



FLORA AND FAUNA ASSESSMENT

Remediation of Macdonaldtown Gasworks Site

Prepared for
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Executive Summary

This document represents an ecological impact assessment for proposed remediation works within the former Macdonaldtown Gasworks. The remediation works will involve the excavation, treatment and disposal of contaminated soils located at the Macdonaldtown site. This document reports on the ecological values within the site and assesses the impacts of the proposed works on the ecological values of the study area in relation to the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Further, it recommends mitigation measures which if included as part of the proposed works would seek to reduce impacts on ecological values within the site.

Investigation of ecological values on the site involved a review of existing documentation including vegetation mapping, threatened species records and the results of previous surveys, in addition to a field survey.

The vegetation recorded on the site was characterised by planted non-local native and exotic species trees around the margin of the site with the ground layer consisting of exotic species and bare ground. A total of 52 species of flora were observed within the study area, with one local native species, seven non-local native species (or suspected plantings) and 44 exotic species recorded. Of the 44 exotic species recorded within the study area, five are listed as noxious weeds for the City of Sydney Local Government Area. One threatened species was recorded within the site, *Syzygium paniculatum* (Brush Cherry). This species typically occurs within littoral and riparian rainforests and the single individual recorded within the site was considered to have been planted.

A total of six fauna species, including five native and one introduced species, were observed during the field survey. None of these species are listed under the TSC or EPBC Act. Further all the fauna species observed are considered disturbance tolerant species which are commonly found in urban and highly modified landscapes. Habitat elements for fauna within the study area were limited to isolated patches of non-local native canopy vegetation and sparse ground-cover vegetation. The absence of habitat elements such as an intact canopy layer, hollow-bearing trees, stags, leaf litter or woody debris (fallen logs and branches) as well as the previous and ongoing disturbance from trains and other works in the rail corridor were considered to contribute to the minimal habitat value of the study area. In general, the study area was considered to represent minimal habitat for common species able to tolerate disturbance. Only one threatened species recorded within the locality was considered to have the potential to occur within the study area, the Grey Headed Flying Fox (*Pteropus poliocephalus*). The remaining threatened flora and fauna were considered unlikely to occur within the site due to its highly disturbed nature, lack of any native vegetation community and the surrounding urban landscape.

The impacts of the proposed works on threatened flora recorded within the site (*Syzygium paniculatum*) and fauna considered to have potential to utilise the site (Grey Headed Flying Fox) were considered against the Draft Guidelines for the assessment of impacts on threatened species, populations or ecological communities or their habitats arising from development applications assessed under Part 3A of the EP&A Act (DECC & DPI 2005) and the EPBC Act Administrative Guidelines on Significance. The impact was assessed using the assumption that there will be complete removal of all vegetation on the site. However, it is important to note that wherever possible mature trees will be retained. It was concluded that the proposed works were unlikely to significantly impact upon the Grey-headed Flying-fox as the site represents only a very minor area of potential foraging habitat. Additionally it was

concluded that the proposed works would not significantly impact upon *Syzygium paniculatum* as the occurrence of this species is the result of planting outside the natural habitat for this species.

While the proposed works, involving vegetation removal were considered unlikely to impact significantly upon threatened species it was recommended that where possible vegetation is retained onsite. Further, it was recommend that weed control strategies and measures for the protection of vegetation to be retained, under guidance of an arborist, be adopted into the Construction Environmental Management Plan (CEMP).

1 Introduction

This Flora and Fauna Assessment has been prepared by Eco Logical Australia for a proposal to remediate contaminated land on the former Macdonaldtown Gasworks site, Lot 50 DP 1001467 (hereafter referred to as 'the site').

The overall objective of this flora and fauna assessment is to assess the impact of the proposal on flora and fauna and specifically on any threatened species, populations, ecological communities or their habitats.

1.1 SITE DESCRIPTION

The site is a small triangular shaped land parcel covering 7,732 m², bounded to the southeast by the Illawarra Rail Corridor, to the west by residential properties fronting Burren Street, Erskineville and to the north by RailCorp land, which is used for train stabling. Macdonaldtown railway station is situated to the north of the site beyond the stabling yard (**Figure 1**). Details of the site are summarised in **Table 1** below.

The site has been heavily disturbed by past and current land uses which have included a gasworks plant, gas storage and occasional storage of railway equipment. The site has little native vegetation present, and the majority of the site surface is compacted gravel with patches of grasses and weeds. Trees are present along the western boundary between the gasholder and the residential dwellings (portions of the site labelled Gasholders and South West on **Figure 2**), and along the northern boundary (portions of the site labelled Retaining Wall and Western Lot on **Figure 2**).

A retaining wall is present along the northern boundary, adjacent to the stabling yards (labelled Retaining Wall on **Figure 2**). The site has a gentle slope to the southeast, except for the western boundary where a steep embankment drops around 4 m towards the ground level of adjacent residential dwellings.

1.2 PROPOSED WORKS

The proposal will involve the excavation, treatment and disposal of contaminated soils located at the Macdonaldtown site. The exact extent of excavation footprint within the site has not been determined at this stage. For the purposes of this assessment, the impact has therefore been assessed as clearing of the entire site.

Subsequent to excavation, the following general activities will require to be undertaken on the Macdonaldtown site with each material type:

- Materials classified as 'general solid' will be either suitable to be disposed from the site, or may be re-used as fill material in less sensitive areas of the site (i.e. backfilling of deep excavations);
- Materials classified as 'restricted solid' will be either suitable to be disposed from the site, will require stabilization prior to off-site disposal at a lower waste classification, or will require treatment prior to off-site disposal or to be re-used as fill material on-site; and

- Materials classified hazardous will include both solid (tar impacted soils) and liquid (free flowing tar and tar impacted water). Soils will require stabilization prior to off-site disposal at a lower waste classification, or will require treatment prior to off-site disposal or to be re-used as fill material on-site. Tar impacted liquids will require on-site treatment to recover tars, or direct pump out and disposal from the site. Tars will require treatment to destroy the tar content or direct disposal from the site.

The treatment methods that are proposed for the remediation works may include:

- Off-Site Disposal: Consists of direct transport of contaminated materials (solid or liquid) from the site and disposal at an appropriately licensed waste facility(s);
- Thermal desorption: A high temperature process that is able to destroy hydrocarbon contaminants. This treatment method will not be used at the Macdonaldtown site;
- Immobilisation: A process of blending the impacted soils with commercial agents to effectively immobilise the soil contaminants. DECCW approvals can be used with immobilisation results to revise waste classifications of immobilised materials prior to off-site disposal;
- Bioremediation: A process which utilises naturally occurring soil organisms to chemically break down soil contaminants into less toxic / non toxic forms by metabolic processes;
- Containment: An on-site isolation system which is implemented to prevent exposure to contaminated soils / materials on the Macdonaldtown site; and
- Water treatment: An on-site system used to remove tar and other contaminants from water encountered during the works. This may include infiltrating seepage / groundwater into excavations or stagnant water currently present in former gasworks infrastructure.



Figure 1: Macdonaldtown Site Location

Table 1: Macdonaldtown site details.

DETAIL	MACDONALDTOWN
Street Address	Burren Street, Erskineville NSW 2043
Lot and DP Number	Part Lot 50 in DP1001467
Geographical Coordinates	624700N; 343200E
Owner	Rail Corporation NSW
Current/Proposed Land Use	Vacant / Commercial-Industrial (for rail-related operations)
Local Government Area	City of Sydney
Parish/ County	Petersham - Cumberland





Figure 3: Remediation Areas & Excavation Depth Estimates

2 Legislative and Policy Framework

This section provides a brief review of the legislation and policy framework relevant to the proposed remediation and this assessment.

2.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC ACT)

The Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act) establishes a process for assessing the environmental impact of activities and developments which occur on Commonwealth land, may impact Commonwealth land or where 'matters of national environmental significance' (NES) may be affected. NES matters relevant to the current study include threatened species, ecological communities and migratory species (JAMBA/CAMBA/ ROKAMBA/Bonn Convention) that are listed under the EPBC Act.

Under the Act, any action which "has, will have, or is likely to have a significant impact on a matter of national environmental significance" is defined as a "controlled action", and requires approval from the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA) which is responsible for administering the EPBC Act.

Actions that may have a significant impact on one or more matters of NES need to be referred to the Department under the EPBC Act. The EPBC Act referrals process can produce one of three outcomes:

- i. Non-controlled action (NCA): Assessment and approval under the EPBC Act is **not required**. The project may proceed without further approval under the EPBC Act.
- ii. Non-controlled action – specified manner (NCA-SM): Assessment and approval under the EPBC Act is **not required** provided the action is undertaken in a specific way (similar to conditions of consent).
- iii. Controlled Action (CA): The project will, or is likely, to have a significant impact on one or more matters of national environmental significance. The project **will require** full assessment and approval before it can proceed.

This report highlights any EPBC NES matters and advises if a referral to the federal Department of Environment, Water, Heritage and Arts (DEWHA) is required.

2.2 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

The Environmental Planning and Assessment Act 1979 provides the legal framework for preparation of environmental planning instruments and development assessment and determination. This remediation will be assessed in accordance with the requirements and framework provided by the EP&A Act 1979 and the EP&A Regulations 2000. There are three assessment pathways for development in NSW, Part 3A, Part 4 and Part 5.

This project application is made under Part 3A of the EP&A Act and seeks the Minister's approval of a project under Section 75E of the EP&A Act. Under Part 3A, the proponent and consent authority must consider all aspects of the environment, including biological, physical, social and economic factors and the principles of ecologically sustainable development, when assessing the impacts of the project. Assessment under Part 3A of the EP&A Act includes consideration of threatened species, endangered populations and communities listed under the TSC Act, and requires a Maintain or Improve Outcome

with respect to biodiversity values. Part 3A of the EP&A Act negates the requirement to assess the significance of impacts on threatened species, populations and ecological communities or their habitat pursuant to Section 5A of the EP&A Act (the assessment the significance or '7-part test').

However, an assessment of the magnitude and extent of impacts and the significance of the impacts as related to the conservation importance of the habitat, individuals and populations likely to be affected is required (DECC & DPI 2005).

2.2.1 Part 3A Threatened Species Assessment Guidelines

The Department of Environment and Climate Change and Water (DECCW) (formerly the Department of Environment and Climate Change (DECC)) and the Department of Primary Industries (DPI) have prepared Draft Guidelines for the assessment of impacts on threatened species, populations or ecological communities or their habitats arising from development applications assessed under Part 3A of the EP&A Act (DECC & DPI 2005). These guidelines are provided for in section 75F in Part 3A of the EPA Act.

The Assessment Guidelines outline guiding principles for the provision of information to:

“...enable decision makers to ensure that developments deliver the following environmental outcomes:

- 1. Maintain or improve biodiversity values (i.e. there is no net impact on threatened species or native vegetation);*
- 2. Conserve biological diversity and promote Environmentally Sustainable Development (ESD);*
- 3. Protect areas of High Conservation value (including areas of critical habitat);*
- 4. Prevent the extinction of threatened species;*
- 5. Protect the long-term viability of local populations of a species, population or ecological community; and*
- 6. Protect aspects of the environment that are matters of National Environmental Significance “(pursuant to the EPBC Act)”.*

These questions have been addressed in **Appendix C** of this document. Where a proposal cannot avoid or mitigate impacts on threatened species, populations and ecological communities, according to key thresholds, other measures, including undertaking a suitable and approved offset action, may need to be taken.

2.3 THREATENED SPECIES CONSERVATION ACT 1995

The Threatened Species Conservation Act 1995 (TSC Act) objectives are to protect and encourage the recovery of threatened species, populations and communities listed under the Act. Two threatened species listed under the TSC Act were identified as potentially occurring on site. Potential impacts on these communities, species and their habitats are assessed as part of the Part 3A assessment process with reference to the Assessment Guidelines (DECC & DPI 2005) described above.

3 Methods

3.1 DATA REVIEW

A data review was undertaken by Eco Logical Australia (ELA) prior to the commencement of the field assessment in order to determine the location and extent of previous surveys, identify the representative spectrum of flora and fauna on the site, and identify the presence of any previously recorded threatened species, populations and ecological communities listed under the TSC Act and the EPBC Act, or that could be expected to occur. To this end, the following documentation was reviewed prior to the conduct of the field investigations:

- Topographic maps and aerial photography of the study site and surrounding area, as well as vegetation mapping (Benson and Howell 1994, Department of Environment and Conservation and Department of Natural Resources 2006);
- Review of available relevant literature for the site pertaining to flora and fauna (Dickson Rothschild 2007);
- A search of NSW DECCW Wildlife Atlas database (data supplied January 2010 and searched June 2010 over a 10km radius around the site boundary); and,
- EPBC online Protected Matters Database Search (June 2010 - Point Search, coordinates - 34.04666,150.9622 buffered at 10km).

3.2 FIELD SURVEYS

Field surveys were conducted on 09 June 2010 by Eco Logical Australia ecologist Brian Towle. The field survey involved a traverse of the entire site recording all flora and fauna species observed. Additionally, notes on habitat types and habitat attributes were made so that an assessment of any threatened flora or fauna species likely to utilise the site could be made.

4 Results

4.1 DATA REVIEW

No native vegetation communities have previously been identified within the site (Benson & Howell 1994, DEC & DNR 2006). Searches of the NPWS Wildlife Atlas and EPBC Act MNES databases indicated a total of 1 endangered ecological community (EEC), 53 threatened flora species, 58 threatened fauna species, and 36 listed migratory species as having been recorded or having potential to occur within the locality (10 km radius).

Based on an assessment of these search results and review of aerial photography, vegetation mapping, and topographical maps, only one threatened species recorded within 10km was considered to have the potential to occur within the study area, the Grey Headed Flying Fox (*Pteropus poliocephalus*). The remaining threatened flora and fauna were considered unlikely to occur within the site due to its highly disturbed nature, a lack of any native vegetation community and the surrounding urban landscape.

4.2 FIELD SURVEYS

4.2.1 Flora

A total of 52 species of flora were observed within the study area, with 1 local native species, 7 non-local native species (or suspected plantings) and 44 exotic species recorded (**Appendix A**). The local native species recorded on the site was *Adiantum aethiopicum* (Common Maidenhair), which was growing on the bricks at the base of the gasholder. The vegetation on site was characterised by planted non-local native trees on the margins of the site, including *Casuarina glauca* (Swamp Oak) and *Casuarina cunninghamiana* (River Oak; approximate locations indicated in **Figure 4**) and a groundcover of exotics. A full list of trees observed onsite and information on health and spread is outlined in **Table 2** based on a previous study by Dickson Rothschild 2007, and updated by this study. The observations of the subject study were consistent with those of Dickson Rothschild 2007, with the exception of the *Syzygium paniculatum* (Brush Cherry; tree 25, **Figure 4**), which had not previously been identified within the site.

A total of 47 trees were recorded within the site, none of which included any hollows. A total of 39 of these trees were in fair or poor health, and in some instances growth was impeded by property fences.

Along the north of the site a row of planted *Casuarina glauca* (trees 1 – 17, **Figure 4**) and *C. cunninghamiana* (trees 19 – 23) were present in addition to a single individual of the exotic *Celtis australis* (European Hackberry; tree 18, **Figure 4**), which is likely to have germinated from seed within the site. All these individuals appeared to be in good condition.

Adjoining, Burren Street and the northern boundary of the property at No. 43 Burren Street were plantings of the non local native *Syzygium paniculatum* (Brush Cherry; tree 25, **Figure 4**) and the exotic *Acer negundo* (Box elder; tree 24, **Figure 4**) in addition to a single individual of the exotic *Celtis australis* (tree 26, **Figure 4**) which is likely to have germinated from seed within the site.

Along the western border of the site, planted non-local and local natives including *Elaeocarpus reticularis* (Blueberry Ash), *Ficus Benjamin* (Weeping Fig) and *Eucalyptus sp.* (trees 36, 47 and 48,

Figure 4)), planted exotic species including *Alnus sp.* (Elder), *Cinnamomum camphora* (Camphor Laurel) and *Schinus areira* (Pepper Tree; trees 27 – 30, 32, 37, 40, 42-46, 49) and exotic species which appear to have germinated on site *Celtis australis* (trees 31, 33, 35, 38 and 41) were present. Trees 34 and 39 are no longer present on the site.

One of the species recorded within the study area is listed as threatened under the TSC Act and EPBC Act, *Syzygium paniculatum* (Brush Cherry, Magenta Lilly Pilly). A single individual was recorded in the north-west corner of the site adjacent to Burren Street, within the area identified as the 'western lot' (Labelled T25 in **Figure 4**). *S. paniculatum* has not been previously identified within the site. *S. paniculatum* is a small to medium sized tree that naturally occurs in moist deep sand of old dunes in rainforest and sandy floodplains of creeks within gallery rainforest remnants (Fairley 2004). This species is widely planted outside its natural habitat and natural range and the individual recorded within the site is considered to have been planted.

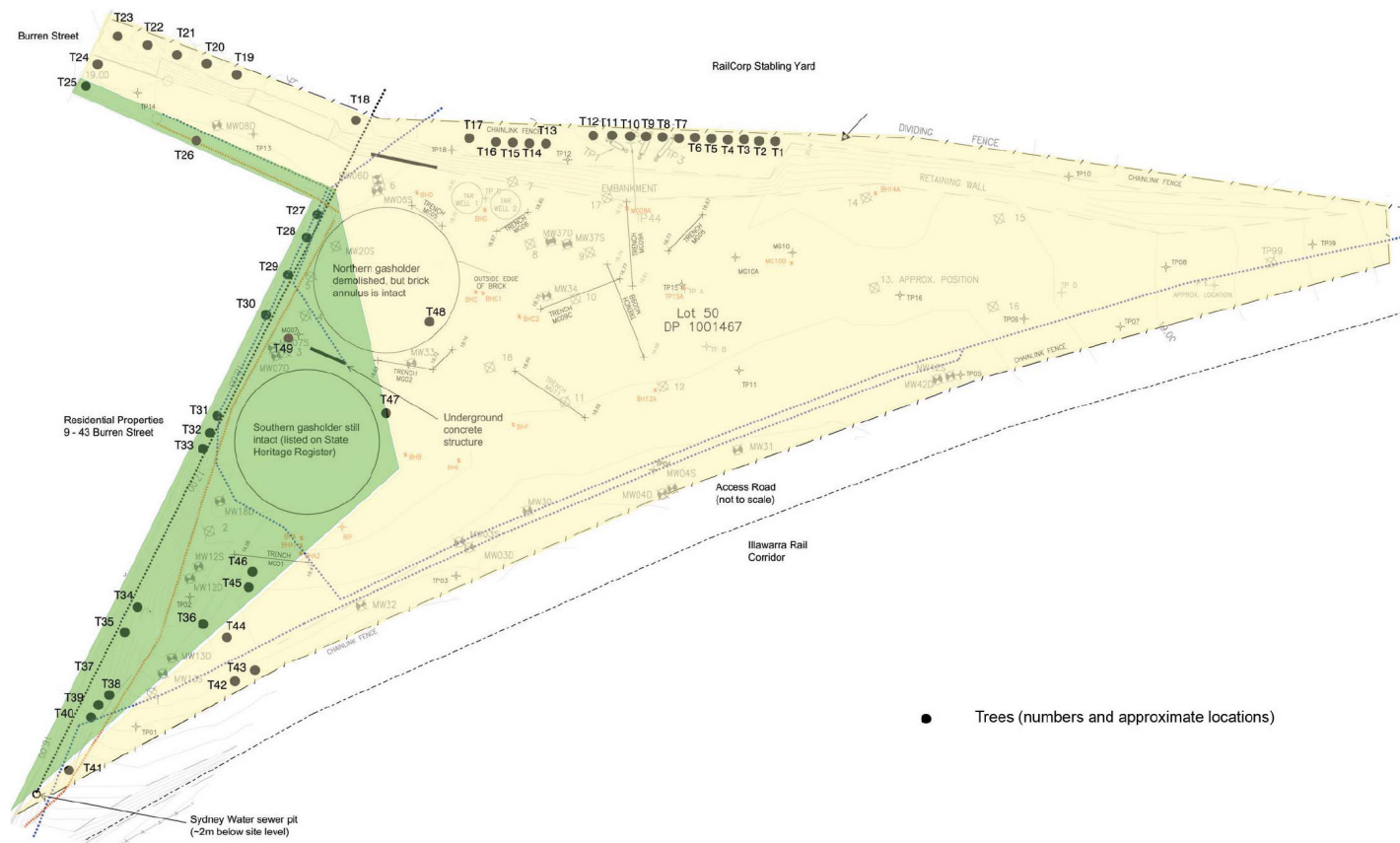


Figure 4: Existing trees. Modified from Dickson Rothschild (2007)

Table 2: Tree species recorded on the site (Modified from Dickson Rothschild 2007).

NB: Trees numbers 34 and 39 are no longer present on the site.

Tree Number	Scientific Name	Common name	Height (m)	Canopy spread (m)	DBH (mm)	Age of Tree Y = Young S = semi-mature M = mature O = over-mature	Vigour G = Good F = Fair P= Poor
1	<i>Casuarina glauca</i>	Swamp Oak	10	4	200 x 2	M	F
2	<i>Casuarina glauca</i>	Swamp Oak	11	3	200	M	F
3	<i>Casuarina glauca</i>	Swamp Oak	11	3	200	M	F
4	<i>Casuarina glauca</i>	Swamp Oak	11	4	200	M	G
5	<i>Casuarina glauca</i>	Swamp Oak	10	2.5	100	M	F
6	<i>Casuarina glauca</i>	Swamp Oak	12	3	150	M	G
7	<i>Casuarina glauca</i>	Swamp Oak	11	4	200	M	F
8	<i>Casuarina glauca</i>	Swamp Oak	11	4	200	M	F
9	<i>Casuarina glauca</i>	Swamp Oak	11	3	200	M	F
10	<i>Casuarina glauca</i>	Swamp Oak	12	5	250	M	G
11	<i>Casuarina glauca</i>	Swamp Oak	11	4	200	M	G
12	<i>Casuarina glauca</i>	Swamp Oak	10	3	80	M	F to P
13	<i>Casuarina glauca</i>	Swamp Oak	11	4	200	M	F
14	<i>Casuarina glauca</i>	Swamp Oak	12	4	200	M	F
15	<i>Casuarina glauca</i>	Swamp Oak	11	3	100	M	F
16	<i>Casuarina glauca</i>	Swamp Oak	11	4	200	M	F
17	<i>Casuarina glauca</i>	Swamp Oak	11	4	200	M	F
18	<i>Celtis australis</i>	European Hackberry	11	11	450	M	F
19	<i>Casuarina cunninghamiana</i>	River Oak	9	6	200	M	F
20	<i>Casuarina cunninghamiana</i>	River Oak	12	6	250	M	F
21	<i>Casuarina cunninghamiana</i>	River Oak	10	3	150	M	F TO P
22	<i>Casuarina cunninghamiana</i>	River Oak	12	5	200	M	G
23	<i>Casuarina cunninghamiana</i>	River Oak	12	11	500	M	G
24	<i>Acer negundo</i>	Box-elder Maple	8	4	150 X 2	M	F
25	<i>Syzygium paniculatum</i>	Brush Cherry	8	6	300	M	F

Tree Number	Scientific Name	Common name	Height (m)	Canopy spread (m)	DBH (mm)	Age of Tree Y = Young S = semi-mature M = mature O = over-mature	Vigour G = Good F = Fair P= Poor
26	<i>Celtis australis</i>	European Hackberry	4	3	100 X 3	M	P
27	<i>Alnus sp.</i>	Elder	9	8	450	M	G
28	<i>Alnus sp.</i>	Elder	8	6	300	M	F
29	<i>Alnus sp.</i>	Elder	9	8	450	M	F
30	<i>Alnus sp.</i>	Elder	9	7	400	M	F TO P
31	<i>Celtis australis</i>	European Hackberry	7	6	200 X 2	M	F
32	<i>Cinnamomum camphora</i>	Camphor Laurel	13	10	500 X 2	M	F
33	<i>Celtis australis</i>	European Hackberry	3	2	50 X 2	S	F
34	Tree now absent						
35	<i>Celtis australis</i>	European Hackberry	3	3	120	S	F
36	<i>Elaeocarpus reticularis</i>	Blueberry Ash	5	4	200	S	F-G
37	<i>Robinia pseudoacacia</i>	Black Locust	7	4	200	M	F
38	<i>Celtis australis</i>	European Hackberry	5	3	150	S	F
39	Tree now absent						
40	<i>Harpephyllum caffrum</i>	Kaffir Plum	7	6	200 X 5	M-O	F
41	<i>Celtis australis</i>	European Hackberry	3	3	50 X 7		F
42	<i>Robinia pseudoacacia</i>	Black Locust	5	4	150 X 3	M	P
43	<i>Robinia pseudoacacia</i>	Black Locust	5	4	200	M	P
44	<i>Schinus areria</i>	Pepper Tree	5	6	200 X 3	M	F
45	<i>Robinia pseudoacacia</i>	Black Locust	5	3	200	M	F
46	<i>Robinia pseudoacacia</i>	Black Locust	5	3	200	M	P
47	<i>Eucalyptus sp.</i>		8	9	250	S	G
48	<i>Ficus benjamina</i>	Weeping Fig	3	2	100	S	F
49	<i>Ficus sp.</i>		3	3	150	S	F

Of the 44 exotic species recorded within the study area 5 are listed as noxious weeds for the City of Sydney Local Government Area (**Table 3**). The control categories for each of these weeds are outlined below.

Table 3: Noxious weeds recorded within the site

SCIENTIFIC NAME	COMMON NAME	NOXIOUS WEED CLASS
<i>Ricinus communis</i>	Castor Oil Plant	4
<i>Ligustrum lucidum</i>	Broad-leaved Privet	4
<i>Oxalis latifolia</i>		5
<i>Cestrum parqui</i>	Green Cestrum	3
<i>Parietaria judaica</i>	Pellitory	4

Control class	Weed type	Example control requirements
Class 3	Plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area.	The plant must be fully and continuously suppressed and destroyed.*
Class 4	Plants that pose a potentially serious threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.*
Class 5	Plants that are likely, by their sale or the sale of their seeds or movement within the State or an area of the State, to spread in the State or outside the State.	There are no requirements to control existing plants of Class 5 weeds. However, the weeds are "notifiable" and a range of restrictions on their sale and movement exists.

NOTE: All Class 1, 2 and 5 weeds are prohibited from sale in NSW. * In some cases the following wording has also been inserted "the plant may not be sold, propagated or knowingly distributed."

4.2.2 Fauna

A total of six fauna species, including 5 native and one introduced species, were observed during the field survey (**Appendix A**). This included 5 bird species and one reptile. None of these species are listed under the TSC or EPBC Act. Further all the fauna species observed are considered disturbance tolerant species which are commonly found in urban and highly modified landscapes.

4.2.3 Fauna Habitat Elements

Habitat elements for fauna within the study area were limited to isolated patches of non-local native canopy vegetation and sparse ground-cover vegetation. Other habitat elements which may be utilized by fauna such as an intact canopy layer, hollow-bearing trees, stags, leaf litter, woody debris (fallen logs and braches) or permanent or intermittent drainage depressions were absent from the study area. The absence of these and other habitat elements as well as the previous and ongoing disturbance from trains and other works in the rail corridor were considered to contribute to the reduction in habitat value of the study area. In general, the study area was considered to represent minimal habitat for common species able to tolerate disturbance.

Nearby residents have recorded anecdotal observations of at least one frog species, but no frogs were encountered during the field surveys. Whilst the surveys were not targeted specifically towards the detection of frog species, very little suitable habitat for frogs was identified apart from pooled water

around the base of the southern Gasholder, and some very minor pooling (<5cm) observed in depressions in the centre of the site. Based upon the habitat present on the site, it is considered unlikely that any of the threatened frog species previously recorded within the locality (Appendix B) occur on the site. The frog species on the site observed by residents are likely to be common disturbance tolerant species.

5 Impact Assessment

For the purposes of this report the impacts of the proposed works in relation to threatened flora and fauna have been assessed using the assumption that there will be complete removal of all vegetation on the site. However, it is important to note that wherever possible mature trees will be retained.

5.1 SUMMARY OF IMPACTS

Possible direct and indirect impacts of the proposal were determined to include the following:

- A loss of ground cover and canopy vegetation across the site; and
- Spread of weed propagules.

Clearing of mature trees will be avoided where possible and where it is safe to do so. Nonetheless, as works progress some or all trees may require removal, and for the purposes of impact assessment it has been assumed that all vegetation within the study site will be removed.

The vegetation to be directly impacted by the proposed works will be limited to non-local native canopy trees and exotic groundcover, shrub and canopy layer vegetation. The only local-native species observed was the *Adiantum aethiopicum* (Common Maidenhair) growing sparsely on the bricks at the base of the southern Gasholder. The southern Gasholder will be retained for its heritage values, but nevertheless from a flora and fauna impact assessment perspective *Adiantum aethiopicum* is not listed as a threatened species, and does not represent significant habitat for any fauna species. The exotic vegetation to be removed is not considered to represent significant habitat for any fauna species.

There are no significant watercourses in close proximity to the site, the nearest mapped watercourse being Shea's Creek, approximately 1.1km south-east of the study site. It is considered unlikely that the proposed works would impact on this watercourse. Furthermore, the controls to be implemented in regard to drainage from the study area should prevent movement of contaminated soil or water from the study area into surrounding water bodies.

The proposed works will involve working in areas which are currently affected by a large number of exotic species including the noxious weeds listed in **Table 3**. The works in these areas of weed infestation may result in the spread of these weed species and controls to avoid the spread of these weeds are recommended.

5.2 IMPACTS TO THREATENED SPECIES

The impacts of the proposed works were considered relevant to two threatened species listed under both the TSC and EPBC Acts. These species are *Syzygium paniculatum*, which was recorded onsite, and the Grey-headed Flying-fox (*Pteropus poliocephalus*) which could potentially use the site. The impacts of the proposed works on these two species were assessed against the Draft Guidelines for the assessment of impacts on threatened species, populations or ecological communities or their habitats arising from development applications assessed under Part 3A of the EP&A Act (DECC & DPI 2005, **Appendix C**) and the EPBC Act Administrative Guidelines on Significance (**Appendix D**).

It was concluded that the proposed works are unlikely to significantly impact upon the Grey-headed Flying-fox as the site represents only a very minor area of potential foraging habitat with no current or historic campsites occurring within the site. Furthermore, similar habitat consisting of isolated trees or groups of trees is widespread within the surrounding locality.

It was concluded that the proposed works would not significantly impact upon *Syzygium paniculatum* as the occurrence of this species is the result of planting outside the natural habitat for this species. The planting of an individual of this species of unknown provenance does not contribute to the recovery of this species as the spread of its genetic material may compromise the genetic integrity of naturally occurring individuals. Additionally, the loss of this tree could easily be replaced as this species is widely cultivated.

6 Ameliorative Measures

6.1 MITIGATION MEASURES

The following measures are recommended to lessen the impacts of the proposed development on flora and fauna species and habitat.

The following mitigation measures are proposed for adoption into the Construction Environmental Management Plan (CEMP):

- The CEMP is to identify vegetation on site proposed to be retained (if any). For these areas an arborist is to be engaged to provide advice on the future stability of trees with the required excavation depths and works, and whether trees should be removed for stability and safety reasons. Where trees are to be retained, protection fencing is to be installed in accordance with Australian Standard 4970 - 2009 Protection of Trees.
- The CEMP is to incorporate the following strategies for weed control and to prevent the spread of weeds :
 - Cleaning of machinery before and after it enters the site, so as to not introduce new weed species or transport propagules from the site to other areas.
 - Noxious weeds are to be removed or controlled using appropriate weed control techniques.
 - Weed vegetative material removed is to be taken to a site licensed to receive green waste.

The CEMP will also include stormwater runoff controls to minimise sediment escape to surrounding lands.

The inclusion of the measures above will be satisfactory measures to control impacts on native flora and fauna. These measures are recommended for inclusion in the CEMP as part of the Statement of Commitments for the project.

References

Benson, D. and Howell, J. 1994. 'The natural vegetation of the Sydney 1:100,000 map sheet.' *Cunninghamia* 3(4).

Department of the Environment and Climate Change and Department of Primary Industries (2005) *Draft Guidelines for Threatened Species Assessment*.

Department of Environment and Conservation and Department of Natural Resources (2006). *Southeast NSW Native Vegetation Classification and Mapping – SCIVL*. NSW Department of Environment and Conservation and Department of Natural Resources.

Dickson Rothschild (2007) *Macdonaldtown Gasworks Site Concept Landscape Design Report*, Unpublished Report prepared for Railcorp, July 2007

Eco Logical Australia (2009). *RailCorp Biodiversity Offset Strategy*. Unpublished document prepared for RailCorp, March 2009.

Fairley, A. (2004). *Seldom Seen – Rare Plants of Greater Sydney*. Reed New Holland, Sydney.

PlantNET (2007). <http://plantnet.rbgsyd.nsw.gov.au/cgi-in/NSWfl.pl?page=nswfl&lvl=sp&name=Syzygium~paniculatum>. Last updated November 2007. Viewed 11 June 2010.

Appendix A: Species recorded within the site

Flora

NB: A '*' preceding the scientific name indicates an exotic species;

A '#' preceding the scientific name indicates a non-local native species or suspected planted local native;

A '+' preceding the scientific name indicates a threatened species listed under the TSC Act and EPBC Act

FAMILY	SCIENTIFIC NAME	COMMON NAME
Aceraceae	* <i>Acer negundo</i>	Box-elder Maple
Adiantaceae	<i>Adiantum aethiopicum</i>	Common Maidenhair Fern
Anacardiaceae	* <i>Schinus areira</i>	Pepper Tree
Apiaceae	* <i>Foeniculum vulgare</i>	Fennel
Apocynaceae	* <i>Araujia sericifera</i>	Moth Vine
	* <i>Nerium oleander</i>	Oleander
Asteraceae	* <i>Ageratina adenophora</i>	Crofton Weed
	* <i>Bidens pilosa</i>	Cobblers Pegs
	* <i>Conyza albida</i>	Tall Fleabane
	* <i>Hypochaeris radicata</i>	Catsear
	* <i>Senecio madagascariensis</i>	Fireweed
	* <i>Sonchus oleraceus</i>	Common Sow-thistle
	* <i>Taraxacum officinale</i>	Dandelion
Basellaceae	* <i>Anredera cordifolia</i>	Madeira Vine
Betulaceae	* <i>Alnus sp.</i>	Alder
Casuarinaceae	# <i>Casuarina cunninghamiana</i>	River Oak
	# <i>Casuarina glauca</i>	Swamp Oak
Davalliaceae	* <i>Nephrolepis cordifolia</i>	Fishbone Fern
Elaeocarpaceae	# <i>Elaeocarpus reticulatus</i>	Blueberry Ash
Euphorbiaceae	* <i>Ricinus communis</i>	Castor Oil Plant
Fabaceae - faboideae	* <i>Robinia pseudoacacia</i>	Black Locust
	* <i>Trifolium sp.</i>	Clover
	* <i>Vicia sp.</i>	
Geraniaceae	* <i>Geranium sp.</i>	
Lauraceae	* <i>Cinnamomum camphora</i>	Camphor-laurel
Malvaceae	* <i>Sida rhombifolia</i>	Paddy's Lucerne
Moraceae	* <i>Ficus benjamina</i>	Weeping Fig
Myrsinaceae	* <i>Anagallis arvensis</i>	Pimpernel
Myrtaceae	# <i>Callistemon sp.</i>	Bottlebrush
	# <i>Eucalyptus sp.</i>	
	#+ <i>Syzygium paniculatum</i>	Magenta Brush Cherry
Oleaceae	* <i>Ligustrum lucidum</i>	Broad-leaved Privet
Oxalidaceae	* <i>Oxalis latifolia</i>	
Plantaginaceae	* <i>Plantago lanceolata</i>	Plantain
Poaceae	* <i>Briza minor</i>	Shivery Grass
	* <i>Chloris gayana</i>	Rhodes Grass
	* <i>Cynodon dactylon</i>	Couch
	* <i>Ehrharta erecta</i>	Panic Veldgrass
	* <i>Eragrostis curvula</i>	African Lovegrass
	* <i>Paspalum dilatatum</i>	Paspalum

FAMILY	SCIENTIFIC NAME	COMMON NAME
	<i>*Pennisetum clandestinum</i>	Kikuyu
	<i>*Setaria gracilis</i>	Slender Pigeon Grass
	<i>*Setaria palmifolia</i>	Palm Grass
	<i>*Sporobolus africanus</i>	Parramatta Grass
Polygonaceae	<i>*Rumex sp.</i>	Dock
Proteaceae	<i>#Grevillea sp.</i>	
Rubiaceae	<i>*Galium aparine</i>	Goose-grass
Solanaceae	<i>*Cestrum parqui</i>	Green Cestrum
	<i>*Solanum americanum</i>	Glossy Nightshade
Ulmaceae	<i>*Celtis australis</i>	Nettle-tree
Urticaceae	<i>*Parietaria judaica</i>	Pellitory
Verbenaceae	<i>*Verbena bonariensis</i>	Purpletop

Fauna

CLASS	SCIENTIFIC NAME	COMMON NAME
Aves	<i>*Acridotheres tristis</i>	Common Mynah
	<i>Cracticus torquatus</i>	Grey Butcherbird
	<i>Grallina cyanoleuca</i>	Australian Magpie-lark
	<i>Hirundo neoxena</i>	Welcome Swallow
	<i>Vanellus miles</i>	Masked Lapwing
Reptiles	<i>Lampropholis delicata</i>	Garden Skink

Appendix B: Threatened species likelihood of occurrence

Searches of the Atlas of NSW Wildlife and EPBC Protected Matters search tool were performed for the study area on 02/06/10. Searches used a radius of 10 km around the site.

The results from both searches were compiled into a list of potentially occurring species, populations and communities that may possibly occur within the study area, although listed marine species excluded from this list as they were considered to not be relevant to the study area.

The likelihood of occurrence was considered for all listed species, populations and communities, and is provided for each under the 'likely' column.

Species, populations and communities considered to have the potential to occur, are likely to occur, or do occur are highlighted in yellow. Marine Species have been excluded

TSC Status = Listing under the Threatened Species Conservation Act 1995

EPBC Status = Listing under the Environment Protection and Biodiversity Conservation Act 1999

CE = Critically Endangered

E = Endangered

Ex = Extinct

V = Vulnerable

M = Migratory

Species/Community	Common Name	Conservation Status*		Likelihood of Occurrence	Habitat Associations
		TSC Act	EPBC Act		
COMMUNITIES					
Eastern Suburbs Banksia Scrub		E	E	None	Occurs on disjunct patches of nutrient poor aeolian (wind blown) dune sand.
PLANTS					
<i>Acacia bynoeana</i>	Bynoe's Wattle	E	V	Unlikely	Bynoe's wattle is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Occurs in heath or dry sclerophyll forest on sandy soils. Latest records are near Royal National Park from 1948 and 1969.

Species/Community	Common Name	Conservation Status*		Likelihood of Occurrence	Habitat Associations
		TSC Act	EPBC Act		
<i>Acacia gordonii</i>		E	E	Unlikely	Restricted to the north-west of Sydney, it has a disjunct distribution and is known from only a few locations. Less than 1500 plants are known from the Bilpin/Faulconbridge/Maroota/Hornsby Heights areas in the east, with some plants within the Blue Mountains National Park in the west. Occurs within the Hawkesbury, Blue Mountainsm Hornsby and Baulkham Hills local government areas.
<i>Acacia prominens</i> population in the Rockdale and Kogarah LGAs	Gosford Wattle	E		None	Occurs at a few sites along the railway line at Penshurst, at Carss Bush Park, Carss Park with unconfirmed siting at Oatley Park, Oatley.
<i>Acacia pubescens</i>	Downy Wattle	V	V	Unlikely	Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone.
<i>Acacia terminalis</i> subsp. <i>terminalis</i>	Sunshine Wattle	E	E	Unlikely	Occurs in coastal scrub and dry sclerophyll woodland on sandy soils in near coastal areas from the northern shores of Sydney Harbour to Botany Bay.
<i>Allocasuarina portuensis</i>		E	E	Unlikely	Originally known from a single site at Neilsen Park, Woollahra although there are no plants left at the original site. t
<i>Amperea xiphoclada</i> var. <i>pedicellata</i>		Ex	Ex	Unlikely	Species is presumed extinct and is known only from the type specimen which was collected in 1892 from Double Bay. The habitat association of this species is unknown although is thought assumed to be somewhat swampy.
<i>Asterolasia buxifolia</i>		E		Unlikely	Known from a single site at a granite outcrop in the riparian zone of the Lett River, apparently restricted to dense riparian scrub along rocky watercourses with a granitic substrate.
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	E	V	Unlikely	The Tessellated Spider Orchid is known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Generally found in grassy sclerophyll woodland on clay loam or sandy soils. Species has not been recorded in the Sydney region for a number of years with the nearest known population at Braidwood. (per comms John Briggs 2008)
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V		Unlikely	Once recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges.
<i>Camarophyllopsis kearneyi</i>		E		Unlikely	Known only from its type locality in Lane Cove Bushland Park in the Lane Cove local government area in the Sydney metropolitan region.

Species/Community	Common Name	Conservation Status*		Likelihood of Occurrence	Habitat Associations
		TSC Act	EPBC Act		
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	V	V	Unlikely	The larger populations typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>); appears to prefer open areas in the understory of this community and is often found in association with the Large Tounge Orchid (<i>C. subulata</i>) and the Tartan Tounge Orchid (<i>C. erecta</i>). Nearest records are from Pittwater (1954) and Twin Falls near Fitzroy Falls (2003).
<i>Darwinia biflora</i>		V	V	Unlikely.	Currently known from the northern and north-western suburbs of Sydney, in the Ryde, Baulkham Hills, Hornsby and Ku-Ring-Gai local government areas. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.
<i>Dichanthium setosum</i>		V	V	None	Bluegrass occurs on heavy basaltic black soils on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW. Nearby records are unlikely to be planted specimens..
<i>Diuris arenaria</i>		E		None	Occurs on the Tomaree Peninsula near Newcastle.
<i>Epacris purpurascens</i> var. <i>purpurascens</i>		V		Unlikely	Sydney Sandstone Gully Forest and wet heath with strong clay influences. Found in a range of habitat types, most of which have a strong shale soil influence.
<i>Eucalyptus camfieldii</i>	Heart-leaved Stringybark	V	V	Unlikely	Associated with shallow sandy soils bordering coastal heath with other stunted or mallee eucalypts, often in areas with restricted drainage and in areas with laterite influenced soils, thought to be associated with proximity to shale
<i>Eucalyptus fracta</i>		V		None	Confined largely to State Forest. Locally common but restricted to the northern Broken Back Range near Cessnock, NSW. Nearby records are likely from planted specimens.
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	V	V	None	This species is widely planted as an urban street tree and in gardens but is quite rare in the wild. It is confined to the New England Tablelands of NSW, where it occurs from Nundle to north of Tenterfield
<i>Eucalyptus pulverulenta</i>	Silver-leaved Mountain Gum	V	V	None	Found in two quite separate areas, the Lithgow to Bathurst area and the Monaro (Bredbo and Bombala areas). Nearby records are likely to be planted specimens.
<i>Eucalyptus scoparia</i>	Wallangarra White Gum	E	V	None	NSW it is known from only three locations near Tenterfield, including Bald Rock National Park. Widely planted as a street tree in the Sydney area.
<i>Genoplesium baueri</i>	Bauer's Midge Orchid	V		Unlikely.	The species has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens..Grows in sparse sclerophyll forest and moss gardens over sandstone.

Species/Community	Common Name	Conservation Status*		Likelihood of Occurrence	Habitat Associations
		TSC Act	EPBC Act		
<i>Grammitis stenophylla</i>	Narrow-leaf Finger Fern	E		Unlikely	Occurs in eastern Queensland and eastern NSW. In NSW it has been found on the south, central and north coasts and as far west as Mount Kaputar National Park near Narrabri. Moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest.
<i>Grevillea caleyi</i>	Caley's Grevillea	E	E	Unlikely	Laterite soils and an open forest vegetation community including Duffys Forest. Restricted to the Duffys Forest region in Northern Sydney t
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea	V	V	Unlikely	Sporadically distributed throughout the Sydney Basin with the main occurrence centred around Picton, Appin and Bargo. Occurs in a range of vegetation types from heath and shrubby woodland to open forest. Grows in sandy or light clay soils usually over thin shales. Often occurs in open, slightly disturbed sites such as along tracks.
<i>Hibbertia puberula</i>		E		Unlikely	Has not been seen for over 40 years. Early records of this species are from the Hawkesbury River area and Frenchs Forest in northern Sydney, South Coogee in eastern Sydney, the Hacking River area in southern Sydney, and the Blue Mountains. Occurs in association with sandstone.
<i>Hygrocybe anomala</i> var. <i>ianthinomarginata</i>		V		Unlikely	Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).
<i>Hygrocybe aurantipes</i>		V		Unlikely	Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).
<i>Hygrocybe austropratensis</i>		E		Unlikely	Only know from type locality at Lane Cove Bushland Park, Lane Cove LGA where it occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).
<i>Hygrocybe collucera</i>		E		Unlikely	Only know from type locality at Lane Cove Bushland Park, Lane Cove LGA where it occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).
<i>Hygrocybe griseoramosa</i>		E		Unlikely	Only know from type locality at Lane Cove Bushland Park, Lane Cove LGA where it occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).
<i>Hygrocybe lanecovensii</i>		E		Unlikely	Only know from type locality at Lane Cove Bushland Park, Lane Cove LGA where it occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).
<i>Hygrocybe reesiaae</i>		V		Unlikely	Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).

Species/Community	Common Name	Conservation Status*		Likelihood of Occurrence	Habitat Associations
		TSC Act	EPBC Act		
<i>Hygrocybe rubronivea</i>		V		Unlikely	Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).
<i>Leptospermum deanei</i>		V	V	Unlikely	Typically occurs in sandy alluvial soil, mostly along Middle Harbour Creek and Bare Creek. Recorded from Hornsby, Warringah, Ku-ring-gai and Ryde LGAs.
<i>Maundia triglochinosides</i>		V		None	Grows in swamps, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients. Restricted to coastal NSW and extending into southern Queensland. The current southern limit is Wyong; former sites around Sydney are now extinct.
<i>Melaleuca biconvexa</i>		V	V	Unlikely	Occurs only in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.
<i>Melaleuca deanei</i>	Deane's Paperbark	V	V	Unlikely	Deane's Paperbark occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas respectively. The species grows in heath on sandstone.
<i>Persoonia hirsuta</i>	Hairy Geebung	E	E	Unlikely	The Hairy Geebung has been recorded in the Sydney coastal area (subsp. <i>hirsuta</i> - Gosford to Berowra to Manly to Royal National Park), the Blue Mountains area (subsp. <i>evoluta</i> - Springwood, Lithgow, Putty) and the Southern Highlands (subsp. <i>evoluta</i> - Balmoral, Buxton, Yanderra and Hill Top areas). The Hairy Geebung is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.
<i>Persoonia nutans</i>	Nodding Geebung	E	E	Unlikely	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south with outliers at Voyager Point. Occurs in isolated and relatively small populations in the Liverpool, Campbelltown, Bankstown and Blacktown LGAs. Confined to aeolian and alluvial sediments and occurs in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland.
<i>Pimelea curviflora</i> var. <i>curviflora</i>		V	V	Unlikely	Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.
<i>Pimelea spicata</i>	Spiked Rice-flower	E	E	Unlikely	Spiked Rice-flower occurs in two disjunct areas, the Cumberland Plain (Narellan, Marayong, Prospect Reservoir areas) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). In both the Cumberland Plain and Illawarra environments this species is found on well-structured clay soils.

Species/Community	Common Name	Conservation Status*		Likelihood of Occurrence	Habitat Associations
		TSC Act	EPBC Act		
<i>Prasophyllum fuscum</i>	Wingecarribee Leek Orchid	CE	V	Unlikely	Type specimen from "moist meadows towards the Georges River" although the species is thought to be extinct from this area. Grows in moist heath, often along seepage lines. The only known population grows in moist sandy soil over sandstone amongst sedges and grasses in an area that appears to be regularly slashed by the local council.
<i>Prostanthera marifolia</i>		CE	Ex	Unlikely	Due to an absence of records over a number of decades, <i>Prostanthera marifolia</i> was presumed to be extinct until it was recently rediscovered in the Manly area of northern Sydney. Early records from south of Sydney and the south coast that were previously ascribed to this species have since been identified as <i>Prostanthera densa</i> .
<i>Pultenaea parviflora</i>	Sydney Bush-pea	E	V	Unlikely	Endemic to the Cumberland Plain within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays
<i>Senecio spathulatus</i>		E		None	Occurs on sand dunes in Nadgee Nature Reserve (Cape Howe) and between Kurnell in Sydney and Myall Lakes National Park.
<i>Syzygium paniculatum</i>	Brush Cherry, Magenta Lilly Pilly	E	V	Unlikely	Primarily occurs in littoral rainforest and riverside gallery rainforest in a narrow, linear coastal strip from Bulahdelah to Conjola State Forest. Is a widely planted species.
<i>Tetratheca glandulosa</i>		V	V	Unlikely	Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone. Southern limit of this species is West Pymble (Lane Cove NP), with records from Manly, Willoughby and Mosman all now extinct.
<i>Tetratheca juncea</i>		V	V	Unlikely	Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock.
<i>Thesium australe</i>	Austral toadflax	V	V	Unlikely	Occurs in grassland or grassy woodland, often in damp sites in association with Kangaroo Grass.
<i>Triplarina imbricata</i>		E	E	Unlikely	Found only in a few locations in the ranges south-west of Glenreagh and near Tabulam in north-east NSW. Records from the Parramatta area considered dubious.
<i>Wahlenbergia multicaulis</i> population in the Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield LGAs	Tadgell's Bluebell	E		None	Limited to the Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield LGAs
<i>Wilsonia backhousei</i>		V		None	Occurs on the margins of Saltmarshes and Lakes.

Species/Community	Common Name	Conservation Status*		Likelihood of Occurrence	Habitat Associations
		TSC Act	EPBC Act		
FAUNA					
Birds					
<i>Anseranas semipalmata</i>	Magpie Goose	V		Unlikely	Activities centred on terrestrial sedge-dominated wetlands; mainly those on floodplains of rivers.
<i>Anthochaera phrygia</i>	Regent Honeyeater	E	E, M	Unlikely	Species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Key foraging eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises : <i>E. microcarpa</i> , <i>E. punctata</i> , <i>E. polyanthemos</i> , <i>E. mollucana</i> , <i>Corymbia robusta</i> , <i>E. crebra</i> , <i>E. caleyi</i> , <i>Corymbia maculata</i> , <i>E. mckieana</i> , <i>E. macrorhyncha</i> , <i>E. laevopinea</i> , and <i>Angophora floribunda</i> .
<i>Botaurus poiciloptilus</i>	Australasian Bittern	V		Unlikely	Terrestrial wetlands with tall dense vegetation, occasionally estuarine habitats. Reedbeds, swamps, streams, estuaries .
<i>Burhinus grallarius</i>	Bush Stone-curlew	E		Unlikely	Associated with dry open woodland with grassy areas, dune scrubs, in savanna areas, the fringes of mangroves, golf courses and open forest / farmland. Forages in areas with fallen timber, leaf litter, little undergrowth and where the grass is short and patchy. Is thought to require large tracts of habitat to support breeding, in which there is a preference for relatively undisturbed in lightly disturbed.
<i>Calidris alba</i>	Sanderling	V	M	Unlikely	Occur in coastal areas on low beaches, near reefs and inlets along tidal mudflats and bare open coastal lagoons. Rarely seen in near-coastal wetlands such as lagoons, hypersaline lakes, saltponds and samphire flats.
<i>Calidris tenuirostris</i>	Great Knot	V	M	Unlikely	Sheltered coastal habitats containing large intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and inlets, or exposed reefs or rock platforms.
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	V		Unlikely	The species is uncommon although widespread throughout suitable forest and woodland habitats. Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (<i>Allocasuarina littoralis</i>), Forest She-oak (<i>A. torulosa</i>) or Drooping She-oak (<i>A. verticillata</i>) occur.
<i>Charadrius leschenaultii</i>	Greater Sand-plover	V	M	Unlikely	Entirely coastal in NSW, foraging on intertidal sand and mudflats in estuaries, roosting during high tide on sandy beaches or rocky shores.
<i>Charadrius mongolus</i>	Lesser Sand-plover	V	M	Unlikely	Favours coastal areas including beaches, mudflats and mangroves where they forage. They may be seen roosting during high tide on sandy beaches or rocky shores.

Species/Community	Common Name	Conservation Status*		Likelihood of Occurrence	Habitat Associations
		TSC Act	EPBC Act		
<i>Diomedea exulans</i> (sensu lato)	Wandering Albatross	E	V	None	Spend the majority of their time in flight soaring over the southern oceans, breed on a number of islands just north of the Antarctic Circle on exposed ridges and hillocks, amongst open and patchy vegetation
<i>Diomedea exulans antipodensis</i> (Formerly <i>Diomedea antipodensis</i>)	Antipodean Albatross	V	V	None	The species ranges across the southern Pacific Ocean, east to the coast of Chile and west to eastern Australia, feeding pelagically on squid, fish and crustaceans with breeding confined to New Zealand
<i>Diomedea exulans gibsoni</i>	Gibson's Albatross	V	V, M	None	Non-breeding range is poorly known however the species probably disperses across the southern Pacific, feeding pelagically on squid, fish and crustaceans. This species is known only to breed on the Adams, Disappointment and Auckland Islands in the subantarctic Auckland Island group.
<i>Erythrotriorchis radiatus</i>	Red Goshawk	E	V	Unlikely	Associated with forests and woodlands with a mosaic of vegetation types, an abundance of birds and permanent water. In NSW, this species is thought to favour mixed subtropical rainforest, Melaleuca Swamp Forest, and open eucalypt forest along rivers, often in rugged terrain.
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		Unlikely	In New South Wales Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range. They mostly occur in dry, open eucalypt forests and woodland.
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V		Unlikely	A coastal species that inhabits rock coastlines, coral cays, reefs and occasionally sandy beaches
<i>Haematopus longirostris</i>	Pied Oystercatcher	V		Unlikely	Roosts and forages on sandy beaches, sand banks, mudflats and estuaries
<i>Ixobrychus flavicollis</i>	Black Bittern	V		Unlikely	In NSW, records of the species are scattered along the east coast, with individuals rarely being recorded south of Sydney or inland. Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation.
<i>Lathamus discolor</i>	Swift Parrot	E	E	Unlikely	The species requires winter flowering eucalyptus and where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	V	M	Unlikely	In NSW, the main site for the species is the Hunter River estuary, with birds occasionally reaching the Shoalhaven estuary. Broad-billed Sandpipers favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat.
<i>Limosa limosa</i>	Black-tailed Godwit	V	M	Unlikely	Primarily found along the coast on sandspits, lagoons and mudflats. The species has also been found to occur inland on mudflats or shallow receding waters of portions of large muddy swamps or lakes.

Species/Community	Common Name	Conservation Status*		Likelihood of Occurrence	Habitat Associations
		TSC Act	EPBC Act		
<i>Macronectes giganteus</i>	Southern Giant-Petrel	E	E	None	Has a circumpolar pelagic range from Antarctica to approximately 20° S and is a common visitor off the coast of NSW. Over summer, the species nests in small colonies amongst open vegetation on Antarctic and subantarctic islands, including Macquarie and Heard Islands and in Australian Antarctic territory.
<i>Macronectes halli</i>	Northern Giant-Petrel	V	V, M	None	Has a circumpolar pelagic distribution, predominantly in sub-Antarctic to Antarctic waters north of the Antarctic convergence, usually between 40-64°S in open oceans. Their range extends into subtropical waters in winter and early spring, and they are a common visitor in NSW waters, predominantly along the south-east coast during winter and autumn
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	CE	CE	Species unlikely to occur within the study area	Breed in the south-west of Tasmania and migrate in autumn to spend winter on the mainland coast of south-eastern South Australia and southern Victoria, with occasional records in NSW. Spends winter mostly within 3 km of the coast in sheltered coastal habitats including bays, lagoons, estuaries, coastal dunes and saltmarshes.
<i>Neophema pulchella</i>	Turquoise Parrot	V		Unlikely	Steep rocky ridges and gullies, rolling hills, valleys and river flats and the plains of the Great Dividing Range comprise the topography inhabited by this species. Spends much of the time on the ground foraging on seed and grasses. It is associated with coastal scrubland, open forest and timbered grassland, especially low shrub ecotones between dry hardwood forests and grasslands with high proportion of native grasses and forbs.
<i>Ninox connivens</i>	Barking Owl	V		Unlikely	Associated with a variety of habitats such as savanna woodland, open eucalypt forests, wetland and riverine forest. The habitat is typically dominated by Eucalypts, however often dominated by Melaleuca species in the tropics. It usually roosts in dense foliage in large trees such as River She-oak (<i>Allocasuarina cunninghamiana</i>), other Casuarina and Allocasuarina, eucalypts, Angophora, Acacia and rainforest species from streamside gallery forests. It usually nests near watercourses or wetlands in large tree hollows with entrances averaging 2-29 metres above ground, depending on the forest or woodland structure and the canopy height.
<i>Ninox strenua</i>	Powerful Owl	V		Unlikely	In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered, mostly historical records on the western slopes and plains. Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest.
<i>Pezoporus wallicus</i>	Eastern Ground Parrot	V		Unlikely	Predominantly restricted to coastal heath and sedgelands that provide a high density of cover and food foraging resources
<i>Pterodroma leucoptera</i>	Gould's Petrel	V	E	None	Breeds on both Cabbage Tree Island, 1.4 km offshore from Port Stephens and on nearby Boondelbah island. The range and feeding areas of non-breeding Petrels are unknown.

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Species/Community	Common Name	Conservation Status*		Likelihood of Occurrence	Habitat Associations
		TSC Act	EPBC Act		
<i>Pterodroma neglecta</i>	Kermadec Petrel (western)	V	V	None	Ranges over subtropical and tropical waters of the South Pacific with Balls Pyramid, near Lord Howe Island, the only known breeding site in Australian waters.
<i>Ptilinopus superbus</i>	Superb Fruit-Dove	V		Unlikely	The Superb Fruit-dove occurs principally from north-eastern in Queensland to north-eastern NSW. It is much less common further south. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.
<i>Puffinus carneipes</i>	Flesh-footed Shearwater	V		None	Ranges throughout the Pacific and Indian Oceans. There are two main breeding areas in the world: one in the South West Pacific includes Lord Howe Island and New Zealand; the other along the coast of Western Australia
<i>Rostratula australis</i> (formerly <i>R. benghalensis australis</i>)	Australian Painted Snipe	E	V, M	Unlikely	This species is regularly recorded from wetlands from the Murray-Darling drainage system. It inhabits shallow, vegetated, temporary or infrequently filled wetlands and feeds at the water's edge.
<i>Stagonopleura guttata</i>	Diamond Firetail	V		Unlikely	Typically found in grassy eucalypt woodlands, but also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. It is often found in riparian areas and sometimes in lightly wooded farmland. Appears to be sedentary, though some populations move locally, especially those in the south.
<i>Sterna albifrons</i>	Little Tern	E		Unlikely	Almost exclusively coastal, preferring sheltered areas, however may occur several kilometres inland in harbours, inlets and rivers. Australian birds breed on sandy beaches and sand spits.
<i>Sterna fuscata</i>	Sooty Tern	V		None	Forages offshore, usually only observed onshore in breeding season or when storms force them to shelter.
<i>Thalassarche bulleri</i>	Buller's Albatross		V, M	None	Buller's Albatross is a New Zealand resident, breeding on Snares and Solander Islands. Individuals generally remain near the breeding sites but, even when breeding, may cross the Tasman Sea.
<i>Thalassarche cauta</i>	Shy Albatross, Tasmanian Shy Albatross	V	V, M	None	Pelagic or ocean-going species inhabits subantarctic and subtropical marine waters, spending the majority of its time at sea.
<i>Thalassarche melanophrys</i>	Campbell Albatross	V	V, M	None	Has a circumpolar range over the southern oceans, and are seen off the southern Australian coast mainly during winter.
<i>Tyto novaehollandiae</i>	Masked Owl	V		Unlikely	Extends from the coast where it is most abundant to the western plains. Lives in dry eucalypt forests and woodlands from sea level to 1100 m.
<i>Xanthomyza phrygia</i>	Regent Honeyeater	E	E	Unlikely	The species requires winter flowering eucalyptus and where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.

Species/Community	Common Name	Conservation Status*		Likelihood of Occurrence	Habitat Associations
		TSC Act	EPBC Act		
<i>Xenus cinereus</i>	Terek Sandpiper	V	M	Unlikely	A rare migrant to the eastern and southern Australian coasts, being most common in northern Australia, and extending its distribution south to the NSW coast in the east. Favours mudbanks and sandbanks located near mangroves, but may also be observed on rocky pools and reefs.
Mammals					
<i>Aepyprymnus rufescens</i>	Rufous Bettong	V		None	Prefer forests with a grassy to sparse understorey including coastal forest, tall wet sclerophyll forest and dry forests west of GDR. It is most commonly found on sites derived from sedimentary rock and in north eastern NSW in forests characterised by Spotted Gum (<i>Corymbia maculata</i> and <i>C. henryi</i>) (NPWS 2005n).
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V		None	The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Unlikely	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in disused bottle-shaped mud nests of the Fairy Martin, frequently low to mid elevation dry open forests and woodlands close to these features. Found in well-timbered areas containing gullies.
<i>Dasyurus maculatus maculatus</i> (SE mainland population)	Spotted-tail Quoll (southeastern mainland population)	V	E	None.	This species is partially boreal and mostly nocturnal inhabiting a wide range of forested habitats, including rainforests, wet sclerophyll forests, lowland forests, River Red Gum forests, dry 'rainshadow' woodlands, sub-alpine woodlands, coastal heathlands and inland riparian forests. The species appear to favour areas with a relatively complex understory, often in association with complex rock formations, hollow bearing trees, rocky escarpment and/or fallen logs or burrows for den sites.
<i>Dasyurus viverrinus</i>	Eastern Quoll	E	V	None	Associated with a variety of habitats, including dry sclerophyll forest, shrub, heath land, riparian forests and agricultural areas. Requires features such as hollow logs and rock piles for shelter.
<i>Miniopterus australis</i>	Little Bentwing-bat	V		Unlikely	Prefers well-timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests. This species shelters in a range of structures including culverts, drains, mines and caves. Relatively large areas of dense vegetation of either wet sclerophyll forest, rainforest or dense coastal banksia scrub are usually found adjacent to caves in which this species is found. Breeding occurs in caves, usually in association with <i>M. schreibersii</i> .
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		Unlikely	Eastern Bent-wing Bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.

Species/Community	Common Name	Conservation Status*		Likelihood of Occurrence	Habitat Associations
		TSC Act	EPBC Act		
<i>Myotis adversus (macropus)</i>	Southern Myotis	V		Unlikely	The Large-footed Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	None	Sheltered or bask during the day in rock crevices caves and overhangs and are most active at night.
<i>Potorous tridactylus tridactylus</i>	Long-nosed Potoroo (SE mainland)	V	V	None	Inhabits coastal heaths and dry wet sclerophyll forests. Dense understory with occasional open areas is an essential part habitat and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Species may forage over the study area.	Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.
Amphibians					
<i>Crinia tinnula</i>	Wallum Froglet	V		None	Wallum swamps and associated low land meandering watercourses on coastal plains (Ehmann 1997). Occurs in elevations up to around 50m and is closely related to freshwater habitats in the coastal zone (NPWS 2005a). Found most commonly in wallum wetlands characterised by low nutrients, highly acidic, tanin-stained waters that are typically dominated by paperbarks and tea-trees.
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	None	This species inhabits sandstone heathland, dry, and also wet sclerophyll forests from north of Sydney to eastern Victoria.
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	Unlikely	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.) Some habit, particularly in the Greater Sydney region occurs in highly disturbed areas.
<i>Mixophyes balbus</i>	Stuttering Frog, Southern Barred Frog (in Victoria)	E	V	None	This frog lives in forests such as Antarctic Beech, wet sclerophyll and rainforests. It often hides in leaf litter near permanent fast flowing streams.
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V		None	The Red-crowned Toadlet has a restricted distribution. Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.

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Species/Community	Common Name	Conservation Status*		Likelihood of Occurrence	Habitat Associations
		TSC Act	EPBC Act		
Reptiles					
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	None	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rock shelters in hollows in large trees within 200m of escarpments in summer.
Migratory Terrestrial Species					
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		M	Unlikely	This large bird is rarely seen as it prefers to be near large areas of water. The site has been significantly disturbed due to current and previous land use activities and as such does not contain the natural habitat of the species.
<i>Hirundapus caudacutus</i>	White-throated Needletail		M	Unlikely	White-throated Needletails are non-breeding migrants in Australia. They are aerial birds.
<i>Merops ornatus</i>	Rainbow Bee-eater		M	Unlikely	The Rainbow Bee-eater is most often found in open forests, woodlands and shrubland, and cleared areas, usually near water. It will be found on farmland with remnant vegetation and orchards and vineyards. It will use disturbed sites such as quarries, cuttings and mines to build nesting tunnels. Habitat is unlikely to occur on site.
<i>Monarcha melanopsis</i>	Black-faced Monarch		M	Unlikely	The Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M	Unlikely	The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests. Preferred habitat does not occur on the site.
<i>Neophema chrysogaster</i>	Orange-bellied Parrot		M	Unlikely	Breed in the south-west of Tasmania and migrate in autumn to spend winter on the mainland coast of south-eastern South Australia and southern Victoria, with occasional records in NSW. Spends winter mostly within 3 km of the coast in sheltered coastal habitats including bays, lagoons, estuaries, coastal dunes and saltmarshes.
<i>Rhipidura rufifrons</i>	Rufous Fantail		M	Unlikely	The Rufous Fantail is generally found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground.
<i>Xanthomyza phrygia</i>	Regent Honeyeater		M	Unlikely.	The species requires winter flowering eucalyptus and where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. The site is a disturbed area that has been significantly altered.
Migratory Wetland Species					
<i>Actitis hypoleucos</i>	Common Sandpiper		M	Unlikely	Banks and rocks near water
<i>Ardea alba</i>	Great Egret, White Egret		M	Unlikely	Great Egrets prefer shallow water, particularly when flowing, but may be seen on any watered area including damp grasslands.

Species/Community	Common Name	Conservation Status*		Likelihood of Occurrence	Habitat Associations
		TSC Act	EPBC Act		
<i>Ardea ibis</i>	Cattle Egret		M	Unlikely	The Cattle Egret is found in grasslands, woodlands and wetlands, and is not common in arid areas. It also uses pastures and croplands, especially where drainage is poor.
<i>Arenaria interpres</i>	Ruddy Turnstone		M	Unlikely	Frequents beaches along the coast of NSW. Flies from Siberia or Alaska to Australia in August - September each year
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper		M	Unlikely	It prefers the grassy edges of shallow inland freshwater wetlands. It is also found around sewerage treatment ponds, flooded grasslands, mudflats, mangroves, rocky shores and beaches
<i>Calidris canutus</i>	Red Knot, Knot		M	Unlikely	Tidal mudflats and rarely inland.
<i>Calidris ferruginea</i>	Curlew Sandpiper		M	Unlikely	Intertidal mudflats of estuaries, lagoons, mangrove channels; around lakes,, dams, floodwaters, flooded saltbush surrounds of inland lakes.
<i>Calidris ruficollis</i>	Red-necked Stint		M	Unlikely	Coastal and inland shore lines
<i>Charadrius bicinctus</i>	Double-banded Plover		M	Unlikely	Beaches, mud-flats, grasslands and bare ground.
<i>Charadrius veredus</i>	Oriental Plover, Oriental Dotterel		M	Unlikely	Recorded in all states but most common in coastal areas and northern Australia. It breeds in Mongolia, and passes through east China on migration. Is found generally inland; in open grasslands in arid and semi-arid zones; and less often in estuarine or littoral environments. This species prefers flat inland plains, sparsely vegetated short grass with hard bare ground including claypans, playing fields, lawns and cattle camps.
<i>Gallinago hardwickii</i>	Latham's Snipe, Japanese Snipe		M	Unlikely	Inland and coastal shallow freshwater wetlands, occurring in both ephemeral and permanent wetlands, particularly where there is grass. Individuals have been spotted in artificial dams, sewage ponds and water logged grasslands. Suitable habitat is not at the site.
<i>Heteroscelus brevipes</i>	Grey-tailed Tattler		M	Unlikely	Associated with reefs, rock platforms , intertidal mudflats, estuaries and coastal lagoons.
<i>Limosa lapponica</i>	Bar-tailed Godwit		M	Unlikely	Mainly coastal, usually sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats. Breeds in Northern Russia, Scandinavia, NW Alaska
<i>Numenius madagascariensis</i>	Eastern Curlew		M	Unlikely	Intertidal coastal mudflats, coastal lagoons, sandy spits. Breeds in Russia, NE China.
<i>Numenius minutus</i>	Little Curlew, Little Whimbrel		M	Unlikely	The Little Curlew is known to breed in Siberia, with migrants arriving after early April. Southern migration begins in September following the Chinese coast and, after a staging in Mongolia, continues to Northern Australia and New Guinea. Outside of the breeding season, the species inhabits grasslands, open plains, parklands and mud-flats of Northern Australia.
<i>Numenius phaeopus</i>	Whimbrel		M	Unlikely	Intertidal coastal mudflats, river deltas and mangroves, occasionally sandy beaches. Breeds Siberia and Alaska .

Species/Community	Common Name	Conservation Status*		Likelihood of Occurrence	Habitat Associations
		TSC Act	EPBC Act		
<i>Pluvialis fulva</i>	Pacific Golden Plover		M	Unlikely	Breeds North Siberia, Alaska (DEH 2005a). Mainly coastal, beaches, mudflats and sandflats and other open areas such as recreational playing fields in Australia
<i>Pluvialis squatarola</i>	Grey Plover		M	Unlikely	In non-breeding grounds in Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes. The species is also very occasionally recorded further inland, where they occur around wetlands or salt-lakes
<i>Tringa stagnatilis</i>	Marsh Sandpiper, Little Greenshank		M	Unlikely	Coastal - Permanent or ephemeral wetlands of varying degrees of salinity, commonly inland. Breeds Eastern Europe to Eastern Siberia
<i>Xenus cinereus</i>	Terek Sandpiper	V	M	Unlikely	A rare migrant to the eastern and southern Australian coasts, being most common in northern Australia, and extending its distribution south to the NSW coast in the east. The two main sites for the species in NSW are the Richmond River estuary and the Hunter River estuary. In Australia, has been recorded on coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks located near mangroves, but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools. Generally roosts communally amongst mangroves on dead trees, often with related wader species.

Appendix C: Part 3A Impact Assessment Criteria

NSW Impact Assessment

An assessment of the impacts of the proposal on species, populations and ecological communities listed Schedules 1 and 2 of the TSC Act was undertaken. The proposal will be assessed under Part 3A of the EP&A Act and consequently this impact assessment was undertaken in accordance with the Draft *Guidelines for Threatened Species Assessment* (DECC 2005).

***Syzygium paniculatum* (Brush Cherry, Magenta Lilly Pilly)**

Syzygium paniculatum (Brush Cherry, Magenta Lilly Pilly) is a threatened species listed as Endangered under the TSC Act and Vulnerable under the EPBC Act. It is a shrub or small tree up to 20m tall (Fairley 2004) which typically grows in moist deep sands of old dunes in Littoral rainforest or in alluvial sands, silts and clays in riparian gallery rainforests (Fairley 2004).

S. paniculatum is restricted to the coastal areas of NSW between Bulahdelah and Jervis Bay where it occurs in widely separated populations. This species is uncommon in the wild where it is threatened by habitat loss, high frequency fire, weed invasion and grazing. This species has been widely cultivated and has consequently become naturalised in some places with some considering these naturalised individuals as weeds (PlantNET 2007).

A single *S. paniculatum* was recorded in the north-western corner of the site. Given the location in which this individual was recorded it is extremely unlikely that it is naturally occurring in this location and it is highly likely to have been planted in this location.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The proposal would involve the excavation, treatment and disposal of contaminated soils at the site. The exact extent of excavations and therefore the footprint of the proposal has not been determined, there is a possibility that the individual *S. paniculatum* would be removed during remediation works.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The site only represents habitat for this species as the result of it being planted within the site. The habitat for the species within the site is therefore considered to be limited to the location of the current individual. The proposal may involve excavations in this location and require removal of the single individual.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

No, the natural distribution of *S. paniculatum* extends from Bulahdelah and Jervis Bay. The site is not at the limit of the distribution of this species.

How is the proposal likely to affect current disturbance regimes?

The site has been subjected to ongoing disturbances such as clearing and weed invasion and the proposal could be considered a continuation of the historic disturbances.

How is the proposal likely to affect habitat connectivity?

The site is located in an urban setting and is currently isolated from any natural habitat for this species. The proposed works will not impact upon habitat connectivity for this species. Furthermore, as the planted individual is of unknown provenance, the spread of genetic material from the individual onsite to natural habitat would be undesirable as it could compromise the genetic integrity of naturally occurring individuals.

How is the proposal likely to affect critical habitat?

Not applicable - critical habitat has not been declared for this species.

Grey-headed Flying-fox (*Pteropus poliocephalus*)

The Grey-headed Flying Fox (*Pteropus poliocephalus*) is listed as vulnerable the TSC Act and EPBC Act. The species is endemic to the east coast of Australia with a distribution from Bundaberg in the north to Melbourne in the south, from the western slopes of the Great Dividing Range to the coast. The distribution of this species has recently suffered a southward contraction and a 30% population decline over the last ten years.

The Grey-headed Flying-fox is a highly mobile species whose migration patterns are determined by the availability of flowering food resources. The species is a canopy-feeding frugivore, blossom-eater and nectarivore, and occurs in rainforest, woodlands, paperbark swamps and Banksia woodlands. This species feeds in particular on the nectar and pollen of native trees, especially *Eucalyptus* spp., *Melaleuca* spp. and *Banksia* spp., and fruits of rainforest trees and vines. During times when native food resources are limited, Grey-Headed Flying-foxes forage on fruit crops and cultivated gardens. Grey-headed Flying-foxes congregate in large colonies of up to 200,000 individuals in the summer season. Camp sites are generally located next to rivers or creeks, and occur in a range of vegetation communities including rainforest, wet sclerophyll forest, *Melaleuca* woodland, *Casuarina* forest or mangroves. These sites have a dense canopy, providing them with the moist, humid microclimate they require. Campsites are critical for mating, birthing, rearing of young and as diurnal refuge from predators. Urban gardens, cultivated fruit crops and roadside verges may also provide temporary roosting habitat for this species.

This species is threatened by a number of processes including loss of foraging habitat, disturbance of roosting sites, unregulated shooting, and electrocution on powerlines.

Grey-headed Flying-fox was not recorded during the current field survey, but is known from records within 10 km radius of the study area. There is potential for the species to use the study area on occasion while foraging, although the study area does not contain current or historic campsites. Impacts are possible due to the clearing of foraging habitat.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The proposal would involve the excavation, treatment and disposal of contaminated soils at the site. In order to access these soils some removal of canopy trees representing potential foraging habitat for this species may occur. The extent of the loss of foraging habitat, up to a maximum of 47 trees, is minor

considering the highly mobile nature of this species and the distances they travel in search of food. Furthermore, similar habitat is present surrounding the site including urban street trees.

The site does not contain any current or historic campsites and the proposal would not disturb or impact on any campsites.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The proposal would involve the loss of a small area of foraging habitat, up to a maximum of 47 trees. This is considered a minor impact considering the highly mobile nature of this species and the distances they travel in search of food. Furthermore, similar habitat is present surrounding the site including urban street trees.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The distribution of this species extends from Bundaberg in the north to Melbourne in the south, from the western slopes of the Great Dividing Range to the coast. The site is not at the limit of the known distribution for the Grey-headed Fly-fox.

How is the proposal likely to affect current disturbance regimes?

The site has been subjected to ongoing disturbances such as clearing and weed invasion and the proposal could be considered a continuation of the historic disturbances.

How is the proposal likely to affect habitat connectivity?

The site is currently isolated from any areas of high quality habitat for this species. Further, given the highly mobile nature of this species and the large distances travelled in search of food, the removal of up to 47 trees within an area of 7,732 m² is considered minor.

How is the proposal likely to affect critical habitat?

Not applicable - critical habitat can not be declared for a Vulnerable species.

Appendix D: EPBC Act Impact Assessments

The EPBC Act Administrative Guidelines on Significance set out 'Significant Impact Criteria' that are to be used to assist in determining whether a proposed action is likely to have a significant impact on matters of national environmental significance. Matters listed under the EPBC Act as being of national environmental significance include:

- Listed threatened species and ecological communities
- Listed migratory species
- Wetlands of International Importance
- The Commonwealth marine environment
- World heritage properties
- National heritage places
- Nuclear actions

Specific 'Significant Impact Criteria' are provided for each matter of national environmental significance except for threatened species and ecological communities in which case separate criteria are provided for species listed as endangered and vulnerable under the EPBC Act.

***Syzygium paniculatum* (Brush Cherry, Magenta Lilly Pilly)**

Syzygium paniculatum (Brush Cherry, Magenta Lilly Pilly) is a threatened species listed as Endangered under the TSC Act and Vulnerable under the EPBC Act. Background information on this species is outlined in **Appendix D**.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Criterion 1: lead to a long-term decrease in the size of an important population of a species

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, key source populations either for breeding or dispersal populations that are necessary for maintaining genetic diversity, and/or • populations that are near the limit of the species range.

Only one *S. paniculatum* occurs on the site and it has been planted. As such it is unlikely that this constitutes an important population.

Criterion 2: reduce the area of occupancy of an important population

The single planted *S. paniculatum* on the site does not constitute an important population

Criterion 3: fragment an existing important population into two or more populations

The single planted *S. paniculatum* on the site does not constitute an important population

Criterion 4: adversely affect habitat critical to the survival of a species

The site does not represent the natural habitat for this species and the occurrence of this species on the site is the result of it being planted at this location. As such, the site is not considered to be habitat critical to the survival of this species.

Criterion 5: disrupt the breeding cycle of an important population

The single planted *S. paniculatum* on the site does not constitute an important population

Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The site does not represent the natural habitat for this species and the occurrence of this species on the site is the result of it being planted at this location. As such, the proposed works and potential removal of the individual *S. paniculatum* is not considered to impact habitat to the extent that the species is likely to decline.

Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Invasive species such as *Lantana camara* (Lantana) and *Chrysanthemoides monilifera* subsp. *rotunda* species have been identified as harmful to *S. paniculatum*. These species are not currently present on the site and it is recommended that strategies to control weeds are included within a Construction Environmental Management Plan.

Criterion 8: introduce disease that may cause the species to decline, or

Disease is not currently recognised as a risk to *S. paniculatum*. Further, the proposed works will not involve any natural habitat for this species and as such are highly unlikely to introduce disease that will cause the species to decline.

Criterion 9: interfere substantially with the recovery of the species.

As the proposal does not involve any naturally occurring individuals of this species, or any natural habitat the proposed works are unlikely to interfere with the recovery of this species.

Conclusion

Based on the above assessment it is concluded that the proposal is unlikely to have a significant impact on *S. paniculatum*. As such, no referral to the DEWHA for assessment and approval by the Environment Minister is necessary.

Grey-headed Flying-fox (*Pteropus poliocephalus*)

The Grey-headed Flying Fox (*Pteropus poliocephalus*) is listed as vulnerable the TSC Act and EPBC Act. Background information on this species is provided in **Appendix D**.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Criterion 1: lead to a long-term decrease in the size of an important population of a species

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, key source populations either for breeding or dispersal populations that are necessary for maintaining genetic diversity, and/or • populations that are near the limit of the species range.

The proposed works would involve the loss of a minor amount of potential foraging habitat for this species, up to a maximum of 47 trees. It is unlikely that an important population of this species is dependent upon the trees within the site to the extent that their removal would cause the important population to decline.

Criterion 2: reduce the area of occupancy of an important population

It is unlikely that an important population of this species is dependent upon the trees within the site to the extent that their removal would reduce the area of occupancy of the population.

Criterion 3: fragment an existing important population into two or more populations

The trees within the site represent only a very minor area of potential foraging habitat, such that the removal of the trees within the site would not fragment an important population of the species.

Criterion 4: adversely affect habitat critical to the survival of a species

The site represents only a minor area of potential foraging habitat which is not habitat critical to the survival of the species.

Criterion 5: disrupt the breeding cycle of an important population

The site represents only potential foraging habitat for the species with no current or historic campsites located within the site. As such the removal of up to 47 trees from the site is unlikely to impact upon the breeding cycle of an important population of the species.

Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The site represents only a minor area of potential foraging habitat. The removal of up to 47 trees from this area is unlikely to cause the species to decline, especially considering the areas of similar habitat in the surrounding area.

Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The site is currently dominated by exotic and non-locally native vegetation, and it is unlikely that the proposed works would lead to invasive species becoming more established within the site.

Criterion 8: introduce disease that may cause the species to decline, or

Disease is not currently recognised as a threat to the Grey-headed Flying Fox and it is considered unlikely the proposed works will introduce disease that may cause this species to decline.

Criterion 9: interfere substantially with the recovery of the species.

The proposed works would involve the loss of up to 47 trees, representing a minor area of potential foraging habitat for this species. The loss of this small area of potential foraging habitat is unlikely to substantially interfere with the recovery of the species.

Conclusion

Based on the above assessment it is concluded that the proposal is unlikely to have a significant impact on the Grey-headed Flying-fox. As such, no referral to the DEWHA for assessment and approval by the Environment Minister is necessary.

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