likely that the species currently occurs there. The isolated nature of the locality offers limited habitat connectivity both due to the close proximity to Botany Bay, as well as industrial development in the area. The proposal is unlikely to further reduce the habitat connectivity of *S.spathulatus*.

The Project Area is at the southern extent of the known distribution of *S.spathulatus*. No individuals or potential habitat were observed within the Project Area and the Project is unlikely to have an impact on this species.

***Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),***

Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for *S.spathulatus*.

***Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,***

There are no recovery plans or threat abatement plans identified by NSW OEH for this species.

***Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.***

Key Threatening Processes (KTPs) are listed under Schedule 3 of the TSC Act (KTP also listed under the EPBC Act). Those related to *S.spathulatus* are:

- Habitat may be lost as land is cleared for coastal developments.
- Off-road driving is a threat to coastal species, including Coast Groundsel.
- Bitou Bush (*Chrysanthemoides monilifera*) may invade Coast Groundsel habitat and smother the species. Coast Groundsel may already be extinct in the Newcastle area as a result of such competition.
- Excessive pedestrian trampling may cause erosion of dunes and loss of Coast Groundsel habitat



The Project is considered unlikely to result in an increased impact to the *S.spathulatus* through any of the relevant KTPs should the aforementioned mitigation measures (as outlined in Section 5 of this report, for the Coast Groundsel) be implemented.

## Conclusion

Although *S.spathulatus* has been recorded within the Project Area recently, given the lack of suitable habitat it is considered likely that the record was located in the adjacent Botany Bay NP. In determining the nature and magnitude of impacts on the potential habitat of *S.spathulatus*, the proposal is considered unlikely to have a significant impact given the species was not recorded during the field surveys of the Project Area and no potential habitat was identified within the Project Area.

## Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions

Swamp Sclerophyll Forest is listed as an Endangered Ecological Community in Part 3, Schedule 1 of the NSW TSC Act and occurs on waterlogged or periodically inundated alluvial flats and drainage lines associated with sandy coastal floodplains. The community is typically rich floristically and may include elements of fernland, tall reedland and sedgeland. Dominant tree species may include *Eucalyptus robusta*, *Melaleuca quinquenervia*, *Eucalyptus botryoides* and *Eucalyptus longifolia*. Other tree species may include *Callistemon salignus*, *Casuarina glauca*, *Eucalyptus resinifera*, *Livistona australis* and *Lophostemon suaveolens*. A layer of small trees may be present, including *Acacia irrorata*, *Acmena smithii*, *Melaleuca linariifolia*, *Melaleuca ericifolia* and *Glochidion ferdinandi*. Shrubs include *Acacia longifolia*, *Dodonaea triquetra*, *Ficus coronata* and *Leptospermum polygalifolium*. Herbs, ferns, grasses and sedges include *Gahnia clarkei*, *Pteridium esculentum*, *Hypolepis muelleri*, *Calochlaena dubia*, *Dianella caerulea*, *Viola hederacea*, *Lomandra longifolia*, *Imperata cylindrica* and *Entolasia marginata*.

The SMCMA (2009) mapping (Figure 3) identifies the community Coastal Flats Swamp Mahogany Forest (Native Vegetation of the Sydney Metropolitan CMA Area, Sydney Metropolitan as occurring within the Project Area, in three separate patches along the eastern boundary, totalling 1.15 Ha. This SMCMA community profile aligns with TSC Act listed TEC, Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions.

***In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.***

N/A

***In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction***

N/A

***In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:***

- I. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or***
- II. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,***

The Project Area has been subject to various forms of disturbance including removal of native vegetation, soil profile disturbance, industrial development, introduction of non-native species and weed control. The proposal is unlikely to compound the effects of the current disturbance regimes.

No potential habitat for SSFCF was identified within the Project Area. Within the 5km locality a total of 29.5 Ha of communities equating to SSFCF have been identified by SMCMA (2009) mapping. This is currently present as a number of vegetation patches with limited connectivity. Given that the proposal does not involve any vegetation clearing or works outside of the current industrialised footprint, it is not considered likely that the proposal will have a significant impact of habitat connectivity for SSFCF.

***In relation to the habitat of a threatened species, population or ecological community:***

- I. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and***
- II. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and***
- III. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,***

No TEC were found within the Project Area, however the SMCMA (2009) mapping (Figure 3) identifies two patches of a community aligning with the TEC Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions with a total area of 1.15 Ha. Ground truthing of these areas identified that, based on the DECC (2007) identification guidelines, final determination (OEH, 2011) and profile information (OEH, 2012) for the TSC Act listed endangered ecological community, the NECR and ENDNV vegetation does not comprise the stratum nor habitat associated with this community. Outside of these vegetated areas, the Project Area is comprised of hard standing and industrial buildings offering no potential habitat to this community. For these reasons it is not considered likely that the proposal will have a significant impact on habitat for SSFCF.

***Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),***

Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for SSFCF.

***Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,***

NSW OEH has identified 12 priority actions to help recover the Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions in New South Wales:

- Undertake research to determine minimum fire frequency.
- Determine location, species composition and threats to remaining remnants to assist with prioritising restoration works.
- Collect seed for NSW Seedbank. Develop collection program in collaboration with BGT - all known provenances (conservation collection).
- Investigate seed viability, germination, dormancy and longevity (in natural environment and in storage).
- Collate existing information on vegetation mapping and associated data for this EEC and identify gaps in knowledge. Conduct targeted field surveys and ground truthing to fill data gaps and clarify condition of remnants.
- Prepare identification and impact assessment guidelines and distribute to consent and determining authorities.
- Use mechanisms such as Voluntary Conservation Agreements to promote the protection of this EEC on private land.
- Liaise with landholders and undertake and promote programs that ameliorate threats such as grazing and human disturbance.
- Enhance the capacity of persons involved in the assessment of impacts on this EEC to ensure the best informed decisions are made.

- Undertake weed control for Bitou Bush and Boneseed at priority sites in accordance with the approved Threat Abatement Plan and associated PAS actions.
- Identify and prioritise other specific threats and undertake appropriate on-ground site management strategies where required.
- Investigate the ecology of Swamp sclerophyll forest species with particular emphasis on the importance of drying and wetting cycles in maintaining ecosystem health.

The Project is considered unlikely to result in an increased impact to the Swamp Sclerophyll Forest through any of the aforementioned KTPs should the aforementioned mitigation measures as outlined in Section 5 of this report, the Coast Groundsel be implemented.

***Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.***

Key Threatening Processes (KTPs) are listed under Schedule 3 of the TSC Act. Those related to Swamp Sclerophyll Forest are:

- Further clearing for urban and rural development, and the subsequent impacts from fragmentation.
- Flood mitigation and drainage works.
- Management of water and tidal flows.
- Landfilling and earthworks associated with urban and industrial development.
- Grazing and trampling by stock and feral animals (particularity pigs).
- Changes in water quality, particularly increased nutrients and sedimentation.
- Weed invasion.
- Climate change.
- Activation of acid sulfate soils.
- Removal of dead wood.
- Rubbish dumping.
- Frequent burning which reduces the diversity of woody plant species.

The Project is considered unlikely to result in an increased impact to the Swamp Sclerophyll Forest through any of the aforementioned KTPs should the mitigation measures outlined in Section 5 of this report be implemented.

## **Conclusion**

Although an ecological community equating to the TEC SSFCF has been previously mapped at three separate patches within the Project Area, ground truthing of these areas identified one as being unvegetated and the remaining two not consistent with the final determination of the TEC. Outside of these areas, no potential habitat for SSFCF was identified within the Project Area. For these reasons the proposal is not considered to have a significant impact on this TEC.

## References

OEH, 2011, *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* - Détermination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act.

OEH, 2012, *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* – profile.

SMCMA, 2009, *Native Vegetation of the Sydney Metropolitan CMA Area, Sydney Metropolitan*. Sydney Metropolitan Catchment Management Area.

DECC, 2007, *Identification Guidelines for Swamp Sclerophyll Forest on Coastal Floodplains*.

## Green and Golden Bell Frog *Litoria aurea*

The Green and Golden Bell Frog is listed as endangered under the New South Wales TSC Act. The Green and Golden Bell Frog is known to occupy areas with a variety of habitat features throughout its range. However, there are important habitat components that the species requires to survive, including ephemeral water bodies, grassy surroundings for foraging and refuge, shelter sites, basking sites and over-wintering sites. The presence of exotic predatory fish *Gambusia holbrooki* is considered a crucial limiting factor, affecting the long-term survival of the species.

The species breeds in still or slow flowing waterbodies with some aquatic emergent vegetation such as *Typha spp.* or *Eleocharis spp.* The Green and Golden Bell Frog spends much of its time amongst emergent aquatic or riparian vegetation but also uses and disperses into other areas including fallen timber adjacent to breeding habitat and other vegetation such as grassland, cropland and modified pastures.

***In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.***

The Kurnell Peninsula is a significant locality for Green and Golden Bell Frogs as there have been a number of records of the species here in recent years. A total of 525 records of Green and Golden Bell Frog available from within a radius of 5km around the locality, however, there are no recent records of the species from within the Project Area.

Habitat that may potentially be suitable for the Green and Golden Bell Frog within the Project Area is restricted to stormwater drains and surface runoff areas. However, these do not provide continuous connectivity across the Project Area as the site is divided into separate catchments and the presence of standing surface water is highly temporal. The high density of records within close proximity to the Project Area raises the expectation that individuals may traverse the site to access other areas of the peninsula and thus the Project Area would act as a movement corridor. No breeding or foraging resources were identified within the Project Area. For these reasons the proposal is considered unlikely to affect the lifecycle of the species.

***In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction***

An Endangered Population is a population listed under Part 2 of Schedule 1 of the TSC Act and is defined as a population that, in the opinion of the NSW Scientific Committee, is facing a very high risk of extinction in NSW in the near future. A population is not eligible to be listed as an Endangered Population if it is a population of a species already listed in Schedule 1 or 1A (i.e. already listed as an Endangered or Critically Endangered species). Therefore, populations of the GGBF within NSW are not eligible to be listed as Endangered Populations.

***In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:***

- I. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or***
- II. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,***

Not applicable to threatened species.

***In relation to the habitat of a threatened species, population or ecological community:***

- I. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and***
- II. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and***
- III. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,***

The Green and Golden Bell Frog's current distribution is limited to the east coast of New South Wales between Byron Bay in northern NSW and Gippsland Lakes in north-eastern Victoria. However, there are large gaps in its coastal distribution. Any populations of this species within the locality of the Project Area would not be at the limit of the species' known distribution.

The locality surrounding the Project Area is known to contain an established population of Green and Golden Bell Frog. The species is often associated with habitats with high variability such as fluctuating environmental conditions and are therefore pre-adapted for colonising and occupying disturbed environments such as the industrial land at Kurnell. Despite this, no suitable breeding ponds with dense stands of emergent vegetation occur within the Project Area. No breeding or foraging habitat for Green and Golden Bell Frog was identified within the Project Area.

Green and Golden Bell Frogs are known to move considerable distances and have been found several kilometres from the nearest breeding habitat. No potential breeding or foraging habitat for Green and Golden Bell Frog was identified within the Project Area. The Kurnell Peninsula does provide habitat for known populations of the species. Being at the headland of the peninsula any connectivity from the extremity of the peninsula is likely to occur along the coastline to the north and south of the Project Area through the Botany Bay National Park where intact native vegetation and naturally occurring drainage channels remain. The Project Area itself offers limited habitat connectivity both due to the close proximity to Botany Bay, as well as industrial development in the area. The proposal is unlikely to further reduce the habitat connectivity for the Green and Golden Bell Frog given the industrial use of the Project Area and extent of activity will remain the same.

The Project Area has been subject to various forms of disturbance including removal of native vegetation, soil profile disturbance, industrial development, introduction of non-native species and weed control. The proposal is unlikely to compound the effects of the current disturbance regimes.

It is therefore concluded that the proposal is unlikely to affect the habitat of the species.

***Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),***

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Green and Golden Bell Frog (<http://www.environment.nsw.gov.au/criticalhabitat/CriticalHabitatProtectionByDoctype.htm>).

Kurnell Peninsula is an important area for Green and Golden Bell Frogs in the Sydney Region, and the population of the species at Kurnell is considered one of 43 "key populations". While the species has also been recorded in Botany Bay National Park, Marton Park Wetland and Towra Point Nature Reserve in Kurnell, these areas including the Project Area are not considered critical habitat for the Kurnell population (DEC 2005).

To date no critical habitat has been declared for the Green and Golden Bell Frog and the proposed action will not impact on critical habitat.

***Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,***

The broad objectives of the Green and Golden Bell Frog Recovery Plan are timeframe dependant. The first objective designed to operate within the first five years of the plan is to: “manage threats impacting on currently known populations so as to stabilise and prevent the decline of the species”. The longer term objective is “returning the species to its former distribution, abundance and role in the ecosystem wherever possible”. The proposal is not inconsistent with the guidelines set out in the recovery plan for this species.

The proposal is consistent with the objectives of the threat abatement plan.

***Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.***

Key Threatening Processes (KTPs) are listed under Schedule 3 of the TSC Act. Those related to the Green and Golden Bell Frog are:

- Alteration of natural flow regimes of rivers and streams and their floodplains and wetlands.
- Clearing of native vegetation.
- Infection by amphibian Chytridiomycosis disease.
- Predation by the European Red Fox.
- Predation by the Feral Cat (*Felis catus*).
- Predation by *Gambusia holbrooki* (Plague Minnow).

The proposal is considered unlikely to result in an increased impact to the GGBF through any of the aforementioned KTPs.

## **Conclusion**

The assessment concludes that it is unlikely that the proposal has the potential to significantly impact the Green and Golden Bell Frog given that no potential breeding sites or foraging habitats will be negatively impacted as a result of the proposal and connectivity around the Project Area will remain the same. As such, a referral to the Minister is not required. A number of measures are recommended in Section 5 of this report to mitigate the degree of impact to ensure that biodiversity values within the Project Area are maintained or improved.

The draft recovery plan prepared for the Green and Golden Bell Frog identifies a specific objective for the Kurnell population, which is to implement a coordinated peninsula wide management strategy across all land tenures to improve the long-term conservation status of this likely Green and Golden Bell Frog metapopulation (DEC 2005).

## **Wallum Froglet *Crinia tinnula***

The Wallum Froglet is a state threatened species. It is listed as vulnerable under the New South Wales TSC Act.

***In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.***

The Wallum Froglet is a coastal species, confined to acid, paperbark swamps and sedge swamps of the “wallum” country. The species is a late winter breeder and males call in choruses from within sedge tussocks or at the water edge.



According to the National Recovery Plan for wallum frog species, essential habitat for these species may be defined as freshwater wetlands and associated vegetation communities occurring on low nutrient sandy soils along the east coast of Australia. The frog species in this plan are typically found amidst heath vegetation and sedges where water collects above organic hardpan layers forming 'perched' swamps and lakes. These acidic (pH < 6.0) swamps and lakes provide essential breeding habitat for wallum frog species (Meyer et al. 2006).

The extent to which wallum frog species rely on vegetation away from breeding sites is largely unknown, however, wallum frog species have also been recorded in woodland and forest some distance from water. Vegetation surrounding swamps may facilitate movement of animals and gene flow between catchments/populations. Vegetation within swamp and lake catchments may therefore also be considered important for the survival of the wallum frog species (Meyer et al. 2006).

A total of 36 records of Wallum Froglet are located within the 5km locality, the majority of which are within 2 km of the Project Area and within Botany Bay NP. Although a significant population is known to occur in close proximity to the Project Area, no potential habitat for Wallum Froglet was identified within the Project Area. It is possible that the boundary of the Project Area may be used by individuals moving between habitat pockets within both Botany Bay NP and the greater Kurnell Peninsula, however it is unlikely that they would enter the Project Area given the lack of breeding or foraging habitat present. Given the proposal would not impact any breeding or foraging habitats it is considered unlikely to impact on the lifecycle of the species.

***In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction***

An Endangered Population is a population listed under Part 2 of Schedule 1 of the TSC Act and is defined as a population that, in the opinion of the NSW Scientific Committee, is facing a very high risk of extinction in NSW. A population is not eligible to be listed as an Endangered Population if it is a population of a species already listed in Schedule 1 or 1A (i.e. already listed as an Endangered or Critically Endangered species).

There are currently no endangered populations listed for the Wallum Froglet in NSW.

***In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:***

- I. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or***
- II. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,***

Not applicable to threatened species.

***In relation to the habitat of a threatened species, population or ecological community:***

- I. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and***
- II. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and***
- III. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,***

Wallum Froglets are found along the coastal margin from Litabella National Park in south-east Queensland to Kurnell in Sydney. The Project Area is located at the southern extent of the known distribution of Wallum Froglet. Given that the proposal is considered unlikely to impact on breeding or foraging habitat, it will not affect the species even though it is at the extent of its range.

The Project Area has been subject to various forms of disturbance including removal of native vegetation, soil profile disturbance, industrial development, introduction of non-native species and weed control. The proposal is unlikely to compound the effects of the current disturbance regimes.

***Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),***

No critical habitat has as yet been declared for the Wallum Froglet and the Project Area is not considered in this assessment to be habitat critical to the survival of a local population of the Wallum Froglet. As such, the proposal is consistent with the recovery plan with regards to critical habitat. No rehabilitation of Wallum Froglet habitat is planned, and no monitoring programs are planned for this species in the Project Area. As such, the proposal is not entirely consistent with the objectives of the recovery plan.

***Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,***

A National Recovery Plan has been prepared for the four frog species dependent on wallum environments, including the Wallum Froglet (Meyer et al. 2006). Objectives of this plan include:

- To identify areas of habitat critical to the survival of wallum frog species more accurately.
- To protect habitat critical to wallum frog survival and important wallum frog populations from threatening processes.
- To rehabilitate degraded Wallum Frog habitat.
- To determine population trends in areas of disturbed undisturbed and rehabilitated habitat.

The threat abatement plan for the predation by *Gambusia holbrooki* is relevant to this species (NPWS 2003). The NSW TAP identifies the Wallum Froglet as one of four threatened species as most likely to be at risk from Plague Minnow predation. Actions include minimising human dispersal of Plague Minnow and reducing impacts of Plague Minnow on threatened frog species at key sites. The threat abatement plan has not yet identified key sites, however, as the Project Area is not considered to contain habitat critical to the survival of a local population of the Wallum Froglet, it is considered not likely that the Project Area would be considered a key site. It is also unlikely that the proposal would result in an increase in human dispersal of Plague Minnow. As such, the proposal is not inconsistent with threat abatement actions of the Plague Minnow TAP relevant to the Wallum Froglet.

***Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.***

The Wallum Froglet is threatened by the following KTPs:

- Clearing of Native Vegetation - the proposal does not involve clearing of native vegetation.
- Ecological Consequences of High Frequency Fires – the Wallum Froglet is threatened by grazing and associated frequent burning of coastal wetlands. The proposal is unlikely to alter the frequency of fire within areas that are potential habitat for the Wallum Froglet.
- Predation by the European Red Fox – the proposal is unlikely to lead to an increase in fox numbers.
- Predation by Feral Cats – the proposal is unlikely to lead to an increase in cat numbers.
- Infection of Frogs by Amphibian Chytrid Causing the Disease Chytridiomycosis – the proposal is unlikely to lead to an increase in the spread of Chytridiomycosis.
- Alteration to the Natural Flow Regimes of Rivers, Streams, Floodplains and Wetlands (DEC 2005a). The proposal could impact potential breeding habitat for the Wallum Froglet due to run-off containing contaminants reducing the water quality and modifying the acidity in wetlands where this species breeds.
- Predation by *Gambusia holbrooki* (Plague Minnow) – the proposal is not likely to increase the threat of predation by the Plague.

## **Conclusion**

The proposal is considered not likely to result in a significant impact on a local population of the Wallum Froglet, as:

- no individuals are likely to be removed as a results of the proposal;
- no limiting breeding habitat would be removed;
- no limiting foraging habitat would be removed;
- the proposal would not have an adverse effect on critical habitat (directly or indirectly); and
- the habitat to be impacted by the proposal is not considered to be important for the long term survival of the species in the locality.

## References

Meyer, E., J.M. Hero, L. Shoo & B. Lewis, 2006. *National recovery plan for the wallum sedgefrog and other wallum-dependent frog species*.

## Appendix 5: Significant Impact Criteria assessment

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The following section provides two Significant Impact Criteria assessments to determine whether the proposed action is likely to have a significant impact on the following matters of national environmental significance; Green and Golden Bell Frog *Litoria aurea* and *Towra Point Nature Reserve Ramsar site* and hence whether a Referral to the Commonwealth Minister (Director General) is required.

### Green and Golden Bell Frog *Litoria aurea*

The Green and Golden Bell Frog (GGBF) is listed as Vulnerable under the EPBC Act. The species was not recorded within the Project Area during the current survey.

Individuals of GGBF potentially occurring within the Project Area are not considered to form part of an 'important population' as defined in Matters of National Environmental Significance Significant Impact Guidelines 1.1 (DEWHA 2009) because they are:

- unlikely to represent a key source population either for breeding or dispersal as the species has not been recorded within the Project Area and habitat connectivity is limited;
- unlikely to be a population necessary for maintaining genetic diversity; and,
- not located at or near the limit of the species' range.

#### ***Is there a real chance or a possibility that the action will lead to a long-term decrease in the size of an important population of the species?***

No Green and Golden Bell Frogs have recently been recorded within the Project Area, though the species has been recorded on 525 occasions within a 5km radius of the Project Area. It is assumed that the Project Area may be utilised as a movement corridor by the species, but subsequent residency and/or settlement here is unlikely as the Project Area provides insufficient habitat for the Green and Golden Bell Frog. At best, temporary habitat is restricted to stormwater drains and surface runoff areas.

Given the above, the proposal is considered unlikely to lead to a long-term decrease in the size of an important population of Green and Golden Bell Frog.

#### ***Is there a real chance or a possibility that the action will reduce the area of occupancy of an important population of the species?***

Green and Golden Bell Frog generally occurs in marshes, dams and streams with much of these habitats characterised by *Typha* spp. or *Eleocharis* spp., which provide much needed shelter (DEC 2005). The Project Area lacks such suitable habitat.

Furthermore, the Project Area does not lie near the limit of the area of occupancy of the Green and Golden Bell Frog, which extends from south-eastern Victoria to near Byron Bay in northern NSW. Therefore it is considered unlikely that the proposal would reduce the area of occupancy of an important population of Green and Golden Bell Frog.

#### ***Is there a real chance or a possibility that the action will fragment an existing important population into two or more populations?***

Green and Golden Bell Frogs are known to move considerable distances and have been found several kilometres from the nearest suitable breeding habitat (Gillespie 1996; Pyke and White 2001). No potential breeding or foraging habitat for Green and Golden Bell Frog was identified within the Project Area. The Kurnell Peninsula does provide habitat for known populations of the species. Being at the headland of the peninsula any connectivity from the

extremity of the peninsula is likely to occur along the coastline to the north and south of the Project Area through the Botany Bay National Park where intact native vegetation and naturally occurring drainage channels remain. The Project Area itself offers limited habitat connectivity both due to the close proximity to Botany Bay, as well as industrial development in the area. The proposal is unlikely to further reduce the habitat connectivity for the Green and Golden Bell Frog given the industrial use of the Project Area and extent of activity will remain the same.

It is therefore considered unlikely that the proposal would fragment an existing important population of the Green and Golden Bell Frog into two or more populations.

***Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of the species?***

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. A Register of Critical Habitat is maintained by the Minister under the EPBC Act. To date, no critical habitat has been declared for the GGBF (DEWHA 2009).

Kurnell Peninsula is an important area for Green and Golden Bell Frogs in the Sydney Region, and the population of the species at Kurnell is considered one of 43 “key populations” (DEC 2005). While the species has also been recorded in Botany Bay National Park, Marton Park Wetland and Towra Point Nature Reserve in Kurnell, these areas including the Project Area are not considered critical habitat for the Kurnell population (DEC 2005).

The proposed action will not impact on critical habitat.

***Is there a real chance or a possibility that the action will disrupt the breeding cycle of an important population of the species?***

The high density of records within close proximity to the Project Area raises the expectation that individuals may traverse the site to access other areas of the peninsula and thus the Project Area would act as a movement corridor. No breeding or foraging resources were identified within the Project Area. It is therefore considered unlikely that the proposal would disrupt the breeding cycle of an important population of the Green and Golden Bell Frog.

***Is there a real chance or a possibility that the action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?***

The Project Area provides only a very restricted amount of potential habitat and the species is expected to be using the Project Area as a movement corridor and/or utilise the restricted habitat only temporarily at most. The Project Area has been subject to various forms of disturbance including removal of native vegetation, soil profile disturbance, industrial development, introduction of non-native species and weed control. The proposal is therefore considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

***Is there a real chance or a possibility that the action will result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat?***

Predation by *Gambusia holbrooki* has been identified as a serious threat to the Green and Golden Bell Frog (DEC 2005). It is unknown at this stage whether *G. holbrooki* may have established in the stormwater drains within the Project Area. However, their establishment and/or spread whether present or in future would be unlikely facilitated by the presence of the Green and Golden Bell Frog in the Project Area.

A threat abatement plan relevant to the Green and Golden Bell Frog is the 'Predation by *Gambusia holbrooki* (Plague Minnow) Threat Abatement Plan' (NPWS 2003). The proposal is consistent with the objectives of the threat abatement plan.

***Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?***

Infection by amphibian chytridiomycosis disease has been identified as a serious threat to the Green and Golden Bell Frog and is also considered a 'Key Threatening Process' under the TSC and EPBC Acts. This disease has been identified as being widespread in NSW populations by the threat abatement plan: Infection of Amphibians with Chytrid fungus resulting in Chytridiomycosis (DEH 2006). However, the proposal is highly unlikely to introduce this disease into the Project Area. However, all works related to the proposal should adhere to the guidelines developed by the NPWS, Hygiene Protocol for the Control of Disease in Frogs (NPWS 2001).

***Is there a real chance or a possibility that the action will interfere substantially with the recovery of the species?***

A recovery plan has not yet been made for the Green and Golden Bell Frog under the EPBC Act, however, a draft recovery plan has been developed by the former DEC (2005). The broad objectives of the Draft Green and Golden Bell Frog Recovery Plan (DEC 2005) are time frame dependant. The first objective designed to operate within the first five years of the plan is to: "manage threats impacting on currently known populations so as to stabilise and prevent the decline of the species". The longer term objective is "returning the species to its former distribution, abundance and role in the ecosystem wherever possible".

The Green and Golden Bell Frog has not been recorded within the Project Area. The proposal is not inconsistent with the guidelines (NPWS 2003) set out in the recovery plan for this species and is therefore considered unlikely to interfere substantially with the recovery of this species.

**Conclusion**

Based on the above assessment the Green and Golden Bell Frog is unlikely to be significantly impacted by the proposal, and as such, a Referral under the provisions of the EPBC Act is not recommended for this species.

**References**

DEC NSW (2005) Threatened species profiles – Green and Golden Bell Frog. Department of Environment and Conservation. Access online 30/11/2012 -

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10483>

Pyke, G.H. and White, A.W. (2001) A review of the biology of the Green and Golden Bell Frog *Litoria aurea*. Australian Zoologist 31(4) 563-598

NSW NPWS (2003) Draft Green and Golden Bell Frog *Litoria aurea* Recovery Plan. NPWS Hurstville, NSW

**Towra Point Nature Reserve Ramsar site**

***Is there a real chance or a possibility that the proposal will result in areas of the wetland being destroyed or substantially modified?***

The Towra Point Nature Reserve Ramsar site consists of 386.5 hectares of wetlands that lie on the mouth of the Georges River on the southern shores of Botany Bay, and located approximately 16 kilometres from the Sydney CBD (DECCW, 2010).

The most eastern extent of the Ramsar listed portion of the site is approximately 2 km west of the Project Area. The Reserve is bounded by the Kurnell Headland, Botany Bay, and Dolls Point.

The Project Area is located in the north eastern extent of Kurnell Peninsula south of Captain Cook Drive and bound by Botany Bay National Park to the east. Despite Kurnell Peninsula being historically subjected to heavy industry, Towra Point Nature Reserve remains the largest and most diverse estuarine wetland complex remaining in the Sydney region (NSW NPWS, 2001; City of Botany Bay Council, 2012).

The proposal will not result in any direct disturbance to the Towra Point Nature Reserve through the conversion of the refinery to a finished product terminal. However based on historical events there is a risk



that during a flood event potentially contaminated oily waters can wash out of the Project Area enter the Towra Point Nature Reserve system, refer to Appendix E, Water Management Report of the EIS. On three separate occasions in June 2012, March 2011 and April 2011 oily waters had been discharged to waters of Botany Bay and Towra Point Nature Reserve during flood events (Caltex 2011). In response to these incidents Caltex has invested in improving its on stormwater system performance and Stormwater Management Plan (Caltex 2011). This plan is underway and being reassessed during 2014.

Towra Point Nature Reserve lies in proximity to the Project Area, however the proposal involves a reduction in industrial activity occurring within the site and taking into consideration the current management strategies and procedures in place to circumvent contamination which had occurred in the past, it is considered unlikely that the Project would have a significant impact on the ecological character of the Towra Point Nature Reserve Ramsar site such that areas of the wetland are destroyed or substantially modified.

***Is there a real chance or a possibility that the proposal will result in a substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland?***

The proposed conversion to a finished product terminal will not change the hydrology occurring within or outside the Project Area. Consequently despite the proximity of the Project Area from the listed Ramsar Wetland, it is considered unlikely that the works will result in a substantial or measurable change in the hydrological regime of the adjacent wetland – in terms of a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetlands.

***Is there a real chance or a possibility that the proposal will result in the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependant upon the wetland being seriously affected?***

The proposed conversion of the refinery to a fuels terminal should not affect the lifecycle of native species dependent on the Towra Point Nature Reserve Ramsar wetland.

***Is there a real chance or a possibility that the proposal will result in a substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health?***

The proposal will not result in any direct disturbance to the Towra Point Nature Reserve through the conversion of the refinery to a fuels terminal. However based on historical events there is a risk that during a flood event potentially contaminated oily waters can wash out of the Project Area enter the Towra Point Nature Reserve system. On three separate occasions in June 2012, March 2011 and April 2011 oily waters had been discharged to waters of Botany Bay and Towra Point Nature Reserve during flood events (Caltex 2011). In response to these incidents Caltex has invested in improving its on stormwater system performance and Stormwater Management Plan (Caltex 2011). This plan is underway and being reassessed during 2014.

Towra Point Nature Reserve lies in proximity to the Project Area, however the proposal involves a reduction in industrial activity occurring within the site and taking into consideration the current management strategies and procedures in place to circumvent contamination which had occurred in the past, it is considered unlikely to have the potential to result in a substantial or measurable change in the water quality of the wetlands – in terms of salinity levels, pollutants, water nutrients, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health.

***Is there a real chance or a possibility that the proposal will result in an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland?***

The Towra Point Nature Reserve is considered to be an area of important habitat for a number of threatened species, including a range of listed-migratory species. The main aquatic noxious weed found in Botany Bay is considered to be *Caulerpa taxifolia* (Caulerpa). The invasive Cane Toad has been recorded at Taren Point (recorded during 2010), however no individuals have been found within Towra Point Nature Reserve Ramsar

site. The proposed works are unlikely to alter current conditions to facilitate colonisation of this wetland by invasive species.

It is considered unlikely that the works associated with the Project would result in an invasive species that is harmful to the ecological character of the wetland being established, or an existing invasive species being spread, in the wetland.

### **Conclusion**

The significant impact criteria assessment concludes that it is unlikely that the proposal has the potential to significantly impact Wetlands of International Importance. As such, a referral to the Minister is not required. A number of measures are recommended in Section 5 of this report to mitigate the degree of impact to ensure that biodiversity values within the Project area are maintained or improved.

### **References**

City of Botany Bay Council, 2012, *A short history of the city of Botany Bay*. Accessed online 10/7/2012 - <http://www.botanybay.nsw.gov.au/index.php/your-city/a-short-history-of-the-city-of-botany-bay>

DECCW, 2010, *Towra Point Nature Reserve Ramsar site: Ecological character description*. Department of Environment, Climate change, and Water. Accessed online November 2012 - [http://sydney.cma.nsw.gov.au/bbccci/publications/Final\\_Towra\\_Pt\\_ECD.pdf](http://sydney.cma.nsw.gov.au/bbccci/publications/Final_Towra_Pt_ECD.pdf)

NSW NPWS, 2001 *Towra Point Nature Reserve – Plan of Management*. National Parks and Wildlife Services. Accessed online November 2012 - <http://www.environment.nsw.gov.au/resources/parks/pomfinaltowra.pdf>

## Appendix 6: Threatened Frog Information

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## The Green and Golden Bell Frog *Litoria aurea*

The Green and Golden Bell Frog is a nationally and state threatened species. It is listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and as endangered under the New South Wales *Threatened Species Conservation Act 1995*.



**Photo 1: Adult female Green and Golden Bell Frog, Port Kembla. Copyright © Biosis Pty Ltd 2012**

### General Appearance

The Green and Golden Bell Frog is recognisable by its large size (up to 10cm) and usually striking colour combination of green and gold. Most individuals appear to have a bright green background colour with irregular large spots and stripes of gold, although sometimes the frogs appear an olive green or even brown colour. The groin is a distinctive turquoise blue colour and the frog has an obvious eardrum (dark circular disc just behind the head).

*Note: there are other small green frog species which are similar in appearance although they are much smaller than adult Green and Golden Bell Frog (up to 5cm).*

### Habitat

Green and Golden Bell Frogs inhabit a range of habitats including creeks, drains, wetlands and dams. The Green and Golden Bell Frog can sometimes be seen basking amongst water plants during sunny weather but is most often encountered sheltering under logs or rocks in the day. It can move long distances and can sometimes be found away from water.

### What should you do if you find a Green and Golden Bell Frog?

Stop work and tell your environmental manager immediately who will provide advice on what to do next.

## The Wallum Froglet *Crinia tinnula*

The Wallum Froglet is a state threatened species. It is listed as vulnerable under the New South Wales *Threatened Species Conservation Act 1995*.



**Photo 1: Adult Wallum Froglet.** Accessed from OEH threatened species profile  
<http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10183#>

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### General Appearance

The Wallum Froglet is a small frog (only 30 mm long) with highly variable colour and pattern, ranging from light grey or brown to dark grey above and usually white or light brown below. Its most distinguishing feature is having a fine median line of white dots along the underside of the throat. The Wallum Froglet lacks webbing in its feet, toe pads are absent and their pupils are horizontal.

*Note: there are other small frog species which are similar in appearance.*

### Habitat

Wallum Froglets inhabit a range of habitats usually associated with acidic swamps on coastal sandplains including sedgelands, wet heathlands, paperbark swamps and drainage lines as well as within disturbed areas. The Wallum Froglet is generally very cryptic sheltering during the day under leaf litter and debris or in small ditches.

### What should you do if you find a Wallum Froglet?

Stop work and tell your environmental manager immediately who will provide advice on what to do next.

## Appendix 7: Key Threatening Process

The Project has the potential to impact on biodiversity through the following Key Threatening Process (KTP) listed under the TSC Act, EPBC Act and FM Act. KTPs are considered to adversely affect threatened species, populations and/or communities and habitats. The works specifically relate to the following KTPs (**Table 14**).

**Table 14: KTPs relevant to the Project**

Key threatening process	Potential impacts	Project specifics
<b>Anthropogenic climate change</b>	<p>This KTP is listed under both the TSC and EPBC Acts. The final determination for this KTP lists some impacts as:</p> <ul style="list-style-type: none"> <li>• Affect current fire regimes;</li> <li>• Affect the current distribution of most species, populations and communities; and</li> <li>• Affect evolutionary processes.</li> </ul>	<p>The Project may result in green house gas emissions being released into the atmosphere and increase the operation of this KTP.</p> <p>The key potential greenhouse gas emissions from the Project are nitrous oxide (N<sub>2</sub>O) and carbon dioxide (CO<sub>2</sub>).</p> <p>Greenhouse gas emissions would also result from increased traffic to, from and within the site.</p>
<b>Competition and grazing by the feral European rabbit (<i>Oryctolagus cuniculus</i>)</b>	<p>This KTP is listed under both the TSC and EPBC Acts. The final determination for this KTP lists some impacts as:</p> <ul style="list-style-type: none"> <li>• Increasing the prevalence of introduced predators such as the Feral Cat, Red Fox and Wild Dog;</li> <li>• Increase competition for resources with indigenous species;</li> <li>• Causing changes to the structure, composition of vegetation and increasing land degradation;</li> <li>• Reducing the survival and recruitment of threatened plant species and ecological communities; and</li> <li>• Increase erosion through the removal of vegetation.</li> </ul>	<p>Rabbit scats were observed on site during the site inspection. However the proposal is unlikely to increase the prevalence of Rabbits within the Project Area and should not contribute to the increase of this KTP.</p>
<b>Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed)</b>	<p>This KTP is listed under the TSC Act. The final determination for this KTP lists some impacts as:</p> <ul style="list-style-type: none"> <li>• Invade and displace native plants;</li> <li>• Decrease diversity in native vegetation communities; and</li> <li>• Decrease habitat for native fauna species.</li> </ul>	<p>Bitou Bush <i>Chrysanthemoides monilifera</i> subsp. <i>rotunda</i> was recorded within the Project Area during the site investigation. The Project has the potential to increase the presence of Bitou Bush during construction and operation of the Project, through the movement of vehicles and increased disturbance within the Project Area. The Project therefore has the potential to cause the spread of this species off site,</p>



Key threatening process	Potential impacts	Project specifics
		through wind and water seed dispersal.
<b>Clearing of native vegetation</b>	<p>This KTP is listed under both the TSC and EPBC Acts. The final determination for this KTP lists some impacts as:</p> <ul style="list-style-type: none"> <li>• Reducing biodiversity;</li> <li>• Destruction of habitat resulting in the loss of local populations and species;</li> <li>• Increasing fragmentation;</li> <li>• Increasing dryland salinity;</li> <li>• Increasing degradation of riparian vegetation;</li> <li>• Increasing green house gas emissions;</li> <li>• Increasing habitat for invasive species;</li> <li>• Disruption to ecological function;</li> <li>• Loss of leaf litter layer; and</li> <li>• Changes to soil biota.</li> </ul>	No intact native vegetation will be removed as part of the project. Consequently the project should not contribute to the increase of this KTP.
<b>Invasion and establishment of exotic vines and scramblers</b>	<p>This KTP is listed under the TSC Act. The final determination for this KTP lists some impacts as:</p> <ul style="list-style-type: none"> <li>• Invade and displace native plants;</li> <li>• Decrease diversity in native vegetation communities; and</li> <li>• Decrease habitat for native fauna species.</li> </ul>	Construction of the Project has the potential to increase the spread and establishment of exotic vines and scramblers through the disturbance of soils and the spread of seeds. Where exotic vines and scramblers are already present within the Project Area, there is potential for these species to be spread via construction vehicles and natural dispersal into cleared and disturbed areas.
<b>Removal of large woody debris from New South Wales rivers and streams</b>	<p>This KTP is listed under the FM Act. The final determination for this KTP lists some impacts as:</p> <ul style="list-style-type: none"> <li>• Decreases in habitat for benthic plants, algae, invertebrates and microorganisms;</li> <li>• Reduction in hiding places (refuges) and resting places out of the main river flow for threatened species;</li> <li>• Reduction in spawning sites essential for successful reproduction;</li> <li>• Erosion from the reduction in the stabilising effects of large woody debris on stream banks and stream beds; and</li> <li>• Reduction in organic enrichment from captured fallen leaves and other detritus.</li> </ul>	The Project does not involve the removal of large woody debris and therefore this KTP will not apply.
<b>Degradation of native riparian vegetation</b>	This KTP is listed under the FM Act. The final determination for this KTP lists some impacts	The Project will not result in the degradation of native riparian vegetation and therefore this

Key threatening process	Potential impacts	Project specifics
<b>along New South Wales water courses</b>	<p>as:</p> <ul style="list-style-type: none"> <li>Increasing the amount of sediment and nutrients reaching streams as runoff, and increasing light penetration of the water body;</li> <li>Reducing the inputs of organic carbon, via leaves, twigs, and branches;</li> <li>Reducing the amount of large woody debris entering the aquatic ecosystem and thereby negatively impacting on habitat and spawning sites of several vulnerable and endangered species listed under the FM Act; and</li> <li>Destabilising river banks.</li> </ul>	<p>KTP does not apply.</p>
<b>Installation and operation of in-stream structures and other mechanisms that alter natural flow regimes of rivers and streams</b>	<p>This KTP is listed under the TSC and FM Acts. The final determination for this KTP lists some impacts as:</p> <ul style="list-style-type: none"> <li>Decreases in water quality, such as increased turbidity, which negatively affect aquatic ecosystems;</li> <li>Changes in species composition due to altered physical, chemical and biological conditions;</li> <li>Prevention of passage of aquatic biota; and</li> <li>Cold water pollution.</li> </ul>	<p>The Project does not involve the installation and operation of instream structures and therefore this KTP will not apply.</p>