

Southlands Remediation and Development Project

Environmental Assessment

Project Application (MP 06_0191)

Appendix N: Flora and Fauna Assessment



FINAL REPORT

Southlands Flora and Fauna Survey and Assessment Banksmeadow, NSW

Prepared for

DBL Property Pty Ltd

on behalf of

Orica Australia Pty Ltd & Goodman International

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43217451



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Executive Summary

URS Australia Pty Ltd (URS) was engaged by the Proponent to undertake a flora and fauna assessment of a proposal for staged remediation and development of a 20 hectare (ha) site known as 'Southlands', fronting McPherson Street, Banksmeadow. This report assesses the flora and fauna impacts of the proposed development of Southlands, in support of an Environmental Assessment (EA) to be submitted under Part 3A of the NSW *Environmental Planning & Assessment Act 1979* (EP&A Act). The report has been prepared in response to the Director-General's requirements for the EA.

The assessment consisted of a literature review, a field survey conducted on 3 and 4 July 2006 and habitat assessment.

The ecological and conservation value of the Site is low, with no remnant vegetation, low native species diversity and an abundance of noxious weeds. The Site provides only marginal habitat for local fauna species. The Site's limited ecological value may be attributed to its previous landuses, infestation with exotic flora and fauna, and groundwater contamination.

No TSC or EPBC Act listed species were recorded during the survey; however some species, such as migratory waterbirds, could utilise foraging habitat on the Site opportunistically on a temporary basis. Assessments of significance pursuant to Section 5A of the EP&A Act (7-part Tests) for these threatened species conclude that it is not 'likely' that the proposed works will result in 'a significant effect' on wetland bird species (e.g. Latham's Snipe, Painted Snipe, Sanderling, Black-tailed Godwit, Magpie Goose and the Australasian Bittern) listed under the TSC Act.

Targeted surveys for the threatened Green and Golden Bell Frog were undertaken in January and February 2007 (White 2007). No individuals of this species were recorded during the surveys. However, White recommends that two small habitat ponds be constructed as part of the proposal to ensure potential habitat for Green and Golden Bell Frog is maintained on the Site. The assessment provides additional detail on the design requirements for the ponds.

Native bird species recorded on Site would be displaced by the development. These species are generally widespread and common and are likely to occupy alternative habitat in the local area. Resident reptile populations will be removed or displaced from the Site. The reptile species recorded on Site are all common, widespread and well represented within conservation reserves in the region. Native mammals have not been recorded on the Site and so native mammal species are not likely to be affected by the proposed works.

Flows through Springvale Drain to Penrhyn Estuary for Stage 1 would match the existing regime. Detailed design of Stage 2 drainage infrastructure would incorporate measures to mitigate potential scouring and sediment impacts at Penrhyn Estuary.

The Construction and Environmental Management Plan for the Site would contain appropriate safeguards to ensure that the proposed development does not result in downstream impacts on sensitive receptors including Penrhyn Estuary during construction. Hydraulic modelling suggests that the development will not significantly alter hydraulic regimes in Springvale Drain and so there are unlikely to be downstream impacts.

Site management during construction will need to focus on removing and limiting the spread of the noxious weeds on Site.

1.1 Scope of Report

Orica Australia Pty Ltd (Orica) and Goodman International (Goodman) (jointly the Proponent) have agreed to seek Project Approval for the staged remediation and development of Southlands, an approximately 20 hectare (ha) Site owned by Orica fronting McPherson Street, Banksmeadow (the Site) (refer to Figure 1). Southlands is split into two blocks, known as Block 1 and Block 2, by Springvale Drain. Parts of the lands immediately to the south of the Southlands property, being the MCS container park and the Goodman Industrial Estate, known as Discovery Cove, are also proposed to be included with the project as a future access road corridor. Various infrastructure associated with the Orica Botany Groundwater Project exist on Southlands.

The Proponent is seeking Project Approval for remediation and development works under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The Application is supported by an Environmental Assessment (EA) prepared in accordance with the requirements of the Director-General (D-G) of the Department of Planning. URS Australia Pty Ltd (URS) was engaged by the Proponent to undertake a flora and fauna assessment of Southlands as part of the EA. The assessment addresses the requirements of the D-G, which include an 'ecological impact assessment, in accordance with DEC's Draft Guidelines for Threatened Species Assessment 2005'.

This report assesses the flora and fauna impacts of the proposed remediation and development of Southlands with regard to Commonwealth and NSW State planning and environmental legislation, including the *EP&A Act*, NSW *Threatened Species Conservation Act 1995* (TSC Act), NSW *Noxious Weeds Act 1993* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.2 Project Description - Staging and Process Description

The Southlands Remediation and Development Project comprises the following key components:

- Industrial Estate (Stages 1 to 3 – Stage 3 will be the subject of a separate Project Application);
- New link road; and
- Internal reconfiguration of Goodman's Discovery Cove Estate.

The general layouts of the key components of the Project are identified in Figure 2.

Southlands Remediation and Development Project will ultimately comprise three stages. This Application seeks approval for a warehousing development in Stages 1 and 2 only. A new access road, the reconfiguration of the Discovery Cove Estate and additional drainage infrastructure is required for the Stage 2 development. Development of Stage 3 is not included in the current Project Application and will be the subject of a later Project Application.

1.2.1 Stage 1

- Site stripping, earthworks and filling to new finished levels and accompanying Site erosion control and sedimentation control works (Block 2, western side of the Site);
- staged development of new warehouse and office buildings, hard stand areas, car parking and landscaping areas (Block 2, west of the unformed Nant Street) for commercial / warehousing facility with delivery of the proposed buildings on Stage 1 to be staged dependent upon market requirements;
- construction of a new private entry road from McPherson Street (east of and adjacent to Nant Street) providing access to Stage 1;
- maintain and landscape Springvale Drain;
- conduct earthworks, and erosion and sediment controls for Stage 2 (south eastern portion of the Site) to create necessary levels to satisfy the flood management strategy;
- conduct earth works in the Stage 3 area to fill the existing paper waste pond;
- works to Hills and Exell Street intersections in accordance with preliminary plans, to be agreed with Botany Bay City Council;
- Site fencing and landscaping of the Stage 2 and 3 areas;
- creation of easements within the Southlands property to provide for existing and potential future groundwater infrastructure, and
- creation of subdivision of the Southlands property, MCS land parcel and Discovery Cove in order to facilitate the proposed development.

1.2.2 Stage 2

- development of the southeastern side of the Site, (Block 1, east of the unformed Nant Street) for warehouses and office buildings;
- new road link from McPherson Street to Botany Road along with new drainage infrastructure and necessary reconfiguration of Discovery Cove Estate;

1.2.3 Stage 3

Stage 3 will be subject to a separate Project Application and will involve the development of the north eastern side of the Site (northern section of Block 1, east of Nant Street) for a commercial/warehousing facility. Stage 3 would not be developed until an adequate remediation strategy has been developed for DNAPL¹ contamination previously identified in this area.

¹ Dense non-aqueous phase liquids.

2.1 Site and Surrounding Landuse

2.1.1 Southlands

The Site falls within the Botany Bay local government area (LGA) and is currently zoned 4(a) Industrial under *Botany Local Environment Plan 1995*.

Southlands is predominantly flat, and contains little original vegetation or surface features. It occupies alluvial terrain and has been subject to extensive previous use for market gardening, peat cutting, dumping of solid wastes, discharge of paper waste slurry and storage of waste paper. Soils at the Site consist of fill from a variety of sources and contain large volumes of building rubble, domestic and industrial waste. The topography is gently undulating, with levelled areas around infrastructure interspersed with open areas containing small mounds of fill.

The Site is generally poorly drained and is often boggy. The low-lying parts of the Site are periodically inundated with water, with swampy areas in the north western corner of Block 2 and in the eastern half of Block 1 (refer to Figures 3 & 4).

There are five constructed ephemeral open wetlands on the Site, generally known as the 'Paper Waste Ponds' (refer Figure 4). It is understood these features are remnants of historical sand and peat mining activities, which during a period of ownership by Australian Paper Manufacturers, were partially backfilled with paper wastes from the manufacturing processes. The ponds are surrounded by rubble mounds overgrown with exotic weeds, but also contain stands of reeds and bulrushes.

Surface water levels across the Site fluctuate depending on the level and duration of rainfall, local changes in groundwater levels and on the operation of the Groundwater Treatment Plant (GTP - refer **Section 2.3**). Hence, the Paper Waste Ponds may be dry or contain open water at various times throughout the year, depending on local hydrology and weather patterns.

2.1.2 Discovery Cove/MCS

The Site immediately to the south of Southlands, including the MCS land strip and Discovery Cove, is also included in the Application for provision of a new road access. The road access is proposed to occur with the development of Stage 2.

Due to extensive industrial use, Discovery Cove contains little native vegetation or potential habitats for threatened species. There is some limited vegetation along Springvale Drain within the MCS land strip.

On this basis, this assessment refers to the Site as being the Southlands Site unless otherwise stated.

2.1.3 Surrounding Land

The land surrounding the Site is dominated by light and heavy industries and warehousing. The Botany Industrial Park (BIP) lies immediately to the northeast. Within the wider locality there are also areas of residential land.

There are sensitive ecological receptors downstream of the Site. The Site drains via Springvale Drain and the adjoining Floodvale Drain to Botany Bay, which lies less than 1km away to the south. The Bay contains substantial areas of significant marine habitat (URS, 2003). Penrhyn Estuary lies at the outlet of Springvale and Floodvale Drains and contains areas of mangrove, seagrass and saltmarsh vegetation and is a recognised habitat for marine shorebirds, including migratory waders (URS, 2006).

There are several remnant areas of natural vegetation within 2km of the Site. The Endangered Ecological Community (EEC) Eastern Suburbs Banksia Scrub (ESBS) occurs in the Bonnie Doon, Eastlake and The Lakes Golf Course areas and at Sir Joseph Banks Park. There is a stand of planted coastal scrub at Penrhyn Estuary which extends along the northern shore of Botany Bay, adjacent to Foreshore Rd (URS, 2006).

The Botany Wetlands and several other important habitats are located near the Site within the Botany Bay LGA. The features described above are illustrated in **Figure 1**.

2.2 Geology, Soils and Topography

The Site lies within the Botany Basin, which is a geomorphic sub-unit of the Sydney Basin and is bounded by Centennial Park to the north, Randwick and Matraville to the east, Alexandria and Rockdale to the west, the Kurnell Peninsula and part of the Sutherland Shire to the south (URS, 2003).

The regional geology at the Site consists of bedrock of Triassic Hawkesbury Sandstone overlain by Quaternary sediments (1:100,000 Sydney Geological Sheet, NSW Department of Mineral Resources 1983). The Hawkesbury Sandstone is a crossbedded medium to very coarse grained quartz sandstone with minor laminated mudstone and siltstone lenses. There are no known geological faults within the investigation area.

Throughout the region Quaternary sediments (up to 80 m thick) have infilled drowned river valleys incised into Hawkesbury Sandstone bedrock. The study area is underlain by Quaternary age sediments known as the Botany sand beds (Botany Sands) which overlie the Hawkesbury Sandstone bedrock. The Botany Sands comprise predominantly unconsolidated to semi-consolidated permeable sands, which contain lenses and layers of peat, peaty sands, silts and clay (low permeability), which become more common in the lower part of the sequence.

The natural geomorphology and soils at the Site have been heavily modified by past land uses, especially peat mining and landfilling. Soils are ‘anthroposols’, i.e. soils heavily modified by humans, and do not reflect the underlying geology. They contain a mix of naturally occurring sands, imported soil and road base, building rubble and general fill material.

The topography consists of flat, levelled areas along roads, drainage lines and around infrastructure interspersed with open area of unused land. These are gently undulating with small (<5m) mounds of fill and 1-2m deep depressions. Blocks 1 and 2 both drain towards Springvale Drain in the centre of the Site, which drains southwards. The surrounding area is generally flat and drains southwards towards Botany Bay.

Penrhyn Estuary to the south and the Foreshore beach dune system were formed during construction of the Port of Botany in the 1970's. Sand dunes are up to 3 m in elevation and vegetated with planted coastal scrub. Floodvale and Springvale Drains discharge into the Estuary and create incised channels into intertidal sand and mud flats.

2.3 Hydrogeology

The Botany Sands contain a system of unconfined and semi-confined aquifers that are referred to as the Botany Aquifer. The water table elevation for the Botany Aquifer ranges from approximately 35 m AHD at Centennial Park at the northern end of the basin to approximately 0 m AHD at Botany Bay. Flow across the Botany Basin is generally in a south to southwesterly direction, with an average hydraulic gradient of 1:120 (URS, 2005).

Throughout 2006 and 2007 Orica has operated groundwater containment lines, which are a requirement of the Notice of Clean Up Action currently applying to the Site. Monitoring conducted in the last quarter of 2006 and first quarter of 2007 indicates that the containment lines are drawing down groundwater and reducing the inflow of groundwater into the Paper Waste Ponds and Springvale Drain.

The soil profile underlying the Southlands Site consists of permeable sands, interspersed with less permeable peaty clay layers to depths exceeding 30 m below ground surface. The water table of the unconfined shallow aquifer and potentiometric surface of the deep aquifer at Southlands are typically between 0 and 3 m below the ground surface, depending on climatic conditions, proximity to the Primary Containment Area (PCA) and the rate of groundwater extraction from the hydraulic containment lines. Due to groundwater extraction and hydraulic containment within the PCA, groundwater flow on Southlands is generally towards the PCA extraction wells. Some water infiltrates through the low permeability layers of sandy clay that separate the shallow aquifer and deeper aquifer, within which groundwater extraction is occurring.

Some movement of groundwater occurs between the shallow aquifer and surface water on the Southlands Site (in the Paper Waste Ponds, Springvale Drain and Floodvale Drain), although continued consistent operation of the GTP containment lines is likely to lower groundwater levels and reduce infiltration of shallow groundwater into surface waters. Continued operation of the GTP would mean the ponds are only likely to contain open water at times of heavy or extended rainfall.

2.4 Climate

The Site, being located in coastal Sydney, has a mild, subtropical maritime climate. Meteorological data for Sydney Airport (approximately 2km to the west) indicates that the area receives relatively high rainfall for the Sydney Basin, with mean annual rainfall of 1094 mm. Mean annual temperatures range from 22.1°C to 13.2°C (BOM, 2004).

3.1 EP&A Act

The EP&A Act forms the legal and policy platform for development assessment and approval in NSW and aims to, *inter alia*, ‘encourage the proper management, development and conservation of natural and artificial resources’. The proposal is a Major Project according to *State Environmental Planning Policy (Major Projects) 2005* and as such, is to be assessed under the provisions of Part 3A of the EP&A Act, with the Minister for Planning as the Consent Authority for the Project Application.

Section 5A of the EP&A Act lists seven factors that must be taken into account in the determination of the significance of potential impacts of a proposed development on ‘threatened species, populations or ecological communities (or their habitats)’ listed under the TSC Act. The so-called ‘7-part test’ is used to determine whether a proposed development is ‘likely’ to impose ‘a significant effect’ on threatened biota and thus whether a Species Impact Statement (SIS) is required to accompany the DA. For development applications under Part 4 and 5 of the EP&A Act, if the 7-part test concludes that there is ‘likely’ to be ‘a significant effect’ on a listed species, population or EEC, a Species Impact Statement (SIS) must be prepared.

Under Part 3A of the EP&A Act, however, there is no requirement for Section 5A of the EP&A Act to be addressed, hence there is no requirement for an SIS. Instead, the flora and fauna assessment must be prepared according to the D-G’s requirements, which refer to the draft *Guidelines for Threatened Species Assessment* (DEC 2005).

Notwithstanding the statutory requirements for Part 3A of the EP&A Act, the approach herein has been to address s.5A and complete the 7-part test as a guide to assessing impacts on threatened biota that could be affected by the proposal. Hence, the 7-part test was carried out for those threatened species and endangered ecological communities listed under the TSC Act recorded and/or predicted to occur on the Site or within adjoining areas. The 7-part tests are provided in **Appendix A**, with the exception of the Green and Golden Bell Frog. A seven-part test for the Green and Golden Bell Frog is provided in the accompanying report by White (2007), which is attached as an appendix to the EA.

3.2 Noxious Weeds Act 1993

Under the NSW *Noxious Weeds Act 1993* (*NW Act*), the City of Botany Bay Council is responsible for the control of noxious weeds in its local LGA. The *NW Act* provides for the declaration of noxious weeds by the Minister of Agriculture. Noxious weeds may be considered noxious on a National, State, Regional or Local scale. All private landowners, occupiers, public authorities and Councils are required to control noxious weeds on their land under Part 3 Division 1 of the *NW Act*.

3.3 EPBC Act

The purpose of the Commonwealth *EPBC Act* is to ensure that actions likely to cause a significant impact on ‘matters of national environmental significance’ undergo an assessment and approval process. Under the *EPBC Act*, an action includes a project, undertaking, development or activity. An action that ‘has, will have or is likely to have a significant impact on a matter of national environmental significance’ is deemed to be a ‘controlled action’ and may not be undertaken without prior approval from the Commonwealth Minister for the Environment and Water Resources.

In January 2007 the Commonwealth and NSW governments signed a Bilateral Agreement which accredits the assessment regimes under Part 3A, Part 4 and Part 5 of the EP&A Act for assessment purposes under the EPBC Act. The Bilateral Agreement applies only to proposals that the Commonwealth Environment Minister has determined are controlled actions under the EPBC Act, with the exception of nuclear actions (DoP 2007).

The *EPBC Act* identifies matters of national environmental significance as:

- World heritage properties;
- National heritage places;
- Wetlands of international importance (Ramsar wetlands);
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

The Administrative Guidelines for the *EPBC Act* (Department of Environment & Heritage 2006) set out criteria intended to assist in determining whether an action is controlled and hence requires approval. In particular, the Guidelines contain criteria for determining whether a proposed action is likely to have a ‘significant impact’ on a matter of national environmental significance (NES). Should the proponent deem the proposal likely to have a significant impact on a matter of NES, a referral to the Commonwealth Minister for the Environment would be undertaken to obtain a determination as to whether the proposal is a ‘controlled action’ requiring Commonwealth approval.

EPBC Act listed species recorded or predicted to occur on the Site are also listed under the *TSC Act* and have been assessed in relation to the current proposal under Section 5A of the EP&A Act (see **Appendix A**).

4.1 Literature Review

A desktop literature review was undertaken by URS to identify the representative spectrum of threatened species, populations and ecological communities listed under the *TSC Act* and the Commonwealth *EPBC Act* that could be expected to occur within the study area, based on habitats present. To this end, the following documentation was reviewed:

- a search of the NSW NPWS Wildlife Atlas database (Selected area for Flora on coordinates 151.20000, -33.99000, 151.40000, -33.83000 and selected area for Fauna on coordinates 151.20000, -34.02000, 151.30000, -33.83000 – June 2006);
- EPBC online Protected Matters Database Search (June 2006 - 10 km radius search centred on the Site);
- White (1997) *Vertebrate Fauna of Southlands*; and
- URS Australia Pty Ltd (2004). *Botany Groundwater Cleanup Project – Environmental Impact Statement*.

4.2 Flora Survey

Flora surveys were conducted on the 3 and 4 July 2006. The primary objectives of the survey were to:

- map and describe the vegetation communities occurring within the study area;
- compile a flora list of those species occurring within the vegetation communities, identifying any threatened, nationally, regionally or locally significant species and communities; and
- assess the likely impacts of the proposed development and provide recommendations to assist in minimising impacts to flora in the study area.

4.2.1 Transect and Opportunistic Surveys

A total of four 100m survey transects were undertaken within Blocks 1 and 2 on 3 and 4 July 2006 (see **Figure 3**), in order to inventory plant species and map vegetation communities within the study area. The location of each four transects were based on the distribution of vegetation types present within the study area such that the extent of vegetation which may be disturbed as a result of the proposal was appropriately assessed. All vascular species observed were recorded on proforma field data sheets.

The transect based survey was also augmented with a random meander search (Cropper 1993). Random meander vegetation surveys were performed within approximately 100m x 100m quadrats adjacent to each survey transect. Vegetation surveying was also undertaken using a random meander whilst incidentally traversing the Site.

Plant specimens not readily identifiable in the field were collected and subsequently identified using standard botanical texts and where required were compared with voucher specimens held in the National Herbarium of New South Wales Online Reference Collection. Flora is described according to classifications made by Specht (1981). Plant identifications were made according to nomenclature in Harden (1990, 1991, 1992 and 1993). Some plant specimens which were difficult to classify (either insufficient sample collected or buds/fruiting bodies were not available at the time of the survey) were submitted to the NSW National Herbarium for identification.

Vascular plants recorded during the July 2006 survey were compiled into a floristic list provided as **Table 1**.

Conservation values of species communities mapped across the study area in July 2006 were determined with reference to relevant legislation including the *TSC Act* and the *EPBC Act*.

4.3 Fauna Survey

Due to the largely cleared nature of the study area low intensity methodology was employed to survey fauna. These included Random Meander (Cropper 1993), opportunistic observations, diurnal bird counts, call recognition and track and scat analyses.

Targeted fauna surveys were carried out on 3 and 4 July 2006 and were generally consistent with the Draft DEC (2004) survey guidelines. Weather experienced during the surveys comprised wet, mild days (14-18°C) and cool nights (9-14°C). Intermittent rain was experienced throughout the survey work comprising steady drizzle with intermittent heavy showers. A total of 36.6mm of rain was received within the vicinity of the Site during the survey period.

4.3.1 Diurnal Bird Counts

Diurnal bird counts were undertaken on 4 July 2006. Two 30-minute counts were undertaken at dawn at the large pond on Block 1 within the open wetland community and through sedgeland and open shrubland in the central portion of Block 1. A third bird count was taken just after dawn in the western portion of Lot 2 through sedgeland and open shrubland. An additional count was taken at dusk through sedgeland and open shrubland in the eastern portion of Block 1. Opportunistic observations of bird species were recorded throughout the day, across the whole Site. Species and bird numbers were recorded by visual observation and call on proforma data sheets.

Light to heavy rain and calm to light winds were experienced during the dawn and morning bird surveys, which may have affected the species and abundance of birds recorded. The July 2006 diurnal bird counts were not undertaken during the optimal detection period for many seasonal migratory species. The potential occurrence of these species was assessed on the basis of desktop review and habitat assessment.

4.3.2 Opportunistic Observations

Opportunistic and incidental observations of fauna species were recorded during the July 2006 field surveys.

4.3.3 Other Methods Considered

Ground debris searches, including active searches for scats, were undertaken during the entire survey period while incidentally traversing the Site.

No targeted searches for frogs and reptiles, mammal trapping (terrestrial/arboreal) or call playbacks were undertaken during the July 2006 surveys. No aquatic fauna surveys were conducted due to the generally degraded nature of aquatic habitat on the Site, especially the groundwater contamination impacting on Springvale Drain and the Paper Waste Ponds.

4.3.4 Habitat Assessment

An assessment of the quality of habitats present for both TSC and EPBC Act-listed species was also made during the July 3 and 4 2006 surveys. Habitat quality was based on the level of breeding, nesting, feeding and roosting resources available. This technique is important in assisting in the compilation of a comprehensive list of fauna that are predicted within the vicinity of the Site, rather than relying solely on one off surveys that are subject to seasonal limitations and only represent a snapshot of assemblages present.

Fauna survey locations are illustrated in **Figure 4**.

4.3.5 Green and Golden Bell Frog

Targeted surveys for the Green and Golden Bell Frog were conducted by White (2007) in January and February 2007. The results of these surveys are summarised in Section 5.1 of this report.

4.4 MCS and Discovery Cove

Assessment of MCS and Discovery Cove was restricted to air photo interpretation, visual inspection and a desktop review of NSW Wildlife Atlas records.

These areas are extensively developed, operating industrial Sites and are unlikely to support local populations of native flora and fauna, including *TSC Act* or *EPBC Act* listed species.

5.1 Literature Review

5.1.1 Flora

Threatened species

The results of the desktop literature review revealed 12 threatened plant species listed under the *EPBC Act* and/or the *TSC Act*, which have been previously recorded within the vicinity of the Site. Of these species, seven are classified as being Vulnerable and five as Endangered under these Acts. This list of threatened plant species is presented in **Table 1**. A review of the specific habitat requirements of these species, and the habitat offered by the Site and its surrounds allowed a number of these species to be immediately eliminated as having no (or low) likelihood of occurrence at the Site. Those that remain as having a potential medium to high likelihood of occurrence at the Site are indicated in **Table 1** and are listed below:

- *Acacia terminalis* subsp. *terminalis*
- *Acacia gordonii*
- *Allocasuarina portuensis*
- *Caladenia tessellata*
- *Callistemon linearifolius*
- *Cryptostylis hunteriana*
- *Pterostylis* sp. Botany Bay
- *Thesium australe*

Endangered Ecological Communities

Four Endangered Ecological Communities listed under the *EPBC Act* and/or the *TSC Act* could potentially occur in the study area. These include:

- Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion (ESBS);
- Sydney Freshwater Wetlands in the Sydney Basin Bioregion;
- Freshwater wetlands on coastal floodplains; and
- Swamp oak floodplain forest.

None of these communities have been previously identified on Southlands. A small remnant of ESBS occurs in Sir Joseph Banks Reserve, approximately 1.5km to the southwest and the Bonnie Doon, Eastlake and The Lakes Golf Course areas.

Flora Environment

The local area surrounding the Site consists of residential and industrial land. Consequently, clearing has resulted in the removal of most of the naturally occurring vegetation. The nearest natural vegetation is a narrow (<100m wide) strip of secondary vegetation bordering Penrhyn Estuary and Foreshore Beach approximately 1km to the south of the study area. This is classified as the community “Planted Shrubland” (Port Botany EIS, URS 2003). This shrubland community occurs on dredged marine sands along Foreshore Beach and at Penrhyn Estuary (Dames & Moore, 1996).

Vegetation at Southlands is primarily open shrubland, dominated by exotic species. Previous field surveys (URS various) have shown that 34 out of 38 vascular plant species identified on the Site do not naturally occur in NSW, and have concluded that the Site contains no significant flora species or vegetation types as the Site was previously cleared of all native flora. The Site is predominantly inhabited by species that do not naturally occur in NSW, i.e.: dominated by exotic weed species, including pampas grass (*Cortaderia selloana*), lantana (*Lantana camara*), castor oil plant (*Ricinus communis*), and green cestrum (*Cestrum parqui*) (Dames & Moore, 1996). Further, the ponds at the Site are surrounded by rubble mounds overgrown with exotic weeds, but also have extensive beds of reeds and bulrushes (Dames & Moore, 1996).

The study area falls within the Botany Bay LGA. A total of 83 weeds are declared as noxious within the LGA. Orica manages noxious weeds on the Southlands Site with a periodic spraying program.

5.1.2 Fauna

Results from fauna desktop reviews indicate the potential presence of approximately 68 threatened species and 28 migratory species as listed under the *TSC Act* and the *EPBC Act* which have been previously recorded within the vicinity of the property. A review of the specific habitat requirements of these species, and the habitat offered by the Site and its surrounds allowed a number of these species to be immediately eliminated as having no (or low) likelihood of occurrence at the Site. Those that remain as having a potential medium to high likelihood of occurrence at the Site are indicated in **Table 2** and are listed below:

- Green and Golden Bell Frog
- Magpie Goose
- Australasian Bittern
- Sanderling
- Black-tailed Godwit
- Australian Painted Snipe
- Large-footed Myotis
- Grey-headed Flying Fox
- Yellow-bellied Shearwater
- White-bellied Sea-Eagle
- Black-faced Monarch
- Orange-bellied Parrot
- Rufous Fantail
- Latham's Snipe
- Painted Snipe

Fauna surveys have previously been conducted on the site by White (1997), who conducted a 12 month fauna survey of the Southlands area. This survey involved intensive trapping and observational survey techniques and was repeated seasonally. The key findings of the report include:

- one endangered amphibian species, the Green and Golden Bell Frog *Litoria aurea*, was discovered on Block 2 during the autumn survey of 1997. Five adult frogs were identified in an ephemeral pond, though subsequent targeted surveys failed to locate any individuals of the species. White (1997) states 'it can be confidently concluded that there are no permanent colonies of these frogs on Southlands' and attributed this to the presence of the exotic mosquito fish *Gambusia holbrooki*. The mosquito fish is a known predator of tadpoles and frog eggs and is recognised as a key threat to the species. Other native frog species were poorly represented;
- 11 reptile species were recorded;
- six species of terrestrial mammals were recorded, all of which were exotic and some regarded as pest species;
- 43 species of bird were recorded, seven of which were introduced species; and
- native mammals were absent and had been displaced by introduced species.

Targeted surveys for the Green and Golden Bell Frog were undertaken on three occasions in January and February 2007 (White 2007 – refer to Appendix in the EA). No individuals of the species were recorded during these surveys.

5.1.3 Surrounding Habitat

Previous investigations on Site, and within the area, have concluded that there are significant ecological communities in the area but that Southlands is heavily modified and degraded and has little ecological value (Dames and Moore, 1996). There are significant ecological receptors downstream of the Site, at Penrhyn Estuary and Botany Bay (URS, 2003; 2006).

Springvale Drain discharges into Penrhyn Estuary approximately 1km south of the Site. Sensitive ecological receptors are present in the inner estuary including saltmarsh, mangrove and seagrass communities (URS, 2006).

The Botany wetlands are located on the northern shore of Botany Bay, and run in an arc to the north and west of the BIP. The wetlands are considered nationally important wetlands, and have been listed in the *Directory of Important Wetlands in Australia* (Environment Australia, 2001).

The wetlands include the Lachlan Swamps, Mill Pond, Mill Stream and Engine Pond, and consist of a chain of 11 ponds, the larger of which are open water with fringing vegetation. They are maintained by surface runoff and the underground Botany aquifer. Historically the wetlands were a water supply for Sydney and nearby industrial areas. There are numerous banks and structures in the complex, most of which no longer function (URS, 2003).

There has been considerable disturbance to both the physical integrity and the water quality of these wetlands over time. The wetlands form the lower part of a trunk drainage system in a 20 km² urbanised catchment, and consequently have high silt and other pollutant loadings from urban runoff. The invasive weed, water primrose (*Ludwigia peruviana*), dominates about 20 hectares of the wetlands, and other aquatic and terrestrial weeds are abundant. (URS, 2003).

Lachlan Swamp is characteristically known to include the catchment section between The Lakes and Eastlake Golf Courses (SMEC, 1992). Flora and fauna in this area have largely been modified or removed for development.

There are several other important fauna habitats on the southern side of Botany Bay, including Towra Point Aquatic Reserve (a marine protected area and RAMSAR wetland) and Silver Beach, to the east of Towra Point. Other areas of interest include Lady Robinsons Beach and Cape Banks Scientific Marine Research Area. These areas are all a significant distance (more than 6 km) from the Southlands Site and are separated by Botany Bay.

The ecological information outlined above was considered in the development of the field program and again in impact assessment of the proposal.

5.2 Field Assessment

5.2.1 Flora

Threatened species

No *TSC* or *EPBC Act* listed threatened species were recorded during the field surveys.

Endangered Ecological Communities

None of the four Endangered Ecological Communities listed under the *EPBC Act* and/or the *TSC Act* which could potentially occur in the study area were recorded on Site.

Flora species

A total of 63 flora species were identified from the targeted field surveys conducted on 3 and 4 July 2006 by URS Ecology Personnel. Of these species 15 are native, 12 are indigenous to the area and 7 are listed as Noxious Weeds. The species recorded are tabulated in **Table 3**.

No primary vegetation was observed in the study area, consistent with the previous land uses as discussed in **Section 1.2**. A total of six secondary vegetation communities were recorded across the study area, none of which are listed as endangered under the *EPBC Act* or the *TSC Act*. Descriptions of the vegetation communities recorded during the field surveys are summarised below and represented in **Figure 5**.

Community No. 1 Open grassland dominated by exotic weeds and pasture species

Open grassland comprising of exotic and pasture grasses was the dominant vegetation community recorded at the Site and was sampled by Transects 1 and 2 (See **Figure 2**). It consists of large expanses of Kikuyu *Pennisetum clandestinum* grass interspersed with a large number of exotic grasses, herbs, forbs and shrubs including *Melinis repens* (Red Natal Grass); *Bromus catharticus* (Prairie Grass), *Ageratina adenophora* (Crofton Weed), *Taraxacum officinale* (Dandelion), *Senecio madagascariensis* (Fireweed), *Ipomoea cairica* with occasional Acacia shrubs such as *Acacia longifolia* subsp. *sophorae* and *Acacia saligna*, small trees *Erythrina sykesii* (Coral Tree) and the occasional *Phoenix canariensis* (Canary Island Date Palm). This community contains declared noxious weeds in the Botany Bay LGA including: *Lantana camera* (Lantana); *Cestrum parqui* (Green Cestrum); *Ricinus* (Castor oil Plant); *Parietaria judaica* (Asthma Weed) and *Cortaderia selloana* (Pampas Grass).

Community No 2 Acacia Open Scrub

Acacia open scrub occurs in the southern and eastern portions of Block 1 and covers an area of approximately 150m². It consists predominantly of secondary growth of *Acacia longifolia* subsp. *sophorae* with an understorey of exotic grasses, forbs and shrubs.

Community No 3 Closed Wetland

A low-lying swampy area exists in the north western portion of Lot 2, adjacent to Floodvale Drain, which forms a closed wetland after rain. This area is approximately 1,050m² in size. It contains a dense stand of native rush species, including *Phragmites australis* and *Schoenoplectus validus*.

Community No 4 Open Wetland

The ephemeral open wetlands in Lot 1 (the Paper Waste Ponds) feature expansive areas of open water surrounded by rubble mounds with some banks supporting beds of marginal vegetation including *Typha orientalis* and *Schoenoplectus validus* and fringing vegetation dominated by the exotic species *Juncus acutus*. The largest of these ponds is approximately 4,180 m² in size. Several other smaller ephemeral depressions across the remainder of the Site fill with water after heavy rain.

Community No 5 Springvale Drain Aquatic Community

Springvale Drain supports a community of aquatic, emergent and semi-aquatic plant species. Plant species diversity is greatest at the northern end of the Site near the Nant Street Tank Farm, where a selection of native herbs, sedges and rushes have colonised the banks of the drain and the adjoining overflow area. Common species in this area include Water Pepper *Persicaria hydropiper*, Water Plantain *Alisma plantago-aquatica* and Bullrush *Typha orientalis*.

In the south, near McPherson Street the banks and channel of the drain are lined with geotextile fabric and do not support aquatic plants. South of McPherson Street the drain is steeply sided and contains exotic plant species.

Community No 6 Planted Open Woodland

There is a discontinuous stand of planted and regrowth native tree species running east-west along the southern boundary of Blocks 1 and 2. The trees are a mixture of indigenous species including *Banksia integrifolia* and *Melaleuca styphelioides*, and non-indigenous natives such as *Acacia elata*, *Acacia saligna* and *Casuarina cunninghamiana*. The greatest concentrations of trees are along the southern boundary of Block 1, to the west of Springvale Drain on Block 2 and near the existing entrance gate to Block 2. The central portion of Block 2 is predominantly grassland with scattered juvenile individuals of *Acacia* species.

This community was sampled by Transect 4. It features an undergrowth of exotic grasses, forbs and shrubs dominated by Kikuyu, similar to that in Communities 1 and 2. A similar planted vegetation group also exists along the northern boundary of MCS, dominated by *Casuarina cunninghamiana*.

5.2.2 Fauna

Threatened species

No *TSC* or *EPBC Act* listed threatened species were recorded during the field surveys.

Fauna species

The July 2006 fauna surveying recorded: 23 species of bird, including 21 native species; one exotic mammal species; and one native amphibian. These species are listed in **Table 4**. The majority of these species are widespread and common.

Birds

A total of 23 species of bird were recorded during both targeted surveys and incidentally whilst traversing the Site (Table 4). Of note are birds of prey utilising the high density and numbers of introduced rodents and rabbits on Site, the waders and ducks, utilising the ponds and nectar and insect feeding birds utilising the patches of *Acacia* on Site.

Mammals

No mammal trapping was undertaken during the July 2006 surveys; however previous trapping efforts (White 1997) recorded six terrestrial mammals at the Site, all of which were exotic (i.e. fox, dog, cat, rat, rabbit, and mouse).

Reptiles

No reptile species were recorded during the current surveys. However, 11 reptile species were previously recorded by White (1997) including:

- She-oak Skink (*Cyclodomorphus casuarinae*);
- Grass Skink (*Lampropholis guichenoti*);
- Garden Skink (*Lampropholis delicata*);
- Red-throated Skink (*Pseudemoia platynota*);
- Eastern Water Skink (*Eulamprus quoyii*);
- Bar-sided Skink (*Eulamprus tenuis*);
- Weasel Skink (*Saproscincus mustelina*);
- Eastern Tiger Snake (*Notechis scaturatus*);
- Black-bellied Swamp Snake (*Hemiaspis signata*); and
- Eastern Small-eyed Snake (*Rhinoplocephalus nigrescens*).

Amphibians

The Common Eastern Froglet *Crinia signifera*, the only species of amphibian recorded at the Site during the July 2006 surveys, was recorded calling from a number of the ponds located within Lot 1 and within inundated areas across the Site. Conditions during the July 2007 survey were not suitable for amphibian surveys and so this result should not be interpreted as indicating a decline in frog species. Previous surveys also recorded Striped Marsh Frog (*Limnodynastes peronii*), and Green and Golden Bell Frog (*Litoria aurea*) (White, 1997).

More recently, White (2007) recorded the Striped Marsh Frog (*Limnodynastes peronii*) and the Common Eastern Froglet (*Crinia signifera*) during targeted surveys for the Green & Golden Bell Frog. Both species are common and widespread throughout the Sydney Basin region. Individuals of both species were recorded in Springvale Drain.

Aquatic fauna

No targeted surveys for aquatic fauna were performed as the portion of Springvale Drain running through the Site provides limited habitat opportunity given the significant contaminant concentrations. Orica advises that eels and some fish are observed in the drain on occasion.

No aquatic fauna were recorded opportunistically on the Southlands Site during the terrestrial field surveys. However, a Short-finned Eel (*Anguilla australis*) was recorded feeding in the outlet of a stormwater pipe during the visual inspection of MCS.

5.3 Habitat Descriptions

Habitat features considered in assigning the quality of habitat on Site were:

- native diversity in ground flora;
- structural and floristic diversity of vegetation layers, particularly the presence or absence of midstorey vegetation in areas of remnant vegetation (shrubs and regenerating eucalypts) and the presence of native tussock grasses;
- the presence and quantity of litter layer and fallen dead timber;
- level of shelter, breeding, roosting and nesting resources available;
- the presence of stem hollows and quantity of mature hollow bearing trees;
- exfoliated bark, feed trees and shrubs;
- fauna movement corridors;
- the position in the landform, connectivity or value as a habitat corridor;
- the presence of rocky outcrops or scattered partially buried rocks; and
- the presence, size and ecological integrity of remnant communities.

5.3.1 Open Grassland

Open grassland comprising primarily of exotic and pasture grasses is the dominant habitat type found across the Site (**Plate 1**). Although no flora or fauna listed as Threatened under the *TSC Act* and/or the *EPBC Act* were observed within these areas of the Site, the open grassland is likely to be breeding and foraging habitat to a number of woodland bird species. However due to the relatively disturbed nature of the Site, the open grassland areas most likely support relatively common species that favour disturbed environments. The open grassland area may, however, provide a relatively large expanse of open space in comparison to the surrounding area and may provide a refuge to birds flying over the Site including some migratory species.

A number of ephemeral ponds form in poorly-drained depressions after heavy rain (**Plate 2**). These may provide suitable breeding habitat for native amphibians, including the threatened Green & Golden Bell Frog.



Plate 1. Open Grassland with rubble mounds.

Plate 2. One of the Paperwaste Ponds in Block 2.



5.3.2 Paper Waste Ponds

The four ephemeral wetlands in Block 1 (the Paper Waste Ponds) are periodically filled by a mixture of surface water and groundwater, which contains elevated levels of chlorinated hydrocarbons and other contaminants (**Plate 3**). At the time of surveys, the ponds contained surface water. However, for the purposes of this assessment, it assumed that the ponds are ephemeral in nature and hence are periodically wet and dry throughout the year.

Contamination of the ponds on the Site may affect the colonisation of many species of aquatic fauna which limits their habitat value. Previous studies have concluded that the level of groundwater contamination would severely limit the potential for significant ecological communities at Southlands (Dames and Moore, 1996). Continuing hydraulic containment is likely to limit the recharge of the Paper Waste Ponds by groundwater and so they might only contain water at times of heavy rain in the future (URS, 2007).

Improvements in water quality over the medium or long term as a result of groundwater containment may improve the aquatic habitat value of ephemeral wetland areas during periods of inundation. However, ongoing hydraulic containment within the PCA is likely to reduce the frequency and duration that the ponds are filled, which may reduce their utilisation by these species.

Previous surveys undertaken at the Site have identified the presence of three amphibian species, one of which, the Green and Golden Bell Frog, is listed as endangered under the *TSC* and *EPBC Act*. Only one species of fish, *Gambusia holbrooki*, has been previously recorded at the Site. It was found to inhabit all four ponds in Block 1 and occasionally the ephemeral areas (presumably after heavy rain and flooding). *Gambusia* was not recorded at the Site during the July 2006 surveys, however, heavy rain which resulted in inundation of the Site and high turbidity within the ponds made it difficult to detect this species. As noted earlier further assessment of the Green and Golden Bell Frog was undertaken by White (2007).

The ponds are relatively free of aquatic vegetation, but are bordered by common semi-aquatic sedges and rushes, such as *Juncus acutus* and Bullrush *Typha orientalis* (**Plate 4**). The Paper Waste Ponds provide areas of open water (during and after periods of high or prolonged rainfall) and marginal foraging habitat for a selection of bird species, including some wetland and migratory species listed under the *TSC* and *EPBC Acts*. Wetland species such as Latham's Snipe, Painted Snipe, Sanderling, Black-tailed Godwit, Magpie Goose and the Australasian Bittern are known to utilise freshwater and estuarine wetlands on occasion and could occur on the Site when open water is present as part of wide-ranging foraging activities. However, the nature and condition of the ponds and their small size is such that wetland birds would only occur (if at all) on a temporary or transient basis. The vast majority of migratory and wetland bird species known to occur in the Botany Bay area utilise estuarine wetland habitats around Towra Point and Taren Point and only breed and forage on open sand spits, a habitat type not found at Southlands. Hence the Site would not represent an important habitat or resource for wetland birds previously recorded in the locality.



Plate 3. Paper Waste Pond during period of inundation.



Plate 4 Semi- aquatic vegetation dominated by *Juncus acutus*.

The ponds may also provide foraging habitat for local microchiropteran bat ('micro bat') populations, such as the one that occurs at the Old Bunnerong Power Station at Matraville. No micro bats were recorded on the Site during the previous fauna surveys undertaken in 1996 (White, 1997). This was attributed to the bright lights and fumes from surrounding industry which may discourage bats from venturing over the Site.

5.3.3 Closed Wetland

The low-lying swampy area which exists in the north western portion of Lot 2 forms a closed wetland after rain and is also considered potential habitat for many bird, reptile and amphibian species. It is relatively free of exotic species and contains a dense, healthy stand of *Phragmites australis*, which provides an area of forage for native bird species, as well as providing shelter for species utilising the adjacent Open Shrubland. It also provides foraging habitat for reptiles and potential breeding habitat for amphibians.

This area appears to be shallow and rainwater-fed and so is unlikely to be affected by groundwater containment.

5.3.4 Springvale Drain Habitat

Springvale Drain is an open stormwater drain running north-south through the Site. It supports a selection of aquatic and semi-aquatic vegetation, particularly in the central and northern portions of the Site (**Plate 5**), which ranges from exotic grassland to sedgeland, with a sparse shrub cover. However the value of the drain as aquatic habitat at the time of the field survey was likely to be limited by contamination with chlorinated hydrocarbons.

The drain and its surrounds provide marginal foraging habitat for a selection of wetland bird species. Stands of vegetation provide suitable habitat for amphibians and reptiles, combining a varied substrate of dense vegetation with shelter in the form of large rocks and fragments of rubble.

Ongoing operation of the groundwater containment lines is likely to reduce groundwater flows into Springvale Drain (URS, 2007). Estuarine species are likely to utilise the southern portions of the drain, though the McPherson Street crossing and associated litter trap may limit upstream movements. The Site is connected with aquatic habitats upstream; however, these are likely to be similarly degraded.



Plate 5. Central portion of Springvale Drain, showing dense exotic grass cover and riparian vegetation.

5.3.5 Open Shrubland

Open Shrubland on Site provides suitable foraging habitat for many native bird species. However it is highly disturbed and has a low diversity of native plant species. Accordingly the Open Shrubland at Southlands is most likely to support relatively common species that favour disturbed environments.

The varied substrate of dense vegetation, rocks, soil and building rubble found within the open shrubland may provide suitable habitat for locally occurring and common native reptile and amphibian species, such as the Marsh Snake, Eastern Tiger Snake, Blue Tongue Lizard and the Jacky Lizard (although these species have not been recorded on the Site).

5.3.6 Acacia Woodland

The areas of Woodland in the east of Block 1 provide suitable foraging habitat for many native bird species. However both the ground cover and canopy species diversity is low and dominated by exotics. There are no significant habitat trees (i.e. diameter greater than 70cm and/or bearing hollows) and the shrub layer is limited to a sparse cover of juvenile acacias. Accordingly the Acacia Woodland at Southlands is most likely to support relatively common species that favour disturbed environments.

6.1 Areas to be cleared and staging of works

The proposed remediation and development of the Site will ultimately encompass its entire area of approximately 183,000m². The Site would be remediated and subsequently developed in three stages, with this Project Application relating to Stages 1 and 2 only (Figure 2). It is envisaged that the entire Site will ultimately become a major industrial and warehousing estate. Further detail on staging is provided in Chapter 5 of the Environmental Assessment.

Stage 1

Stage 1 of the development will involve the clearing of Block 2 and the southwestern side of Block 1. Springvale Drain improvements will be conducted in this initial stage to maintain and landscape the Drain. This may require some minor earthworks. Human health considerations require that all wetland and pond areas be filled as part of this initial development stage.

Stage 2

Block 1 (the eastern block) is proposed to be developed in two stages, known as Stage 2 (the southern section) and Stage 3 (the northern section). The Site immediately to the south of Southlands, including the MCS land strip and Discovery Cove, is also included in the Project Application for provision of a new road access and drainage infrastructure works (proposed to occur with the development of Stage 2).

Stage 3

Stage 3 will not be developed until an adequate remediation strategy has been developed for DNAPL² contamination previously identified in this area.

The assessment of impacts in this Section is based on the end point of the proposed development and encompasses Stages 1, 2 and 3. Over time, the proposed development will result in the removal of all vegetation within the Site and the in-filling of all wetlands (i.e. the Paper Waste Ponds and the closed wetland in the northwestern portion of Block 2).

6.2 Flora

The proposed remediation and development of the Site will result in the clearing of all vegetation present. Vegetation at the Site is dominated by environmental weeds and has low ecological value. Areas of regrowth and planted native vegetation contain common and widespread native and exotic species. Of the 63 flora species identified, 27 are native and 36 are exotic. Of the native species, 15 are non-indigenous natives and 12 are locally indigenous. Of the exotic species, seven are listed as Noxious Weeds under the *Noxious Weeds Act 1993* for Botany Bay LGA.

² Dense non-aqueous phase liquids.

Historic clearing of the Site has resulted in the removal of naturally occurring vegetation. Threatened flora species which have been recorded or are predicted to occur in the local area have a low likelihood of occurring at the Site (**Table 2**). Vegetation communities recorded at the Site during the July 2006 surveys were not representative of the *TSC* or *EPBC Act* listed EECs.

Remnant vegetation on the Site is isolated in the local area by surrounding industrial development. Accordingly clearing associated with the proposal will not result in the isolation or fragmentation of vegetation patches. The nearest native vegetation in the proximity of the Site is a narrow (<100m wide) strip of secondary vegetation bordering Penrhyn Estuary and Foreshore Beach located approximately 1km to the south.

Due to extensive industrial use, Discovery Cove contains little native vegetation or potential habitats for threatened species. There is some limited vegetation along Springvale Drain within the MCS land strip.

6.3 Fauna

The proposed development of the Site will result in the loss of all fauna habitats present and directly impact fauna present at the time of development. The fauna species recorded on the Site and those expected to occur are all generally widespread and common. The removal of fauna habitats and individuals associated with construction of the proposal will not render any local population of any fauna species extinct with the locality.

No threatened species of fauna listed under the *TSC* or *EPBC Act* were recorded. The likelihood of threatened species utilising the Site, and the potential impacts on fauna assemblages are discussed below.

6.3.1 Bats

The Paper Waste Ponds and Springvale Drain may provide foraging habitat for a number of threatened micro bats, including the Yellow-bellied Sheath-tail-bat and Large-footed Myotis, although no such species have been recorded on-site to date. The bright lights and fumes from surrounding industry may discourage bats from utilising the Site. Further, it is likely that other areas in close proximity to the Site such as Botany Bay National Park would provide the main habitat for bat populations in the local area. Therefore the loss of potential foraging habitat associated with the proposed development is unlikely to have a significant impact on native bats, including any local populations of threatened species (if present).

6.3.2 Mammals

The Site is unlikely to provide suitable habitat for threatened mammal species previously recorded or predicted to occur in the local area. Previous fauna surveys at the Site recorded only exotic species including the predatory Red Fox, Domestic Dog and Cat. The presence of these predatory species in addition to the highly disturbed nature of the Site and the lack of adjoining vegetation all suggest the Site contains poor habitat for native mammal species. Therefore the loss of habitat associated with development at the Site is not likely to have a significant impact on local populations of native mammals.

6.3.3 Frogs

The proposed development will result in the removal of potential foraging and breeding habitat for native amphibians. This includes approximately 0.66ha of Open Wetland and 960m² of Closed Wetland, with 12ha of foraging habitat in the Exotic Open Grassland community surrounding the Ponds.

Despite the lack of recent records, the Paper Waste Ponds and surrounding grassland areas may intermittently support a local population of the *TSC* and *EPBC Act* listed Green and Golden Bell Frog. Further details are provided in the accompanying report by (White, 2007).

Other frog species observed on Site are widespread and common. Habitat at Southlands is probably of limited value to local populations of these species due to groundwater contamination and the presence of higher grade habitat in Sir Joseph Banks Park, the Lachlan Swamps and the Botany Wetlands. Therefore the proposed development is likely to have a minor impact upon local populations of native amphibians.

6.3.4 Reptiles

The proposed development of the Site will result in the removal of habitat for native reptiles. During construction individuals and habitat for a narrow selection of native reptiles utilising the Site will be removed or displaced. It is likely that some of the more mobile skinks and snakes will relocate when disturbed; however there are limited areas for such movements and it is likely that the development will cause the removal of these species from the Site.

6.3.5 Birds

Despite the extent of groundwater contamination, the Site provides potential suitable habitat for listed wetland bird species including the Latham's Snipe, Painted Snipe, Sanderling, Black-tailed Godwit, Magpie Goose and the Australasian Bittern. The Ponds and the Closed Wetland provide suitable habitat for freshwater wetland species such as the Painted Snipe, Magpie Goose and the Australasian Bittern. Given the Site's close proximity to Penrhyn Estuary and Botany Bay it is possible that the marine shorebirds may utilise the Site as additional or marginal foraging habitat. However, despite year-long surveys (White 1997), these species were not recorded on Site.

The proposed development will result in the removal of potential foraging habitat for these species. Approximately 0.66Ha of Paper Waste Ponds and 960m² of Closed Wetland will be removed. Approximately 12Ha of Exotic Open Grassland surrounding these areas will also be removed, which may represent additional foraging habitat, admittedly of poor quality.

This loss is likely to be negligible in the context of large areas of less disturbed habitat in the local area. Other areas of suitable habitat include Sir Joseph Banks Park, the Lachlan Swamps, the Botany Wetlands and Towra Point Nature Reserve. Given the limited foraging and breeding habitat the Site provides within the context of the LGA the loss of potential habitat for these species is not considered significant. Bird species are highly mobile and so species displaced by the development are likely to relocate to other habitat. This displacement is unlikely to constitute a significant impact on these species. A 7-part test for

threatened wetland birds and migratory species was conducted (see **Appendix A**) and concludes that the proposed works are not ‘likely’ to impose a ‘significant effect’ on any ‘threatened species, populations or ecological communities’ listed under the TSC Act.

6.4 Springvale Drain

The proposed development of Southlands will not result in any major modification to the operation of Springvale Drain. Rather it will be maintained as the main drainage line for that catchment, but will be cleaned and revegetated to compliment the new development.

Although contaminated, Springvale Drain contains freshwater habitat within the Site and supports an assemblage of aquatic and semi-aquatic plants, particularly at the northern end. However, as the drain is highly disturbed by weed invasion, physical disturbance and contaminated groundwater, its value as freshwater habitat is likely to be very limited.

Development of the Site will maintain existing hydrological flows (by onsite detention) and therefore flows to downstream receptors, including Penrhyn Estuary and Botany Bay, will be largely unchanged for Stage 1. Detailed design of Stage 2 drainage infrastructure would incorporate measures to mitigate potential scouring and sediment impacts at Penrhyn Estuary.

Provided that appropriate sediment controls and other mitigation measures (**Section 7**) are followed, development of all Stages is unlikely to have significant impacts on aquatic habitat in Springvale Drain.

6.5 Offsite Impacts

The most significant offsite receptor is Penrhyn Estuary and associated aquatic habitats. These include *TSC Act* listed saltmarsh and seagrass communities which are present in the inner estuary. The estuary is also of ecological significance to fish and migratory shorebirds including listed threatened species. The approved Port Botany expansion proposal will have a substantial impact on the ecological values of Penrhyn Estuary. Nevertheless, the estuary is likely to retain considerable conservation significance.

The potential offsite impacts on Penrhyn Estuary and Springvale Drain associated with the proposed development of Southlands are likely to be limited to alterations to the hydraulic regime of Springvale Drain and increased erosion or sedimentation.

With regard to changes to hydrology, flood modelling conducted by Connell Wagner has been prepared assuming that current hydraulic flows from the site are maintained at their current level in Stage 1 based on significant on-site detention incorporated into the design. Flows through Springvale Drain to Penrhyn Estuary will therefore match the existing regime following the proposed development in Stage 1.

Stage 2 works would involve the delivery of new drainage infrastructure to reduce flood impacts for the wider area. The delivery of this new infrastructure has the potential to affect the outlet to Botany Bay and the surrounding Penrhyn Estuary wetlands. Initial modelling and design resolution by Connell Wagner as part of their flooding and stormwater modelling for the Project (refer to the Environmental Assessment), confirms that mitigating measures can be incorporated into the final detailed design for the new Stage 2

infrastructure, that would reduce flow and scour impacts in the Penrhyn Estuary. Detailed design and incorporation of these mitigating measures would be required, and are proposed as part of the commitments, prior Stage 2 works to ensure that impacts to Penrhyn Estuary are minimised.

With regard to erosion and sedimentation, these potential offsite impacts can be readily managed by the implementation of standard erosion controls for urban developments, such as those detailed in the Landcom (2004) guidelines *Managing Urban Stormwater: Soils and Construction* (the so-called 'Blue Book'). Moreover, erosion controls for the construction phase of the development will be detailed in an erosion and sedimentation control plan, which will form part of the construction environment management plan (CEMP).

Any potential offsite impacts on flora and fauna relating to transmission of contaminated groundwater or surface water into offsite receptors such as Penrhyn Estuary, cannot be attributed specifically to the proposed Southlands development. Contamination of groundwater is being addressed independently of the current proposal by ongoing treatment and containment measures being implemented by Orica separate to this development. Issues relating to contamination are addressed in the accompanying Environmental Assessment.

The mitigation measures outlined in the following sections have been identified in order to minimise potential impacts to flora and fauna species on Site.

7.1 Design

The incorporation of on site detention along with appropriate water quality controls has been proposed to mimic current surface water flow conditions down stream of the Southlands site so as to not significantly alter the local hydraulic regime.

7.2 Offset Habitat

The construction of compensatory habitats for the Green and Golden Bell Frogs is recommended as part of the White (2007) assessment. These would be in the form of two small frog ponds and associated foraging areas. Further detail is provided in the White (2007) report attached to the Environmental Assessment.

7.3 Planning

It is recommended that the Construction Environmental Management Plan (CEMP) and Operation Environment Management Plan (OEMP) be developed for the Site and address the issues outlined below.

7.3.1 Weed Management

A Weed and Pest Management Plan would be completed as part of the CEMP and OEMP for the Site. Caution is required during all remediation and construction activities to limit the risk of spread of Noxious Weed Species present on Site.

7.3.2 Soil Erosion / Runoff

The CEMP should include an erosion and sedimentation control plan, incorporating measures to reduce the risk of soil erosion and pollutant run-off. Particular areas of concern are controlling runoff into Springvale and Floodvale Drains.

7.3.3 Complementary Plantings

Whilst no offsets against the proposed clearing are likely to be required, there is an opportunity for development to increase ecological values present in the surrounding areas. It is recommended that any landscaping utilise native species of local provenance, such as those found within the Eastern Suburbs Banksia Scrub community, which historically occurred throughout Botany Bay LGA.

The landscape plans prepared for the project have adhered to this approach.

The ecological and conservation value of the Site is low, with no remnant vegetation, low native species diversity and an abundance of noxious weeds. The Site provides only marginal habitat for local fauna species. The Site's limited ecological value may be attributed to its previous landuses, infestation with exotic flora and fauna, and groundwater contamination.

No *TSC* or *EPBC Act* listed species were recorded during the survey; however some species, such as migratory waterbirds, could utilise foraging habitat on the Site opportunistically on a temporary basis. Assessments of significance pursuant to Section 5A of the EP&A Act (7-part Tests) for these threatened species conclude that it is not 'likely' that the proposed works will result in 'a significant effect' on wetland bird species (e.g. Latham's Snipe, Painted Snipe, Sanderling, Black-tailed Godwit, Magpie Goose and the Australasian Bittern) listed under the TSC Act.

Targeted surveys for the threatened Green and Golden Bell Frog were undertaken in January and February 2007 (White 2007). No individuals of this species were recorded during the surveys. However, White recommends that two small habitat ponds be constructed as part of the proposal to ensure potential habitat for Green and Golden Bell Frog is maintained on the Site. The assessment provides additional detail on the design requirements for the ponds.

Native bird species recorded on Site would be displaced by the development. These species are generally widespread and common and are likely to occupy alternative habitat in the local area. Resident reptile populations will be removed or displaced from the Site. The reptile species recorded on Site are all common, widespread and well represented within conservation reserves in the region. Native mammals have not been recorded on the Site and so native mammal species are not likely to be affected by the proposed works.

Flows through Springvale Drain to Penrhyn Estuary for Stage 1 would match the existing regime. Detailed design of Stage 2 drainage infrastructure would incorporate measures to mitigate potential scouring and sediment impacts at Penrhyn Estuary.

A CEMP for the Site would contain appropriate safeguards to ensure that the proposed development does not result in downstream impacts on sensitive receptors including Penrhyn Estuary during construction. Stormwater designs for the site suggest that the development will not alter hydraulic regimes in Springvale Drain and so there are unlikely to be downstream impacts.

Site management during construction will need to focus on removing and limiting the spread of the noxious weeds on Site.

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Tables

Tables

Table 1: Threatened flora species previously recorded or predicted to occur in the study area

Botanical Name	Common Name	Classification	Potential Occurrence at the Site
<i>Acacia terminalis</i> subsp. <i>terminalis</i> ^{1 2}	Sunshine Wattle	E1, E	✓
<i>Acacia gordonii</i> ¹		E1	✓
<i>Allocasuarina portuensis</i> ¹	Nielsen Park She oak	E1	X
<i>Caladenia tessellata</i> ²	Thick-lipped Spider-orchid	V	✓
<i>Callistemon linearifolius</i> ¹	Netted Bottle Brush	V	X
<i>Cryptostylis hunteriana</i> ²	Leafless Tongue-orchid	V	✓
<i>Eucalyptus camfieldii</i> ¹	Heart leaved Stringybark	V	X
<i>Eucalyptus pulverulenta</i> ¹	Silver-leaved Gum	V	X
<i>Eucalyptus scoparia</i> ¹	Wallangarra White Gum	E1	X
<i>Pterostylis</i> sp. Botany Bay ^{1 2}	Botany Bay Bearded Greenhood	E	X
<i>Syzygium paniculatum</i> ²	Magenta Lily Pily	V	X
<i>Thesium australe</i> ^{1 2}	Austral Toadflax	V, V	✓

✓ = Possible X = Unlikely

1 = Threatened species listed under TSC Act 1995 previously recorded within 10km of the Site

2 = Threatened species or species habitat listed under EPBC Act 1999 predicted to occur in the study area

V = Vulnerable species listed under TSC Act 1995 or EPBC Act 1999

E1 = Category 1 Endangered species listed under TSC Act 1995

E = Endangered species listed under EPBC Act 1999

Tables

Table 2: Threatened fauna species previously recorded or predicted to occur in the study area

Scientific Name	Common Name	Classification	Potential Occurrence at the Site
Amphibian			
<i>Crinia tinnula</i>	Wallum Froglet ¹	V	X
<i>Heleioporus australiacus</i>	Giant Burrowing Frog ²	V	X
<i>Pseudophryne australis</i>	Red-crowned Toadlet ¹	V	X
<i>Litoria aurea</i>	Green and Golden Bell Frog ^{1 2}	E1, V	✓
Reptilia			
<i>Chelonia mydas</i>	Green Turtle ^{1 2}	V	X
<i>Dermochelys coriacea</i>	Leatherback Turtle ^{1 2}	V	X
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake ²	V	X
Aves			
<i>Anseranas semipalmata</i>	Magpie Goose ¹	V	✓
<i>Botaurus poiciloptilus</i>	Australasian Bittern ¹	V	✓
<i>Calidris alba</i>	Sanderling ¹	V	✓
<i>Calidris tenuirostris</i>	Great Knot ¹	V	X
<i>Calyptorhynchus lathamii</i>	Glossy Black Cockatoo ¹	V	X
<i>Charadrius leschenaultia</i>	Greater Sand-plover ¹	V	X
<i>Charadrius mongolus</i>	Lesser Sand-plover ¹	V	X
<i>Dasyornis brachypterus</i>	Eastern Bristlebird ¹	E1	X
<i>Diomedea amsterdamensis</i>	Amsterdam Albatross ²	E	X
<i>Diomedea antipodensis</i>	Antipodean Albatross ²	V	X
<i>Diomedea dabbenana</i>	Tristan Albatross ²	E	X
<i>Diomedea exulans</i>	Wandering Albatross ^{1 2}	E1, V	X
<i>Diomedea gibsoni</i>	Gibsons Albatross	V	X
<i>Erythrotriorchis radiatus</i>	Red Goshawk ¹	E1	X
<i>Gygis alba</i>	White Tern ¹	V	X
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher ¹	V	X
<i>Haematopus longirostris</i>	Pied Oystercatcher ¹	V	X
<i>Lathamus discolor</i>	Swift Parrot ^{1 2}	E1, E	X
<i>Limicola falcinellus</i>	Broad-billed Sandpiper ¹	V	X
<i>Limosa limosa</i>	Black-tailed Godwit ¹	V	✓
<i>Macronectes giganteus</i>	Southern Giant Petrel ^{1 2}	E1, E	X
<i>Macronectes hallii</i>	Northern Giant Petrel ^{1 2}	V, V	X
<i>Neochmia ruficauda</i>	Star Finch ¹	E4	X
<i>Neophema chrysogaster</i>	Orange Bellied Parrot ^{1 2}	E1, E	X

Tables

Scientific Name	Common Name	Classification	Potential Occurrence at the Site
<i>Ninox connivens</i>	Barking Owl ¹	V	✓
<i>Ninox strenua</i>	Powerful Owl ¹	V	✓
<i>Pandion haliaetus</i>	Osprey ¹	V	X
<i>Polytelis swainsonii</i>	Superb Parrot ¹	V	X
<i>Procelsterna caerulea</i>	Grey Ternlet ¹	V	X
<i>Pterodroma leucoptera leucoptera</i>	Gould's Petrel ^{1 2}	E1, E	X
<i>Pterodroma neglecta neglecta</i>	Kermadec Petrel ^{1 2}	V, V	X
<i>Ptilinopus superbus</i>	Superb Fruit Dove ¹	V	X
<i>Puffinus carneipes</i>	Flesh-Footed Shearwater ¹	V	X
<i>Rostratula australis</i>	Australian Painted Snipe ²	V	✓
<i>Stagonopleura guttata</i>	Diamond Firetail ¹	V	X
<i>Sterna albifrons</i>	Little Tern ¹	E1	X
<i>Sterna fuscata</i>	Sooty Tern ¹	V	X
<i>Thassalarchi bulleri</i>	Buller's Albatross ²	V	X
<i>Thassalarchi cauta</i>	Shy Albatross ^{1 2}	V, V	X
<i>Thassalarchi impavida</i>	Campbell Albatross ²	V	X
<i>Thassalarchi melanophris</i>	Black-browed Albatross ^{1 2}	V, V	X
<i>Thassalarchi salvini</i>	Salvin's Albatross ²	V	X
<i>Thassalarchi steadi</i>	White Capped Albatross ²	V	X
<i>Xanthomyza phrigia</i>	Regent Honeyeater ^{1 2}	E1, E	X
<i>Xenus cinereus</i>	Terek Sandpiper ¹	V	X
Mammalia			
<i>Aepyprymnus rufescens</i>	Rufous Bettong ¹	V	X
<i>Arctocephalus forsteri</i>	New Zealand Fur-Seal ¹	V	X
<i>Arctocephalus pusillus doriferus</i>	Australian Fur-seal ¹	V	X
<i>Balaenoptera musculus</i>	Blue Whale ²	E	X
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat ^{1 2}	V	X
<i>Dasyurus maculatus maculatus</i>	Spotted-tailed Quoll ^{1 2}	E	X
<i>Dasyurus viverrinus</i>	Eastern Quoll ¹	E1	X
<i>Dugong dugon</i>	Dugong ¹	E1	X
<i>Eubalaena australis</i>	Southern Right Whale ^{1 2}	V, E	X
<i>Megaptera novaengliaea</i>	Humpback Whale ^{1 2}	V, V	X
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bent-wing Bat ¹	V	X
<i>Myotis adversus</i>	Large-footed Myotis ¹	V	✓
<i>Petrogale penicillata</i>	Brush-tailed Rock Wallaby ²	V	X
<i>Potorous tridactylus tridactylus</i>	Long-nose Potoroo ^{1 2}	V	X
<i>Pteropus poliocephalus</i>	Grey-headed Flying Fox ^{1, 2}	V, V	✓

Tables

Scientific Name	Common Name	Classification	Potential Occurrence at the Site
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat ¹	V	✓
Migratory Terrestrial Birds			
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle ²	M	✓
<i>Hirundapus caudacutus</i>	White-throated Needletail ²	M	X
<i>Monarcha melanopsis</i>	Black-faced Monarch ²	M	✓
<i>Myiagra cyanoleuca</i>	Satin Flycatcher ²	M	X
<i>Neophema chrysogaster</i>	Orange-bellied Parrot ²	M	✓
<i>Rhipidura rufifrons</i>	Rufous Fantail ²	M	✓
<i>Xanthomyza phrygia</i>	Regent Honeyeater ²	M	X
Migratory Wetland Birds			
<i>Arenaria interpres</i>	Ruddy Turnstone ²	M	X
<i>Charadrius mongolus</i>	Lesser Sand Plover ²	M	X
<i>Gallinago hardwickii</i>	Latham's Snipe ²	M	✓
<i>Numenius madagascariensis</i>	Eastern Curlew ²	M	X
<i>Pluvialis fulva</i>	Pacific Golden Plover ²	M	X
<i>Rostratula benghalensis s. lat.</i>	Painted Snipe ²	M	✓
Migratory Marine Birds			
<i>Diomedea amsterdamensis</i>	Amsterdam Albatross ²	M	X
<i>Diomedea antipodensis</i>	Antipodean Albatross ²	M	X
<i>Diomedea dabbenena</i>	Tristan Albatross ²	M	X
<i>Diomedea exulans</i>	Wandering Albatross ²	M	X
<i>Diomedea gibsoni</i>	Gibson's Albatross ²	M	X
<i>Macronectes giganteus</i>	Southern Giant-Petrel ²	M	X
<i>Macronectes halli</i>	Northern Giant-Petrel ²	M	X
<i>Pterodroma leucoptera leucoptera</i>	Gould's Petrel ²	M	X
<i>Puffinus leucomelas</i>	Streaked Shearwater ²	M	
<i>Thalassarche bulleri</i>	Buller's Albatross ²	M	X
<i>Thalassarche cauta</i>	Shy Albatross ²	M	X
<i>Thalassarche impavida</i>	Campbell Albatross ²	M	X
<i>Thalassarche melanophrys</i>	Black-browed Albatross ²	M	X
<i>Thalassarche salvini</i>	Salvin's Albatross ²	M	X
<i>Thalassarche steadi</i>	White-capped Albatross ²	M	X

✓ = Possible X = Unlikely

1 = Threatened species listed under TSC Act 1995 previously recorded within 10km of the Site

2 = Threatened species or species habitat listed under EPBC Act 1999 predicted to occur in the study area

V = Vulnerable species listed under TSC Act 1995 or EPBC Act 1999

E1 = Category 1 Endangered species listed under TSC Act 1995

E = Endangered species listed under EPBC Act 1999

M = Migratory species listed under EPBC Act 1999

Table 3: Plant species recorded during the July 2006 survey

Botanical name	Common Name
Family name	
Alismataceae	
<i>Sagittaria graminea</i> subsp. <i>platyphylla</i> **	Arrow-Head
Amarylidaceae	
<i>Clivia</i> sp.*	Kaffir Lily
Apiaceae	
<i>Hydrocotyle bonariensis</i> *	Kurnell Curse
<i>Foeniculum vulgare</i> *	Fennel
Areaceae	
<i>Phoenix canariensis</i> *	Canary Island Date Palm
Asteraceae	
<i>Ageratina adenophora</i> *	Crofton Weed
<i>Ambrosia psilostachya</i> **	Perennial Ragweed
<i>Bidens pilosa</i> *	Cobblers Pegs
<i>Conyza bonariensis</i> *	Flaxleaf Fleabane
<i>Hypochaeris radicata</i> *	Flatweed
<i>Senecio madagascariensis</i> *	Fireweed
<i>Taraxacum officinale</i> *	Dandelion
Bignoniaceae	
<i>Anredera cordifolia</i> *	Madeira Vine
Brassicaceae	
<i>Brassica fruticulosa</i> *	Twiggy Turnip
Casuarinaceae	
<i>Casuarina cunninghamiana</i>	River She-Oak
Convolvulaceae	
<i>Ipomoea cairica</i> *	Coastal Morning Glory
Commelinaceae	
<i>Tradescantia albiflora</i> *	Wandering Jew
Cucurbitaceae	
<i>Sechium edule</i> *	Choko
Cyperaceae	
<i>Cyperus eragrostis</i> *	
<i>Isolepis nodosa</i>	Knobby Club Rush
<i>Schoenoplectus validus</i>	River Club Rush
Euphorbiaceae	
<i>Ricinus communis</i> **	Castor Oil Plant

Tables

Botanical name	Common Name
Fabaceae	
Subf. Mimosoides	
<i>Acacia elata</i>	Cedar Wattle
<i>Acacia longifolia</i> var. <i>sophorae</i>	Sydney Coastal Wattle
<i>Acacia saligna</i> [#]	Golden Wreath Wattle
Subf. Faboides	
<i>Erythrina</i> X <i>sykesii</i> [*]	Coral Tree
<i>Trifolium</i> spp. [*]	Clover
<i>Vicia sativa</i> subsp. <i>nigra</i> [*]	Narrow-Leaved Vetch
Geraniaceae	
<i>Pelargonium</i> sp. [*]	
Juncaceae	
<i>Juncus kraussii</i>	Sea Rush
<i>Juncus acutus</i> [*]	
Malvaceae	
<i>Sida rhombifolia</i> [*]	Paddy's Lucerne
Meliaceae	
<i>Melia azederach</i> [#]	White Cedar
Moraceae	
<i>Morus alba</i> [*]	Mulberry
<i>Ficus macrophylla</i> [#]	Moreton Bay Fig
Myrtaceae	
<i>Melaleuca styphelioides</i>	Prickly-Leaved Paperbark
<i>Melaleuca ericifolia</i>	Swamp Paperbark
Oxalidaceae	
<i>Oxalis</i> spp. [*]	
Passifloraceae	
<i>Passiflora mollissima</i> [*]	Banana Passionfruit
<i>Passiflora caerulea</i> [*]	Blue Passionflower
Plantaginaceae	
<i>Plantago lanceolata</i> [*]	Lamb's Tongues
Poaceae	
<i>Bromus catharticus</i> [*]	Prairie Grass
<i>Cortaderia selloana</i> ^{**}	Pampas Grass
<i>Cynodon dactylon</i>	Couch
<i>Ehrharta erecta</i> [*]	Panic Veldgrass
<i>Eragrostis curvula</i> [*]	African Lovegrass
<i>Lolium perenne</i> [*]	Perennial Ryegrass
<i>Melinis repens</i> [*]	Red Natal Grass

Tables

Botanical name	Common Name
<i>Paspalum dilatatum</i> *	Paspalum
<i>Paspalum sp.</i> *	
<i>Paspalum urvillei</i> *	Vasey Grass
<i>Pennisetum clandestinum</i> *	Kikuyu Grass
<i>Phragmites australis</i>	Common Reed
<i>Stenotaphrum secundatum</i> *	Buffalo Grass
Polygonaceae	
<i>Persicaria decipiens</i>	Spotted Knotweed
<i>Rumex obtusifolius</i> *	Broadleaf Dock
Proteaceae	
<i>Banksia integrifolia</i>	Coastal Banksia
Verbenaceae	
<i>Lantana camara</i> **	Declared Noxious Weed In 50 NSW Council Areas.
<i>Verbena bonariensis</i> *	Purple Top
Solanaceae	
<i>Cestrum parqui</i> **	Chilean Cestrum
<i>Solanum nigrum</i> *	Black-Berry Nightshade
Urticaceae	
<i>Parietaria judaica</i> **	Asthma Weed
<i>Urtica urens</i> *	Stinging Nettle

* Exotic

** Declared noxious weed within the Botany Bay LGA and/or NSW

Non-indigenous native

Table 4: Fauna species recorded during the July 2006 survey

Common Name	Scientific Name
Aves	
Indian Mynah*	<i>Acridotheres tristis</i>
Chestnut Teal	<i>Anas castanea</i>
Pacific Black Duck	<i>Anas superciliosa</i>
Red Wattlebird	<i>Anthochaera carunculata</i>
Cattle Egret	<i>Ardea ibis</i>
Intermediate Egret	<i>Ardea intermedia</i>
Golden-headed Cisticola	<i>Cisticola exilis</i>
Grey Strike-thrush	<i>Colluricincla harmonica</i>
Black-faced Cuckoo Shrike	<i>Coracina novaehollandiae</i>
Australian Raven	<i>Corvus coronoides</i>
White-faced Heron	<i>Egretta novaehollandiae</i>
Black-shouldered Kite	<i>Elanus notatus</i>
Australian Kestrel	<i>Falco cenchroides</i>
Magpie Lark	<i>Grallina cyanoleuca</i>
Australian Magpie	<i>Gymnorhina tibicen</i>
Superb Fairy-wren	<i>Malurus cyaneus</i>
Red-browed finch	<i>Neochmia temporalis</i>
Crested Pigeon	<i>Ocyphaps (Geophaps) lophotes</i>
New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>
Willie Wagtail	<i>Rhipidura leucophrys</i>
Spotted Turtle-Dove*	<i>Streptopelia chinensis</i>
Common Starling*	<i>Sturnus vulgaris</i>
Australian White Ibis	<i>Threskiornis aethiopica</i>
Amphibia	
Common Eastern Froglet	<i>Crinia signifera</i>
Mammalia	
Cat*	<i>Felis catus</i>
Osteichthes	
Short-finned Eel	<i>Anguilla australis</i>

1 =Threatened species listed under TSC Act 1995





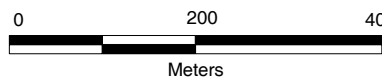

2 = Threatened species listed under EPBC Act 1999

* = exotic species

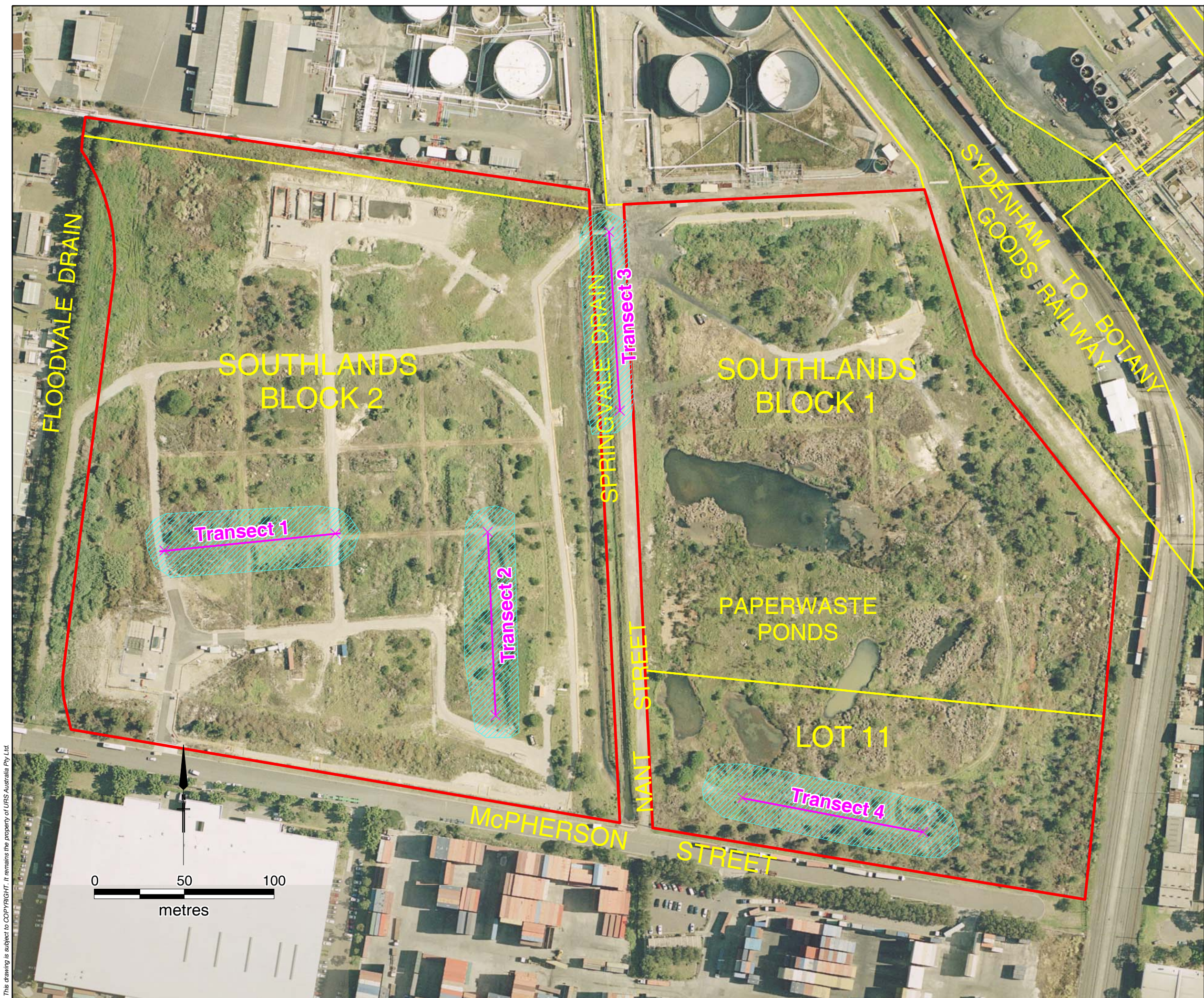
= observed by scat identification

Figures



Legend:																													
	PROPOSED DEVELOPMENT																												
	SPRINGVALE DRAIN																												
	FLOODVALE DRAIN																												
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Legend:

- SOUTHLANDS PROPERTY BOUNDARY
- CADASTRAL BOUNDARIES
- RANDOM MEANDERS
- VEGETATION TRANSECTS

Datum: GDA94, Projection: UTM, Grid: MGA Zone 56
Map compiled using SKM Aerial Imagery, January 2005, Mapinfo StreetPro (and CadastralPlus) © 2005 and PSMA Australia Ltd.

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Job No: 43217541	File: 43217541-002.wor	
Client		
ORICA AUSTRALIA PTY LIMITED/ GOODMAN INTERNATIONAL		
Project		
SOUTHLANDS REMEDIATION AND DEVELOPMENTFLORA AND FAUNA ASSESSMENT		
Title		
FLORA SURVEY		
Figure: 3		

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Legend:

- SOUTHLANDS PROPERTY BOUNDARY
- CADASTRAL BOUNDARIES
- BIRD TRANSECTS

Datum: GDA94, Projection: UTM, Grid: MGA Zone 56
Map compiled using SKM Aerial Imagery, January 2005, Mapinfo StreetPro (and CadastralPlus) © 2005 and PSMA Australia Ltd.

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Job No: 43217541	File: 43217541-003.wor	
Client		
ORICA AUSTRALIA PTY LIMITED/ GOODMAN INTERNATIONAL		
Project		
SOUTHLANDS REMEDIATION AND DEVELOPMENT FLORA AND FAUNA ASSESSMENT		
Title		
FAUNA SURVEY		
Figure: 4		

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- Legend:
- SOUTHLANDS PROPERTY BOUNDARY
 - CADASTRAL BOUNDARIES
 - OPEN GRASSLAND DOMINATED BY EXOTIC WEEDS AND PASTURE SPECIES
 - ACACIA OPEN SCRUB
 - CLOSED WETLAND
 - OPEN WETLAND
 - SPRINGVALE DRAIN AQUATIC COMMUNITY
 - PLANTED OPEN WOODLAND

Datum: GDA94, Projection: UTM, Grid: MGA Zone 56
Map compiled using SKM Aerial Imagery, January 2005,
Mapinfo StreetPro (and CadastralPlus) © 2005 and PSMA
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Drawn: AW Approved: DRAFT Date: 23/07/2007

Job No: **43217541** File: 43217541-005.wor

Client

ORICA AUSTRALIA PTY LIMITED/
GOODMAN INTERNATIONAL

Project

SOUTHLANDS REMEDIATION
AND DEVELOPMENT FLORA AND FAUNA
ASSESSMENT

Title

VEGETATION COMMUNITIES

Figure: **5**



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Appendix A
Seven-part Tests – Threatened Waders
and Migratory Birds

Contents

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Seven-Part Test

A1.1 Water birds

Results from fauna desktop reviews indicate the potential presence of approximately 68 Threatened species and 28 Migratory species as listed under the NSW *TSC Act 1995* and/or the *EPBC Act 1999* which have been previously recorded within the vicinity of the property. A review of the specific habitat requirements of these species, and the habitat offered by the Site and its surrounds allowed a number of these species to be immediately eliminated as having no (or low) likelihood of occurrence at the Site. Exclusively coastal water birds and migratory waders were excluded despite their probable occurrence at Penrhyn Estuary, less than 2km from the study site.

Six threatened species of water bird and one migratory wader were considered to have a medium to high likelihood of occurrence at the Site. No individuals of these species were recorded during the July 2006 survey. However the season and weather conditions at the time of the fauna survey were not suitable and so their presence on site cannot be discounted. Habitat assessments concluded that the study area may provide suitable foraging habitat for these species. The Proposed Development may impact upon these species by reducing the area of feeding habitat available.

Wetland bird species assessed are summarized in the following table:

Common Name	Scientific Name	Classification
	Birds	
Magpie Goose	<i>Anseranas semipalmata</i>	V¹
Australasian Bittern	<i>Botaurus poiciloptilus</i>	V¹
Sanderling	<i>Calidris alba</i>	V¹, M
Black-tailed Godwit	<i>Limosa limosa</i>	V¹, M
Australian Painted Snipe	<i>Rostratula australis</i>	V²
Latham's Snipe	<i>Gallinago hardwickii</i>	M

1 = Threatened species listed under TSC Act 1995

2 = Threatened species listed under EPBC Act 1999

V = Vulnerable species listed under TSC Act 1995 or EPBC Act 1999

E1 = Category 1 Endangered species listed under TSC Act 1995

E = Endangered species listed under EPBC Act 1999

M = Migratory species listed under EPBC Act 1999

A1.1.1 Background Ecology

Magpie Goose

Distribution

The Magpie Goose is still relatively common in the Australian northern tropics, but had disappeared from south-east Australia by 1920 due to drainage and overgrazing of reed swamps used for breeding. Since the 1980s there have been an increasing number of records in central and northern NSW. Vagrants can

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follow food sources to south-eastern NSW

(<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx>).

Habitat and ecology

The Magpie Goose is mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. It is equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes. Foraging is centred on wetlands, mainly those on floodplains of rivers and large shallow wetlands formed by run-off; breeding can occur in both summer and winter dominated rainfall areas and is strongly influenced by water level; most breeding now occurs in monsoonal areas; nests are formed in trees over deep water; breeding is unlikely in south-eastern NSW. Often seen in trios or flocks on shallow wetlands, dry ephemeral swamps, wet grasslands and floodplains; roosts in tall vegetation (<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx>).

Local Occurrence

Occasional, isolated sightings in the Sydney Metropolitan area. Suitable habitat for the species is present in the Open Wetlands (the Paperwaste Ponds) at the Site and surrounding Open Grassland.

Australasian Bittern

Distribution

Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west (<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx>).

Habitat and ecology

The Australasian Bittern favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha spp.*) and spikerushes (*Eleocharis spp.*). It hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains.

Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds; there are usually six olive-brown eggs to a clutch.

Local Occurrence

There is a record for this species on the Kurnell Peninsula. Suitable foraging habitat for the Australasian Bittern occurs in the closed wetland in the north-western corner of Lot 2. The closed wetland is not permanent and so is probably not optimum habitat for the species.

Sanderling

Distribution

The Sanderling is a regular summer migrant from Siberia and other Arctic breeding grounds to most of

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the Australian coastline. It is uncommon to locally common, arriving from September and leaving by May (some may overwinter in Australia). Sanderlings occur along the NSW coast, with occasional inland sightings(<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx>).

Habitat and ecology

Often found in coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and bare open coastal lagoons; individuals are rarely recorded in near-coastal wetlands. Generally occurs in small flocks, however may associate freely with other waders. Individuals run behind receding waves, darting after insects, larvae and other small invertebrates in the sand, then dart back up the beach as each wave breaks. Also feeds on plants, seeds, worms, crustaceans, spiders, jellyfish and fish, foraging around rotting heaps of kelp, at the edges of shallow pools on sandspits and on nearby mudflats.

It roosts on bare sand, behind clumps of beach-cast kelp or in coastal dunes; breeding occurs in the Northern Hemisphere (<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx>).

Local Occurrence

Although the Sanderling only rarely occurs in near-coastal wetlands it has been recorded nearby at Botany Bay. This species typically feeds in the wave zone of ocean beaches at Boat Harbour and will generally flee to the northern shores of the Bay (Penrhyn Estuary) during rough weather for shelter and feeding. Shorebirds preferably forage in areas where prey density, prey availability and intake rates are relatively high and where energy expenditure is low. Shorebird densities, therefore, tend to reach a maximum in the most preferred feeding areas - Boat Harbour and Penrhyn Estuary for this species (URS, 2004). Occurrences of this species at the Site would probably represent a temporary shift away from utilisation of optimum habitat.

Black-tailed Godwit

Distribution

The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia (Palearctic) and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the north and south coast, and inland. Records in western NSW indicate that a regular inland passage is used by the species, as it may occur around any of the large lakes in the western areas during summer, when the muddy shores are exposed (<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx>).

Habitat and ecology

The Black-tailed Godwit is primarily a coastal species, usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found on mudflats and in water less than 10 cm deep, around muddy lakes and swamps. Individuals have been recorded in wet fields and sewerage treatment works.

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It forages for insects, crustaceans, molluscs, worms, larvae, spiders, fish eggs, frog eggs and tadpoles in soft mud or shallow water. Roosts and loafs on low banks of mud, sand and shell bars.

Local Occurrence

This species occurs in very small numbers (1 or 2 individuals) in the Parramatta River estuary at Homebush Bay and may occasionally forage and roost at Penrhyn Estuary although no sightings of this species have been recorded in Botany Bay in recent years (URS, 2004). As with other shorebirds, occurrences of this species at the Site would probably represent a temporary shift away from optimum habitat.

Australian Painted Snipe

Distribution

In NSW, this species has been recorded at the Paroo wetlands, Lake Cowell, Macquarie Marshes and Hexham Swamp. It is most common in the Murray-Darling Basin. However it is known to occur in the Sydney Metropolitan Catchment Area (<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx>).

Most records of Australian Painted Snipe are from temporary or infrequently filled freshwater wetlands and although they have occurred at many sites, no site can be identified in which they are resident or regular in occurrence. This may suggest the species is nomadic but the extent to which its cryptic behaviour may contribute to this belief is uncertain. The birds are able to remain hidden in rank vegetation, but many reports are of birds not being secretive, but rather still and unobtrusive (<http://www.birdsaustralia.com.au/birds/>).

Habitat and ecology

The Australian Painted Snipe prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. It nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves.

Breeding is often in response to local conditions and generally occurs from September to December. It forages nocturnally on mud-flats and in shallow water, feeding on worms, molluscs, insects and some plant-matter (<http://www.birdsaustralia.com.au/birds/>).

Local Occurrence

Isolated, incidental sightings within the region.

Latham's Snipe

Distribution

The Latham's Snipe is a migratory shorebird listed under both Japan Australia Migratory Bird Agreement (JAMBA) and the China Australia Migratory Bird Agreement (CAMBA). It breeds in Japan and migrates to Australia during the non-breeding season, the first birds arriving in August and departing in

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February. Once visiting the area in large numbers each summer, smaller numbers are now seen at Homebush Bay and other sites in the Sydney Metropolitan area (http://www.sydneyolympicpark.com.au/education_and_learning/environment/biodiversity/birds/migratory_waders/).

Habitat and ecology

The Latham's Snipe is a cryptic species, roosting during the day and feeding at night on nearby wet grasslands on worms, aquatic larvae and seeds. It is thus rarely seen unless flushed, when it will take flight in a distinctive zig-zagging manner

(http://www.sydneyolympicpark.com.au/education_and_learning/environment/biodiversity/birds/migratory_waders/).

Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture. They are omnivorous, eating seeds and plant material, worms, spiders and insects, some molluscs, isopods and centipedes (<http://birdsinyourbackyards.net/finder/>).

Local Occurrence

As with other shorebirds, occurrences of this species at the Site would probably represent a temporary shift away from optimum habitat.

A1.1.2 Seven Part Test

a) 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,

As discussed above there is little evidence for viable local populations of these species at the Site. Accordingly this assessment is based on the known foraging, breeding and roosting requirements of species that may potentially form local populations at the Site.

The Magpie Goose breeds in northern Australia. Local occurrences represent opportunistic foraging outside the species' normal range.

The Closed Wetland on site is probably too small (960m²) to provide roosting or breeding habitat for the Australasian Bittern, which requires isolated sites in stands of dense wetland vegetation.

The specific breeding and habitat requirements of the Australian Painted Snipe are poorly understood, such that specific sites or local populations are not recognised (<http://www.birdsaustralia.com.au/birds/>). Given the disturbed nature of the site, limited area and limited quality of habitat the proposal is unlikely to impact on a viable local population.

The migratory shorebirds Latham's Snipe, the Black Tailed Godwit and the Sanderling breed in the northern hemisphere and feed in Southeastern Australia. Potential impacts to the viability of local

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populations are likely to be as a result of reduced foraging opportunities. Reductions in feeding may affect the capacity of shorebirds to fatten at an adequate rate and therefore prolong the pre-migratory feeding period and departure delay. Such delays in migration departure from wintering grounds can seriously affect breeding success of migratory birds, where individuals arriving late at the summer breeding grounds may be at a disadvantage in the competition for mates and territories (URS, 2004). This in turn will affect the long term viability of the local population that overwinters in Botany Bay. Foraging habitat at the Site is not optimal for Shorebirds, which along with its small area (<1Ha) means that the proposal is unlikely to have a significant impact on foraging opportunities.

b) 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 Applicable.

c) 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.

d) 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,

(i) The proposed development will result in the removal of potential foraging habitat for these species. Approximately 0.66Ha of Open Wetland and 960m² of Closed Wetland will be lost. Approximately 12Ha of Exotic Open Grassland surrounding these areas will also be removed, which may represent additional foraging habitat.

This area is likely to be negligible in the context of large areas of less disturbed habitat in the local area including Sir Joseph Banks Park, the Lachlan Swamps and Penrhyn Estuary.

(ii) Habitat present on Site is already isolated from other areas of habitat in the region. It is surrounded on all sides by industrial development.

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(iii) The area's habitat values are considered to be low due to its small size (<1Ha of wetland, 12 Ha of exotic grassland), degree of disturbance and degraded ecological features associated with the Site. Degraded features include: absence of native vegetation in surrounding area; presence of exotic weed species in surrounding area; presence of exotic predators (foxes and cats); and chlorinated hydrocarbon contamination.

Freshwater wetlands are marginal or rarely utilised habitat for the shorebirds Latham's Snipe, the Sanderling and the Black Tailed Godwit which all prefer coastal or estuarine habitats.

The habitat that is proposed to be removed is replicated elsewhere in the local area (including Sir Joseph Banks Park, the Lachlan Swamps and Penrhyn Estuary) and region (Towra Point Nature Reserve). These local areas are larger, less disturbed and in the case of the Lachlan Swamps, not impacted by CHC contamination. Habitat present at Penrhyn Estuary is also likely to be considerably less contaminated with CHC's due to its greater distance from the source of pollution and dilution with seawater (URS, 2004).

It is not anticipated that removal of this habitat will impact on the long term survival of these species.

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

The study area is not listed as critical habitat under Part 3 Division 1 of the *Threatened Species Conservation Act 1995*.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A total of 10 recovery strategies have been identified to help recover the threatened population of the Magpie Goose in NSW. The proposal is not consistent with the strategy "Habitat Protection" in that some potentially suitable habitat will be lost as a result of the proposed development. However the recovery strategy states its main action as "Nominate important wetlands to the Directory of Important Wetlands in Australia". Since the Site does not constitute an important wetland the proposed development does not directly contradict the actions of the recovery plan.

Species recovery plans have not been prepared for the Latham's Snipe, Painted Snipe, Sanderling, Black-tailed Godwit, or the Australasian Bittern. The DEC's Priorities Action Statement (PAS) for threatened species applies to these species. The proposal is generally consistent with the PAS in that it involves survey and assessment for threatened species and does not impact upon known populations or areas of critical habitat. The proposed development is not consistent with the following strategies:

- Protect wetlands, ponds and associated marshy areas from clearing or disturbance;
- Protect foraging and roosting areas from disturbance or inappropriate development; and
- Protect and maintain known or potential habitat.

(<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx>).

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g) 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.

In Part 1 of the *TSC Act*, a threatening process is defined as “a process that threatens, or may have the capability to threaten the survival or evolutionary development of species, populations or ecological communities”.

The proposal will result in the operation of the clearing of native vegetation and alteration of wetlands – listed as Key Threatening Processes in Schedule 3 of the *TSC Act*. However this native vegetation has been planted on site and retains no conservation significance and negligible ecological value.

A1.1.3 Part 5A Assessment

The removal of less than 1Ha of habitat will not significantly impact on the foraging resources available to wetland birds in this locality. Wetland bird species are mobile and will occupy optimum foraging habitats when available. Habitat present at the site is of comparatively low grade due to its limited area, disturbance and contamination. Significant areas of equivalent or higher grade habitat are available in the local area. In addition freshwater wetland habitats are considered marginal or occasional foraging habitat for shorebirds (three of the species assessed).

Adjacent and surrounding resources containing high quality habitat will not be impacted by the proposal. It is concluded that there is unlikely to be a significant impact on the wetland bird species Latham's Snipe, Painted Snipe, Sanderling, Black-tailed Godwit, Magpie Goose and the Australasian Bittern as a result of the proposed development.