



MTMS Waterfall Stabling Yard and Platform Extension Flora and Fauna Assessment Report

Transport for NSW

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Abbreviations

Abbreviation	Description
BC Act	<i>Biodiversity Conservation Act 2016</i>
BDAR	Biodiversity Development Assessment Report
BOM	Bureau of Meteorology
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>
ISCA	Infrastructure Sustainability Council of Australia
MNES	Matters of National Environmental Significance
MTMS	More Trains, More Services
OEH	Office of Environmental and Heritage
TfNSW	Transport for New South Wales

Executive Summary

Eco Logical Australia Pty Ltd was engaged by AECOM to prepare this Flora and Fauna Assessment report for the proposed upgrade of Waterfall Station, including platform extensions and stabling works. ELA understands that this Flora and Fauna Assessment report would form part of a Review of Environmental Factors 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 proposed project footprint is mostly contained within the rail corridor with approximately 2,500m² of road verge land, owned and maintained by Sutherland Shire Council, also affected. The footprint also contains existing hardstand surfaces, native vegetation and rail infrastructure. Field survey identified one native vegetation community as present in the study area; *Sydney South Exposed Sandstone Woodland*. This community does not form part of a threatened ecological community. The study area also contained a regrowth form of this community present as a shrubland and Planted Native and Exotic Cover. Planted Native and Exotic Cover does not form part of a native ecological community.

One endangered ecological community, *Coastal Upland Swamps in the Sydney Basin Bioregion* was mapped as present in the study area (OEH 2016). This community is listed as endangered under the BC Act and EPBC Act. This vegetation community would not be directly affected as part of the proposed works, however some indirect impacts may occur. A BC Act test of significance and the EPBC Act significant impact criteria was applied and determined that the proposal is unlikely to constitute a significant impact on this community. No threatened flora or fauna species were identified in the study area during the survey, however the native vegetation present may provide foraging habitat for the following threatened fauna species:

- *Calyptorhynchus lathami* (Glossy Black Cockatoo) – vulnerable under the BC Act
- *Cercartetus nanus* (Eastern Pygmy Possum) – vulnerable under the BC Act
- *Glossopsitta pusilla* (Little Lorikeet) – vulnerable under the BC Act
- *Miniopterus australis* (Little Bentwing-bat) – vulnerable under the BC Act
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat) – vulnerable under the BC Act
- *Pteropus poliocephalus* (Grey-headed Flying-fox) – vulnerable under the BC Act and EPBC Act.

Tests of significance under the BC Act were applied to these species and concluded that the proposal is unlikely to constitute a significant impact. The Significant Impact Criteria under the EPBC Act was 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 Sydney South Exposed Sandstone Woodland in good condition (0.82 ha) were

calculated individually, and offsets for Sydney South Exposed Sandstone Woodland and Planted Native and Exotic vegetation (0.49 ha) was calculated. Offset ratios of 2.80 and 2.40 respectively, were determined.

Offsets under the Infrastructure Sustainability Council of Australia (ISCA) tool were calculated. Some vegetation will be retained as part of the proposed works. However, when applying the tool the amount of vegetation to be retained versus vegetation to be removed and the relative increase in hardstand surfaces, a score of 0 is achieved. As such, offsets will be required.

1. Introduction

Eco Logical Australia Pty Ltd (ELA) was engaged by AECOM on behalf of Transport for New South Wales (TfNSW) to provide a Flora and Fauna Assessment (FFA) Report for the proposed Waterfall stabling yard and platform extension as part of the More Trains, More Services (MTMS) Project. ELA understands that this FFA report will form part of a Review of Environmental Factors 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 upgrade. The impact assessment in this report is based on information gathered from data 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 that as part of the MTMS works, the Waterfall station platform needs to be extended and additional stabling capacity is required at the Waterfall Stabling yard to support future operation of the T4 Illawarra and South Coast Lines.

The Proposal would include the following key elements:

- Demolition and extension of the northern end of the existing island platform at Waterfall Station by approximately 40 metres to facilitate new 10-car intercity trains
- reconfiguration of existing track within the existing siding on the western side of the rail corridor, including changes in the location and operation of freight and passenger loops
- new suburban train stabling yard to the west of the existing main line
- a new staff amenities building on the western side of the proposed stabling yard
- an elevated staff footbridge between the staff amenities building and the platform
- upgrade of the existing access road off the southbound carriageway of the Princes Highway
- reconfiguration and extension of the existing freight refuge loop by approximately 850 metres on the western side of the existing tracks, to accommodate freight trains up to 1500 metres in length
- ancillary works, including new and relocated services, lighting, CCTV, retaining walls, and landscaping
- operation of the Proposal.

1.2 Site description

The study area is located at Waterfall Train Station, Waterfall, approximately 45 kilometres south of the Sydney CBD and 15 kilometres south of Sutherland. The study area is zoned SP2 – Infrastructure: Railway under the Sutherland Shire Local Environmental Plan 2015.

The study area contains existing rail infrastructure, remnant patches of native vegetation and planted vegetation. The study area does not contain any riparian corridors or bodies of water, such as dams.

The study area is mostly within the rail corridor and extends from south of Waterfall Station at the junction with Cawleys Trail and to north of the Hanrob Pet Hotel at Heathcote (Extent of works; Figure 1). Indirect impacts to vegetation marked for retention may occur within the study area.

The subject site is the area requiring vegetation removal (Vegetation clearance footprint; Figure 1).

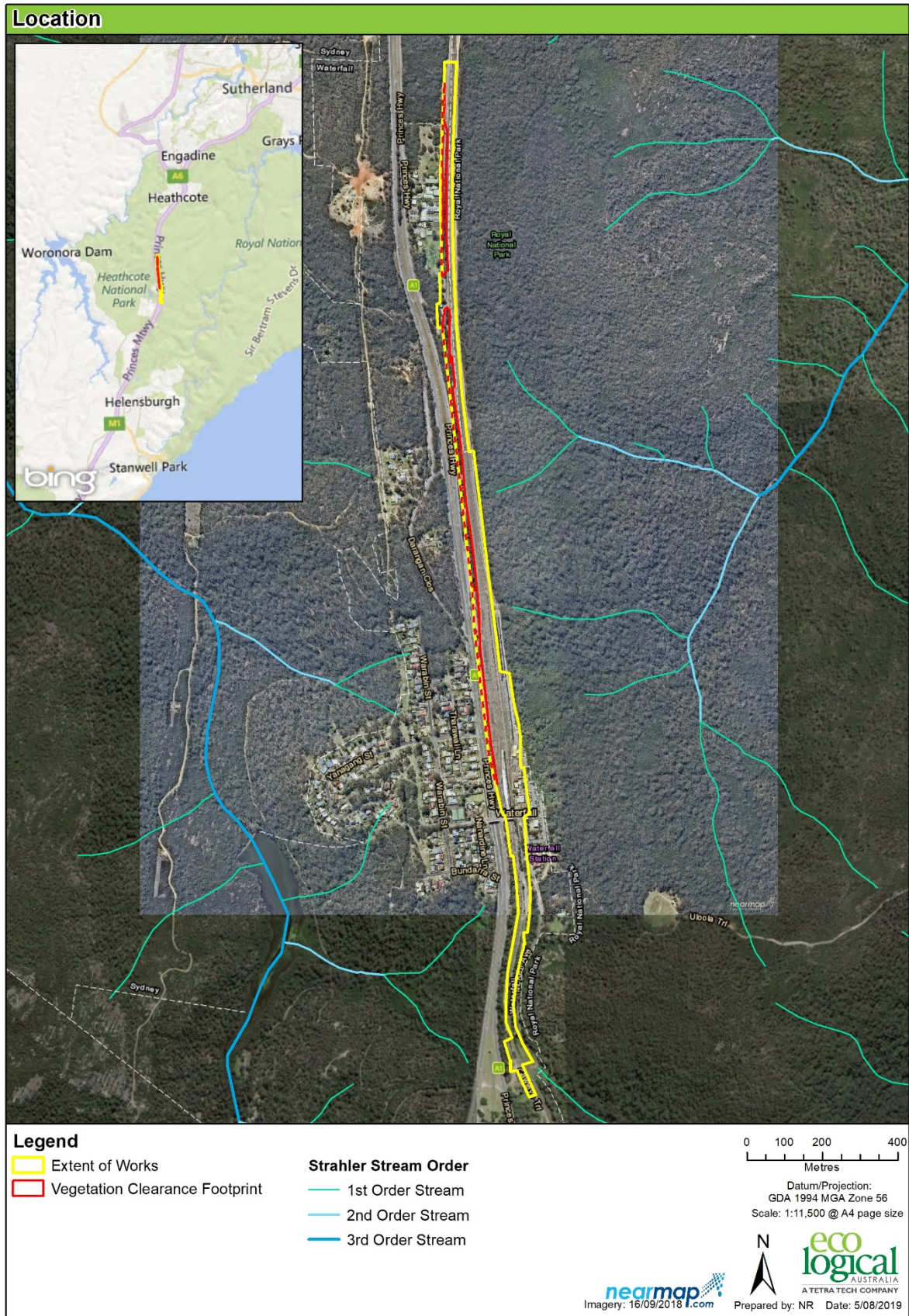


Figure 1: Location of the study area (extent of works) and the subject site (vegetation clearance footprint)

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)	<p>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.</p>	Section 5
<i>Biodiversity Conservation Act 2016</i> (BC Act)	<p>The purpose of the BC Act is to maintain a healthy and 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 into or a Species Impact Statement can be prepared.</p> <p>Tests of significance for the impact to threatened species and endangered ecological communities consistent with s7.3 of the Act have been undertaken for the proposed work. A significant impact is unlikely to result, and therefore the BOS is not triggered nor a Species Impact Statement required</p>	Section 5
<i>Fisheries Management Act 1994</i> (FM Act)	<p>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. The development will not involve any impacts to matters listed under the FM Act. No permits are required.</p>	N/A
<i>Biosecurity Act 2015</i> (BS Act)	<p>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 11 priority weeds were identified within the site (Appendix A).</p>	Section 5
<i>Water Management Act 2000</i> (WM Act)	<p>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 <i>Water Management</i></p>	N/A

Name	Relevance to the project	Section
	<p><i>Act</i> (s91). The project does not involve works on waterfront land. The proponent is a public authority, and as such controlled activity approvals are not required for any impacts to waterfront land.</p>	
<p>Environmental 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>SEPP 44 – Koala Habitat Protection</p>	<p>The SEPP encourages the conservation and management of areas of natural vegetation providing habitat for koalas. The consent authority must determine whether or not the land contains potential koala habitat and core koala habitat. Schedule 1 of the SEPP lists local government areas to which the plan applies.</p> <p>SEPP 44 applies to the local government area in which the development is proposed. An assessment of koala habitat has been made in accordance with Part 2 of the SEPP. The project is being assessed under Division 5.1 of the EP&A Act and therefore SEPP 44 does not apply.</p>	<p>N/A</p>

3. Methods

3.1 Literature and data review

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

- BioNet / Atlas of NSW Wildlife (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).

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 of Wildlife (10 kilometre radius) and Protected Matters Search Tool (10 kilometre radius) searches were performed around the co-ordinates (-34.134334, 150.994518) on 23 May 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

A field survey was conducted on 12 April 2019 by ELA Ecologist Alex Gorey for a total of eight person hours. Weather conditions during the survey were clear and sunny with temperatures ranging from 15.5°C to 23°C (BOM 2019).

The subject site was traversed on foot and focused on the following:

- validation of existing vegetation mapping, determining type, condition and extent
- threatened flora and fauna habitat assessment
- habitat bearing tree search
- 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.

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. Where important habitat features, such as hollow bearing

trees or deep leaf litter were observed, their location was noted. Hollow bearing trees, where 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 will 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. For patches where impacts to threatened ecological values was deemed unlikely to be significant the Vegetation Offset Guide for Native Vegetation was applied. 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.

No field survey was conducted for any vegetation within the study area but outside of the subject site. The OEH Vegetation Mapping (OEH 2016) has been relied upon for these portions of the study area.

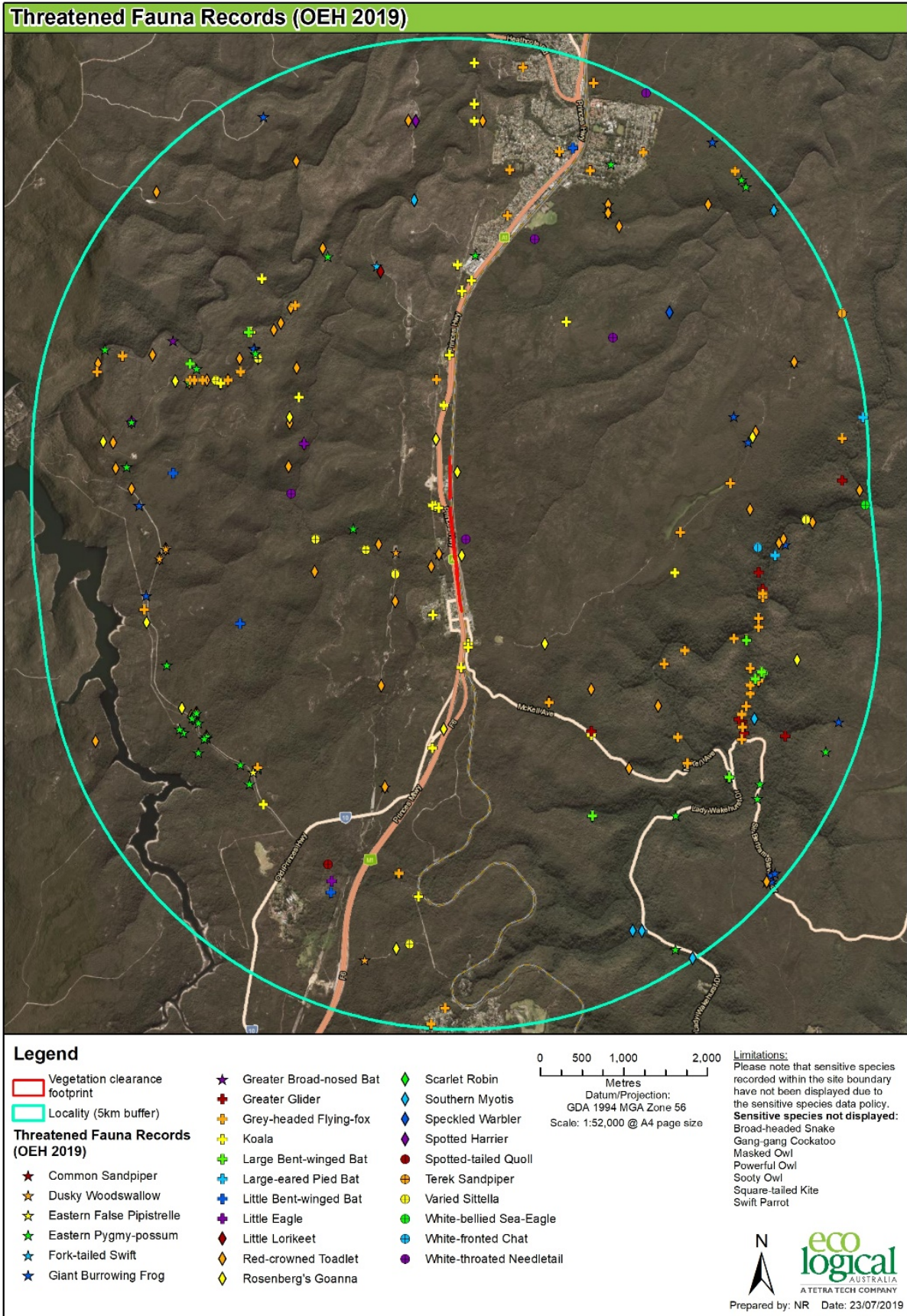


Figure 2: Threatened fauna species records within a 5 km radius of the study area

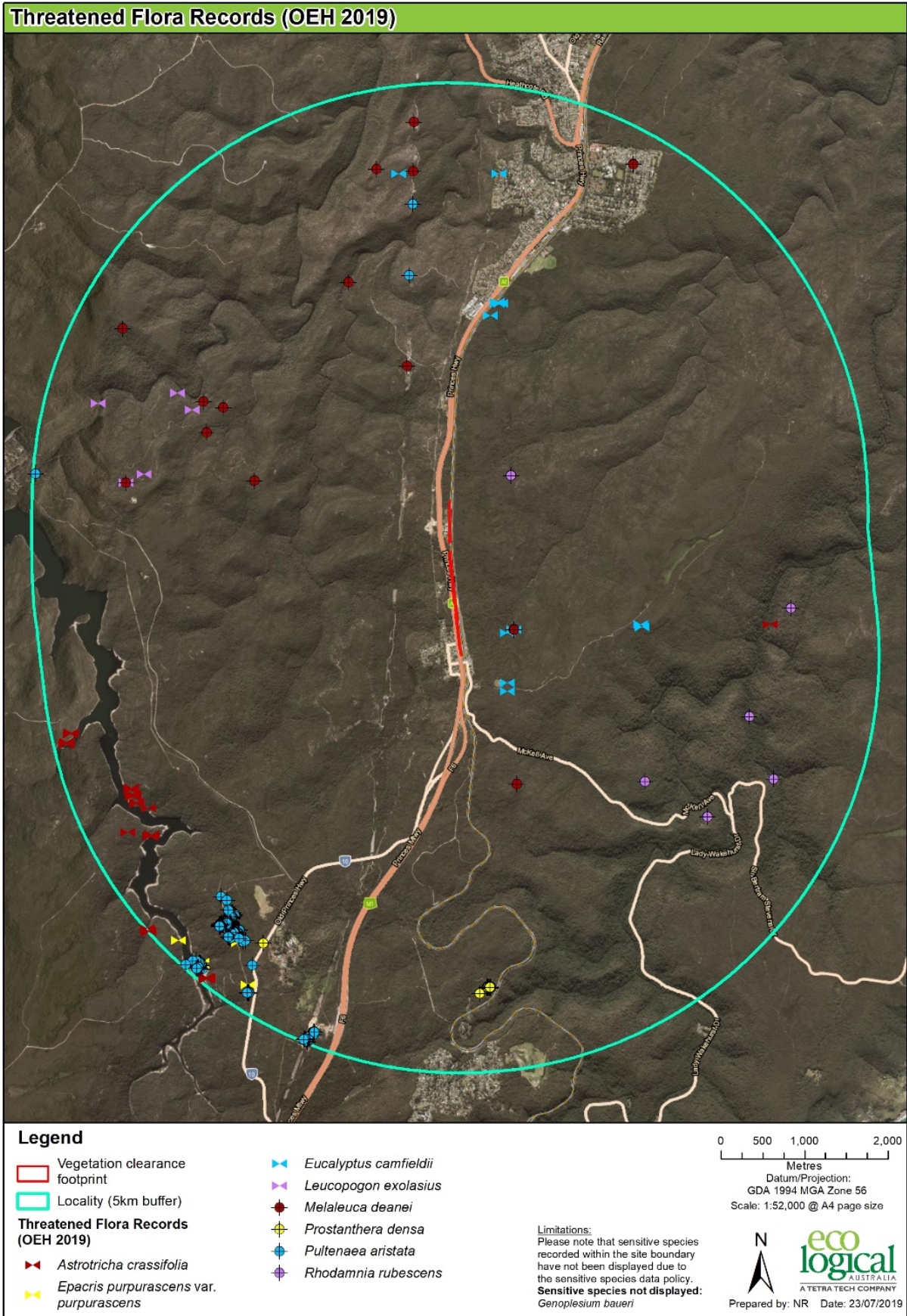


Figure 3: Threatened flora records within a 5 km radius of the study area

4. Existing environment

4.1 Literature and data review

The literature and data review returned 28 threatened flora, 88 threatened fauna (including migratory species) and six threatened ecological communities either known or considered likely to occur within a 5 km radius of the study area. *Phascolarctos cinereus* (Koala), *Hirundapus caudacutus* (White-throated Needletail), *Varanus rosenbergi* (Rosenberg's Goanna) and *Heleioporus australiacus* (Giant Burrowing Frog) have been previously recorded immediately adjacent to the study area. There are no threatened flora or fauna species previously recorded within the study area.

4.1.1 Vegetation mapping

Four vegetation communities were previously mapped within the study area (OEH 2016):

- Sydney South Exposed Sandstone Woodland
- Undifferentiated regenerating shrubs
- Coastal Upland Damp Heath Swamp
- Urban Native and Exotic.

4.2 Field survey

4.2.1 Vegetation validation

Field survey confirmed the presence of two vegetation communities in the subject site:

- Sydney South Exposed Sandstone Woodland
- Planted native and exotic cover.

No threatened ecological communities were identified in the subject site during survey (Figure 6, Figure 7, Figure 8).

Sydney South Exposed Sandstone Woodland

Sydney South Exposed Sandstone Woodland is a low eucalypt woodland with a diverse heathy understorey found on Hawkesbury sandstone ridgetops in the north-east of the Woronora Plateau. It is associated with high mean annual rainfall (greater than 1,200 millimetres) and coastal elevations (10-250 metres above sea level). In these moister climates sites are dominated by *Eucalyptus haemastoma*/*Eucalyptus racemosa* (Scribbly Gum) and/or *Eucalyptus sieberi* (Silver-top Ash) with *Corymbia gummifera* (Red Bloodwood) a frequent associate. The rainfall level also appears to encourage a very diverse and dense shrub layer in which five species of banksia are known to occur. The taller *Banksia serrata* (Old-man Banksia) and *Banksia ericifolia* subsp. *ericifolia* (Heath-leaved Banksia) are the most common. Other genera are similarly diverse with multiple species of hakeas, wattles, tea-trees and peas found within the community. The ground layer is a sparse cover of forbs, grasses and sedges. The distinctive *Doryanthes excelsa* (Gymea Lily) occurs amongst the ground and lower shrub layers on sites of heavily eroded ironstone laterite. These mantles are a feature of the central and eastern Woronora Plateau. The community occurs extensively throughout Royal and Dharawal national parks and eastern sections of the Woronora catchment area.

Field survey confirmed the presence of Sydney South Exposed Sandstone Woodland in two conditions: moderate condition and regeneration.

Where the community was in moderate condition it contained a canopy of *Eucalyptus sieberi* (Silver-top Ash), *Corymbia gummifera* (Red Bloodwood) and *Eucalyptus racemosa* (Narrow-leaved Scribbly Gum). The midstorey contained *Allocasuarina littoralis* (Black She-oak), *Astroloma humifusum* (Cranberry Heath), *Isopogon anemonifolius* (Broad-leaf Drumsticks), *Leucopogon juniperinus* (Prickly Beard-heath), *Acacia myrtifolia* (Myrtle Wattle) and *Dodonaea triquetra* (Common Hop Bush). The groundcover varied in condition containing native and exotic flora species. Where native species were present, they included *Wahlenbergia gracilis* (Sprawling Bluebell), *Entolasia marginata* (Bordered Panic), *Aristida ramosa* (Threeawn Speargrass), *Desmodium brachypodum* (Large Tick-trefoil) and *Dichondra repens* (Kidney Weed). Exotic species included *Eragrostis curvula* (African Lovegrass), *Setaria parviflora* (Pigeon Grass), *Paspalum urvillei* (Vasey Grass), *Poa annua* (Winter Grass) and *Conyza bonariensis* (Flax-leaf Fleabane) (Figure 4).



Figure 4: Sydney South Exposed Sandstone Woodland in good condition in the subject site

Where the community existed as regeneration, the patches did not contain a canopy, but were dominated by midstorey species typical to Sydney South Exposed Sandstone Woodland. This condition state occurred along the steeper embankments of the rail corridor. The midstorey species present included *Banksia ericifolia* (Heath-leaved Banksia), *Acacia binervata* (Two-veined Hickory), *Leptospermum polygalifolia* (Jelly Bush) and *Pomaderris lanigera* (Woolly Pomaderris). The

groundcover contained *Pteridium esculentum* (Bracken Fern), *Cynodon dactylon* (Couch) and *Imperata cylindrica* (Blady Grass) (Figure 5).



Figure 5: Sydney South Exposed Sandstone Woodland as regeneration in the subject site

Planted native and exotic cover

Planted Native and Exotic cover occurred along the edges of the rail corridor closest to the existing platforms at Waterfall. The species present included *Callistemon citrinus* (Crimson Bottlebrush) and *Pittosporum revolutum* (Wild Yellow Jasmine). The groundcover was dominated by *Cenchrus clandestinus* (Kikuyu) and *Bidens pilosa* (Beggar's Ticks).



Figure 6: Validated vegetation communities (ELA 2019) and OEH Vegetation Mapping (2016) in the study area (S1)



Figure 7: Validated vegetation communities (ELA 2019) and OEH Vegetation Mapping (2016) in the study area (S2)



Figure 8: Validated vegetation communities (ELA 2019) and OEH Vegetation Mapping (2016) in the study area (S3)



Figure 9: Previously mapped vegetation in the study area (S4)

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. The native vegetation in the study area may provide foraging habitat for the following threatened fauna species:

- *Calyptorhynchus lathami* (Glossy Black Cockatoo) – vulnerable under the BC Act
- *Cercartetus nanus* (Eastern Pygmy Possum) – vulnerable under the BC Act
- *Glossopsitta pusilla* (Little Lorikeet) – vulnerable under the BC Act
- *Miniopterus australis* (Little Bentwing-bat) – vulnerable under the BC Act
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat) – vulnerable under the BC Act
- *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 these species, given there are no hollow bearing trees or camps (with respect to the Grey-headed Flying-fox) in the study area. The native vegetation in the study area would likely provide an occasional foraging resource for these species. Throughout this report, these species will be referred to as the ‘potentially affected species’. Where there are differences in foraging or roosting behaviour between species, these will be discussed separately.

4.3 ISCA Ecological Values Assessment Criteria

The Ecological Value Calculator was applied, based on the assumption that all vegetation within the subject site would be removed (Figure 10, Figure 12). Some vegetation would be retained in the study area. For retention areas, the OEH 2016 vegetation mapping was used to enter data into the tool. The vegetation to be retained was not based on a field survey and likely represents an underestimate of the vegetation to be retained.

This assumption included that no vegetation would be retained or enhanced, within the subject site. 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 in the Royal National Park and Heathcote National Park. Sydney South Exposed Sandstone Woodland, Coastal Upland Damp Heath Swamp and undifferentiated regenerating shrubs were included within this category, as they form native vegetation in the study area.

The study area achieved a score of 0.58 before construction and a score of -0.06 after construction and a change in ecological value of -0.521 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.

4.4 TfNSW Offsetting Guide

The vegetation in the study area was broken down into two categories based on vegetation type and condition (Figure 13). One offsetting calculator was applied to Sydney South Exposed Sandstone Woodland in good condition and one calculator was applied to Sydney South Exposed Sandstone

Woodland – regeneration and planted native and exotic cover. This is because the community structure of Sydney South Exposed Sandstone Woodland in good condition contained a canopy and represented a typical woodland structure. Each calculator was 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 Sydney South Exposed Sandstone Woodland in good condition was applied to an area of 0.82 ha which determined an offset ratio of 2.80 based on the assumptions in Figure 10.

The primary offset ratio for Sydney South Exposed Sandstone Woodland mapped as regeneration and planted native and exotic cover was applied to an area of 0.49 ha which determined an offset ratio of 2.40 based on the assumptions in Figure 11.

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?	60-79%	▼
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?	No	▼
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 10: Offsetting tool assumptions for Sydney South Exposed Sandstone Woodland in good condition

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?	N/A - Native Grassland or Shrubland	▼
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?	No	▼
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: Offsetting guide assumptions applied to other vegetation in the study area



Figure 12: Vegetation requiring offsets under the ISCA Tool



Figure 13: Vegetation requiring offset 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 Sydney South Exposed Sandstone Woodland and foraging habitat for the potentially affected species (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)
Sydney South Exposed Sandstone Woodland	0.82
Sydney South Exposed Sandstone Woodland Regeneration	0.41
Planted Native and Exotic cover	0.08
Total	1.31
Foraging habitat for the potentially affected species	0.82

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 and the new stabling yard and freight loop
- increased movement of dust, soil and plant material during construction.

5.1.3 Key threatening processes

There is one key threatening process associated with this proposal, clearing of native vegetation.

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 impacted, 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

One threatened ecological community; Coastal Upland Swamp in the Sydney Basin Bioregion was previously mapped in the study area (OEH 2016). A test of significance was applied for potential indirect impacts and concluded that a significant impact is unlikely.

5.2.2 Threatened flora

No threatened flora species were identified in the subject site. No tests of significance have been applied.

5.2.3 Threatened fauna

Six threatened fauna species were considered likely to utilise the subject site for foraging on an occasional basis:

- *Calyptorhynchus lathami* (Glossy Black Cockatoo) – vulnerable under the BC Act
- *Cercartetus nanus* (Eastern Pygmy Possum) – vulnerable under the BC Act
- *Glossopsitta pusilla* (Little Lorikeet) – vulnerable under the BC Act
- *Miniopterus australis* (Little Bentwing-bat) – vulnerable under the BC Act
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat) – vulnerable under the BC Act
- *Pteropus poliocephalus* (Grey-headed Flying-fox) – vulnerable under the BC Act and EPBC Act.

The tests of significance concluded that a significant impact on these species was unlikely to occur.

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

One threatened ecological community; Coastal Upland Swamp in the Sydney Basin Bioregion was previously mapped in the study area (OEH 2016). The significant impact criteria was applied for potential indirect impacts and concluded that a significant impact is unlikely.

5.3.2 Threatened flora

No threatened flora species were identified in the subject site. No significant impact criteria have been 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.

6. Recommendations

To minimise the potential impacts on the study area and improve environmental outcomes, the following recommendations for impact mitigation have been recommended. 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)
 - Weed Management and Disposal Guideline (TfNSW)
 - Offsets should be secured consistent with the TfNSW Offsetting Guideline
 - 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 ameliorate potential impacts to biodiversity values within the study area outside of the subject site. 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
 - 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 m either side of the construction footprint (where possible)
 - surface runoff should be diverted away from areas of soil disturbance
 - 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.
 - work will not take place during or after heavy rain when doing so is likely to cause soil erosion or soil structural damage
 - no washing of concrete should be undertaken on site.
 - 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 activities adjacent to vegetation to be retained does not alter existing drainage and existing light conditions.

- 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 m 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 previously undiscovered threatened species or communities are discovered during works. An assessment of the impact and any required approvals must be obtained.
- 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, without the use of herbicides.

7. Conclusion

Eco Logical Australia Pty Ltd was engaged by AECOM to prepare this Flora and Fauna Assessment report for the proposed MTMS Waterfall Stabling Yard and Platform Extension. ELA understands that this Flora and Fauna Assessment report would form part of a Review of Environmental Factors to 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 contained within the rail corridor and 2,500m² of land owned by Council, along with existing hardstand surfaces, native vegetation and rail infrastructure. Field survey identified one native vegetation community as present in the study area; *Sydney South Exposed Sandstone Woodland*. This community does not form part of a threatened ecological community. The study area also contained a regrowth form of this community representing as a shrubland and Planted Native and Exotic Cover. Planted Native and Exotic Cover does not form part of a native ecological community.

One endangered ecological community, *Coastal Upland Swamps in the Sydney Basin Bioregion* was mapped as present in the study area (OEH 2016). This community is listed as endangered under the BC Act and EPBC Act. This vegetation community would not be directly affected as part of the proposed works, however some indirect impacts may occur. A BC Act test of significance and the EPBC Act significant impact criteria was applied and determined that the proposal is unlikely to constitute a significant impact on this community.

No threatened flora or fauna species were identified in the study area during the survey, however the native vegetation present may provide foraging habitat for the following threatened fauna species:

- *Calyptorhynchus lathami* (Glossy Black Cockatoo) – vulnerable under the BC Act
- *Cercartetus nanus* (Eastern Pygmy Possum) – vulnerable under the BC Act
- *Glossopsitta pusilla* (Little Lorikeet) – vulnerable under the BC Act
- *Miniopterus australis* (Little Bentwing-bat) – vulnerable under the BC Act
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat) – vulnerable under the BC Act
- *Pteropus poliocephalus* (Grey-headed Flying-fox) – vulnerable under the BC Act and EPBC Act.

Tests of significance under the BC Act were applied to these species and concluded that the proposal is unlikely to constitute a significant impact. The EPBC Act Significant Impact Criteria was 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 Sydney South Exposed Sandstone Woodland in good condition (0.82 ha) were calculated individually, and offsets for Sydney South Exposed Sandstone Woodland and Planted Native and Exotic vegetation (0.49 ha) was calculated. Offset ratios of 2.80 and 2.40 respectively, were determined.

Offsets under the ISCA tool were calculated. Some vegetation will be retained as part of the proposed works. However, when applying the tool the amount of vegetation to be retained versus vegetation to be removed and the relative increase in hardstand surfaces, a score of 0 is achieved. As such, offsets will be required.

8. References

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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 binervia</i>	Coastal Myall	N
<i>Acacia buxifolia</i>	Box-leaf Wattle	N
<i>Acacia decurrens</i>	Black Wattle	N
<i>Acacia linearifolia</i>	Narrow-leaved Wattle	N
<i>Acacia linifolia</i>	White Wattle	N
<i>Acacia terminalis</i>	Sunshine Wattle	N
<i>Acacia myrtifolia</i>	Myrtle 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>Angophora costata</i>	Sydney Red-gum	N
<i>Araujia sericifera</i>	Moth Vine	E*
<i>Aristida ramosa</i>	Purple Wiregrass	N
<i>Asteraceae</i> sp.	-	
<i>Astroloma humifusum</i>	Native Cranberry	N
<i>Avena barbata</i>	Bearded Oat	E
<i>Banksia ericifolia</i>	Heath-leaved Banksia	N
<i>Banksia integrifolia</i>	Coast Banksia	N
<i>Bidens pilosa</i>	Cobbler's Peg's	E
<i>Bossiaea ensata</i>	Sword Bossiaea	N
<i>Bothriochloa macra</i>	Red Grass	N
<i>Callistemon</i> spp.	-	N
<i>Cenchrus clandestinus</i>	Kikuyu Grass	E
<i>Centella asiatica</i>	Indian Pennywort	E
<i>Chloris gayana</i>	Rhodes Grass	E
<i>Chrysanthemoides monilifera</i> subsp. <i>rotunda</i>	Bitou Bush	E*
<i>Cirsium vulgare</i>	Spear Thistle	E*
<i>Conyza bonariensis</i>	Flax-leaf Fleabane	E
<i>Corymbia gummifera</i>	Red Bloodwood	N
<i>Corymbia maculata</i>	Spotted Gum	N
<i>Cotoneaster</i> sp.	-	E*
<i>Cupressus</i> sp.	-	E
<i>Cymbopogon refractus</i>	Barbed Wire Grass	N

Scientific name	Common Name	Exotic/ Native
<i>Cynodon dactylon</i>	Couch	N
<i>Desmodium brachypodum</i>	Large Tick-trefoil	N
<i>Dichondra repens</i>	Kidney Weed	N
<i>Dodonaea triquetra</i>	Large-leaf Hop-bush	N
<i>Doryanthes excelsa</i>	Gynea Lily	N
<i>Entolasia marginata</i>	Bordered Panic	N
<i>Epacris pulchella</i>	Wallum Heath	N
<i>Eragrostis curvula</i>	African Lovegrass	E*
<i>Eucalyptus haemastoma</i>	Scribbly Gum	N
<i>Eucalyptus racemosa</i>	Narrow-leaved Scribbly Gum	N
<i>Eucalyptus sieberi</i>	Silvertop Ash	N
<i>Eustrephus latifolius</i>	Wombat Berry	N
<i>Ficus benjamina</i>	Weeping Fig	N
<i>Glycine clandestina</i>	-	N
<i>Grevillea sphacelata</i>	Grey Spider Flower	N
<i>Hakea sericea</i>	Needlebush	N
<i>Hypochaeris radicata</i>	Flatweed	E
<i>Imperata cylindrica</i>	Blady Grass	N
<i>Ipomoea purpurea</i>	Morning Glory	E
<i>Isopogon anemonifolius</i>	Broad-leaf Drumsticks	N
<i>Jacksonia scoparia</i>	Winged Broom-pea	N
<i>Lantana camara</i>	Lantana	E*
<i>Lepidosperma laterale</i>	-	N
<i>Leptospermum polygalifolium</i>	Jelly Bush	N
<i>Leptospermum</i> spp.	-	N
<i>Leptospermum trinervium</i>	Flaky-barked Tea-tree	N
<i>Leucopogon juniperinus</i>	Prickly Beard-heath	N
<i>Ligustrum lucidum</i>	Large-leaved Privet	E*
<i>Lomatia silaifolia</i>	Crinkle Bush	N
<i>Lophostemon confertus</i>	Brush Box	N
<i>Lysimachia arvensis</i>	Scarlet Pimpernel	E
<i>Melaleuca linariifolia</i>	Flax-leaved Paperbark	N
<i>Melinis repens</i>	Red Natal Grass	E
<i>Modiola caroliniana</i>	Red-flowered Mallow	E
<i>Nephrolepis cordifolia</i>	Fishbone Fern	N
<i>Osteospermum spinescens</i>	African Daisy	E

Scientific name	Common Name	Exotic/ Native
<i>Oxalis corniculata</i>	-	E
<i>Paspalum dilatatum</i>	Paspalum	E
<i>Paspalum urvillei</i>	Giant Paspalum	E
<i>Pellaea falcata</i>	Sickle Fern	N
<i>Persoonia linearis</i>	Narrow-leaved Geebung	N
<i>Pittosporum revolutum</i>	Wild Yellow Jasmine	N
<i>Pittosporum undulatum</i>	Native Daphne	N
<i>Plantago lanceolata</i>	Ribwort	E
<i>Poa annua</i>	Winter Grass	E
<i>Pomaderris lanigera</i>	Woolly Pomaderris	N
<i>Portulaca oleracea</i>	Pig Weed	N
<i>Pteridium esculentum</i>	Common Bracken	N
<i>Romulea</i> spp.	Onion Grass	E
<i>Rubus fruticosus</i> spp. aggregate	Blackberry	E*
<i>Senecio</i> spp.	-	
<i>Senna pendula</i>	Cassia	E*
<i>Setaria parviflora</i>	-	E
<i>Sida rhombifolia</i>	Paddy's Lucerne	E
<i>Solenogyne</i> spp.	-	N
<i>Sporobolus africanus</i>	Parramatta Grass	E*
<i>Trifolium repens</i>	White Clover	E
<i>Verbena bonariensis</i>	Purpletop	E
<i>Veronica plebeia</i>	Trailing Speedwell	N
<i>Viminaria juncea</i>	Golden Spray	N
<i>Watsonia</i> sp.	-	E
<i>Wahlenbergia gracilis</i>	Australian Bluebell	N
* = 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.

The records column refers to the number of records occurring within 10 km of the study area, as provided by the Atlas of NSW Wildlife (BioNet) and Protected Matters Search Tool database search.

Information provided in the habitat associations’ 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
<i>Ecological communities</i>						
<i>Coastal Swamp Oak (Casuarina glauca)</i> <i>Forest of NSW and South East QLD</i>		E	E	his 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
<i>Coastal Upland Swamps in the Sydney Basin Bioregion</i>		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 (n 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.	Likely	Yes
<i>Littoral Rainforest and Coastal Vine Thickets of Eastern Australia</i>		E	CE	Typically occurs within two kilometres of the coast; in NSW, found in the NSW North Coast, Sydney Basin and South East Corner bioregions. Occurs on dunes and flats, cheniers, berms, cobbles, headlands, scree, seacliffs, marginal bluffs, spits, deltaic deposits, coral rubble and islands.	No	No– not identified in the study area
<i>Shale Sandstone Transition Forest of the Sydney Basin Bioregion</i>		CE	CE	Occurs at the edges of the Cumberland Plain in western Sydney, most now occurs in the Hawkesbury, Baulkham Hills, Liverpool, Parramatta, Penrith, Campbelltown and Wollondilly local government areas. Intergrade between clay soils from the shale rock and earthy and sandy soils from sandstone, or where shale caps overlay sandstone.	No	No– not identified in the study area
<i>Turpentine-Ironbark Forest of the Sydney Basin Bioregion</i>		E	CE	Cumberland Lowlands, with remnants also occurring to the west on shale-capped ridges in the Blue Mountains. Restricted to areas with clay soil derived from Wianamatta Shale in an area that generally has an annual rainfall of more than 950 mm.	No	No– not identified in the study area

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion</i>		-	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
FAUNA						
<i>Actitis hypoleucos</i>	Common Sandpiper	-	M	Summer migrant. In NSW, widespread along coastline and also occurs in many areas inland. Coastal wetlands and some inland wetlands, especially muddy margins or rocky shores. Also estuaries and deltas, lakes, pools, billabongs, reservoirs, dams and claypans, mangroves.	No	No – no habitat in the study area
<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).	Unlikely	No – no preferred feed trees 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 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 habitat in the study area
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	-	M	Summer migrant. Widespread in most regions of NSW, especially in coastal areas, but sparse in the south-central Western Plain and east Lower Western Regions.	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>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 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 habitat in the study area
<i>Calidris melanotos</i>	Pectoral Sandpiper	-	M	Summer migrant to Australia. Widespread but scattered in NSW. East of the Great Divide, recorded from Casino and Ballina, south to Ulladulla. West of the Great Divide, widespread in the Riverina and Lower Western regions. Shallow fresh to saline wetlands, including coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	No	No– no 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 – no suitable feed trees in the study area
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	V	-	In NSW, widespread along coast and inland to the southern tablelands and central western plains, with a small population in the Riverina. Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.	Likely	Yes
<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.	Likely	Yes

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country. Roosts in caves, rock overhangs and disused mine shafts and as such is usually associated with rock outcrops and cliff faces. It also possibly roosts in the hollows of trees. The species is thought to require roosting habitat that is adjacent to higher fertility sites which are used for foraging. This species probably forages for small, flying insects below the forest canopy. Likely to hibernate through the coolest months. It is uncertain whether mating occurs early in winter or in spring.	Unlikely	No – lack of suitable roosting and foraging 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 foraging 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 foraging habitat present
<i>Dasyurus maculatus maculatus</i> (SE mainland population)	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 foraging habitat present
<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 foraging habitat

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
						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.	Unlikely	No – lack of suitable roosting and foraging habitat in the study area
<i>Gallinago hardwickii</i>	Latham's Snipe	-	M	Migrant to east coast of Australia, extending inland west of the Great Dividing Range in NSW. Freshwater, saline or brackish wetlands up to 2000 m above sea-level; usually freshwater swamps, flooded grasslands or heathlands.	No	No– no suitable 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.	Likely	Yes
<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 suitable foraging habitat present
<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.	No	No– no suitable 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 foraging or breeding habitat present (no drainage lines, riparian corridors or waterways present in the study area. Significant expanses of hardstand surfaces (M1 and rail corridor) between waterways and 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.	Potential	No– no suitable foraging habitat 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.	Potential	No– no suitable foraging habitat

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
						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
<i>Isodon 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 suitable habitat present
<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.	Unlikely	No-no suitable feed trees present
<i>Limosa lapponica</i>	Bar-tailed Godwit	-	M	Summer migrant to Australia. Widespread along the coast of NSW, including the offshore islands. Also numerous scattered inland records. Intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, bays, seagrass beds, saltmarsh, sewage farms and saltworks, salt lakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Rarely inland wetlands, paddocks and airstrips.	No	No-no 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.	No	No-no habitat present
<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	No	No-no habitat present

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
				permanent streams and perched swamps. Non-breeding habitat is heath-based forests and woodlands		
<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 habitat present
<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-no suitable habitat present
<i>Merops ornatus</i>	Rainbow Bee-eater	-	-	Distributed across much of mainland Australia, including NSW. Open forests and woodlands, shrublands, farmland, areas of human habitation, inland and coastal sand dune systems, heathland, sedgeland, vine forest and vine thicket.	Unlikely	No- no suitable habitat present
<i>Miniopterus australis</i>	Little Bentwing-bat	V	-	East coast and ranges south to the Wollongong in NSW. Moist Eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub.	Likely	Yes – foraging only
<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.	Likely	Yes-foraging only
<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 habitat present

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Monarcha melanopsis</i>	Black-faced Monarch	-	M	In NSW, occurs around the eastern slopes and tablelands of the Great Divide, inland to Coutts Crossing, Armidale, Widden Valley, Wollemi National Park and Wombeyan Caves. It is rarely recorded farther inland. Rainforest, open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens.	No	No-no habitat present
<i>Monarcha trivirgatus</i>	Spectacled Monarch	-	-	Coastal eastern Australia south to Port Stephens in NSW. Mountain/lowland rainforest, wooded gullies, riparian vegetation including mangroves.	No	No-no habitat present
<i>Motacilla flava</i>	Yellow Wagtail	-	M	Regular summer migrant to mostly coastal Australia. In NSW recorded Sydney to Newcastle, the Hawkesbury and inland in the Bogan LGA. Swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land, lawns.	No	No-no habitat present
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	-	M	In NSW, widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on the western plains. Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies.	No	No-no habitat present
<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.	No	No-no habitat present
<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 herbland and taller coastal shrubland.	No	No-no habitat present
<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.	Unlikely	No- no foraging or roosting habitat present

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<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 present
<i>Petauroides volans</i>	Greater Glider	-	V	Eastern Australia, from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest). Eucalypt forests and woodlands. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows.	No	No - no habitat present
<i>Petrogale penicillate</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 present
<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.	Unlikely	No -no habitat present
<i>Phascolarctos cinereus</i>	Koala	V	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands. Eucalypt woodlands and forests.	Unlikely	No -hardstand barriers between surrounding vegetation and study area and large fences would prevent movement into 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

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
						present
<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 suitable foraging or breeding habitat present (no drainage lines, riparian corridors or waterways present in the study area. Significant expanses of hardstand surfaces (M1 and rail corridor) between waterways and 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
<i>Rhipidura rufifrons</i>	Rufous Fantail	-	M	Coastal and near coastal districts of northern and eastern Australia, including on the east of the Great Divide in NSW. Wet Sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands.	No	No -no habitat present

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 present
<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 habitat present
<i>Sternula albifrons</i>	Little Tern	E1	M	In NSW, it arrives from September to November, occurring mainly north of Sydney, with smaller numbers found south to Victoria. Sheltered coastal environments, harbours, inlets and rivers.	No	No -no habitat present
<i>Tringa nebularia</i>	Common Greenshank	-	M	Summer migrant to Australia. Recorded in most coastal regions of NSW; also widespread west of the Great Dividing Range, especially between the Lachlan and Murray Rivers and the Darling River drainage basin, including the Macquarie Marshes, and north-west regions. Terrestrial wetlands (swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans, saltflats, sewage farms and saltworks dams, inundated rice crops and bores) and sheltered coastal habitats (mudflats, saltmarsh, mangroves, embayments, harbours, river estuaries, deltas, lagoons, tidal pools, rock-flats and rock platforms).	No	No -no habitat present
<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.	Unlikely	No – lack of foraging and roosting habitat present
<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.	Potential	No-no termite mounds, hollow logs, rock crevices or burrows. Native

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
						vegetation present is not extensive and may not provide adequate foraging range for this species.
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-not identified during survey
<i>Acacia pubescens</i>	Downy Wattle	V	V	Restricted to the Sydney region around the Bankstown-Fairfield-Rookwood and Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon.	No	No-not identified during survey
<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-not identified during survey
<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. Dry sclerophyll woodland on sandstone.	No	No-not identified during survey
<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-requires clay soil profile. Study area is sandstone

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<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-not identified during survey
<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.	Unlikely	No-previous disturbance in the study area unlikely to provide suitable habitat
<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.	No	No-not identified during survey
<i>Daphnandra johnsonii</i>	Illawarra Socketwood	E1	E	Restricted to the Illawarra region, in the Shoalhaven, Kiama, Shellharbour and Wollongong areas. Rainforest and moist eucalypt forest on rocky hillsides and gullies of the Illawarra lowlands, occasionally extending onto the upper escarpment slopes.	No	No-not identified during survey
<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-not identified during survey
<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-not identified during survey
<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.	Unlikely	No-unsuitable vegetation community and 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>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea	V	V	Sporadically distributed throughout the Sydney Basin and in the Hunter in the Cessnock - Kurri Kurri area. Also known from Putty to Wyong and Lake Macquarie on the Central Coast. Heath and shrubby woodland to open forest on sandy or light clay soils usually over thin shales.	No	No-not identified during survey
<i>Haloragis exalata</i> subsp. <i>exalata</i>	Square Raspwort	V	V	Disjunct distribution in the Central Coast, South Coast and North Western Slopes botanical subdivisions of NSW.	No	No-not identified during survey
<i>Leucopogon exolasius</i>	Woronora Beard-heath	V	V	Upper Georges River area and in Heathcote National Park. Woodland on sandstone.	No	No-not identified during survey
<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-not identified during survey
<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-not identified during survey
<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.	No	No-not identified during survey
<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. Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	No	No-not identified during survey
<i>Pimelea curviflora</i> var. <i>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-not identified during survey

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Pomaderris brunnea</i>	Brown Pomaderris	E1	V	In NSW, found around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands. Moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	No	No-not identified during survey
<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-not identified during survey
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	E1	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south.	No	No- study area does not contain habitat – sandstone rock shelves above cliff lines
<i>Pultenaea aristata</i>	Prickly Bush-pea	V	V	Restricted to the Woronora Plateau. Dry sclerophyll woodland or wet heath on sandstone.	No	No-not identified during survey
<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-not identified during survey
<i>Thelymitra kangaloonica</i>	Kangaloon Sun Orchid	E4A	CE	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 sedgeland over grey silty grey loam soils.	No	No-not identified during survey
<i>Thesium australe</i>	Austral Toadflax	V	V	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.	No	No-not identified during survey

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of occurrence	Impact Assessment Required
<i>Xerochrysum palustre</i>	Swamp Everlasting	-	V	In NSW, found in Kosciuszko National Park and the eastern escarpment south of Badja. In or on the margins of swamps and bogs which are often dominated by heaths.	No	No-not identified during survey

BC Act Key: V = vulnerable, E1 = endangered, E4A = critically endangered.

EPBC Act Key: V = vulnerable, E = endangered, CE = critically endangered, Mar = marine, M = migratory under JAMBA, CAMBA, RoKAMBA and Bonn Migratory agreements

Appendix C - Tests 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 are subject of the assessment for the proposed works are:

- *Calyptorhynchus lathami* (Glossy Black Cockatoo) – vulnerable under the BC Act
- *Cercartetus nanus* (Eastern Pygmy Possum) – vulnerable under the BC Act
- *Glossopsitta pusilla* (Little Lorikeet) – vulnerable under the BC Act
- *Miniopterus australis* (Little Bentwing-bat) – vulnerable under the BC Act
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat) – vulnerable under the BC Act
- *Pteropus poliocephalus* (Grey-headed Flying-fox) – vulnerable under the BC Act.

Threatened ecological communities that are subject to assessment are:

- Coastal Upland Swamps of the Sydney Basin Bioregion – endangered under the BC Act.

For the purpose of the following Tests of Significance, the species were grouped according to foraging requirements. Microchiropteran bats (microbats) were assessed collectively. The Grey-headed Flying-fox, Eastern Pygmy Possum, Little Lorikeet and Glossy Black Cockatoo were addressed separately due to their individual foraging and roosting requirements.

THREATENED MICROCHIROPTERAN BATS

Miniopterus australis (Little Bentwing-bat)

Little Bentwing-bat is listed as a vulnerable species under the BC Act. The species is generally found in well-timbered areas, including moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.

There are 60 records for this species within a 5 km 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.

Miniopterus schreibersii oceanensis (Eastern Bentwing-bat)

Eastern Bentwing-bat is listed as a vulnerable species under the BC Act. This species occupies a range of forested environments (including wet and dry sclerophyll forests), along the coastal portion of eastern Australia, and through the Northern Territory and Kimberley area (subject to subdivision of this species).

This species has a fast, level flight exhibiting swift shallow dives. It forages from just above the tree canopy, to many times the canopy height in forested areas, and will utilise open areas where it is known to forage at lower levels. Moths appear to be the main dietary component. This highly mobile species is capable of large regional movements in relation to seasonal differences in reproductive behaviour and winter hibernation. Though individuals often use numerous roosts, it congregates in large numbers at a small number of nursery caves to breed and hibernate. Although roosting primarily occurs in caves, it has also been recorded in mines, culverts, stormwater channels, buildings, and occasionally tree-hollows. This species occupies a number of roosts within specific territorial ranges usually within 300 km of the maternity cave and may travel large distances between roost sites.

There are 177 records for this species within a 5 km radius of the study area (OEH 2019a). The study area is considered marginal foraging habitat for this species, although it is unlikely that individuals rely upon resources in the study area (OEH 2019b).

- 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 local population is considered to be any individuals within a 5 km radius of the study area. This is because the potentially affected species are known to forage widely and utilise a range of vegetation communities. Factors likely to have an adverse effect on the potentially affected species include impacts that result in:

- the loss of significant areas of foraging habitat
- loss of roosting habitat (native vegetation)
- use of pesticides in or adjacent to foraging areas.

The proposal would remove of 0.82 ha of native vegetation considered foraging habitat for these species. No roosting habitat would be affected.

The potentially affected species are highly mobile, have a large foraging range and would not rely solely on the foraging resources within the study area. About 9,509 ha of potential foraging habitat occurs in the locality. This habitat is likely to be of better condition given its presence in the Royal National Park and Heathcote National Park. The removal of 0.82 ha of potential foraging habitat constitutes 0.01 % of the remaining potential habitat in the foraging range for these species. This is considered a minor impact given the potentially affected species forage widely and tend to rely on a range of foraging resources within the foraging range for these species.

The proposal would be unlikely to have an adverse impact on the potentially affected species such that they are 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 local occurrence is likely to be placed at risk of extinction, or**
- ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Not applicable.

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 0.01 % of the native vegetation considered foraging habitat for these species. No roosting habitat would be 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 habitat to be removed is located within the rail corridor and road verge and is fragmented from other areas of habitat by the rail corridor and associated hardstand infrastructure. The removal of this vegetation would not increase fragmentation throughout the landscape given its already fragmented nature. While the work would increase gaps between habitat, this is not likely to be an impediment to these species. Microbats are highly mobile species and would be able to utilise other foraging habitat within the foraging range for these 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 habitat to be removed is not considered important to the long-term survival of the potentially affected species given that:

- the foraging habitat to be removed would not provide a habitat link between other foraging resources within the foraging range for these species
- the potentially affected species are highly mobile and would rely on a range of resources within the foraging range for these species

- about 9,509 ha of potential foraging habitat would be retained in the foraging range for these species
- no known roosting habitat would be affected.

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 associated with this proposal; clearing of native vegetation. The proposal would involve the clearing of 0.82 ha of native vegetation which forms potential foraging habitat for the potentially affected species. The potentially affected species are highly mobile and are known to rely on a range of foraging resources within the foraging range for these 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 potentially affected species given the following:

- the proposal would remove 0.82 ha of potential foraging habitat
- the potentially affected species are highly mobile, would not rely on the resources to be removed and would utilise a range of foraging habitat within the locality
- the habitat to be removed would not isolate or fragment other foraging resources within the foraging range for these species
- about 9,509 ha of potential foraging habitat would be retained within the foraging range for these species
- no known roosting habitat would be affected.

A Species Impact Statement or Biodiversity Development Assessment Report (BDAR) is not recommended with respect to the potentially affected species.

MEGA BATS

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 km 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 50 km). 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 km 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 25 km north in Kareela. The population of the camp is estimated at 1 - 499 individuals (DotEE 2019b).

There are 23 records for this species within a 5 km 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 40 km radius of the study area. This is because this species typically forages over a range of 20 – 40 km per night, with the average distance travelled 30 km 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 two camps within a 30 km radius of the study area:

- Kareela – 1 – 499 individuals
- Macquarie Fields 2,500 – 9,999.

- 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 of 0.82 ha of native vegetation and considered foraging habitat for the Grey-headed Flying-fox. No known camps would be affected. The impact is expected to be minimal given the retention of 9,509 ha of potential foraging habitat available in the local occurrence. The removal of 0.82 ha of potential foraging habitat constitutes 0.01 % 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 potential habitat present within the local occurrence is in better condition than the foraging habitat in the study area, given its presence in Royal National Park and Heathcote National Park, and

its formation as part of a large, continuous patch. The nearest camp is 25 km north of the study area in Kareela (DotE 2019). Some disturbance (noise and dust) is expected to occur during the construction phase, however the works would not reach the camp. Any noise and dust impacts would be low-level, temporary and occurring during both day and night-time hours. There would be an increase in operational noise once works have been completed.

Therefore, these impacts would be unlikely to indirectly impact the camp or degrade adjacent habitat affecting species' habitat. Additionally, the expected light pollution is unlikely to significantly increase beyond the current operational levels of the rail corridor.

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 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 local occurrence is likely to be placed at risk of extinction, or**
- ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Not applicable.

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 0.82 ha of native vegetation and considered foraging habitat for the Grey-headed Flying-fox. This forms 0.01 % of the potential foraging habitat within the foraging range for this species, with 9,509 ha present. No known camps would be 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 of potential foraging habitat to be affected exist as small, isolated pockets and do not form part of a larger patch. The areas to be affected would not act as a foraging link between two areas of foraging habitat. The Grey-headed Flying-fox is also highly mobile and forages up to 30 km in a feeding foray. The removal of 0.82 ha of potential foraging habitat 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 0.82 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. As such, the habitat is considered marginal for this species. The local occurrence contains larger, continuous patches of potential foraging habitat that would likely contain a higher proportion of suitable feed trees for this species. The area to be affected would contribute to the connectivity of foraging habitat throughout the local occurrence, however the area does not form the only link with other areas of habitat.

The potential foraging habitat to be retained in the local occurrence has very high security. Suitable areas of foraging habitat are present in the Royal National Park and Heathcote National Park within the foraging range for this species. The Grey-headed Flying-fox is also highly mobile and forages up to 30 km in a feeding foray. The removal of 0.82 ha of potential foraging habitat would not prevent this species from utilising other resources within the locality.

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 associated with the proposal; clearing of native vegetation. The proposal would involve the clearing of 0.82 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 0.82 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 affected.

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

***Cercartetus nanus* (Eastern Pygmy Possum)**

The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. It is found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest.

The Eastern Pygmy Possum feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. It also feeds on insects throughout the year. This feed source may be more important in habitats where flowers are less abundant such as wet forests.

The Eastern Pygmy Possum shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (*Pseudocheirus peregrinus*) dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks.

Appear to be mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares. The species frequently spends time in torpor especially in winter.

There are 57 records for this species within a 10 km radius of the study area (OEH 2019a). No breeding or roosting features were present, however marginal foraging habitat was present in the form of 0.82 ha of Sydney South Exposed Sandstone Woodland.

- 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 proposal will result in the removal of 0.82 ha of native vegetation which forms marginal foraging habitat for the Eastern Pygmy-possum. No breeding habitat (hollow-bearing trees and burrows) will be affected as part of the proposal.

The impact is expected to be minimal when considering the large undisturbed areas of potential habitat available in the surrounding landscape of Royal National Park and Heathcote National Park. Consequently, the proposed works would not be likely to place a viable local population of Eastern Pygmy Possum 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 local occurrence is likely to be placed at risk of extinction, or**
 - ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Not applicable.

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 will remove of 0.82 ha of native vegetation which forms marginal foraging habitat for the Eastern Pygmy-possum. No breeding habitat (hollow-bearing trees and burrows) will be affected as part of the proposal.

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 will not fragment any areas of foraging habitat for this species. The marginal foraging habitat is located between the M1 motorway and the rail corridor and exists as an isolated patch. This patch does not form a corridor between other areas of potential foraging habitat.

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 removal of 0.82 ha of marginal foraging habitat is not considered important to the long-term survival of the Eastern Pygmy Possum. There is 9,509 ha of potential foraging habitat available within a 5 km radius of the study area, and as such the area to be removed forms 0.01% of the habitat within the locality. This potential habitat forms part of the Royal National Park and Heathcote National Park, contains similar Proteaceaceous shrubs and is in better condition than the habitat in the study area. There are also records for the Eastern Pygmy Possum within this vegetation. Given the isolated nature of the marginal habitat to be removed and the abundance of a large, continuous patch adjacent to the site, the habitat in the study area is not important to the long-term survival of the Eastern Pygmy Possum.

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),

The proposed development will not impact an area of outstanding biodiversity value.

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.

The proposal will contribute to one key threatening process; clearing of native vegetation. The proposal will remove of 0.82 ha of native vegetation which forms marginal foraging habitat for the Eastern Pygmy-possum. No breeding habitat (hollow-bearing trees and burrows) will be affected as part of the proposal. Given the availability of 9,509 ha of native vegetation within a 5 km radius of the study area, 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 Eastern Pygmy Possum given the following:

- the proposal would remove 0.82 ha of potential foraging habitat
- the Eastern Pygmy Possum would not rely on the resources to be removed and would utilise a range of foraging habitat within the locality

- the habitat to be removed would not isolate or fragment other foraging resources within the locality
- about 9,509 ha of potential foraging habitat would be retained within the locality
- no known roosting habitat would be affected.

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

BIRDS

***Calyptorhynchus lathami* (Glossy Black Cockatoo)**

The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. The Glossy Black Cockatoo inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of *Allocasuarina littoralis* (Black Sheoak) and *A. torulosa* are important foods.

Inland populations feed on a wide range of sheoaks, including *A. diminuta* and *A. gymnanthera*. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by *Casuarina cristata*. This species is dependent on large hollow-bearing eucalypts for nest sites.

- 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 local population for these species is considered to be a 5 km radius of the study area. Impacts likely to have an adverse impact on the Glossy Black Cockatoo include:

- habitat loss and fragmentation
- infrequent fire regimes
- loss of old growth forest
- loss of hollow bearing trees.

The study area contains limited habitat for the Glossy Black Cockatoo. *Allocasuarina littoralis* was the only feed tree species present within the study area, and was present in a low and scattered density. The study area would only provide marginal foraging habitat for this species. No roosting habitat would be affected.

- 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 local occurrence is likely to be placed at risk of extinction, or**
- ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

No 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 0.82 ha of marginal foraging habitat for the Glossy Black Cockatoo. No roosting habitat would be removed.

- 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 of potential foraging habitat to be affected exist as small, isolated pockets within the rail corridor and do not form part of a larger patch. The areas to be affected would not act as a foraging link between two areas of foraging habitat. The removal of 0.82 ha of potential foraging habitat 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 0.82 ha of potential foraging habitat to be removed is not considered important to the long-term survival of the Glossy Black Cockatoo. 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, and where present, were scattered. As such, the habitat is considered marginal for this species. The foraging range for this species contains larger, continuous patches of potential foraging habitat that would likely contain a higher proportion of suitable feed trees for this species. The area to be affected would contribute to the connectivity of foraging habitat throughout the foraging range for this species, however the area does not form the only link with other areas of habitat.

The potential foraging habitat to be retained in the foraging range for this species has very high security as it forms part of both the Royal National Park and Heathcote National Park. The Glossy Black Cockatoo is mobile and would utilise the resources within the local occurrence for foraging purposes. The removal of 0.82 ha of potential foraging habitat would not prevent this species from utilising other resources within the locality.

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 associated with the proposal; clearing of native vegetation. The proposal would involve the clearing of 0.82 ha of native vegetation which forms marginal foraging habitat for the Glossy Black Cockatoo. These species are highly mobile and are known to rely on a range of foraging resources within the local occurrence. 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 Glossy Black Cockatoo given the following:

- the proposal would remove 0.82 ha of potential foraging habitat
- these species are 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 is marginal and would not isolate or fragment other foraging resources within the foraging range for this species

- about 9,509 ha of potential foraging habitat would be retained within the foraging range for this species
- no known roosting or breeding habitat would be affected.

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

***Glossopsitta pusilla* (Little Lorikeet)**

The Little Lorikeet is listed as vulnerable under the BC Act. The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year and 'locally nomadic' movements are suspected of breeding pairs.

The Little Lorikeet forages primarily in the canopy of open Eucalyptus forest and woodland, but will also utilise *Angophora*, *Melaleuca* and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity and will use isolated flowering trees in open country, roadside remnants and urban areas. The species roosts in treetops and hollow bearing limbs, often distant from feeding areas and are used repeatedly for decades.

The Little Lorikeet is a gregarious species, travelling and feeding in small flocks (<10), though often with other lorikeets. Flocks numbering hundreds are still occasionally observed and may have been the norm in past centuries. Nesting season extends from May to September.

There are 26 records for this species within a 10 km radius of the subject site (OEH 2019a). There is potential that the subject site is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon resources in the subject site.

- 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 local population for these species is considered to be a 5 km radius of the subject site. This species forage widely and migrate as a population for breeding purposes. Factors likely to have an adverse effect on the threatened forest birds include impacts that result in the loss of significant areas of foraging habitat.

The proposal would remove 0.82 ha of potential foraging habitat for the Little Lorikeet. No potential roosting habitat would be affected.

The Little Lorikeet also has a large foraging range. The foraging habitat to be removed would not be relied upon by these species and forms a large mosaic of resources within the foraging range of this species. In addition, about 9,509 ha of potential foraging habitat would be available within the species foraging range. The potential foraging habitat to be removed forms 0.01 % of the resources available within the foraging range for this species.

The foraging habitat to be removed is not considered important to the life cycle of the Little Lorikeet.

- 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 local occurrence is likely to be placed at risk of extinction, or**

- ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Not applicable.

- 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 0.82 ha of potential foraging habitat for the Little Lorikeet. No potential roosting habitat would be 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 habitat to be removed exists as isolated patches between the M1 motorway and the rail corridor. The removal of these areas would not cause fragmentation or isolation in the landscape, given their already fragmented nature and the abundance of 9,509 ha of foraging habitat within this species foraging range. The Little Lorikeet is a highly mobile species and is known to forage widely, using a variety of resources within their foraging range.

- 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 potential foraging habitat to be removed forms part of a range of foraging resources within this species foraging range. The Little Lorikeet forages widely and would use the resources in the study area on an occasional basis. There would be about 9,509 ha of potential foraging habitat retained within the foraging range for this species. The area to be removed constitutes 0.01 % of the resources within the local occurrence. This habitat would not be important to the long-term survival of the Little Lorikeet.

- 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 associated with the proposal; clearing of native vegetation. The proposal would involve the clearing of 0.82 ha of native vegetation which forms potential foraging habitat for the Little Lorikeet. This species is highly mobile and is known to rely on a range of foraging resources within its foraging range. 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 Little Lorikeet given the following:

- the proposal would remove 0.82 ha of potential foraging habitat
- this species is highly mobile, would not rely on the resources to be removed and would utilise a range of foraging habitat within their foraging range

- the habitat to be removed would not isolate or fragment other foraging resources within the foraging range for this species
- about 9,509 ha of potential foraging habitat would be retained within the foraging range for this species
- no known roosting or breeding habitat would be affected.

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

THREATENED ECOLOGICAL COMMUNITIES

Coastal Upland Swamps in the Sydney Basin Bioregion

The Coastal Upland Swamp in the Sydney Basin Bioregion includes open graminoid heath, sedgeland and tall scrub associated with periodically waterlogged soils on the Hawkesbury sandstone plateaux (OEH 2019b). The Coastal Upland Swamp is generally associated with soils that are acidic and vary from yellow or grey mineral sandy loams with a shallow organic horizon to highly organic spongy black peat soils with pallid subsoils (OEH 2019b).

The Coastal Upland Swamp is endemic to NSW and confined to the Sydney Basin Bioregion. It occurs in the eastern Sydney Basin from the Somersby district in the north to the Robertson district in the south. In the north it occurs on the Somersby-Hornsby plateaux, in the south it occurs on the Woronora plateau. It occurs in elevations from 20 metres to over 600 metres above sea level, with the majority of swamps occurring within 200 and 450 metres elevation (OEH 2019c).

- 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,**

Not applicable.

- 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 local occurrence is likely to be placed at risk of extinction, or**

No. The proposal will not directly affect any Coastal Upland Swamps in the study area. Any impacts will be limited to indirect impacts and may include an increase in dust mobilisation and temporary changes to hydrology. These indirect impacts would not adversely affect the extent of the community such that it is placed at risk of extinction.

- ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

No. The proposal will not directly impact any Coastal Upland Swamps in the study area. The indirect impacts likely to be associated with the proposal include dust mobilisation and temporary changes to hydrology. Given that the community will be retained, any indirect impacts are unlikely to substantially or adversely modify the composition of the community.

- 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 will not remove any areas of the community, nor would it be modified as part of the proposal.

- 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 community would not become fragmented or isolated from other areas of habitat, given the proposal will not remove any areas of the community.

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 proposal will not directly impact any areas of Coastal Upland Swamps. Impacts would be limited to indirect impacts and would likely include increased dust mobilisation and temporary changes to hydrology. These indirect impacts would not remove, fragment, isolate or modify the community.

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.

No.

Conclusion

The proposal is unlikely to constitute a significant impact to Coastal Upland Swamps.

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 BC Act. It is generally found within 200 km 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 50 km). 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 km 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 25 km north in Kareela. The population of the camp is estimated at 1 - 499 individuals (DotEE 2019b).

There are 23 records for this species within a 5 km 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 40 km radius of the study area. This is because this species typically forages over a range of 20 – 40 km per night, with the average distance travelled 30 km 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 two camps within a 30 km radius of the study area:

- Kareela – 1 – 499 individuals
- Macquarie Fields 2,500 – 9,999.

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

The proposed action would remove 0.82 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 25 km north of the study area in Kareela. There is also one additional camp within a 30 km radius of the study area at Macquarie Fields. 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, and as such, 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 Grey-headed Flying-fox tends to travel up to 20 – 40 km on feeding forays to compensate for the changes in the availability of foraging resources. This indicates that the species is wide ranging and likely to utilise a range of different foraging resources on a daily basis.

The proposed action would remove 0.82 ha of potential foraging habitat for this important population. This is a small disturbance to the potential foraging habitat within the locality and is considered a minor disturbance given the availability of potential foraging habitat in the locality, within the Royal National Park and Heathcote National Park. There is about 9,509 ha of potential foraging habitat within a 5 km radius of the study area. Thus, the proposed action is unlikely to reduce the area of occupancy of an important population.

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, and as such, any colony or individual of the species is part of an important population of the species. No known Grey-headed Flying-fox camps would be affected as part of the proposed action with the nearest camp located 25 km north of the study area in Kareela.

Approximately 0.82 ha of potential foraging habitat would be removed as part of the proposed action. Foraging habitat would be retained in the locality within the Royal National Park and Heathcote National Park. Given that the species forages over a 30 km range and no camps are present within the study area, the proposed action would not result in the fragmentation or isolation of the population or known camps in the locality.

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 km of a known camp with over 20,000 roosting individuals. The study area is located 25 km south and 20 km east of two camps (Kareela and Macquarie Fields, however these camps do not meet this criterion as they contain between 1 – 499 and 2,500 – 9,999 individuals respectively (DotEE 2019b). The proposed action would not directly impact any known Grey-headed Flying-fox camp but would result in the removal of 0.82 ha of foraging habitat. This habitat is not critical to the survival of the species because it is not located within 30 km of a known camp containing >20,000 individuals.

Criterion e: disrupt the breeding cycle of an important population

The proposed action would not 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 negligible amount of the foraging habitat within the locality. The proposed action is unlikely to disrupt the breeding cycle of the Grey-headed Flying-fox given that no known camps would be affected and the availability of potential foraging habitat within the locality.

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 0.82 ha of foraging habitat for this species. The area of foraging habitat to be removed exists as isolated pockets of vegetation, and in some areas on the edge of a larger patch that is bordered by a road. The proposed action would not isolate or fragment 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 2009 (DECCW).

Specific objectives to be met in the 5-year timeframe of the recovery plan relevant to this project include:

- to identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes throughout their range
- to protect and increase the extent of key winter and spring foraging habitat of Grey-headed Flying-foxes
- to identify roosting habitat critical to the survival of Grey-headed Flying-foxes
- to protect and enhance roosting habitat critical to the survival of Grey-headed Flying-foxes.

As no camps would be 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 a population of Grey-headed Flying-fox. A referral to the Commonwealth DotEE is not recommended.

Coastal Upland Swamps in the Sydney Basin Bioregion**Criterion a: reduce the extent of an ecological community**

No. The proposed action would not reduce the extent of this community, given that no direct impacts would occur. The proposed action may indirectly affect the community through dust mobilisation and temporary changes to hydrology.

Criterion b: fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines

No. The proposed action would not directly impact the community. Any impacts would be limited to indirect impacts such as dust mobilisation and temporary changes to hydrology. These indirect impacts would not fragment the community.

Criterion c: adversely affect habitat critical to the survival of an ecological community

Areas critical to the survival of the community include areas that are currently occupied by the community. The study area contains critical habitat, however it would not be directly affected by the proposed action. Any impacts would be indirect, and would not adversely affect the community, given their temporary nature.

Criterion d: modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns

No. No direct impacts to the community are expected to occur.

Criterion e: cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting

The indirect impacts likely to be associated with the proposed action include dust mobilisation and temporary changes to hydrology. Given that the community will be retained, any indirect impacts are unlikely to substantially or adversely modify the composition of the community.

Criterion f: cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: assisting invasive species, that are harmful to the listed ecological community, to become established, or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or

No. The proposed action would not directly impact any areas of the community. The proposed action may involve indirect impacts such as dust mobilisation and temporary changes to hydrology. Any indirect impacts would be temporary in nature during the construction phase of the proposed action. The patch of the community is bordered by existing rail infrastructure, and as such the proposed action would not involve the use of fertilisers, herbicides, chemicals or pollutants. The proposed action would not cause a substantial reduction in the quality of the community.

Criterion g: interfere with the recovery of an ecological community.

No. No indirect impacts are expected to occur.

Conclusion

The proposed is unlikely to constitute a significant impact on Coastal Upland Swamps in the Sydney Basin Bioregion.

