



1 June 2016

Reference: 5151434

Mr Mark Jenkins
Assessments (NSW, ACT) and Fuel Branch
Department of the Environment
GPO Box 787
CANBERRA ACT

Dear Mr Jenkins

**Response to request for additional information
New Intercity Fleet Maintenance Facility, Kangy Angy, NSW (EPBC 2016/7681)**

Thank you for your letter of 6 May 2016 requesting additional information regarding the referral made under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for the New Intercity Fleet Maintenance Facility.

The referral was made based upon initial ecological investigations undertaken as part of the preliminary ecological assessment by EMM Consulting. This assessment found that the project was likely to have a significant impact on *Melaleuca Biconvexa*. *Melaleuca Biconvexa* is listed as Vulnerable under the EPBC Act.

Since the referral was submitted, a Species Impact Statement (SIS) has been prepared by WSP | Parsons Brinckerhoff on behalf of TfNSW for the project under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). Detailed ecological investigations undertaken as part of the preparation of the SIS have further defined the project's biodiversity impacts, particularly the local population of the threatened plant *Melaleuca biconvexa*. The SIS has been prepared in accordance with Chief Executive Requirements (CERs) from the NSW Office of Environment and Heritage.

Appendix A provides a summary assessment of the EPBC listed species that were identified in the EPBC Protected Matters Search Tool within a 2km radius of the project. An initial likelihood of occurrence was undertaken for these species. The likelihood of occurrence and background literature review enabled the project team to refine the list of species likely to be impacted by the project.

Those species considered to have a moderate or higher likelihood of occurrence within the study area based on the available habitat were subjected to targeted surveys. Appendix A outlines the survey methods and results.

As a result of the likelihood of occurrence and targeted surveys, EPBC significant impact



assessments have been prepared in accordance the EPBC Act Significant Impact Guidelines 1.1 – Matters of National Significance for the following species:

- *Melaleuca biconvexa*
- Regent Honeyeater (*Anthochaera phrygia*)
- Swift Parrot (*Lathamus discolor*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)

A copy of these EPBC significant impact assessments can be found in Appendix A.

The EPBC significant impact assessments concluded that the project is unlikely to have a significant impact on any EPBC Act listed threatened flora or fauna species, including the *Melaleuca biconvexa*.

As a result TfNSW now considers that the project would not constitute a Controlled Action under the EPBC Act.

Whilst it is considered that a significant impact is unlikely, the project is committed to the delivery of a comprehensive biodiversity offset package utilising the NSW BioBanking Scheme that will include in perpetuity conservation and management of *Melaleuca biconvexa*.

Should you have any questions about any of the new information provided, please contact Tanya Coates, Senior Manager Planning on 9422 7948 or email Tanya.Coates@transport.nsw.gov.au.

Yours sincerely

Ben Groth
Principal Manager, Environmental Impact Services
Infrastructure and Services
Transport for NSW

Enclosed

1. Appendix A EPBC Listed Species Likelihood Assessment, Targeted Surveys and Significant Impact Assessments

New Intercity Fleet Maintenance Facility

EPBC Summary Report

1. LIKELIHOOD OF OCCURRENCE ASSESSMENT

As part of the SIS an initial likelihood of occurrence assessment was undertaken to determine which species would require targeted surveys and potentially subsequent significance assessments. Results of the initial likelihood assessment for all threatened species identified in the Department's EPBC Protected Matters Search Tool as occurring within 2 kilometers (as requested by DoE) of the subject site are provided in Table 1.1.

Table 1.1 Initial likelihood of occurrence assessment of the EPBC Act listed species requested by DoE.

THREATENED SPECIES	EPBC ACT	LIKELIHOOD OF OCCURRENCE
Threatened flora species		
<i>(Asterolasia elegans)</i>	Endangered	Low – this species is known to occur on Hawkesbury Sandstone in sheltered forest of which no suitable habitat was recorded within the study area. In addition the study area is outside the species known distribution range (approx. 30 km north of northern distribution limit). Therefore, it is considered unlikely that this species would occur.
Austral Toadflax <i>(Thesium australe)</i>	Vulnerable	Low – the species is known to occur within grassland and grassy woodland on coastal headlands on away from the coast of which no suitable habitat was recorded within the study area. In addition the species has not been recorded within the locality (nearest record >60 m from the study area). Therefore, it is considered unlikely that the species would occur.
Bauers Midge Orchid <i>(Genoplesium baueri)</i>	Endangered	Low – the species is known to occur within dry sclerophyll forest and moss over sandstone of which no similar habitat was recorded within the study area. In addition the study area is outside the species known distribution range (approx. 30 km north of the norther distribution limit). Therefore the species is considered unlikely to occur.
Biconvex Paperbark <i>(Melaleuca biconvexa)</i>	Vulnerable	Recorded. This species has been previously recorded within the study area and has also been frequently recorded in high abundances within the locality. Based on the species being recorded, availability of the known habitat, records within the locality and the species being provided in the project's CERs by the OEH this species is considered a 'subject species' for the SIS.
Black-eyed Susan <i>(Tetralthea juncea)</i>	Vulnerable	Low – the species is known to occur in dry sclerophyll forest with an understorey dense in grasses on well drained soils. Although swampy habitats did occur within the study area the understorey was dense and dominated by sedges which is unlikely to provide habitat for the species. The species has not been previously recorded within the locality (nearest records approx. 7 km from the study area). Given this and the lack of suitable habitat, it is considered unlikely that the species would occur within the study area.
Bynoes Wattle <i>(Acacia bynoeana)</i>	Vulnerable	Low - species is known to occur within heath or dry sclerophyll forests on sandy soils of which no similar habitats were recorded within the study area. In addition the species has not been recorded within the locality (nearest record >15 km from study area). Therefore, it is considered unlikely that the species would occur.
Camfield's Stringybark, Heart-leaved Stringybark <i>(Eucalyptus camfieldii)</i>	Vulnerable	Low – this species is known to occur within coastal heath and low open woodland on exposed sandy ridges of which no similar habitats were recorded within the study area. Although the species has been recorded within the locality, based on lack of suitable habitat it is considered unlikely that the species would occur within the study area.

THREATENED SPECIES	EPBC ACT	LIKELIHOOD OF OCCURRENCE
Eastern Australian Underground Orchid (<i>Rhizanthella slateri</i>)	Endangered	Low – within the Hunter–Central Rivers catchment management region essential habitat for this species is unknown however it is known to occur within wet sclerophyll grassy and shrubby forests in the Karuah Manning sub-region (Office of Environment & Heritage 2016c). The species has not been recorded within the locality (nearest record approx. 30 km from the study area) and is not predicted or known from the Wyong sub-region (Office of Environment & Heritage 2016c). The absence of known or predicted habitat and lack of any records from the locality it is considered unlikely that the species may occur within the study area.
Leafless Tongue Orchid (<i>Cryptostylis hunteriana</i>)	Vulnerable	Low – the species is known to occur in a variety of habitats within the Hunter–Central Rivers although the PCT vegetation associations recorded within the study area are not listed as essential habitat for this species (Office of Environment & Heritage 2016c). Further, this species has not been recorded within the locality, with the nearest record approx. 10km from the study area at Somersby. Specimens at this location were recorded growing in sandstone heath woodland. Therefore, given the lack of records in the locality and the absence of essential PCT habitats, it is considered unlikely that the species may occur within the study area
Magenta Lilly Pilly (<i>Syzygium paniculatum</i>)	Vulnerable	Moderate – within the locality the species is known to occur in riparian forest along Ourimbah Creek of which similar habitats were recorded within the study area (PCT1528/HU742: Jackwood – Lilly Pilly – Sassafras riparian warm temperate rainforest on the Central Coast). This species has also been frequently recorded within the locality including a record approx. 1 km from the study area along Bangalow Creek.
Omeo Stork's-bill (<i>Pelargonium sp. Striatellum</i>)	Endangered	Low – the species is known to occur in lakes and their transition zones of which no suitable habitat was recorded within the study area. The study area occurs outside the known distribution range of the species (i.e. Monaro and Lake Bathurst). Therefore, it is considered unlikely that the species would occur.
Siah's Backbone (<i>Streblus pendulinus</i>)	Endangered	Low. Although suitable habitat occurs within the subject site (PCT1528/HU742: Jackwood – Lilly Pilly – Sassafras riparian warm temperate rainforest on the Central Coast) this species is only listed as a threatened species on Norfolk Island. Due to taxonomic changes (April 2012 – May 2015) the mainland Australian species <i>Streblus brunonianus</i> was treated as a synonym of <i>Streblus pendulinus</i> and incorrectly included. Since May 2015, <i>Streblus pendulinus</i> is now regarded as restricted to Norfolk Island. Subsequently this species is not considered significant in context with Project and will not be considered further.
Small-flower Grevillea (<i>Grevillea parviflora</i> subsp. <i>Parviflora</i>)	Vulnerable	Low – species is known to occur within dry sclerophyll woodlands of which no similar habitats were recorded within the subjects site. In addition the species has not been recorded within the locality (nearest record >10 km north of the study area). Therefore, the species is considered unlikely to occur.
Somersby Mintbush (<i>Prostanthera junonis</i>)	Endangered	Low – the species is known to occur in open forest, low woodland and/or open scrub restricted to the Somersby Plateau. The study area does not contain potential habitat for the species and is outside the species known distribution range (approx. 11 km east of the species northern distribution limit). Although the species has been recorded at the periphery of the locality no habitat occurs within the study area therefore, it is considered unlikely that the species would occur.

THREATENED SPECIES	EPBC ACT	LIKELIHOOD OF OCCURRENCE
Tranquility Mintbush (<i>Prostanthera askania</i>)	Endangered	Moderate. This species is known to occur on alluvial soils in rainforest and moist sclerophyll habitats within the catchments of Chittaway Creek and Ourimbah Creek in which the study area resides. Potential habitat for this species may occur within PCT1528/HU742: Jackwood – Lilly Pilly – Sassafras riparian warm temperate rainforest on the Central Coast. The species has been recorded frequently within locality (nearest record approx. 1.5 kilometres from study area). Based on the availability of the potential habitat, records within the locality and the species being provided in the project's CERs by the OEH this species is considered a 'subject species' for the SIS.
Threatened fauna species		
Regent Honeyeater (<i>Anthochaera phrygia</i>)	Critically Endangered	Moderate. In recent years the Regent Honeyeater has become progressively rarer across its range, including the Central Coast region. The species is not resident in the region, but has in the past migrated to local habitats on an intermittent basis when local blossom resources are abundant. To the north at Morisset it has returned on a 4–5 year cycle and movements coincide with large aggregations of other honeyeaters. However, numbers have been in serious decline since 2002 and it hasn't returned to Morisset since the winter of 2011. Periodical occurrences on the Central Coast coincide primarily with <i>Eucalyptus robusta</i> (Swamp Mahogany) blossoming events. It has not been recorded as breeding in the subject site's locality, with the closest breeding activity recorded at Quorrobolong in the Hunter Valley 42 km to north. Although Regent Honeyeaters are considered unlikely to breed within the study area, there is an abundance of Swamp Mahogany on site, which may be visited intermittently when blossom resource distribution across the Regent Honeyeater's range pushes them into near coastal habitats. Although stands of Swamp Mahogany in the region continue to exist, this community is threatened by development in well populated coastal areas.
Australasian Bittern (<i>Botaurus poiciloptilus</i>)	Endangered	Low – The Australasian Bittern is a wetland bird that frequents freshwater and brackish swamps, in which it forages and breeds. Such habitats do not occur within the vicinity of the study area so it is considered unlikely to occur
Eastern Bristlebird (<i>Dasyornis brachypterus</i>)	Endangered	Low – There are no records for the Eastern Bristlebird locally and this species is known to inhabit coastal and montane heathland habitats. As such habitat does not occur within the study area and there are no local records, this species is considered unlikely to occur.
Painted Honeyeater (<i>Grantiella picta</i>)	Vulnerable	Low – The Painted Honeyeater is a western dry woodlands species that does not extend its range into in near coastal locations. There are no known records for this species in the study area's locality and habitat within the study area is not suitable. Therefore it is considered unlikely to occur.
Australian Painted Snipe (Painted Snipe) <i>Rostratula australis</i> (syn. <i>R. benghalensis</i>)	Endangered	Low – The Australian Painted Snipe occurs in freshwater and brackish wetlands throughout Australia, although they appear to be highly nomadic in response to the distribution of water as a consequence of their use of soft substrates for foraging purposes. There is no suitable habitat for this species within the study area.
Swift Parrot (<i>Lathamus discolor</i>)	Critically Endangered	High. Suitable seasonal foraging habitat occurs throughout the study area for Swift Parrots in the form of winter flowering tree species, notably Swamp Mahogany and Forest Red Gum and the Swift Parrot has been recorded in the subject site in the past. Local occurrences of Swift Parrots are highly dependent upon the distribution of blossom resources and they may not occur in some favourable locations for a number of years.

THREATENED SPECIES	EPBC ACT	LIKELIHOOD OF OCCURRENCE
Giant Burrowing Frog (<i>Heleioporus australiacus</i>)	Vulnerable	Low – Giant Burrowing Frog is confined to sandstone ridgetop habitat and upland valleys where it is associated with small headwater and slow flowing/intermittent creek lines. Such habitat does not occur in the project study area and this species is considered to have a low likelihood of occurrence therein.
Green and Golden Bell Frog (<i>Litoria aurea</i>)	Vulnerable	Low - Expert advice received regarding the Green and golden Bell Frog found that there was no suitable foraging or shelter habitats within the project area for this species. Assessment of the study area for breeding habitat found that there was a single depression that may be suitable under optimum conditions, but possible utilisation by the frogs is unlikely due to surrounding dense forest habitat that is not suitable for the Green and Golden Bell Frog.
Littlejohn's Tree Frog, Heath Frog (<i>Litoria littlejohni</i>)	Vulnerable	Low – Breeding habitat for Littlejohn's Tree Frog is associated with upper reaches of permanent rocky streams with fringing vegetation and perched swamps. Foraging habitat includes shrub and groundcover within 100 m of breeding habitat. The study area does not constitute breeding or foraging habitat and this species is considered to have a low likelihood of occurrence in the project study area.
Stuttering Frog (<i>Mixophyes balbus</i>)	Vulnerable	Low – Although the Stuttering Frog occupies streams in rainforest or tall open wet forest in foothills and escarpment on the eastern side of the Great Dividing Range, within the Wyong sub-catchment area, this species is typically associated with relatively wide flat sections of first order (headwater) mountain streams at the top of a catchment, with populations known from higher altitudes in the Watagan Mountains. In the study area, Chittaway Creek and Bangalow Creek, do not occur as first order streams with the project occurring at low elevation, effectively on the floodplain of Chittaway, Bangalow and Ourimbah Creeks. Further, whilst rainforest (riparian) habitat associated with these creeks was in good condition, they lacked the protective buffer of other forest habitat types, which were absent due to land managed for rural residential land holdings; effectively occurring as a thin riparian corridor in an otherwise cleared landscape. Accordingly, this species was considered to have a low likelihood of occurrence in the study area.
Giant Barred Frog (<i>Mixophyes iteratus</i>)	Endangered	Moderate – The Giant Barred Frog is associated with permanent flowing drainages, from slow flowing rocky rainforest streams to slow-flowing rivers in lowland open forest. Within proximity to the project study area, five populations of this species are known from the Watagan Mountains area (Department of the Environment 2016b). As this species has been found in disturbed habitats (i.e. vegetated riparian strips in agricultural lands used to run livestock) in the lower reaches of streams, this species was considered to have moderate likelihood of occurrence in the project study area.
Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>)	Vulnerable	Moderate – Whilst the study area did not contain roosting or breeding structures for this species, suitable foraging habitat occurred in swamp forest and wet open forest habitat types.
Spotted-Tailed Quoll (Southern Subspecies) (<i>Dasyurus maculatus maculatus</i>)	Endangered	Moderate – The project study area would not support Spotted-tailed Quoll in isolation of larger tracts of surrounding contiguous forests. However, the study area is likely to form part of larger home range for an individual(s) of this species. Potential foraging habitat occurred in the form of rainforest, swamp forest and wet open forest habitat types.
Greater Glider (<i>Petauroides volans</i>)	Vulnerable	Low - Habitat assessments suggest that the study area is recovering from previous widespread disturbance, including a relatively young cohort of canopy strata and general paucity of tree hollows which is not suitable habitat for this species. Thus, it is considered that the Greater Glider would have a low likelihood of occurrence in the study area.

THREATENED SPECIES	EPBC ACT	LIKELIHOOD OF OCCURRENCE
Brush-tailed Rock-wallaby (<i>Petrogale penicillata</i>)	Vulnerable	Low – The Brush-tailed rock Wallaby is found along the Great Dividing Range where they live on rocky escarpments and granite outcrops and cliffs that have caves and ledges for shelter and face north for warmth. Such habitats do not occur in the study area, and this species is considered to have a low likelihood of occurrence.
New Holland Mouse (<i>Pseudomys novaehollandiae</i>)	Vulnerable	Low – Across the species range, the New Holland Mouse is known to inhabit open heathland, open woodland with heathy understorey and vegetated sand dunes (Department of the Environment 2016b). Further, soil type is considered to be an important indicator of habitat (Department of the Environment 2016b), with deeper top soils and soft substrates being preferred. As much of the study area was characterised floodplain topography, perched above Chittaway, Bangalow and Ourimbah Creek's, the underlying substrates are subject to variations in elevation, which formed a mosaic of low areas holding water, as well as more elevated areas less subject to waterlogging. Thus, it is considered that the New Holland Mouse would have a low likelihood of occurrence in the study area.
Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>)	Vulnerable	Recorded. The Grey-headed Flying-fox was recorded flying over site during two nocturnal survey events. Although this species was not specifically recorded utilising habitat attributes associated with the study area, the Grey-headed Flying-fox is a blossom nomad known to travel large distances during nightly foraging events. Due the large numbers of <i>Eucalyptus robusta</i> within the study area, it is likely that the study area's swamp forests would be used seasonally during flowering events. No evidence of Grey-headed Flying-fox camps was observed in the study area during field surveys.
Koala (<i>Phascolarctos cinereus</i>)	Vulnerable	Moderate. Although records for the Koala in the project locality are few, Swamp forest habitats in the study area consisted of a canopy stratum of <i>Eucalyptus robusta</i> , which is preferred feed tree species for this species.
Long-nosed Potoroo (<i>Potorous tridactylus tridactylus</i>)	Vulnerable	Moderate. Potential habitat occurred in rainforest, swamp forest and wet open forest habitat types.
Broad-headed Snake	Vulnerable	Low – The Broad-headed Snake is associated with exposed cliff edges and sandstone rock outcropping, where it shelters in rock crevices and under flat sandstone rocks during autumn, winter and spring. During summer, this species seeks shelter in hollows of large trees within 500 m of their escarpment habitat. The project study area did not comprise habitat suitable for habitation by this species and it is considered to have a low likelihood of occurrence therein.

2. SURVEY METHODS AND EFFORT

Those species considered to have a moderate or higher likelihood of occurrence within the study area based on the available habitat were subjected to targeted surveys as part of the SIS.

Survey methodologies used to complete the flora and fauna surveys were undertaken in accordance with relevant survey methodology guidelines for each identified subject species likely to occur in the study area in order to address the CERs. Surveys were completed in accordance with minimum efforts outlined in the CERs and in consideration of the following survey methodologies:

- NSW Guide to Surveying Threatened Plants (Office of Environment and Heritage 2016b)
- Survey Guidelines for Australia's Threatened Bats: Guidelines for detecting bats listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (Department of Environment Water Heritage and the Arts 2010a)

- Survey Guidelines for Australia's Threatened Birds: Guidelines for detecting birds listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (Department of Environment Water Heritage and the Arts 2010b)
- Survey Guidelines for Australia's Threatened Mammals: Guidelines for detecting mammals listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (Department of Environment Water Heritage and the Arts 2011)
- EPBC Act Referral Guidelines for the Vulnerable Koala: Combined populations of Queensland, New South Wales and the Australian Capital Territory (Department of Environment 2014).

A summary of the targeted survey methodologies and survey effort are provided in Table 2.1.

Table 2.1 Targeted survey for EPBC Act listed threatened flora and fauna species as requested by DoE with a moderate or higher likelihood of occurrence

SUBJECT SPECIES	SURVEY TYPE	SURVEY EFFORT	DATES SURVEYED	HABITAT SEARCHED
Threatened flora species				
<i>Melaleuca biconvexa</i>	Random meanders, visual abundance (Duncan) and stem counts (total counts and stem density quadrats (20 x 20 m). Opportunistic surveys i.e. vegetation mapping, BioBanking quadrats and fauna survey.	300 hours	10, 16 and 17 September 2015 7–17 December 2015 1, 22, 23, 26 and 29 February 2016 14, 17, 21, 22, 23, 24 and 29 March 2016	PCT1723/HU937: Melaleuca biconvexa – Swamp Mahogany – Cabbage Palm swamp forest of the Central Coast
<i>Prostanthera askania</i> <i>Syzygium paniculatum</i>	Random meander. Opportunistic surveys.	60 hours	10, 16 and 17 September 2015 7–17 December 2015	PCT1528/HU742: Jackwood – Lilly Pilly – Sassafras riparian warm temperate rainforest on the Central Coast
Threatened fauna species				
Long-nosed Potoroo	Terrestrial mammal trapping	225 trap nights	17, 21–23 March 2016	Swamp Forest (29.3 ha)
Spotted-tailed Quoll	Spotlight surveys Camera traps	14 person hours 75 trap nights	17, 21–23 March 2016 22 March–5 April 2016	Wet Open Forest (3.8 ha)
Regent Honeyeater Swift Parrot	Standard 20 minute area search	6 person hours 5 hours	17, 21–24 March 2016 20 May 2016	Swamp Forest (29.3 ha) Wet Open Forest (3.8 ha)
Koala	(SPOT assessment technique) Spotlight survey Call playback	2 person hours 14 person hours	21–24 March 2016	Habitat containing Koala feed tree species Swamp Forest (29.3 ha)

SUBJECT SPECIES	SURVEY TYPE	SURVEY EFFORT	DATES SURVEYED	HABITAT SEARCHED
Grey-headed Flying-fox	Spotlighting	14 person hours	17, 21–24 March 2016	Swamp Forest (29.3 ha) Rainforest (1 ha) Wet Open Forest (3.8 ha) Within entirety of the study area
Large-eared Pied Bat	Active ultrasonic bat detection	1 hr active during spotlight event	21–23 March 2016	Swamp Forest (29.3 ha)
	Passive ultrasonic bat detection	6 nights full recording		Rainforest (1 ha) Wet Open Forest (3.8 ha)
	Harp trapping	6 trap nights	21–23 March 2016	
Giant Barred Frog	Spotlight surveys	14 person hours	17, 21–24 March 2016	Swamp Forest (29.3 ha)
	Call playback	3 person hours	Please refer to opportunistic surveys below	Rainforest (1 ha)
	Herpetofauna active searches	5 days		Wet Open Forest (3.8 ha)
	Opportunistic sightings			Within entirety of the study area
All threatened species	Opportunistic sightings	26 days		29 April 2016 14, 17, 21–24 March 2016 22, 23, 26 and 29 February 2016 7–17 December 2015 10, 16 and 17 September 2015 20 May 2016

3. RESULTS OF SURVEYS

3.1 Description of Vegetation communities

The desktop analysis of existing vegetation mapping and field validation surveys identified that the vegetation within the subject site was comprised of four vegetation communities, the distribution of which are related to geological, topographical and geomorphological characteristics as well as previous and current land uses. The vegetation communities mapped within the subject site are provided in [Table 3.1](#) and illustrated in Figure 1 of Appendix B.

3.2 Flora species recorded

A total of 173 species of plant were recorded within the subject site, of which 132 species (76 per cent) were native. The most diverse family was the Poaceae with 20 species, the Myrtaceae with 16 species and the Fabaceae with 12 species.

Table 3.1 Vegetation communities identified within the study area

WSP PB 2016	Plant community type/Biometric vegetation type ¹	Existing broad-scale mapping ²	EMM 2015 ³	TSC Act status	EPBC Act status	Extant within subject site (ha)	Extant within study area (ha)
Melaleuca biconvexa – Swamp Mahogany – Cabbage Palm Forest	PCT1723/HU937: Melaleuca biconvexa – Swamp Mahogany – Cabbage Palm forest of the Central Coast	MU17: Alluvial Robusta – Paperbark Sedge Palm Forest	Swamp Mahogany Forest	Endangered – Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	Not listed	25.5	32.4
Jackwood – Lilly Pilly – Sassafras Rainforest	PCT1528/HU742: Jackwood – Lilly Pilly – Sassafras riparian warm temperate rainforest on the Central Coast	MU40: Riverine Alluvial Gallery Rainforest – Moist Forest	Jackwood – Lilly Pilly	Not listed	Not listed	1.1	1.6
Blackbutt – Turpentine – Sydney Blue Gum Mesic Tall Open Forest	PCT1568/HU782: Blackbutt – Turpentine – Sydney Blue Gum mesic tall open forest on ranges of the central coast	MU27: Narrabeen Coastal Blackbutt Scrubby Forest	Not mapped	Not listed	Not listed	3.6	4.5
Exotic and planted vegetation	N/A	Not mapped	Not mapped	Not listed	Not listed	12.1	12.6

1) Plant Community Type (PCT)/Biometric Vegetation Type (BVT) derived from 'Vegetation Information Systems (VIS) Classification 2.1' (Office of Environment and Heritage 2016c)

2) Existing broad-scale mapping derived from 'The natural vegetation of the Wyong Local Government Area, Central Coast, New South Wales' (Bell 2002).

3) Previous vegetation mapping undertaken as part of the *Preliminary Ecological Assessment: New Intercity Maintenance Facility* (EMM 2015).

3.3 Description of fauna habitats

The suitability, size and configuration of the fauna habitats correlated broadly with the vegetation communities, as summarised in Table 3.2. These areas provided habitat for a range of birds, herpetofauna and mammals, and vegetation communities within the study area and were observed to vary in suitability for native fauna from good to poor.

Habitat features recorded in the study area generally included those associated with swamp forest types occurring on flood plains in the Central Coast and wet sclerophyll forests occurring in sheltered gullies and drainage lines in the foot hills of near coastal ranges.

Table 3.2 Fauna habitat corresponding to vegetation communities

FAUNA HABITAT DESCRIPTION	CORRESPONDING VEGETATION COMMUNITY (REFER TO SECTION 3.2)
Rainforest	Jackwood – Lilly Pilly – Sassafras Rainforest High
Swamp Forest	<i>Melaleuca biconvexa</i> – Swamp Mahogany – Cabbage Palm Forest High <i>Melaleuca biconvexa</i> – Swamp Mahogany – Cabbage Palm Forest Moderate <i>Melaleuca biconvexa</i> – Swamp Mahogany – Cabbage Palm Forest Low
Wet Open Forest	Blackbutt – Turpentine – Sydney Blue Gum Mesic Tall Open Forest High
Cleared land with scattered trees	Exotic and planted vegetation

While the majority of vegetation within the study area is dominated by native species, it is evident by the general paucity of understorey debris, the relatively young age cohort of canopy trees, the lack of canopy strata in some areas and the dense understorey strata that the vegetation communities are recovering from previous widespread disturbance. As a consequence the vegetation communities do not occur as old-growth forms and important fauna habitat attributes such as hollows, fallen timber, connectivity and large patch size are lacking. The general lack of these important habitat attributes reduce the study area's capacity for supporting a wide diversity of local native species, including threatened species, in isolation from other higher quality habitats in the locality.

3.4 Fauna species recorded

A total of 92 species of animal were recorded during field surveys (Table 3.3), including one MNES Grey-headed Flying-fox.

Table 3.3 Species of animal recorded

GROUP	NATIVE	INTRODUCED	THREATENED	TOTAL
Frogs	6	–	-	6
Reptiles	6	–	-	6
Birds	60	1	-	61
Mammals	17	1	1	19
Total	89	2	1	92

3.5 MNES flora species recorded

One targeted threatened flora species was recorded during previous and current surveys completed for the project; *Melaleuca biconvexa* (Figure 3, Appendix B). *Melaleuca biconvexa* grows as shrub to small tree usually to 10 metres in height (but is known to reach 20 metres). The species has typical paperbark bark with small leaves to 18 millimetres in length and two millimetres in width. Each of the leaves has a characteristic

centre-vein groove from which the leaf blade curves upright on either side (Office of Environment and Heritage 2016a) (Photo 3.1). This species is listed as Vulnerable under both the TSC Act and EPBC Act.



Photo 3.1 *Melaleuca biconvexa* recorded within the subject site

The distribution of *Melaleuca biconvexa* was associated with the *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm Forest vegetation type. Within these areas the species occurred in high, medium and low abundances forming small to large populations across the subject site (Figure 5, Appendix B).

Melaleuca biconvexa occurred in all three age class categories the dominant being the immature cohort (i.e. stem DBH at breast height less than 200 millimetres and less than six metres in height) whilst the abundance of saplings and mature specimens were considerably less Photo 3.2. The juvenile individuals generally occurred at the peripheries of the population along access tracks and roads. In one location the species was recorded only as juveniles and no immature or mature specimens were recorded (Photo 3.3).

The population recorded within the subject site forms part of local population (population two) within the Wyong Shire as described by Duncan (Duncan 2001a). Duncan (Duncan 2001a) maps the distribution of this local population as occurring approximately four kilometres south of the subject site and north to Tuggerah. This local population contains numerous subpopulations, such as that recorded within the subject site, of varying sizes and abundances. The subject site is also mapped as a priority area for conservation reserves and habitat protection in accordance with Duncan's (Duncan 2001a) conservation strategy for the species within the Wyong LGA.



Photo 3.2 High density immature *Melaleuca biconvexa* within the subject site



Photo 3.3 Juvenile *Melaleuca biconvexa* within subject site

Melaleuca biconvexa recorded within the subject site were subjected to population counts and age class estimates to identify the number of plant stems likely to be impacted upon by the project. Given that determining the population size of *Melaleuca biconvexa* through visual inspections is difficult (i.e. reproduced from seedlings and rhizome growth) the population size and abundance within the subject site were estimated via total counts or density average quadrats which included stem counts and a broad visual abundance assessment. In order to gain a more accurate extent and population estimate, the

distribution of *Melaleuca biconvexa* within the subject site was split into 20 areas as shown in Table 3.4. A summary of this assessment is provided below in Table 3.4 and illustrated in Figure 3 of Appendix B.

Table 3.4 Summary of *Melaleuca biconvexa* in the study area

IMPACTED AREA	AGE CLASSIFICATION			TOTAL	VISUAL ABUNDANCE ASSESSMENT (DUNCAN 2001B)	COUNT METHOD ¹
	Mature	Immature	Saplings			
Inside area of impact						
Area 1	0	0	30	30	Low	Total count
Area 2	1	57	0	58	Medium	Density average
Area 3	154	167	247	568	High	Total count
Area 4a	1	28	5	34	High	Density average
Area 4c	34	938	176	1,148	High	Density average
Area 5a	9	243	44	296	High	Density average
Area 5b	0	8	2	10	High	Density average
Area 6a	26	49	72	147	High	Total count
Area 10a	0	1	1	2	High	Total count
Area 11	32	227	32	291	Medium	Density average
Area 12	0	12	6	18	Medium	Total Count
Area 13	1	23	4	28	High	Density average
Area 14	29	816	153	998	High	Density average
Area 15	6	174	33	213	High	Density average
Area 16	2	44	8	54	High	Density average
Area 17	3	72	14	89	High	Density average
Total inside area of impact				3,984		
<i>Melaleuca biconvexa</i> to be retained within the study area boundary						
Area 4b	23	634	119	776	High	Density count
Area 6b	32	62	92	186	High	Total count
Area 7	2	9	4	15	Medium	Density average
Area 10b	3	40	10	53	High	Total count
Total be retained within the project site boundary				1,030		

Note: 1) High density abundance stem counts based on 83 mature plant stems, 2,317 immature plant stems and 433 sapling plant stems per hectare; Medium density abundance stem counts based on 100 mature plant stems, 350 immature plant stems and 150 sapling plant stems per hectare; Low density abundance stem counts based on 50 mature plant stems, 350 immature plant stems and 50 sapling plant stems per hectare.

Results of the population estimate surveys identified that 5,014 *Melaleuca biconvexa* plant stems occur within the study area. Of these, 3,984 will be removed by the project whilst the remaining 1,030 will be retained. The majority of *Melaleuca biconvexa* plants likely to be impacted occur as immature to sapling age class.

Based on these survey results and given the project will result in both direct and indirect impacts on this species, *Melaleuca biconvexa* is considered as an 'affected species'.

LOCAL POPULATION STUDY

In defining the local population of *Melaleuca biconvexa* the following definition has been considered:

The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area (Department of Environment and Climate Change 2007).

The addition, Duncan (2001a) study identifies a total of five populations of *Melaleuca biconvexa* within the Wyong LGA and these comprise of:

- Population 1 – Tumby Umbi
- Population 2 – Ourimbah/Fountaindale/Berkeley Vale
- Population 3 – Wyong/Porters Creek Wetland
- Population 4 – Jiliby/Dooralong
- Population 5 – Buttonderry Creek.

These populations were defined based on habitat discontinuity of no more than one kilometre from discrete groupings of plants that were deemed likely to be reasonable for maintain cross-pollination processes Duncan (2001a). This population framework was derived from a geographic discontinuity rule of thumb definition as outlined in Keith *et al* (1997).

It is considered that cross-pollination between *Melaleuca biconvexa* specimens within these patch areas are likely due to relatively contiguous vegetation (separation <one kilometre) that could be utilised by relatively mobile pollination species. The extent of the local population in which the study area occurs is considered generally consistent with Wyong LGA – Population 2 – Ourimbah/Fountaindale/Berkeley Vale (Duncan 2001a) and is shown in Table 3.3.

The local population study utilised existing extent mapping of the local population undertaken by Duncan (2001). Field verification of the *Melaleuca biconvexa* mapping of the local population was relatively accurate. Where appropriate, updates to the existing mapping was completed which included the addition of new areas where the species was not previously recorded or modifications to the abundance categories.

An estimate of the total population of *Melaleuca biconvexa* was extrapolated using the averaged density of each abundance category (i.e. High, Medium and Low) and this was applied to all existing mapped abundance/age call patches and newly identified patch areas. A total of seven density quadrats within the local population and five density plots completed in the study area were averaged to estimate the total local population.

The local population study estimates that the local population of mature and immature *Melaleuca biconvexa* plant stems consist of approximately 72,275 and 167,612 respectively. Therefore, the 3,984 plant stems recorded within the subject site constitute approximately 1.6 per cent of the total population of mature and immature plant stems within the local population.

The records and abundances obtained from OEH's BioNet Atlas of NSW Wildlife, Duncan (2001) and field validation surveys were collectively mapped to generate a heat map of the local population (Figure 4, Appendix B). The heat map indicates that the *Melaleuca biconvexa* within the study area is one of numerous densely populated areas within the local population.

Table 3.5 Local population abundance and distribution estimate

PATCH AREA	AGE CLASS	AVERAGE PLANT STEMS PER VISUAL ABUNDANCE CATEGORY (DUNCAN 2001B) ¹			TOTAL
		Low	Medium	High	
Area 2	Mature	676	1,335	-	2,011
	Immature	1,201	2,518	-	3,719
Area 3	Mature	-	6,717	510	7,227
	Immature	-	17,310	961	18,271
Area 5	Mature	-	2,428	-	2,428
	Immature	-	4,578	-	4,578
Area 6	Mature	-	2,151	2,276	4,427
	Immature	-	5,544	4,292	9,836
Area 9	Mature	1,084	4,334	7,371	12,789
	Immature	1,928	8,172	18,997	29,097
Area 11b	Mature	-	2,538	2,126	4,664
	Immature	-	4,787	5,480	10,267
Area 12	Mature	229	1,381	24,812	11,237
	Immature	408	2,604	9,627	27,824
Area 14	Mature	710	5,443	7,515	13,668
	Immature	1,262	10,265	19,368	30,895
Area 15	Mature	-	2,082	-	2,082
	Immature	-	3,926	-	3,926
Area 16	Mature	720	704	10,318	11,742
	Immature	1,280	1,328	26,591	29,199
Total plant stems to be removed (all age classes within subject site)					3,984
Total mature plant stems within local population					72,275
Total immature plant stems within local population					167,612
Total plant stems within local population (including those within the subject site)					243,874

Note: 1) High density abundance stem counts based on 702 mature plant stems and 1,808 immature plant stems per ha; Medium density abundance stem counts based on 292 mature plant stems and 550 immature plant stems per hectare; Low density abundance stem counts based on 113 mature plant stems, 200 immature plant stems per hectare.

3.6 MNES fauna species recorded

The Grey-headed Flying-fox, which is listed as Vulnerable under the EPBC Act was observed flying over the project study area during two separate nocturnal survey events (Figure 6, Appendix B). Although this species was not specifically observed using habitat within the study area, this species is a blossom nomad that is known to commute long distances as food availability varies over time.

Potential habitat for Grey-headed Flying-fox in the project study area included swamp forest, rainforest and wet open forest type habitats. In the study area swamp forest was dominated by *Eucalyptus robusta*, which is a winter-flowering eucalypt with strong and profuse flowering events every three years or so. No evidence of Grey-headed Flying-fox camps was observed in the study area during field surveys.

Due to the relatively large numbers of *Eucalyptus robusta* within the study area, it is likely that the study area's swamp forests would be used seasonally by the Grey-headed Flying-fox, during Swamp Mahogany flowering events. Rainforest habitat associated with Chittaway Creek contained a variety of native broad-leaved trees providing seasonal fruits for frugivorous animals, including the Grey-headed Flying-fox. Wet open forest were dominated by *Eucalyptus pilularis* with some areas also containing *Corymbia gummifera*, *Eucalyptus saligna*. This canopy stratum would provide summer seasonal nectar foraging resources for the Grey-headed Flying-fox.

4. SPECIES IMPACTED

On completion of the targeted surveys, a review of the available literature, analysis of NSW BioNet (Atlas of NSW Wildlife), and consideration of potential impacts the list of species considered likely to be affected by the project was refined. Results of this refinement are provided in Table 4.1.

Table 4.1 Refinement of EPBC Act threatened flora and fauna species to be impacted requested by DoE

THREATENED SPECIES	POTENTIAL TO BE AFFECTED BY THE PROJECT	EPBC IMPACT ASSESSMENT REQUIRED?
Threatened flora species		
<i>Melaleuca biconvexa</i> (Biconvex Paperbark)	<p><i>Melaleuca biconvexa</i> is listed as Vulnerable under the TSC Act and EPBC Act. This species is known to occur within the Wyong sub-region of the Hunter–Central Rivers CMA and has been recorded by previous studies within or adjacent to the study area (Duncan 2001a; EMM 2015). A review of the NSW BioNet and Duncan’s study of the species within the Wyong Shire Duncan (2001a) has also identified the species as occurring frequently throughout the locality.</p> <p>OEH (Office of Environment & Heritage 2016a) identify that <i>Melaleuca biconvexa</i> flowering period is between September and October however can be detected year round during targeted surveys. Surveys targeting the species were undertaken by EMM (September 2015) and Parsons Brinckerhoff (February and March 2016) which involved stem counts and visual abundance estimates of cover. The survey identified 5014 <i>Melaleuca biconvexa</i> plant stems as occurring within the study area from a single vegetation type; PCT1723/HU937: <i>Melaleuca biconvexa</i> – Swamp Mahogany – Cabbage Palm swamp forest of the Central Coast.</p> <p>The Project will require the removal of 3,984 <i>Melaleuca biconvexa</i> plant stems and the removal of 25.5 hectares of PCT1723/HU937: <i>Melaleuca biconvexa</i> – Swamp Mahogany – Cabbage Palm swamp forest of the Central Coast which constitutes known habitat for the species. Consequently, <i>Melaleuca biconvexa</i> is considered an ‘affected species’ and is subject to further detailed assessment in Attachment A.</p>	Yes. Refer to Attachment A.

THREATENED POTENTIAL TO BE AFFECTED BY THE PROJECT SPECIES

EPBC IMPACT ASSESSMENT REQUIRED?

<i>Prostanthera askania</i> (Tranquility Mintbush)	<p><i>Prostanthera askania</i> is listed as Endangered under the TSC Act and EPBC Act. This species is known to occur within the Wyong sub-region of the Hunter Central Rivers CMA. A review of the NSW BioNet has identified that the species has been recorded within the locality from four locations (nearest record approx. 1.5 kilometres south of the study area).</p> <p>The species is known to occur on alluvial soils derived from Narrabeen sandstone adjacent to drainage lines on flat to moderately steep slopes (Office of Environment & Heritage 2016d). Vegetation matching the species known habitat was recorded within the study area; PCT1528/HU742: Jackwood – Lilly Pilly – Sassafras riparian warm temperate rainforest on the Central Coast.</p> <p>OEH (Office of Environment & Heritage 2016d) recognise that although <i>Prostanthera askania</i> flowering period is September to December when the species is more easily identified the species can be detected year round during targeted surveys. Surveys targeting the species were undertaken by Parsons Brinckerhoff (February and March 2016) and EMM (September 2015). These surveys involved a series of random meanders through potential habitat available within the study area. No <i>Prostanthera askania</i> individuals were recorded within the study area during targeted survey.</p> <p>As the species is not cryptic and no individuals were recorded within the study area it is considered unlikely that <i>Prostanthera askania</i> individuals occur within the study area. Although not recorded within the study area there is potential for the species to occur within in the soil seed bank.</p> <p>The reproductive ecology of <i>Prostanthera askania</i> is relatively unknown however the species is considered to reproduce both asexually (vegetative growth) and sexually (production of seed). The viability of seeds and seeds within the soil seed bank is also unknown however the species has been suggested to be a colonising species which utilises gaps in the canopy (i.e. along tracks, post fire and in canopy gaps). It is also considered likely that they species may require cues to break seed coat dormancy such as disturbances caused by increased light intensity or fire (heat and/or smoke) (Department of the Environment and Conservation 2006). The potential habitat within the study area contained a canopy cover (30–70 per cent) which may prevent the recruitment and establishment of <i>Prostanthera askania</i> individuals and was dominated by exotic species therefore the species is considered unlikely to contain a persistent soil seed bank within the study area.</p> <p>Although the study area provides potential habitat for <i>Prostanthera askania</i> the species is not considered to occur within the study area. This is based on the fact that the species was not recorded during targeted surveys for the species, that the vegetation is likely to provide marginal habitat for the species and therefore unlikely to be important for the species in the locality. Consequently, <i>Prostanthera askania</i> is not considered an 'affected species' and is not subject to further detailed assessment.</p>	No.
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THREATENED POTENTIAL TO BE AFFECTED BY THE PROJECT SPECIES

EPBC IMPACT ASSESSMENT REQUIRED?

<i>Syzygium paniculatum</i> (Magenta Lilly Pilly)	<p><i>Syzygium paniculatum</i> is listed as Endangered under the TSC Act and Vulnerable under the EPBC Act. This species is known to occur within the Wyong sub-region of the Hunter Central Rivers CMA (Office of Environment & Heritage 2016b). A review of the NSW BioNet has identified that the species has been recorded frequently within the locality; particularly along Ourimbah Creek and Bangalow Creek.</p> <p><i>Syzygium paniculatum</i> is recognised to be separated geographically into five meta-populations across the coast of NSW between Upper Lansdowne in the north to Conjola National Park in the South including:</p> <ul style="list-style-type: none">→ Karuah-Manning→ Central Coast→ Botany Bay→ Coalcliff→ Jervis Bay. <p>The study area forms part of the Central Coast meta-population which is comprised of 22 subpopulations. This meta-population is considered by the OEH to contain up to two thirds of all individuals of the species within three subpopulations (located at Wyrabalong National Park, Ourimbah Creek and Martinsville).</p> <p><i>Syzygium paniculatum</i> is known to utilise a range of habitats including areas which have been previously cleared or modified including subtropical, lowland and littoral rainforest as well as riparian forests on sandy soils or stabilised dunes in proximity to the sea (Harden 2002; Office of Environment & Heritage 2011, 2012). Within the Central Coast <i>Syzygium paniculatum</i> is known to occur within riparian forest; especially along Ourimbah Creek (600 metres from study area). This riparian forest habitat is generally characterised by <i>Cryptocarya glaucescens</i> (Jackwood), <i>Acmena smithii</i> (Lilly Pilly), <i>Doryphora sassafras</i> (Sassafras) and <i>Diploglottis cunninghamii</i> (Native Tamarind) and the occasional <i>Eucalyptus saligna</i> (Sydney Blue Gum) as an emergent canopy species (Office of Environment & Heritage 2012). Vegetation within the study area aligning to PCT1528/HU742: Jackwood – Lilly Pilly – Sassafras riparian warm temperate rainforest on the Central Coast is consistent with this description of riparian forest which is known to be suitable habitat for the species. Additionally, the suitable habitat recorded within the study area occurs along Bangalow Creek and Chittaway Creek which are tributaries of Ourimbah Creek from where the species is known to occur.</p> <p>OEH (Office of Environment & Heritage 2016b) recognise that although the species flowering time is between December and March the species can be detected year round during targeted surveys. Surveys targeting the species were undertaken by EMM (September 2015) and Parsons Brinckerhoff (February and March 2016). These surveys involved a series of random meanders through potential habitat available within the study area. No <i>Syzygium paniculatum</i> individuals were recorded within the study area during these surveys.</p> <p>Although potential habitat occurs within the study area for <i>Syzygium paniculatum</i> the species is not considered to occur within the study area. This is based on the assumption that the species was not recorded during targeted surveys, that the vegetation is likely to provide marginal habitat for the species and therefore unlikely to be significant for the species in the locality. Consequently, <i>Syzygium paniculatum</i> is not considered an 'affected species' and is not subject to further detailed assessment.</p>	No.
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Threatened fauna species

Regent Honeyeater (<i>Anthochaera phrygia</i>)	<p>The Regent Honeyeater is listed as Critically Endangered under both the TSC Act and EPBC Act. This species was not recorded within the study area during onsite surveys and there are no previous records known for the site (Office of Environment & Heritage 2016c).</p> <p>The Regent Honeyeater is a blossom nomad within NSW, with its range extending across a range of areas from the western slopes to near coastal localities (Pizzey & Knight 2012). Individual birds, or groups of birds, follow the changing distribution of blossom resources as governed by seasonal blossom timings and discontinuous flowering frequencies (Saunders, D. L. & Heinsohn 2008). Tree species' flowering events are often characterised by return rates spanning several years which in turn are influenced by rainfall reliability. Consequently the distribution of Regent Honeyeaters follows the patchy matrix of blossom resources over scales much greater than what can be measured at the local level. As a consequence of blossom event variability Regent Honeyeater return rates to a given patch of suitable blossom is spasmodic and may span a number of years, such as the 4–5 year return frequency noted at Morisset to the study area's north (Richardson A. 2016).</p> <p>In recent years the Regent Honeyeater has become progressively rarer across its range, including the Central Coast region (Pizzey & Knight 2012). The species is not resident in the region, but has in the past migrated to local habitats on an intermittent basis when local blossom resources are abundant (Higgins <i>et al.</i> 2001). Periodical occurrences on the Central Coast coincide primarily with <i>Eucalyptus robusta</i> (Swamp Mahogany) blossoming events. To the north at Morisset, between 2002 and 2011, it has returned on a 4–5 year cycle with local occurrences coinciding with large aggregations of other honeyeaters. However, numbers have been in serious decline since 2002 (100+, 2002: 50, 2007: 13, 2011) and it hasn't been recorded in Morisset since the winter of 2011.</p> <p>The Regent Honeyeater has not been recorded as breeding in the study area's locality, with the closest breeding activity recorded at Quorrobolong in the Hunter Valley 42 kilometres to north (Roderick 2015). Although Regent Honeyeaters are considered unlikely to breed within the study area, there is an abundance of Swamp Mahogany on site, which may be visited intermittently when blossom resource distribution across the Regent Honeyeater's range pushes them into near coastal habitats. Although stands of Swamp Mahogany in the region continue to exist, this community is increasingly threatened by development in well populated coastal areas (Office of Environment & Heritage 2016c).</p> <p>Winter-flowering tree species within the study, Swamp Mahogany in particular, represent a relatively large patch of blossom resources, which may be of significance to the Regent Honeyeater locally during times when winter blossom is scarce elsewhere in its range (Figure 7, Appendix B). Therefore the Regent Honeyeater is considered to be an 'affected species' in relation to the project and a detailed assessment of likely impacts of the project on Regent Honeyeater is provided in Attachment A.</p>	Yes. Refer to Attachment A.
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Swift Parrot
(*Lathamus
discolor*)

The Swift Parrot is listed as Endangered under the TSC Act and Critically Endangered under the EPBC Act. This species was not recorded within the study area during onsite surveys, but there is a previous record known for the site (Office of Environment & Heritage 2016c).

Yes. Refer to Attachment A.

The Swift Parrot is largely a blossom nomad within NSW, with its distribution extending across a range of areas from the south-western slopes to coastal localities (Higgins 1999; Pizzey & Knight 2012). Individual birds, or groups of birds, follow the changing distributions of blossom resources as governed by seasonal blossom timings and discontinuous flowering frequencies (Higgins 1999; Saunders, D. L. & Heinsohn 2008). They use nectar from blossom widely, but in many areas they seek out lerps often avoiding large honeyeaters such as Noisy Friarbirds and Red Wattlebirds (Higgins 1999).

In recent years the Swift Parrot has declined across its range, including the Central Coast region (Higgins 1999; Pizzey & Knight 2012). The species is not resident in the region, due migration to Tasmania during the summer months but has in the past migrated to local habitats on an intermittent basis when local blossom resources are abundant (Higgins 1999). Around Lake Macquarie to the north of the study area they have been observed to take nectar from *Eucalyptus robustus* (Swamp Mahogany) and *E. tereticornis* (Forest Red Gum) and lerps from *E. pilularis* (Blackbutt) (Author pers. obs.). In the Central to Lower Hunter Swift Parrots have been observed to take nectar from *Corymbia maculata* (Spotted Gum) and *E. fergusonii*, and taking lerps from *E. crebra* (Narrow-leaved Red Ironbark), *E. punctata* (Grey Gum), Forest Red Gum and Spotted Gum (Richardson A. 2016).

The study area has a resident Bill Miner colony, which have been observed to protect areas of forest habitat supporting lerp colonies from other species of bird (Higgins 1999). Such infestations of lerps have been observed to attract Swift Parrots (Department of the Environment 2016a) and therefore the study area may continue to attract Swift Parrots during years when winter-flowering trees are not flowering.

Dominant vegetation communities within the study area are listed as Swift Parrot habitat in the National Recovery Plan for the Swift Parrot (Saunders, D. A. & Tzaros 2011). Winter-flowering tree species within the study, Swamp Mahogany in particular, represent a relatively large patch of blossom resources, which may be of significance to the Swift Parrot locally during times when winter blossom is scarce elsewhere in its range. Therefore, due to the occurrence of known habitat (Figure 8, Appendix B) and a previous onsite observation, the Swift Parrot is considered to be an 'Affected Species' in relation to the project and a detailed assessment of likely impacts of the project on Swift Parrot is provided in Attachment A.

<p>Giant Barred Frog (<i>Mixophyes iteratus</i>)</p>	<p>The Giant Barred Frog is listed as Endangered under the TSC Act and EPBC Act. No. This species is known to occur within the Wyong CMA sub-region of the Hunter–Central River Catchment Management Region (Office for Environment & Heritage 2016), with a distribution along the coast and ranges from Eumundi in south-east Queensland to Warrimoo in the Blue Mountains (Office for Environment & Heritage 2016). The nearest NSW BioNet (Office for Environment & Heritage 2016) record occurs approximately three kilometres to the north near Mardi Dam. No other records for this species exist within the project locality. Moreover, whilst in some parts of this species range they are coastal and lowland, in the Wyong CMA sub-region this does not necessarily hold. Indeed, a review of NSW BioNet indicate this species association with higher order streams in the Watagan Mountains (Office for Environment & Heritage 2016).</p> <p>Giant Barred Frog survey effort typically includes a combination of aural recognition of calls, call playback and nocturnal streamside searches during suitable weather conditions (Department of Environment and Climate Change 2009). Suitable survey periods are considered to occur from September to March, when air temperature is above 18°C (Department of Environment and Climate Change 2009).</p> <p>Surveys undertaken as part of this SIS were completed in mid to late March 2016, during and following rainfall events and incorporated a combination of aural recognition of calls, call playback, spotlight transects and habitat assessments. Targeted surveys were completed in the study area as follows:</p> <ul style="list-style-type: none"> → From 21 and 23 March 2016 with 88.4 millimetres recorded in the week preceding survey period (Bureau of Meteorology 2016). <p>Targeted surveys for Giant Barred Frog during suitable weather conditions are considered to have had a reasonable expectation of recording this species. During the survey period, <i>Mixophyes</i> sp. were recorded calling in known stream side habitat in the Watagan Mountains to the north-west of the project study area (Richardson 2016).</p> <p>The Giant Barred frog is associated with permanent flowing drainages, from slow flowing rocky rainforest streams to slow-flowing rivers in lowland open forest. In mid-eastern NSW (i.e. in proximity to the project study area), five populations of this species is known from the Watagan Mountains area (Department of Primary Industries 2016). As this species has been found in disturbed habitats (i.e. vegetated riparian strips in agricultural lands used to run livestock) in the lower reaches of streams, this species was considered to have moderate – low likelihood of occurrence in the project study area in rainforest habitat in association with Chittaway Creek. However, due to the paucity of Giant Barred Frogs in the project locality, that the species was not accounted for during targeted surveys during reasonable weather conditions (88.4 millimetres in the week preceding survey), together with majority of evidence for this species occurring to the north-west of study area in association with Watagan Mountain area, it is considered that potential habitat in the project study area is not considered important for this species in the locality. Consequently, Giant Barred frog is not considered an ‘affected species’ and is not subject to further detailed assessment.</p>
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<p>Large-eared Pied-bat (<i>Chalinolobus dwyeri</i>)</p>	<p>The Large-eared Pied Bat is mainly found in areas with extensive cliffs and caves, from Rockhampton in Queensland, south to Bungonia in the Southern Highlands of NSW, with scattered records from the north west slopes of NSW and New England Tableland (Office of Environment & Heritage 2016c). This species is known to roost in caves, crevices in cliffs, old mine workings and in disused Fairy Martin nests, from which they frequent low to mid-elevation dry open forest and woodland close to these features, as well as well-timbered areas containing gullies.</p> <p>Targeted surveys for microchiropteran bats were completed in the study area in late March 2016, with a combination of harp trapping (six trap nights) and passive ultrasonic bat detection (six nights full recording) completed in suitable habitat. The Large-eared Pied Bat was not recorded in the study area during targeted surveys. A review of records for the Large-eared Pied Bat in the Hunter–Central River CMA indicate that the species is known from 266 records, none of which occur within the project locality (Office for Environment & Heritage 2016). The nearest record occurs approximately nine kilometres to the north of the project, adjacent to Jilliby State Conservation Area (Office for Environment & Heritage 2016).</p> <p>Although caves may occur in the project locality (i.e. Ourimbah State Forest), the study area did not contain critical roost structures for the Large-eared Pied Bat. Whilst occasional foraging events cannot be discounted in the study area, based on the rare status of the species in the locality, evidenced by a low incidence of records, it is not likely that the Large-eared Pied Bat would be an ‘affected species’ as a consequence of the project and is not considered further.</p>	<p>No.</p>
<p>Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>)</p>	<p>The Grey-headed Flying-fox is listed as Vulnerable under both the TSC Act and EPBC Act. The species was observed flying over the project study area during two separate nocturnal survey events (Figure 6, Appendix B). Although this species was not specifically observed using habitat within the study area, this species is a blossom nomad that is known to commute long distances as food availability varies over time. Rainforest, swamp forest (particularly <i>E. robusta</i>) and wet open forest provide potential seasonal foraging resources for this species.</p> <p>Given that Grey-headed Flying-fox was recorded during field surveys and the project will impact potential important seasonal foraging resources, this species is considered an ‘affected species’. A detailed assessment of likely impacts of the project on Grey-headed Flying-fox is provided in Attachment A.</p>	<p>Yes. Refer to Assessment A.</p>
<p>Koala (<i>Phascolarctos cinereus</i>)</p>	<p>The koala is listed as Vulnerable under the TSC Act and EPBC Act. The species has a fragmented distribution in eastern Australia from north-east Queensland to South Australia, where they inhabit eucalypt woodlands and forests and feed on more than 70 eucalypt species and 30 non-eucalypt species (Office of Environment & Heritage 2016c). In the study area swamp forest type habitat was dominated in the canopy strata by <i>Eucalyptus robusta</i> (Swamp Mahogany), which is listed as a primary food trees species for the Koala in the Central Coast Koala Management Area (Department of Environment and Climate Change 2008). One other primary food tree species, <i>Eucalyptus tereticornis</i> (Forest Red Gum) was recorded in the study area but it occurred as a solitary specimen.</p> <p>In the Hunter–Central Rivers CMA the Koala is known from 10,555 records, of which four occur in the project locality. Of those, two are records from 1949 and 1968 to the north of the study area near Tuggerah and Wyong. The remaining two records are more recent from Berkeley Vale and Chittaway in 2006 and 2007 respectively (Office for Environment & Heritage 2016).</p> <p>Targeted surveys undertaken as part of the SIS were completed in mid to late March 2016, with targeted survey effort involving a combination of spotlight transects, call playback and scat searches in accordance with SAT methodology. The Koala was not recorded in the study area during targeted searches.</p> <p>The relatively rare status of Koala in the locality, as evidenced by a low incidence of records, and the lack of records in the study area during targeted searches and 25 days of opportunistic sightings over different seasonal contexts, suggest that the study area may not be important for the Koala. Whilst intermittent occurrences of the Koala in the study area cannot be discounted, it is considered unlikely that the Koala will be an ‘affected species’ as a consequence of the project and is not subject to further detailed assessment.</p>	<p>No.</p>

<p>Spotted-tailed Quoll (<i>Dasyurus maculatus maculatus</i>)</p>	<p>The Spotted-tailed Quoll is found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Spotted-tailed Quoll occur in a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline (Belcher 2003; Office of Environment & Heritage 2016c). Preferred habitat for Spotted-tailed Quoll includes dry and moist sclerophyll forests, suitable den sites include hollow-bearing trees, fallen logs, burrows, small caves, rock crevices, boulder-fields and rocky-cliff faces and will feed in nearby cleared areas (Office of Environment & Heritage 2016c; Strahan 1995). Spotted-tailed quolls have large home ranges (up to 3,500 hectares for males), and these predominately solitary and are known to travel up to six kilometres at night to forage (Office of Environment & Heritage 2016c). Potential habitat for the Spotted-tailed Quoll in the study area included rainforest, swamp forest and wet open forest type habitats.</p> <p>Targeted surveys for the Spotted-tailed Quoll were completed in the study area in late March 2016, with a combination of remote camera traps, hair tubes and spotlight transects completed in suitable habitat (Parsons Brinckerhoff 2016). The Spotted-tailed Quoll was not recorded in the study area during targeted surveys. A review of records for the Spotted-tailed Quoll in indicates that in the Hunter–Central Rivers CMA, this species known from 2,489 records, of which 10 occur in the project locality.</p> <p>Whilst the study area may to be visited by Spotted-tailed Quoll on at least an intermittent basis, potential habitat therein would not be utilised in isolation of other areas and largely lacked an abundance of hollow-bearing trees and ground debris due to the disturbed nature of much of the study area. Due to the extensive and contiguous nature of similar or higher quality habitat available in the adjacent foothills and ranges, it is not likely that project related impacts would have an adverse effect on local populations of Spotted-tailed Quoll. Therefore, the Spotted-tailed Quoll is not considered an ‘affected species’ as a consequence of the project and it is not considered further.</p>	<p>No.</p>
<p>Long-nosed Potoroo (<i>Potorous tridactylus tridactylus</i>)</p>	<p>The Long-nosed Potoroo is listed as Vulnerable under the TSC Act and EPBC Act. The species is found on the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania, including some of the Bass Strait islands. In NSW it is generally restricted to coastal heaths and dry and wet sclerophyll forests east of the Great Dividing Range, with an annual rainfall exceeding 760 millimetres. Dense understorey with occasional open areas is an essential part of habitat. The fruit-bodies of hypogeous (underground-fruited) fungi are a large component of the diet of the Long-nosed Potoroo. They also eat roots, tubers, insects and their larvae. The species is mainly nocturnal, solitary, and non-territorial and have home range sizes ranging between 2–5 hectares.</p> <p>Within the Hunter–Central Rivers CMA the Long-nosed Potoroo is known from 1,206 records, of which none occur in the project locality Gosford (Office of Environment & Heritage 2016c). The nearest record for this species occurs to the south of the project site near Holgate, NSW. Furthermore, five management sites for the Long-nosed Potoroo have been identified in NSW; the nearest being Mount Royal near Barrington Tops.</p> <p>Surveys undertaken as part of the SIS were completed in mid to late March 2016. Survey effort involved a combination of remote camera trapping, spotlight transects and opportunistic sighting over 25 days during different seasonal contexts. The Long-nosed Potoroo was not recorded in the study area during the survey period.</p> <p>Although intermittent occurrences of Long-nosed Potoroo locality cannot be discounted, the rare status in the locality, as evidenced by no previous records, together with the extensive and contiguous nature of habitat available in the locality and region, the Long-nosed Potoroo is not considered an ‘affected species’ as a result of the project and is not subject to further detailed assessment.</p>	<p>No.</p>

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ATTACHMENT A

EPBC SIGNIFICANT IMPACT ASSESSMENTS

1. MELALEUCA BICONVEXA

CONSERVATION STATUS

Melaleuca biconvexa is listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

DISTRIBUTION

Melaleuca biconvexa is restricted in its distribution, limited to coastal regions between Port Macquarie in the north to Jervis Bay in the south within NSW. The species occurs in scattered and disjunct populations within the Hawkesbury–Nepean, Northern Rivers, Hunter–Central Rivers and Southern Rivers CMAs (NSW Scientific Committee 2008).

Melaleuca biconvexa recorded within the study area does not form part of the species known distribution limits. At a regional scale the study area falls within the centre of the species known distribution and at a local scale the study area is located within the central portion of the Gosford–Wyong meta-population.

Results of the population estimate surveys undertaken to inform this SIS identify 5,014 *Melaleuca biconvexa* plant stems as occurring within the study area, the majority of which are within the immature and sapling age class. Of the 5,014 *Melaleuca biconvexa* plant stems recorded approximately 3,984 stems occur within the subject site and therefore will require removal, whilst the remaining 1,030 stems in the study area will be retained in situ. Of the 3,984 plant stems to be removed a total of 298 have been identified as a mature age class.

In addition to these plant stems estimates, private lands directly adjoining the study area (within patch 11 in Figure 4) have also been previously mapped as containing a high abundance mature to intermediate stand age class of *Melaleuca biconvexa* (Duncan 2001). Due to site access restrictions, it was not possible to undertake field verification of these patches. Given this, density estimate extrapolation over these areas indicate that an additional 14,932 *Melaleuca biconvexa* plant stems are likely occur.

HABITAT

The species is known to occur in damp areas which are often associated with streams or low lying areas on alluvial soils. Within these areas the species is known to favour lower slopes and/or sheltered aspects (Office of Environment & Heritage 2016a). Within the Wyong sub-region of the Hunter–Central Rivers CMA the species is known to occur in association with the following Plant Community Types:

- Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
- Paperbarks - Woollybutt swamp forest on coastal lowlands of the Central Coast
- Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
- *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion
- Tallowwood – Narrow-leaved White Mahogany open forest of the hinterland ranges of the North Coast
- Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion.

ECOLOGY

Melaleuca biconvexa grows as shrub to small tree usually to 10 metres in height (but is known to reach 20 metres). The species has typical paperbark bark with small leaves to 18 millimetres in length and two millimetres in width. Each of the leaves have a characteristic centre-vein groove from which the leaf blade curves upright on either side (Office of Environment and Heritage 2016).

Similar to Eucalypt, Callistemon and other *Melaleuca* species, *Melaleuca biconvexa* contains woody fruit with numerous fine seeds that are often retained in the canopy. The species is recorded as flowering for approximately 3–4 weeks during September and October (Office of Environment & Heritage 2016a).

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Reproduction is known to occur both sexually (seed germination) and asexually (root suckering) with the latter leading to dense stands of clonal plants that cause difficulties for understanding population densities and individual genetic specimens (Duncan 2001; NSW Scientific Committee 2011).

KEY THREATS

The Threatened Species Scientific Committee have identified the following key threats to *Melaleuca biconvexa* in the Commonwealth Conservation Advice for the species (NSW Scientific Committee 2008):

- Land clearing
- Alteration of water tables
- Too-frequent fire
- Grazing and trampling by stock.

Additionally, OEH have identified the following processes that may threaten the survival of *Melaleuca biconvexa* (Office of Environment & Heritage 2016a):

- It is likely Biconvex Paperbark has evolved to cope with infrequent fires. Burning for hazard reduction and other unnatural ignitions have increased fire frequency and may threaten the species' survival
- Clearing for residential development
- Most populations are on private land and there is poor threats knowledge about the species and its requirements by land managers
- Alterations to the drainage hydrology of low-lying floodplains and swamps including swamp reclamation
- Increased pollution and nutrients through adjoining developments and rubbish dumping
- Grazing and trampling by stock causing root damage, prevention of seedling establishment and erosion
- Potentially affected by Myrtle Rust
- Increased pollution and nutrients through adjoining developments and rubbish dumping
- Competition from noxious aquatic weeds particular *Sagittaria platyphylla* along with woody weeds such as Privet.

SPECIFIC IMPACTS

Within the study area the species was recorded from within PCT1723/HU937: *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm swamp forest of the Central Coast. Within this habitat *Melaleuca biconvexa* was identified to occur in association with other *Melaleuca* and *Callistemon* species such as *Melaleuca nodosa*, *Melaleuca ericifolia*, *Melaleuca linearifolia*, *Melaleuca sieberi*, *Melaleuca styphelioides* and *Callistemon salignus* which favour similar habitat.

Approximately 3,984 plant stems of *Melaleuca biconvexa* or 2.2 hectares will be removed by the project (Figure 3, Appendix B). The species was recorded from within a single vegetation type within the study area (PCT 1723/BVT HU937 *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm swamp forest of the Central Coast) of which 25.5 hectares will be removed by the project (Figure 5, Appendix B). An additional, 1,030 plant stems recorded from within the study area will be retained (Figure 3, Appendix B).

1.1 EPBC Act assessment

Melaleuca biconvexa is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment 2013).

IS IT PART OF AN IMPORTANT POPULATION?

The guidelines identify an 'important population' as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in a recovery plan, and/or that are:

Attachment A – EPBC Significant Impact Assessments

- Key source populations either for breeding or dispersal
- Populations that are necessary for maintaining genetic diversity, and/or
- Population that are near the limit of the species range.

At a regional scale the *Melaleuca biconvexa* recorded within the study area forms part of the Gosford – Wyong meta-population. The study area occurs within the Wyong LGA which has been previously subjected to a local population study by Duncan (2001). In the study Duncan (2001) identified local populations based on habitat discontinuity of no more than one kilometre from discrete groupings of plants that were deemed likely to be reasonable for maintain cross-pollination processes (Duncan 2001). This population framework was derived from a geographic discontinuity rule of thumb definition as outlined in Keith *et al.* (1997). Duncan identifies that the study area is situated within “Population 2 – Ourimbah/Fountaindale/Berkeley Vale” which is the largest in terms of patch area, abundance and maturity of age class (Duncan 2001).

It is considered that cross-pollination between *Melaleuca biconvexa* specimens within these patch areas are likely due to relatively contiguous vegetation (separation <one kilometre) that could be utilised by relatively mobile pollination species. The extent of the local population in which the study area occurs is considered generally consistent with Wyong LGA – Population 2 – Ourimbah/Fountaindale/Berkeley Vale (Duncan 2001) and is shown in Figure 3.

A local population study of *Melaleuca biconvexa* was undertaken as part of the Review of Environmental Factors and Species Impact Statement prepared for the project. The study identified that Population 2 generally comprises of a number of core patch areas of *Melaleuca biconvexa* that have been identified to contain high to medium abundance of intermediate to mature age class (Figure 4, Appendix B). In addition it was estimated that Population 2 comprised more than 243,000 plant stems of mature to intermediate age class that extend over low-lying swamp vegetation associated with the Ourimbah Creek floodplain and associated tributaries. The removal of 3,984 *Melaleuca biconvexa* plant stems constitutes a 1.6 per cent loss in this local population (WSP | Parsons Brinckerhoff 2016).

Given, that habitat within the study area forms part of a local population (Population 2) which is likely to be a key source in dispersal and in maintaining genetic diversity between other populations in the locality the *Melaleuca biconvexa* recorded within the study area are considered to form part of an important population. Although the proposed works will require the removal of 3,984 *Melaleuca biconvexa* and available habitat for the species the impacts on the local important population are unlikely to be significant.

WOULD THE ACTION LEAD TO A LONG-TERM DECREASE IN THE SIZE OF AN IMPORTANT POPULATION OF THE SPECIES?

Targeted surveys identified 5,014 *Melaleuca biconvexa* plant stems as occurring within the study area. These were recorded from a single vegetation type; PCT1723/HU937: *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm swamp forest of the Central Coast.

The project will require the removal of 3,984 *Melaleuca biconvexa* plant stems or 2.2 hectares recorded within the subject site and the removal of 25.5 hectares of Swamp PCT1723/HU937: *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm swamp forest of the Central Coast which constitutes potential habitat for the species (Figure 5, Appendix B). The removal of 3,984 plant stems of *Melaleuca biconvexa* would represent a loss of 1.6 per cent of the local population.

The project is committed to the delivery of a comprehensive biodiversity offset package that will include in perpetuity conservation and management of in excess of 50,000 *Melaleuca biconvexa* BioBanking species credits and 170 hectares of Swamp Sclerophyll Forest habitat, much of which is looking to be sourced from the local population. Additionally, amelioration measures include a threatened flora species management plan which will provide a translocation strategy that will focus on seed collection and soil biomass translocation to ensure that genetic material is salvaged.

Whilst the project will remove 3,984 plant stems and therefore result in a short term decrease in the important population, this removal constitutes 1.6per cent of the local important population. Given that 1,030 plant stems will be retained within the study area, numerous high to medium abundant patches occur in the locality and the likely retention of the majority the estimated 243,000 local area population it is unlikely that the actions would lead to a long term decrease in the size of an important population.

WOULD THE ACTION REDUCE THE AREA OF OCCUPANCY OF AN IMPORTANT POPULATION?

Within the local population *Melaleuca biconvexa* is estimated to occupy approximately 295.9 hectares. The action would require the removal of 3,984 *Melaleuca biconvexa* plant stems that occupy 2.2 hectares of the study area which constitutes 0.7 per cent of the area of an important population (Figure 4, Appendix B).

WOULD THE ACTION FRAGMENT AN EXISTING POPULATION INTO TWO OR MORE POPULATIONS?

The study area is situated within the centre of Population 2– Ourimbah/Fountaindale/Berkeley Vale. Within the population *Melaleuca biconvexa* occurs in low-lying areas along the coastal floodplain that have already been disturbed by existing infrastructure and vegetation clearing. Although the study area is surrounded by cleared and managed rural residential tenures; construction and operation of the project would add incrementally to existing fragmentation of the local population.

The population framework for *Melaleuca biconvexa* outlined by Duncan (2001) suggests that patch areas of the species would have to be separated by more than one kilometre for the population to be considered fragmented in accordance with the geographic discontinuity rule of thumb definition as outlined in Keith *et al.* (1997). The proposed works will not separate the local population by more than one kilometre and it is considered that cross-pollination between *Melaleuca biconvexa* specimens within the remnant patch areas are likely to continue.

Whilst the removal of this vegetation will incrementally increase fragmentation in the study area, it is unlikely to occur at a scale that would lead to the fragmentation of the existing population into two or more populations (i.e. lead to a separation of >one kilometre between patch areas). Additionally, given the species is considered capable of a 10 per cent loss in the local population (Office of Environment & Heritage 2016b), able to both sexual and asexual reproduce and has pollination agents with effective foraging range (for example Grey-headed Flying-fox) the capability of the local population to reproduce is unlikely to be significantly impacted upon by the disruption to existing corridors.

Given this, habitat is unlikely to become significantly fragmented or isolated from other patches of *Melaleuca* within the population as a result of the proposed action.

WOULD THE ACTION ADVERSELY AFFECT HABITAT CRITICAL TO THE SURVIVAL OF A SPECIES?

Critical habitat refers to those areas of land listed in the Register of Critical Habitat kept by the Threatened Species Scientific Committee and the Minister for the Environment. No critical habitat has been listed for this species.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- For activities such as foraging, breeding, roosting, or dispersal
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- To maintain genetic diversity and long-term evolutionary development
- For the reintroduction of populations or recovery of the species or ecological community (Department of the Environment 2013).

Although the *Melaleuca biconvexa* recorded within the study area may contribute to dispersal and genetic diversity, the plant stems to be removed represent approximately 1.6 per cent of the local population and the species has been considered to be able to sustain up to a 10 per cent loss for populations greater than 100 mature individuals (Office of Environment & Heritage 2016b). Therefore the habitat to be affected by the project is considered not to represent critical habitat critical to the survival of *Melaleuca biconvexa*.

WOULD THE ACTION DISRUPT THE BREEDING CYCLE OF AN IMPORTANT POPULATION?

The reproduction of *Melaleuca biconvexa* is known to occur both sexually (seed germination) and asexually (root suckering) with the latter leading to dense stands of clonal plants that cause difficulties for understanding population densities and individual genetic specimens (Duncan 2001; NSW Scientific Committee 2011).

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Within the Hunter–Central Rivers CMA, NSW OEH identify that the species can sustain up to a 10 per cent loss for populations greater than 100 mature individuals (Office of Environment & Heritage 2016b). As the project would ultimately remove 1.6 per cent of the total local population this would suggest that the species can sustain such a loss within the Hunter–Central Rivers CMA.

Therefore, the removal of 3,984 *Melaleuca biconvexa* plant stems is considered unlikely to adversely disrupt the breeding cycle of the species such that the important population is placed at risk of extinction.

WOULD THE ACTION MODIFY, DESTROY, REMOVE OR ISOLATE OR DECREASE THE AVAILABILITY OR QUALITY OF HABITAT TO THE EXTENT THAT THE SPECIES IS LIKELY TO DECLINE?

The action would require the removal of 3,984 *Melaleuca biconvexa* plant stems which occupy 2.2 hectares of the study area. In total, the study area will reduce the availability of habitat by 25.5 hectares (Swamp PCT1723/HU937: *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm swamp forest of the Central Coast).

Whilst the project will remove 3,984 plant stems (1.6 per cent of the total population) and 2.2 hectares of occupied habitat (<1 per cent of the local populations area of occupancy) this represents a small proportion of the local population and its habitat and is therefore unlikely to result in a significant decline of the species habitat to the extent that the species is likely to decline.

WOULD THE ACTION RESULT IN INVASIVE SPECIES THAT ARE HARMFUL TO A VULNERABLE SPECIES BECOMING ESTABLISHED IN THE VULNERABLE SPECIES' HABITAT?

Invasive species likely to be harmful to *Melaleuca biconvexa* habitat are already present within the study area. These invasive species include woody weeds such as *Ligustrum lucidum**, *Ligustrum sinense** and *Lantana camara**. The amelioration measures that will be implemented as part of the project, including the management of retained vegetation and mitigation measures to prevent the introduction of additional weeds, will minimise impacts of existing weed infestations within the study area and prevent the establishment of weeds into the species habitat such that the species is likely to decline.

Subsequently, the action is unlikely to result in invasive species becoming established in this vulnerable species' habitat.

WOULD THE ACTION INTRODUCE DISEASE THAT MAY CAUSE THE SPECIES TO DECLINE?

Two diseases that have potential to cause *Melaleuca biconvexa* to decline include Root Rot Fungus (*Phytophthora cinnamomi*) and Myrtle Rust (*Puccinia psidii*). No evidence of these two diseases is currently present within the study area.

Although the action has the potential to introduce pathogens such as Root Rot Fungus and Myrtle Rust ameliorative measures will be incorporated into the Construction Environmental Management Plan for the project to control the introduction of these diseases. Amelioration measures to be incorporated include hygiene and control measures to prevent the diseases entering the study area.

Subsequently, the action is unlikely to result in the introduction of disease that may cause the species to decline.

WOULD THE ACTION INTERFERE WITH THE RECOVERY OF THE SPECIES?

To date, a recovery plan for *Melaleuca biconvexa* has not been prepared. The DoE has however identified seven recovery actions and two research priorities in the approved Conservation Advice for *Melaleuca biconvexa*. Of these, the action is likely to interfere with the following:

- Manage changes to hydrology and water tables - the proposed works are likely to modify the natural hydrology of this habitat within the study area which has potential to impact the population of *Melaleuca biconvexa* on site.
- Develop and implement appropriate fire management strategy – the proposed works would include potential sources of ignition (such as hot works) that may increase the risk of bushfire or alter the current bushfire regime of the study area. The mitigation measures related to bushfire risks and management would be prepared as part of the Bushfire Management Plan as part of the project's Construction Environmental Management Plan.

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In addition the OEH have assigned *Melaleuca biconvexa* to the site-managed species management stream under the 'Saving our Species' conservation program (Office of Environment & Heritage 2016a). Site-managed species are species that have been considered to require management activities to ensure security of the species in the wild for the next 100 years. Under this program the NSW OEH have established three management sites for *Melaleuca biconvexa* which include:

- Porters Creek management site within the Wyong LGA
- Ourimbah management site within the Gosford LGA
- St Georges Basin management site within the Shoalhaven LGA.

The study area does not form part of any management site in which the species is conserved under the 'Saving our Species' conservation program.

Whilst the action proposed will not impact any *Melaleuca biconvexa* management sites it will result in the loss of 3,984 *Melaleuca biconvexa* plant stems and removal of 25.5 has of potential habitat and is not considered consistent with recovery objectives or actions for this community.

CONCLUSION

A total of 5,014 *Melaleuca biconvexa* plant stems were recorded within the study area. Of these, 3,984 will be removed by the project and the remaining 1,030 will be retained. Vegetation within the study area identified as providing potential habitat included the PCT1723/HU937: *Melaleuca biconvexa* – Swamp Mahogany – Cabbage Palm swamp forest of the Central Coast of which 25.5 hectares will be removed by the project. This vegetation community is not listed on the EPBC Act. The removal of 3,984 plant stems constitutes 1.6per cent of the local population and <1per cent of the local populations area of occupancy.

Although the action will remove 3,984 plant stems it is considered unlikely to have an adverse effect on the breeding cycle of a viable important population so that *Melaleuca biconvexa* is placed as risk of extinction. Although the action proposed will add incrementally to fragmentation within the study area is it unlikely to exacerbate fragmentation at local or regional scale that would prevent cross-pollination or seed dispersal mechanisms of fragment the population into one or more populations. In addition, the subject site is unlikely to be of critical habitat necessary for long term survival of *Melaleuca biconvexa*. Consequently, a significant impact to *Melaleuca biconvexa* is considered unlikely to occur as a result of the project.

Whilst it is considered that a significant impact is unlikely, the project is committed to the delivery of a comprehensive biodiversity offset package that will include in perpetuity conservation and management of in excess of 50,000 *Melaleuca biconvexa* species credits and 170 hectares of Swamp Sclerophyll Forest habitat, much of which is looking to be sourced from the local population.

2. GREY-HEADED FLYING-FOX (*PTEROPUS POLIOCEPHALUS*)

CONSERVATION STATUS

The Grey-headed Flying-fox is listed as Vulnerable under the EPBC Act.

DISTRIBUTION

This species is generally found within 200 kilometres of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia (Department of the Environment 2016b). At any one time, the majority of animals only occupy a small proportion of this entire range (NSW National Parks and Wildlife Service 2001), as the species selectively forages where food is available. Consequently, patterns of occurrence and relative abundance within its distribution varies between seasons and between years (Department of the Environment 2016b). The project study area does not occur at the limit of the known distribution of the Grey-headed Flying-fox.

HABITAT

The Grey-headed Flying-fox typically occur in subtropical and temperate rainforests, tall sclerophyll forests, woodlands, heaths, swamps and mangroves, as well as urban gardens and fruit crops (Churchill 2008; NSW National Parks and Wildlife Service 2001). Approximately 15 per cent of the species' distribution occurs on reserves within NSW National Parks and Wildlife Service estate (Office for Environment & Heritage 2016b; Office of Environment & Heritage 2016c). Accordingly, the Grey-headed Flying-fox is not considered to be adequately represented in conservation reserves.

ECOLOGY

This species is considered an important pollinator and seed disperser of native trees, as they forage on the nectar and pollen of *Eucalyptus*, *Angophora*, *Melaleuca* and *Banksia*, as well as fruit of rainforest trees and vines (NSW National Parks and Wildlife Service 2001; Van Dyck & Strahan 2008). While the majority of foraging events occur within 20 kilometres of their day roost, some individuals will disperse and commute up to 50 kilometres (Van Dyck & Strahan 2008).

Grey-headed Flying-foxes are highly mobile and as the availability of native fruits, nectar and pollen varies over time and throughout their range, they respond to this by migrating between camps up and down the east coast, sometimes travelling hundreds of kilometres (NSW National Parks and Wildlife Service 2001). The population concentrates in May and June in northern NSW and Queensland where animals exploit winter-flowering trees such as Swamp Mahogany, Forest Red Gum and Paperbark, dispersing south during the summer (Department of the Environment and Heritage 2003).

Grey-headed Flying-fox roost in large colonies of up to tens of thousands and may be shared with Little Red Flying-fox and Black Flying-fox (Churchill 2008). Camps are generally located in gullies with dense vegetation (such as mangrove, rainforest, *Melaleuca* and *Casuarina*), close to water and generally located within 20 kilometres of a regular food source (NSW National Parks and Wildlife Service 2001). Site fidelity to camps is high with some camps in NSW used for over a century (NSW National Parks and Wildlife Service 2001). These bats usually return annually to particular camps for rearing young (NSW National Parks and Wildlife Service 2001).

THREATS

The NSW OEH and Heritage have detailed the following threats to the Grey-headed Flying-fox (Office of Environment & Heritage 2016c):

- Loss of roosting and foraging sites
- Electrocution on powerline, entanglement in netting and barbed-wire
- Heat stress
- Conflict with humans
- Incomplete knowledge of abundance and distribution across the species' range.

SPECIFIC IMPACTS

The Grey-headed Flying-fox was observed flying over the project study area during two separate nocturnal survey events. The project study area largely comprised foraging resources that would likely be available on an intermittent and seasonal basis. Although Grey-headed flying-fox camps are commonly located in close forest habitats, including *Melaleuca* swamps or stands of *Casuarina* in close proximity to creek and rivers (Hall 2000), no evidence of a camp was observed in the study area during field surveys and none are known to occur within the project locality (Department of the Environment 2016a).

Potential foraging habitat for Grey-headed Flying-fox in the project study area included swamp forest, rainforest and wet open forest type habitats (Figure 6, Appendix B). Due to the relatively large numbers of *Eucalyptus robusta* within the study area, it is likely that the study area's swamp forests would be used seasonally by the Grey-headed Flying-fox, during *Eucalyptus robusta* flowering events. *Eucalyptus robusta* is a winter-flowering eucalypt with strong and profuse flowering events every three years or so. Rainforest habitat associated with Chittaway Creek contained a variety of native broad-leaved trees that would provide seasonal fruits, while the canopy stratum of wet open forest (*Eucalyptus pilularis* with some areas also containing *Corymbia gummifera* and *Eucalyptus saligna*), would provide summer seasonal nectar foraging resources for this species.

Specifically, the project will impact approximately 24.3 hectares of foraging habitat, including 19.6 hectares of swamp forest, 3.6 hectares wet open forest and 1.1 hectare of rainforest.

2.1 Assessment of significance

The Grey-headed Flying-fox is listed as vulnerable under the EPBC Act. The following assessment has been undertaken following the vulnerable species criteria of the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment 2013).

Under the EPBC Act, important populations are:

- key source populations either for breeding or dispersal
- populations necessary for maintaining genetic diversity, and/or
- populations at or near the limit of the species range.

IS THIS PART OF AN IMPORTANT POPULATION?

Grey-headed Flying-foxes occur across a range of wooded habitats where their favoured food, eucalypt blossom occurs. They are a highly mobile and nomadic species that rely on food sources that largely have irregular patterns of production. Consequently, patterns of occurrence and abundance within its distribution can vary between seasons and between years. Roosting camps are set-up in association with blossom availability with nightly foraging events occurring up to 50 kilometres from camps; although commuting distances < 20 kilometres are more typical. The national population of Grey-headed Flying-fox is structured spatially into colonies that are distributed from Rockhampton in Queensland to Adelaide in South Australia. No distinct or separate populations are known due constant genetic exchange and movement between camps throughout the entirety of the species' geographic range (Department of the Environment 2016b).

The project subject site provided potential irregular foraging resources for the Grey-headed Flying-fox in the form of swamp forest, wet open forest and rainforest type habitats. *Eucalyptus robusta* (Swamp Mahogany) is the dominant canopy species in swamp forest habitat in the project subject site, together with a sub-canopy of *Melaleuca*. *Eucalyptus robusta* is a prolific winter flowering species and an important provider of food resources for nectivorous fauna during those years when it flowers.

Two individual Grey-headed Flying-foxes were observed flying over the project study area during two separate nocturnal survey events. No evidence of a Grey-headed Flying-fox camp was observed in the project study area during field surveys and none are known to occur in the project locality (5 kilometre radius). The nearest nationally important Grey-headed Flying-fox camp occurs some 52 kilometres to the project's north-east in Blackbutt Reserve (Newcastle). Therefore, although the project subject site provides potential intermittent foraging resources for the Grey-headed Flying-fox, a population of this species in the study area would not be considered important.

WOULD THE ACTION LEAD TO A LONG-TERM DECREASE IN THE SIZE OF AN IMPORTANT POPULATION OF A SPECIES?

Not applicable. Grey-headed Flying-fox occurring in the project subject site is not considered to constitute an 'important population' (refer Section 2.1).

WOULD THE ACTION REDUCE THE AREA OF OCCUPANCY OF AN IMPORTANT POPULATION?

Not applicable. Grey-headed Flying-fox occurring in the project subject site is not considered to constitute an 'important population' (refer Section 2.1).

WOULD THE ACTION FRAGMENT AN EXISTING IMPORTANT POPULATION INTO TWO OR MORE POPULATIONS?

Not applicable. Grey-headed Flying-fox occurring in the project subject site is not considered to constitute an 'important population' (refer Section 2.1).

WOULD THE ACTION ADVERSELY AFFECT HABITAT CRITICAL TO THE SURVIVAL OF A SPECIES?

Critical habitat refers to those areas of land listed in the Register of Critical Habitat kept by the Threatened Species Scientific Committee and the Minister for the Environment. No critical habitat has been listed for this species.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- For activities such as foraging, breeding, roosting, or dispersal
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- To maintain genetic diversity and long-term evolutionary development
- For the reintroduction of populations or recovery of the species or ecological community (Department of the Environment 2013).

The study area provided approximately 31.8 hectares of potential foraging habitat for the Grey-headed Flying-fox, of which 24.3 hectares is likely to be impacted, including 1.1 hectares of rainforest, 19.6 hectares of swamp forest and 3.6 hectares of wet open forest. In the locality (5 kilometre radius) this equates to approximately 0.5 per cent of similarly suitable habitat for the Grey-headed Flying-fox. Therefore, whilst the project will add incrementally to the loss of foraging habitat in the locality, no roost/ maternity camps will be impacted. The loss of approximately 0.5 per cent of potentially suitable foraging habitat in the locality is not likely to adversely affect the survival of this species.

WOULD THE ACTION DISRUPT THE BREEDING CYCLE OF AN IMPORTANT POPULATION?

Not applicable. Grey-headed Flying-fox occurring in the project subject site is not considered to constitute an 'important population' (refer Section 2.1).

WOULD THE ACTION MODIFY, DESTROY, REMOVE OR ISOLATE OR DECREASE THE AVAILABILITY OR QUALITY OF HABITAT TO THE EXTENT THAT THE SPECIES IS LIKELY TO DECLINE?

The Grey-headed Flying-fox is a wide ranging nomadic species that that relies on food sources that largely have irregular patterns of production, with nightly foraging events typically occurring within 20 km of camps, but some commutes can be up to 50 kilometres. The study area provided approximately 31.8 hectares of potential foraging habitat for this species, of which 24.3 hectares is likely to be impacted, including 1.1 hectares of rainforest, 19.6 hectares of swamp forest and 3.6 hectares of wet open forest. In the locality this equates to approximately 0.5 per cent of potentially suitable foraging habitat for the Grey-headed Flying-fox. Furthermore, no evidence of a Grey-headed Flying-fox camp was observed in the project study area during field surveys and none are known to occur in the project locality (5 kilometre radius). The nearest nationally important Grey-headed Flying-fox camp occurs some 52 kilometres to the project's north-east in Blackbutt Reserve (Newcastle).

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Given the mobile nature of this species, the lack of camps in the study area and locality, the irregular pattern of available foraging resource in the study area, and the extensive and contiguous nature of similarly suitable habitat in the locality, the project is not likely to significantly affect the availability of habitat to the extent that this species would decline.

WOULD THE ACTION RESULT IN INVASIVE SPECIES THAT ARE HARMFUL TO A VULNERABLE SPECIES BECOMING ESTABLISHED IN THE VULNERABLE SPECIES' HABITAT?

It is not likely that invasive species (such as introduced predators) that are potentially harmful to this species would become further established as a result of the project.

WOULD THE ACTION INTRODUCE DISEASE THAT MAY CAUSE THE SPECIES TO DECLINE?

No. There are no known diseases that are likely to increase in the area as a result of the project.

WOULD THE ACTION INTERFERE WITH THE RECOVERY OF THE SPECIES?

A Draft National Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus* was prepared in 2009 (Department of Environment Climate Change and Water NSW 2009), which details 12 objectives to help recover this species (Table 2.1).

Table 2.1 Recovery objectives for the Grey-headed Flying-fox

OBJECTIVE	LIKELY TO BE AFFECTED BY THE PROJECT?
Identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes throughout their range	Not applicable
Protect and increase the extent of key winter and spring foraging habitat of Grey-headed Flying-foxes	Not applicable
Identify roosting habitat critical to the survival of Grey-headed Flying-foxes	Not applicable
Protect and enhance roosting habitat critical to the survival of Grey-headed Flying-foxes	Not applicable
Substantially reduce deliberate destruction of Grey-headed Flying-foxes in fruit crops	Not applicable
Reduce negative public attitudes toward Grey-headed Flying-foxes and reduce conflict with humans	Not applicable
Increase public awareness and understanding of Grey-headed Flying-foxes and the recovery program, and to involve the community in recovery actions.	Not applicable
Monitor population trends in Grey-headed Flying-foxes so as to monitor the species' national distribution and status	Not applicable
Assess and reduce the impact on Grey-headed Flying-foxes of electrocution on powerlines and entanglement in netting and on barbed-wire	Not applicable
Improve knowledge of the demographics and population structure of Grey-headed Flying-foxes in order to increase understanding of the ecological requirements of the species	Not applicable
Increase the effectiveness and efficiency of recovery initiatives for Grey-headed Flying-foxes by working cooperatively with conservation and management programs	Not applicable
Maintain an effective Grey-headed Flying-fox National Recovery Team to oversee the implementation of the Grey-headed Flying-fox National Recovery Plan	Not applicable

The project will not interfere significantly with any of these recovery objectives.

CONCLUSION

The Grey-headed Flying-fox was observed flying over the project study area during two separate nocturnal survey events. Although this species was not specifically observed using habitat within the study area, this

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species is a blossom nomad that is known to commute long distances as food availability varies over time. Accordingly, this species is likely to be present intermittently and irregularly. Although four Grey-headed Flying-fox camps occur in proximity to the project, no evidence of a camp was observed in the study area and none are known to occur in the project locality (5 kilometre radius). The nearest nationally important Flying-fox camp occurs some 52 kilometre to the project's north-east in Blackbutt Reserve, Newcastle.

The study area provided approximately 31.8 hectares of foraging habitat for the Grey-headed Flying-fox, of which 24.3 hectares is likely to be impacted, including 1.1 hectares of rainforest, 19.6 hectares of swamp forest and 3.6 hectares of wet open forest. In the locality this constitutes approximately 0.5 per cent of similarly suitable habitat for the Grey-headed Flying-fox. Therefore, whilst the project will add incrementally to the loss of foraging habitat in the locality, no camps will be impacted. The loss of approximately 0.5 per cent of potentially suitable foraging habitat in the locality is not likely to have a significantly adverse impact on the Grey-headed Flying-fox.

3. REGENT HONEYEATER (*ANTHOCHAERA PHRYGIA*)

CONSERVATION STATUS

The Regent Honeyeater is listed as Critically Endangered under the Commonwealth EPBC Act.

DISTRIBUTION

The Regent Honeyeater distribution extends generally from Brisbane in the north to Melbourne in the south. They are largely a western slopes species (Higgins *et al.* 2001) extending to near coastal areas during periods when blossom is scarce west of the divide (Higgins *et al.* 2001). In the past two known key breeding areas have been recognised in NSW — the Capertee Valley and Bundarra–Barraba regions (Geering & French 1998). More recent breeding event observations have shown that woodlands in the Lower Hunter Region near Cessnock are also important as breeding and winter foraging habitat for this species (M. Roderick *et al.* 2014). As well as the Lower Hunter Region the Regent Honeyeater periodically moves into more coastal swamp forest habitats, including the Central Coast, for winter-flowering tree species, particularly Swamp Mahogany (Roderick, M *et al.* 2014).

In recent years the Regent Honeyeater has become progressively rarer across its range, including the Central Coast region (Pizzey & Knight 2012). The species is not resident on the Central Coast, but has in the past migrated to local habitats (Office of Environment & Heritage 2016c) on an intermittent basis when local winter blossom resources are abundant (Higgins *et al.* 2001). Periodical occurrences on the Central Coast region coincide primarily with Swamp Mahogany blossoming events (Roderick, M *et al.* 2014). To the north at Morisset, between 2002 and 2011, it has returned on a 4–5 year cycle with local occurrences usually coinciding with large aggregations of other honeyeaters. However, numbers have been in decline since 2002 (c. 100+ in 2002: c. 50 in 2007: c. 13 in 2011: 1 in 2013) and it hasn't been recorded in Morisset since December 2013 (Roderick, M *et al.* 2014).

HABITAT

Throughout much of their known range Regent Honeyeaters inhabit dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak (Department of Environment and Conservation 2006). The woodlands they inhabit support a significantly high abundance and richness of bird species. Where they persist in good condition these western woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes (Higgins *et al.* 2001).

In addition to the use of western slopes habitat types, movements to coastal areas, including the Central Coast, occur intermittently due to drought and the changing distribution of blossom resources as governed by seasonal blossom timings and discontinuous flowering frequencies (Saunders, D. L. & Heinsohn 2008).

ECOLOGY

The Regent Honeyeater is a generalist forager, which mainly feeds on nectar from a wide range of eucalypts and mistletoes. Key eucalypt species on the western slopes include Mugga Ironbark, Yellow Box, Blakely's Red Gum and White Box with Spotted Gum, Stringybark (Roderick M. 2015) and Swamp Mahogany important nectar resources in the Lower Hunter and Central Coast. Nectar and fruit from the mistletoes *Amyema miquelii*, *Amyema pendula* and *Amyema cambagei* are also eaten during the breeding season (Oliver 2000). When nectar is scarce, lerp and honeydew comprise a large proportion of the diet. Insects make up about 15 per cent of the total diet and are important components of the diet of nestlings (Higgins *et al.* 2001). A shrubby understorey is an important source of insects and nesting material (Oliver *et al.* 1998).

Twenty-five kilometres to the north, in Morisset, Swamp Mahogany stands along drainage lines in similar topography to the study area are used for foraging, with proximate coinciding blossom of *Eucalyptus saligna* (Sydney Blue Gum) and *Eucalyptus capitellata* (Brown Stringybark) sometimes used (Richardson A. 2016). Where competition with largely honeyeaters from blossom occurred Regent Honeyeaters were forced to perch in adjacent Scribbly Gum woodland. In Morisset Regent Honeyeaters preparing to roost have been observed to stage together in large loose groupings within dry open woodland associated with riparian habitats, with birds sparsely roosting singularly or in pairs in riparian or near-riparian trees (Richardson A. 2016).

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Colour-banding of Regent Honeyeater has shown that the species can undertake large-scale nomadic movements in the order of hundreds of kilometres (Higgins *et al.* 2001). However, the exact nature of these movements is still poorly understood. It is likely that movements are dependent on spatial and temporal flowering and other resource patterns. To successfully manage the recovery of this species a full understanding of the habitats used in the non-breeding season is critical (Department of Environment and Conservation 2006).

The Regent Honeyeater has not been recorded as breeding in the study area's locality, with the closest breeding activity recorded at Quorrobolong in the Hunter Valley 42 kilometres to north (Roderick, M. 2015).

KEY THREATS

Key threats detailed in the National Recovery Plan for the Regent Honeyeater (Department of the Environment 2015) in order of importance include:

- Small population size
- Habitat loss and fragmentation
- Habitat degradation
- Competition.

SPECIFIC IMPACTS

The Regent Honeyeater was not recorded in the project study area during field surveys or historically. The Regent Honeyeater is known from eight records comprising 17 birds in the project locality, all dated between January 1 and August 6, 1991. Two habitat types within the study area provide seasonal foraging resources for Regent Honeyeater; swamp forest and wet open forest habitats.

Swamp forest habitats provide Swamp Mahogany stands, which is a prolific winter flowering species and an important provider of winter food resources for nectivorous fauna during those years when it flowers. The regional significance of coastal Swamp Mahogany stands to the Regent Honeyeater is likely to be high, due to regular movements recorded (Roderick, M & Ingwersen 2014) and the lengths Regent Honeyeaters go to reach them from their usual western habitats, such as appears to occur in times of drought (Saunders, D. L. & Heinsohn 2008). Wet open forest habitats contain Blackbutt, Red Bloodwood and Sydney Blue Gum in the canopy. This habitat may be used by Regent Honeyeaters for supplementary resources during periods when they move to the coast for Swamp Mahogany.

Specifically, the project will impact approximately 23.2 hectares of foraging habitat, including 19.6 hectares of swamp forest and 3.6 hectares of wet open forest.

3.1 Assessment of significance

The Regent Honeyeater is listed as Critically Endangered under the EPBC Act. The following assessment has been undertaken following the critically endangered species criteria of the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment 2013).

Under the EPBC Act, a population of a species is defined as:

- a geographically distinct regional population, or collection of local populations; or
- a population, or collection of local populations, that occurs within a particular bioregion.

WOULD THE ACTION LEAD TO A LONG-TERM DECREASE IN THE SIZE OF A POPULATION OF A SPECIES?

The Regent Honeyeater is believed to consist of a single population with some interchange of individuals between the most frequently used locations (Department of the Environment 2015). Due to their nectivorous habits they are not strictly resident in any region, but their stronghold is generally recognised as occurring to the west of and on the slopes of the Great Dividing Range (Higgins *et al.* 2001). Movements to near coastal areas, such as the Central Coast of NSW where the study area occurs, appear to be in response to limits on

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nectar resources in their usual more westerly habitats as a consequence of drought or other cause of blossom failure (Saunders, D. L. & Heinsohn 2008).

Two types of habitat in the project study area provide potential seasonal foraging resources for the Regent Honeyeater, including swamp forest and wet open forest habitats. Swamp forest habitat provides stands of *Eucalyptus robusta* (Swamp Mahogany), which is a prolific winter flowering species and important provider of winter food resources for nectivorous fauna during those years when it flowers. As the Regent Honeyeater is listed as critically endangered under the EPBC Act, any habitat across its range could be considered important under different seasonal contexts; particularly as habitat patches do not blossom every year and are not necessarily synchronised in their flowering events.

The study area provides approximately 30.2 hectares of potential foraging habitat for this species, of which 23.2 hectares is likely to be impacted, including 19.6 hectares of swamp forest and 3.6 hectares of wet open forest. In the locality this equates to approximately 0.6 per cent of potentially suitable habitat for the Regent Honeyeater. Specifically regarding swamp forest type habitats, the project is likely to impact approximately 3 per cent of similar habitat in the locality (5 kilometre radius).

Therefore, the project will add incrementally to the loss of potential foraging habitat when environmental factors push individuals from their usual dry forest habitat west of the Great Dividing Range to near coastal habitats. However, the loss of approximately 0.6 per cent of potentially suitable foraging habitat in the project locality is not considered to lead to a long-term decrease in the size of a population of this species.

WOULD THE ACTION REDUCE THE AREA OF OCCUPANCY OF THE SPECIES?

This species was not recorded within the study area during field surveys and has not been recorded in the locality since 1991. The Regent Honeyeater's use of near coastal habitats, particularly stands of Swamp Mahogany, appear to be important during times when other regions in their range are experiencing low incidences of blossom (Roderick, M & Ingwersen 2014). The project will likely result in the removal of 23.2 hectares of potential foraging habitat, including 19.6 hectares of swamp forest and 3.6 hectares of wet open forest. In the locality (5 kilometre radius) this constitutes approximately 0.6 per cent of similarly available habitat for the Regent Honeyeater. Therefore, although the project will add incrementally to the loss of potential foraging habitat during periods of blossom shortage elsewhere in this species range, the loss of approximately 0.6 per cent of potentially suitable foraging habitat in the project locality (5 kilometre radius) is not considered to reduce the area of occupancy for the species.

WOULD THE ACTION FRAGMENT AN EXISTING POPULATION INTO TWO OR MORE POPULATIONS?

Habitat within and immediately surrounding the study area is already fragmented by the existing rail corridor and managed rural residential lands. Construction of the project would add incrementally to existing fragmentation of habitat in an approximate north-south alignment from the coastal range south of the existing rail corridor to riparian habitat associated with Ourimbah Creek in the north. Whilst the removal of 23.2 hectares of potential foraging habitat will incrementally increase habitat fragmentation in the study area, it is unlikely to occur at a scale that would lead to the fragmentation of the existing population into two or more populations, given the mobile nature of this species and lack of recent records.

WOULD THE ACTION ADVERSELY AFFECT HABITAT CRITICAL TO THE SURVIVAL OF A SPECIES?

Critical habitat refers to those areas of land listed in the Register of Critical Habitat kept by the Threatened Species Scientific Committee and the Minister for the Environment. No critical habitat has been listed for this species.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- For activities such as foraging, breeding, roosting, or dispersal
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- To maintain genetic diversity and long-term evolutionary development
- For the reintroduction of populations or recovery of the species or ecological community (Department of the Environment 2013).

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Due to their nectivorous habits the Regent Honeyeater is not strictly resident in any region, but their stronghold is generally recognised as occurring to the west of and on the slopes of the Great Dividing Range (Higgins *et al.* 2001). Movements to near coastal areas, such as the Central Coast of NSW where the study area occurs, appear to be in response to limits on nectar resources in their usual more westerly habitats as a consequence of drought or other cause of blossom failure (Saunders, D. L. & Heinsohn 2008). As the Regent Honeyeater is listed as critically endangered under the EPBC Act, any habitat across its range could be considered important under different seasonal contexts; particularly as habitat patches do not blossom every year and are not necessarily synchronised in their flowering events. Notwithstanding this, whilst the project will add incrementally to the loss of potential foraging habitat in the project locality, the loss of approximately 0.6 per cent of potentially suitable foraging habitat in the locality is not likely to adversely affect habitat critical to the Regent Honeyeaters survival.

WOULD THE ACTION DISRUPT THE BREEDING CYCLE OF A POPULATION?

In the past two known key breeding areas have been recognised in NSW, including the Capertee Valley and Bundarra – Barraba region. More recent breeding event observations have shown that woodlands in the Lower Hunter Region near Cessnock are also important as breeding and winter foraging habitat for this species. The closest breeding activity is recorded at Quorrobolong in the Hunter Valley, 42 kilometres to north of the project (Roderick, M. 2015). It is considered unlikely that this species would breed within the study area and that this action would disrupt its breeding cycle.

WOULD THE ACTION MODIFY, DESTROY, REMOVE, ISOLATE OR DECREASE THE AVAILABILITY OR QUALITY OF HABITAT TO THE EXTENT THAT THE SPECIES IS LIKELY TO DECLINE?

Throughout much of their range, Regent Honeyeater's inhabit dry open forest and woodland and riparian forests of River She-oak occurring west of and on the slopes of the Great Dividing Range (Department of Environment and Conservation 2006, Higgins *et al.* 2001). Movements of the Regent Honeyeater to near coastal areas, such as the Central Coast of NSW where the study area occurs, appears to be in response to limits on nectar resources in their usual more westerly habitats (Saunders, D. L. & Heinsohn 2008).

The project will impact approximately 23.2 hectares of potential foraging habitat for the Regent Honeyeater, when environmental factors push individuals from their usual dry forest habitat west of the Great Dividing Range to near coastal habitats. However, the loss of approximately 0.6 per cent of potentially suitable foraging habitat in the project locality is not considered likely to significantly reduce the quality or availability of habitat to the extent that this species is likely to decline.

WOULD THE ACTION RESULT IN INVASIVE SPECIES THAT ARE HARMFUL TO AN ENDANGERED SPECIES BECOMING ESTABLISHED IN THE ENDANGERED SPECIES' HABITAT?

It is not likely that invasive species (such as introduced predators) that are potentially harmful to this species would become further established as a result of the project.

WOULD THE ACTION INTRODUCE DISEASE THAT MAY CAUSE THE SPECIES TO DECLINE?

No. There are no known diseases that are likely to increase in the area as a result of the project.

WOULD THE ACTION INTERFERE WITH THE RECOVERY OF THE SPECIES?

A Draft National Recovery Plan for the Regent Honeyeater *Anthochaera phrygia* was prepared in 2015 (Department of the Environment 2015). Regent Honeyeater has been assigned as a site-managed species under the Saving our Species program, in which the Office of Environment and Heritage has established four management sites where conservation activities need to take place to ensure the conservation of this species (Office for Environment & Heritage 2016b). The subject site does not impact any of these sites or the management objectives assigned to each site, which include:

- negotiate in land management agreements to minimise the impacts of clearing of key habitat
- monitoring disturbance impacts
- track species abundance
- land management consultation to ensure appropriate grazing regime

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- restore and rehabilitate native vegetation
- reduce impacts of noisy miners

The project will not interfere significantly with any of these management objectives.

CONCLUSION

The Regent Honeyeater was not recorded within the study area during field surveys. Historically, this species is known in the project locality (5 kilometre radius) from eight records comprising seventeen birds between January 1 and August 6, 1991, with the nearest breeding activity occurring some 42 kilometres to the north of the project at Quorrobolong in the Hunter Valley. The Regent Honeyeater's use of near coastal habitats, particularly stands of Swamp Mahogany, appear to be important during times when other regions in their range are experiencing low incidences of blossom. The study area provided approximately 30.2 hectares of potential foraging habitat for this species, of which 23.2 hectares is likely to be impacted, including 19.6 hectares of swamp forest and 3.6 hectares of wet open forest. In the locality this constitutes approximately 0.6 per cent of potentially suitable foraging habitat for the Regent Honeyeater.

Whilst the project will add incrementally to the loss of foraging habitat in the locality, in particular reducing the amount of seasonal foraging resources available (i.e. swamp forest), the loss of approximately 0.6 per cent of potentially suitable foraging habitat in the project locality is not likely to result in a significantly adverse impact on this species.

4. SWIFT PARROT (*LATHAMUS DISCOLOR*)

CONSERVATION STATUS

The Swift Parrot is listed as Critically Endangered under the Commonwealth EPBC Act.

DISTRIBUTION

The Swift Parrot distribution extends generally from Brisbane in the north to Tasmania in the south and across to Adelaide in the west (Higgins 1999). They become scarcer north of the Hunter Region (Higgins 1999) and records north of Brisbane are rare. The entire population resides in Tasmania from September to April during the breeding season (Higgins 1999), and no Swift Parrots breed on the Mainland. On the mainland during the winter months they are widely nomadic in response to the varying distribution of blossom (Higgins 1999). Swift Parrot movements locally vary from year to year in response to resources within their range, and the presence of good resources locally is not an indicator that they will necessarily be present at a given location. Although blossom is used by Swift Parrots, they also frequently take lerps and may be found using lerps even when blossom is present to avoid conflict with large honeyeaters, such as Noisy Friarbirds and Red Wattlebirds (Saunders, D. A. & Tzaros 2011).

In recent years like the Regent Honeyeater the Swift Parrot has become progressively rarer across its range, including occurrences in the Central NSW Coast region (Roderick, M *et al.* 2013). Their migration to the mainland sometimes includes habitats in the project locality when winter-blossom resources are available (Roderick, M *et al.* 2013). Periodical occurrences in the Central NSW area coincide with Swamp Mahogany *Eucalyptus robusta* blossoming events and Forest Red Gum *Eucalyptus tereticornis* (Roderick, M *et al.* 2014).

HABITAT

Throughout much of their known range Swift Parrots inhabit forest and woodland habitats, particularly Box-Ironbark woodland in inland habitats, including the Lower Hunter Region, with riparian forests and coastal heathland used in more coastal locations (Higgins 1999). Habitat use is not predictable on the occurrence of blossom alone as blossom distributions may encompass many regions at the same time preventing Swift Parrots from visiting some areas even when blossom is present in good quantities.

As Swift Parrots use western slopes habitat types, movements to coastal areas, including the Central Coast, sometimes occur as a consequence of drought conditions and the changing distribution of blossom resources as governed by seasonal blossom timings and discontinuous flowering frequencies (Saunders, D. A. & Tzaros 2011). Local habitat preferences of Swift Parrots include habitats that are listed as Endangered in NSW, including River-Flat Eucalypt Forest on Coastal Floodplains and Swamp Sclerophyll Forest on Coastal Floodplains (Saunders, D. A. & Tzaros 2011).

ECOLOGY

The Swift Parrot is a generalist forager, which mainly feeds on nectar, psyllids and lerps from a wide range of eucalypts (Higgins 1999). Key eucalypt species in the Central Coast area include Swamp Mahogany and Forest Red Gum as providing important nectar resources with Blackbutt and Sydney Blue Gum sometimes providing lerp resources (Roderick, M *et al.* 2014). Often blossom resources are so dominated by larger honeyeater species that Swift Parrots are forced away from key blossom, using lerps instead (Saunders, D. A. & Tzaros 2011). Furthermore, Bell Miner colonies are resident in areas of lerp occurrences and defend these sites from other bird species, (Higgins 1999), which often attracts Swift Parrots to these colonies for the lerps (Richardson A. 2016). In the south of Lake Macquarie to north of the project area Bell Miners establish colonies in a range of different eucalypt dominated communities including Forest Red Gum, Sydney Blue Gum, Blackbutt and Swamp Mahogany (Richardson A. 2016).

Although Swift Parrots are often associated with Regent Honeyeaters, due to a crossover in resource use, the two species use markedly different pathways to reach Central Coast locations; Regent Honeyeaters essentially moving east from westerly locations Swift Parrots travelling north from Tasmania (Higgins 1999; Higgins *et al.* 2001). Swift Parrots are very fast fliers and are well equipped to cross breaks in vegetation continuity, as their traverse of Bass Strait twice each year suggests (Higgins 1999).

Attachment A – EPBC Significant Impact Assessments

Swift Parrots breed in Tasmania during the austral summer generally in areas dominated by Blue Gum *Eucalyptus globulus*. Although they do use Swamp Gum *Eucalyptus ovata* patches these areas often contain some Blue Gums (Higgins 1999). Breeding is in a tree hollow most often in large Blue Gums, Messmate *E. obliqua* or White Peppermint *Eucalyptus pulchella* with a diameter at breast height > 0.7 metres (Higgins 1999). In recent years studies of Swift Parrot nesting events have found that Swift Parrot nests are predated upon by the Sugar Glider (*Petaurus breviceps*), which was introduced to Tasmania from the mainland in the past (Stojanovic 2014). The study found that females were almost always lost as a consequence of Sugar Glider predation and that survival rates for Swift Parrot nests in Sugar Glider areas was only 0.17 per cent over a 60-day nesting period (Stojanovic 2014).

KEY THREATS

Key threats detailed in the National Recovery Plan for the Swift Parrot (Saunders, D. A. & Tzaros 2011) in order of importance include:

- Habitat loss and alteration
- Climate Change
- Collision mortality
- Competition
- Psittacine Beak and Feather Disease
- Illegal wildlife capture and trading
- Listed threatening processes
- Cumulative impacts.

SPECIFIC IMPACTS

The Swift Parrot was not recorded within the project study area during field surveys, but there is a previous record known therein (Office for Environment & Heritage 2016a). Two habitat types within the study area provide seasonal foraging resources for Swift Parrots; swamp forest and wet open forest habitats. Swamp forest habitats provide Swamp Mahogany stands, which is a prolific winter flowering species and an important provider of winter food resources for nectivorous fauna during those years when it flowers. Swamp Mahogany stands as occur within the study area have been observed to be important to Swift Parrots during times when other regions in their range are experiencing low incidences of blossom. Wet open forest habitats within the study area contain Red Bloodwood *Corymbia gummifera*, Blackbutt *Eucalyptus pilularis* and Sydney Blue Gum *Eucalyptus saligna*. Each of these tree species are not recognised as important for Swift Parrot winter resources, but Blackbutt, Red Bloodwood and Sydney Blue Gum (Richardson A. 2016) stands have been used by Swift Parrots for lerp foraging particularly in areas where Bell Miners occur, as is the case with the project study area.

Specifically, the project will impact approximately 23.2 hectares of foraging habitat, including 19.6 hectares of swamp forest and 3.6 hectares wet open forest.

4.1 Assessment of significance

The Swift Parrot is listed as Critically Endangered under the EPBC Act. The following assessment has been undertaken following the critically endangered species criteria of the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment 2013).

Under the EPBC Act, population of a species is defined as:

- a geographically distinct regional population, or collection of local populations; or
- a population, or collection of local populations, that occurs within a particular bioregion.

WOULD THE ACTION LEAD TO A LONG-TERM DECREASE IN THE SIZE OF A POPULATION OF A SPECIES?

The Swift Parrot consists of a single population, which resides in Tasmania from September to April during the breeding season. During the non-breeding season the population migrates to mainland Australia with the bulk of the population using Victoria and south-eastern NSW with some birds reaching south-eastern South Australia and South-east Queensland (Saunders, D. A. & Tzaros 2011). On the mainland, Swift Parrots are widely nomadic in response to varying distribution of blossom (Higgins 1999) and are not strictly resident in any region. Throughout much of their range, Swift Parrots inhabit forest and woodland habitats, particularly Box – Ironbark woodland in inland habitats, with riparian forests and coastal heathland used more in coastal locations (Higgins 1999). The Swift Parrot is a generalist forager, which mainly feeds on nectar, psyllids and lerps from a wide range of eucalypts (Higgins 1999). Key eucalypt species in the Central Coast area include *Eucalyptus robusta* (Swamp Mahogany), *Eucalyptus tereticornis* (Forest Red Gum) as providing important nectar resources with *Eucalyptus pilularis* (Blackbutt) and *Eucalyptus saligna* (Sydney Blue Gum) sometimes providing lerp resources (Roderick et al 2014).

Two types of habitat in the project study area provide seasonal and intermittent foraging resources for the Swift Parrot, including swamp forest and wet open forest habitats. Swamp forest habitat provides stands of *Eucalyptus robusta* (Swamp Mahogany), which is a prolific winter flowering species and important provider of winter food resources for nectivorous fauna during those years when it flowers. As the Swift Parrot is listed as critically endangered under the EPBC Act, any habitat across its range could be considered important under different seasonal contexts; particularly as habitat patches do not blossom every year and are not necessarily synchronised in their flowering events.

The study area provided approximately 30.2 hectares of foraging habitat for this species, of which 23.2 hectares is likely to be impacted, including 19.6 hectares of swamp forest and 3.6 hectares of wet open forest. In the locality this equates to approximately 0.6 per cent of potentially suitable habitat for the Swift Parrot. Therefore, whilst the project will add incrementally to the loss of foraging habitat in the project locality (5 kilometre radius). The loss of approximately 0.6 per cent of potentially suitable foraging habitat is not considered likely to lead to a long-term decrease in the size of a population of this species.

WOULD THE ACTION REDUCE THE AREA OF OCCUPANCY OF THE SPECIES?

On mainland Australia, Swift Parrots are widely nomadic in response to varying distribution of blossom (Higgins 1999) and are not strictly resident in any region. Throughout much of their range, Swift Parrots inhabit forest and woodland habitats, particularly Box – Ironbark woodland in inland habitats, with riparian forests and coastal heathland used more in coastal locations (Higgins 1999).

In the project study area, swamp forest habitat provides stands of *Eucalyptus robusta*, which is a prolific winter flowering species and important provider of winter food resources for nectivorous fauna during those years when it flowers. However, habitat patches do not blossom every year and are not necessarily synchronised in their flowering events. Although the Swift Parrot's use of coastal swamp sclerophyll habitats may in certain years be in response low blossom availability in the western portions of this species range, the availability of such intermittent resources may enable this species to survive periodic climatic stochastic events.

The project will impact approximately 23.2 hectares of potential Swift Parrot foraging habitat, including 19.6 hectares of swamp forest and 3.6 hectares of wet open forest. In the project locality this equates to approximately 0.6 per cent of potentially suitable and similarly available habitat for the Swift Parrot. Therefore, whilst the project will add incrementally to the loss of foraging habitat in the project locality, it is not considered to reduce the area of occupancy of the species.

WOULD THE ACTION FRAGMENT AN EXISTING POPULATION INTO TWO OR MORE POPULATIONS?

Habitat within and immediately surrounding the study area is already fragmented by the existing rail corridor and managed rural residential lands. Construction of the project would add incrementally to existing fragmentation of habitat in an approximate north-south alignment from the coastal range south of the existing rail corridor to riparian habitat associated with Ourimbah Creek in the north. Swift Parrots are very fast fliers and are well equipped to cross breaks in vegetation continuity, as their traverse of Bass Strait twice each year suggests (Higgins 1999). Accordingly, the project will not fragment an existing population of Swift Parrot.

WOULD THE ACTION ADVERSELY AFFECT HABITAT CRITICAL TO THE SURVIVAL OF A SPECIES?

Critical habitat refers to those areas of land listed in the Register of Critical Habitat kept by the Threatened Species Scientific Committee and the Minister for the Environment. No critical habitat has been listed for this species.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- For activities such as foraging, breeding, roosting, or dispersal
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- To maintain genetic diversity and long-term evolutionary development
- For the reintroduction of populations or recovery of the species or ecological community (Department of the Environment 2013).

On the mainland, Swift Parrots are widely nomadic in response to varying distribution of blossom (Higgins 1999) and are not strictly resident in any region. Throughout much of their range, Swift Parrots inhabit forest and woodland habitats, particularly Box – Ironbark woodland in inland habitats. The occurrence of Swift Parrot's in more coastal environments typically occur in response to flowering *Eucalyptus robusta* and *Eucalyptus tereticornis*. As the Swift Parrot is listed as critically endangered under the EPBC Act, any habitat across its range could be considered important under different seasonal contexts; particularly as habitat patches do not blossom every year and are not necessarily synchronised in their flowering events. Notwithstanding this, whilst the project will add incrementally to the loss of foraging habitat in the project locality, the loss of approximately 0.6 per cent of suitable foraging habitat in the project locality is not likely to adversely affect habitat critical to the Swift Parrots survival.

WOULD THE ACTION DISRUPT THE BREEDING CYCLE OF A POPULATION?

Swift Parrots breed in Tasmania during the austral summer generally in areas dominated by *Eucalyptus globulus* (Blue Gum) in tree hollows, migrating to south-eastern Australia during autumn and winter. While Swift Parrots are dependent upon flowering resources across a wide range of habitats (woodland and forests) within their NSW winter grounds, the removal of approximately 23.2 hectares of foraging habitat and constituting 0.6 per cent of similarly available habitat in the project locality, it is not likely to disrupt their movements to Tasmanian breeding grounds.

WOULD THE ACTION MODIFY, DESTROY, REMOVE, ISOLATE OR DECREASE THE AVAILABILITY OR QUALITY OF HABITAT TO THE EXTENT THAT THE SPECIES IS LIKELY TO DECLINE?

On the mainland, Swift Parrots are widely nomadic in response to varying distribution of blossom (Higgins 1999) and are not strictly resident in any region. Throughout much of their range, Swift Parrots inhabit forest and woodland habitats, particularly Box – Ironbark woodland in inland habitats. The occurrence of Swift Parrot's in more coastal environments typically occur in response to flowering *Eucalyptus robusta* and *Eucalyptus tereticornis*. As the Swift Parrot is listed as critically endangered under the EPBC Act, any habitat across its range could be considered important under different seasonal contexts; particularly as habitat patches do not blossom every year and are not necessarily synchronised in their flowering events.

Two types of habitat in the project study area provide seasonal and intermittent foraging resources for the Swift Parrot, including swamp forest and wet open forest habitats. Swamp forest habitat provides stands of *Eucalyptus robusta* (Swamp Mahogany), which is a prolific winter flowering species and important provider of winter food resources for nectivorous fauna during those years when it flowers. The project will impact approximately 23.2 hectares of suitable foraging habitat for the Swift Parrot. Although the project will add incrementally to the loss of foraging habitat, the loss of approximately 0.6 per cent of similarly suitable habitat in the project locality is not considered likely to significantly reduce the quality or availability of habitat to the extent that this species is likely to decline.

WOULD THE ACTION RESULT IN INVASIVE SPECIES THAT ARE HARMFUL TO AN ENDANGERED SPECIES BECOMING ESTABLISHED IN THE ENDANGERED SPECIES' HABITAT?

It is not likely that invasive species (such as introduced predators) that are potentially harmful to this species would become further established as a result of the project.

WOULD THE ACTION INTRODUCE DISEASE THAT MAY CAUSE THE SPECIES TO DECLINE?

No. There are no known diseases that are likely to increase in the area as a result of the project.

WOULD THE ACTION INTERFERE WITH THE RECOVERY OF THE SPECIES?

A National recovery Plan for the Swift Parrot has been developed and recovery actions associated with this plan include:

- identify the extent and quality of habitat
- manage and protect swift parrot habitat at the landscape scale
- monitor and manage the impact of collisions, competition and disease
- monitor population and habitat.

The project will not interfere with any of these recovery actions.

CONCLUSION

The Swift Parrot was not recorded within the study area, but there are past records of the species occurring within the subject site. The study area provides approximately 30.2 hectares of potential foraging habitat for this species, of which 23.2 hectares is likely to be impacted, including 19.6 hectares of swamp forest and 3.6 hectares of wet open forest. In the locality this equates to approximately 0.6 per cent of potentially suitable foraging habitat for the Swift Parrot.

Whilst the project will add incrementally to the loss of foraging habitat in the locality, in particular reducing the amount of seasonal foraging resources available (i.e. swamp forest), the loss of approximately 0.6 per cent of potentially suitable foraging habitat in the locality is not likely to have a significantly impact on the Swift Parrot.

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Attachment A – EPBC Significant Impact Assessments

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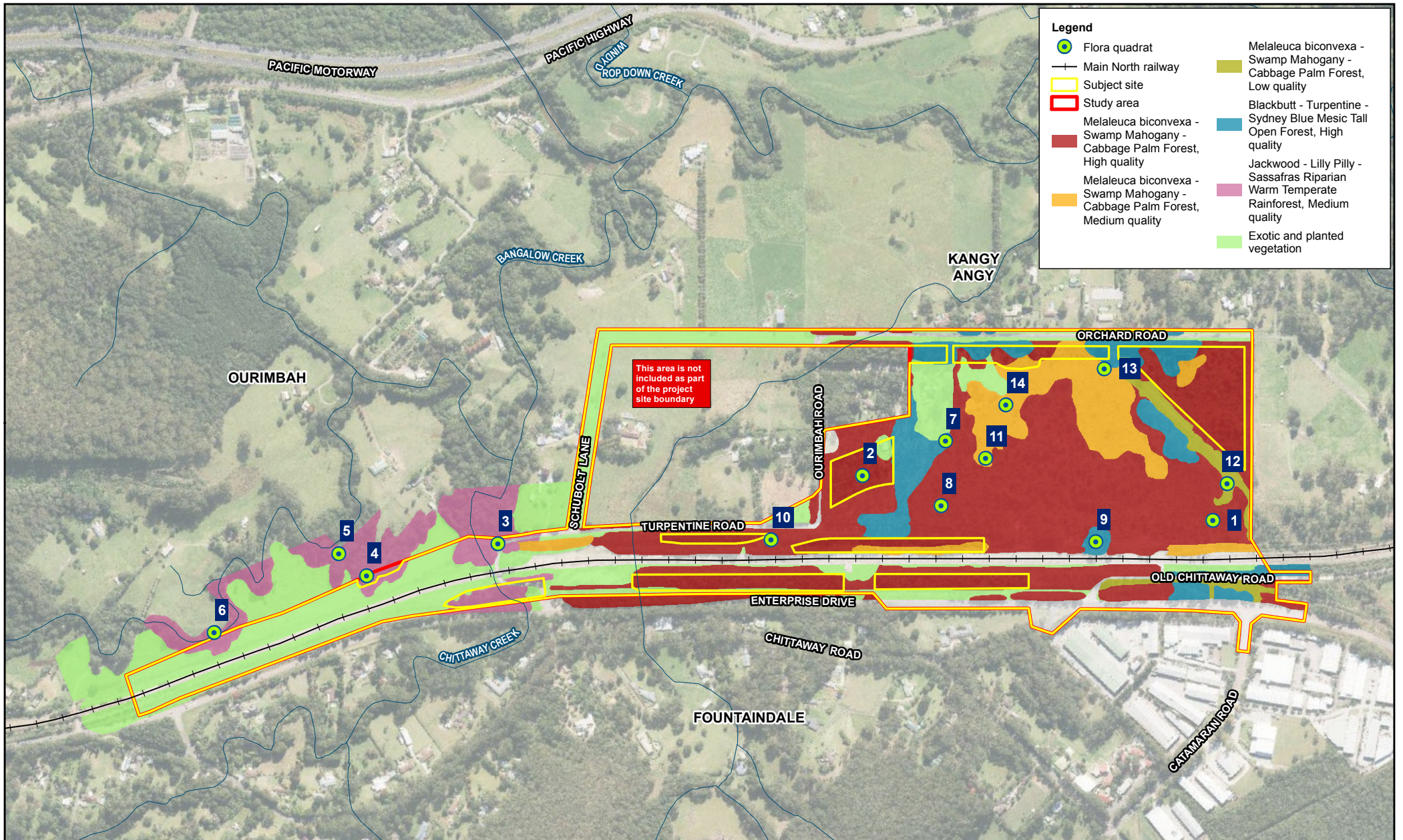
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ATTACHMENT B

FIGURES



Legend

- Flora quadrat
- Main North railway
- Subject site
- Study area
- Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm Forest, High quality
- Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm Forest, Medium quality
- Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm Forest, Low quality
- Blackbutt - Turpentine - Sydney Blue Mesic Tall Open Forest, High quality
- Jackwood - Lilly Pilly - Sassafras Riparian
- Warm Temperate Rainforest, Medium quality
- Exotic and planted vegetation

Map: 2202522A_GIS_F067_A1 Author: suansrir

Date: 19/05/2016 Approved by: -

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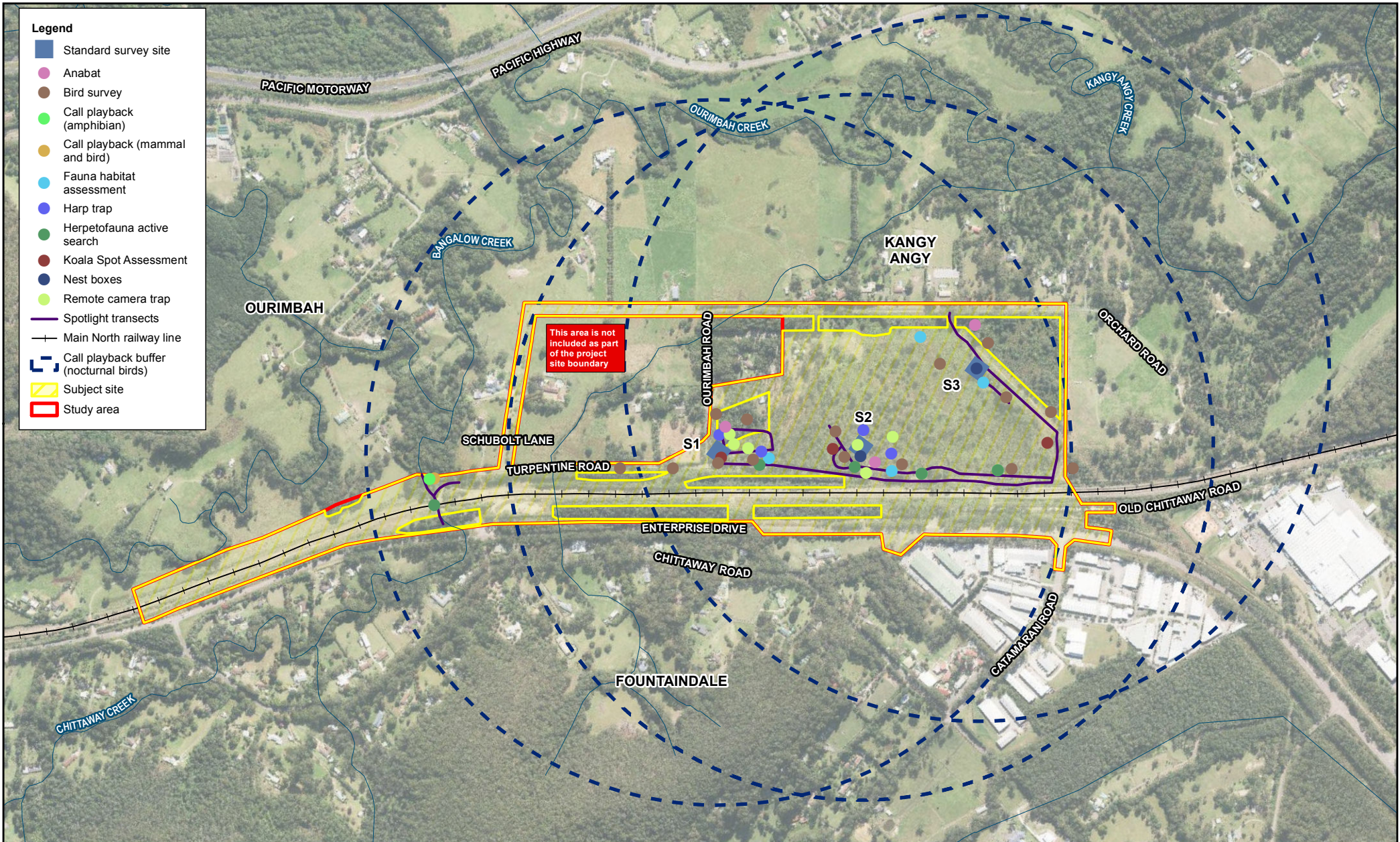
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New Intercity Fleet Maintenance Facility Project
Figure 1
Vegetation communities and flora survey effort

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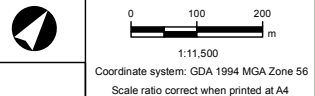
Legend

- Standard survey site
- Anabat
- Bird survey
- Call playback (amphibian)
- Call playback (mammal and bird)
- Fauna habitat assessment
- Harp trap
- Herpetofauna active search
- Koala Spot Assessment
- Nest boxes
- Remote camera trap
- Spotlight transects
- Main North railway line
- Call playback buffer (nocturnal birds)
- Subject site
- Study area

Map: 2202522A_GIS_F068_A1 Author: suansrir

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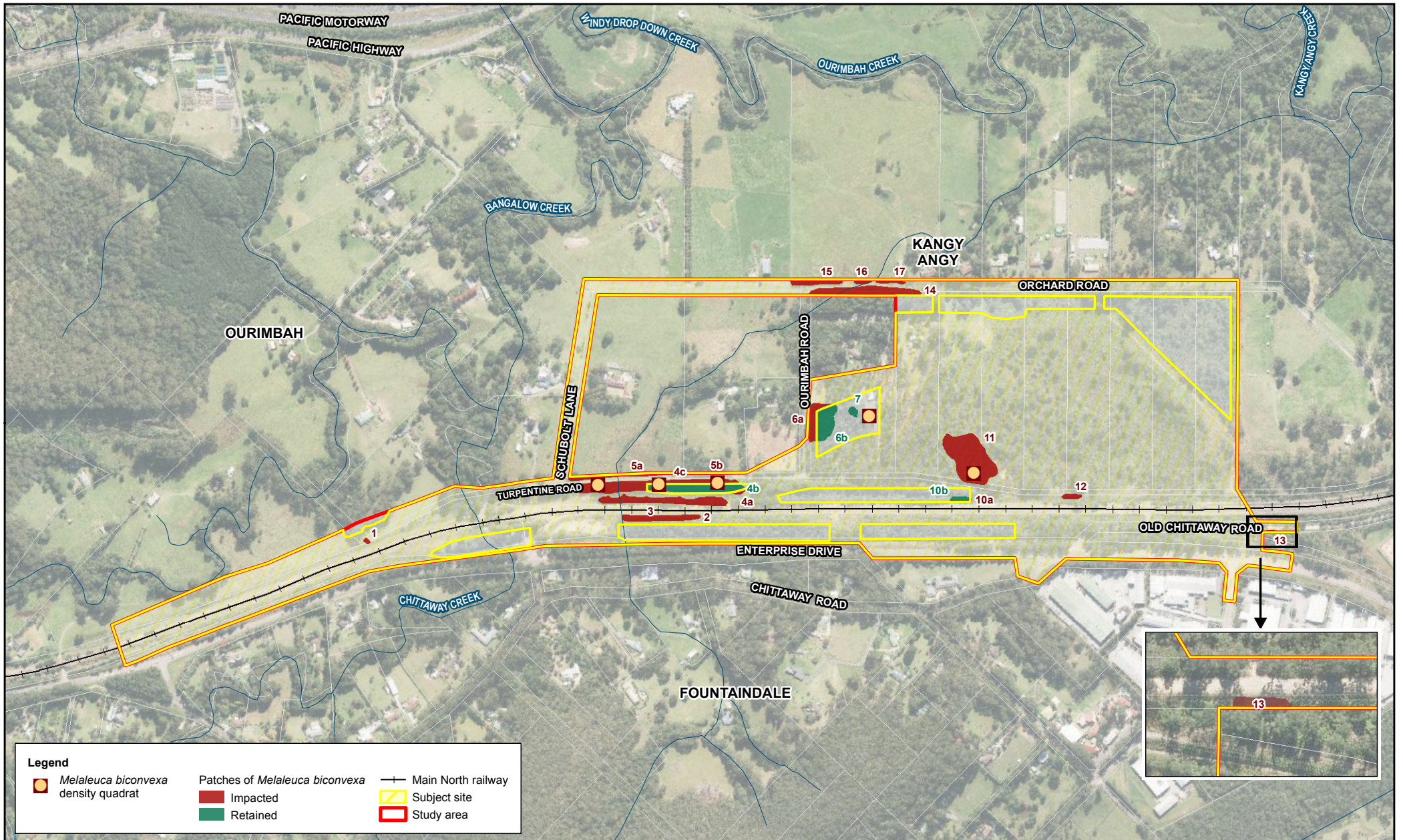


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New Intercity Fleet Maintenance Facility Project
Figure 2
Fauna survey effort

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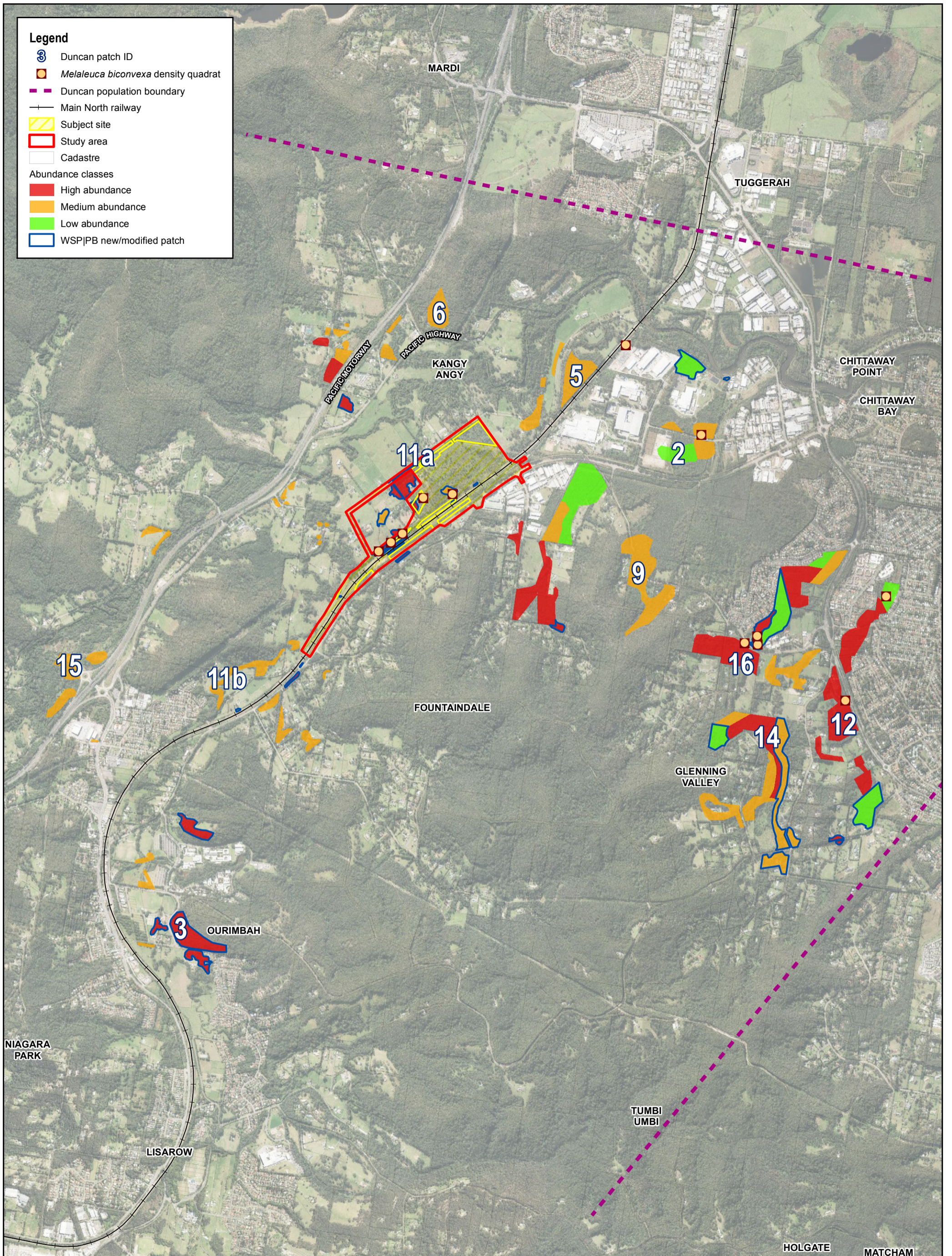
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New Intercity Fleet Maintenance Facility Project
Figure 3
 Location of *Melaleuca biconvexa*

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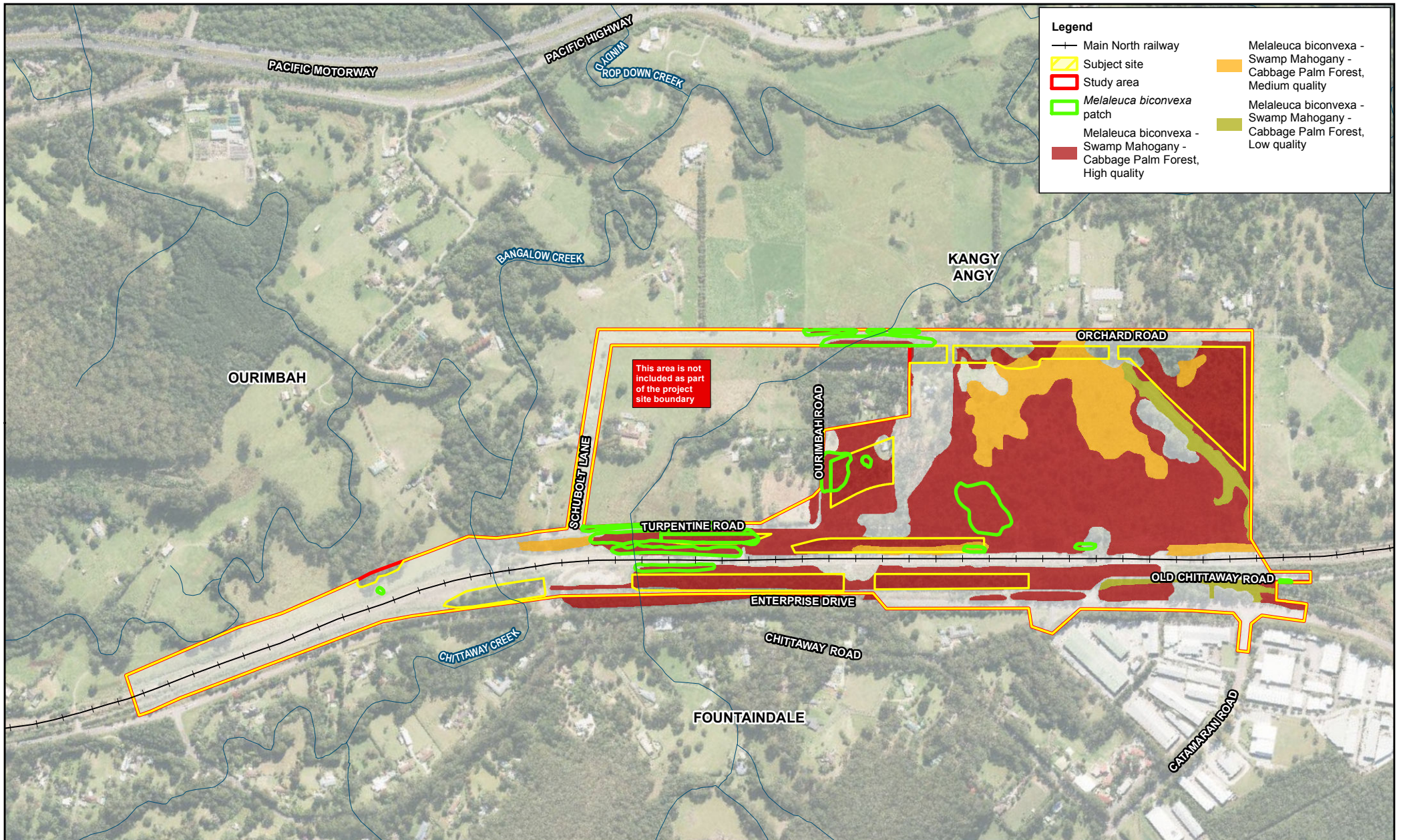
Legend

- Duncan patch ID
- Melaleuca biconvexa* density quadrat
- Duncan population boundary
- Main North railway
- Subject site
- Study area
- Cadastre

Abundance classes

- High abundance
- Medium abundance
- Low abundance
- WSP|PB new/modified patch

Map: 2202522A_GIS_F070_A1	Author: Suansrir		 1:26,003 Coordinate system: GDA 1994 MGA Zone 56 Scale ratio correct when printed at A3	Note: Design is indicative only. Subject to detailed design.	New Intercity Fleet Maintenance Facility Project Figure 4 <i>Melaleuca biconvexa</i> local population distribution and survey effort
Date: 19/05/2016	Approved by: -				
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Legend

- + Main North railway
- ▭ Subject site
- ▭ Study area
- ▭ *Melaleuca biconvexa* patch
- ▭ *Melaleuca biconvexa* - Swamp Mahogany - Cabbage Palm Forest, High quality
- ▭ *Melaleuca biconvexa* - Swamp Mahogany - Cabbage Palm Forest, Medium quality
- ▭ *Melaleuca biconvexa* - Swamp Mahogany - Cabbage Palm Forest, Low quality

This area is not included as part of the project site boundary

Map: 2202522A_GIS_F071_A1	Author: suansrir
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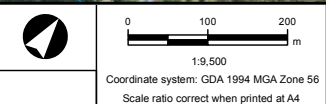
New Intercity Fleet Maintenance Facility Project
Figure 5
Melaleuca biconvexa habitats



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Map: 2202522A_GIS_F072_A1
 Author: suansrir
 Date: 19/05/2016
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Note: Design is indicative only.
 Subject to detailed design

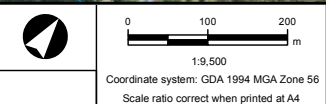
New Intercity Fleet Maintenance Facility Project
Figure 6
 Grey-headed Flying-fox habitat

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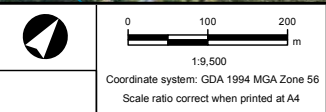
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Figure 7
 Regent Honeyeater habitat

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Figure 8
 Swift Parrot habitat

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