

Appendix F Flora and Fauna Assessment



Wolli Creek Substation and T8 Airport Line Power Supply Upgrade - Flora and Fauna Assessment Report

Transport for NSW

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Template 2.8.1

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Abbreviations

Abbreviation	Description
BC Act	<i>Biodiversity Conservation Act 2016</i>
BDAR	Biodiversity Development Assessment Report
BOM	Bureau of Meteorology
BOS	Biodiversity Offsets Scheme
BS Act	<i>Biosecurity Act 2015</i>
DotEE	Department of the Environment and Energy
ELA	Eco Logical Australia Pty Ltd
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999.</i>
FFA	Flora and Fauna Assessment
FM Act	<i>Fisheries Management Act 1994</i>
MNES	Matters of National Environmental Significance
OEH	Office of Environmental and Heritage
ROC	Rail Operations Centre
TfNSW	Transport for New South Wales

Executive Summary

Eco Logical Australia Pty Ltd (ELA) was engaged by AECOM to prepare this Flora and Fauna Assessment report for the proposed Wolli Creek Substation and T8 Airport Line Power Supply Upgrade. ELA understands that this Flora and Fauna Assessment (FFA) Report would form part of a Review of Environmental Factors (REF) to be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This report also addresses the *Biodiversity Conservation Act 2016* (BC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Transport for NSW (TfNSW) Vegetation Offset Guide and the Infrastructure Sustainability Council of Australia (ISCA) offsetting guide were also applied to the proposed impacts on vegetation within the project footprint (the study area).

The majority of the proposed project footprint is contained within the rail corridor. The footprint contains existing hardstand surfaces, native vegetation and rail infrastructure. Field survey identified one native vegetation community, Coastal Sandstone Foreshores Forest in moderate condition, as present in the study area. This community does not correspond with a threatened ecological community. The study area also contained a regrowth form of this community present as a shrubland. The regrowth was considered likely as a result of clearing portions of the study area for the installation and construction of rail infrastructure and associated maintenance.

The study area also contained planted native vegetation and exotic cover, neither of which form part of a native ecological community. The remainder of the study area was comprised of hardstand infrastructure, including rail infrastructure and concrete. The proposed project footprint is immediately adjacent to Wolli Creek, which is a third order stream.

No threatened flora or fauna species were identified in the study area during survey, however the native vegetation present may provide foraging habitat for *Pteropus poliocephalus* (Grey-headed Flying-fox) which is listed as vulnerable under the BC Act and EPBC Act.

A test of significance under the BC Act was applied to this species and concluded that the proposal is unlikely to constitute a significant impact. The Significant Impact Criteria under the EPBC Act were applied to the Grey-headed Flying-fox and concluded that a significant impact is unlikely to occur.

Offsets for impacts on native vegetation will be required under the TfNSW Vegetation Offsetting Guide. The vegetation within the study area was split into two categories, based on vegetation formation and structure. Offsets for Coastal Sandstone Foreshores Forest in moderate condition and regrowth (0.47 ha) were calculated individually, and offsets for planted native and exotic cover (0.57 ha) was calculated. Offset ratios of 2.20 and 2.60 respectively, were determined.

Offsets under the ISCA tool were calculated and achieved a score of -0.116 and 0 points were achieved.

1. Introduction

ELA was engaged by AECOM on behalf of TfNSW to provide a FFA Report for the proposed Wolli Creek Substation and T8 Airport Line Power Supply Upgrade as part of the More Trains, More Services Program. ELA understands that this report will form part of a REF and be assessed under Division 5.1 of the EP&A Act. This report also addresses the BC Act and the EPBC Act.

This report describes impacts on native vegetation, threatened species, populations and communities listed under the BC Act and EPBC Act and associated habitat features as a result of the proposed works. The impact assessment in this report is based on information gathered from database searches and field investigations. The report sets out the legislative context, methods used, impacts on the environment and recommendations to minimise these impacts.

1.1 Project description

ELA understands the Proposal involves the upgrade of the rail traction power system near Wolli Creek Station, within the Airport Line Tunnel, at Green Square and through to Chalmers Street Substation near Central Station. This FFA Report only assesses the portion of the Proposal at Wolli Creek as the remaining sections are located in urban environments, and no vegetation is required to be removed. The remaining sections are assessed within the REF.

The Proposal at Wolli Creek would include the following key elements:

- construction of a proposed traction substation (proposed traction substation) at Wolli Creek Junction, located between the existing T8 Airport and South Line and existing residential apartments that front onto Lusty Street, Wolli Creek (5 – 13 Lusty Street)
- upgrade of an access road at the end of Lusty Street, Wolli Creek to provide access to the proposed substation
- demolition of the Undercliffe Substation and Wolli Creek Sectioning Hut (to be replaced by the proposed traction substation)
- installation of 33 kV, 11 kV and 1500 V underground feeders to connect the substation to the high-voltage and 1500V DC networks and the Wolli Creek portal of the Airport Line Tunnel
- installation of a padmount substation (proposed padmount substation)
- removal of overhead wiring (OHW) structures and OHW supported by those structures

1.2 Site description

The study area is located at Wolli Creek Station and predominately within the rail corridor located to the north, south and west of Wolli Creek, approximately 10 kilometres south of the Sydney CBD. The study area is zoned SP2 – Infrastructure and IN2 – Light Industrial under the Rockdale Local Environmental Plan 2011 (Rockdale LEP).

The study area contains existing rail infrastructure, cleared land and patches of remnant native vegetation. The study area is immediately adjacent to Wolli Creek which is mapped as unzoned land under the Rockdale LEP. Wolli Creek is mapped as a third order stream under the Strahler Stream Order classification system. Wolli Creek is also mapped as Key Fish Habitat under the *Fisheries Management Act 1994* (FM Act).

For the purposes of this FFA Report, the study area was assessed. The study area commences north of Chisholm Street in the north, extending to Henderson Street in the west and to the south of Guest Avenue in the south. The vegetation clearance footprint is identical to the study area.

The *study area* is the area shown in Figure 1.

The *subject site* is the area surveyed which consists of the study area with the exception of the areas mapped as 'un-validated' (Figure 1).

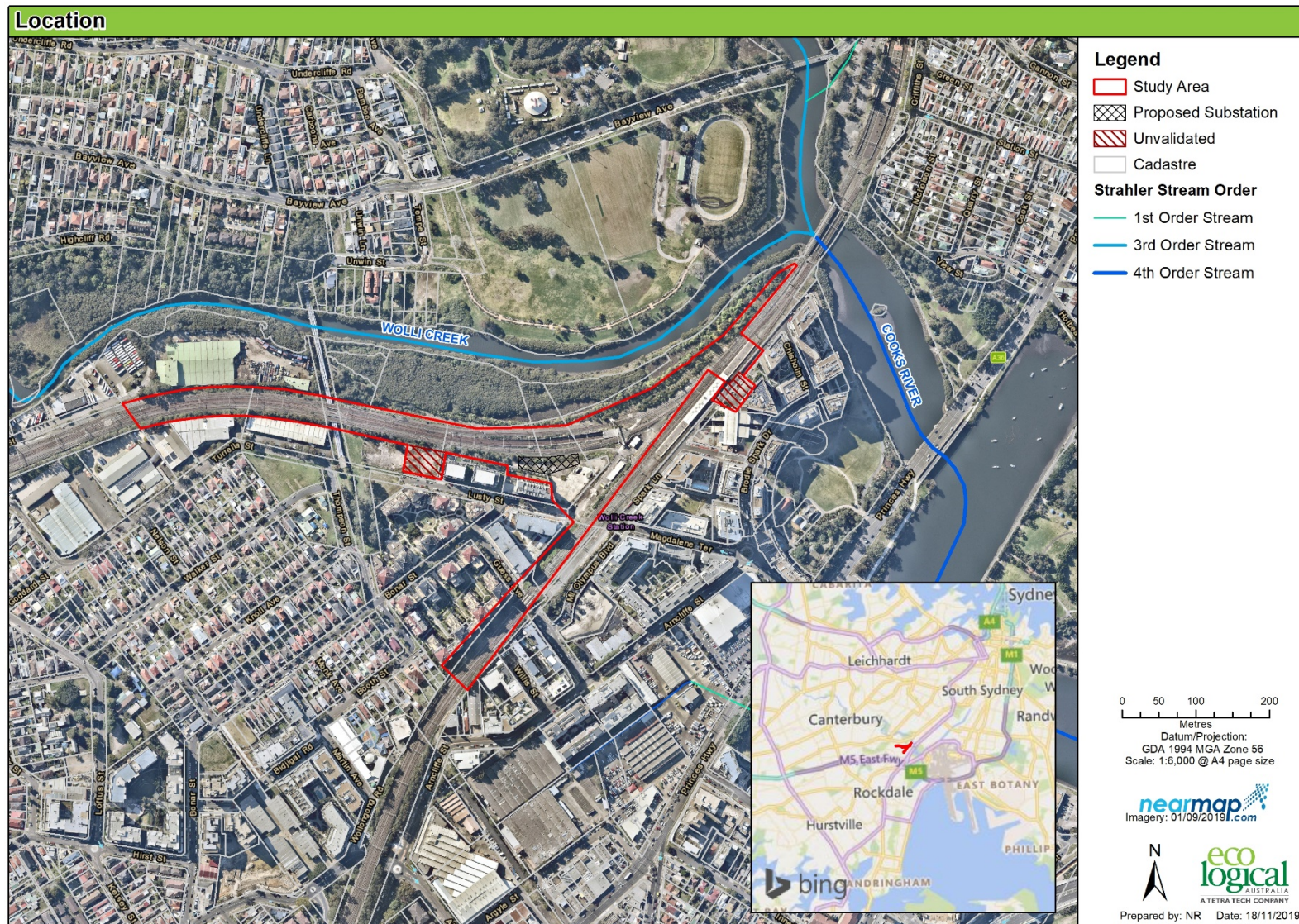


Figure 1: Location of the study area

2. Legislative context

Table 1: Legislative context.

Name	Relevance to the project	Section
Commonwealth		
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	<p>The EPBC Act aims to protect Matters of National Environmental Significance (MNES) including wetlands of international importance, threatened species and communities and listed migratory species. An action that may or is likely to have a significant impact on MNES should be referred to the Commonwealth to determine whether it is a Controlled Action that requires approval from the Commonwealth.</p> <p>MNES have been identified as having a potential to occur within the locality. This report assesses the likelihood of occurrence of MNES within the site and concludes that the development is not likely to have a significant impact on MNES.</p>	Section 5
State		
<i>Environmental Planning and Assessment Act 1979</i> (EP&A Act)	The EP&A Act establishes the system of environmental planning and assessment in NSW. The proposal will be assessed under Division 5.1 of the EP&A Act with Transport for NSW being both the proponent and determining authority.	Section 5
<i>Biodiversity Conservation Act 2016</i> (BC Act)	<p>The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development.</p> <p>Development or activities that have significant impacts on biodiversity values as set out in Part 7 of the BC Act and Part 7 of the <i>Biodiversity Conservation Regulation 2017</i> trigger the Biodiversity Offset Scheme (BOS). If a significant impact is determined for an activity assessed under Division 5.1 of the EP&A Act, the BOS can be opted in to or a Species Impact Statement can be prepared.</p> <p>A Test of significance for the impact on threatened species consistent with s7.3 of the Act was undertaken for the proposed work. A significant impact is unlikely to result.</p>	Section 5
<i>Fisheries Management Act 1994</i> (FM Act)	The objects of the FM Act are to conserve, develop and share the fishery resources of the State for the benefits of present and future generations. The Act provides protection and approval processes for activities which may impact on threatened species, protected marine vegetation or involve dredging, reclamation or obstruction of fish passage. No marine vegetation would be harmed and no consultation is required under the FM Act nor is a permit required.	N/A
<i>Biosecurity Act 2015</i> (BS Act)	The Act provides a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers. Whilst the Act provides for all biosecurity risks, implementation of the Act for weeds is supported by Regional Strategic Weed Management Plans (RSWMP) developed for each region in NSW. Appendix A of the Greater Sydney Regional Strategic Weed Management Plan identifies the priority weeds for control at a regional scale. A total of eight priority weeds were identified within the site (Appendix A).	Section 5
<i>Water Management Act 2000</i> (WM Act)	The purpose of the WM Act is the sustainable and integrated management of the state's water for the benefit of both present and future generations. If a 'controlled activity' is proposed on 'waterfront land', an approval is required under the WM Act (s91). The project does not involve works on waterfront land. The proponent is a public	N/A

Name	Relevance to the project	Section
	authority, and as such controlled activity approvals are not required for any impacts on waterfront land.	
<p><i>Coastal Management Act 2016</i></p>	<p>This Act provides for the protection of the coastal environment for the benefit of both present and future generations. It divides the coastal zone into four coastal management areas (coastal wetlands and littoral rainforests area; coastal vulnerability area; coastal environment area; and coastal use area).</p> <p>The Wolli Creek section of the Proposal Area is located:</p> <ul style="list-style-type: none"> • adjacent to land mapped as 'Coastal Wetlands' • on land mapped as 'Coastal Use Area' • on land mapped as 'Proximity Area for Coastal Wetlands' • on land mapped as 'Coastal Environment Area'. <p>Section 23 of the Act requires public authorities to have regard to coastal management programs when exercising their functions. The proposal area is located in the area that would be subject to the Cooks River Catchment Coastal Management Program when it is finalised. That coastal management program is still within a "scoping stage".</p>	<p>Section 5</p>
<p>Planning Instruments</p>		
<p>State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017</p>	<p>The aims of this Policy are to protect the biodiversity values of trees and other vegetation in non-rural areas of the State, and to preserve the amenity of non-rural areas of the State through the preservation of trees and other vegetation. The State Environmental Planning Policy (SEPP) does not apply to clearing which is authorised under other legislation as listed in section 600 of the <i>Local Land Services Act 2013</i>. This includes clearing authorised by a development consent under Part 4 of the EP&A Act and clearing carried out by a determining authority under Division 5.1 of the EP&A Act.</p>	<p>N/A</p>
<p>State Environmental Planning Policy (Coastal Management) 2018</p>	<p>The aim of this Policy is to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the <i>Coastal Management Act 2016</i>, including the management objectives for each coastal management area.</p> <p>The proposed development is located on land mapped under the SEPP as coastal environment area, proximity area for coastal wetlands and coastal use area. Clauses 11, 13 and 14 of the Coastal Management SEPP. This SEPP has been considered in the Review of Environmental Factors.</p>	<p>Section 5</p>

3. Methods

3.1 Literature and data review

The following information and data sources were reviewed prior to the field survey:

- BioNet Atlas (OEH 2019a)
- EPBC Act Protected Matters Search Tool (DotEE 2019)
- NSW Threatened Species Profiles (OEH 2019b)
- Native Vegetation Maps of the Sydney Metropolitan Area v3.0 (OEH 2016)
- Rockdale Local Environmental Plan 2011
- 1:25,000 hydroline data.

Aerial photography of the study area and surrounds were also used to investigate the extent of native vegetation cover and landscape features in the study area.

The BioNet Atlas (10 kilometre radius) and Protected Matters Search Tool (10 kilometre radius) searches were performed around the co-ordinates (-33.927947) on 2 October 2019. The results of these searches were combined to produce a list of threatened flora, fauna and ecological communities considered likely to occur or utilise the study area. The likelihood of occurrence for each species was determined using recent records, the likely presence of suitable habitat and knowledge of the species ecology. A list of species (defined as “yes”, “likely” or having “potential”) was then used to inform the need for any targeted surveys. The terms for the likelihood of occurrence are listed in **Appendix B**.

3.2 Field survey

Field survey was conducted on 30 May 2019 and 27 September 2019 by ELA Ecologist Alex Gorey for a total of four person hours. Field survey covered a majority of the footprint, however the two areas mapped as ‘un-validated’ were not assessed (Figure 1; Figure 5). Weather conditions during both surveys were clear and sunny with temperatures ranging from 8.3 °C to 17.0°C and 14.4°C to 27.7°C respectively (BOM 2019). The study area was traversed on foot and focused on the following:

- validation of existing vegetation mapping, determining type, condition and extent
- identification of threatened flora and fauna habitat
- search for habitat bearing tree
- opportunistic fauna sightings
- assessment of vegetation present against ISCA criteria
- assessment of vegetation present against TfNSW offsetting guide.

Where the boundaries of vegetation communities differed from those mapped, they were modified using hard copy maps. A list of above ground vascular flora was collected and used to determine the vegetation community likely to be present, and its condition. Assessment against the ISCA ratings and the TfNSW offsetting guide was noted.

Where vegetation was mapped in un-validated portions of the study area, assumptions were made about the vegetation likely to be present. This was based on the following:

- aerial imagery
- previous vegetation mapping (OEH 2016)
- historical disturbance.

Where a canopy was identified using aerial imagery, this was compared to historical images obtained from nearmap (2019) to determine how long the canopy had been present. This was cross-referenced with google street view (where available) and previous vegetation mapping (OEH 2016). Where aerial imagery and google street view pre-2018 showed no canopy present and the latest aerial imagery showed a canopy present (September 2019) the vegetation was mapped as planted native and exotic.

3.2.1 Threatened flora and fauna habitat assessment

The presence of threatened fauna species identified as having potential to occur in the study area was determined through a habitat assessment. If important habitat features, such as hollow bearing trees or deep leaf litter were observed, their location was noted. Hollow bearing trees, if present were marked spatially using a handheld GPS unit.

3.2.2 ISCA Ecological Value Assessment criteria

During field survey, all native vegetation present was assessed against the ISCA Ecological Values criteria. The aim of the assessment was to determine the current ecological value of the site versus the future ecological value of the site. The assessment included consideration of:

- presence of threatened ecological values in the study area
- the type of ecological values present in the study area
- the extent to which ecological values would be retained or affected
- habitat connectivity.

Assessment of the criteria was noted during the survey. The Ecological Value Calculator was then applied to all vegetation polygons within the study area that would be affected.

3.2.3 TfNSW Offsetting Guide

The TfNSW offsetting guide was applied after the completion of field work and once the vegetation mapping was complete. The proposed footprint was overlaid onto the vegetation mapping to identify areas where native vegetation would be removed. Where exotic trees were present that would be removed, the Vegetation Offset Guide for Trees was applied.

Once the type of vegetation to be removed was determined, the TfNSW Vegetation Offset Calculator was applied to determine what offsets would be required.

3.2.4 Survey limitations

Targeted survey for threatened flora and fauna species considered likely to occur was not conducted during the field survey. Instead, a habitat assessment of habitat features was undertaken to determine the suitability of the study area to provide habitat. This was considered sufficient to assist in determining whether any threatened species were likely to be present and inform the potential requirements for impact assessments and pre-clearance and clearance surveys prior to works commencing. Some portions of the site were inaccessible and survey was conducted using binoculars from nearby areas. The entire study area was not surveyed. Assumptions have been made about the vegetation likely to be present, based on aerial photography, previous vegetation mapping and historical disturbance.

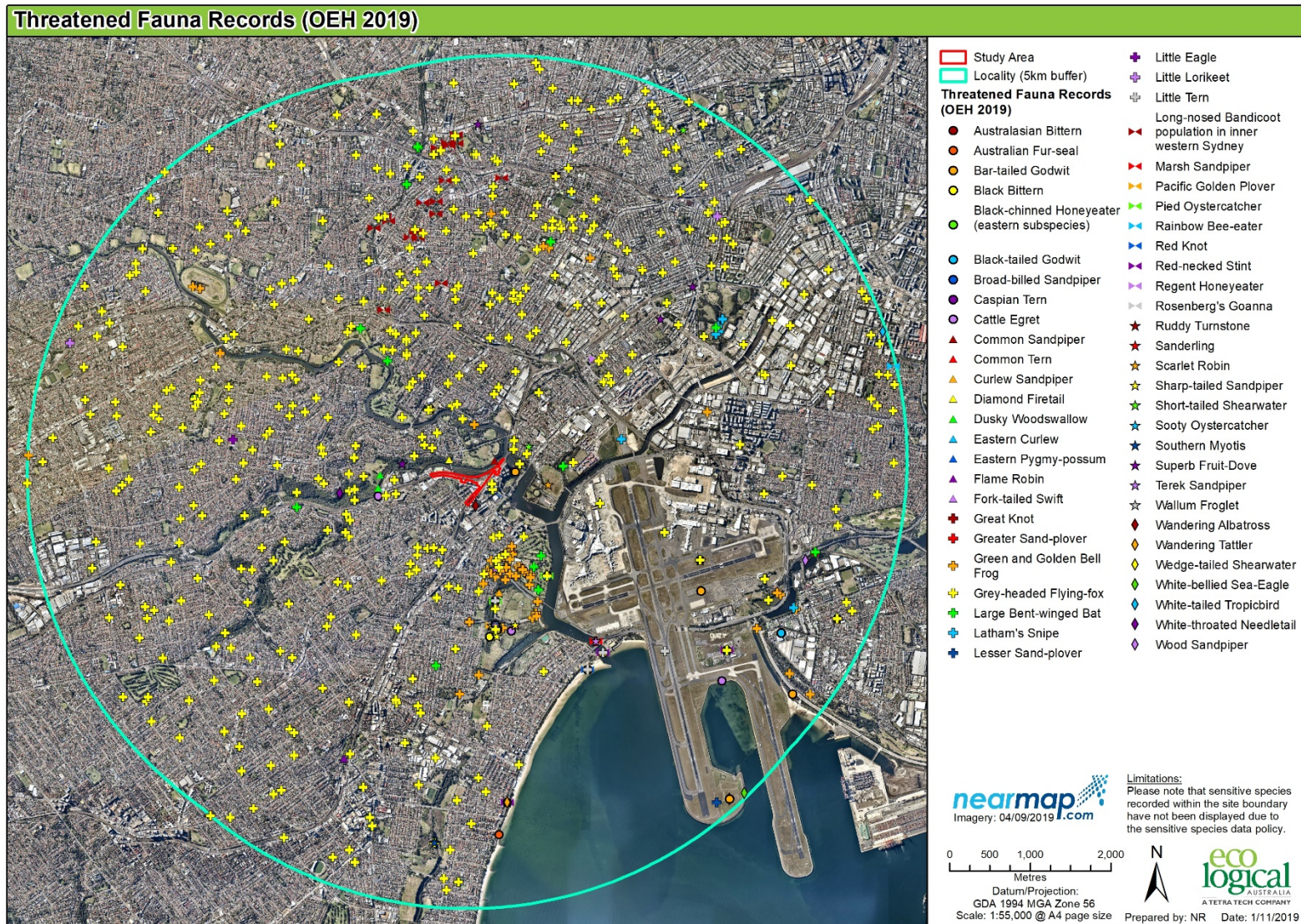


Figure 2: Threatened fauna species records within a 5 kilometre radius of the study area

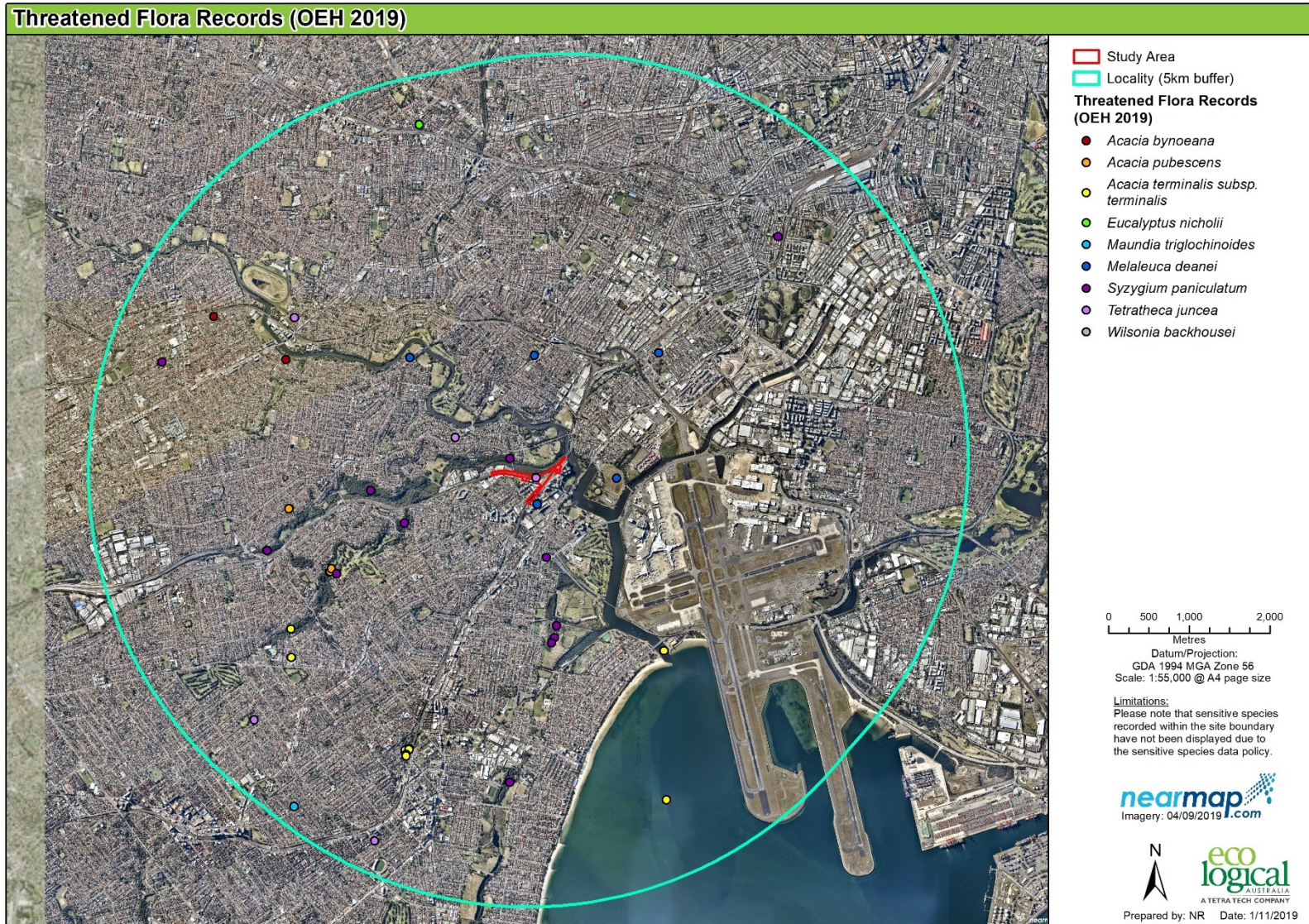


Figure 3: Threatened flora records within a 5 kilometre radius of the study area

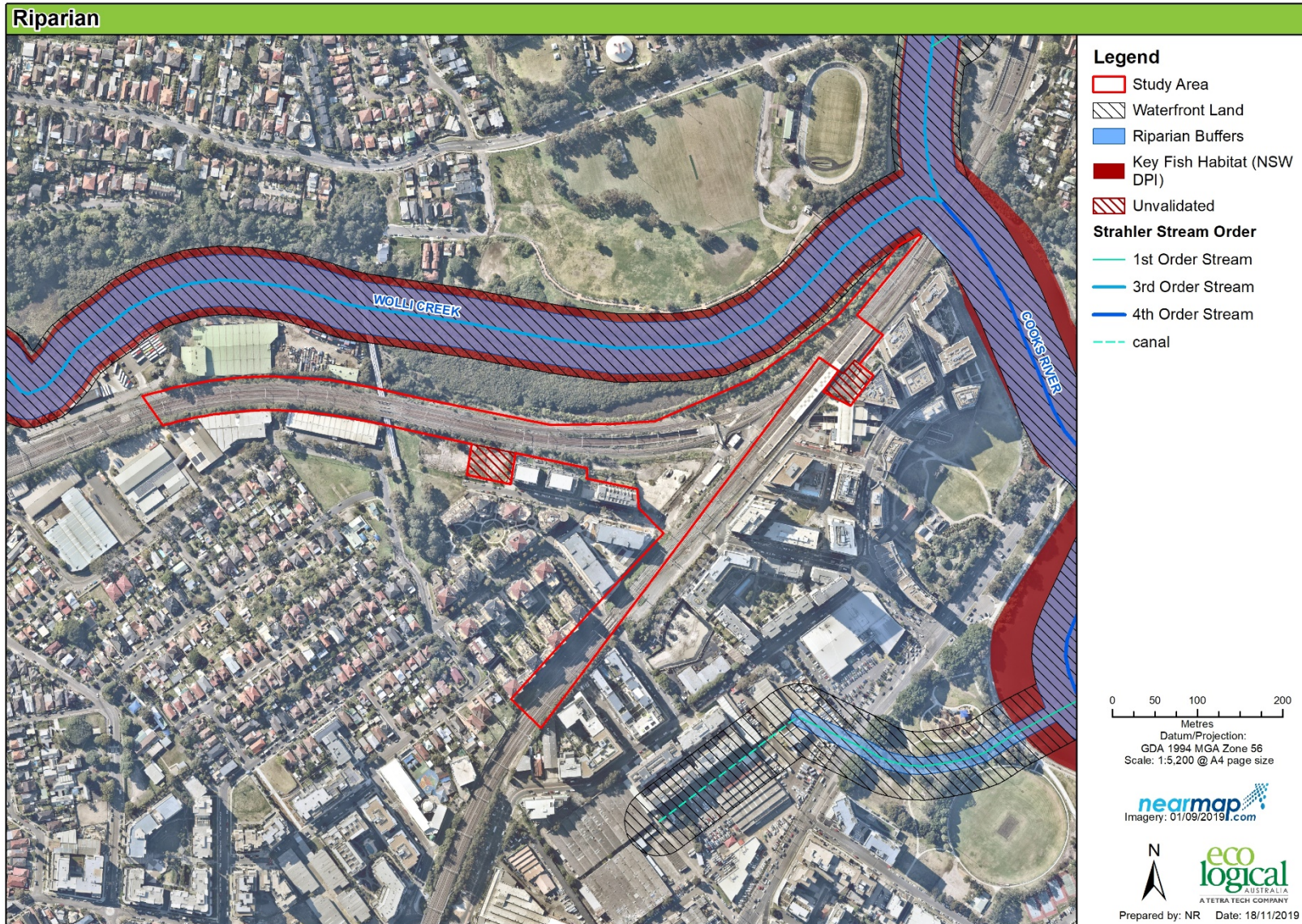


Figure 4: Strahler mapped streams, waterfront land, riparian corridors and Key Fish Habitat adjacent to the study area

4. Existing environment

4.1 Literature and data review

The literature and data review returned 22 threatened flora, 48 threatened fauna (including migratory species) and three threatened ecological communities either known or considered likely to occur within a 10 kilometre radius of the study area. The threatened fauna species *Pteropus poliocephalus* (Grey-headed Flying-fox) has been previously recorded immediately adjacent to the study area. There are no threatened fauna species previously recorded within the study area. One threatened flora species; *Tetratheca juncea* (Black-eyed Susan) was previously recorded within the study area. The record is from 1886 (OEH 2019a).

The study area is adjacent to Wolli Creek and Cooks River (Figure 4).

4.1.1 Vegetation mapping

Two vegetation communities were previously mapped within the study area with large areas not containing any previous mapping (OEH 2016):

- Estuarine Mangrove Forest
- Weeds and Exotics.

4.2 Field survey

4.2.1 Vegetation validation

Field survey confirmed the presence of three vegetation communities in the study area and one additional feature:

- Coastal Sandstone Foreshores Forest (0.47 hectares)
- Planted native and exotic (0.57 hectares)
- Exotic cover (0.35 hectares)
- Hardstand surfaces (4.66 hectares).

No threatened ecological communities were identified in the study area during survey (Figure 5).

Coastal Sandstone Foreshores Forest

Coastal Sandstone Foreshores Forest is found on sheltered sandstone slopes along the foreshores of Sydney's major waterways and coastal escarpments. It is an open forest with a moist shrub layer and a ground cover of ferns, rushes and grasses. The flora of this community has a maritime influence given its exposure to prevailing sea breezes. The canopy can be dominated by pure stands of Smooth-barked Apple (*Angophora costata*), though more regularly this is found in combination with other tree species. Localised patches of Bangalay (*Eucalyptus botryoides*) and coast banksia (*Banksia integrifolia*) occur closest to the coast, whereas Sydney Peppermint (*Eucalyptus piperita*) and Blackbutt (*Eucalyptus pilularis*) prefer more protected locations and in the case of the latter some minor shale enrichment in the soil.

A prominent layer of hardy mesic small trees and shrubs is present. These include Sweet Pittosporum (*Pittosporum undulatum*), Cheese Tree (*Glochidion ferdinandi*) and Blueberry Ash (*Elaeocarpus reticulatus*). This forest is restricted to sandstone soils derived from either Hawkesbury or Narrabeen geology. The distribution is coastal and requires a combination of low elevation (between two and 45 metres above sea level) and mean annual rainfall that exceeds 1,100 millimetres per annum. Samples are situated up to 10 kilometres from the coastline, but still in proximity to major waterways.

Field survey confirmed the presence of Coastal Sandstone Foreshores Forest in two conditions: moderate condition and regrowth.

Where the community was in moderate condition the canopy was absent. The midstorey was diverse and contained *Banksia integrifolia* (Coast Banksia), *Allocasuarina littoralis* (Black She-oak), *Indigofera australis* (Australian Indigo), *Melaleuca ericifolia*, *Melaleuca linariifolia*, *Melaleuca nodosa*, *Pittosporum undulatum* (Native Daphne) and *Banksia serrata* (Old Man Banksia). The groundcover was dominated by exotic species including *Asparagus aethiopicus* (Ground Asparagus), *Conyza bonariensis* (Flaxleaf Fleabane), *Ageratina adenophora* (Crofton Weed) and *Chloris gayana* (Plump Windmill Grass). Where native species were present, they were scattered in occurrence and included *Imperata cylindrica* (Blady Grass), *Dianella revoluta* and *Lomandra longifolia* (Spiny-headed Mat-rush) (Figure 6).

Where the community existed as regrowth, the patches did not contain a canopy and contained limited midstorey species with an exotic groundcover. Midstorey species present were limited to *Pittosporum undulatum*, *Melaleuca linearifolia* and *Melaleuca styphelioides*. The groundcover was dominated by *Cenchrus clandestinus* (Kikuyu) and *Chloris gayana* (Figure 7).

Planted native and exotic cover

Planted Native and Exotic cover occurred along the edges of the rail corridor closest to the existing platforms at Wolli Creek. The species present included *Callistemon citrinus* (Crimson Bottlebrush), *Casuarina glauca* (Swamp Oak), *Populus nigra* (Lombardy Poplar), *Acacia longifolia*, *Acacia mearnsii* (Black Wattle) and *Phoenix canariensis* (Canary Island Date Palm). The groundcover was dominated by *Cenchrus clandestinus* (Kikuyu) and *Bidens pilosa*¹² (Beggar's Ticks) (Figure 8).

Exotic cover

The exotic cover in the study area consisted of exotic groundcover species. Areas mapped as exotic cover were dominated by *Cenchrus clandestinus*, *Cynodon dactylon* (Couch), *Andropogon virginicus* (Whisky Grass) and *Chloris gayana* (Figure 9).

Hardstand surfaces

Hardstand surfaces were mapped as all areas of existing rail infrastructure and concrete within the study area (Figure 10).



Figure 5: Validated vegetation communities (ELA 2019)



Figure 6: Coastal Sandstone Foreshores Forest in moderate condition in the study area (ELA 2019)



Figure 7: Coastal Sandstone Foreshores Forest as regrowth in the study area (ELA 2019)



Figure 8: Planted native and exotic cover in the study area (ELA 2019)



Figure 9: Exotic cover in the study area (ELA 2019)



Figure 10: Hardstand surfaces in the study area (ELA 2019)

4.2.2 Threatened flora and fauna habitat assessment

The study area lacked habitat features beyond the native vegetation present. No habitat trees were identified during survey. There were no water bodies, riparian corridors, areas of good leaf litter, rocky outcrops or caves in the study area. The study area is close to Wolli Creek and Cooks River. The native vegetation in the study area may provide foraging habitat for the following threatened fauna species:

- *Pteropus poliocephalus* (Grey-headed Flying-fox) – vulnerable under the BC Act and EPBC Act.

There are no habitat features in the study area that would provide roosting or breeding habitat for this species, given there are no camps in the study area. There is, however, a camp 500 metres to the west of the study area. This camp when last recorded contained 500 – 2,499 individuals. The native vegetation in the study area would likely provide an occasional foraging resource for the Grey-headed Flying-fox.

The previous record for *Tetratheca juncea* – vulnerable under the BC Act and EPBC Act, is located in the middle of the rail corridor on hardstand surfaces. The record is from 1886 and the plant was not found during survey. The study area is highly unlikely to provide any potential habitat for this species given the extensive history of disturbance since the construction of the T8 Airport Line in 2000 (Figure 3).

4.3 Streams and waterways

The study area is adjacent to Wolli Creek which is mapped as a third order stream. Wolli Creek connects to the Cooks River at the eastern extent of the study area, which is mapped as a fourth order stream. Wolli Creek and Cooks River require a 60 metre vegetated riparian buffer and 40 metre riparian buffer respectively. No impacts are proposed to either stream or their respective riparian corridors. Both streams are mapped as Key Fish Habitat. The study area is outside the Key Fish Habitat.

The study area is also mapped under the Coastal Management SEPP as a coastal environment area, proximity to coastal wetlands area and a coastal use area. The provisions of the SEPP have been discussed in Section 5.5.

4.4 ISCA Ecological Values Assessment Criteria

The Ecological Value Calculator was applied, based on the assumption that all vegetation within the study area would be removed (Figure 11, Figure 13). This assumption included that no vegetation would be retained or enhanced within the study area. One ecologically sensitive habitat was identified in the study area during survey, as per the definition in the ISCA Technical Manual (ISCA 2016). The native vegetation was within 100 metres of land that contributes to whole of landscape conservation outcomes along Wolli Creek. Coastal Sandstone Foreshores Forest and Planted native and exotic cover were included within this category, as they form native vegetation in the study area.

The study area achieved a score of 0.12 before construction and a score of 0.00 after construction and a change in ecological value of -0.116 which resulted in 0 points being achieved. A habitat connectivity score of 0 was applied to the study area. The vegetation present did not meet any of the 'degree of connectivity' classes as it was <50 metres wide and did not form part of several links to other native vegetation.

4.5 TfNSW Offsetting Guide

The vegetation in the study area was divided into two categories based on vegetation type and condition (Figure 11, Figure 14). One offsetting calculator was applied to Coastal Sandstone Foreshores Forest in moderate and regrowth condition because the structure of the patches was similar, with most differences being in the species diversity. One offsetting calculator was applied to planted native and exotic cover. This is because this community contained a mature overstorey. The calculators were run based on all communities forming a patch of native vegetation, as each patch met the definition of 'native vegetation' as per the offsetting guide.

The primary offset ratio for Coastal Sandstone Foreshores Forest in moderate and regrowth condition to be removed was applied to an area of 0.47 hectares which determined an offset ratio of 2.20 based on the assumptions in Figure 11.

The primary offset ratio for planted native and exotic cover to be removed was applied to an area of 0.57 hectares which determined an offset ratio of 2.60 based on the assumptions in Figure 12.

It was assumed that there are no primary offset sites identified for the proposed work, and as such the tool determined that primary offsetting is not available. When primary offsets are not available, Group 1 secondary offsets are required at the primary offsetting ratio. Where this is not possible, group 2 and / or group 3 offsets are required.

Overall Percentage of Native Species to be removed?	40-59%
Are there any medium-large (>30cm DBH) trees to be removed?	No
Does the overstorey to be removed contain native species?	No
Does the mid-canopy in the remnant to be removed contain native species?	Yes
Does the understorey to be removed contain native species?	Yes
Is the remnant to be removed connected to other vegetation?	Yes
Are there any endangered Ecological Communities to be removed?	No
What is the average number of hollow-bearing trees to be removed (per 1000m ²)?	0 per 1000m ²
What is the average length of fallen timber (>10cm diameter) to be removed (per 1000m ²)?	0-5m
What is the average leaf litter and detritus cover to be removed?	0-10%

Figure 11: TfNSW offsetting tool assumptions for Coastal Sandstone Foreshores Forest in moderate and regrowth condition

Overall Percentage of Native Species to be removed?	20-39%
Are there any medium-large (>30cm DBH) trees to be removed?	Yes
Does the overstorey to be removed contain native species?	Yes
Does the mid-canopy in the remnant to be removed contain native species?	Yes
Does the understorey to be removed contain native species?	Yes
Is the remnant to be removed connected to other vegetation?	Yes
Are there any endangered Ecological Communities to be removed?	No
What is the average number of hollow-bearing trees to be removed (per 1000m ²)?	0 per 1000m ²
What is the average length of fallen timber (>10cm diameter) to be removed (per 1000m ²)?	0-5m
What is the average leaf litter and detritus cover to be removed?	0-10%

Figure 12: TfNSW offsetting tool assumptions applied to planted native and exotic cover in the study area

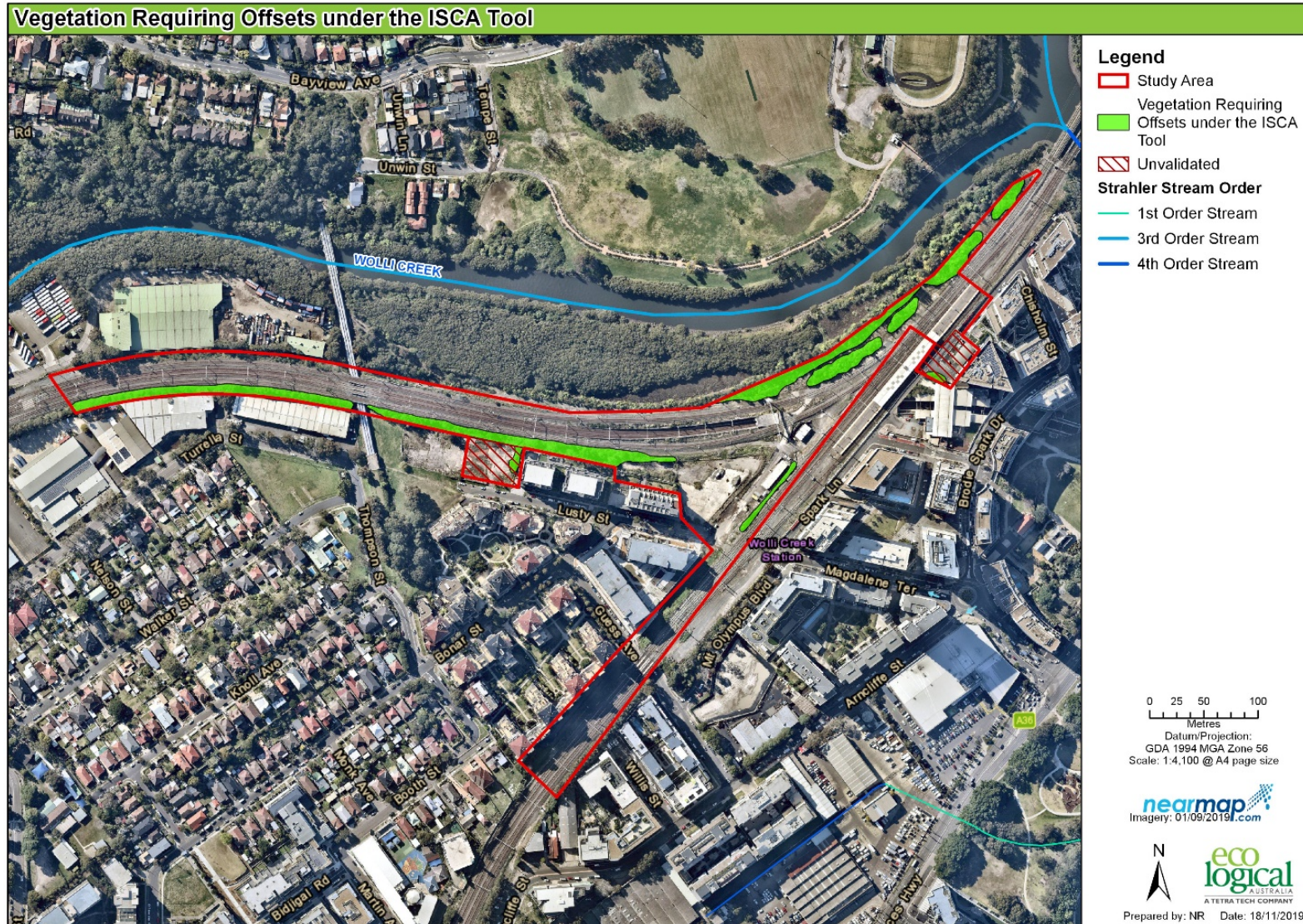


Figure 13: Vegetation requiring offsets under the ISCA Tool



Figure 14: Vegetation requiring offsets under the TfNSW offsetting guide

5. Impact Assessment

5.1 Summary of impacts

5.1.1 Direct impacts

The proposal will result in the removal of Coastal Sandstone Foreshores Forest and foraging habitat for the Grey-headed Flying-fox (Table 2). No threatened ecological communities, flora or endangered populations would be affected as part of the works.

Table 2: Values that will be affected in the study area

Value	Affected (ha)
Coastal Sandstone Foreshores Forest Moderate	0.34
Coastal Sandstone Foreshores Forest Regeneration	0.13
Planted Native and Exotic cover	0.57
Exotic cover	0.35
Total	1.39
Foraging habitat for the Grey-headed Flying-fox	1.04

5.1.2 Indirect impacts

Indirect impacts associated with the proposal include:

- temporary increases in noise during construction
- permanent increase in noise resulting from the operation of fixed facilities
- increased movement of dust, soil and plant material during construction and operation
- temporary increase in light pollution.

5.1.3 Key threatening processes

One key threatening process, clearing of native vegetation, is associated with the proposal.

5.2 NSW BC Act s7.3 Test of Significance

If a species, population or ecological community listed under Schedules 1 or 2 of the BC Act is likely to be affected, the factors set out to establish if there is likely to be a significant impact on that species, population, ecological community or habitat, must be assessed. Section 7.3 of the BC Act sets out five factors that must be addressed as part of a Test of Significance. This enables a decision to be made as to whether there is likely to be a significant impact on the species and the BOS or a Species Impact Statement is triggered.

5.2.1 Threatened ecological communities

No threatened ecological communities were identified in the study area during survey. No tests of significance have been applied.

5.2.2 Threatened flora

The previous record for *Tetratheca juncea* is located in the middle of the rail corridor on hardstand surfaces. The record is from 1886 and was not identified during survey. The study area is highly unlikely to provide any potential habitat for this species given the extensive history of disturbance since the construction of the T8 Airport Line in 2000. No tests of significance have been applied.

5.2.3 Threatened fauna

The Grey-headed Flying-fox was considered likely to utilise the study area for foraging on an occasional basis given the proximity of the Turrella camp 500 m west of the study area. The test of significance concluded that a significant impact to the Grey-headed Flying-fox was unlikely to occur. The test of significance also assessed indirect impacts likely to result from the proposed development. These are considered unlikely to significantly affect this species.

5.3 EPBC Act Impact Assessment

The EPBC Act establishes a process for assessing the environmental impact of activities and developments where Matters of National Environmental Significance (MNES) may be affected. Under the Act, any action which “has, will have, or is likely to have a significant impact on a MNES” is defined as a controlled action and requires approval from the Commonwealth Department of the Environment and Energy (DotEE).

The process includes the application of Significant Impact Criteria for listed MNES that will be affected as a result of the proposed action. Impact assessment guidelines outline a number of criteria to provide assistance in conducting the assessment and help decide whether a referral to the Commonwealth is recommended. These guidelines were used in applying the Significant Impact Criteria.

5.3.1 Threatened ecological communities

No threatened ecological communities were identified in the study area during survey. No significant impact criteria were applied.

5.3.2 Threatened flora

The previous record for *Tetratheca juncea* is located in the middle of the rail corridor on hardstand surfaces. The record is from 1886 and was not identified during survey. The study area is highly unlikely to provide any potential habitat for this species given the extensive history of disturbance since the construction of the T8 Airport Line in 2000. No significant impact criteria were applied.

5.3.3 Threatened fauna

One threatened fauna species, *Pteropus poliocephalus* (Grey-headed Flying-fox), was considered likely to utilise the subject site for foraging habitat on an occasional basis. The significant impact criteria were applied with respect to this species and concluded that a significant impact is unlikely to occur. The significant impact criteria also assessed indirect impacts likely to result from the proposed development. These are considered unlikely to significantly affect this species.

5.4 Key Fish Habitat

The development footprint has been designed to avoid any impacts to Key Fish Habitat. No further assessment is required. Any indirect impacts to Key Fish Habitat would be managed via the mitigation

measures in section 6. No marine vegetation would be harmed and no consultation is required under the FM Act nor is a permit required.

5.5 Coastal Management SEPP 2018

The study area is covered by the Coastal Management SEPP and is partially mapped as a proximity area for coastal wetlands, coastal environment area and coastal use area. The development footprint does not impact any areas mapped as Coastal Wetland or Littoral Rainforest. The applications of the Coastal Management SEPP are discussed in the Review of Environmental Factors. As such no further discussion regarding the application of the SEPP is included as part of this assessment.

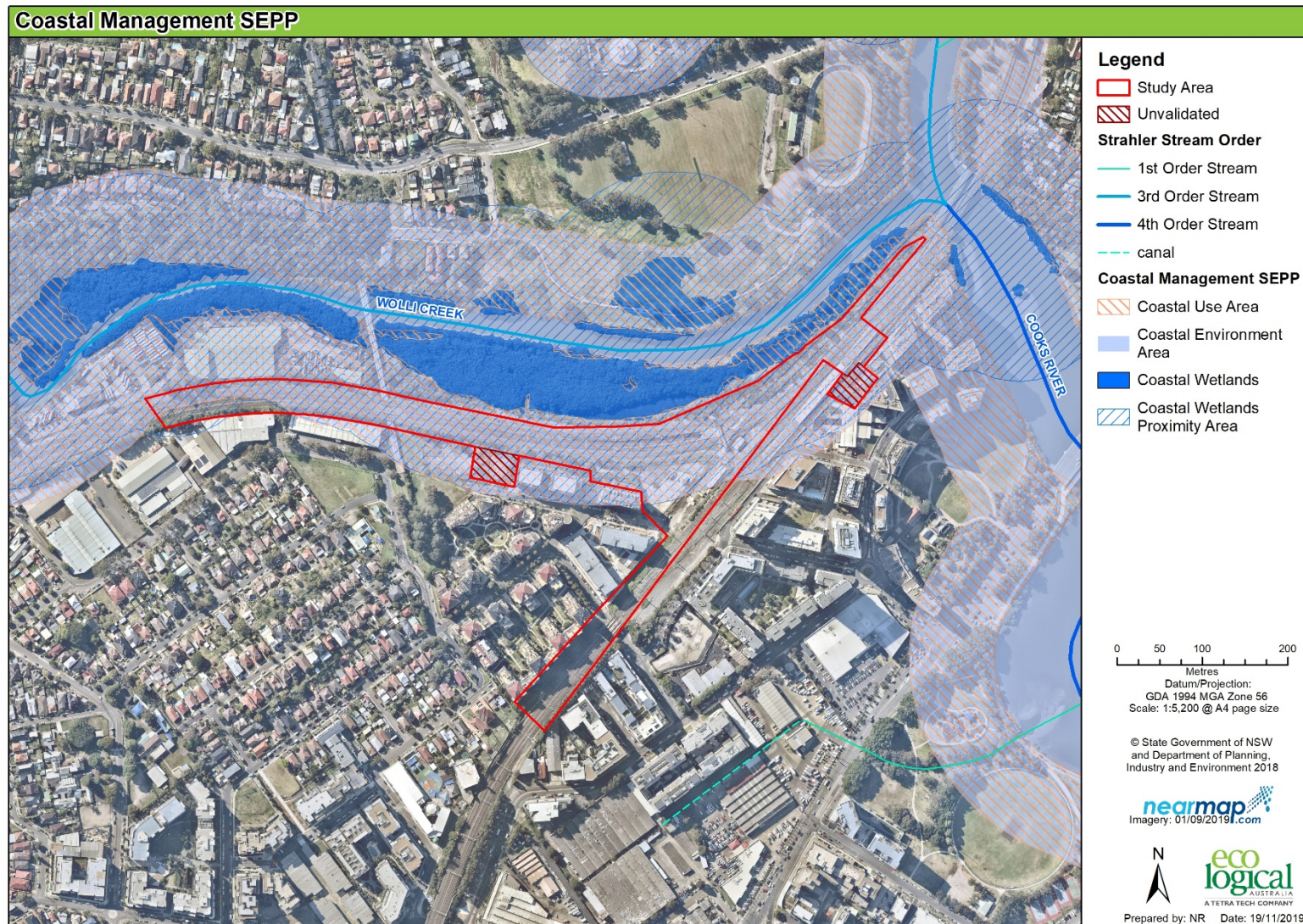


Figure 15: Coastal Management SEPP

6. Recommendations

To minimise the potential impacts on the study area and improve environmental outcomes, the following recommendations for impact mitigation have been provided. It is suggested that these recommendations form part of the Review of Environmental Factors.

6.1 Documentation and guidelines

- Works within the corridor should be consistent with the following guidelines:
 - Vegetation Management (Protection and Removal) Guidelines (TfNSW 2019)
 - Weed Management and Disposal Guideline (TfNSW 2019)
 - Offsets should be secured consistent with the TfNSW Offsetting Guideline (2016)
 - Potential offset requirements or retention of some native vegetation present should be considered in relation to the ISCA tool metrics.

6.2 Sediment and Erosion Control Measures

- Develop a Construction Environmental Management Plan (CEMP) with relevant mitigation measures to minimise potential impacts to biodiversity values within the study area and outside of the study area. The CEMP should include:
 - Sediment and Erosion Control Plan
 - the establishment of clearly defined areas, such as the works area and any 'no-go' areas within/adjacent to work site boundaries that are not to be in any way disturbed or damaged by the works, particularly adjacent to vegetation to be retained and Wolli Creek
 - construction fencing prior to and during construction to ensure that construction related impacts are contained within the construction areas
 - sediment fencing should be placed 2 metres either side of the construction footprint (where possible)
 - surface runoff should be diverted away from areas of soil disturbance and away from Wolli Creek
 - prevent tracking of soils / sediments from work site to roadways, footpaths and drainage lines as a result of work vehicle / machinery movement
 - vehicle and machinery movement will be confined to designated tracks and work areas
 - any washing of concrete must be consistent with the TfNSW Concrete Washout Guideline (2019)
 - the site-specific CEMP must include instructions for dealing with orphaned or injured native animals and include the contact details for the NSW Wildlife Information, Rescue and Education Service Inc. (WIRES).
- Drainage should be controlled in the impact areas consistent with the *Protection of the Environment Operations Act 1997* requirements to avoid impacts on downstream habitats, and ecological communities.

6.3 During construction

- Ensure fertilisers, turf, mulch, weeds and imported soils are not unintentionally introduced into bushland areas adjacent to the rail corridor (i.e. through natural drainage pathways or general proximity).
- Temporary tree protection measures (such as machinery exclusion zones from tree roots and tree trunk protection) must be in place for any retained trees and to protect adjacent native vegetation during all construction works. High visibility orange bunting must be placed at a 1 metre distance from the trunk of the tree with “no-go” signage attached.
- No chemicals or rubbish must be allowed to escape the construction area.
- All chemicals must be correctly stored within bunding.
- Works must be stopped if any threatened species are discovered during works.
- Equipment, heavy machinery and materials must be situated in designated lay-down areas in portions of cleared land where they are least likely to cause erosion or damage vegetation.
- Work vehicle access must be restricted to designated work areas and existing formed access tracks/roadways.
- Weed removal must be undertaken using mechanical and manual means, and if herbicides are required use must follow the prescriptions on the label. Herbicide use should be restricted within proximity to the creek.

7. Conclusion

ELA was engaged by AECOM on behalf of TfNSW to provide a FFA Report for the proposed Wolli Creek Substation and T8 Airport Line Power Supply Upgrade as part of the More Trains, More Services Program. ELA understands that this FFA report will form part of a REF and be assessed under Division 5.1 of the EP&A Act. This report also addresses the BC Act and the EPBC Act. TfNSW Vegetation Offset Guide and the ISCA offsetting guide were also applied to the proposed impacts to vegetation within the project footprint.

The proposed project footprint is mostly contained within the rail corridor. The footprint contains existing hardstand surfaces, native vegetation and rail infrastructure. Field survey identified one native vegetation community as present in the study area; Coastal Sandstone Foreshores Forest in moderate condition. This community does not form part of a threatened ecological community. The study area also contained a regrowth form of this community present as scattered shrubby regrowth. This community was considered to form opportunistic regrowth following the clearing of portions of the site for the installation and construction of rail infrastructure and associated maintenance.

The study area also contained planted native and exotic cover, neither of which form part of a native ecological community. The remainder of the study area was comprised of hardstand infrastructure, namely rail infrastructure and concrete. The proposed project footprint is immediately adjacent to Wolli Creek.

No threatened flora or fauna species were identified in the study area during survey, however the native vegetation present may provide foraging habitat for *Pteropus poliocephalus* (Grey-headed Flying-fox) listed as vulnerable under the BC Act and EPBC Act.

A test of significance under the BC Act was applied to this species and concluded that the proposal is unlikely to constitute a significant impact. The Significant Impact Criteria under the EPBC Act were applied with respect to the Grey-headed Flying-fox and concluded that a significant impact is unlikely to occur.

Offsets for impacts to native vegetation will be required under the TfNSW Vegetation Offsetting Guide. The vegetation within the study area was split into two categories, based on vegetation formation and structure. Offsets for Coastal Sandstone Foreshores Forest in moderate condition and regrowth (0.47 hectares) were calculated individually, and offsets for planted native and exotic cover (0.57 hectares) was calculated. Offset ratios of 2.20 and 2.60 respectively, were determined.

The study area achieved a score of 0.12 before construction and a score of 0.00 after construction and a change in ecological value of -0.116 which resulted in 0 points being achieved.

8. References

Bureau of Meteorology, 2019. *Climate statistics for Australian locations*. Available from:
<http://www.bom.gov.au/climate/data/>

Department of the Environment and Energy 2019. *Species Profile and Threats Database*. Available at:
<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Infrastructure Sustainability Council of Australia (ISCA) 2016. *ISCA Ecological Values Criteria*. Available at https://www.isca.org.au/is_v1_2_operations

Office of Environment and Heritage (OEH) 2016. *The Native Vegetation of the Sydney Metropolitan Area v3.0*.

Office of Environment and Heritage (OEH) 2019a. *Atlas of NSW Wildlife*. Wildlife Data Unit, OEH, Parramatta NSW. Available at:
http://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx

Office of Environment and Heritage (OEH) 2019b. *Threatened Species Profiles*
<http://www.threatenedspecies.environment.nsw.gov.au/index.aspx>

Transport for NSW (TfNSW) 2016. *Vegetation Offsetting Guide 9TP-SD-087*.

Appendix A - Flora and fauna species recorded in the study area

Scientific name	Common Name	Exotic/ Native
<i>Acacia longifolia</i>	Sydney Golden Wattle	N
<i>Acacia mearnsii</i>	Black Wattle	N
<i>Ageratina adenophora</i>	Crofton Weed	E*
<i>Allocasuarina littoralis</i>	Black She-oak	N
<i>Andropogon virginicus</i>	Whisky Grass	E
<i>Asparagus asparagoides</i>	Bridal Creeper	E*
<i>Asparagus aethiopicus</i>	Ground Asparagus	E*
<i>Banksia integrifolia</i>	Coast Banksia	N
<i>Banksia serrata</i>	Old-man Banksia	N
<i>Bidens subalternans</i>	Greater Beggar's Ticks	E
<i>Briza maxima</i>	Quaking Grass	E
<i>Bromus catharticus</i>	Prairie Grass	E
<i>Bursaria spinosa</i>	Blackthorn	N
<i>Callistemon citrinus</i>	Crimson Bottlebrush	N
<i>Casuarina glauca</i>	Swamp Oak	N
<i>Celtis</i> spp.		E
<i>Cenchrus clandestinus</i>	Kikuyu Grass	E
<i>Cestrum parqui</i>	Green Cestrum	E
<i>Chloris gayana</i>	Rhodes Grass	E
<i>Cinnamomum camphora</i>	Camphor Tree	E
<i>Cirsium vulgare</i>	Spear Thistle	E*
<i>Conyza bonariensis</i>	Flax-leaf Fleabane	E
<i>Ehrharta erecta</i>	Panic Veldtgrass	E
<i>Eragrostis curvula</i>	African Lovegrass	E*
<i>Foeniculum vulgare</i>	Fennel	E
<i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton Bush	E
<i>Hakea sericea</i>	Needlebush	N
<i>Hibbertia scandens</i>	Climbing Guinea Flower	N
<i>Imperata cylindrica</i>	Blady Grass	N
<i>Indigofera australis</i>	Australian indigo	N
<i>Lantana camara</i>	Lantana	E*
<i>Lolium perenne</i>	Perennial Ryegrass	E
<i>Lomandra longifolia</i>	Honey-reed	N
<i>Medicago polymorpha</i>	Burr Medic	E

Scientific name	Common Name	Exotic/ Native
<i>Medicago sativa</i>	Lucerne	E
<i>Melaleuca ericifolia</i>	Swamp Paperbark	N
<i>Melaleuca linariifolia</i>	Flax-leaved Paperbark	N
<i>Melaleuca nodosa</i>	Prickly-leaved Paperbark	N
<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree	N
<i>Morus alba</i>	White Mulberry	E
<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive	E
<i>Passiflora</i> spp.	Passionfruit	E
<i>Phoenix canariensis</i>	Canary Islands date palm	E
<i>Pittosporum revolutum</i>	Wild Yellow Jasmine	N
<i>Pittosporum undulatum</i>	Native Daphne	N
<i>Plantago lanceolata</i>	Ribwort	E
<i>Populus nigra</i>	Lombardy Poplar	E
<i>Ricinus communis</i>	Castor Oil Plant	E
<i>Salix</i> spp.	Willow	E*
<i>Senecio madagascariensis</i>	Fireweed	E*
<i>Sida rhombifolia</i>	Paddy's Lucerne	E
<i>Stipa gigantea</i>	Giant Feather Grass	E
<i>Trifolium repens</i>	White Clover	E
<i>Tristaniopsis laurina</i>	Water Gum	N
<i>Verbena bonariensis</i>	Purpletop	E
<i>Vicia sativa</i>	-	E

* = priority weed / weed of national significance

Appendix B - Likelihood of occurrence

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the database search. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the site inspection and professional judgement. Some Migratory or Marine species identified from the Commonwealth database search have been excluded from the assessment, due to lack of habitat. The terms for likelihood of occurrence are defined below:

- “known” = the species was or has been observed on the site
- “likely” = a medium to high probability that a species uses the site
- “potential” = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- “unlikely” = a very low to low probability that a species uses the site
- “no” = habitat on site and in the vicinity is unsuitable for the species.

A test of significance was conducted for threatened species or ecological communities that were recorded within the study area or had a higher likelihood of occurring and were not recorded during the site visit. It is noted that some threatened fauna species that are highly mobile, wide ranging and vagrant may use portions of the study area intermittently for foraging. For these fauna species, the habitat present and likely to be impacted is not considered to be important to the threatened species, particularly in relation to the amount of similar habitat remaining in the surrounding landscape. As such, a test of significance in reference to State or Commonwealth legislation was not considered necessary.

Information provided in the distribution and habitat' column has primarily been extracted (and modified) from the Commonwealth Species Profile and Threats Database and the NSW Threatened Species Profiles.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
ECOLOGICAL COMMUNITIES						
Coastal Upland Swamps in the Sydney Basin Bioregion	-	E	E	Endemic to NSW and confined to the Sydney Basin Bioregion. It occurs in the eastern Sydney Basin from the Somersby district in the north (Somersby-Hornsby plateaux) to the Robertson district in the south (on the Woronora plateau). Occur primarily on impermeable sandstone plateaux with shallow groundwater aquifers in the headwaters and impeded drainage lines of streams, and on sandstone benches with abundant seepage moisture. Generally associated with acidic soils.	No	No – not identified in the study area during survey
Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of NSW and South East QLD	-	E	E	This community is found on the coastal floodplains of NSW. It has a dense to sparse tree layer in which <i>Casuarina glauca</i> (swamp oak) is the dominant species northwards from Bermagui. Associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Generally occurs below 20 m (rarely above 10 m) elevation. The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees.	No	No – not identified in the study area during survey
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	-	-	E	Generally confined to the Sydney Basin bioregion, including the Moss Vale, Ettrema, Burragorang, Sydney Cataract, and Wollemi IBRA sub-regions. However, some patches may extend into in the Kanangra and Oberon IBRA sub -regions of the South Eastern Highlands bioregion. Found on igneous rock (predominately Tertiary basalt and microsyenite). Typically occurs at elevations between 650 and 1050 m above sea level.	No	No – not identified in the study area during survey

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Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Anthochaera phrygia</i>	Regent Honeyeater	E4A	CE	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley regions. Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of <i>Casuarina cunninghamiana</i> (River Oak).	No	No – no suitable foraging habitat in the study area
<i>Apus pacificus</i>	Fork-tailed Swift	-	M	Recorded in all regions of NSW. Riparian woodland, swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes.	No	No – no suitable foraging habitat in the study area
<i>Ardenna tenuirostris</i>	Short-tailed Shearwater	-	M	Breeds on islands north to Broughton Island off NSW. Commonly observed south of coastal northern NSW during summer. Islands, offshore.	No	No – no suitable foraging habitat in the study area
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E1	E	Found over most of NSW except for the far north-west. Permanent freshwater wetlands with tall, dense vegetation, particularly <i>Typha</i> spp. (bullrushes) and <i>Eleocharis</i> spp. (spikerushes).	No	No – no suitable foraging habitat in the study area

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Calidris canutus</i>	Red Knot	-	E, M	Summer migrant to Australia. In NSW, widespread in suitable habitat along the coast. Occasionally recorded inland in all regions. Intertidal mudflats, sandflats sheltered sandy beaches, estuaries, bays, inlets, lagoons, harbours, sandy ocean beaches, rock platforms, coral reefs, terrestrial saline wetlands near the coast, sewage ponds and saltworks. Rarely inland lakes or swamps.	No	No – no suitable foraging habitat in the study area
<i>Calidris ferruginea</i>	Curlew Sandpiper	E1	CE, M	Occurs along the entire coast of NSW, and sometimes in freshwater wetlands in the Murray-Darling Basin. Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	No	No – no suitable foraging habitat in the study area
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	-	In NSW, distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. Isolated records known from as far north as Coffs Harbour and as far west as Mudgee. Tall mountain forests and woodlands in summer; in winter, may occur at lower altitudes in open eucalypt forests and woodlands, and urban areas.	Unlikely	No – lack of nearby records and negligible foraging habitat in the study area
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. Rainforest, sclerophyll forest (including Box-Ironbark), woodland and heath.	No	No – no suitable habitat present
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes. Wet and dry sclerophyll forests, Cyprus Pine	No	No – no suitable

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
				dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.		habitat present
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	Distribution in NSW is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, mallee and <i>Acacia</i> woodland.	Unlikely	No – no suitable habitat present
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E1	E	There are three main populations: Northern - southern Qld/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. Central and southern populations inhabit heath and open woodland with a heathy understorey. In northern NSW, habitat comprises open forest with dense tussocky grass understorey.	No	No – no suitable habitat present
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Qld. Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	No	No – no suitable habitat present
<i>Epthianura albifrons</i>	White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	E2	-	Two isolated sub-populations known from the Sydney Metropolitan Catchment Management Authority area; one at Newington Nature Reserve on the Parramatta River and one at Towra Point Nature Reserve in Botany Bay. Saltmarsh of Newington Nature Reserve and in grassland on the northern bank of the Parramatta River. Saltmarsh and on the sandy shoreline of a small island of Towra Point Nature Reserve.	No	No – no suitable habitat present

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Epthianura albifrons</i>	White-fronted Chat	V	-	Occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Saltmarsh vegetation, open grasslands and sometimes low shrubs bordering wetland areas.	No	No – no suitable habitat present
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	South-east coast and ranges of Australia, from southern Qld to Victoria and Tasmania. In NSW, records extend to the western slopes of the Great Dividing Range. Tall (greater than 20m) moist habitats.	No	No – no roosting or foraging habitat present
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	In NSW, found from the coast westward as far as Dubbo and Albury. Dry, open eucalypt forests and woodlands, including remnant woodland patches and roadside vegetation.	No	No – no roosting or foraging habitat present
<i>Grantiella picta</i>	Painted Honeyeater	V	V	Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas. Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	No	No – no foraging habitat in the study area
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	-	Distributed along the coastline of mainland Australia and Tasmania, extending inland along some of the larger waterways, especially in eastern Australia. Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.	Unlikely	No – no roosting or foraging habitat present

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	South eastern NSW and Victoria, in two distinct populations: a northern population in the sandstone geology of the Sydney Basin as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	No	No – No suitable habitat in the study area
<i>Hieraetus morphnoides</i>	Little Eagle	V	-	Throughout the Australian mainland, with the exception of the most densely-forested parts of the Dividing Range escarpment. Open eucalypt forest, woodland or open woodland, including sheoak or <i>Acacia</i> woodlands and riparian woodlands of interior NSW.	No	No – geographical distribution does not overlap with the study area, and no suitable vegetation present
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	M	All coastal regions of NSW, inland to the western slopes and inland plains of the Great Divide. Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland.	Unlikely	No – no roosting or foraging habitat present
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E1	V	Largely confined to Triassic and Permian sandstones within the coast and ranges in an area within approximately 250 km of Sydney. Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands.	No	No – no suitable habitat present

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern)	E1	E	Found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River. Heath or open forest with a heathy understorey on sandy or friable soils.	No	No – no habitat present in the study area
<i>Lathamus discolor</i>	Swift Parrot	E1	CE	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes. Box-ironbark forests and woodlands.	No	No – no roosting or foraging habitat present
<i>Litoria aurea</i>	Green and Golden Bell Frog	E1	V	Since 1990, recorded from ~50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region. Marshes, dams and stream-sides, particularly those containing <i>Typha</i> spp. (bullrushes) or <i>Eleocharis</i> spp. (spikerushes). Some populations occur in highly disturbed areas.	Unlikely	No – no recent records and no suitable habitat in the study area
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	V	V	Plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest south to Buchan in Victoria. The species has not been recorded in southern NSW within the last decade. Breeding habitat is the upper reaches of permanent streams and perched swamps. Non-breeding habitat is heath-based forests and woodlands	No	No – no recent records and no suitable habitat in the study area

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Litoria raniformis</i>	Southern Bell Frog	E1	V	In NSW, only known to exist in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. A few recent unconfirmed records have also been made in the Murray Irrigation Area. Permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. Also found in irrigated rice crops.	No	No – no recent records and no suitable habitat in the study area
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	In NSW, it is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast. Timbered habitats including dry woodlands and open forests, particularly timbered watercourses.	Unlikely	No – lack of suitable habitat in the study area
<i>Miniopterus australis</i>	Little Bentwing-bat	V	-	East coast and ranges south to Wollongong in NSW. Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub.	Unlikely	No – no roosting or foraging habitat in the study area
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	-	In NSW it occurs on both sides of the Great Dividing Range, from the coast inland to Moree, Dubbo and Wagga Wagga. Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.	Unlikely	No – no roosting or foraging habitat in the study area
<i>Mixophyes balbus</i>	Stuttering Frog	E1	V	Along the east coast of Australia from southern Qld to north-eastern Victoria. Rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	No	No – no suitable

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
						habitat in the study area
<i>Myotis macropus</i>	Southern Myotis	V	-	In NSW, found in the coastal band. It is rarely found more than 100 km inland, except along major rivers. Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20m.	Unlikely	No – no roosting or foraging habitat in the study area
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	E4A	CE	Breeds in Tasmania and migrates in autumn to spend the winter on the mainland coast of south-eastern SA and southern Victoria. Occasional reports from NSW, most recently Shellharbour and Maroubra in May 2003. Winter habitat is mostly within 3 km of the coast in sheltered bays, lagoons, estuaries, coastal dunes and saltmarshes. Also small islands and peninsulas, saltworks, golf courses, low samphire hermland and taller coastal shrubland.	No	No – no habitat in the study area
<i>Ninox strenua</i>	Powerful Owl	V	-	In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains. Woodland, open sclerophyll forest, tall open wet forest and rainforest.	No	No – no roosting or foraging habitat in the study area
<i>Numenius madagascariensis</i>	Eastern Curlew	-	CE, M	Summer migrant to Australia. Primarily coastal distribution in NSW, with some scattered inland records. Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	No	No – no habitat in the study area

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E1	V	In NSW they occur from the Qld border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	No	No – no habitat in the study area
<i>Petroica boodang</i>	Scarlet Robin	V	-	In NSW, it occurs from the coast to the inland slopes. Dry eucalypt forests and woodlands, and occasionally in mallee, wet forest, wetlands and tea-tree swamps.	No	No – no habitat in the study area
<i>Phaethon lepturus</i>	White-tailed Tropicbird	-	M	Uncommon south to Ballina January-April; casual visitor south to Batemans Bay, some well inland. Marine.	No	No – no habitat in the study area
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	-	V	Fragmented distribution across eastern NSW. Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	No	No – no habitat in the study area
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V	-	Confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains. Open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.	No	No – no habitat in the study area
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria. Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Likely	Yes – foraging only

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Rostratula australis</i>	Australian Painted Snipe	E1	E	In NSW most records are from the Murray-Darling Basin. Other recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Swamps, dams and nearby marshy areas.	No	No – no habitat in the study area
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	Both sides of the great divide, from the Atherton Tableland in Qld to north-eastern Victoria, mainly along river systems and gullies. In NSW it is widespread on the New England Tablelands. Woodland, moist and dry eucalypt forest and rainforest.	Unlikely	No – no foraging or roosting habitat in the study area
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	Recorded over approximately 90% of NSW, excluding the most arid north-western corner. Most abundant on the coast but extends to the western plains. Dry eucalypt forests and woodlands from sea level to 1100 m.	No	No – no habitat in the study area
<i>Tyto tenebricosa</i>	Sooty Owl	V	-	Occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands. Dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	No	No – no habitat in the study area
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V	-	In NSW, found on the Sydney Sandstone in Wollemi National Park, in the Goulburn and ACT regions and near Cooma in the south. Also recorded from the South West Slopes near Khancoban and Tooma River. Heath, open forest and woodland.	No	No – no habitat in the study area
FLORA						
<i>Acacia bynoeana</i>	Bynoe's Wattle	E1	V	Found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Heath or dry sclerophyll forest on sandy soils.	No	No – no habitat in the study area

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Allocasuarina glareicola</i>	-	E1	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Castlereagh woodland on lateritic soil. Found in open woodland with <i>Eucalyptus parramattensis</i> , <i>Eucalyptus fibrosa</i> , <i>Angophora bakeri</i> , <i>Eucalyptus sclerophylla</i> and <i>Melaleuca decora</i> .	No	No – geographic distribution does not overlap
<i>Astrotricha crassifolia</i>	Thick-leaf Star-hair	V	V	Near Patonga, and in Royal NP and on the Woronora Plateau. There is also a record from near Glen Davis. Dry sclerophyll woodland on sandstone.	No	No - geographic distribution does not overlap
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	E1	V	Currently known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations in the Wyong area on the Central Coast. Grassy sclerophyll woodland on clay loam or sandy soils, or low woodland with stony soil.	No	No - geographic distribution does not overlap and no habitat present
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V	-	Georges River to Hawkesbury River in the Sydney area (limited to the Hornsby Plateau area), and north to the Nelson Bay area of NSW. Also, Coalcliff in the northern Illawarra. Dry sclerophyll forest.	No	No – no habitat present in the study area

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V	V	In NSW, recorded mainly on coastal and near coastal ranges north from Victoria to near Forster, with two isolated occurrences inland north-west of Grafton. Coastal heathlands, margins of coastal swamps and sedgeland, coastal forest, dry woodland, and lowland forest.	No	No – no habitat present in the study area
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E1	E	Restricted to eastern NSW, from Brunswick Heads on the north coast to Gerroa in the Illawarra region, and as far west as Merriwa in the upper Hunter River valley. Dry rainforest; littoral rainforest; <i>Leptospermum laevigatum</i> - <i>Banksia integrifolia</i> subsp. <i>integrifolia</i> (Coastal Tea-tree– Coastal Banksia) coastal scrub; <i>Eucalyptus tereticornis</i> (Forest Red Gum) or <i>Corymbia maculata</i> (Spotted Gum) open forest and woodland; and <i>Melaleuca armillaris</i> (Bracelet Honey myrtle) scrub.	No	No – no habitat present in the study area
<i>Epacris purpurascens</i> var. <i>purpurascens</i>		V	-	Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Sclerophyll forest, scrubs and swamps. Most habitats have a strong shale soil influence.	No	No – no habitat present in the study area
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	V	Narrow band from the Raymond Terrace area south to Waterfall. Coastal heath on shallow sandy soils overlying Hawkesbury sandstone, mostly on exposed sandy ridges.	No	No – no habitat present in the study area
<i>Genoplesium baueri</i>	Bauer's Midge Orchid	E1	E	Has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. Dry sclerophyll forest and moss gardens over sandstone.	No	No – no habitat present in the study area

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Leucopogon exolasius</i>	Woronora Beard-heath	V	V	Upper Georges River area and in Heathcote National Park. Woodland on sandstone.	No	No – geographic distribution does not overlap with study area and no habitat present in the study area
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	Only found in NSW, populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Damp places, often near streams or low-lying areas on alluvial soils.	No	No – geographic distribution does not overlap with study area and no habitat present in the study area
<i>Melaleuca deanei</i>	Deane's Paperbark	V	V	Ku-ring-gai/Berowra area, Holsworthy/Wedderburn area, Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas. Heath on sandstone.	No	No – geographic distribution does not overlap with study area

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
						and no habitat present in the study area
<i>Persoonia hirsuta</i>	Hairy Geebung	E1	E	Scattered distribution around Sydney, from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	No	No – geographic distribution does not overlap with study area and no habitat present in the study area
<i>Persoonia nutans</i>	Nodding Geebung	E1	E	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Northern populations: sclerophyll forest and woodland (Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland and Cooks River / Castlereagh Ironbark Forest) on aeolian and alluvial sediments. Southern populations: tertiary alluvium, shale sandstone transition communities and Cooks River / Castlereagh Ironbark Forest.	No	No – geographic distribution does not overlap with study area and no habitat present in the study area

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Pimelea curviflora</i> <i>var. curviflora</i>		V	V	Confined to the coastal area of the Sydney and Illawarra regions between northern Sydney and Maroota in the north-west and Croom Reserve near Albion Park in the south. Woodland, mostly on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	No	No – geographic distribution does not overlap with study area and no habitat present in the study area
<i>Prostanthera densa</i>	Villous Mint-bush	V	V	Currarong area in Jervis Bay, Royal National Park, Cronulla, Garie Beach and Port Stephens (Gan Gan Hill, Nelson Bay). Sclerophyll forest and shrubland on coastal headlands and near-coastal ranges, chiefly on sandstone.	No	No – geographic distribution does not overlap with study area and no habitat present in the study area
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	E1	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. Small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines, adjacent to sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	No	No – geographic distribution does not overlap with study area

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
						and no habitat present in the study area
<i>Pultenaea aristata</i>	Prickly Bush-pea	V	V	Restricted to the Woronora Plateau. Dry sclerophyll woodland or wet heath on sandstone.	No	No – geographic distribution does not overlap with study area and no habitat present in the study area
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E1	V	Only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Subtropical and littoral rainforest on gravels, sands, silts and clays.	No	No – no habitat present in the study area
<i>Tetradlea juncea</i>	Black-eyed Susan	V	V	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. It is usually found in low open forest/woodland with a mixed shrub understorey and grassy groundcover. However, it has also been recorded in heathland and moist forest. The majority of populations occur on low nutrient soils associated with the	Unlikely	No – previous record now forms hardstand rail corridor. Not identified during survey

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
				<p>Awaba Soil Landscape. While some studies show the species has a preference for cooler southerly aspects, it has been found on slopes with a variety of aspects.</p> <p>It generally prefers well-drained sites below 200m elevation and annual rainfall between 1000 - 1200mm. The preferred substrates are sandy skeletal soil on sandstone, sandy-loam soils, low nutrients; and clayey soil from conglomerates, pH neutral.</p>		
<i>Thelymitra kangaloonica</i>	Kangaloon Sun Orchid	E4A	CE	<p>Only known to occur on the southern tablelands of NSW in the Moss Vale / Kangaloon / Fitzroy Falls area at 550-700 m above sea level. Swamps in sedgelands over grey silty grey loam soils.</p>	No	No – known geographic distribution does not overlap with study area and no habitat present in the study area
<i>Thesium australe</i>	Austral Toadflax	V	V	<p>In eastern NSW it is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands. Grassland on coastal headlands or grassland and grassy woodland away from the coast.</p>	No	No – no habitat present in the study area

BC and FM Acts: E1 = Endangered, E2 = Endangered Population, E4 = Extinct, E4A = Critically Endangered, V = Vulnerable

EPBC Act: Bonn = Listed migratory species under Bonn Convention, CD = Conservation Dependent, CE = Critically Endangered, E = Endangered, V = Vulnerable, X = Extinct, C, J or K = listed under the China, Japan or Republic of Korea and Australia Migratory Bird Agreement (CAMBA, JAMBA and ROKAMBA)

Appendix C - Test of Significance

The 'Test of significance' (5-part test) is applied to species, populations and ecological communities listed on Schedules 1 and 2 of the BC Act and Schedules 4, 4A and 5 of the FM Act. The assessment sets out 5 factors, which when considered, allow proponents to undertake a qualitative analysis of the likely impacts of an action and to determine whether a significant impact is likely. All factors must be considered, and an overall conclusion made based on all factors in combination.

The threatened fauna species that is subject of the assessment for the proposed works is:

- *Pteropus poliocephalus* (Grey-headed Flying-fox) – vulnerable under the BC Act.

Pteropus poliocephalus (Grey-headed Flying-fox)

Grey-headed Flying-fox is listed as a vulnerable species under the BC Act. It is generally found within 200 kilometre of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. It occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops and has been recorded as travelling long distances on feeding forays (averaging 20 kilometres per night). Fruits and flowering plants of a wide variety of species are the main food source.

The species roosts in large 'camps' of up to 200,000 individuals. Camps are usually formed within 20 kilometres of a regular food source and are generally close to water and along gullies. However, the species has been known to form camps in urban areas. Key threats to the species are loss of roosting and foraging sites, electrocution on powerlines, entanglement in netting and on barbed-wire, heat stress, and conflict with humans (OEH 2019b). The nearest known camp is located approximately 500 m west along Wolli Creek. The population of the camp is currently (9 October 2019) estimated at 500 – 2, 499 individuals and has historically contained up to 50,000 individuals (DotEE 2019b).

There are 855 records for this species within a 10 kilometre radius of the study area (OEH 2019a). There is potential that the study area is used by this species as part of a mosaic of foraging resources, although it is unlikely that individuals of this species are dependent solely upon resources in the study area. Although the Grey-headed Flying-fox is one large interbreeding population, for the purposes of the following test of significance, the local population is considered any individuals roosting in camps within a 40 kilometre radius of the study area. This is because this species typically forages over a range of 20 – 40 kilometres per night, with the average distance travelled 30 kilometres per night (DotEE 2017). As such, the resources in the study area would be utilised for foraging by individuals within the documented foraging range. There are four additional camps to the Turrella camp within a 30 kilometre radius of the study area:

- Centennial Park – 16,000 – 49,999 individuals
- Clyde 2,500 – 9,999 individuals
- Gladesville 2,500 – 9,999 individuals
- Gordon 2,500 – 9,999 individuals.

The locality is considered a 30 kilometre radius around the study area.

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

The Grey-headed Flying-fox is one large interbreeding population. Impacts likely to have an adverse effect on the life cycle of Grey-headed Flying-fox would include impacts which resulted in the loss of significant areas of foraging habitat, increases in the mortality rate, and increases in conflicts with humans.

The proposal would remove 1.04 ha of native vegetation considered potential foraging habitat for the Grey-headed Flying-fox. No known camps would be directly affected, however indirect impacts associated with noise, light and dust are likely to temporarily affect the camp at Turrella, 500 m west of the study area.

The direct impact to foraging habitat is expected to be minimal given the availability of >20,000 ha (vegetation in locality (30 kilometre radius as per OEH 2016)) of potential foraging habitat available in the locality. The removal of 1.04 ha of potential foraging habitat constitutes 0.005 % of the habitat present in the foraging range for this species. This is considered a minor impact given the species wide foraging range and the availability of habitat.

The study area is immediately adjacent to a patch of potential foraging habitat along Wolli Creek, which forms a continuous corridor. The nearest camp is 500 metres west of the study area in Wolli Creek (DotEE 2019). Some disturbance (noise and dust) is expected to occur during the construction phase, and some indirect impacts may reach the camp. There would be a minor increase in operational noise once works have been completed. Any dust and light impacts would be low-level, temporary and occurring during both day and night-time hours.

Therefore, these impacts would be unlikely to significantly affect the camp or degrade adjacent habitat such that the life cycle of the species is affected that would cause the population to decline. Additionally, the expected light pollution is unlikely to increase beyond the current operational levels of the rail corridor. The increase in noise is likely to be consistent with the current noise levels occurring adjacent to the camp. The increase in noise is unlikely to affect the camp such that the population would be placed at risk of extinction.

It is unlikely that the proposal would result in increases in mortality rates through heat stress or electrocution, given the small portion of potential habitat to be removed and no expected direct impacts to any camps. It is unlikely that the proposal would increase conflicts with humans as it is unlikely the proposal would contribute to Grey-headed Flying-fox establishing a camp in the locality.

Therefore, removal of potential foraging habitat is unlikely to have a significant impact on the life cycle of this species such that a viable local population of the species would be placed at risk of extinction.

b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

- i is likely to have an adverse effect on the extent of the ecological community such that its locality is likely to be placed at risk of extinction, or**
- ii is likely to substantially and adversely modify the composition of the ecological community such that its locality is likely to be placed at risk of extinction,**

Not applicable.

c. in relation to the habitat of a threatened species or ecological community:

- i the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**

The proposal would remove of 1.04 hectare of native vegetation and considered potential foraging habitat for the Grey-headed Flying-fox. This forms 0.005 % of the potential foraging habitat within the foraging range for this species, with >20,000 ha present (vegetation in locality (30 kilometre radius as per OEH 2016)). No known camps would be directly affected.

- ii whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and**

The proposal would not result in the fragmentation or isolation of any areas of foraging habitat for this species. The areas to be affected would not act as a foraging link between two areas of foraging habitat, given the extensive residential developments occurring on the southern side of the rail corridor. The Grey-headed Flying-fox is highly mobile and forages up to 30 kilometres in a feeding foray. The removal of 1.04 ha of fragmented foraging habitat within the rail corridor would not prevent this species from utilising other resources within the foraging range for this species.

iii the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The 1.04 ha of potential foraging habitat to be removed is not considered important to the long-term survival of the species. The habitat to be removed is located within the rail corridor and is fragmented from other areas by the rail corridor and hardstand infrastructure. The vegetation in the study area contained a low proportion of trees that are suitable feed trees for this species. The habitat is considered marginal for this species. The locality contains larger, continuous patches of potential foraging habitat that would likely contain a higher proportion of suitable feed trees for this species.

d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

There are no areas of outstanding biodiversity value in the study area.

e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

There is one key threatening process, clearing of native vegetation, associated with the proposal. The proposal would involve the clearing of 1.04 ha of native vegetation which forms potential foraging habitat for the Grey-headed Flying-fox. This species is highly mobile and is known to rely on a range of foraging resources within the foraging range for this species. Therefore, the proposal is unlikely to exacerbate the impacts of this key threatening process.

Conclusion

The proposal is unlikely to constitute a significant impact on the Grey-headed Flying-fox given the following:

- the proposal would remove 1.04 ha of potential foraging habitat
- the Grey-headed Flying-fox is highly mobile, would not rely on the resources to be removed and would utilise a range of foraging habitat within the foraging range for this species
- the habitat to be removed would not isolate or fragment other foraging resources within the foraging range for this species
- potential foraging habitat would be retained within the foraging range for this species
- no known camps would be directly affected.

A Species Impact Statement or BDAR is not recommended with respect to the potentially affected species.

Appendix D - Application of Significant Impact Criteria

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

Grey-headed Flying-fox is listed as a vulnerable species under the EPBC Act. It is generally found within 200 kilometre of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. It occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops and has been recorded as travelling long distances on feeding forays (up to 40 kilometre). Fruits and flowering plants of a wide variety of species are the main food source.

The species roosts in large 'camps' of up to 200,000 individuals. Camps are usually formed within 30 kilometre of a regular food source and are generally close to water and along gullies. However, the species has been known to form camps in urban areas. Key threats to the species are loss of roosting and foraging sites, electrocution on powerlines, entanglement in netting and on barbed-wire, heat stress, and conflict with humans (OEH 2019b). The nearest known camp is located at Turrella 500 m west of the study area in Wolli Creek. The population of the camp is estimated at 500 – 2,499 individuals (DotEE 2019b).

There are 855 records for this species within a 5 kilometre radius of the study area (OEH 2019a). There is potential that the study area is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon resources in the study area. Although the Grey-headed Flying-fox is one large interbreeding population, for the purposes of the following test of significance, the local population is considered any individuals roosting in camps within a 30 kilometre radius of the study area. This is because this species typically forages over a range of 20 – 40 kilometre per night, with the average distance travelled 30 kilometre per night (DotEE 2017). As such, the resources in the study area would be utilised for foraging by individuals within the documented foraging range. There are an additional four camps in addition to the Turrella camp within a 30 kilometre radius of the study area:

- Centennial Park – 16,000 – 49,999 individuals
- Clyde 2,500 – 9,999 individuals
- Gladesville 2,500 – 9,999 individuals
- Gordon 2,500 – 9,999 individuals.

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

The proposed action would remove 1.04 ha of potential foraging habitat for the Grey-headed Flying-fox. There is a single interbreeding population of Grey-headed Flying-fox in Australia, and as such, any colony or individual of the species is part of an important population of the species. The closest known Grey-headed Flying-fox camp is approximately 500 m west of the study area in Wolli Creek. There are also four additional camps within a 30 kilometre radius of the study area. No camps would be directly affected as part of the proposed action.

The area of potential foraging habitat that would be removed is minimal, given its small extent and the highly mobile nature of the species. The Grey-headed Flying-fox is known to utilise a range of foraging resources during a feeding foray and would not rely solely on the foraging habitat to be removed in the

study area. There is potential foraging habitat present in the locality that could be used by this species. The proposed action is unlikely to lead to a long-term decrease in the size of an important population.

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

There is a single interbreeding population of Grey-headed Flying-fox in Australia, therefore any colony or individual of the species is part of an important population of the species. The species occurs along the coastal belt from Rockhampton in central Queensland to Melbourne in Victoria.

The proposed action would remove 1.04 ha of potential foraging habitat within the centre of its total area of occupancy. This is a small disturbance to the potential foraging habitat and is considered a minor disturbance to the total area of occupancy. There is > 20,000 ha of potential foraging habitat within a 30 kilometre radius of the study area. Thus, the proposed action is unlikely to reduce the area of occupancy of an important population to any significant extent.

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

There is a single interbreeding population of Grey-headed Flying-fox in Australia. No known Grey-headed Flying-fox camps would be affected as part of the proposed action with the nearest camp located 500 m west of the study area in Wolli Creek.

The removal of a small area of potential foraging habitat will not create any barriers or gaps that would split the population into two or more populations.

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

Habitat critical to the survival of the Grey-headed Flying-fox is any habitat within 30 kilometres of a known camp with over 20,000 roosting individuals. The study area is located 500 m east of the Wolli Creek camp, although this camp does not meet this criterion as it contains between 500 – 2,499 individuals (DotEE 2019b). Centennial Park is the closest camp containing >20,000 individuals and is within a 30 kilometre radius of the study area. Therefore, the foraging habitat to be removed is considered critical habitat for the Grey-headed Flying-fox. Although this habitat forms critical habitat for this species, there is >20,000 hectares of potential foraging habitat within 30 kilometres (OEH 2016). The potential foraging habitat to be removed forms 0.005% of the habitat present. The proposed action is unlikely to adversely affect habitat critical to the survival of this species.

Criterion e: disrupt the breeding cycle of an important population

The proposed action would not directly affect any known Grey-headed Flying-fox camps. Reproduction occurs from autumn to late spring and occurs in the roosting camp. Foraging habits change during the reproduction period. Individuals decrease the foraging distance as they carry their young during forays. The proposed action would result in the removal of a small amount of the potential foraging habitat for several camps (e.g. Turrella and Centennial Park). The proposed action is unlikely to disrupt the breeding cycle of the Grey-headed Flying-fox given that no known camps would be directly affected and the camps would rely on a far greater area for foraging.

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

The vegetation to be removed does not form part of a Grey-headed Flying-fox camp. The proposed action would remove 1.04 hectares of potential foraging habitat for this species. The area of potential foraging habitat to be removed exists as pockets of vegetation, and in some areas on the edge of a larger patch that is bordered by the rail corridor. The proposed action would not isolate or fragment potential foraging habitat in the study area.

The proposed action would decrease the availability of potential foraging habitat. However, the area to be removed comprises a small proportion of potential foraging habitat within the locality. The species is also known to forage over large areas in response to seasonal changes in flower and fruiting events and the availability of resources. The proposed action will not modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

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

The action would not result in an invasive species that would be harmful to the Grey-headed Flying-fox. Is it unlikely that the proposed action would result in an increased number of invasive species.

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

Grey-headed Flying-fox are reservoirs for the Australian bat lyssavirus and can cause clinical disease and mortality in the species. The proposed action is unlikely to present a significant ecological stress on known individuals utilising the study area for foraging and therefore is unlikely to affect this species. The proposed action would be unlikely to introduce a disease such that the species would decline.

Criterion i: interfere substantially with the recovery of the species

The Draft National Recovery Plan for the Grey-headed Flying-fox was developed in 2017 (DotEE) and defines nine recovery objectives for the species:

1. to identify, protect and enhance foraging habitat critical to the survival of Grey-headed Flying-fox
2. identify, protect and enhance roosting habitat of Grey-headed Flying-fox camps
3. determine population trends in Grey-headed Flying-foxes so as to monitor the species' national distribution and conservation status
4. build community capacity to coexist with flying-foxes and minimise the impacts on urban settlements from existing camps without resorting to dispersal
5. increase public awareness and understanding of Grey-headed Flying-foxes and the recovery program, and involve the community in the recovery program where appropriate
6. improve the management of Grey-headed Flying-fox camps in sensitive areas
7. significantly reduce levels of deliberate Grey-headed Flying-fox destruction associated with commercial horticulture
8. support research activities that will improve the conservation status and management of Grey-headed Flying-foxes
9. assess and reduce the impact on Grey-headed Flying-foxes of electrocution on power lines, and entanglement in netting and on barbed-wire.

Of these objectives, only objective one is relevant to this proposal. As no camps would be directly affected and extensive patches of good quality, contiguous foraging habitat exists in the surrounding landscape, the proposed action would be unlikely to interfere with the recovery of this species.

Conclusion

Based on the above assessment it is concluded that the proposed works are unlikely to have a significant impact on an important population of Grey-headed Flying-fox. A referral to the Commonwealth with respect to the Grey-headed Flying-fox is unlikely to be required.