North Byron Parklands Cultural Events Site

EPBC Act Referral – Attachment A

Prepared for
Billinudgel Property Pty Ltd

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Attachment A: Impact Assessment

1.1 Introduction

Billinudgel Property Pty Ltd (Billinudgel Property) propose to establish a permanent cultural events site at the North Byron Parklands (Parklands) in Yelgun, New South Wales (NSW). The Parklands is located on the Tweed Valley Way and Jones Road within the Byron Bay Shire Council area, covering an area of approximately 260 ha. Billinudgel Property have owned and managed the Parklands since September 2006. During this time extensive habitat restoration works have been carried out, including tree planting, noxious weed removal, removal of fence lines that limit fauna movement and revegetation of the site.

Billinudgel Property have utilised the Parklands as a cultural events site under a five year trial period approved by the NSW Planning Assessment Commission (PAC) in April 2012 and by the Commonwealth Minister for the Environment in October 2012. A total of seven large and medium sized events, capped at 35,000 patrons have been held at the Parklands to date. Extensive monitoring of flora and fauna has been undertaken prior to, during and following these events to assess any potential impacts. Impacts were detected to a few species / species groups and were minor and reversible.

1.2 Purpose of this report

The objective of this report is to provide an assessment of potential impacts to Matters of National Environmental Significance (MNES) as a result of the proposed action at Parklands as described in the accompanying referral. It describes the available information, analyses the likelihood of occurrence for species/communities and presents an impact assessment in line with the Environmental Protection and Biodiversity Conservation Act (EPBC Act) *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (Commonwealth of Australia, 2013).

1.3 Available information

A desktop assessment and review of previous ecological studies, environmental databases, maps and relevant literature was undertaken to evaluate existing data relating to MNES within the Parklands.

The following databases were reviewed to assess the potential for MNES to occur:

- EPBC Act Protected Matters Search Tool (search run on 23 February 2017 on coordinates -28.47583, 153.5175 with a 5 km buffer)
- Bionet Atlas Database
- Vegetation Information System (VIS) maps
- Coastal Wetlands (State Environmental Planning Policy No. 14) - SEPP 14
- Atlas of Living Australia
- Aerial photography
- Approved Conservation Advice, National Recovery Plans and Survey Guidelines for MNES occurring within the Parklands.

Numerous ecological studies have previously been carried out at Parklands since 2007. These reports collectively provide a comprehensive picture of the listed threatened species, their habitats and ecological communities that occur within and directly adjacent to Parklands. These include:

- Performance Report #1 – #4 Appendices B1 Environmental Performance Report and B2 Results and Analyses of Event Impact Monitoring Data (North Byron Parklands 2014a, 2014b, 2015, 2016)
- August 2007 Fauna Survey of (Fitzgerald 2007)
- February 2009 Fauna Survey of North Byron Parklands (Fitzgerald 2009)
- North Byron Parklands Biennial Fauna Survey (Fitzgerald 2014)
- North Byron Parklands Flora and Fauna Rehabilitation Program (Fitzgerald 2016)
- Yelgun Koala Survey and Koala Plan of Management (Biolink 2007)
- Yelgun Koala Survey Koala Habitat Reassessment (Biolink 2008)
- North Byron Parklands SEPP No. 44 Koala Survey and Habitat Reassessment (Biolink 2013)
- North Byron Parklands SEPP No. 44 Koala Monitoring Report (Biolink 2016)

Furthermore, two targeted surveys were undertaken to provide specific information for this referral. These are summarised in Appendix B below.

1.3.1 Survey effort

Survey effort has been extensive at the Parklands since 2007. This allows for a very robust assessment of MNES occurrence. The total survey effort undertaken at the Parklands is provided in Table 1 and

Table 2, with further details available in Eco Logical Australia (2017) and the above listed reports.

Table 1: Total fauna survey effort 2007 – 2017, including general fauna survey, targeted Koala survey and all Event Impact Monitoring (8 events)

Target fauna group	Method	Total survey effort
Mammals	Elliot trapping	1,125 trap nights
	Hair tube sampling	4,800 tubes
Koala	Koala Spot Assessment Technique (KSAT)	97 assessments
	Habitat assessment and incidental observations	27 days
Reptiles	Pitfall traps	75 traps days
Reptiles and amphibians	Targeted habitat searches	13 days
Mammals and reptiles	Sand traps and motion cameras	420 nights
Nocturnal species	Spotlighting	59 nights
Microbats	Harp netting	26 trap nights
	Anabat deployment	237 nights
Forest birds	Timed bird census	240 hours
Water birds	Timed bird census at dam	10.5 hours
Owls and cryptic birds	Call playback	33 sessions

Table 2: Total vegetation and threatened flora surveys 2007 – 2017

Vegetation / flora	Survey and effort
Site-wide vegetation mapping	Undertaken in 2008
Forest blocks	22 permanent plots; established in 2009 Monitoring before and after each event (8 events)
Grasslands within event areas	
Threatened flora species	Initial surveys for threatened flora in 2009 in suitable habitat Condition checks of known individuals during event monitoring (8 events)
Lowland Rainforest TEC	Targeted survey to assess condition and extent – 1 day (28 April 2017)
Hairy-joint Grass	Targeted survey to detect presence and assess condition and extent of habitat – 1 day (6 June 2017)

1.4 MNES occurrence

1.4.1 Likelihood assessment

The available information described above was used to analyse the likelihood of occurrence for MNES. MNES were assessed as known, likely, possible, unlikely or not present according to the criteria below. This assessment is based on the species or community's known distribution, habitat quality within the Parklands and previous records within and surrounding the Parklands (see Figure 1 and Figure 2). Table 3 and Table 4 provide the results of this assessment.

Likelihood of occurrence criteria include:

- Known – the species or community has been recorded on the site
- Likely – the site is within the species or communities known distribution, suitable good quality habitat occurs on the site and the species is known to occur within the region
- Possibly – the site is within the species or communities known distribution, suitable habitat occurs on the site and the species is known to occur within the region, however, the species was not recorded during previous targeted surveys (>5 year previous)
- Unlikely – there is a low probability that the species or community will occur within the site as it is outside the species or communities known distribution, marginal to low quality habitat occurs on the site or the species and/or community is not known to occur within the region

Exclusively marine species (e.g. fish, cetaceans, turtles, seabirds) have been excluded from this assessment.

It should be noted that EPBC Act threatened and migratory species lists have changed between the present and 2012 (when the original referral for events at the Parklands was submitted). For information purposes, a comparison of species' listings between now and 2012 has been undertaken for species listed in the likelihood tables below (i.e. non-marine species retuned on the PMST). Some species that have been returned on the current PMST were not returned on the 2012 PMST despite being listed species at that time. The reason for this is unknown. The assessment in this referral uses the EPBC Act listings as they currently stand.

Furthermore, several species have been removed from the EPBC Act since 2012 (primarily migratory birds). Some of these species were returned on the 2012 PMST however as they are no longer MNES, they have not been addressed in this referral.

Table 3: Fauna Likelihood of occurrence assessment

Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Distribution and Habitat	Likeli-hood	Justification
Amphibians						
Litoria olongburensis	Wallum Sedge Frog	V		The Wallum Sedge Frog prefers lowland sandy swamps, creeks and lakes of wallum.	Unlikely	No suitable habitat, no records within 10 km
Birds						
Anthochaera phrygia	Regent Honeyeater	CE 2012: E, Mi	E4A,P	The Regent Honeyeater mostly inhabits the inland slopes of the Great Dividing Range and can be found in dry eucalypt woodland and open forests on wetter, more fertile areas around forest edges, wooded farmland and urban areas.	Unlikely	Outside species primary range and habitat largely unsuitable. One record approximately 2km south of site. Species not recorded in BNR or in surveys on the site in 2007, 2009 and 2014. Nor during event monitoring.
Apus pacificus	Fork-tailed Swift	Mi		The Fork-tailed Swift is predominantly aerial, more commonly inland however occasionally above foothills in coastal areas with dry and open habitat.	Possible	Marginal habitat, may be seen flying overhead
Botaurus poiciloptilus	Australasian Bittern	E		Occurs in permanent and seasonal freshwater wetlands and habitats, rarely estuarine habitats.	Unlikely	Marginal habitat on site, no records within area Species not detected during targeted call-playback surveys on the site in 2007, 2009 and 2014.

Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Distribution and Habitat	Likeli-hood	Justification
Calidris ferruginea	Curlew Sandpiper	CE, Mi 2012: Mi		Curlew Sandpiper commonly occur on the coastline, foraging and roosting in intertidal mudflats in sheltered estuaries, bays, inlets and lagoons.	Unlikely	No suitable habitat
Cuculus optatus	Oriental Cuckoo	Mi		Oriental Cuckoo inhabits forested woodlands. Large range, visiting the east coast of Australia from late Spring and Summer.	Likely	Recorded once in four years' of site surveys within 1 km of project area
Cyclopsitta diophthalma coxeni	Coxen's Fig-Parrot	E	CE	Coxen's Fig Parrot prefers lowland subtropical rainforests, also found in dry rainforest, littoral and vine forests.	Possible	Known food tree species occur on site, including Sandpaper Figs, Moreton Bay Fig, Strangler Figs and Small-leaved Figs. Species not detected during targeted surveys on the site in 2007, 2009 and 2014. Nor during event monitoring.
Dasyornis brachypterus	Eastern Bristlebird	E		Eastern Bristlebird prefers low dense vegetation in sedgelands, heathlands, swampland, shrubland, sclerophyll forest, woodlands and rainforests.	Unlikely	The species occurs in mid- to high elevations in this region, and the nearest records are from >500 m elevation in Whian Whian Conservation Area, > 20 kms to the west of Parklands. It has a very loud and distinctive call and has not been detected extensive bird monitoring in Parklands and Billinudgel Nature Reserve (BNR).

Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Distribution and Habitat	Likeli-hood	Justification
Erythrotriorchis radiatus	Red Goshawk	V		The Red Goshawk prefers wooded and forested lands, from eucalypt woodland, open forest, swamp and sclerophyll forests with permanent water. Species does not breed in NSW and distribution has contracted north, with few records in the Northern Rivers (DoE 2017).	Unlikely	Marginal habitat. Species is rare in its southern range. No known records in surrounding areas Species not detected during targeted surveys on the site in 2007, 2009 and 2014, Nor during event monitoring.
Gallinago hardwickii	Latham's Snipe	Mi		Latham's Snipe occurs in permanent and ephemeral wetlands, inhabiting low dense vegetation.	Possible	Marginal habitat on site, existing records in surrounding areas Species not detected during targeted surveys on the site in 2007, 2009 and 2014. Nor during event monitoring.
Gallinago megala	Swinhoe's Snipe	Mi		Swinhow's Snipe occurs along the coast, preferring the edges of wetlands, such as wet paddy fields, swamps and freshwater streams.	Unlikely	Marginal habitat, few definite records exist within Australia
Gallinago stenura	Pin-tailed Snipe	Mi		The distribution of the Pin-tailed Snipe in Australia is not well understood. The species can be found most often in or at the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation.	Unlikely	Marginal habitat, few definite records exist within Australia
Hirundapus caudacutus	White-throated Needletail	Mi		White-throated Needletail is recorded in all regions of Australia and is almost exclusively	Known	Recorded during 2009 surveys.

Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Distribution and Habitat	Likeli-hood	Justification
				aerial, however has been observed roosting in a variety of wooded habitats.		
Lathamus discolor	Swift Parrot	CE 2012: E	E1,P,3	The Swift Parrot visits the mainland during the winter months and inhabit eucalypt woodlands, plantations and banksias, street trees, parks and gardens. Key habitat in NSW include Narrow-leaved Red Ironbark, *Eucalyptus crebra*, Forest Red Gum forests and Yellow Box Forests.	Possible	Habitat on site. One record 5km south east of site Species not recorded in BNR or in surveys on the site in 2007, 2009 and 2014. Nor during event monitoring. Potential occasional visitor to site
Limosa lapponica	Bar-tailed Godwit	V, Mi 2012: Mi		Bar-tailed Godwit is found in all coastal areas of Australia, inhabiting large intertidal sandflats, mudflats, banks and estuaries	Unlikely	No suitable habitat
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit	CE 2012: not listed		Northern Siberian Bar-tailed Godwit is found in all coastal areas of Australia, inhabiting large intertidal sandflats, mudflats, banks and estuaries	Unlikely	No suitable habitat
Monarcha melanopsis	Black-faced Monarch	Mi		Black-faced Monarch occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical and sub-tropical rainforests	Known	Recorded in Parklands during targeted bird surveys
Monarcha trivirgatus	Spectacled Monarch	Mi		The Spectacled Monarch prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	Known	Recorded regularly in Parklands during targeted bird surveys

Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Distribution and Habitat	Likeli-hood	Justification
Motacilla flava	Yellow Wagtail	Mi		Summer migrant to north-east Queensland and increasing records in the Hunter region of NSW (DoE 2017). No known records in the Byron LGA. Habitats include open areas with low vegetation such as grasslands, airstrips, pastures, sports fields; damp open areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland	Unlikely	Suitable habitat, no records in Byron LGA
Myiagra cyanoleuca	Satin Flycatcher	Mi		The Satin Flycatcher is widespread across Australia, often found in eucalypt forests near wetlands or watercourses.	Known	Recorded in Parklands during targeted bird surveys
Numenius madagascariensis	Eastern Curlew	CE, Mi 2012: Mi		The Eastern Curlew can be found along the Australian coast, found in estuaries, bays, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats	Unlikely	No suitable habitat
Numenius minutus	Little Curlew	Mi		The Little Curlew can be found along the NSW coast, often found in short, dry grassland and sedgeland, including dry floodplains with scattered shallow freshwater pools or seasonally inundated areas.	Unlikely	Marginal habitat, no known records in area
Numenius phaeopus	Whimbrel	Mi		The Whimbrel can be found along the coast of Australia, typical habitat includes intertidal mudflats or sheltered coasts, as well as harbours, lagoons, estuaries and rivers.	Unlikely	No suitable habitat

Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Distribution and Habitat	Likeli-hood	Justification
Pandion cristatus	Eastern Osprey	Mi		Osprey habitat includes terrestrial wetlands, mostly in coastal areas, however can travel inland along major rivers. They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes (DoE 2017)	Known	Recorded in Parklands during targeted bird surveys (2015)
Pluvialis fulva	Pacific Golden Plover	Mi		The Pacific Golden Plover is a widespread coastal species, usually inhabiting beaches, mudflats and sandflats, occasionally around inland wetlands.	Unlikely	Marginal habitat, no known records in area
Poephila cincta cincta	Southern Black-throated Finch	E		Species distribution has contracted north and is considered extinct in NSW.	Unlikely	Considered extinct in NSW
Rhipidura rufifrons	Rufous Fantail	Mi		The Rufous Fantail occurs in coastal and near coastal areas of northern and eastern Australia. Usually inhabits wet sclerophyll forests usually with a dense shrubby understory.	Known	Recorded in Parklands during targeted bird surveys
Rostratula australis	Australian Painted Snipe	E 2012: V, Mi		Australian Painted Snipe occurs in all states of Australia, more common in eastern Australia. Wetland dependent species, found in shallow terrestrial freshwater (occasionally brackish) wetlands, temporary or permanent lakes, swamps and clay pans.	Unlikely	Marginal habitat, no records in area
Sterna albifrons	Little Tern	Mi		In NSW, the Little Tern occurs mostly north of Sydney, with small numbers in Victoria. Species is almost exclusively coastal, preferring sheltered	Unlikely	No suitable habitat

Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Distribution and Habitat	Likeli-hood	Justification
				environments, occasionally observed in inlets and rivers.		
Tringa brevipes	Grey-tailed Tattler	Mi		Grey-tailed Tattler is found in most coastal regions in Australia, found in sheltered coasts with reefs and rock platforms or intertidal mudflats.	Unlikely	No suitable habitat
Tringa nebularia	Common Greenshank	Mi		The Common Greenshank can be found along the coast and coastal inland areas of Australia. Occurs in all types of wetland habitats and coastal habitats of varying salinity, both permanent and ephemeral.	Unlikely	No suitable habitat
Turnix melanogaster	Black-breasted Button-quail	V		Black-breasted Button-quail has a scattered distribution in New South Wales. Often found in semi-evergreen vine thickets, coastal dune scrub and dry rainforests	Unlikely	Suitable habitat onsite, no known records in area
Gastropods						
Thersites mitchellae	Mitchell's Rainforest Snail	CE	E1	Mitchell's Rainforest Snail is found in remnant vegetation on the coastal plain between the Richmond River and Tweed River on the NSW north coast. Prefers lowland subtropical rainforest and swamp forests.	Possible	Suitable habitat onsite Shell records have been confirmed within BNR
Insects						

Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Distribution and Habitat	Likeli-hood	Justification
Phyllodes imperialis smithersi	Pink Underwing Moth	E	E	The Pink Underwing Moth is found below the altitude of 600 m in undisturbed, subtropical rainforest on rich volcanic soils and fertile alluvium. It occurs in association with the vine *Carronia multisepalea*, a collapsed shrub that provides the food and habitat the moth requires in order to breed. Where *C. multisepalea* attains an upright form, the association with the moth does not occur	Unlikely	No suitable habitat
Flying Mammals						
Chalinolobus dwyeri	Large-eared Pied Bat	V	V,P	Large-eared Pied Bat occurs throughout much of NSW in a variety of habitat types, including dry sclerophyll forest, woodlands, sub-alpine woodland, edges of rainforest and wet sclerophyll forest.	Known	Recorded on site
Pteropus poliocephalus	Grey-headed Flying-fox	V	V,P	The Grey-headed Flying-fox occurs in coastal region from Rockhampton to Melbourne. Typically camps in closed forests >8m high, dominated by rainforest, broad-leaved paperbark melaleuca quinquenervia, mangrove or casuarina species. Primary food source is flowering Eucalypts and related genera.	Known	Recorded on site
Terrestrial Mammals						
Dasyurus maculatus	Spotted-tailed Quoll	E	V,P	Spotted-tailed Quoll occur along both sides of the range in NSW, preferring a variety of habitat	Unlikely	Habitats onsite are too fragmented, and have too high level of wild dog

Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Distribution and Habitat	Likeli-hood	Justification
				types, from forest, woodlands, coastal heathland and rainforests.		presence to be considered suitable. Targeted survey for 2007, 2009 & 2014. Nor during event monitoring.
Petauroides volans	Greater Glider	V 2012: not listed		The Greater Glider occurs along the east coast of Australia, largely restricted to eucalypt forests and woodlands.	Unlikely	Marginal habitat, no records in area or in fauna surveys undertaken to date.
Petrogale penicillata	Brush-tailed Rock-wallaby	V		The Brush-tailed Rock Wallaby has a patchy distribution along the Great Dividing Range. Species preferred habitat is rock outcrops in rainforests to tall eucalypt and open woodland forests.	Unlikely	No suitable habitat
Phascolarctos cinereus	Koala	V	V,P	Koala populations are scattered throughout NSW, associated with a range of temperate, tropical and sub-tropical forests as well as semi-arid communities dominated by eucalyptus species.	Known	Recorded on site
Potorous tridactylus	Long-nosed Potoroo	V	V,P	The long-nosed potoroo is found on the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania. Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas (OEH 2017).	Unlikely	Marginal habitat on site Species not recorded in BNR or in surveys on the site in 2007, 2009 and 2014. Nor during event monitoring.

Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Distribution and Habitat	Likeli-hood	Justification
Pseudomys novaehollandiae	New Holland Mouse,	V		The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes	Unlikely	No suitable habitat on site, no known records in area
Xeromys myoides	Water Mouse	V		The Water Mouse has a patchy distribution along the coast of northern Australia, with northern NSW being the southern end of its distribution. The species requires similar habitat including mangroves and the associated saltmarsh, sedgelands, clay pans, heathlands and freshwater wetlands.	Unlikely	No suitable habitat
Reptiles						
Delma torquata	Adorned Delma	V		The Collared Delma has a distribution in South-East Queensland to parts north-east NSW, normally inhabiting eucalypt-dominated woodlands and open-forests	Unlikely	Marginal habitat, has not been recorded in local area.
Saiphos reticulatus	Three-toed Snake-tooth Skink	V		The Three-toed Snake-tooth Skink occurs from Crescent Head in north-east NSW to Fraser Island in south-east Queensland. In NSW, the Three-toed Snake-tooth Skink has been recorded in dry rainforest, northern warm temperate rainforest, subtropical rainforest, grassy wet sclerophyll forest and shrubby sclerophyll forest	Unlikely	Marginal habitat, no records in surrounding area Species not recorded in BNR or in surveys on the site in 2007, 2009 and 2014

Table 4: Flora likelihood of occurrence assessment

Scientific Name	Common Name	EPBC Act Status[1]	TSC Act Status[2]	Distribution and Habitat	Likelihood	Justification
Acronychia littoralis	Scented Acronychia	E	E1,P	Scented Acronychia occurs from Fraser Island in Queensland to Port Macquarie in NSW. The species is found on sand in humid, high rainfall zones (greater than 1600 mm), within 2 km of the ocean, often in transition zones between littoral rainforest and swamp sclerophyll forest; between littoral and coastal cypress pine communities; and margins of littoral forest and cleared land	Unlikely	No suitable habitat (unsuitable soils within site)
Allocasuarina defungens	Dwarf Heath Casuarina	E		Only in NSW, from the Nabiac area, north-west of Forster, to Byron Bay on the NSW north coast. Tall heath on sand, also nearby-coastal hills or headlands adjacent to sandplains.	Unlikely	No suitable habitat, no records in surrounding area. Species not observed during targeted flora surveys 2008
Arthraxon hispidus	Hairy-joint Grass	V	V,P	In Australia, the species has been recorded from scattered locations throughout Queensland and on the northern tablelands and north coast of NSW. Hairy-joint Grass has been recorded in or on the edges of rainforest and in wet eucalypt forest, often near creeks and swamps, as well as woodlands, around freshwater springs on coastal foreshore dunes, in shaded gullies, on creek banks, and on alluvium in creek beds in open forest (TSSC 2008).	Unlikely	Targeted survey undertaken in potential habitat in June 2017 (see Appendix B). Species not recorded and habitat assessed as marginal at best.

Scientific Name	Common Name	EPBC Act Status[1]	TSC Act Status[2]	Distribution and Habitat	Likelihood	Justification
Baloghia marmorata	Marbled Balogia,	V		Marbled Balogia has a geographically disjunct distribution confined to the Lismore district, in north-east NSW, and the Tamborine Mountains and Springbrook, in south-east Queensland (TSSC 2008). Marbled Balogia is found in subtropical rainforest/notophyll vine forest and wet sclerophyll forest (brush box woodland) with rainforest understorey between 150 and 550 m above sea level. Soils are rich black or dark brown clay and loam derived from basalt (TSSC 2008).	Unlikely	Suitable habitat north west of site, no records in surrounding area
Bosistoa transversa	Yellow Satinheart	V	V,P	In north-east NSW, it is found south to the Nightcap Range north of Lismore. Lowland subtropical rainforest up to 300 m in altitude.	Unlikely	Marginal habitat, records within BNR 1.5 km from site Species not observed during targeted flora survey 2009 or subsequent site inspections
Corokia whiteana	Corokia	V	V,P	Only in north-east NSW: one population in the Nightcap Range, one in the Tweed Valley, and the other near Brunswick Heads. Boundaries between wet eucalypt forest and warm temperate rainforest, at altitudes up to 800 m.	Unlikely	Marginal habitat on site, records within BNR 1.5 km from site Species not observed during targeted flora survey 2009 or subsequent site inspections
Cryptocarya foetida	Stinking Cryptocarya	V	V,P	Known from Iluka, NSW, to Fraser Island and east of Gympie in southern Queensland (DoE 2015). The Stinking Cryptocarya is restricted to coastal sands, or if not, then close to the coast, occurring in littoral rainforest on old sand dunes	Known	Recorded on site

Scientific Name	Common Name	EPBC Act Status[1]	TSC Act Status[2]	Distribution and Habitat	Likelihood	Justification
				and subtropical rainforests over slate and occasionally on basalt to an altitude of 150 m (DoE 2015).		
Cryptostylis hunteriana	Leafless Tongue-orchid	V		Leafless Tongue-orchid occurs in Victoria, NSW, and Queensland. Populations have been recorded from sandy heathland (TSSC 2008).	Unlikely	No suitable habitat, no records in surrounding area
Cynanchum elegans	White-flowered Wax Plant	E		Restricted to eastern NSW, from Brunswick Heads on the north coast to Gerroa in the Illawarra region, and as far west as Merriwa in the upper Hunter River valley. Dry rainforest; littoral rainforest; *Leptospermum laevigatum-Banksia integrifolia subsp. integrifolia* (Coastal Tea-tree– Coastal Banksia) coastal scrub; *Eucalyptus tereticornis* (Forest Red Gum) or *Corymbia maculata* (Spotted Gum) open forest and woodland; and *Melaleuca armillaris* (Bracelet Honeymyrtle) scrub.	Unlikely	Marginal habitat, no records in surrounding area Species not observed during targeted flora survey 2009 or subsequent site inspections
Davidsonia jerseyana	Davidson's Plum	E	E1,P,2	The species is distributed from south-east Qld to north-east NSW near Tintenbar (DoE 2015). The species is known to occur in lowland subtropical rainforest and wet eucalypt forest below 300m (DoE 2015).	Known	Recorded on site

Scientific Name	Common Name	EPBC Act Status[1]	TSC Act Status[2]	Distribution and Habitat	Likelihood	Justification
Davidsonia johnsonii	Smooth Davidson's Plum	E	E1,P	South-east Qld and north-east NSW south to Tintenbar. Lowland subtropical rainforest and wet eucalypt forest below 300m.	Unlikely	Suitable habitat on site, records in area (approx. 1.5km from site) Species not observed during targeted flora survey 2009 or subsequent site inspections – species is very conspicuous and would have been identified if present
Diospyros mabacea	Red-fruited Ebony	E		Only in north-east NSW. Found in a few stands on the Tweed and Oxley Rivers, upstream from Murwillumbah, on Stotts Island in the lower Tweed River and west of Mullumbimby on the Brunswick River. Lowland subtropical rainforest, often close to rivers.	Unlikely	No suitable habitat, no records in surrounding area Species not observed during targeted flora survey 2009 or subsequent site inspections
Diploglottis campbellii	Small-leaved Tamarind	E	E1,P,2	Recorded from the coastal lowlands between Richmond River on the Far North Coast of NSW and Mudgeeraba Creek on the Gold Coast hinterland, Queensland (OEH 2015). The species is confined to warm subtropical rainforests, usually on basalt-derived soils and also on poorer soils such as those derived from quartz monzonite (OEH 2015).	Unlikely	No suitable habitat Species not observed during targeted flora survey 2009 or subsequent site inspections
Elaeocarpus williamsianus	Hairy Quandong	E	E1,P,3	Restricted to a very few sites between Goonengerry and Burringbar in north-east NSW. Subtropical to warm temperate rainforest,	Unlikely	No suitable habitat Species not observed during targeted flora surveys 2009 or subsequent site inspections

Scientific Name	Common Name	EPBC Act Status[1]	TSC Act Status[2]	Distribution and Habitat	Likelihood	Justification
				including regrowth areas, on soils derived from metasediments.		
Endiandra floydii	Crystal Creek Walnut	E	E1,P	The species is known to occur in north-eastern NSW and south-eastern Queensland (DoE 2015). Species is known to occur in warm temperate, subtropical rainforest or wet sclerophyll forest with brush box over storey, and in Camphor laurel forest. The species has also been recorded in disturbed and regrowth areas (OEH 2015).	Unlikely	Suitable habitat, no records in surrounding area Species not observed during targeted flora surveys 2009 or subsequent site inspections
Endiandra hayesii	Rusty Rose Walnut	V	V,P	Rusty Rose Walnut is endemic to Australia, occurring in a restricted area north from Maclean, on the lower Clarence River, NSW to Burleigh Heads, Queensland (DoE 2015). The Rusty Rose Walnut is a rainforest tree, occurring in cool, moist sheltered valleys and gullies; mostly lowland riverine notophyll to complex notophyll vineforest on sedimentary soils and alluvium.	Possible	Suitable habitat, several records adjacent to site (<500 m), one within BNR Species not observed during targeted flora surveys 2009 or subsequent site inspections
Floydia praealta	Ball Nut	V	V,P	The Ball Nut occurs in small, scattered populations from Gympie, Queensland, southwards to the Clarence River in north-east NSW (TSSC 2008). The species inhabits riverine and subtropical rainforest, usually on soils derived from basalt or in coastal scrub (TSSC 2008).	Unlikely	Marginal habitat, single record >2 km from site

Scientific Name	Common Name	EPBC Act Status[1]	TSC Act Status[2]	Distribution and Habitat	Likelihood	Justification
Fontainea australis	Southern Fontainea	V	V,P	The species is known to occur in north-eastern NSW and south-eastern Queensland. Southern Fontainea mainly occurs in lowland subtropical rainforest and complex notophyll vine forest on basaltic alluvial flats and well drained, bright reddish-brown alluvial clay loam (DoE 2015).	Possible	Suitable habitat, known from area (< 3km from site) Species not observed during targeted flora survey 2009 or subsequent site inspections
Gossia fragrantissima	Sweet Myrtle	E	E1,P	Occurs in south-east Queensland and in north-east NSW south to the Richmond River (OEH 2015). Found mostly in subtropical and riverine rainforest on basalt derived soils. As it can coppice from roots left in the ground when rainforest is cleared, it is found at several sites as isolated plants in paddocks or regrowth (OEH 2015).	Unlikely	Marginal habitat, records >4km from site Species not observed during targeted flora survey 2009 or subsequent site inspections
Hicksbeachia pinnatifolia	Red Boppel Nut	V	V,P	Coastal areas of north-east NSW from the Nambucca Valley north to south-east Qld. Subtropical rainforest, moist eucalypt forest and Brush Box forest.	Unlikely	Suitable habitat on site, records within 1.5 km of site Species not observed during targeted flora survey 2009 or subsequent site inspections – species is very conspicuous and would have been identified if present
Isoglossa eranthemoides	Isoglossa	E		Very restricted distribution in north-east NSW from the Tweed to the Lismore area. Lowland subtropical rainforest, in moist situations on floodplains and slopes.	Unlikely	Marginal habitat, all records in Byron Shire located in south-west of Shire

Scientific Name	Common Name	EPBC Act Status[1]	TSC Act Status[2]	Distribution and Habitat	Likelihood	Justification
						Species not observed during targeted flora surveys 2009
Macadamia integrifolia	Macadamia Nut	V		Not known to occur naturally in the wild in NSW (Plant Net 2017). This species grows in remnant rainforest, including complex mixed notophyll forest, and prefers partially open areas such as rainforest edges (TSSC 2008).	Unlikely	Not known to occur naturally in the wild in NSW
Macadamia tetraphylla	Rough-shelled Bush Nut	V	V,P	Rough-shelled Bush Nut occurs from north-east New South Wales (chiefly in the Richmond & Tweed River areas) to south-east Queensland (Mt Glorious, near Brisbane) (TSSC 2008). Rough-shelled Bush Nut occurs in subtropical rainforest and notophyll vine forest in near coastal areas. It is often found on steep slopes, especially at ecotones (TSSC 2008).	Known	Recorded on site
Marsdenia longiloba	Slender Marsdenia; Clear Milkvine	V	E1,P	Slender Marsdenia is known from scattered sites on the NSW north coast from Hastings River northwards to Mount Nebo in Queensland. Subtropical and warm temperate rainforest, lowland moist eucalypt forest adjoining rainforest, areas with rock outcrops (DoE 2015).	Possible	Suitable habitat, known record < 1km from site (across highway to west), Species not observed during targeted flora survey 2009 or subsequent site inspections
Ochrosia moorei	Southern Ochrosia	E	E1,P	The Southern Ochrosia has a sparse distribution from north-east NSW to south-east Queensland. The range of this species extends from the Richmond River in NSW through to the	Unlikely	No suitable habitat (elevation of site)

Scientific Name	Common Name	EPBC Act Status[1]	TSC Act Status[2]	Distribution and Habitat	Likelihood	Justification
				McPherson Ranges, Queensland (DoE 2015). The Southern Ochrosia is often found on hillsides near drainage lines, in warm subtropical rainforest or complex notophyll vineforest, at elevations of 100—1000 m above sea level.		
Phaius australis	Lesser Swamp-orchid	E		Lesser Swamp-orchid is endemic to Australia and occurs in eastern Queensland and northern New South Wales. This species is associated with coastal wet heath/sedgeland wetlands, swampy grassland or swampy forest and often where Broad-leaved Paperbark (*Melaleuca leucadendra*) or Swamp Mahogany (*Eucalyptus robusta*) are found. Less commonly, the species has been found in drier forest near the coast (TSSC 2008).	Unlikely	Suitable habitat, no records in surrounding area Species not observed in targeted flora surveys 2009
Randia moorei	Spiny Gardenia	E	E1,P	From Lismore in north-east NSW north to the Logan River in south-east Qld. Subtropical, riverine, littoral and dry rainforest.	Unlikely	No suitable habitat
Syzygium hodgkinsoniae	Red Lilly Pilly	V	V,P	From the Richmond River in north-east NSW to Gympie in Qld. Riverine and subtropical rainforest on rich alluvial or basaltic soils.	Unlikely	Marginal habitat, records in surrounding area Species not observed during targeted flora surveys 2009
Syzygium moorei	Coolamon Rose Apple	V	V,P	Richmond, Tweed and Brunswick River valleys in north-east NSW and into south-east Qld. Subtropical and riverine rainforest at low altitude. Often occurs as isolated remnant paddock trees.	Known	Recorded on site

Scientific Name	Common Name	EPBC Act Status[1]	TSC Act Status[2]	Distribution and Habitat	Likelihood	Justification
Thesium australe	Austral Toadflax	V		The Austral Toadflax occurs in New South Wales, the Australian Capital Territory, Queensland and Victoria. Its current distribution is sporadic but widespread occurring between the Bunya Mountains in south-east Queensland to northeast Victoria and as far inland as the southern, central and northern tablelands in New South Wales and the Toowoomba region (DoE 2015). Austral Toadflax is semi-parasitic on roots of a range of grass species, notably Kangaroo Grass (*Themeda triandra*). It occurs in subtropical, temperate and subalpine climates over a wide range of altitudes.	Unlikely	No suitable habitat, no records in surrounding area

1.4.2 Known, likely and potential MNES

The MNES identified as known, likely or potentially occurring within the proposed Project area are:

Matter	Known occurrence	Potential occurrence
TEC	Lowland Rainforest of Subtropical Australia (immediately adjacent to project area)	-
Threatened flora	Davidson's Plum Coolamon Rose Apple Rough Shelled Bushnut Stinking Cryptocarya	Rusty Rose Walnut Slender Marsdenia (Clear Milkvine) Southern Fontainea
Threatened fauna	Grey-headed flying fox Koala Large-eared Pied Bat	Coxen's Fig Parrot Swift Parrot Mitchell's Rainforest Snail
Migratory species	Black-faced Monarch Oriental Cuckoo Osprey Rufous Fantail Satin Flycatcher Spectacled Monarch White-throated Needletail	Fork-tailed Swift Latham's Snipe

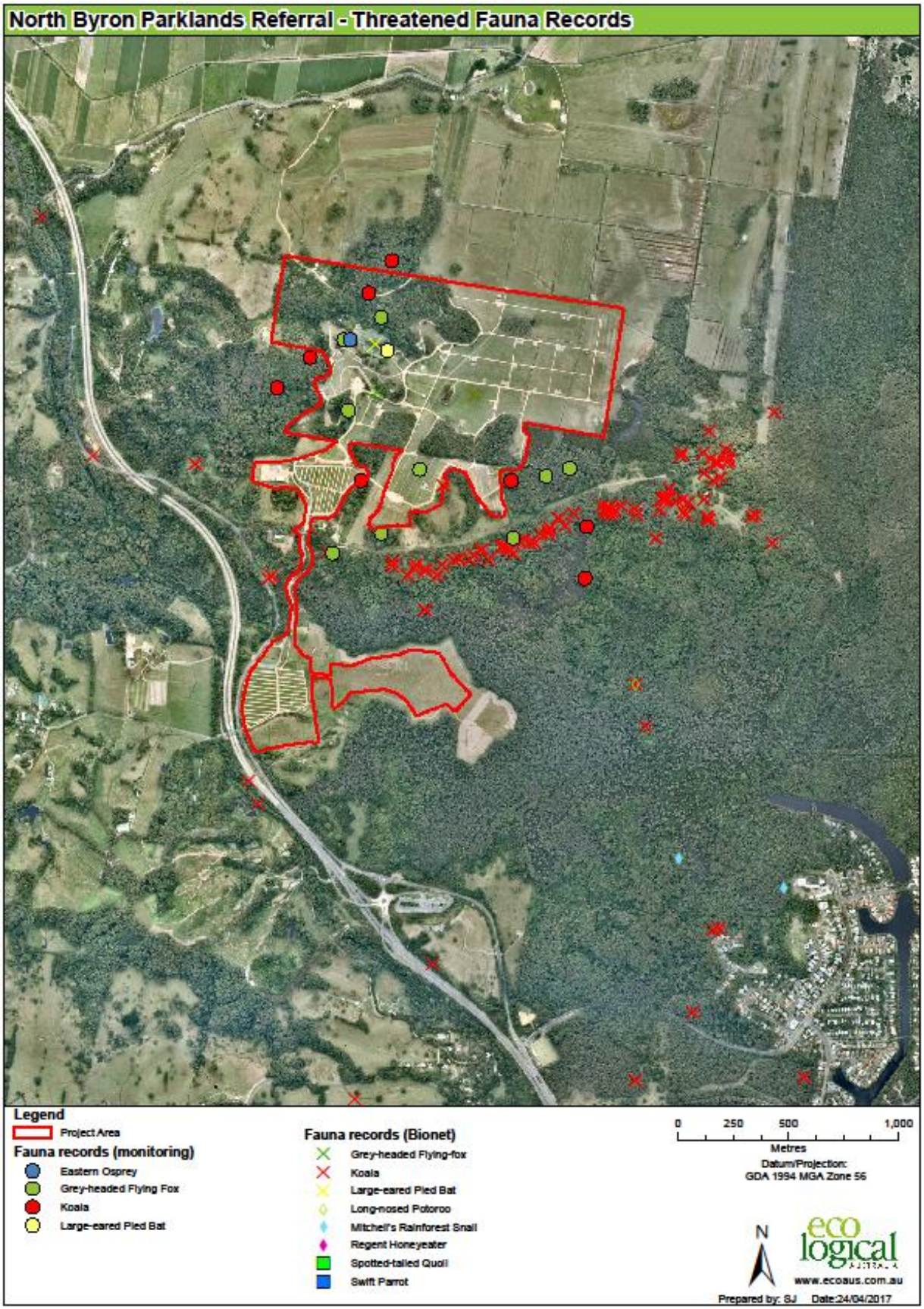

Figure 1: EPBC Act fauna records

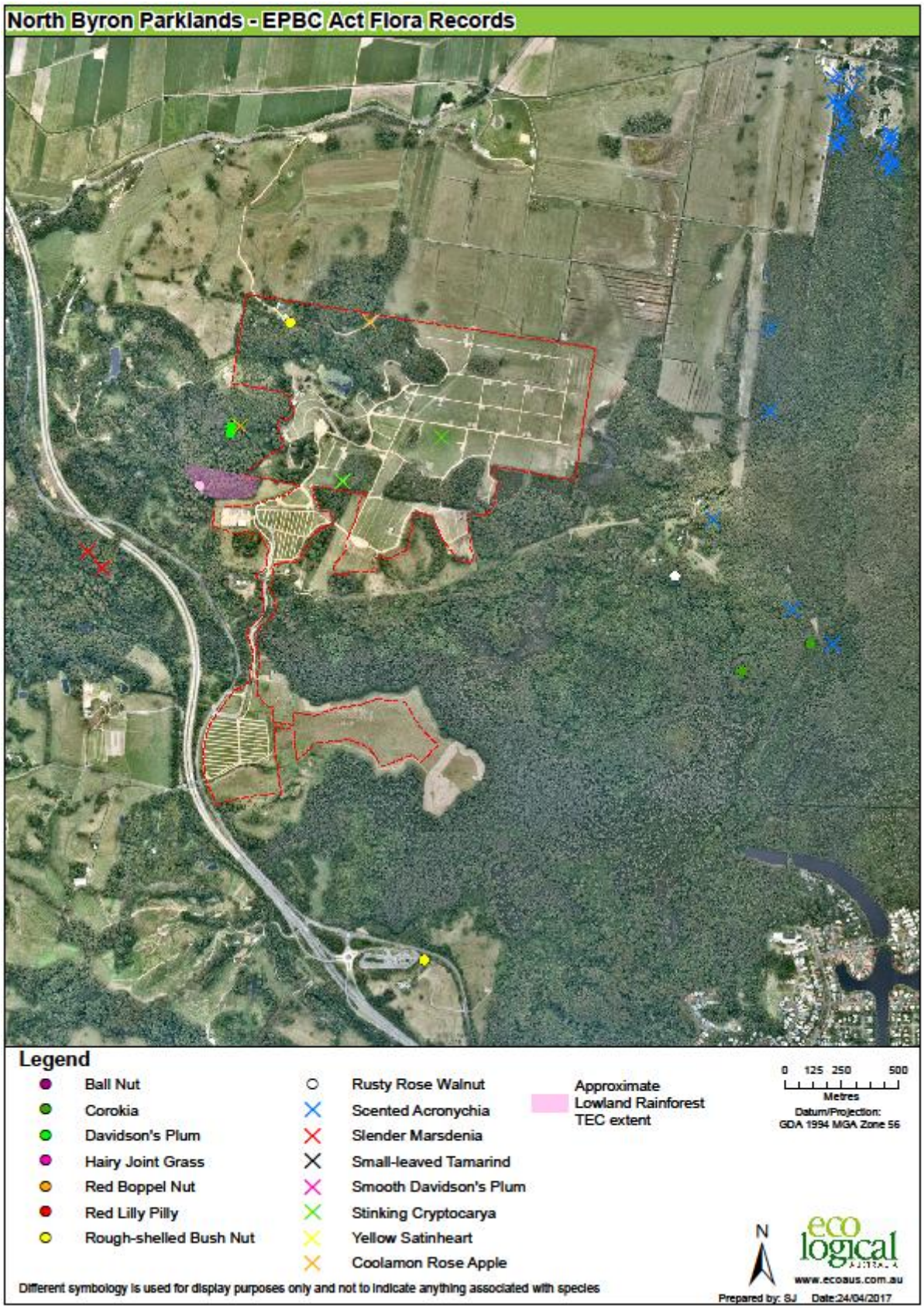

Figure 2: EPBC Act flora records and Lowland Rainforest TEC

1.5 Impact assessment

In determining the significance of impact associated with the Project, the relevant criteria listed in the Matters of National Environmental Significance – Significant Impact Guidelines 1.1 (DoE) dated 2013 were applied, along with any additional species specific policy guidance.

EPBC Act key concepts

This impact assessment is presented within the context of the key concepts commonly applied to assessments of threatened species under the EPBC Act and defined in *Matters of National Environmental Significance Significant impact guidelines 1.1* (Commonwealth of Australia 2013). In particular, the concepts of an important population of a species and habitat critical to the survival of a species.

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

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

'Habitat critical to the survival of a species or ecological community' refers to areas that 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, or
- For the reintroduction of populations or recovery of the species or ecological community

1.5.1 Lowland Rainforest of Subtropical Australia

Ecology and distribution

The Lowland Rainforest of Subtropical Australia Ecological Community (Lowland Rainforest) is listed as Critically Endangered under the EPBC Act. Lowland Rainforest has a limited distribution, occurring from the Clarence River in NSW as far north as Maryborough in Queensland (QLD). The ecological community is also known from isolated locations between the Clarence River and Hunter River such as the Bellinger and Hastings valleys (TSSC, 2011).

Lowland Rainforest of Subtropical Australia within the Project area

A small patch (0.75 ha) of Lowland Rainforest occurs to the west of the site (Figure 2, Appendix B). The Lowland Rainforest and associated bushland areas are outside of proposed event areas and will be preserved. This patch of Lowland Rainforest is surrounded by other native vegetation and grassy areas that provide a buffer between the event area and the TEC of ~30 m at its minimum.

Potential impacts and mitigation

The Lowland Rainforest and associated bushland areas are outside of proposed event areas and will be preserved and protected for the duration of the project. The perimeter of the site is fenced during events to prevent unauthorised access, and this has the effect of preventing entry to the TEC which is outside of the event area. This measures have been in place during the 5-year trial period. During this time,

monitoring has detected no adverse impacts to the native vegetation on site, including the Lowland Rainforest ecological community. Ongoing vegetation management and restoration measures will continue across the site with the objective of improving the ecological condition of the vegetation over time.

Overall, significant impacts to the ecological community as a result of the project are unlikely.

1.5.2 Threatened flora

Four threatened flora species are known to occur in or immediately adjacent to the Parklands site. These are the Davidson's Plum, Coolamon Rose Apple, Rough Shelled Bushnut and Stinking Cryptocarya. These species are also known from the adjacent Billinudgel Nature Reserve.

An additional three flora species have the potential to occur on site – Rusty Rose Walnut, Slender Marsdenia and Southern Fontainea. Whilst individuals of these species were not detected during systematic flora searches in 2009, there is suitable habitat on site and records within close proximity to the Parklands site (500 m – 3 km). Given the latter points, it is possible that these species have recently recruited into the Parklands area, particularly considering the improvements in condition and extent of vegetation that have occurred as a result of the management of the site over the last decade. Therefore, these species are also considered in this impact assessment.

Ecology and distribution

Table 5: Ecology and distribution of threatened flora species

Species	Ecology and distribution
Rough-shelled Bush Nut – vulnerable	The species distribution ranges from the Richmond/Tweed River region in Northern NSW to south-east QLD. The species generally occurs in small localised populations of up to 20 individuals. The total population in QLD is estimated at 350 mature individuals, with population numbers in New South Wales unknown (DoE, 2017d).
Coolamon Rose Apple – vulnerable	The species has a limited distribution, occurring along sections of the Richmond, Brunswick and Tweed Rivers in New South Wales and Upper Mudgeeraba and Upper Tallebudgera Creeks in QLD. The species has been recorded 75 times in the Byron Bay Local Government Area, with many records consisting of just one individual (TSSC, 2008b).
Davidson's Plum – endangered	Davidson's Plum occurs within a limited distribution in the Tweed and Brunswick River catchments. The species occurs in subtropical and riverine rainforest at low altitudes (DoE, 2017e).
Stinking Cryptocarya – vulnerable	The species has a limited distribution in northern NSW and Southern QLD, ranging from Iluka on the NSW north coast to Fraser Island and east of Gympie in south-east QLD. Stinking Cryptocarya occurs on coastal sands in littoral and sub-littoral open rainforests and subtropical rainforest areas. Mature specimens are fairly rare and primarily known from Brunswick heads, Fingal and North of Terranora Broadwater (DoE, 2017f).

Rusty Rose Walnut – vulnerable	The Rusty Rose Walnut exists in a restricted distribution in northern NSW and southern QLD. Records occur in the Border Ranges and Nightcap Ranges (NP) area, Mooball NP and Billinudgel NR, Burleigh Heads, Tallebudgera and Springbrook NP. It occurs on poorer soils of sedimentary, metamorphic or acid volcanic rock composition. Habitat includes subtropical and warm temperate rainforests, Brush Box forests, and is also found in highly modified forms or regrowth of these vegetation types (TSSC 2008c).
Slender Marsdenia (Clear Milkvine) – vulnerable	This species is endemic to south-east QLD from the NSW border to north-east of Gympie. It is found on hillslopes and ridge tops in open eucalypt forest and woodland communities with shallow, well-draining soils (TSSC 2013).
Southern Fontainea – vulnerable	This species occurs in NSW from the Tweed Valley and upper reaches of Richmond Valley; Nightcap NP, Numinbah NR, Goonengerry SF, Limpinwood NR and Mount Warning NP. In QLD it occurs from Springbrook NP, Currumbin and Tallebudgera Valleys Conservation Reserves, Deep Creek and Six Mile Creek. Its habitat includes lowland subtropical rainforest and complex notophyll vine forest on basaltic alluvial flats or well-drained reddish-brown alluvial clay loam (DoE 2017g).

Threatened flora within the Project area

The location of threatened flora within the project area is presented below and in Figure 2.

Table 6: Location of threatened flora within the Parklands site

Species	**Threatened flora within the** Parklands site
Rough-shelled Bush Nut – vulnerable	Three Rough-shelled Bush Nut trees are located in the northwest corner of the Parklands site. They are located in a paddock in the north-east corner of the site and are associated with an old domestic structure. It is possible that they represent planted specimens. These individuals are currently being impacted by historical competition from Camphor Laurel and Mango Trees (Fitzgerald 2016a).
Coolamon Rose Apple – vulnerable	Two mature Coolamon Rose Apple trees are located close to the western boundary of the Parklands site.
Davidson's Plum – endangered	A small stand of mature Davidson's Plum trees occurs on the western boundary of the Parklands site, in association with an area of Lowland Rainforest TEC.
Stinking Cryptocarya – vulnerable	A single tree specimen is present in an area of swamp sclerophyll forest habitat on Lot 402 DP755687 near the centre of the Parklands site.
Rusty Rose Walnut – vulnerable; Slender Marsdenia – vulnerable; Southern Fontainea – vulnerable	No individuals of these species have been detected within the project area. However, suitable habitat for these flora is present within the stands of native remnant vegetation on site (so-called forest blocks).

Potential impacts and mitigation

The threatened flora species known to occur on the Parklands site are represented by few individuals and inhabit fragmented patches of remnant vegetation, which has a history of significant disturbance. These individuals and their habitats do not meet any of the criteria for important populations and/or habitat critical to the survival of the species. This is equally applicable to the species that have the potential to occur onsite. If present, they would be represented by a small number of newly recruited individuals occupying fragmented and historically disturbed areas.

Rainforest and woodland species

There will be no direct impacts to the rainforest and woodland species within the project area (list). These species occur in areas of vegetation that are not disturbed by events. These areas are fenced off during events to prevent disturbance to the vegetation. Indirect impacts due to increased bushfire risk, trampling associated with unauthorised access, increased weed invasion are possible, however measures to avoid and reduce these impacts will be implemented (see below). These measures have been implemented during the 5-year trial period and 6-monthly checks on the threatened flora species known to inhabit the site has detected no change in the condition of these species (Fitzgerald 2016a).

The risk of bushfire is increased during events due to the large numbers of people occupying the site. However, this also poses a significant safety issue for event patrons and therefore stringent fire management protocols are implemented. The primary aim of these measures is to prevent fire and manage it effectively if a fire occurs from a public safety perspective. However, these measures will also benefit the vegetation on site.

There is a very limited risk of vegetation trampling from people without tickets to events trying to access the site through vegetated areas. Over the previous events, the instances of this are very low (and have continued to reduce with the assistance of NSW Police prosecuting trespassers). Trampling risk is greatest (but still very low) for saplings of the tree and shrub species that may have recently recruited into the project area.

Increased presence of people and vehicles on site presents a weed invasion pathway. However, the site has a long history of disturbance with over 50 exotic flora species known to occur across the Parklands. As part of the ongoing environmental stewardship of the site, the Parklands have implemented a program of bush regeneration, which includes weed management throughout areas of remnant vegetation, including the habitat for threatened flora species. This has significantly reduce the presence of weeds across the site and has resulted in overall improved condition of the vegetation at the site. This program will continue and will more than offset any introduction of weeds during events.

Conclusion

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

- Lead to a long-term decrease in the size of an (important – vulnerable species only) population of a species
- Reduce the area of occupancy of an (important) population
- Fragment an existing (important)population into two or more populations

- Adversely affect habitat critical to the survival of a species
- Disrupt the breeding cycle of an (important)population
- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in invasive species that are harmful to a vulnerable species becoming established in the species' habitat
- Introduce disease that may cause the species to decline, or
- Interfere substantially with the recovery of the species.

The potential impacts from the project as describe above are not expected to result in any of the above occurring. Furthermore, events at the Parklands have been occurring since 2012 with no discernible impact to threatened flora species. A suite of measure to avoid and reduce impacts will continue to be implemented, along with extensive habitat restoration and bush regeneration works. Monitoring and adaptive management will also be implemented.

Therefore, it is considered unlikely that the project will result in significant impacts to threatened flora species.

1.5.3 Flying mammals (Grey-headed Flying Fox and Large-eared Pied Bat)

A number of microbat and flying fox species are known to occur at the Parklands site. Two of these, the Grey-headed Flying Fox and Large-eared Pied Bat, are listed as vulnerable under the EPBC Act.

Ecology and distribution

Grey-headed flying fox has a distribution that ranges from Bundaberg in QLD to Melbourne in Victoria, extending from the coast to approximately 200 km inland. The species has also been recorded in eastern parts of South Australia. An assessment of population size in 2005 estimated the nationally species population to be 674,000 (DoE, 2017).

The species is migratory within its range, with patterns of occurrence and abundance varying widely between seasons and years. The species roosts and feeds in the canopies of rainforests, forests and woodlands, predominantly feeding on the blossom and fruit of Eucalyptus species although the species is known to feed on a variety of genera (DoE, 2017).

The Large-eared Pied Bat's historical and current distribution is poorly known, as the species was only formally described in 1966 and it nocturnal and unobtrusive making opportunistic observations rare. It is thought to occur from north of Rockhampton in QLD to Ulladulla in New South Wales in the south. The species requires suitable roost areas, such as sandstone cliffs, within close proximity to forage habitat including high fertility woodlands or rainforest corridors. The largest known populations occur in areas dominated by sandstone escarpments, including the Hunter Valley, Sydney Basin and Southern Tablelands of NSW and Carnavon, Expedition ranges and Blackdown Tablelands of QLD.

Grey-headed Flying Fox and Large-eared Pied Bat within the Project area

Grey-headed flying fox have been recorded within the Project area on multiple occasions since 2007. The species is known to utilise the site when food resources are present and has been recorded feeding on flowering Forest Red Gum and Swamp Mahogany (*Eucalyptus robusta*) during spot-light surveys of the Project area (Fitzgerald, 2007). The species has also been observed feeding in Blackbutt (*Eucalyptus*

pilularis) (Fitzgerald, 2014). Records are primarily from the south-eastern boundary of the project area, adjacent to Billinudgel Nature Reserve. Grey-headed Flying Foxes have been recorded within event areas.

Nationally important roosts / camps have been identified by DoEE (Commonwealth of Australia, 2015b) and are defined as camps that have been occupied by more than 10,000 grey-headed flying-foxes in any one year in the previous 10 years or have been occupied by more than 2,500 individuals permanently or seasonally every year for the last 10 years. The Parklands does not meet these criteria and therefore the Parklands are not considered to have an important population of grey-headed flying-foxes nor comprise habitat critical to the survival of this species.

Large-eared Pied Bat calls have been recorded at a large permanent freshwater dam in the north-west corner of the Project area. This species' call have not been recorded in all years at the site and it has not been captured during harp trapping, suggesting it is either a periodic visitor to the area and/or occurs in low densities and utilises a wide area in the region. Populations are considered to occur where suitable roosts are present (TSSC, 2010).

Roosting habitat is considered critical to the survival of the Large-eared Pied Bat and is comprised of a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites particularly box gum woodlands or river/rainforest corridors which are used for foraging (DERM, 2011). Sandstone cliff/escarpment roosting habitat is not available within the Parklands and no roosts have been observed in the project area, therefore the site is not considered to provide habitat critical to the survival of this species.

Potential impacts and mitigation

Foraging habitat for Grey-headed Flying Fox and Large-eared Pied Bat will not be directly impacted by the project. Food resources onsite are located in Eucalypt woodlands and rainforest areas, and these areas will be preserved and protected for the duration of the project. All areas of remnant vegetation will be fenced during events to prevent disturbance and strict fire management procedures will also be implemented. These measures have been in place during the 5-year trial period. During this time, monitoring has detected no adverse impacts to the native vegetation on site. Ongoing vegetation management and restoration measures will continue across the site with the objective of improving the ecological condition of the vegetation and therefore its foraging habitat values over time.

Noise, light and activity during events may deter Grey-headed Flying Fox from utilising forage habitat across the Parklands and/or cause them to abandon the site altogether. The presence and extent of these impacts has been monitored during the trial period. Overall the impacts to Grey-headed Flying Fox were minor and temporary, with observations including:

- Flying-foxes were observed to fly over illuminated canopies of flowering eucalypts, but to return within minutes of light spill being removed
- Flying-foxes avoided brightly illuminated blossom but exploited this resource soon after lights were switched off
- Flying-foxes appeared to preferentially forage within rather than on the surface of weakly illuminated tree canopies
- Flying-foxes were heard vocalising within event areas during the 2015 and 2016 Falls Festivals and Splendour in the Grass events.

A range of light management measures will be implemented during all future events, and Parklands are seeking opportunities to continually reduce light impacts (while balancing public safety). Therefore, based on the results of previous monitoring, it is expected that similar minor and very short-term disturbance impacts to Grey-headed Flying Fox will occur during future events.

Similar potential disturbance impacts are also relevant to the Large-eared Pied Bat. As this species has only been recorded on site periodically, there is less direct evidence upon which to base an assessment of potential impacts. However, numerous other microbats have been detected on site and their behaviour during events observed. Food resources and feeding behaviour are increased for many of these species during events, as light attracts insects, which are a key diet item. Other adverse impacts such as avoiding lighting or leaving the Parklands were not observed.

Conclusion

An action is likely to have a significant impact on a vulnerable species such as the Grey-headed Flying Fox and Large-eared Pied Bat, if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of an important population of a species
- Reduce the area of occupancy of an important population
- Fragment an existing important population into two or more populations
- Adversely affect habitat critical to the survival of a species
- Disrupt the breeding cycle of an important population
- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in invasive species that are harmful to a vulnerable species becoming established in the species' habitat
- Introduce disease that may cause the species to decline, or
- Interfere substantially with the recovery of the species.

The potential impacts from the project as describe above are not expected to result in any of the above occurring. Furthermore, events at the Parklands have been occurring since 2012 with very minor and reversible impacts to threatened flying mammals. A suite of measure to avoid and reduce impacts will continue to be implemented, along with extensive habitat restoration and bush regeneration works. Monitoring and adaptive management will also be implemented.

Moreover, the Parklands site does not comprise habitat critical to the survival of these species, nor contain important populations. Therefore, it is considered unlikely that the project will result in significant impacts to as the Grey-headed Flying Fox and Large-eared Pied Bat.

1.6 Koala (*Phascolarctos cinereus;* combined populations of Qld, NSW and the ACT)

Koala (combined populations of Qld, NSW and the ACT) is listed as Vulnerable under the EPBC Act.

Ecology and distribution

The Koala has a widespread distribution, which ranges from Burdekin-Lynd Divide in central Queensland, west to Longreach and Charleville, east to the coast between Port Curtis and Proserpine, and south to New South Wales north of latitude 29° S. There is some uncertainty of the current population size, but it may be in the vicinity of 40,000 individuals (TSSC, 2015).

Koala inhabit a range of forest and woodland habitats containing known food trees for the species (DoE, 2017b). Koalas in coastal parts of NSW are found in *Eucalyptus* spp*, Melaleuca* spp. or *Casuarina* spp. dominated habitats.

Koala within the Project area

Targeted Koala surveys have been undertaken at the Parklands in 2007, 2008, 2013 and 2016 (Biolink 2007, 2008, 2013, 2016), along with seven Event Impact Monitoring (EIM) surveys (North Bryon Parklands 2014a, 2014b, 2015, 2016). Results of these surveys include:

- 2007 – small area of core Koala habitat (3 ha) mapped on site; Koala scats observed at four locations within the Parklands; results suggest use of the site by 1 – 2 Koalas
- 2008 – significantly reduce evidence of activity, such that activity level does not reach the threshold that indicates active, ongoing use by resident animals
- 2013 – no evidence of Koala within the Parklands
- 2016 – evidence of Koala (scats and scratches) at 7 sites, primarily in the north-west corner of the Parklands and within Billindugel Nature Reserve. Mixed age scats suggest significant, repeat use of sites by Koala individuals with home ranges that encompass the north-west corner of the Parklands (individuals may be coming to the Parklands from the Billindugel Nature Reserve and/or areas to the west of the Pacific Highway). It is likely that these Koalas have begun using this area of the Parklands within the previous 1 – 3 years
- EIM – no evidence of Koala within the Parklands or surrounds (based on general observations, not targeted survey)

The *EPBC Act Referral Guidelines for the Vulnerable Koala* (Commonwealth of Australia, 2014) provide criteria that can be used to determine whether a site should be considered habitat critical to the survival of a species. Using these criteria (see below), the Parklands can be considered habitat critical to the survival of the species with a habitat assessment score of 9/10.

Table 7: Habitat assessment for Koala as per EPBC Act guidelines

Attribute	Application to the Parklands	Score
Koala occurrence	Evidence of one or more koalas within the last 2 years	2
Vegetation composition	Has forest or woodland with two or more known Koala food tree species	2
Habitat connectivity	Area is part of a contiguous landscape >500 ha (when Parklands is aggregated with Billinudgel Nature Reserve)	2
Key existing threats	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence	2
Recovery value	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context. This is given the variability in Koala usage of the site over the previous decade. However, ongoing improvements	1

	in koala habitat on site may be important if local populations increase over time	
	TOTAL SCORE	9 / 10

Potential impacts and mitigation

The *EPBC Act Referral Guidelines for the Vulnerable Koala* (Commonwealth of Australia, 2014) also provide guidance for significant impact thresholds. Impacts are not considered significant if <2 ha of habitat critical to the survival of the species is being cleared.

No Koala habitat will be cleared as result of the project. All Koala habitat on site will be preserved and protected for the duration of the project. All areas of remnant vegetation within event areas will be fenced during events to prevent disturbance and strict fire management procedures are also implemented. These measures have been in place during the 5-year trial period. During this time, monitoring has detected no adverse impacts to the native vegetation on site.

Ongoing vegetation management and restoration measures will continue across the site with the objective of improving the ecological condition of the vegetation and therefore its value as Koala habitat over time. Results of recent (2016) surveys, suggest Koala habitat improvements should be focused on the areas of recent use in the north-western areas of the Parklands. This will focus and support koala use in that area and not provide encouragement for Koalas to enter the event areas.

Indirect impacts to Koala are also unlikely. Koalas have moved back into the Parklands area during the 5-year trial period i.e. the results of the most surveys (Biolink 2016) suggest Koala use of the north-western areas of the Parklands has begun within the last 1 – 3 years. This suggests the ongoing use of the site for events has not precluded the area from providing suitable habitat for Koala.

Key threats to Koala including dog attack and vehicle strike will not be exacerbated by the project. Dogs (apart from restrained assistance and security dogs) are not allowed on site and on site speed limits are restricted to 25 km/hr. Koalas will be discouraged from enter event area due to fencing. While this fencing itself may restrict Koala movement, it will be in place for short periods of time at discrete intervals over the year. It is also unlikely that Koalas would be seeking to traverse the busy event area. Impacts from more generalised disturbance will be short-lived and contained within the event areas of the Parklands site. There are also large areas of suitable habitat available in the adjacent Billinudgel Nature Reserve and to the west of the Parklands.

Conclusion

As per the EPBC Act policy guidance, whilst the Parklands site can be considered habitat critical to the survival of the Koala, significant impacts are unlikely. There will be no clearing of Koala habitat, key threats will not be exacerbated and any disturbance related impacts will be short lived. Koalas have re-established use of the Parklands site between 2013 and 2016, while events have been undertaken.

Koala habitat within the Project area has been improved with Koala food trees included in planting and large scale regeneration of food trees has occurred in western hillslope areas of the site (Fitzgerald, 2016b). The vast extent of alternative suitable habitat surrounding the Project area means that overall impacts to Koala habitat within the region are minor and temporary.

Therefore, it is considered unlikely that the project will result in significant impacts to Koala.

1.7 Threatened birds (Swift Parrot and Coxen's Fig Parrot)

The Parklands has a rich bird diversity, with two bird species that have the potential to occur on site, listed on the EPCB Act. The Swift Parrot (*Lathamus discolor*) is listed as critically endangered and migratory while the Coxen's Fig Parrot (*Cyclopsitta diophthalma coxeni)* is listed as endangered.

Ecology and distribution

The Swift Parrot is a wide-ranging, highly mobile species which is endemic to south-eastern Australia (DoE 2014c). Swift Parrots breed in Tasmania during spring and summer (Sept to Jan), then migrate to Victoria, the eastern parts of South Australia and up to south-east Queensland in the autumn and winter months. In NSW this species mostly occurs on the coast and south west slopes.

On the mainland, Swift Parrots occur in areas where eucalypts are flowering profusely or where there is abundant lerp (from sap-sucking bugs) infestations (OEH 2013b). Favoured feed trees include winter flowering species such as *Eucalyptus robusta* (Swamp Mahogany), *Corymbia maculata* (Spotted Gum), *C. gummifera* (Red Bloodwood), *E. sideroxylon* (Mugga Ironbark), and *E. albens* (White Box). Commonly used lerp infested trees include *E. microcarpa* (Inland Grey Box), *E. moluccana* (Grey Box) and *E. pilularis* (Blackbutt).

The distribution of Coxen's Fig Parrot is poorly understood, with most reliable records indicating QLD locations such as Imbil, Kin Kin Creek, Upper Pinbarren Creek, Montville, the Maleny area, Mount Glorious, Main Range NP, and Lamington NP. NSW locations include Border Ranges NP, Tweed River valley, Nightcap Range and the Hastings River area. It occurs in rainforest habitats such as subtropical rainforest, dry rainforest, littoral and developing littoral rainforest, and vine forest. It prefers alluvial areas that support figs and other trees with fleshy fruits (TSSC, 2016a).

Swift Parrot and Coxen's Fig Parrot within the project area

Neither Swift Parrot nor Coxen's Fig Parrot have been recorded at the Parklands during the extensive fauna survey and monitoring that has been undertaken since 2007. However, there are numerous food trees for both species within the patches of remnant vegetation on site. This includes Eucalyptus species for the Swift Parrot (e.g. Forest Red Gum and Blackbutt) and native fig trees for the Coxen's Fig Parrot (e.g. Sandpaper Figs, Moreton Bay Fig, Strangler Figs and Small-leaved Figs). The Swift Parrot has also been recorded within 5 km of the Parklands. It is therefore possible that both species would occasionally visit the Parklands for foraging (the Swift Parrot during is winter northward migration). Given the small overall extent and fragmented nature of the remnant vegetation on site and historical disturbance, the Parklands is not considered to be habitat critical to the survival of these species.

Potential impacts and mitigation

No habitat for the Swift Parrot or Coxen's Fig Parrot will be cleared as result of the project. All habitat on site will be preserved and protected for the duration of the project. All areas of remnant vegetation will be fenced during events to prevent disturbance and strict fire management procedures are also implemented. These measures have been in place during the 5-year trial period. During this time, monitoring has detected no adverse impacts to the native vegetation on site. Ongoing vegetation management and restoration measures will continue across the site with the objective of improving the

ecological condition of the vegetation and therefore its value as Swift Parrot or Coxen's Fig Parrot habitat over time.

Indirect impacts to Swift Parrot or Coxen's Fig Parrot are also unlikely. Minor disturbance of individuals may occur if the species is present on site during events (for the Swift Parrot this is relevant only during the winter months). Both species are highly mobile and as such this disturbance is likely to be insignificant. Monitoring of events has demonstrated that all bird species that leave the site during events return very soon after.

Key threats for the Swift Parrot are listed below (TSSC, 2016b) and are unlikely to be exacerbated by the project:

- Predation by sugar gliders (present only in low abundance at the Parklands)
- Habitat loss and alteration (habitats will be maintained)
- Collision mortality (most relevant in urban contexts, all fencing on site will be fauna friendly)
- Competition with large, aggressive honeyeaters and introduced species (habitat restoration works will improve habitat values for native species and reduce the prevalence of aggressive species)
- Psittacine Beak and Feather Disease (there are no elements of the project that are likely to exacerbate the spread of disease
- Illegal wildlife capture and trading (such activities will not occur as a result of the project)

Key threats for the Swift Parrot are listed below (TSSC, 2016b) and are unlikely to be exacerbated by the project:

- Habitat clearance (habitats will be maintained)
- Fragmentation of feeding habitat (feeding habitats on site are already highly fragmented, with regeneration works aiming to increase connectivity)
- Invasive weeds (extensive restoration and bush regeneration works are ongoing to address historical weed issues)
- Illegal collection of eggs (such activities will not occur as a result of the project)

Conclusion

An action is likely to have a significant impact on a critically endangered or endangered species such as the Swift Parrot and Coxen's Fig Parrot, if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of a population
- Reduce the area of occupancy of the species
- Fragment an existing population into two or more populations
- Adversely affect habitat critical to the survival of a species
- Disrupt the breeding cycle of a population
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
- Introduce disease that may cause the species to decline, or
- Interfere with the recovery of the species.

The potential impacts from the project as describe above are not expected to result in any of the above occurring. Furthermore, events at the Parklands have been occurring since 2012 with minor and reversible impacts to bird species. A suite of measure to avoid and reduce impacts will continue to be implemented, along with extensive habitat restoration and bush regeneration works. Monitoring and adaptive management will also be implemented.

Therefore, it is considered unlikely that the project will result in significant impacts to as the Swift Parrot Coxen's Fig Parrot.

1.8 Mitchell's Rainforest Snail (*Thersites mitchellae)*

Mitchell's Rainforest Snail is listed as critically endangered under the EPBC Act.

Ecology and distribution

This species is restricted to coastal lowlands occurring between the Tweed and Richmond Rivers in NSW. The species is currently only known from five locations between Banora Point and Lennox Head, within an 80 km long stretch of coastline. The estimated total number of mature individuals is less than 500 (DoE, 2017c).

The preferred habitat for the species is lowland subtropical rainforest and swamp sclerophyll forest with a rainforest understorey on alluvial soils with a basaltic influence (DoE, 2017c). The species is found in areas with deep leaf litter and an intact forest canopy and are known to shelter under palm fronds, leaf litter and bark during the day.

Mitchell's Rainforest Snail within the Project area

Three shells of Mitchell's Rainforest Snail have been found in Billinudgel Nature Reserve and suitable habitat exists within the patches of remnant vegetation at the Parklands. The long history of forest clearing, fragmentation and trampling by cattle suggests the species would not be present found in the event areas. The species has not been detected during targeted survey and monitoring.

Given the close proximity of the Billinudgel Nature Reserve and suitable habitat on site, there is potential for the species to be present within areas of remnant vegetation at the Parklands. Given the rarity of this species, any habitat surrounding known records of the species should be considered habitat critical to the survival of the species.

Potential impacts and mitigation

No Mitchell's Rainforest Snail habitat will be cleared as result of the project. All habitat on site will be preserved and protected for the duration of the project. All areas of remnant vegetation will be fenced during events to prevent disturbance and strict fire management procedures are also implemented. These measures have been in place during the 5-year trial period. During this time, monitoring has detected no adverse impacts to the native vegetation on site. Ongoing vegetation management and restoration measures will continue across the site with the objective of improving the ecological condition of the vegetation and therefore its value as Mitchell's Rainforest Snail habitat over time.

This species may also be impacted by trampling, if areas of remnant vegetation are accessed illegally during events. However, this risk is considered to be very low. All areas of remnant vegetation will be fenced during events and there have been few instances of people without tickets trying to access the site through these vegetated areas (as discussed above for flora). It is considered unlikely that Mitchell's

Rainforest Snail would be affected by noise and light disturbances and bushfire risk is tightly managed during events (as discussed above for flora).

Key threats for Mitchell's Rainforest Snail are listed below (TSSC, 2016c) and are unlikely to be exacerbated by the project:

- Land clearing (habitats will be maintained)
- Habitat degradation and disturbance, particularly edge effects (habitats on site are already highly fragmented, with regeneration works aiming to increase connectivity)
- Grazing by cattle (cattle grazing was ceased on site by the Parklands in 2006)
- Intensity and frequency of fire (fire management is a key issue during events due to public safety issues)
- Predation by rats (rats are known from the site, however events are unlikely to increase their prevalence. The Parklands implements best practise waste management, which mitigates increases in the rat population)
- Invasion by weeds (extensive restoration and bush regeneration works are ongoing to address historical weed issues)

Conclusion

An action is likely to have a significant impact on a critically endangered species such as Mitchell's Rainforest Snail if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of a population
- Reduce the area of occupancy of the species
- Fragment an existing population into two or more populations
- Adversely affect habitat critical to the survival of a species
- Disrupt the breeding cycle of a population
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
- Introduce disease that may cause the species to decline, or
- Interfere with the recovery of the species.

The potential impacts from the project as describe above are not expected to result in any of the above occurring. A suite of measure to avoid and reduce impacts will continue to be implemented, along with extensive habitat restoration and bush regeneration works. Monitoring and adaptive management will also be implemented.

Therefore, it is considered unlikely that the project will result in significant impacts to Mitchell's Rainforest Snail.

1.8.1 Migratory species

This impact assessment of listed migratory species is presented within the context of the following concepts:

- Important habitat; and

- Ecologically significant proportion of the population.

The meaning of these two concepts is defined in the EPBC Act Significant Impact Guidelines 1.1 (Commonwealth of Australia 2013). Where neither of these two features of a migratory species are present, impacts are generally not considered an issue under the EPBC Act. Further policy advice regarding migratory species provides thresholds for impacts to important habitat and numerical definitions of ecologically significant proportions of populations (Commonwealth of Australia, 2015a).

The above concepts and thresholds have been applied to migratory bird species known or likely to occur on site (see Table 8). Overall, it is concluded that the project is unlikely to have significant impacts to migratory bird species.

Table 8: Impact assessment for migratory species

Species	Occurrence within Project area	Impact assessment	Significant impact
Black-faced Monarch *Monarcha melanopsis*	Species has been recorded on numerous occasions within the Project area, including on two occasions during fauna monitoring in 2009 and during event impact monitoring for Falls Festival in 2015-2016.	The action will not lead to a substantial loss or modification of important habitat exceeding 2,600 ha, or disrupt the lifecycle of an ecologically significant proportion of the population (4,600 individuals).	No
Fork-tailed Swift *Apus pacificus*	Species has not been recorded within the Project area. The species is primarily aerial and possibly occurs over or utilises forage habitat within the Project area.	The action is not expected to result in a significant impact on the species as the Project area is highly unlikely to support a sufficient population to be considered an ecological significant proportion of the species and the Project will not result in the loss or modification of potential foraging habitat. The species is not known to breed in Australia.	No
Latham's Snipe *Gallinago hardwickii*	Species has not been recorded within the project area. There is limited suitable wetland habitat for the species within the Project area, the majority of which has been significantly degraded by historical land uses.	Some impacts to degraded wetland habitat within the Project area and adjacent wetlands such as noise and night-time illumination may occur and result in a temporary reduction in habitat for the species. These impacts will be temporary and occur during events only.	No
Oriental Cuckoo *Cuculus optatus*	Species has been recorded within the Project area. Species is wide ranging, occurring throughout the east coast of Australia so the Project area is unlikely to comprise important habitat for the species. The species does not breed in Australia so disruption to the lifecycle of an ecologically significant proportion of the population are considered highly unlikely.	The action will not lead to a substantial loss or modification of important habitat exceeding 250,000 ha, or disrupt the lifecycle of an ecologically significant proportion of the population (10,000 individuals).	No

Species	Occurrence within Project area	Impact assessment	Significant impact
Osprey *Pandion haliaetus*	Species has been recorded within the Project area.	The action will not lead to a substantial loss or modification of important habitat exceeding 840 km of coastline, or disrupt the lifecycle of an ecologically significant proportion of the population (240 individuals).	No
Rufous Fantail *Rhipidura rufifrons*	Species has been recorded within the Project area.	The action will not lead to a substantial loss or modification of important habitat exceeding 7,500 ha, or disrupt the lifecycle of an ecologically significant proportion of the population (48,000 individuals).	No
Satin Flycatcher *Myiagra cyanoleuca*	Has been recorded to the east of the Project area. Could occur in forested habitats with Project area, however, large areas of alternative suitable habitat occur within the Byron floodplain.	The action will not lead to a substantial loss or modification of important habitat exceeding 4,400 ha, or disrupt the lifecycle of an ecologically significant proportion of the population (17,000 individuals).	No
Spectacled Monarch *Symposiachrus trivirgatus*	Species has been recorded numerous times within the Project area and within the adjacent BNR.	The action will not lead to a substantial loss or modification of important habitat exceeding 2,100 ha, or disrupt the lifecycle of an ecologically significant proportion of the population (6,500 individuals).	No
White-throated Needletail *Hirundapus caudacutus*	Species has been recorded within the Project area and within the adjacent BNR.	The action will not lead to a substantial loss or modification of important habitat, or disrupt the lifecycle of an ecologically significant proportion of the population (100 individuals).	No

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Appendix A PMST search results

Appendix B : Targeted surveys

Lowland Rainforest of Subtropical Australia TEC

Targeted survey of an area of vegetation to the north-west of the Parklands site – area known as Forest Block 25 – was undertaken by Dr Mark Fitzgerald and Robert Kooyman on 28 April 2017. The purpose of the survey was to map vegetation communities and determine if any met the criteria to be considered Lowland Rainforest of Subtropical Australia TEC.

Three distinct vegetation zones were identified during the survey, including:

- A narrow band of lower slope vine forest
- An extensive area of Brushbox hillslope forest
- A section of gully forest which largely conforms to the EPBC Act listed Lowland Rainforest of Subtropical Australia TEC

An analysis of the gully forest characteristics was undertaken against the EPBC Act listing criteria (see Table A1 and A2 below). The patch met most of the key diagnostic criteria and met the condition thresholds. It is therefore considered to be the Lowland Rainforest TEC.

The extent of this patch of Lowland Rainforest TEC is ~0.75 ha and its extent confined by a small watercourse. It is embedded within an area of native forest and is likely to be effectively buffered by this surrounding vegetation.

Table A1: Key diagnostic criteria for Lowland Rainforest TEC

Key Diagnostic Criteria	Gully Forest Patch
Distribution of the ecological community is primarily in the NSW North Coast and South Eastern Queensland bioregions, according to Interim Biogeographic Regionalisation for Australia (IBRA) version 6.1 (2004).	Yes
The ecological community occurs on: soils derived from basalt or alluvium; or enriched rhyolitic soils; or basaltically enriched metasediments.	No – metasediment derived soils
The ecological community generally occurs at an altitude less than 300 m above sea level.	Yes
The ecological community typically occurs in areas with high annual rainfall (>1300mm).	Yes
The ecological community is typically more than 2 km inland from the coast.	Block 25 is 3.5 kms from the sea
The structure of the ecological community is typically a tall (20 m–30 m) closed forest, often with multiple canopy layers.	Yes
Patches of the ecological community typically have high species richness (at least 30 woody species from Appendix A.	Yes. At least 42 spp from Appendix A (see species list below)

Table A2: Condition thresholds for Lowland Rainforest TEC (must meet all)

Condition threshold	Gully Forest Patch
Natural remnant evident by the persistence of mature residual trees from Appendix B	Yes – 11 spp from Appendix B (see species list below) Also, patch is evident in historical aerial photographs, when much of the surrounding area was cleared
>0.1 ha	Yes
Emergent/canopy/subcanopy cover is ≥ 70%	Yes
Contains ≥ 40 native woody species from Appendix A	Yes
≥70% of vegetation is native	Yes

Table A3: Species list

Species	Cover abundance (Braun-Blanquet)	Appendix A spp	Appendix B spp
Acacia disparrima	Occasional		
Acacia melanoxylon	Rare		
Acronychia imperforata	Rare		
Acronychia pubens	Very occasional		
Adiantum aethiopicum	Very occasional		
Adiantum hispidulum	Very occasional		
Alchornea ilicifolia	Rare		
Alphitonia excelsa	Rare	A	B
Alpinia caerulea	Very occasional		
Alyxia ruscifolia	Very occasional		
Amyema congener	Rare		
Archidendron muellerianum	Rare	A	
Archirhodomyrtus beckleri	Common		
Archontophoenix cunninghamiana	Very occasional	A	B
Asplenium australasicum	Rare		
Blechnum cartilagineum	Very occasional		
Breynia oblongifolia	Rare	A	
Calamus muelleri	Rare	A	
Callistemon salignus	Rare		
Calochlaena dubia	Rare		
*Cinnamomum camphora**	Very occasional		

Cissus antarctica	Very occasional	A	
Cissus hypoglauca	Very occasional	A	
Cissus sterculifolia	Rare		
Clerodendrum tomentosum	Very occasional		
Commersonia bartramia	Occasional	A	
Cordyline rubra	Very occasional		
Cordyline stricta	Very occasional		
Corymbia intermedia	Occasional		
Croton verreauxii	Very occasional		
Cryptocarya glaucescens	Very occasional		
Cryptocarya microneura	Occasional		
Cupaniopsis anacardioides	Rare		
Cupaniopsis newmanii	Rare		
Cupaniopsis parvifolia	Very occasional		
Cyathea australis	Occasional		
Cyathea cooperi	Very occasional		
Cyathea leichhardtiana	Rare		
Cyclophyllum longipetalum	Very occasional		
Cymbidium madidum	Rare		
Davallia pyxidata	Rare		
Denhamia celastroides	Rare		
Dianella caerulea	Very occasional		
Dioscorea transversa	Very occasional	A	
Diploglottis australis	Very occasional	A	B
Doodia aspera	Rare		
Echinostephia aculeata	Very occasional		
Elaeocarpus obovatus	Very occasional	A	B
Elaeocarpus reticulatus	Rare		
Endiandra globosa	Very occasional	A	
Endiandra muelleri ssp bracteata	Very occasional	A	
Entolosia stricta	Rare		
Eucalyptus grandis	Occasional		
Eupomatia laurina	Very occasional		
Euroschinus falcata	Rare		

Eustrephus latifolius	Very occasional	A	
Ficus coronata	Very occasional	A	B
Ficus macrophylla	Rare	A	B
Flagelleria indica	Very occasional		
Flindersia bennettiana	Very occasional		
Flindersia schottiana	Occasional	A	B
Gahnia aspera	Rare		
Geitonoplesium cymosum	Very occasional	A	
Glochidion ferdinandi	Rare	A	
Glochidion sumatranum	Very occasional		
Guioa semiglauca	Common	A	
Hibbertia scandens	Very occasional		
Homolanthus populifolius	Rare		
Jagera pseudorhus	Very occasional	A	
Lomandra longifolia	Rare		
Lophostemon confertus	Occasional	A	B
Maclura cochinchinensis	Occasional	A	
Mallotus discolor	Rare	A	
Mallotus phillipensis	Very occasional	A	
Marsdenia rostrata	Very occasional		
Melicope elleryana	Very occasional		
Melodinus australis	Very occasional		
Mischocarpus pyriformis	Occasional		
Morinda jasminoides	Occasional	A	
Myrsine variabile	Very occasional		
Notolaea johnsonii	Rare	A	B
Notolaea longifolia	Very occasional	A	
Ozothamnus diosmifolius	Rare		
Pandorea pandorana	Very occasional		
Panicum lamprophyllum	Very occasional		
Parsonsia straminae	Very occasional		
Pentaceras australis	Rare	A	
Pilidiostigma glabrum	Very occasional		
Pittosporum revolutum	Very occasional	A	

Platcerium bifurcatum	Rare	A	
Platycerium superbum	Very occasional	A	
Pouteria australis	Very occasional	A	
Pseuderanthemum variabile	Rare		
Pseudoweinmannia lachnocarpa	Very occasional		
Psychotria loniceroides	Rare		
Pyrrosia confluens	Very occasional		
Pyrrosia rupestris	Rare		
Rhodamnia rubescens	Very occasional	A	
Ripogonum album	Very occasional		
Ripogonum brevifolium	Rare		
Ripogonum elseyanum	Rare		
Sarcopteryx stipata	Very occasional	A	
Sloanea woolsii	Very occasional	A	B
Smilax australis	Very occasional	A	
Smilax glyciphylla	Very occasional		
Stephania japonica var. discolor	Rare	A	
Synoum glandulosum	Common		
Syzygium oleosum	Rare		
Syzygium smithii	Very occasional	A	B
Tabernaemontana pandacaqui	Very occasional	A	
Toechima dasyrrache	Very occasional	A	
Tripladenia cunninghamiana	Rare		
Trophis scandens	Very occasional		
Wikstroemia indica	Rare		
Wilkea huegeliana	Occasional	A	

Hairy-joint Grass (*Arthraxon hispidus*)

A foot-based search was undertaken by Dr Mark Fitzgerald in the southern grassland area of North Byron Parklands property, targeting the threatened species Hairy-joint Grass. The search area is depicted below.

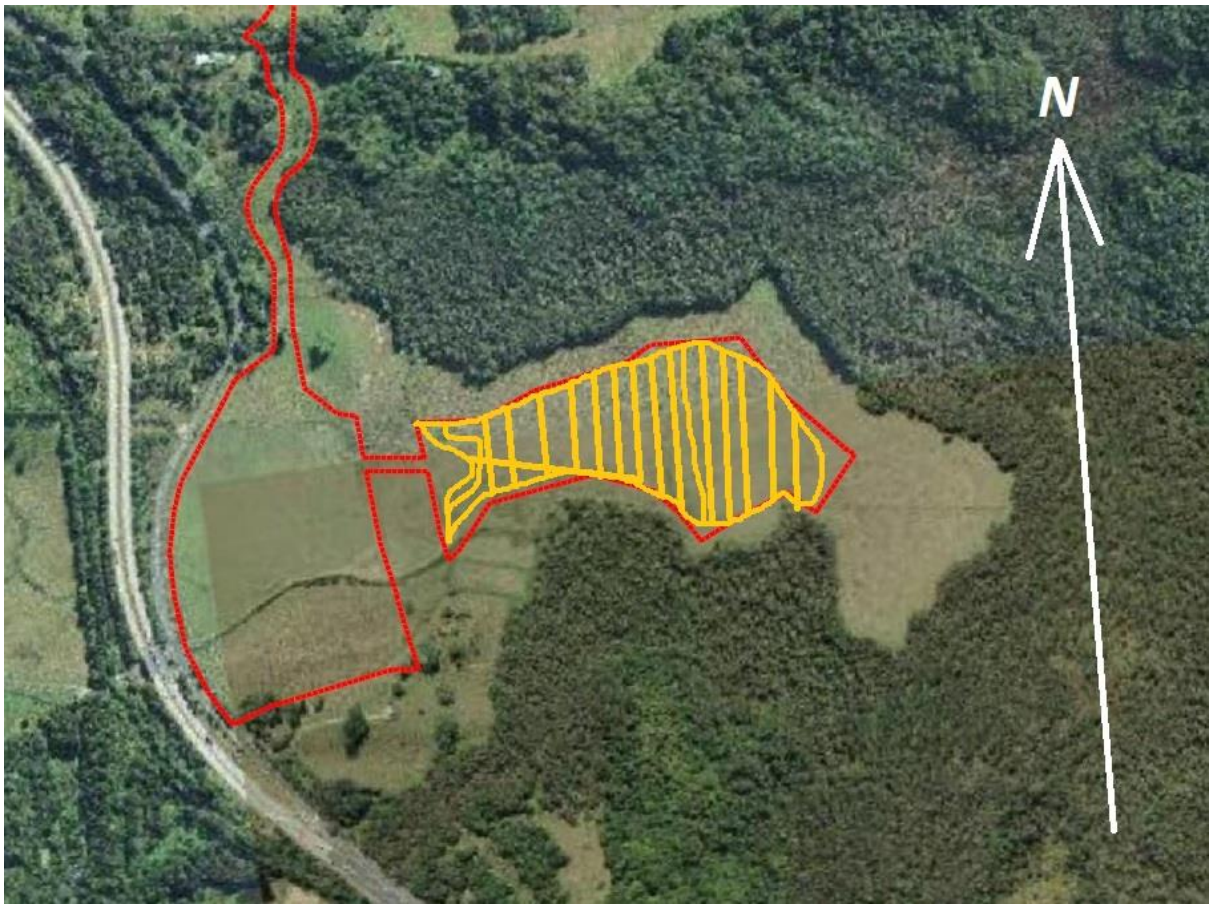

Figure B1: Hairy-joint Grass search area 6th June 2017. Yellow lines indicate the approximate location of foot-based searches. Scale = ~1 : 9,000

Method

Surveys were undertaken on 6 June 2017 with good survey conditions (clear, calm and dry). The area searched is a ~15 ha closed grassland which may be converted to car parking in the future. Two approaches were used:

- The perimeter of the area was searched on recently cleared tracks.
- Seventeen north-south oriented transects were searched every ~30 m along the length of the designated search area. This enabled a detection area of ~1.5 m either side of the transect line. Transects were non-linear in the western part of the site where wet areas and deep flooded drains were constraints to walking.

Site Description

The area searched is a near-level low elevation paddock compromising mainly the exotic pasture grass South African Pigeon Grass. Scientific names are provided in a flora species list below. The grass in this area has not been grazed or slashed (except for perimeter tracks and extraneous planting areas) since ~2012. The result is a tall closed grassland which is a near monoculture of dense South African Pigeon

Grass with occasional small gaps occupied by Cuphea, Blue Billygoat Weed, Tall Verbena and Narrow-leaved Cottonbush. Very occasional woody species are present including the exotic Giant Groundsel, Slash Pine, and native Sally Wattle, and Umbrella Cheese Tree.

The South African Pigeon Grass annually falls over and is grown through by the next season's growth, resulting in an accumulated 20-30cm layer of organic material underfoot which largely excludes the establishment of other species.

Evidence of recent flooding (Cyclone Debbie: late March 2017) was present in the lower western parts of the search area.

Results

No Hairy-joint Grass was found and as described above, habitat values for this species were considered poor. A few twining species were present in the search area, mainly Siratro, with Wandering Tradescantia in the wetter western areas. It is therefore considered unlikely that Hairy-joint Grass is present within the project area.

A flora list is provided in the table below.

Figure B2: Indicative site photograph

Table B1: Species list from survey area

Common Name	Scientific Name	Exotic	Native
Black Nightshade	*Solanum nigrum*	X	
Blue Billygoat Weed	*Ageratum houstonianum*	X	
Brazilian Fireweed	*Erechtites valerianifolia*	X	
Broad-leaved Paspalum	*Paspalum mandiocanum*	X	
Bunchy Sedge	*Cyperus polystachyos*	X	
Camphor Laurel	*Cinnamomum camphora*	X	
Common Silkpod	*Parsonsia straminea*		X
Croftonweed	*Ageratina adenophora*	X	
Dock	*Rumex crispus*	X	
Fireweed	*Senecio madagascariensis*	X	
Giant Groundsel	*Baccharis halimifolia*	X	
Hard Quandong	*Elaeocarpus obovatus*		X
Kikuyu	*Pennisetum clandestinum*	X	
Narrow-leaved Cottonbush	*Gomphocarpus fruticosus*	X	
Paddy's Lucerne	*Sida rhombifolia*	X	
Pennywort	*Centella asiatica*		X
Sally Wattle	*Acacia melanoxylon*		X
Sea Rush	*Juncus kraussii*		X
Siratro	*Macroptilium atropurpureum*	X	
Slash Pine	*Pinus elliotti*	X	
Tall Verbena	*Verbena bonariensis*	X	
Thickhead	*Crassocephalum crepidioides*	X	
Smart Weed	*Persicaria sp.*	X	
Umbrella Cheese Tree	*Glochidion sumatranum*		X

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