

29 January 2020
Ref No: 3510-1004

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Byron Bay Bypass – Mitchell's Rainforest Snail Over and Above Environmental Investigations

1. Introduction

Overview

Byron Shire Council (BSC) are investigating environmental compensation options for the Byron Bay bypass over and above the project approval requirements. Three potential sites have been identified for bush regeneration works, as follows:

- Option 1: Sunrise Boulevard Bushland
- Option 2: Butler Street Reserve
- Option 3: Midgen Park and Swamp Suffolk.

Locations of the sites are provided in **Illustration 1.1**. Attribute data for each site is provided in **Table 1.1**.

GeoLINK was engaged to undertake investigations at these sites to determine their values for threatened species and ecological communities impacted by the Byron Bay bypass construction (refer to **Appendix A**); particularly if the sites comprise existing or potential habitat for Mitchell's Rainforest Snail (*Thersites mitchellae*; MRS).



LEGEND

- Byron Bay bypass clearing limit
- Option 1: Sunrise Boulevard Bushland
- Option 2: Butler Street Reserve
- Option 3: Midgen Park and Swamp Suffolk

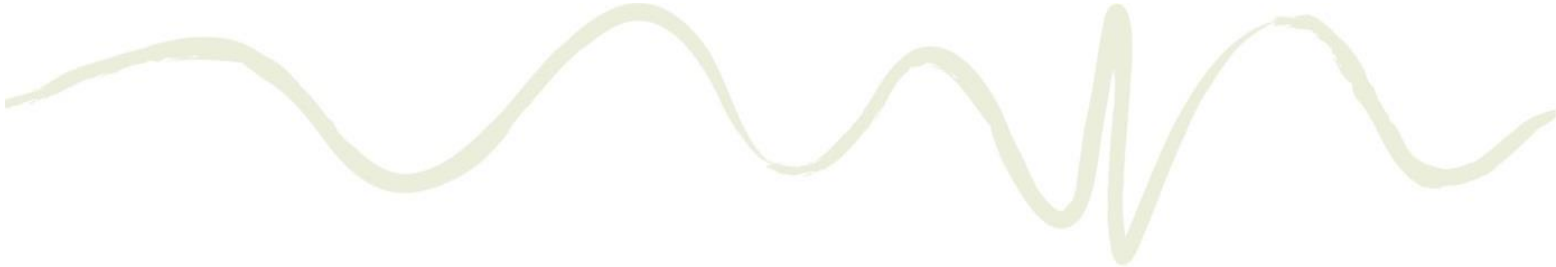
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Locality of Sites - Illustration 1.1

Table 1.1 Site Attributes

Site	Area (ha)	Zoning	Council Information [^]	Comment
Option 1: Sunrise Boulevard Bushland	12.05	<ul style="list-style-type: none"> ■ Byron Local Environmental Plan 2014: DM. ■ Byron Local Environmental Plan 1988: 7A (Environmental Protection – Wetlands Zone), 2A (Urban – Residential Zone), 1D (Rural – Investigation Zone). 	<ul style="list-style-type: none"> ■ Council owned community land. ■ High Environmental Value (HEV) mapping covers the entire site. ■ Known Koala habitat. ■ BSC vegetation mapping: <ul style="list-style-type: none"> – Broad-leaved Paperbark swamp sclerophyll forest with rainforest elements on coastal floodplains. The majority of the site is mapped as this community. – Swamp Mahogany-tea-tree-Tassell Rush forested wetland of waterlogged wallum soils. A small area in the south-eastern corner of the site is mapped as this community. – Unassigned. Mapping covers a small area of vegetation in the central west of the site. ■ Threatened Ecological Community (TEC) mapping: The western third of the site is mapped as the TEC <i>Swamp sclerophyll forest on coastal floodplains</i> as listed under the <i>Biodiversity Conservation Act 2016</i> (BC Act). 	<ul style="list-style-type: none"> ■ A larger area of vegetation occurs to the north of the site which is contiguous with Tyagarah Nature Reserve. ■ If MRS is present, it would be a separate population to the population impacted by the Byron Bay bypass due to geographic separation.
Option 2: Butler Street Reserve	2.1	<ul style="list-style-type: none"> ■ Byron Local Environmental Plan 2014: DM; surrounding land RE1 Public Recreation. ■ Byron Local Environmental Plan 1988: 6A (Urban – Open Space Zone). 	<ul style="list-style-type: none"> ■ Crown Land/Byron Shire Council managed. ■ HEV mapping covers the entire site. ■ BSC vegetation mapping: <ul style="list-style-type: none"> – Broad-leaved Paperbark swamp sclerophyll forest with rainforest elements on coastal floodplains. The majority of the site is mapped as this community. – Swamp Oak with rainforest elements on coastal floodplains and metasediments. The majority of the western third of the site is mapped as this community. – Unassigned. Mapping covers a small area of vegetation in the south-west of the site. ■ TEC mapping: Three TECs listed under the BC Act are mapped as occurring on site: <ul style="list-style-type: none"> – Swamp sclerophyll forest on coastal floodplains. – Swamp Oak floodplain forest (also listed in the federal <i>Environment Protection and Biodiversity Conservation Act 1999</i> [EPBC Act]) as an endangered community. – Lowland rainforest on floodplain. 	<ul style="list-style-type: none"> ■ This site is known to support a flying-fox camp, which is identified in the Byron Bay Flying-fox Management Strategy (BSC and GeoLINK 2017). ■ A larger area of vegetation occurs to the west and south of the site, including Cumbebin Nature Reserve. ■ Contains potential MRS habitat (GeoLINK 2019a) and if present, would form part of the same population impacted by the Byron Bay bypass.



Site	Area (ha)	Zoning	Council Information [^]	Comment
Option 3: Midgen Park and Swamp Suffolk	3.7	<ul style="list-style-type: none"> ■ Byron Local Environmental Plan 2014: DM ■ Byron Local Environmental Plan 1988: 7A (Environmental Protection – Wetlands Zone), 7B (Environmental Protection – Coastal habitat Zone), 7F2 (Environmental Protection – Urban Coastal Lands). 	<ul style="list-style-type: none"> ■ Council owned community land ■ High Environmental Value (HEV) mapping covers the entire site. ■ BSC vegetation mapping: <ul style="list-style-type: none"> – Broad-leaved Paperbark swamp sclerophyll forest with rainforest elements on coastal floodplains. The majority of the site is mapped as this community. – Tuckeroo - Bird's Eye Alectryon - Beach Acronychia littoral rainforest. The eastern fringes of the site are mapped as this community. – Coast Cypress Pine with littoral rainforest elements. The southern portion of the site is mapped as this PCT. ■ TEC mapping: Two TECs listed under the BC Act are mapped as occurring on site: <ul style="list-style-type: none"> – Littoral Rainforest: corresponds with the Tuckeroo - Bird's Eye Alectryon - Beach Acronychia littoral rainforests community. – Coastal Cypress Pine: corresponds with the Coastal Cypress Pine community. ■ Mapping of littoral rainforest shown it as EPBC Act TEC <i>Littoral Rainforest and Coastal Vine Thickets of Eastern Australia</i>. 	<ul style="list-style-type: none"> ■ Contiguous with a larger area of vegetation to the west and north, extending into Arakwal National Park. ■ If MRS is present, it would be a separate population to the population impacted by the Byron Bay bypass.

Notes:

* Threatened fauna records from DPIE (2020) BioNet and Atlas of Living Australia (2020)

[^] information provided by Mr David Filipczyk, Byron Shire Council Bush Regeneration Officer (24/12/2019) and/or from BSCs GIS mapping.

Vegetation communities described in this table reflect Council mapping and classification, rather than approved plant community types (PCTs) under the NSW BioNet Vegetation Classification System.

2. Methodology

The following methodology was adopted to identify the ecological values of each site:

- Review threatened species records on the BioNet and Atlas of Living Australia databases.
- Diurnal site inspection at each site, performing the following activities:
 - Identifying and mapping vegetation types (PCTs), including threatened ecological communities.
 - Opportunistic searches for threatened flora.
 - Identify and mapping potential MRS habitat.
 - Habitat assessment for other threatened fauna species impacted by the Byron Bay bypass project.
- Targeted nocturnal MRS searches where MRS habitat is identified during diurnal surveys under appropriate survey conditions.

Field surveys were undertaken on 28 January 2020. The survey effort at each site is summarised in **Table 2.1**.

Table 2.1 Field Survey Effort – 28 January 2020

<i>Site</i>	<i>Diurnal Inspection</i>	<i>Nocturnal Survey</i>
Option 1: Sunrise Boulevard Bushland	Three person hours	Survey time: 20:00 to 21:20. No. personnel: three. Survey effort: four person hours
Option 2: Butler Street Reserve	One person hours	Survey time: 21:45 to 22:45. No. personnel: three. Survey effort: three person hours
Option 3: Midgen Park and Swamp Suffolk	Two person hours	Survey time: 23:00 to 0:00. No. personnel: three. Survey effort: three person hours
Total	Six person hours	10 person hours

Weather conditions during the survey were fine with temperatures between 25 and 26°C with relative humidity ranging between 89 per cent and 90 per cent (Byron Bypass weather station). Ground/soil moisture was present in low lying/poor draining areas, with surface water present in some areas of the Option 2 and 3 sites.


The cryptic nature of MRS (Parkyn 2014) was a key survey limitation during target surveys. No other targeted fauna or flora surveys were undertaken.

3. Results

3.1 Database Search Results

Searches on the BioNet and Atlas of Living Australia databases returned the following relevant threatened fauna species records in proximity to the subject sites:

- Option 1: Sunrise Boulevard Bushland: Koala records adjacent to the site.
- Option 2: Butler Street Reserve: Records of Grey-headed Flying-fox camp on site. MRS, Koala and Pale-vented Bush-hen records occur within 150 m of the site.

- 
- Option 3: Midgen Park and Swamp Suffolk: MRS, Koala, Pale-vented Bush-hen, Southern Myotis, Common Planigale, Rose-crowned Fruit-Dove and Black Bittern records occur within 300 m of site in contiguous habitat.

3.2 Plant Community Types

Vegetation classification at the sites based on the NSW BioNet Vegetation Classification system using available Plant Community Types (PCTs) is provided in **Table 3.1** and displayed in **Illustration 3.1**. Corresponding TECs are also provided. The BSC derived 'PCT' classification system used in Council GIS data (refer to **Table 1.1**) provides a more accurate vegetation description to those available from the NSW BioNet Vegetation Classification System.

TECs impacted by the Byron Bypass project that occur at the subject sites (refer to **Appendix A**) include:

- Swamp sclerophyll forest on coastal floodplains (BC Act). This TEC occurs at all sites, with a total combined area of 4.21 ha.
- Littoral rainforest and coastal vine thickets of eastern Australia (EPBC Act). 0.71 ha of this community occurs at the Option 3: Midgen Park and Swamp Suffolk site.

3.3 Opportunistic Threatened Flora Records

One threatened flora species was opportunistically recorded during inspection of the subject sites. Stinking Cryptocarya (*Cryptocarya foetida*; EPBC Act and BC Act listed Vulnerable species) was detected at Option 3: Midgen Park and Swamp Suffolk site (easting: 560075, northing: 6827060; refer to **Illustration 3.1**). Five plants were detected including one small tree (seven metres tall and eight-centimetre diameter at breast height [DBH]) and four adjacent saplings around 0.5 m tall.

The BioNet database shows a White Lace Flower (*Archidendron hendersonii*; BC Act listed Vulnerable species) record on the Option 3: Midgen Park and Swamp Suffolk site (refer to **Illustration 3.1**) however this species was not encountered during the site inspection.

Table 3.1 PCTs and TECs at each site

<i>Site</i>	<i>PCT</i>	<i>TEC</i>	<i>Area (ha)</i>
Option 1: Sunrise Boulevard Bushland	1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Swamp sclerophyll forest on coastal floodplains (BC Act)	0.73
	1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	N/A (site is on sandplain therefore not a floodplain TEC)	7.13
	1230 Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion	N/A (site is on sandplain therefore not a floodplain TEC)	3.54
	Non-PCT vegetation	-	0.07
Option 2: Butler Street Reserve	1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Swamp sclerophyll forest on coastal floodplains (BC Act)	0.87
	1235 Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Swamp Oak floodplain forest (BC Act) (not Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland ecological community [EPBC Act])	0.49
	Non-PCT vegetation	-	0.19
Option 3: Midgen Park and Swamp Suffolk	1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Swamp sclerophyll forest on coastal floodplains (BC Act)	2.61
	1275 Tuckeroo - Riberry - Yellow Tulipwood littoral rainforest of the NSW North Coast Bioregion (TEC)	Littoral rainforest (BC Act) Littoral rainforest and coastal vine thickets of eastern Australia (EPBC Act)	0.31
	776 Coast Cypress Pine shrubby open forest of the NSW North Coast Bioregion (TEC)	Coastal Cypress Pine Forest (BC Act)	0.71


3.4 Mitchell's Rainforest Snail Habitat Assessment and Survey Results

Swamp sclerophyll forest that provides potential MRS habitat to varying degrees was present at each site (refer to **Illustration 3.1** and **Table 3.2**). The Option 2: Butler Street Reserve and Option 3: Midgen Park and Swamp Suffolk sites support the best quality potential MRS habitat, with a moist leaf litter layer and woody debris present. The Option 1: Sunrise Boulevard Bushland site has areas of habitat floristically similar to areas of known habitat locally, however had a drier microclimate associated with the sandplain location, and therefore was nominated as low quality potential habitat.

Target nocturnal surveys at each site on 28 January 2020 did not record any MRS, despite suitable conditions (confirmed during inspection of a Cumbebin Swamp reference site where MRS was active and detected with <5 minutes of survey effort). It is unclear if the failure to record the species is associated with the species absence at target sites or its cryptic nature (e.g. occurring at low density thus avoiding detection), or if environmental conditions (such as high water levels in Tallow Creek last year and subsequent understorey dieback) have impacted the species current distribution. Further surveys would be required to confirm this.

Table 3.2 Potential MRS Habitat at Over and Above Sites

Site	MRS Potential Habitat Quality	Area (ha)	Comment/Limitations
Option 1: Sunrise Boulevard Bushland	Low	1.55	<ul style="list-style-type: none"> ■ The majority of the site is sandplain with an understorey floristic composition indicative of wet heath or wallum, and not known MRS habitat. ■ Areas identified as low-quality potential MRS habitat are floristically similar to areas of known habitat locally; however, have the following limitations: <ul style="list-style-type: none"> - Location on a sandplain with high drainage, particularly for western/southern areas. - Evidence of past fire. - Historic disturbance in the north-western area. ■ Weed invasion is limited to the periphery where the site adjoins residential land.
Option 2: Butler Street Reserve	Moderate to High	1.36	<ul style="list-style-type: none"> ■ Areas identified as potential MRS habitat are floristically and structurally similar to areas of known habitat locally. ■ Recent MRS records are located within adjacent habitat <70 m from the site. ■ MRS occurrence may extend into non-mapped weed dominated areas. ■ The main habitat limitations are associated with an unknown disturbance history. The high weed occurrence at the site is indicative of at least a moderate disturbance history. ■ Easements to the south and west (including a large fill pile to the west) fragment the site from areas of known habitat to the south and south-west. ■ Weed invasion is moderate to high across most of the site.
Option 3: Midgen Park and Swamp Suffolk	Moderate to High	2.61	<ul style="list-style-type: none"> ■ Areas identified as potential MRS habitat are floristically and structurally similar to areas of known habitat locally.

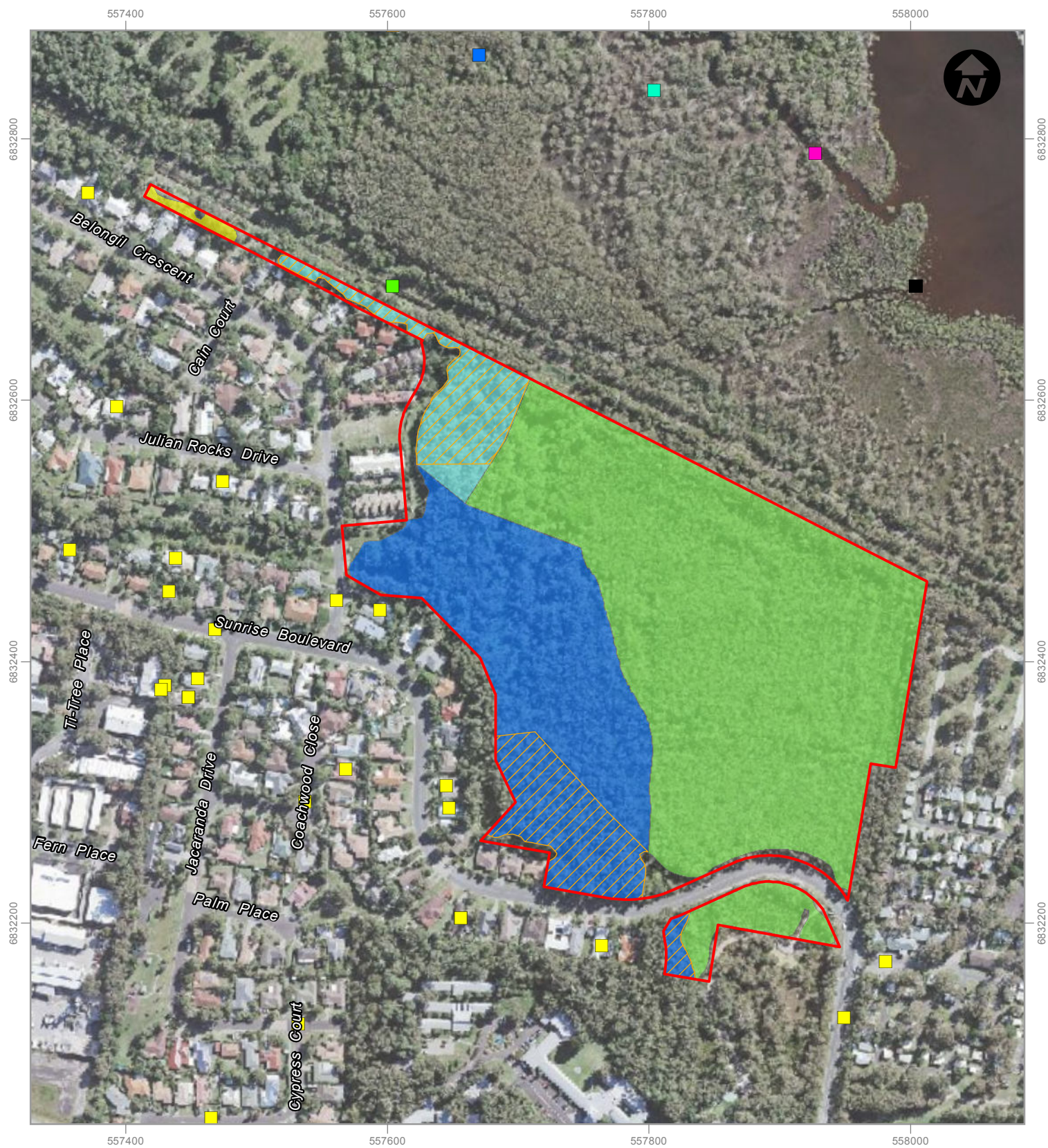


<i>Site</i>	<i>MRS Potential Habitat Quality</i>	<i>Area (ha)</i>	<i>Comment/Limitations</i>
			<ul style="list-style-type: none"> ■ Local BioNet MRS records are located on the eastern side of Tallow Creek in habitat contiguous to the site. ■ Understorey vegetation dieback is present across large portions of the site. ■ It is unclear if periodic saline water incursion in Tallow Creek extends into the site, making parts of the site at least periodically unsuitable for the MRS. ■ Weed invasion is mainly limited to the periphery where the site adjoins residential land.

3.5 Potential Occurrence Assessment for Other Threatened Fauna Species Associated with the Byron Bay Bypass

A potential occurrence assessment to determine the potential for threatened fauna species associated with the Byron Bay bypass to occur at the potential 'Over and Above' sites is provided in **Appendix A**. All sites have potential to support at least several threatened fauna species associated with the project, with.

- Option 1: Sunrise Boulevard Bushland providing potential habitat for at least 10 threatened fauna species.
- Option 2: Butler Street Reserve providing potential habitat for at least 11 threatened fauna species.
- Option 3: Midgen Park and Swamp Suffolk providing potential habitat for at least 11 threatened fauna species.



GDA 1994 MGA Zone 56

LEGEND

- Option 1: Sunrise Boulevard Bushland
- Potential MRS habitat - Low
- PCT 1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (TEC)
- PCT 1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (not TEC)
- PCT 1230 Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion (not TEC)
- Non-PCT vegetation (not TEC)

BioNet - Other Records

- Black-necked Stork
- Eastern Osprey
- Glossy Black-Cockatoo
- Koala
- Little Tern
- Pied Oystercatcher
- Stinking Cryptocarya

0 80 Metres

Option 1: Sunrise Boulevard Bushland - Sheet 1 of 3

559400

559600



6631400

6631400

559400

559600

GDA 1994 MGA Zone 56

LEGEND

- Option 2: Butler Street Reserve
- Potential MRS habitat - Moderate/High
- PCT 1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (TEC)
- PCT 1235 Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion (TEC)
- Non-PCT vegetation (not TEC)

- BioNet - Mitchell's Rainforest Snail

GeoLINK Byron Bay Bypass Survey

- Mitchell's Rainforest Snail

BioNet - Other Records

- Grey-headed Flying-fox

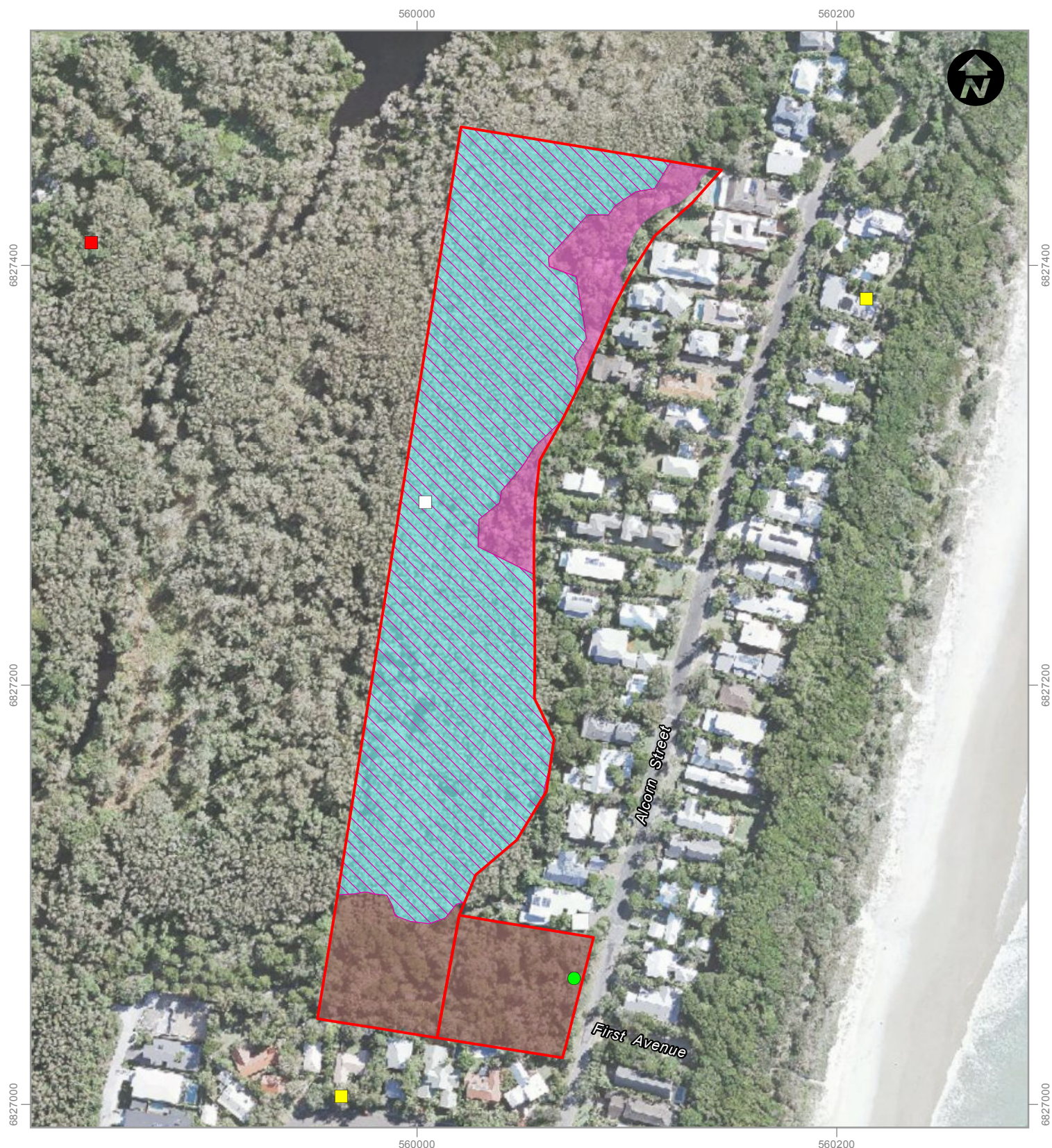
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Byron Bay Bypass - Mitchell's Rainforest Snail
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Option 2: Butler Street Reserve - Sheet 2 of 3

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Source of base data: DFSI
Date: 29/01/2020



GDA 1994 MGA Zone 56

LEGEND

- Option 3: Midgen Park and Swamp Suffolk
- Potential MRS habitat - Moderate/High
- PCT 1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (TEC)
- PCT 1275 Tuckerroo - Riberry - Yellow Tulipwood littoral rainforest of the NSW North Coast Bioregion (TEC)
- PCT 776 Coast Cypress Pine shrubby open forest of the NSW North Coast Bioregion (TEC)

● Stinking Cryptocarya (GeoLINK)

BioNet - Other Records

- Green and Golden Bell Frog
- Koala
- White Lace Flower

0 50 Metres

Option 3: Midgen Park and Swamp Suffolk - Sheet 3 of 3

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Source of base data: DFSI
Date: 29/01/2020

4. Discussion

The 'Over and Above' investigation sites with the best potential to support MRS (the focal species of the project) are:

- Option 2: Butler Street Reserve
- Option 3: Midgen Park and Swamp Suffolk.

The Option 1: Sunrise Boulevard Bushland and Option 3: Midgen Park and Swamp Suffolk sites comprise mostly intact vegetation with weed invasion largely restricted to the urban fringes. Therefore, there is very limited potential for bush regeneration to improve the habitat quality of these sites for the MRS.

The Option 2: Butler Street Reserve site is a degraded site with a high occurrence of weeds. It is also adjacent to known MRS habitat. Bush regeneration works at this site could improve the sites habitat value/potential for the MRS through:

- Managing weeds and assisting native regeneration
- Connecting (or improving connectivity between) the site and known MRS habitat to the south.

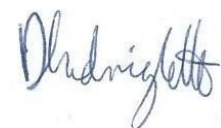
Mitchell's Rainforest Snail displays behaviour that is conducive to colonising suitable habitat (Parkyn 2014). The recording of 23 MRS at the Byron Bypass Burns Street swamp sclerophyll forest clearing area demonstrates the species ability to colonise fringing regenerating vegetation. This site was previously cleared and contained former road and utilities infrastructure; and was subsequently abandoned and allowed to regenerate, with the vegetation supporting both adult and juvenile MRS.

With consideration of the above, the Option 2: Butler Street Reserve site offers the best MRS habitat improvement opportunities, and if successful, would directly benefit the MRS population associated with the Byron Bypass project. Any bush regeneration works at the site should be guided by a Vegetation Management Plan (VMP) that considers the ecological values of the site.

Please contact me on 02 6687 7666 or dandrighetto@geolink.net.au if you would like to discuss this assessment further.

Yours sincerely

GeoLINK



David Andrighetto
Senior Ecologist

UPR	Description	Date issued	Issued By
3510-1004	First issue	29/01/2020	David Andrighetto



5. References

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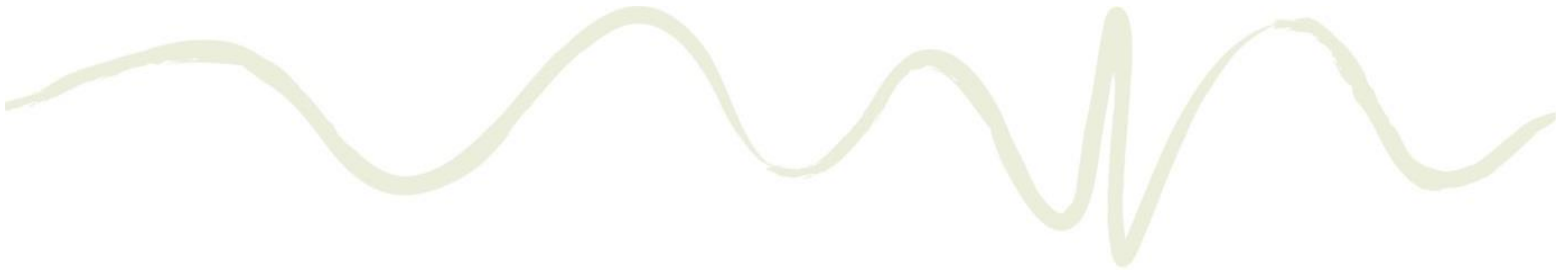


Appendix A

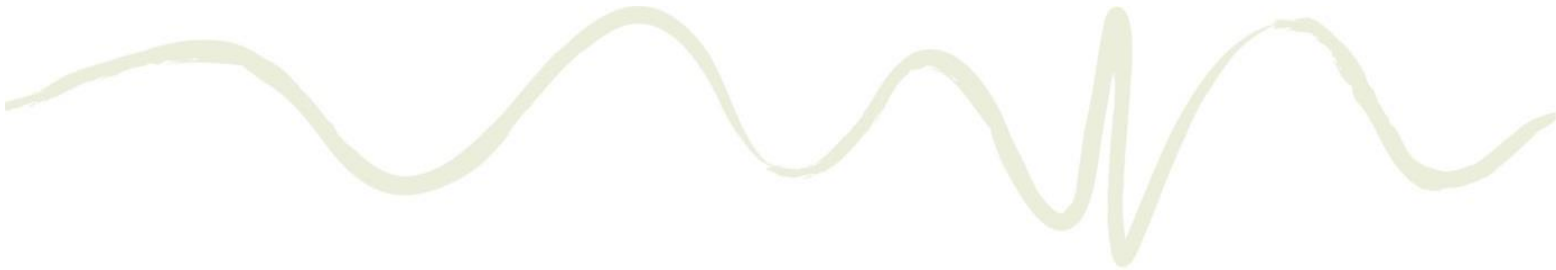
Threatened Fauna and TECs Associated with the Byron Bay Bypass and Potential Occurrence Assessment

Table A1 Threatened Species and Ecological Communities Impacted by Byron Bypass and Potential Occurrence at 'Over and Above' Sites

Common Name	Scientific Name	Byron Bypass Potential Occurrence (Source*)	BC Act Status	EPBC Act Status	Habitat Requirement^	Occurrence Potential		
						Option 1: Sunrise Boulevard Bushland	Option 2: Butler Street Reserve	Option 3: Midgen Park and Swamp Suffolk.
Fauna								
Common Planigale	<i>Planigale maculata</i>	Known (EIS)	Vulnerable	Not listed	Rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas with surface cover close to water.	Moderate	Moderate	Likely
Eastern Long-eared Bat	<i>Nyctophilus bifax</i>	Known (EIS)	Vulnerable	Not listed	Lowland subtropical rainforest and wet and swamp eucalypt forest, extending to adjacent moist eucalypt forest.	Moderate	Moderate	Moderate
Southern Myotis	<i>Myotis macropus</i>	Known (EIS)	Vulnerable	Not listed	Bodies of water, rainforest streams, large lakes, reservoirs.	Low-moderate	Low	Low-moderate
Little Bent-wing Bat	<i>Miniopterus australis</i>	Known (EIS)	Vulnerable	Not listed	Moist eucalypt forest, rainforest and dense coastal scrub.	Likely (foraging habitat)	Likely (foraging habitat)	Likely (foraging habitat)
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	Known (EIS)	Vulnerable	Not listed	Woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest.	Moderate	Moderate	Moderate
Eastern Freetail Bat	<i>Mormopterus norfolkensis</i>	Known (EIS)	Vulnerable	Not listed	Rainforests to open forests and woodlands often along watercourses.	Moderate	Moderate	Moderate
Black Bittern	<i>Ixobrychus flavicollis</i>	Known (EIS)	Vulnerable	Not listed	Dense vegetation fringing and in streams, swamps, tidal creeks and mudflats, particularly amongst swamp sheoaks and mangroves.	Moderate	Moderate	Moderate
Pale-vented Bush-hen	<i>Amaurornis moluccana</i>	Known (EIS)	Vulnerable	Not listed	Variety of coastal wetlands from wetlands, mangroves, lagoons and swamps to river margins and creeks running through rainforest.	Moderate	Likely	Likely



Common Name	Scientific Name	Byron Bypass Potential Occurrence (Source*)	BC Act Status	EPBC Act Status	Habitat Requirement^	Occurrence Potential		
						Option 1: Sunrise Boulevard Bushland	Option 2: Butler Street Reserve	Option 3: Midgen Park and Swamp Suffolk.
Mitchell's Rainforest Snail	<i>Thersites mitchellae</i>	Known (EIS, EPBC Act referral)	Endangered	Critically Endangered	Remnant areas of lowland subtropical rainforest and swamp forest on alluvial soils, found amongst leaf litter on the forest floor.	Low-moderate	Moderate/high	Moderate/high
White-eared Monarch	<i>Carterornis leucotis</i>	Predicted (EIS)	Vulnerable	Not listed	Coastal rainforest, swamp forest and wet eucalypt forest, prefers edges where trees frequently covered with vines.	Moderate	Moderate	Moderate
Wompoo Fruit-Dove	<i>Ptilinopus magnificus</i>	Predicted (EIS)	Vulnerable	Not listed	Rainforests, low-elevation moist eucalypt forest, and Brush Box forests.	Low-moderate	Low-moderate	Low-moderate
Rose-crowned Fruit-Dove	<i>Ptilinopus regina</i>	Predicted (EIS)	Vulnerable	Not listed	Subtropical and dry rainforest, moist eucalypt forest and swamp forest.	Low-moderate	Low-moderate	Low-moderate
Superb Fruit-Dove	<i>Ptilinopus superbus</i>	Predicted (EIS)	Vulnerable	Not listed	Subtropical and dry rainforest, moist eucalypt forest and swamp forest.	Low-moderate	Low-moderate	Low-moderate
Eastern Bentwing-bat	<i>Miniopterus orianae oceanensis</i>	Predicted (EIS)	Vulnerable	Not listed	Forest or woodland, roost in caves, old mines and stormwater channels.	Likely (foraging habitat)	Likely (foraging habitat)	Likely (foraging habitat)
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	Predicted (EIS)	Vulnerable	Vulnerable	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Likely	Known	Likely
Koala	<i>Phascolarctos cinereus</i>	Local records	Vulnerable	Vulnerable	Appropriate food trees in forests and woodlands, and treed urban areas.	Known	Low (no preferred food trees; may move through the site)	Low (no preferred food trees; may move through the site)



Common Name	Scientific Name	Byron Bypass Potential Occurrence (Source*)	BC Act Status	EPBC Act Status	Habitat Requirement^	Occurrence Potential		
						Option 1: Sunrise Boulevard Bushland	Option 2: Butler Street Reserve	Option 3: Midgen Park and Swamp Suffolk.
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	Local records (EPBC Act referral)	Vulnerable	Endangered	Dry and moist eucalypt forests and rainforests, fallen hollow logs, large rocky outcrops.	Low	Low	Low
White-throated Needletail	<i>Hirundapus caudacutus</i>	Local records (EPBC Act referral)	Not listed	Vulnerable	Most often recorded aerial foraging above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy. Breeding does not occur in Australia.	Low on site (likely aerial forager above site)	Low on site (likely aerial forager above site)	Low on site (likely aerial forager above site)
Threatened Ecological Communities								
Swamp Sclerophyll Forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	-	Known (EIS)	TEC	Not listed	-	Present	Present	Present
Littoral rainforests and coastal vine thickets of eastern Australia	-	Known (EPBC Act referral)	Not listed	TEC		Not present.	Not present.	Present.

* EIS (GHD 2016); EPBC Act referral (GHD 2019).

^ Source: NSW Office of Environment and Heritage threatened species profile database (<https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species>) and/or Australian Government Department of the Environment and Energy *Species Profile and Threats Database* (<https://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>).