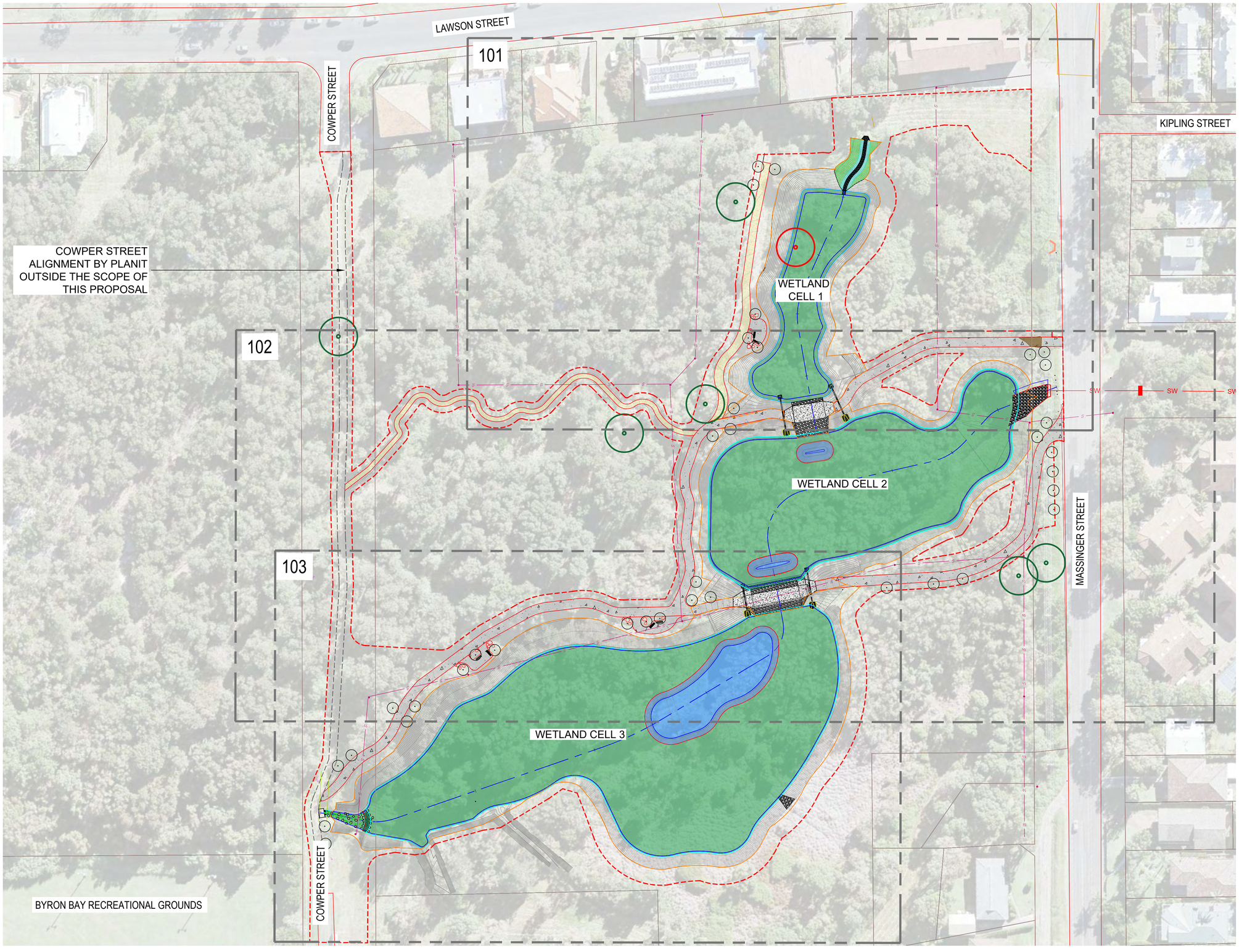
Appendix 1 – Proposal Plan



LEGEND

- CONCRETE CYCLEWAY — REFER DETAIL 02_702
- DECOMPOSED GRANITIC SAND PATH — REFER DETAIL 01_702
- EXISTING TREE RETAINED — PROTECTED TO MEET AS 4970-2009
- PROPOSED FEATURE TREE — REFER PLANTING PLANS 501-503
- EXTENT OF EARTH WORKS
- OPERATING WATER LEVEL (OWL)
- FINISHED FLOOR LEVEL (FFL)
- EXTENT OF WORKS
- PROPOSED 0.2m CONTOURS
- SEWER INFRASTRUCTURE
- SEWER ACCESS HOLE
- S/W PIPE HEADWALL
- CADESTRAL BOUNDARIES
- COWPER STREET ALIGNMENT
- EXISTING TREE REMOVED

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CLIENT: Byron Shire Council

DRAWING:
SITE CONTEXT & SHEET LAYOUT PLAN

PROJECT:
SANDHILLS WETLAND
DETAILED DESIGN PACKAGE

REV.	ISSUE / AMENDMENTS	DATE
A	*PRE -DETAILED DESIGN PACKAGE COUNCIL REVIEW*	*17.11.2021*
B	*DETAILED DESIGN PACKAGE 70%*	*28.02.2022*
C	*DETAILED DESIGN PACKAGE 100%*	*02.11.2022*
D	*DETAILED DESIGN PACKAGE AMENDMENTS 100%*	*17.11.2022*
E	*DETAILED DESIGN PACKAGE AMENDMENTS 100%*	*13.12.2022*
F	*FOR TENDER*	*25.08.2023*

N

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SCALE 1:600 @ A1 (0 5 10 15 20 25m)
REV. F

DESIGNED KC
DRAWN RS/TC
CHECKED DM

CAD FILE No. **1-91194_SANDHILLS_DD.DWG**
SHEET No. **1-191194_DD_002**

LEGEND

- CUT DEPTH 3.0-2.0m
- CUT DEPTH 2.0 - 1.0m
- CUT DEPTH 1.0 - 0.5m
- CUT DEPTH 0.5-0m
- FILL DEPTH 0-0.25m
- FILL DEPTH 0.25-0.5m
- FILL DEPTH 0.5-0.75m
- FILL DEPTH 0.75-1m
- EXTENT OF WORKS
- SEWER INFRASTRUCTURE

SETOUT NOTE:
SETOUT COORDINATES TO BE PROVIDED IN DWG. DIGITAL FORMAT FOR CONSTRUCTION

SERVICES NOTE:
LOCATIONS OF ALL SERVICES TO BE CONFIRMED ON SITE. REFER TO GENERAL ARRANGEMENT PLANS FOR STORMWATER AND SEWAGE PIPES

*** BULKING FACTOR NOTE**:
A BULKING FACTOR HAS NOT BEEN APPLIED TO THESE EARTHWORKS VOLUMES.

CONTAMINATED CUT NOTE:
REFER TO ENV SOLUTIONS (2021) FOR DETAILS ON SITE CUT MATERIALS AND THE ACID SULPHATE SOIL MANAGEMENT PLAN (ENV SOLUTIONS 2021)

CUT & FILL TABLE

WETLAND CELL	Topsoil m³ (300mm assumed)	cut vol m³ 300mm below FSL	fill vol m³	Planting Media m³	Excess spoil m³
1	719	1903	120	725	1783
2	1566	3235	102	1993	3238
3	2785	9700	15	2512	9685
Paths	256	25	625	240	-600
TOTAL	**3636**	**15642**	**1122**	**3437**	**14520**
* This includes the open Water Sections					

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DRAWING:
SITE CUT & FILL PLAN

PROJECT:
SANDHILLS WETLAND
DETAILED DESIGN PACKAGE

REV.	ISSUE / AMENDMENTS	DATE
A	*PRE -DETAILED DESIGN PACKAGE COUNCIL REVIEW*	*17.11.2021*
B	*DETAILED DESIGN PACKAGE 70%*	*28.02.2022*
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E	*DETAILED DESIGN PACKAGE AMENDMENTS 100%*	*13.12.2022*
F	*FOR TENDER*	*25.08.2023*

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SCALE
1:600 @ A1
0 5 10 15 20 25m

REV. **F**

DESIGNED KC
DRAWN RS/TC
CHECKED DM

CAD FILE No.
1-91194_SANDHILLS_DD.DWG

SHEET No.
1-191194_DD_003

LEGEND

- EXTENT OF WORKS
- CONCRETE CYCLE WAY — REFER DETAIL 02_702
- DECOMPOSED GRANITIC SAND PATH — REFER DETAIL 01_702
- EXISTING TREE REMOVED
- EXISTING TREE RETAINED — PROTECTED TO MEET AS 4970-2009
- EXTENT OF EARTH WORKS
- OPERATING WATER LEVEL (OWL)
- FINISHED FLOOR LEVEL (FFL)
- PROPOSED 0.2m CONTOURS
- SEWER INFRASTRUCTURE
- SEWER ACCESS HOLE
- S/W PIPE HEADWALL
- CADESTRAL BOUNDARIES
- COWPER STREET ALIGNMENT

- P1 MACROPHYTE ZONE — 2.6-2.9mAHD 6/m² REFER 01_500 & 05_703
- P2 MACROPHYTE ZONE — 2.6-2.9mAHD 6/m² REFER 01_500 & 05_703
- P3 EPHEMERAL ZONE — 2.9-3.2m AHD 6/m² REFER 04_500 & 02_703
- P4 DRY BATTER ZONE — >3.2m AHD 4/m² REFER 04_500 & 03_703
- P4 DRY BATER ZONE LOW PLANTING — NO TREES OR LARGE SHRUBS
- P5 MACROPHYTE ZONE — 2.0-2.2mAHD 6/m² REFER 02_500 & 05_703
- P6 MACROPHYTE ZONE — 2.0-2.2mAHD 6/m² REFER 02_500 & 05_703
- P7 MACROPHYTE ZONE — 1.8-1.9mAHD 6/m² REFER 03_500 & 05_703
- P8 MACROPHYTE ZONE — 1.8-1.9mAHD 6/m² REFER 03_500 & 05_703
- P9 FROG MARSH ZONE — 1.8-1.9mAHD 6/m² REFER 03_500 & 05_703
- P10 FOREST PLANTING ZONE — >1.8m AHD 4/m² REFER 03_500 & 05_703
- P10 FOREST PLANTING ZONE LOW — NO TREES OR LARGE SHRUBS
- P11 SHOULDER PLANTING ZONE — 4/m² REFER SCHEDULES 04_500 & 03_703
- SHADE FEATURE TREE — REFER DETAIL 01_703 & 05_500

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CLIENT: Byron Shire Council

DRAWING: SITE EXTENT OF WORKS

PROJECT: SANDHILLS WETLAND DETAILED DESIGN PACKAGE

REV.	ISSUE / AMENDMENTS	DATE
A	*PRE -DETAILED DESIGN PACKAGE COUNCIL REVIEW*	*17.11.2021*
B	*DETAILED DESIGN PACKAGE 70%*	*28.02.2022*
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F	*FOR TENDER*	*25.08.2023*

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SCALE 1:600 @ A1 (0 5 10 15 20 25m)

REV. F

DESIGNED KC
DRAWN RS/TC
CHECKED DM

CAD FILE No. 1-91194_SANDHILLS_DD.DWG

SHEET No. 1-191194_DD_004

Appendix 2 – Flora List

FLORA SURVEY SPECIES LIST [NATIVE]. SANDHILLS PRECINCT BUSHLAND @ COWPER STREET BYRON BAY

SPECIES LISTED ALPHABETICALLY BY GENUS_SPECIES > FAMILY

SCIENTIFIC NAME	COMMON NAME	FAMILY	NSW SPECIES CODE	GROWTH FORM GROUP
Acacia aulacocarpa	Salwood	Fabaceae (Mimosoideae)	7581	Tree (TG)
Acacia longifolia subsp. sophorae	Coastal Wattle	Fabaceae (Mimosoideae)	10791	Shrub (SG)
Acacia maidenii	Maiden's Wattle	Fabaceae (Mimosoideae)	3821	Tree (TG)
Acacia melanoxylon	Blackwood	Fabaceae (Mimosoideae)	3824	Tree (TG)
Acacia fimbriata	Brisbane Wattle	Fabaceae (Mimosoideae)	3774	Shrub (SG)
Acronychia imperforata	Beach Acronychia	Rutaceae	8418	Shrub (SG)
Acrotriche aggregata	Red Cluster Heath	Ericaceae	2580	Shrub (SG)
Alectryon coriaceus	Beach Alectryon	Sapindaceae	5872	Shrub (SG)
Archirhodomyrtus beckleri	Rose Myrtle	Myrtaceae	3976	Shrub (SG)
Archontophoenix cunninghamiana	Bangalow Palm	Arecaceae	6458	Other (OG)
Asplenium australasicum	Bird's Nest Fern	Aspleniaceae	8031	Fern (EG)
Austromyrtus dulcis	Midgen Berry	Myrtaceae	3979	Shrub (SG)
Banksia ericifolia	Heath-leaved Banksia	Proteaceae	5342	Shrub (SG)
Banksia integrifolia	Coast Banksia	Proteaceae	5343	Tree (TG)
Banksia oblongifolia	Fern-leaved Banksia	Proteaceae	5345	Shrub (SG)
Blechnum indicum	Swamp Water Fern	Blechnaceae	8057	Fern (EG)
Brachychiton acerifolius	Flame Tree	Malvaceae	6126	Tree (TG)
Breynia oblongifolia	Coffee Bush	Phyllanthaceae	2695	Shrub (SG)
Callistemon pachyphyllus	Wallum Bottlebrush	Myrtaceae	4010	Shrub (SG)
Callistemon salignus	Willow Bottlebrush	Myrtaceae	4015	Shrub (SG)
Callitris columellaris	Coast Cypress	Cupressaceae	2278	Tree (TG)
Calochlaena dubia	Rainbow Fern	Dicksoniaceae	8341	Other (OG)
Carpobrotus glaucescens	Pigface	Aizoaceae	1025	Forb (FG)
Castanospermum australe	Black Bean	Fabaceae (Faboideae)	2796	Tree (TG)
Casuarina equisetifolia	Beach Oak	Casuarinaceae	9247	Tree (TG)
Casuarina glauca	Swamp Oak	Casuarinaceae	2022	Tree (TG)
Centella asiatica	Indian Pennywort	Apiaceae	1106	Forb (FG)
Choretrum candollei	White Sour Bush	Santalaceae	5856	Shrub (SG)
Cissus antarctica	Water Vine	Vitaceae	6282	Other (OG)
Cissus sterculiifolia	Water Vine	Vitaceae	6286	Other (OG)
Commelina cyanea	Native Wandering Jew	Commelinaceae	2209	Forb (FG)
Cordyline petiolaris	Broad-leaf Palm Lily	Asteliaceae	7386	Other (OG)
Commersonia bartramia	Brown Kurrajong	Sterculiaceae	6129	Tree (TG)
Corymbia henryi	Large-leaved Spotted Gum	Myrtaceae	9689	Tree (TG)

Cryptocarya foetida	Stinking Cryptocarya	Lauraceae	3477	Tree (TG)
Cryptocarya obovata	Pepperberry	Lauraceae	3484	Tree (TG)
Cryptocarya triplinervis var. pubens	Hairy 3-veined Laurel	Lauraceae	8390	Tree (TG)
Cryptocarya triplinervis var. triplinervis	3-veined Laurel	Lauraceae	9275	Tree (TG)
Cupaniopsis anacardioides	Tuckeroo	Sapindaceae	5884	Tree (TG)
Crinum pedunculatum	Swamp Lily	Amaryllidaceae	3539	Forb (FG)
Cyclophyllum longipetalum	Coast Canthium	Rubiaceae	11599	Tree (TG)
Cyclosorus dentatus	Binung	Thelypteridaceae	14610	Fern (EG)
Cyperus difformis	Dirty Dora	Cyperaceae	7143	Grass & grasslike (GG)
Cyperus polystachyos	Bunchy Sedge	Cyperaceae	8483	Grass & grasslike (GG)
Dianella caerulea	Blue Flax-lily	Phormiaceae	3540	Forb (FG)
Dicksonia youngiae	Bristly Treefern	Dicksoniaceae	8083	Other (OG)
Diospyros fasciculosa	Grey Ebony	Ebenaceae	2563	Tree (TG)
Duboisia myoporoides	Corkwood	Solanaceae	6036	Tree (TG)
Dysoxylum mollissimum subsp. molle	Red Bean	Meliaceae	11079	Tree (TG)
Elaeocarpus obovatus	Hard Quandong	Elaeocarpaceae	2573	Tree (TG)
Elaeocarpus reticulatus	Blueberry Ash	Elaeocarpaceae	2574	Shrub (SG)
Eleocharis sphacelata	Spike Rush	Cyperaceae	6988	Grass & grasslike (GG)
Eucalyptus curtissi	Plunkett Mallee	Myrtaceae	N/A	Tree (TG)
Eucalyptus tereticornis	Blue Gum	Myrtaceae	4191	Tree (TG)
Euroschinus falcatus var. falcatus	Ribbonwood	Anacardiaceae	7734	Tree (TG)
Eustrephus latifolius	Wombat Berry	Luzuriagaceae	6015	Other (OG)
Exocarpos latifolius	Broad-leaved Native Cherry	Santalaceae	6383	Shrub (SG)
Ficus coronata	Creek Sandpaper Fig	Moraceae	7479	Shrub (SG)
Ficus watkinsiana	Strangling Fig	Moraceae	3927	Tree (TG)
Flagellaria indica	Whip Vine	Flagellariaceae	7106	Other (OG)
Gahnia clarkei	Tall Saw-sedge	Cyperaceae	2432	Grass & grasslike (GG)
Geitonoplesium cymosum	Scrambling Lily	Luzuriagaceae	6016	Other (OG)
Gleichenia dicarpa	Pouched Coral Fern	Gleicheniaceae	7138	Fern (EG)
Glochidion ferdinandi	Cheese Tree	Phyllanthaceae	7866	Tree (TG)
Glochidion sumatranum	Umbrella Cheese Tree	Phyllanthaceae	8464	Tree (TG)
Glycine clandestina	Twining glycine	Fabaceae (Faboideae)	2860	Other (OG)
Gompholobium pinnatum	Pinnate Wedge Pea	Fabaceae (Faboideae)	2868	Shrub (SG)
Guioa semiglauca	Wild Quince	Sapindaceae	5917	Tree (TG)
Halfordia kendack	Saffron Heart	Rutaceae	5802	Tree (TG)
Hibbertia scandens	Climbing Guinea Flower	Dilleniaceae	2548	Other (OG)
Homalanthus populifolius	Bleeding Heart	Euphorbiaceae	11947	Shrub (SG)

Hovea acutifolia	Pointed-leaf Hovea	Fabaceae (Faboideae)	2874	Shrub (SG)
Hydrocotyle bonariensis	Pennywort	Apiaceae	1123	Forb (FG)
Hymenosporum flavum	Native Frangipani	Pittosporaceae	4678	Shrub (SG)
Hypolaena fastigiata	Tassel Rush	Restionaceae	5533	Grass & grasslike (GG)
Imperata cylindrica	Blady Grass	Poaceae	6803	Grass & grasslike (GG)
Isolepis inundata	Club Rush	Cyperaceae	2454	Grass & grasslike (GG)
Jagera pseudorhus var. pseudorhus	Foambark	Sapindaceae	12514	Tree (TG)
Juncus planifolius	Broad-leaf Rush	Juncaceae	11903	Grass & grasslike (GG)
Juncus usitatus	Common Rush	Juncaceae	3350	Grass & grasslike (GG)
Leersia hexandra	Swamp Ricegrass	Poaceae	5024	Grass & grasslike (GG)
Lepiderema pulchella	Fine-leaved Tuckeroo	Sapindaceae	8291	Tree (TG)
Leptospermum laevigatum	Coast Teatree	Myrtaceae	4222	Shrub (SG)
Litsea australis	Brown Bolly Gum	Lauraceae	8675	Tree (TG)
Livistona australis	Cabbage Palm	Arecaceae	1221	Other (OG)
Lomandra longifolia	Spiny-headed Mat-rush	Lomandraceae	6308	Grass & grasslike (GG)
Lophostemon suaveolens	Swamp Mahogany	Myrtaceae	4243	Tree (TG)
Ludwigia octovalvis	Willow Primrose	Onagraceae	7297	Forb (FG)
Lygodium microphyllum	Climbing Fern	Schizaeaceae	8179	Fern (EG)
Lygodium microphyllum	Climbing Fern	Schizaeaceae	8179	Fern (EG)
Macaranga tanarius	Blush Macaranga	Euphorbiaceae	2732	Tree (TG)
Mallotus discolor	White Kamala	Euphorbiaceae	2734	Tree (TG)
Melaleuca quinquenervia	Broad-leaved Paperbark	Myrtaceae	4260	Tree (TG)
Melastoma affine	Blue Tongue	Melastomataceae	3675	Shrub (SG)
Melicope elleryana	Pink-flowered Doughwood	Rutaceae	8659	Tree (TG)
Monotoca scoparia	Prickly Broom Heath	Ericaceae	2649	Shrub (SG)
Myoporum acuminatum	Coast Boobialla	Myoporaceae	7906	Shrub (SG)
Neolitsea australiensis	Green Bolly Gum	Lauraceae	8386	Tree (TG)
Notelaea longifolia	Large Mock-olive	Oleaceae	4318	Tree (TG)
Oplismenus aemulus	Beard Grass	Poaceae	5044	Grass & grasslike (GG)
Ottochloa gracillima	Shade Grass	Poaceae	5048	Grass & grasslike (GG)
Pandanus tectorius var. australianus	Screw Pine	Pandanaceae	9349	Other (OG)
Parsonsia straminea	Common Silkpod	Apocynaceae	1185	Other (OG)
Paspalum distichum	Water Couch	Poaceae	5087	Grass & grasslike (GG)
Persicaria attenuata	Knotweed	Polygonaceae	5277	Forb (FG)
Persicaria strigosa	Prickly Smartweed	Polygonaceae	5286	Forb (FG)
Persoonia stradbrokensis	Coast Geebung	Proteaceae	8596	Shrub (SG)

Persoonia virgata	Fine-leaf Geebung	Proteaceae	5476	Shrub (SG)
Philydrum lanuginosum	Frogsmouth	Philydraceae	7065	Forb (FG)
Phragmites australis	Common Reed	Poaceae	5113	Grass & grasslike (GG)
Pimelea linifolia	Slender Rice Flower	Thymelaeaceae	6182	Shrub (SG)
Pittosporum undulatum	Sweet Pittosporum	Pittosporaceae	4685	Shrub (SG)
Planchonella australis	Black Apple	Sapotaceae	5936	Tree (TG)
Platycerium bifurcatum	Elkhorn	Polypodiaceae	8159	Fern (EG)
Platycerium superbum	Staghorn	Polypodiaceae	8161	Fern (EG)
Polyscias elegans	Celery Wood	Araliaceae	1209	Tree (TG)
Polyscias murrayi	Pencil Cedar	Araliaceae	1210	Tree (TG)
Pseuderanthemum variabile	Pastel Flower	Acanthaceae	1010	Forb (FG)
Pseudognaphalium luteoalbum	Jersey Cudweed	Asteraceae	7780	Forb (FG)
Pteridium esculentum	Bracken	Dennstaedtiaceae	6403	Fern (EG)
Schizaea dichotoma	Branched Comb Fern	Schizaeaceae	8182	Fern (EG)
Schoenus brevifolius	Bog Rush	Cyperaceae	2492	Grass & grasslike (GG)
Smilax australis	Barbwire Vine	Smilacaceae	7592	Other (OG)
Stephania japonica var. discolor	Snake Vine	Menispermaceae	8428	Other (OG)
Stenocarpus sinuatus	Firewheel	Proteaceae	5482	Tree (TG)
Sticherus lobatus	Spreading Shield Fern	Gleicheniaceae	7035	Fern (EG)
Synoum glandulosum subsp. glandulosum	Scentless Rosewood	Meliaceae	11178	Shrub (SG)
Syzygium australe	Brush Cherry	Myrtaceae	6778	Tree (TG)
Syzygium luehmannii	Riberry	Myrtaceae	4291	Tree (TG)
Themeda australis	Kangaroo Grass	Poaceae	7770	Grass & grasslike (GG)
Trophis scandens	Burny Vine	Moraceae	10416	Other (OG)
Typha orientalis	Broad-leaved Cumbungi	Typhaceae	6217	Grass & grasslike (GG)
Waterhousea floribunda	Weeping Lillipilli	Myrtaceae	6799	Tree (TG)
Wikstroemia indica	Bootlace Bark	Thymelaeaceae	6197	Shrub (SG)

Denotes species listed as Vulnerable under the *Biodiversity Conservation Act 2016*

FLORA SURVEY SPECIES LIST [EXOTIC/WEEDS]. SANDHILLS PRECINCT BUSHLAND @ COWPER STREET BYRON BAY

SPECIES LISTED ALPHABETICALLY BY GENUS_SPECIES > FAMILY

SCIENTIFIC NAME	COMMON NAME	FAMILY	NSW SPECIES CODE
Ageratina adenophora	Crofton Weed	Asteraceae	1255
Ageratina houstonianum	Billygoat Weed	Asteraceae	1258
Ageratina riparia	Mistflower	Asteraceae	1256
Ambrosia artemisiifolia	Annual Ragweed	Asteraceae	1259
Andropogon virginicus	Whisky Grass	Poaceae	4748
Avena sativa	Wild Oats	Poaceae	4782
Axonopus compressus	Broad-leaved Carpet Grass	Poaceae	4785
Axonopus fissifolius	Carpet Grass	Poaceae	11194
Baccharis halimifolia	Groundsel	Asteraceae	1281
Bidens pilosa	Cobblers Pegs	Asteraceae	1283
Briza minor	Shivery Grass	Poaceae	4801
Canna indica			
Chrysanthemoides monilifera ssp. rotundata	Bitou Bush	Asteraceae	8686
Cinnamomum camphora	Camphor Laurel	Lauraceae	3471
Conyza sumatrensis	Fleabane	Asteraceae	10442
Crassocephalum crepidioides	Thickhead	Asteraceae	1421
Cynodon dactylon	Common Couch	Poaceae	6540
Cyperus brevifolius	Mullumbimby Couch	Cyperaceae	2353
Desmodium uncinatum	Siver leaf Desmodium	Fabaceae	8824
Digitaria didactyla	Blue Couch	Poaceae	4904
Dypsis lutescens	Golden Cane Palm	Arecaceae	11671
Erythrina sykesii	Coral Tree	Fabaceae	8689
Eugenia uniflora	Brazillian Cherry	Myrtaceae	11438
Gloriosa superba	Scrambling Lily	Colchicaceae	3548
Inga edulis	Ice-cream Bean	Fabaceae	11603
Ipomoea cairica	Five-leaved Morning Glory	Convolvulaceae	2225
Ipomoea indica	Blue Morning Glory	Convolvulaceae	2227
Ipomoea purpurea	Morning Glory	Convolvulaceae	2229
Lantana camara	Lantana	Verbenaceae	6248
Ligustrum lucidum	Privet	Oleaceae	4343
Melicope rubra	Little Euodia	Rutaceae	14078
Melinis minutiflora	Molasses Grass	Poaceae	7291
Morus alba	Mulberry	Moraceae	3930
Murraya paniculata	Murraya	Rutaceae	9042
Musa sp.	Banana	Musaceae	MUSA
Nephrolepis cordifolia	Fishbone Fern	Davalliaceae	8088
Ochna serrulata	Mickey Mouse Bush	Ochnaceae	4306
Paspalum dilatatum	Vasey Grass	Poaceae	5086

Paspalum wettsteinii	Broad-leaved Vasey Grass	Poaceae	8715
Passiflora suberosa	Corky Passion flower	Passifloraceae	4649
Passiflora subpeltata	White Passionflower	Passifloraceae	4650
Pennisetum clandestinum	Kikuyu	Poaceae	5096
Pennisetum purpureum	Elephant Grass	Poaceae	5098
Pinus elliottii	Slash Pine	Pinaceae	8777
Asparagus aethiopicus	Asparagus Fern	Asparagaceae	11784
Asparagus plumosus	Climbing Asparagus Fern	Asparagaceae	11785
Prunis persica			
Psidium cattleianum	Cherry Guava	Myrtaceae	10495
Schefflera actinophylla	Umbrella Tree	Araliaceae	8701
Schinus terebinthifolius	Pepper Tree	Anacardiaceae	10918
Senecio madagascariensis	Fireweed	Asteraceae	6465
Senna pendula	Easter Cassia	Fabaceae	7376
Senna septemtrionalis	Smooth Cassia	Fabaceae	10505
Setaria sphacelata	Pigeon Grass	Poaceae	5167
Sida rhombifolia	Paddys Lucerne	Malvaceae	3673
Solanum mauritianum	Wild Tobacco	Solanaceae	6090
Solanum nigrum	Blackberry Nightshade	Solanaceae	6091
Solanum seaforthianum	Climbing Nightshade	Solanaceae	6104
Sphagneticola trilobata	Singapore Daisy	Asteraceae	12815
Syagrus romanzoffiana	Cocos Palm	Arecaceae	11731
Verbena bonariensis	Purple Top	Verbenaceae	6256

Appendix 3 – BAM Vegetation Integrity Plot Survey Data Sheets

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Zone ID	Recorders			
Date	29/11/2021	Sandhills	771	TR			
Zone 56	Datum MGAZ	**Plot ID**	T1	**Plot dimensions**	20m x 50m	**Photos**	YES
Easting 560424	Northing 6831287	**IBRA region**	SEQLD	**Midline bearing from 0 m**	122º		
Vegetation Class		Heathlands				Confidence: (H) M L	
Plant Community Type		771		**EEC:** NO		Confidence: H (M) L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of **Native Richness**	**Trees**	2
	Shrubs	4
	Grasses etc.	1
	Forbs	1
	Ferns	0
	Other	0
Sum of **Cover** of native vascular plants by growth form group	**Trees**	20
	Shrubs	76.7
	Grasses etc.	0.1
	Forbs	0.1
	Ferns	0
	Other	0
High Threat Weed cover		3.1

BAM Attribute (1000 m² plot)		
DBH	**# Tree Stems Count**	**# Stems with Hollows**
80 + cm	-	0
50 – 79 cm	0	
30 – 49 cm	Yes	
20 – 29 cm	Yes	
10 – 19 cm	Yes	
5 – 9 cm	Yes	
< 5 cm	Yes	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	9.5m	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	100	98	10	100	60	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	73.6																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1	O	Area historically sand mined
Cultivation (inc. pasture)	3	O	*Leptospermum laevigatum* utilised post mining
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness	1	NR	Low
Other	2	R	Anthropogenic debris

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet 2 of 2		Survey Name	Plot Identifier	Recorders
Date	29/11/2021	Sandhills	T1	TR

GF Code	*Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable*	N, E or HTW	Cover	Abund	stratum	voucher
Shrub (SG)	*Leptospermum laevigatum*	N	75			
Shrub (SG)	*Acacia longifolia subsp. sophorae*	N	1	10		
Tree (TG)	*Banksia integrifolia*	N	15			
-	*Pinus elliottii*	HTW	3	3		
Tree (TG)	*Acacia maidenii*	N	5			
Shrub (SG)	*Persoonia virgata*	N	0.2	1		
Grass (GG)	*Baumea rubiginosa*	N	0.1	10		
-	*Sporobolus pyramidalis*	E	0.1	5		
Forb (FG)	*Drosera spatulata*	N	0.1	2		
-	*Andropogon virginicus*	HTW	0.1	3		
Shrub (SG)	*Persoonia stradbrokensis*	N	0.5	1		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Zone ID	Recorders			
Date	29/11/2021	Sandhills	751	TR			
Zone 56	Datum MGAZ	**Plot ID**	T2	**Plot dimensions**	20m x 50m	**Photos**	YES
Easting 560642	Northing 6831272	**IBRA region**	SEQLD	**Midline bearing from 0 m**	13º		
Vegetation Class		Littoral Rainforest				Confidence: H M L	
Plant Community Type		751		**EEC:** Yes		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of **Native Richness**	**Trees**	9
	Shrubs	5
	Grasses etc.	2
	Forbs	0
	Ferns	0
	Other	2
Sum of **Cover** of native vascular plants by growth form group	**Trees**	85.2
	Shrubs	0.6
	Grasses etc.	0.2
	Forbs	0
	Ferns	0
	Other	0.6
High Threat Weed cover		28.3

BAM Attribute (1000 m² plot)		
DBH	**# Tree Stems Count**	**# Stems with Hollows**
80 + cm	-	0
50 – 79 cm	0	
30 – 49 cm	Yes	
20 – 29 cm	Yes	
10 – 19 cm	Yes	
5 – 9 cm	Yes	
< 5 cm	Yes	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	64m	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	95	60	75	20	95	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	69																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1	O	Area historically sand mined
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness	2	NR	Weeds abundant
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet 2 of 2		Survey Name	Plot Identifier	Recorders
Date	29/11/2021	Sandhills	T2	TR

GF Code	*Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable*	N, E or HTW	Cover	Abund	stratum	voucher
Tree (TG)	*Banksia integrifolia*	N	75			
Tree (TG)	*Cupaniopsis anacardioides*	N	7			
-	*Eugenia uniflora*	E	1	20		
-	*Ochna serrulata*	HTW	25			
-	*Senna pendula var. glabrata*	HTW	0.5	50		
Shrub (SG)	*Synoum glandulosum subsp. glandulosum*	N	0.1	2		
-	*Setaria sphacelata*	E	0.1	10		
Grass (GG)	*Cypress difformis*	N	0.1	20		
-	*Paspalum dilatatum*	HTW	2	100		
Other (OG)	*Smilax australis*	N	0.5	10		
Tree (TG)	*Polyscias elegans*	N	1	4		
Tree (TG)	*Mallotus discolor*	N	0.5	3		
-	*Schefflera actinophylla*	HTW	0.5	2		
Shrub (SG)	*Pittosporum undulatum*	N	0.1	1		
Tree (TG)	*Cryptocarya triplinervis var. triplinervis*	N	0.1	1		
Shrub (SG)	*Alectryon coriaceus*	N	0.1	1		
Tree (TG)	*Macaranga tanarius*	N	0.5	2		
Shrub (SG)	*Acacia longifolia subsp. sophorae*	N	0.2	1		
-	*Dracaena spp.*	E	0.1	2		
Shrub (SG)	*Exocarpos latifolius*	N	0.1	2		
Other (OG)	*Hibbertia scandens*	N	0.1	4		
Tree (TG)	*Ficus watkinsiana*	N	0.5	1		
Tree (TG)	*Euroschinus falcatus var. falcatus*	N	0.5	1		
-	*Solanum seaforthianum*	HTW	0.2	10		
-	*Solanum mauritianum*	E	0.1	1		
Tree (TG)	*Cryptocarya foetida*	N	0.1	1		
-	*Lantana camara*	HTW	0.1	10		
Grass (GG)	*Juncus usitatus*	N	0.1	1		
-	*Gloriosa superba*	HTW	0.1	1		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Zone ID	Recorders			
Date	29/11/2021	Sandhills	1064	TR			
Zone 56	Datum MGAZ	**Plot ID**	T3	**Plot dimensions**	20m x 50m	**Photos**	YES
Easting 560724	Northing 6831153	**IBRA region**	SEQLD	**Midline bearing from 0 m**	245º		
Vegetation Class		Coastal Swamp Forests				Confidence: (H) M L	
Plant Community Type		PCT 1064		**EEC:** No		Confidence: (H) M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of **Native Richness**	**Trees**	7
	Shrubs	4
	Grasses etc.	3
	Forbs	1
	Ferns	3
	Other	6
Sum of **Cover** of native vascular plants by growth form group	**Trees**	81.5
	Shrubs	3.5
	Grasses etc.	2.2
	Forbs	0.1
	Ferns	0.7
	Other	0.6
High Threat Weed cover		2.5

BAM Attribute (1000 m² plot)		
DBH	**# Tree Stems Count**	**# Stems with Hollows**
80 + cm	-	0
50 – 79 cm	0	
30 – 49 cm	Yes	
20 – 29 cm	Yes	
10 – 19 cm	Yes	
5 – 9 cm	Yes	
< 5 cm	Yes	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	58m	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	85	50	70	80	85	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	74																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1	O	Area historically sand mined
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness	2	NR	Weeds abundant within groundlayer
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m^2 plot: Sheet 2 of 2		Survey Name	Plot Identifier	Recorders
Date	29/11/2021	Sandhills	T3	TR

GF Code	*Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable*	N, E or HTW	Cover	Abund	stratum	voucher
Tree (TG)	*Melaleuca quinquenervia*	N	75			
Other (OG)	*Archontophoenix cunninghamiana*	N	5			
Grass (GG)	*Gahnia clarkei*	N	2	20		
Fern (EG)	*Gleichenia dicarpa*	N	0.5	50		
Shrub (SG)	*Pittosporum undulatum*	N	0.5	3		
Shrub (SG)	*Synoum glandulosum var. glandulosum*	N	1	5		
-	*Sphagneticola trilobata*	E	20			
Tree (TG)	*Macaranga tanaius*	N	0.1	1		
-	*Ochna serrulata*	HTW	0.1	10		
Forb (FG)	*Centella asiatica*	N	0.1	100		
Other (OG)	*Stephania japonica*	N	0.1	1		
-	*Paspalum dilatatum*	HTW	0.1	1		
Tree (TG)	*Guoia semiglauca*	N	0.2	1		
Other (OG)	*Smilax australis*	N	0.1	3		
-	*Cinnamomum camphora*	HTW	2	2		
Shrub (SG)	*Acronychia imperforata*	N	1	4		
Other (OG)	*Parsonsia straminea*	N	0.1	10		
-	*Senna pendula var. glabrata*	HTW	0.2	15		
Fern (EG)	*Pteridium esculentatum*	N	0.1	3		
Fern (EG)	*Blechnum indicum*	N	0.1	1		
Grass (GG)	*Isolepis inundata*	N	0.1	5		
Other (OG)	*Livistona australis*	N	0.1	1		
-	*Lantana camara*	HTW	0.1	1		
Other (OG)	*Glycine clandestina*	N	0.1	1		
Grass (GG)	*Juncus usitatus*	N	0.1	1		
Shrub (SG)	*Ficus coronata*	N	1	6		
Other (OG)	*Trophis scandens*	N	0.1	1		
Tree (TG)	*Syzygium luehmannii*	N	0.5	1		
Tree (TG)	*Litsea australis*	N	0.5	1		
-	*Citrus spp.*	E	0.2	1		
Tree (TG)	*Notelaea longifolia*	N	0.2	1		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Zone ID	Recorders			
Date	29/11/2021	Sandhills	1064	TR			
Zone 56	Datum MGAZ	**Plot ID**	T4	**Plot dimensions**	20m x 50m	**Photos**	YES
Easting 560683	Northing 6831191	**IBRA region**	SEQLD	**Midline bearing from 0 m**	1°		
Vegetation Class		Coastal Swamp Forests				Confidence: H M L	
Plant Community Type		PCT 1064		**EEC:** No		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of **Native Richness**	**Trees**	2
	Shrubs	2
	Grasses etc.	2
	Forbs	1
	Ferns	5
	Other	2
Sum of **Cover** of native vascular plants by growth form group	**Trees**	81
	Shrubs	0.2
	Grasses etc.	2
	Forbs	0.1
	Ferns	7.5
	Other	3.5
High Threat Weed cover		50.3

BAM Attribute (1000 m² plot)		
DBH	**# Tree Stems Count**	**# Stems with Hollows**
80 + cm	-	0
50 – 79 cm	0	
30 – 49 cm	Yes	
20 – 29 cm	Yes	
10 – 19 cm	Yes	
5 – 9 cm	Yes	
< 5 cm	Yes	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	11m	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	60	80	85	50	60	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	67																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1	O	Area historically sand mined
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness	2	NR	Weeds abundant within groundlayer
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet 2 of 2		Survey Name	Plot Identifier	Recorders
Date	29/11/2021	Sandhills	T4	TR

GF Code	*Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable*	N, E or HTW	Cover	Abund	stratum	voucher
Tree (TG)	*Melaleuca quinquenervia*	N	80			
Fern (EG)	*Gleichenia dicarpa*	N	7			
Other (OG)	*Stephania japonica var. discolor*	N	0.5	100		
-	*Paspalum dilatatum/wettsteinii*	HTW	50			
Fern (EG)	*Lygodium microphyllum*	N	0.2	50		
Other (OG)	*Parsonsia straminea*	N	3	100		
-	*Cuphea carthagenensis*	E	0.1	1		
-	*Polygala paniculata*	E	0.1	5		
-	*Ochna serrulata*	HTW	0.1	1		
Grass (GG)	*Gahnia clarkei*	N	1	10		
Forb (FG)	*Centella asiatica*	N	0.1	200		
Tree (TG)	*Casuarina glauca*	N	1	1		
Grass (GG)	*Baumea rubiginosa*	N	1	30		
Fern (EG)	*Selaginella uliginosa*	N	0.1	1		
-	*Senna pendula var. glabrata*	HTW	0.1	2		
-	*Andropogon virginicus*	HTW	0.1	3		
-	*Sphagneticola trilobata*	E	5			
-	*Setaria sphacelata*	E	0.5	10		
Shrub (SG)	*Callistemon salignus*	N	0.1	1		
Shrub (SG)	*Synoum glandulosum var. glandulosum*	N	0.1	1		
Fern (EG)	*Pteridium esculentum*	N	0.1	10		
Fern (EG)	*Blechnum indicum*	N	0.1	1		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Zone ID	Recorders			
Date	2/12/2021	Sandhills	1235	TR			
Zone 56	Datum MGAZ	**Plot ID**	T5	**Plot dimensions**	20m x 50m	**Photos**	YES
Easting 560190	Northing 6831305	**IBRA region**	SEQLD	**Midline bearing from 0 m**	2º		
Vegetation Class		Coastal Swamp Forests					Confidence: H M L
Plant Community Type		PCT 1235		**EEC:** No			Confidence: H M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of **Native Richness**	**Trees**	6
	Shrubs	0
	Grasses etc.	1
	Forbs	0
	Ferns	1
	Other	2
Sum of **Cover** of native vascular plants by growth form group	**Trees**	91
	Shrubs	0
	Grasses etc.	0.1
	Forbs	0
	Ferns	0.5
	Other	3.2
High Threat Weed cover		11.7

BAM Attribute (1000 m² plot)		
DBH	**# Tree Stems Count**	**# Stems with Hollows**
80 + cm	-	0
50 – 79 cm	1	
30 – 49 cm	Yes	
20 – 29 cm	Yes	
10 – 19 cm	Yes	
5 – 9 cm	Yes	
< 5 cm	Yes	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	3m	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	80	75	80	80	60	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	75																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1	O	Area historically sand mined
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness	3	NR	Weeds dominant within groundlayer
Other	N/A	N/A	Small drain. Flying fox roost camp present.

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet 2 of 2		Survey Name	Plot Identifier	Recorders
Date	2/12/2021	Sandhills	T5	TR

GF Code	*Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable*	N, E or HTW	Cover	Abund	stratum	voucher
Tree (TG)	*Casuarina glauca*	N	60			
Tree (TG)	*Melaleuca quinquenervia*	N	20			
Tree (TG)	*Eucalyptus pilularis*	N	3	1		
Tree (TG)	*Eucalyptus robusta*	N	4	2		
-	*Syagrus romanzoffiana*	E	3	6		
Tree (TG)	*Cupaniopsis anacardioides*	N	2	10		
Tree (TG)	*Corymbia citriodora*	N	2	3		
-	*Cinnamomum camphora*	HTW	8			
Other (OG)	*Archotonphoenix cunninghamiana*	N	3	4		
-	*Schefflera actinophylla*	HTW	1	3		
-	*Sphagneticola trilobata*	E	95			
-	*Ochna serrulata*	HTW	0.5	1		
-	*Senna pendula var. glabrata*	HTW	0.2	1		
Fern (EG)	*Pteridium esculentum*	N	0.5	10		
Other (OG)	*Parsonsia straminea*	N	0.2	5		
Grass (GG)	*Gahnia clarkei*	N	0.1	1		
-	*Erythrina sykesii*	HTW	2	3		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Zone ID	Recorders			
Date	2/12/2021	Sandhills	663	TR			
Zone 56	Datum MGAZ	**Plot ID**	T6	**Plot dimensions**	20m x 50m	**Photos**	YES
Easting 560190	Northing 6831305	**IBRA region**	SEQLD	**Midline bearing from 0 m**	249º		
Vegetation Class		Coastal Swamp Forests					Confidence: (H) M L
Plant Community Type		PCT 1064		**EEC:** No			Confidence: (H) M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of **Native Richness**	**Trees**	1
	Shrubs	0
	Grasses etc.	1
	Forbs	0
	Ferns	2
	Other	1
Sum of **Cover** of native vascular plants by growth form group	**Trees**	2
	Shrubs	0
	Grasses etc.	0.2
	Forbs	0
	Ferns	110
	Other	0.1
High Threat Weed cover		0.5

BAM Attribute (1000 m² plot)		
DBH	**# Tree Stems Count**	**# Stems with Hollows**
80 + cm	-	0
50 – 79 cm	No	
30 – 49 cm	Yes	
20 – 29 cm	No	
10 – 19 cm	Yes	
5 – 9 cm	No	
< 5 cm	Yes	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	0m	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	95	95	95	90	75	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	90																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet 2 of 2		Survey Name	Plot Identifier	Recorders
Date	2/12/2021	Sandhills	T6	TR

GF Code	*Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable*	N, E or HTW	Cover	Abund	stratum	voucher
Fern (EG)	*Gleichenia dicarpa*	N	20			
Fern (EG)	*Pteridium esculentum*	N	90			
-	*Andropogon virginicus*	HTW	0.5	10		
Tree (TG)	*Melaleuca quinquenervia*	N	2	2		
Other (OG)	*Parsonsia straminea*	N	0.1	2		
Grass (GG)	*Gahnia clarkei*	N	0.2	1		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Zone ID	Recorders			
Date	2/12/2021	Sandhills	751	TR			
Zone 56	Datum MGAZ	**Plot ID**	T7	**Plot dimensions**	20m x 50m	**Photos**	YES
Easting 560577	Northing 6831258	**IBRA region**	SEQLD	**Midline bearing from 0 m**	158º		
Vegetation Class		Littoral Rainforest				Confidence: (H) M L	
Plant Community Type		PCT 751		**EEC:** Yes		Confidence: (H) M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of **Native Richness**	**Trees**	7
	Shrubs	4
	Grasses etc.	2
	Forbs	1
	Ferns	1
	Other	7
Sum of **Cover** of native vascular plants by growth form group	**Trees**	69.6
	Shrubs	2.9
	Grasses etc.	0.3
	Forbs	0.1
	Ferns	0.2
	Other	0.7
High Threat Weed cover		24.7

BAM Attribute (1000 m² plot)		
DBH	**# Tree Stems Count**	**# Stems with Hollows**
80 + cm	-	0
50 – 79 cm	4	
30 – 49 cm	Yes	
20 – 29 cm	Yes	
10 – 19 cm	Yes	
5 – 9 cm	Yes	
< 5 cm	Yes	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	88m	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	98	99	95	90	99	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	96.2																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness	2	O	Weeds abundant
Other	1	R	Anthropogenic debris

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet 2 of 2		Survey Name	Plot Identifier	Recorders
Date	2/12/2021	Sandhills	T7	TR

GF Code	*Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable*	N, E or HTW	Cover	Abund	stratum	voucher
Tree (TG)	*Banksia intergrifolia*	N	50			
Tree (TG)	*Mallotus discolor*	N	3	8		
-	*Ochna serrulata*	HTW	15			
Shrub (SG)	*Synoum glandulosum subsp. glandulosum*	N	0.5	2		
Tree (TG)	*Cupaniopsis anacardioides*	N	5			
Other (OG)	*Smilax australis*	N	0.1	10		
-	*Cinnamomum camphora*	HTW	3	5		
Tree (TG)	*Glochidion sumatranum*	N	5			
-	*Paspalum dilatatum/wettsteinii*	HTW	2	50		
Grass (GG)	*Cyperus difformis*	N	0.2	10		
-	*Sporobolus pyramidalis*	E	0.1	5		
Tree (TG)	*Litsea australis*	N	6			
Other (OG)	*Cissus sterculiifolia*	N	0.1	1		
-	*Murraya paniculata*	E	0.2	2		
-	*Gloriosa superba*	HTW	0.5	50		
Grass (GG)	*Ottochloa gracilima*	N	0.1	50		
-	*Lantana camara*	HTW	5			
-	*Eugenia uniflora*	E	2	10		
Other (OG)	*Stephania japonica*	N	0.1	1		
-	*Senna pendula var. glabrata*	HTW	0.5	40		
-	*Passiflora suberosa*	HTW	0.1	1		
-	*Syagrus romanzoffiana*	E	0.5	1		
Tree (TG)	*Polyscias elegans*	N	0.5	2		
Forb (FG)	*Commelina cyanea*	N	0.1	1		
Other (OG)	*Trophis scandens*	N	0.1	1		
Shrub (SG)	*Acronychia imperforata*	N	2	2		
Shrub (SG)	*Archirhodomyrtus beckleri*	N	0.2	1		
-	*Solanum mauritianum*	N	0.1	1		
Other (OG)	*Hibbertia scandens*	N	0.1	1		
Other (OG)	*Livistona australis*	N	0.1	1		
Fern (G)	*Platycerium superbum*	N	0.2	2		
-	*Asparagus aethiopicus*	HTW	0.1	3		
Tree (TG)	*Melicope elleryana*	N	0.1	1		
Other (OG)	*Geitonoplesium cymosum*	N	0.1	1		
Shrub (SG)	*Pittosporum undulatum*	N	0.2	1		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.
Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*
Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

Appendix 4 – BAM Calculator Report

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00029578/BAAS18025/21/00029579

Proposal Name
Sandhills Precinct

BAM data last updated *
22/06/2023

Assessor Name
Tomislav Rados

Assessor Number
BAAS18025

BAM Data version *
61

Proponent Names

Report Created
11/12/2023

BAM Case Status
Finalised

Assessment Revision
3

Assessment Type
Part 5 Activities

Date Finalised
11/12/2023

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
751-Brush Box - Tuckeroo littoral rainforest on coastal headlands of the NSW North Coast Bioregion	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.6	0	15	15
1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.1	0	1	1
1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	1.5	0	29	29

751-Brush Box - Tuckeroo littoral rainforest on coastal headlands of the NSW North Coast Bioregion

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 670, 751, 910, 1275, 1534, 1536, 1537, 1832, 1833, 3005, 3008, 3022, 3039, 3121, 3122, 3123, 3124, 3127, 3128, 3129, 3130, 3131, 3132, 3133, 3134, 3135, 4110, 4113, 4114, 4146	-	751_Poor_Moderate	No	15	Burringbar-Conondale Ranges, Scenic Rim and Sunshine Coast-Gold Coast Lowlands. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

1064-Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region

	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798, 3272, 3906, 3983, 3985, 3986, 3988, 3989, 3990, 3995, 3997, 3998, 4000, 4001, 4004, 4006, 4009, 4013, 4019, 4020, 4021, 4044, 4047, 4057	-	1064_Poor	No	0	Burringbar-Conondale Ranges, Scenic Rim and Sunshine Coast-Gold Coast Lowlands. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798, 3272, 3906, 3983, 3985, 3986, 3988, 3989, 3990, 3995, 3997, 3998, 4000, 4001, 4004, 4006, 4009, 4013, 4019, 4020, 4021, 4044, 4047, 4057	-	1064_Poor_Moderate	No	29	Burringbar-Conondale Ranges, Scenic Rim and Sunshine Coast-Gold Coast Lowlands. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 915, 916, 917, 918, 919, 1125, 1230, 1232, 1234, 1235, 1236, 1726, 1727, 1728, 1729, 1731, 1800, 1808, 3962, 3963, 3985, 3987, 3993, 4016, 4023, 4026, 4027, 4028, 4030, 4035, 4038, 4040, 4048, 4049, 4050, 4056	-	1235_Poor_Moderate	No	1	Burringbar-Conondale Ranges, Scenic Rim and Sunshine Coast-Gold Coast Lowlands. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

BAM Biodiversity Credit Report (Like for like)

Species	Vegetation Zone/s	Area / Count	Credits
Crinia tinnula / Wallum Froglet	**1064_Poor_Moderate, 1064_Poor, 1235_Poor_Moderate**	0.4	5.00
Cryptocarya foetida / Stinking Cryptocarya	**751_Poor_Moderate, 1064_Poor_Moderate**	11.0	22.00
Myotis macropus / Southern Myotis	**751_Poor_Moderate, 1064_Poor_Moderate, 1064_Poor, 1235_Poor_Moderate**	2.1	46.00
Planigale maculata / Common Planigale	**751_Poor_Moderate, 1064_Poor_Moderate, 1064_Poor, 1235_Poor_Moderate**	2.1	46.00

Credit Retirement Options

Like-for-like credit retirement options

Crinia tinnula / Wallum Froglet	Spp	IBRA subregion
	Crinia tinnula / Wallum Froglet	Any in NSW
Cryptocarya foetida / Stinking Cryptocarya	Spp	IBRA subregion
	Cryptocarya foetida / Stinking Cryptocarya	Any in NSW

Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW
Planigale maculata / Common Planigale	Spp	IBRA subregion
	Planigale maculata / Common Planigale	Any in NSW

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00029578/BAAS18025/21/00029579	Sandhills Precinct	22/06/2023
Assessor Name	Report Created	BAM Data version *
Tomislav Rados	11/12/2023	61
Assessor Number	BAM Case Status	Date Finalised
BAAS18025	Finalised	11/12/2023
Assessment Revision	Assessment Type	
3	Part 5 Activities	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Brush Box - Tuckeroo littoral rainforest on coastal headlands of the NSW North Coast Bioregion												
1	751_Poor_Moderate	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	54.7	54.7	0.56	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		15
											Subtotal	**15**
Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion												
3	1064_Poor	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	6.9	6.9	0.26	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		0

4	1064_Poor_Moderate	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	48.7	48.7	1.2	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		29
											Subtotal	**29**
Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion												
2	1235_Poor_Moderate	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	37.3	37.3	0.05	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		1
											Subtotal	**1**
											Total	**45**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Crinia tinnula / Wallum Froglet (Fauna)									
1064_Poor_Moderate	48.7	48.7	0.19			Vulnerable	Not Listed	False	3
1064_Poor	6.9	6.9	0.16			Vulnerable	Not Listed	False	1
1235_Poor_Moderate	37.3	37.3	0.04			Vulnerable	Not Listed	False	1
								Subtotal	**5**
Cryptocarya foetida / Stinking Cryptocarya (Flora)									
751_Poor_Moderate	N/A	N/A	7			Vulnerable	Vulnerable	False	14
1064_Poor_Moderate	N/A	N/A	4			Vulnerable	Vulnerable	False	8
								Subtotal	**22**
Myotis macropus / Southern Myotis (Fauna)									
751_Poor_Moderate	54.7	54.7	0.56			Vulnerable	Not Listed	False	15
1064_Poor_Moderate	48.7	48.7	1.2			Vulnerable	Not Listed	False	29
1064_Poor	6.9	6.9	0.26			Vulnerable	Not Listed	False	1
1235_Poor_Moderate	37.3	37.3	0.05			Vulnerable	Not Listed	False	1
								Subtotal	**46**

Planigale maculata / Common Planigale (Fauna)									
751_Poor_Moderate	54.7	54.7	0.56			Vulnerable	Not Listed	False	15
1064_Poor_Moderate	48.7	48.7	1.2			Vulnerable	Not Listed	False	29
1064_Poor	6.9	6.9	0.26			Vulnerable	Not Listed	False	1
1235_Poor_Moderate	37.3	37.3	0.05			Vulnerable	Not Listed	False	1
								Subtotal	**46**

Appendix 5 – MNES Likelihood of Occurrence Assessment

Threatened Species or Ecological Community	Conservation Status		Recorded in Locality		Description / Preferred Habitat*	Likelihood of Occurrence in Proposal Area	Likelihood of Significant Impact	Assessment of Significance Required?
	EPBC Act Status	BCA Status	PMST	Bionet Records <10km site				
Threatened Ecological Community								
Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community	E	-	Likely to occur	-	Physical Environment This ecological community occurs in sub-tropical, sub-humid and temperate climatic zones from Curtis Island, north of Gladstone, in Queensland to Bermagui in southern New South Wales. The ecological community is found within the South Eastern Queensland (SEQ), NSW North Coast (NNC), Sydney Basin (SYB) and South East Corner (SEC) IBRA7 bioregions (Department of the Environment and Energy, 2012) (see Appendix A). The extent of the ecological community corresponds to country (the traditional lands) of a number of Indigenous groups, including the Gureng Gureng, Bajtala, Gubbi Gubbi, Yuggera, Bundjalung, Gumbaynggirr, Dainggatti, Biripi, Worimi, Awabakal, Kurin-gai, Eora, Dharug, Tharawa/D'harawal and the Yuin. The ecological community occurs in coastal catchments, mostly at elevations of less than 20 m above sea-level (ASL) that are typically found within 30 km of the coast. However, this distance varies by catchment; for example, low elevations can occur as far as 40 km inland on the Hawkesbury River, or more than 100 km on the Clarence River. On the mid and north coast of NSW the ecological community may also occur up to 50 m ASL on floodplains of, or coastland flats associated with, former or current coastal river systems (Department of Environment and Climate Change, 2007). Coastal Swamp Oak Forest typically occurs on unconsolidated sediments, including alluvium deposits, and where soils formed during the Quaternary period as a result of sea-level rise during the Holocene period (Sloss et al., 2007). These are most typically hydrosols, which are saturated with water for long periods of time (typically grey-black clay-loam and/or sandy loam soils). The ecological community can also occur on organosols (peaty soils). Occurrences of swamp oak trees on rocky headlands or other consolidated substrates are not considered to be a part of the ecological community, but areas where soils transition into unconsolidated sediments may contain the ecological community. The ecological community is typically found where groundwater is saline or brackish, but can occur in areas where groundwater is relatively fresh. It is typically found on coastal flats, floodplains, drainage lines, lake margins, wetlands and estuarine fringes where soils are at least occasionally saturated, water-logged or inundated. These are typically associated with low-lying coastal alluvial floodplains and alluvial flats (Keith and Scott, 2005). Minor occurrences can be found on coastal dune swales or flats, particularly deflated dunes and dune soaks. Vegetative Structure Coastal Swamp Oak Forest is often found in association with other vegetation types such as coastal saltmarsh, mangroves, freshwater wetlands, littoral rainforests or swamp sclerophyll forests in a 'mosaic' of coastal floodplain communities. The structure of Coastal Swamp Oak Forest can vary from forest to woodland depending on its location in the landscape and disturbance history. The local expression of the ecological community is influenced by soils, history of inundation by tidal flows/estuarine system dynamics, groundwater salinity, site history, disturbance regimes and current land management. Many remaining patches of the ecological community contain regrowth from past clearance or other disturbances, and/or due to naturally occurring river and coastal dynamics. Some patches, for example where drainage is more impeded, may be expressed primarily as sedgeland or rushland, with a very sparse canopy (down to 10 per cent crown cover) of predominantly swamp oak. Other patches may just occur as canopy trees, over dense needle litter with sparse native groundcover. Where groundwater is more saline, for example on estuarine and/or coastal lake fringes, the ecological community is typically expressed as a low woodland or forest. In these areas, the composition of the understory is more likely to include saline tolerant (typically saltmarsh) species. In more freshwater areas, the ecological community is more likely to demonstrate greater structural diversity – often being expressed as a taller open or rarely closed forest with a diverse understory, typically including a greater abundance of grasses and herbs. Many patches have a sub-canopy of smaller trees, but the mid-layer or shrub layer is typically sparse. Climbing and epiphytic plant species are commonly observed and are characteristic of Coastal Swamp Oak Forest. The ecological community typically includes a continuous to semi-continuous ground	This community was not recorded within the site. Whilst Swamp Oak forests are present, these areas did not meet the condition threshold for it to be considered to be the EEC.	-	No

Threatened Species or Ecological Community	Conservation Status		Recorded in Locality		Description / Preferred Habitat*	Likelihood of Occurrence in Proposal Area	Likelihood of Significant Impact	Assessment of Significance Required?
	EPBC Act Status	BCA Status	PMST	Bionet Records <10km site				
					layer that may include either forbs, sedges, grasses and/or plant litter (including branchlets/needles, leaves, bark, twigs). Key Diagnostics The key diagnostic characteristics presented here are the features that define the ecological community, noting that more details are provided in the other sections of this document. Patches that do not meet the key diagnostics are not the nationally listed ecological community. The ecological community is defined as patches of vegetation that meet the following key diagnostic characteristics: • Occurs from south-east Queensland to southern NSW within the South Eastern Queensland, NSW North Coast, Sydney Basin, or South East Corner bioregions • Occurs in coastal catchments at elevations up to 50 m ASL, typically less than 20 m ASL, on coastal flats, floodplains, drainage lines, lake margins, wetlands and estuarine fringes where soils are at least occasionally saturated, water-logged or inundated. There are also minor occurrences on coastal dune swales or flats, particularly deflated dunes and dune soaks. • Occurs on soils derived from unconsolidated sediments (including alluvium), typically hydrosols (grey-black clay-loam and/or sandy loam soils) and sometimes organosols (peaty soils). It may occur in transitional soils (or catenas) where shallow unconsolidated sediments border lithic substrates. • Has an open woodland, woodland, forest, or closed forest structure, with a tree canopy that has a total crown cover1 of at least 10 per cent. • Has a canopy of trees dominated by Casuarina glauca (swamp-oak, swamp she-oak). Other characteristics that may help identify the ecological community include: • Typically occurs where groundwater is saline or brackish. • Typically occurs within 30km of the coast, but in some areas, such as along tidal river catchments, the ecological community can occur more than 100km inland. • Does not occur on rocky headlands, sea cliffs or other consolidated sediments.			
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	E	-	Known to occur	-	Location and Physical Environment The Coastal Swamp Sclerophyll Forest ecological community occurs on the mainland and islands near to the coast (within 20 km) within the following IBRA2 Bioregions: South East Queensland (SEQ); NSW North Coast (NNC); Sydney Basin (SYB); and the Bateman subregion of the South East Corner (SEC2). The ecological community typically occurs in low-lying coastal alluvial areas with minimal relief, such as swamps, floodplain pockets, depressions, alluvial flats, back-barrier flats, fans, terraces, and behind fore-dunes (DPI 2016; Queensland Government 2019a). The ecological community most commonly occurs at elevations below 20m above sea-level (ASL) but may occur occasionally up to 220m ASL on hill slopes, for example in association with perched swamps and lakes, or a naturally high-water table. Vegetation Structure and Flora The structure of the Coastal Swamp Sclerophyll Forest ecological community varies from open woodland to closed forest with a crown cover5 of at least 10% and typically no more than 70% (Tozer et al. in prep.). In an intact forest, the canopy can be layered, with a sub-canopy of melaleuca grading into a taller mixed melaleuca and/or eucalypt canopy. Canopy density, light availability, water regime, salinity level and soil fertility influence the development and composition of the understorey flora (Tozer et al. 2010; NSW Scientific Committee 2011; Queensland Government 2019a; Tozer et al. in prep.) The Coastal Swamp Sclerophyll Forest typically features a canopy and/or sub-canopy dominated by Melaleuca spp. and/or Eucalyptus robusta. Other eucalypts, which are also tolerant of regular inundation and are adapted to sandy soils, may emerge from the canopy with the mix of species present varying depending on the location. Eucalypt trees other than E.	This community was recorded within the site.	Potential. Assessment of significance required.	Yes

Threatened Species or Ecological Community	Conservation Status		Recorded in Locality		Description / Preferred Habitat*	Likelihood of Occurrence in Proposal Area	Likelihood of Significant Impact	Assessment of Significance Required?
	EPBC Act Status	BCA Status	PMST	Bionet Records <10km site				
					robusta that occur scattered through the canopy, often emergent, in some areas but do not dominate the canopy of a patch, include Corymbia intermedia (Pink Bloodwood), E. tereticornis, (Forest Red Gum/Queensland Blue Gum), E. longifolia (Woollybutt), E. botryoides (Southern Mahogany/Bangalay) and E. ovata (Swamp Gum). Lophostemon suaveolens (Swamp Box/Swamp Turpentine) can be an associate (typically minor) in the canopy north from the Hastings River (Griffith & Wilson 2007a, b). In the northern extent of the ecological community (northern SYB to the SEQ bioregion) the canopy is typically dominated or co-dominated by Melaleuca quinquenervia (Broad-leaved Paperbark) and/or Eucalyptus robusta (Swamp Mahogany). Other canopy or sub-canopy species can also include the following shrubs and trees: Acacia leiocalyx (Black wattle), A. melanoxylon (Blackwood), Alphitona excelsa (Red Ash, Soapbush, Soap Tree), Callistemon salignus (White/Willow Bottlebrush), Cupaniopsis anacardioides (Tuckeroo), Elaeocarpus reticulatus (Blueberry Ash), Glochidion ferdinandi (Cheese Tree) and G. sumatranum, Melicope elleryana (Pink-flowered Doughwood), and Pittosporum undulatum (Sweet Pittosporum). Other characteristic species in some areas include Livistona australis (Cabbage Tree Palm) and Lophostemon suavolens (NSW Scientific Committee 2011; Tozer et al. in prep.). The understorey has a diverse range of hydrophytic plants including some species tolerant of brackish water in proximity to estuarine areas. Ground layer composition is variable depending mostly on latitude, canopy cover, inundation regime and disturbance. A mid-dense to dense cover of freshwater sedges, ferns and grasses is common, with some brackish species evident in sites closer to estuarine areas. Key Diagnostic Characteristics The key diagnostic characteristics are designed to allow identification of the ecological community irrespective of the season. Areas of vegetation that do not meet the key diagnostics do not support the nationally listed ecological community. The ecological community is defined as patches of native vegetation meeting the description in Section 1 that meet the following key diagnostic characteristics: • Occurs on the mainland and islands near to the coast (within 20 km) from South East Queensland to south-eastern NSW specifically within these IBRA Bioregions: South Eastern Queensland (SEQ); NSW North Coast (NNC); Sydney Basin (SYB) and the Bateman sub-region of the South East Corner (SEC). • Occurs in coastal catchments typically below 20m ASL, but occasionally up to 220m ASL. • Occurs on hydric soils with inundation patterns ranging from intermittent to episodic. • The vegetation structure varies from tall closed to open forest to woodland, to dense (closed) shrubland or scrub forest. Minimum crown cover (see footnote 5, p. 4) is at least 10%, but it is more typically in the range 50% to 70%. Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland ecological community Conservation Advice Threatened Species Scientific Committee Page 11 of 94 • From South East Queensland to the Sydney Basin Bioregion, the canopy9 is typically dominated or co-dominated by Melaleuca quinquenervia and/or Eucalyptus robusta. In some areas, the canopy may be locally dominated by other melaleuca species including M. dealbata (SEQ bioregion) (rarely); M. biconvexa (mid-NSW coast to south of Sydney); M. decora (north of Shoalhaven), frequently with Parsonsia straminea climbing on the trunks of canopy species. In the SEC bioregion, M. ericifolia may occur as a dominant canopy or sub-canopy species.			

Threatened Species or Ecological Community	Conservation Status		Recorded in Locality		Description / Preferred Habitat*	Likelihood of Occurrence in Proposal Area	Likelihood of Significant Impact	Assessment of Significance Required?
	EPBC Act Status	BCA Status	PMST	Bionet Records <10km site				
					• Other tree species may occur in the canopy (or sub-canopy) in some areas, but they are not dominant across a patch, including Casuarina glauca, Banksia spp., Callistemon salignus, Corymbia intermedia (Pink Bloodwood), E. tereticornis, (Forest Red Gum/Queensland Blue Gum), E. longifolia (Woollybutt), E. botryoides (Southern Mahogany/Bangalay), E. ovata (Swamp Gum), Livistona australis and/or Lophostemon spp. • The understorey typically includes a variable ground layer, depending on the canopy cover and inundation rate/period. Tall sedges (typically Gahnia spp.) and/or ferns often dominate the ground layer, mixed with graminoids and other herbs, especially Imperata cylindrica (Blady Grass). • While they can occur regularly in the ground layer, the ecological community is not present if halophytic species, more typically associated with estuarine/saltmarsh areas, dominate the ground layer of a patch, for example, Appium prostratum, Atriplex cineria, Chenopodium glaucum, Rhagodia candolleaus and Samolus repens.			
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	CE	-	Likely to occur	-	General Features The ecological community represents a complex of rainforest and coastal vine thickets, including some that are deciduous, on the east coast of Australia. Typically, the ecological community occurs within two kilometres of the coast or adjacent to a large salt water body, such as an estuary and, thus, is influenced by the sea. It is naturally distributed as a series of disjunct and localised stands occurring on a range of landforms derived from coastal processes that can include dunes and flats, cheniers, berms, cobbles, headlands, scree, seacliffs, marginal bluffs, spits, deltaic deposits, coral rubble and islands. As a result, the ecological community is not associated with a particular soil type and can occur on a variety of geological substrata. The ecological community occurs from Princess Charlotte Bay, Cape York Peninsula to the Gippsland Lakes in Victoria as well as on offshore islands on the east coast. The latitudinal range where the ecological community occurs encompasses warm temperate, sub-tropical and tropical climate zones. In terms of temperature and humidity, the climate is more equable than sites further inland. The ecological community is defined by habitat expressed in terms of structure, floristic composition and ecology in response to coastal processes. The unifying feature of its habitat is the salinity, derived from the ecological community's proximity to the sea. Saline influence is delivered via aerosols, saline water-tables or occasional inundation. Whilst the ecological community's canopy species are well adapted to coastal exposure (e.g. strong and persistent salt-laden winds and storm events), the canopy protects less tolerant species and propagules in the understorey. The canopy height varies with the degree of exposure and can range from dwarf to medium (<1-25 m; Specht 1970). Due to extreme exposure to salt laden winds, the canopy often demonstrates a continuum of heights. Highly exposed patches will display the effect of windshear in the canopy. In more sheltered sites, for example, around estuaries, wind shear may not be evident in the canopy. The canopy is typically closed but may also be patchy and may include emergents. Those stands that occur in exposed coastal situations can have many rainforest gaps caused by storm events which, in turn, may lead to canopy decapitation. In these exposed sites, there is often a secondary canopy that has developed below the old canopy. The diversity of plant taxa (particularly canopy species) generally declines in a north to south direction, i.e. with increasing latitude. However, species richness of adjacent patches may vary considerably within one latitudinal zone. The ecological community provides important stepping stones along the eastern Australian coast for various migratory and marine birds. For example, the nationally listed marine species Ducula bicolor (Pied Imperial Pigeon), a migratory species from north of New Guinea, feeds on fruit associated with mainland littoral rainforests and disperses the seeds on offshore islands where it roosts. Given its proximity to the sea, seabirds may also be associated with some stands	This community was recorded within the site.	Potential. Assessment of significance required.	Yes

Threatened Species or Ecological Community	Conservation Status		Recorded in Locality		Description / Preferred Habitat*	Likelihood of Occurrence in Proposal Area	Likelihood of Significant Impact	Assessment of Significance Required?
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					of littoral rainforest, e.g. the nationally endangered migratory Pterodroma leucoptera leucoptera (Gould's Petrel) has one significant breeding locality at Cabbage Tree Island off the coast at Port Stephens in New South Wales (NSW) (DEC 2006a). Key Diagnostic Characteristics The key diagnostic features of the ecological community are described below to aid its identification. • The ecological community occurs in the following IBRA bioregions: Cape York Peninsula (from Princess Charlotte Bay southwards), Wet Tropics, Central Mackay Coast, South Eastern Queensland, NSW North Coast, Sydney Basin and South East Corner. • Patches of the ecological community occur within two kilometres of the east coast, including offshore islands, or adjacent to a large body of salt water, such as an estuary, where they are subject to maritime influence. • The structure of the ecological community typically is a closed canopy of trees that can be interspersed with canopy gaps that are common in exposed situations or with storm events. Usually, several vegetation strata are present. However, where there is extreme exposure to salt laden winds, these strata may merge into a height continuum rather than occurring as distinct vegetation layers. The canopy forms a mosaic due to canopy regeneration, typically in the form of basal coppice following canopy decapitation due to prevailing salt laden winds and storm events. Wind sheared canopy can be present on the frontal section leading to closed secondary canopies. Emergents may be present, for example, species from the genera Araucaria (northern bioregions only), Banksia or Eucalyptus. The ground stratum of the vegetation typically is very sparse. • The ecological community contains a range of plant life forms including trees, shrubs, vines, herbs, ferns and epiphytes. To the north, most plant species diversity is in the tree and shrub (i.e. canopy) layers rather than in lower strata. The converse generally occurs from the Sydney Basin Bioregion southwards. Feather palms, fan palms, large leaved vascular epiphytes and species that exhibit buttressing are generally rare. Ground ferns and vascular epiphytes are lower in diversity in littoral rainforests compared to most other rainforest types. • Plants with xeromorphic and succulent features are generally more common in littoral rainforest than in hinterland rainforest types. Canopy stem sizes also tend to be smaller compared to that in hinterland rainforest. Trunks rarely host mosses though lichens are usually common. • Whilst species can be regionally predictable, there may be considerable variation in the composition of individual stands of the ecological community within any given bioregion. Attachment A provides a list of flora species for each relevant bioregion.			
Lowland Rainforest of Subtropical Australia	CE	-	Likely to occur	-	Physical Environment The ecological community occurs on basalt and alluvial soils, including sand and old or elevated alluvial soils as well as floodplain alluvia. It also occurs occasionally on enriched rhyolitic soils and basaltically enriched metasediments. Lowland Rainforest mostly occurs in areas <300 m above sea level. Aspect can result in the ecological community being found at >300 m altitude on north-facing slopes, but typically 300 m defines the extent of the lowlands. In addition, Lowland Rainforest typically occurs in areas with high annual rainfall (>1300 mm). The physical environment where the ecological community occurs is differentiated from the EPBC listed Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community (hereafter referred to as Littoral Rainforest) by the level of coastal or estuarine influence (such as windshear). Lowland Rainforest typically occurs more than 2 km from the coast, however, it can (and does) intergrade with Littoral Rainforest in some coastal areas. Vegetation Structure	This community was not recorded within the site.	-	No

Threatened Species or Ecological Community	Conservation Status		Recorded in Locality		Description / Preferred Habitat*	Likelihood of Occurrence in Proposal Area	Likelihood of Significant Impact	Assessment of Significance Required?
	EPBC Act Status	BCA Status	PMST	Bionet Records <10km site				
					The ecological community is generally a moderately tall (≥20 m) to tall (≥30 m) closed forest (canopy cover ≥70%). Tree species with compound leaves are common and leaves are relatively large (notophyll to mesophyll). Typically there is a relatively low abundance of species from the genera *Eucalyptus*, *Melaleuca* and *Casuarina*. Buttresses are common as is an abundance and diversity of vines. Lowland Rainforest has the most diverse tree flora of any vegetation type in NSW (Floyd, 1990a) and the species composition of the canopy varies between local stands and between regions (Keith, 2004). The ecological community typically has high species richness (≥ 30 woody species from Appendix A). The canopy comprises a range of tree species but in some areas a particular species may dominate e.g. palm forest, usually dominated by *Archontophoenix cunninghamiana* (bangalow palm) or *Livistona australis* (cabbage palm); and riparian areas dominated by *Syzygium floribundum* (syn. *Waterhousea floribunda*) (weeping satinash/weeping lilly pilly). The canopy is often multilayered consisting of an upper, discontinuous layer of emergents, over the main canopy and subcanopy. Below the canopy is an understorey of sparse shrubs and seedlings. The upper, discontinuous layer includes canopy emergents that may be 40–50 m tall and have large spreading crowns. This layer is composed of species such as *Araucaria cunninghamii* (hoop pine), *Ficus* spp. (figs), *Lophostemon confertus* (brushbox), and in some sites, *Eucalyptus* spp. Typically non-rainforest species such as eucalypts and brushbox comprise <30% of canopy emergents. The canopy/subcanopy layer contains a diverse range of species. Representative species include: hoop pine, figs, *Argyrodendron trifoliolatum/Heritiera trifoliolata* (white booyong), *Castanospermum australe* (black bean), *Cryptocarya obovata* (white walnut, pepperberry), *Lowland Rainforest of Subtropical Australia* listing advice - Page 3 of 31 *Dendrocnide excelsa* (giant stinging tree), *Diploglottis australis* (native tamarind), *Dysoxylum fraserianum* (rosewood), *Dysoxylum mollissimum* (red bean), *Elattostachys nervosa* (green tamarind), *Endiandra pubens* (hairy walnut), *Flindersia schottiana* (bumpy ash, cudgerie, silver ash), *Gmelina leichhardtii* (white beech), *Neolitsea australiensis* (bolly gum), *Neolitsea dealbata* (white bolly gum), *Sloanea australis* (maiden"s blush), *Sloanea woollsii* (yellow carabeen), *Toona ciliata* (red cedar), and epiphytes such as *Platycerium* spp. and *Asplenium australasicum* (bird"s nest fern). The understorey contains a sparse layer of species such as *Cordyline stricta* (narrow-leaved palm lily), *Linospadix monostachya* (walking stick palm), *Neolitsea dealbata* (white bolly gum), *Notelaea johnsonii* (veinless mock olive), *Pittosporum multiflorum* (orange thorn), *Triunia youngiana* (native honey-suckle bush), *Wilkiea austroqueenslandica* (smooth wilkiea) and *Wilkiea huegeliana* (veiny wilkiea) as well as seedlings of a variety of canopy species. A variety of vines may be present such as *Calamus muelleri* (lawyer vine), *Cissus antarctica* (native grape vine, water vine), *Cissus hypoglauca* (giant water vine), *Dioscorea transversa* (native yam), *Flagellaria indica* (whip vine), *Morinda jasminoides* (sweet morinda), *Pandorea floribunda* (wonga wonga vine) and *Smilax australis* (sarsaparilla). Ferns such as *Adiantum hispidulum* (rough maidenhair fern), *Doodia aspera* (rasp fern), *Lastreopsis decomposita* (trim shield fern) and *Lastreopsis marginans* (bordered shield fern, glossy shield fern) may also be present. Key Diagnostics 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). The ecological community occurs on soils derived from basalt or alluvium, enriched rhyolitic soils or basaltically enriched metasediments and occurs generally at an altitude less than 300 m above sea level. The community typically occurs in areas with high annual rainfall (>1300mm) and in locations typically more than 2 km inland from the coast. The vegetative structure is typically a tall (20 m–30 m) closed forest, often with multiple canopy layers with typically having high species richness (TSSC, 20011:6).			
Birds								
Regent Honeyeater (*Anthochaera phrygia*)	CE	CE	Likely to occur	0	The Regent Honeyeater is mostly recorded within box-ironbark eucalypt and riparian associations incorporating River She-oak on the inland slopes of the Great Dividing Range (Menkhorst et al, 1999; NPWS, 1999). Only three key breeding regions are known [north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region]	Low. Marginal potential foraging habitat present for the species. The species was	Unlikely. The removal of a small area of marginal potential foraging habitat is	No

Threatened Species or Ecological Community	Conservation Status		Recorded in Locality		Description / Preferred Habitat*	Likelihood of Occurrence in Proposal Area	Likelihood of Significant Impact	Assessment of Significance Required?
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					although non-breeding flocks have been recorded in flowering coastal Swamp Mahogany and Spotted Gum forests particularly on the central coast and occasionally on the upper north coast (DEC. 2005; Menkhorst et al, 1999). In Queensland, the Regent Honeyeater has been recorded from 15 sites, primarily south of a line between Chinchilla and the Sunshine Coast. There are several records on Bribie Island from between 1995–1998. There are several records from the Granite Belt between Warwick in the east, Gore in the west and Sundown NP in the south (Higgins et al. 2001; Webster & Menkhorst 1992). Regular records in the Gore-Karara area suggests a small breeding population may have been present in the mid 1990s (Geering 1997 unpub. data). A single record from the south-west of the state, near Eulo (Franklin et al. 1989), is likely to be erroneous (Geering 2005 pers. comm.) [online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=82338]. Their diet is mostly reliant on nectar from 16 species of Eucalypt and two species of Mistletoe although the preferred sources are three species of eucalypt; Red Ironbark, White Box and Yellow box (Webster & Menkhorst 1992; NPWS, 1999; Menkhorst et al, 1999). At times of food shortage (e.g. when flowering fails in preferred habitats), Honeyeaters also use other woodland types and wet lowland coastal forest dominated by *Eucalyptus robusta* (Swamp Mahogany) or *E. maculata* (Spotted Gum) (Franklin et al. 1989b; Geering & French 1998; Ley & Williams 1992; Oliver et al. 1999; Webster & Menkhorst 1992). They sometimes use native pine *Callitris* woodlands, usually where mixed with eucalypts. They regularly occur in remnant trees or patches of woodland in farmland, partly cleared agricultural land and riverine forest of River Sheoak, usually infested by mistletoe, and sometimes mixed with eucalypts (Franklin et al. 1989; D. Geering 2005, pers. comm.; Geering 1997; Geering & French 1998; Ley et al. 1996; Ley & Williams 1994; Oliver et al. 1999). Regent Honeyeaters usually build their nests in rough-barked trees, mostly eucalypts such as ironbarks, stringybarks or River Sheoak, or sometimes in smooth or box-barked species (e.g. Blakely's Red Gum, White Box, Yellow Box) if rough-barked trees are not available (D. Geering 2005, pers. comm.; Geering 1997; Geering & French 1998; Geering & Herman 1999; Ley & Williams 1992, 1994; Oliver et al. 1998). Nests are often also built amongst mistletoes in trees (D. Geering 2005, pers. comm.; Geering & Herman 1999; Oliver et al. 1998; Webster & Menkhorst 1992).	not recorded during survey efforts.	unlikely to significantly impact the species.	
Australasian Bittern (*Botaurus poiciloptilus*)	E	E	Known to occur	3	The Australasian Bittern occurs mainly in densely vegetated, permanent and seasonal freshwater wetlands with tall dense vegetation particularly those dominated by sedges, rushes and/or reeds (e.g. *Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, , Bolboschoenus*) or cutting grass (*Gahnia*) growing over muddy or peaty substrate (Marchant & Higgins1990). The Bittern forages in still, shallow water, feeding on freshwater crayfish, fish (including goldfish), weevils, snakes, leaves and fruit (Marchant & Higgins 1990), frogs and tadpoles. Today, it is rarely recorded in Queensland, and possibly survives only in protected areas such as the Cooloola and Fraser regions (Jaensch 2005 in DoE, 2014). The major threat to the Bittern in Australia is the loss or alteration of suitable habitat, primarily through the diversion of water away from wetlands for irrigation, and the drainage and salinisation of swamps (Garnett & Crowley 2000; Jaensch 2004; Kingsford 2000; Kingsford & Thomas 1995; Marchant & Higgins 1990). In Queensland, clearing of coastal wetlands for urbanisation, particularly around the Sunshine Coast, has greatly reduced the area of occupancy.	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No
Red Knot (*Calidris canutus*)	E, M, MA	-	Known to occur	1	"The Red Knot is common in all the main suitable habitats around the coast of Australia (Barrett et al. 2002b; Minton, C.D.T. 2002, pers. comm.; Watkins 1993), but is less numerous in south-west Australia than elsewhere (Lane 1987). In Queensland, the Red Knot migrates along the coast north of 19 °S, sometimes in large numbers. In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No

Threatened Species or Ecological Community	Conservation Status		Recorded in Locality		Description / Preferred Habitat*	Likelihood of Occurrence in Proposal Area	Likelihood of Significant Impact	Assessment of Significance Required?
	EPBC Act Status	BCA Status	PMST	Bionet Records <10km site				
					occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps (Higgins & Davies 1996). The Red Knot usually forage in soft substrate near the edge of water on intertidal mudflats or sandflats exposed by low tide. At high tide the may feed at nearby lakes, sewage ponds and floodwaters (Higgins & Davies 1996). They have also been recorded foraging on beds of eelgrass on tidal sandflats (Battley, P. in Higgins & Davies 1996), on a thick algal mat in shallow water (Dann 1983), and in shallow pools on crest of coral reef (Domm & Recher 1973). The Red Knot roosts on sandy beaches, spits and islets, and mudflats; also in shallow saline ponds of saltworks. In New Zealand they are known to roost on short wet pastures near the coast (Higgins & Davies 1996). They have been seen roosting on an inland claypan near Roebuck Bay, north-west Western Australia (Collins et al. 2001). They like to roost in open areas far away from potential cover for predators, but close to feeding grounds (Rogers 2001). In hot conditions, waders prefer to roost where a damp substrate lowers the local temperature (Rogers 1999b)". (DEE 2017 online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=855)			
Curlew Sandpiper (*Calidris ferruginea*)	CE, M, MA	E	Known to occur	1	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one year old birds remain in Australia rather than migrating north. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (Higgins & Davies 1996). Curlew Sandpipers forage on mudflats and nearby shallow water. In non-tidal wetlands, they usually wade, mostly in water 15–30 mm, but up to 60 mm, deep. They forage at the edges of shallow pools and drains of intertidal mudflats and sandy shores. At high tide, they forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated saltflats. Occasionally they forage on wet mats of algae or waterweed, or on banks of beachcast seagrass or seaweed. They rarely forage on exposed reefs (Higgins & Davies 1996). In Roebuck Bay, northern Western Australia, they are also said to feed on part of the mudflats that have been exposed for a longer period, foraging in small groups (Tulp & de Goeij 1994). Curlew Sandpipers generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh (Higgins & Davies 1996). They have also been recorded roosting in mangroves in Inverloch, Victoria (Minton & Whitelaw 2000). This species forages mainly on invertebrates, including worms, molluscs, crustaceans, and insects, as well as seeds. Outside Australia, they also forage on shrimp, crabs and small fish. Curlew Sandpipers usually forage in water, near the shore or on bare wet mud at the edge of wetlands. On wet mud they forage by pecking and probing. They probe in shallow water, and jab at the edge of the water where a film of water remains on the sand. They glean from mud, from the surface of water, or in drier areas above the edge of the water. For a 'jab' less than half the length of the bill is inserted into the substrate; a probe is performed with a slightly open bill inserted to its full length. Curlew Sandpipers may wade up to the belly, often with their heads submerged while probing. They often forage in mixed flocks (Dann 1999b), including with Red-necked Stints (Calidris ruficollis)". (DEE 2017 online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=856)	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No

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Greater Sand Plover (*Charadrius leschenaultii*)	V, M, MA	V	Likely to occur	0	In Australia, the Greater Sand Plover occurs in coastal areas in all states, though the greatest numbers occur in northern Australia, especially the north-west (Marchant & Higgins 1993; Minton et al. 2006). The species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons and inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs (DoE 2014). They are occasionally recorded on near-coastal saltworks and saltlakes, including marginal saltmarsh, and on brackish swamps (C.D.T. Minton 2002 pers.comm; Sibson 1953; Storr 1964b, 1977; Storr et al. 1986). They seldom occur at shallow freshwater wetlands (Storr 1977). Once, during a severe drought, the species was recorded in a poorly grassed paddock with large bare areas, more than 1 km from the nearest water (Eckert 1968). Greater Sand Plovers usually feed from the surface of wet sand or mud on open intertidal flats of sheltered embayments, lagoons or estuaries (Ewart 1973; Sibson 1948; Marchant & Higgins 1993), more often on firm sandy flats than on soft muddy ones (Rogers 1999b). They usually roost on sand-spits and banks on beaches or in tidal lagoons, and occasionally on rocky points (Bamford 1988; Ewart 1973; Pegler 1983; Sibson 1948, 1953), or in adjacent areas of saltmarsh (Gosper & Holmes 2002) or claypans (Collins et al. 2001). They tend to roost further up the beach than other waders, sometimes well above high-tide mark (C.D.T Minton, 2002 pers.comm).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Coxen's Fig Parrot (*Cyclopsitta diophthalma coxeni*)	E	CE	Likely to occur	1	The small, predominantly green Coxen's Fig Parrot is found wherever fig trees are present in lowland and upland forest types, riparian corridors, farmland and urban environments (Coxen's Fig-Parrot Recovery Team 2001). Seeds of native figs are the major food source of this endangered bird species (Forshaw 1981, Romer and Spittall 1994, Pizzey and Knight 1997). The Moreton Bay Fig (*Ficus macrophylla*) and Green-leaved Strangler Fig (*F. watkinsiana*) are preferred species. Other fig species also selected as food source are Rusty Fig (*F. rubiginosa*), White Fig (*F. virens*), Small-leaved Fig (*F. oblique*), Cluster Fig (*F. 9tilize9*), Sandpaper Figs (*F. coronata*), *F. 9tilize9* and *F. fraseri* and deciduous fig *F. superba* (Holmes 1990, Gynther et al. 1998). Other likely food sources include fruits of Lilly-Pillies (*Syzygium* spp., *Acmena* spp.), Blue Quandong (*Elaeocarpus grandis*), bolly gum (*Litsea 9tilize99d*), Red Ash (*Alphitonia excelsa*) and nectar of Silky Oaks (*Grevillea robusta*) (Holmes 1990, Irby 1930). The Coxen's Fig Parrot may obtain a source of zinc through consumption of lichens (Romer and Spittall 1994). Fruiting trees in gardens and cultivated farmlands may also be suitable as food source, including Edible Fig (*F. carica*), Cotoneaster (C*otoneaster lacteus*), Queen Palm (*Syagrus romanzoffiana*) and Loquat (*Eriobotrya japonica*) (Holmes 1990, Gynther et al. 1998, Forshaw 1969). Most records of Coxen's Fig-Parrot have been taken within small remnant stands, forest edges (Holmes 1994) or thin strips of gallery forest (Norris 1964). Subtropical rainforest, dry rainforest, sclerophyll forest and subtropical rainforest are preferred nesting sites (Coxen's Fig-Parrot Recovery Team 2001). High trees within or near the edge of rainforest are suitable for nesting. The nest chamber is found to be within the excavated underside of a dead or decaying limb or trunk in a living or dead tree. Habitat clearing and fragmentation are the major threats of this species (Holmes 1995, Pizzey and Knight 1997). Coxen's Fig-Parrot is estimated to occur in four subpopulations: greater Bundaberg region, Maleny/Imbil/Kin Kin Creek area, the Qld/NSW border area (Lamington National Park, Whian Whian State Forest, Alstonville plateau), and the upper Hastings River catchment. This estimate is considered to be of low reliability (i.e. there is uncertainty about the number of subpopulations and the extent of genetic separation between subpopulations) (Garnett & Crowley 2000 in DSEWPC, 2013). Most recent records of the species are recorded from the Lamington Plateau (Qld) with only seven unconfirmed sightings recorded from NSW since 1981. It is estimated that the remaining wild population of the species may be less than 100 individuals (DSEWPC, 2013).	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No

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Antipodean Albatross (*Diomedea antipodensis*)	V, M, MA	V	May occur	0	"The Antipodean Albatross is endemic to New Zealand, however forages widely in open water in the south-west Pacific Ocean, Southern Ocean and the Tasman Sea, notably off the coast of NSW (Elliott & Walker 2005; Environment Australia 2001f; Garnett & Crowley 2000). The Antipodean Albatross is marine, pelagic and aerial. It rarely enters the belt of icebergs region of Antarctica (Hicks 1973), but in late summer, it may approach the edge of pack-ice (Darby 1970). It sleeps and rests on ocean waters when not breeding. The Antipodean Albatross nests in open patchy vegetation, such as among tussock grassland or shrubs on ridges, slopes and plateaus (BirdLife International 2009; Warham & Bell 1979). On Antipodes Island, they nest in relatively uniform densities, but avoid areas of tall vegetation on steep coastal slopes, or amongst the tall ferns on poorly drained parts of the peaks near the island's centre (Walker & Elliott 2005). The Antipodean Albatross feeds primarily on cephalopods, fish and crustaceans (BirdLife International 2009; Gales 1998). Large seabirds, such as Albatrosses, feed on or close to the surface of the water. Their foraging behaviours, such as flying long distances to search for food, following boats, feeding aggressively on offal and diving for baits, make them susceptible to being drowned in longline fishing gear (AGDEH 2006q)." (DEE 2017 online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64458)	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Gibson's Albatross (*Diomedia antipodensis ibsoni*)	V, MA	V	May occur	0	"In Australian territory, Gibson's Albatross has been recorded foraging between Coffs Harbour, NSW, and Wilson's Promontory, Victoria (Garnett & Crowley 2000). Males and females appear to use different foraging areas, with females frequenting the Tasman Sea in the vicinity of 40° S, while males either disperse westwards at lower latitudes or north-east towards the mid-Pacific Ocean (EA 2001f). Gibson's Albatrosses are rarely observed in the Pacific Ocean or Indian Ocean. The only Australian record of this species is from a recapture off Wollongong, NSW, in September 1997. The bird had been banded as a chick on Gough Island four years prior (Leishman 1998; L. Smith n.d., pers. Comm., cited in EA 2001f). There are no breeding colonies of Gibson's Albatross in Australian territory. This albatross visits Australian waters while foraging and during the non-breeding season (EA 2001f). Previously, population decreases of more than 20% have been predicted as a result fishing by-catch mortality (Garnett & Crowley 2000), however, recent programs aimed at reducing these deaths may have been successful (e.g. AGDEH 2006q). Gibson's Albatross is marine, pelagic and aerial. In the Antarctic, it occurs in open water, and rarely enters the belt of icebergs region (Falla 1937a; Hicks 1973). In late summer, it may approach the edge of the pack-ice (Darby 1970) Gibson's Albatross flies within 15 m of the sea surface, using the updraft from wave fronts for lift. It circles over breeding islands to heights of at least 1500 m (Marchant & Higgins 1990). On breeding islands, the Gibson's Albatross nests on coastal or inland ridges, slopes, 10lateau and plains, often on marshy ground (Falla 1937a; Warham & Bell 1979). Nests of the Gibson's Albatross are sited on moss terraces, in dense tussocks, and often in loose aggregations on the west (windward) side of islands. It prefers open or patchy vegetation (tussocks, ferns or shrubs), and it requires nesting areas that are near exposed ridges or hillocks so that it can take off (Warham & Bell 1979). Gibson's Albatross eats squid, fish and crustaceans (Gales 1998; Marchant & Higgins 1990). Gibson's Albatross feeds pelagically, using the wind to travel great distances to forage, both during and between breeding seasons (Reinke et al. 1998). It feeds from the sea surface or just below it, or makes shallow dives from heights of 2–5 m (Harper 1987; Voisin 1981). Foraging behaviours of albatrosses, such as flying long distances to search for food, following boats, feeding aggressively on offal and diving for baits make them susceptible to being drowned in longline fishing gear (AGDEH 2006q)". (DEE 2017 online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=82270)	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No

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Wandering Albatross (*Diomedia exulans*)	V, M, MA	V	May occur	0	"The Wandering Albatross breeds on Macquarie Island (Environment Australia 1999; Marchant & Higgins 1990). A single breeding pair has also been recorded on Heard Island (Woehler 1991). It feeds in Australian portions of the Southern Ocean (Nicholls et al. 1995, 1997). The Wandering Albatross is marine, pelagic and aerial (Falla 1937; Hicks 1973). It occurs where water surface temperatures range from -2° to 24°C (Biermann & Voous 1950, Grindley 1981). In the Australasian region, it occurs inshore, offshore and in pelagic waters (Barton 1979, 1980; Blaber 1986; Norris 1967). It flies within 15 m of the sea surface, using the updraft from wave fronts for lift. It circles over breeding islands to heights of at least 1500 m (Marchant & Higgins 1990). On breeding islands, the Wandering Albatross nests on coastal or inland ridges, slopes, 11lateau and plains, often on marshy ground (Falla 1937; Warham & Bell 1979). Nests of the Wandering Albatross are sited on moss terraces, in dense tussocks, and often in loose aggregations on the west (windward) side of islands. It prefers open or patchy vegetation (tussocks, ferns or shrubs), and it requires nesting areas that are near exposed ridges or hillocks so that it can take off (Warham & Bell 1979). The Wandering Albatross eats mainly squid and fish, but also crustaceans and carrion (Marchant & Higgins 1990). The Wandering Albatross feeds mainly in pelagic, offshore and inshore waters. It feeds from the sea surface or just below it or makes shallow dives from heights of 2-5 m (Harper 1987; Voisin 1981). It regularly feeds in sheltered harbours and straits (Secker 1969), and sometimes gathers at outfalls of unmodified sewage (Milledge 1977). Foraging behaviours such as flying long distances to search for food, following boats, feeding aggressively on offal and diving for baits makes the species susceptible to being drowned in longline fishing gear (DEH 2006)". (DEE 2017 Online @http://www.environment.gov.au/cgibin/sprat/public/publicspecies.pl?taxon_id=89223).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Red Goshawk (*Erythrotriorchis radiatus*)	V	CE	Likely to occur	0	This raptor utilises coastal-subcoastal tall forests/woodlands, savanna traversed by forested rivers and rainforest fringes (Marchant & Higgins, 1993; NPWS, 2002; NPWS, 1999). In south-east Qld, Araucaria vine forests and open forests are a significant component of the vegetation mosaics frequented by Red Goshawks (Czechura 1997). In north-east NSW and south-east Qld, Red Goshawks are mainly found in rugged terrain (Debus 1993; Czechura 1996) as most suitable lowland forest has been cleared or modified. In northern Australia, they nest in both rugged terrain and lowland sites (Aumann & Baker-Gabb 1991 in NPWS, 2002) The population size is difficult to estimate because the red goshawk has a very sparse and discontinuous distribution over a wide area — from the Kimberley in Western Australia across northern Australia, and down the east coast of Queensland to northern New South Wales. It is estimated there are between 100 and 200 breeding pairs in Queensland. Some researchers have suggested that the species is extinct in New South Wales, although there is evidence that some pairs do remain along the Queensland-New South Wales border (Ryan, 2006). Based on analysis during 2001, the distribution of the Red Goshawk in south-east Qld has been recorded from areas of different land tenure. Six pairs are centred in National Park lands and four pairs are recorded from either private land or other crown land (e.g. State Forests) (Stewart & Hobson 2002 in NPWS, 2002). Hunting occurs for medium-large birds within open forests and riparian/gallery forests over a very large home range of up to 200km2 (Blakers et al., 1984, Aumann and Baker-Gabb, 1991, Czechura and Hobson, 2000; NPWS, 2002). The home range of the red goshawk is extremely large — estimates for five pairs in south-east Queensland vary from 50 to 220sq.km. A Northern Territory telemetry study estimate the home range for females at 120sq.km and males at 200sq.km (Ryan, 2006; Debus & Czechura, 1988). Nesting is restricted to tall trees within proximity of a creek, river or wetland (NPWS, 1999; NT Parks & Wildlife Commission, 2002). Nests are usually built towards the outer edge of the canopy on a substantial live horizontal limb and braced against a vertical branch on the limb. Favoured nest trees are taller than 20m and species in the genera Eucalyptus, Melaleuca, Corymbia and, less	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts. No nest were recorded.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No

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					frequently, Angophora. Red goshawks commonly nest in the tallest and largest tree in a stand of tall trees, often directly beside but always within 1km of a permanent waterway or wetland (Ryan, 2006).			
Grey Falcon (*Falco hypoleucos*)	V	E	May occur	0	The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses (Garnett et al. 2011; Watson 2011; Schoenjahn 2013, 2018; Janse et al. 2015; Ley and Tynan 2016). The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter (Olsen and Olsen 1986; Schoenjahn 2018). While breeding Grey Falcons feed almost exclusively on birds (Cupper and Cupper 1980, 1981; Harrison 2000; Aumann 2001c; Falkenberg 2011; Sutton 2011; Schoenjahn 2013; Janse et al. 2015; Ley and Tynan 2016). Prey species include doves, pigeons, small parrots and cockatoos, and finches, but a variety of other bird prey species has been recorded (Marchant and Higgins 1993, Hollands 1984; Debus and Rose 2000; Schoenjahn 2013, Cook 2014, Fisher 2015). Nonavian prey recorded by direct observation include small mammals on three occasions (Schoenjahn 2013, Moore 2016) and a lizard (Czechura 1981). Breeding occurs from June to November. Clutch size can vary from 1 – 4 eggs (Olsen and Olsen 1986; Garnett et al. 2011; Schoenjahn 2013). Eggs are laid in the old nests of other birds, particularly those of other raptors or corvids. The nests chosen are usually in the tallest trees along watercourses, particularly River Red Gum (Eucalyptus camaldulensis) and Coolibah (E. coolabah), but falcons also nest in telecommunication towers (Marchant and Higgins 1993; Schoenjahn 2013, 2018; Falkenberg 2010).	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts. No nests were recorded.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No
White-bellied Storm-petrel (*Fregetta grallaria grallaria*)	V	V	Likely to occur	0	The White-bellied Storm-Petrel occurs across sub-tropical and tropical waters in the Tasman Sea, Coral Sea and, possibly, the central Pacific Ocean (Harrison 1983; Hutton 1991; Marchant & Higgins 1990). In the non-breeding season, it reaches and forages over near-shore waters along the continental shelf of mainland Australia (Holmes 1977; Priddel 1996). It breeds, in Australian territory, on offshore islets and rocks in the Lord Howe Island group (Hutton 1991). It nests in crevices between large volcanic rocks (Fullagar et al. 1974; Hutton 1991), and in burrows excavated in banks (Hindwood 1940; McAllan et al. 2004). Breeding colonies are often situated along dykes (Fullagar 2002, pers. comm.). The White-bellied Storm-Petrel (Tasman Sea) breeds on small offshore islets and rocks in the Lord Howe Island group, including Roach Island and Balls Pyramid (Baker et al. 2002; Hutton 1991; Mayr & Cottrell 1979; McAllan et al. 2004; Rogers 1972). Its pelagic distribution is poorly understood, but it has been recorded north and east of its breeding islands to the tropics, in the Tasman Sea, Coral Sea, and north of New Zealand (Hindwood et al. 1963; Lovegrove 1978; Marchant & Higgins 1990; Norris 1965, 1967), and it is thought that some birds also reach the central Pacific Ocean (Harrison 1983; Hutton 1991). The White-bellied Storm-Petrel (Tasman Sea) feeds on small crustaceans and squid (Hutton 1991).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
White-throated Needletail (*Hirundapus caudacutus*)	V, M, MA	-	Known to occur	9	In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground (Coventry 1989; Tarburton 1993; Watson 1955). Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable (Cramp 1985), but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland (Higgins 1999). They also commonly occur over heathland (Cooper 1971; Learmonth 1951; McFarland 1988), but less often over treeless areas, such as grassland or swamps (Cooper 1971; Gosper 1981; Learmonth 1951). When flying above farmland, they are more often recorded above partly cleared pasture, plantations or remnant vegetation at the edge of paddocks (Emison & Porter 1978; Friend 1982; Tarburton 1993). In coastal areas, they are sometimes seen flying over sandy beaches or mudflats (Cooper 1971; Crompton 1936; Davis 1965), and often	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. The species will continue to be able to forage in the air space above the site.	No

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					around coastal cliffs and other areas with prominent updraughts, such as ridges and sand-dunes (Cooper 1971; Dawson et al. 1991; Loyn 1980; Mitchell et al. 1996; Schulz & Kristensen 1994). They are sometimes recorded above islands well out to sea (Brandis et al. 1992; Cooper 1971; Warham 1957). The species has been recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows (Corben et al. 1982; Day 1993; Quested 1982; Tarburton 1993), though the number of references to Needletails roosting in trees possibly over-emphasizes such occurrences (Higgins 1999). It has been suggested that they also sometimes roost aerially (Currie 1928; Dove 1919; Schulz & Kristensen 1994), and it was formerly erroneously thought that the species did not alight while in Australia (Pescott 1983). White-throated Needletails may take refuge during extreme conditions. Many birds were seen perching on the trunks of trees during a bushfire (Currie 1916; Currie 1928); during cold weather, one was found roosting during the day in the hollow branch of a eucalypt (Pettigrew & Wilson 1985) and some were seen sheltering in stunted scrub during bad weather on the high plains (Paterson 1930). They may also alight on the trunks or branches of trees during hot or inclement weather (Davies 1982; Littler 1910a; Loyn 1980; Whackett 1989; Wheeler 1959); and there is a record of Needletails resting on a lawn under sprinklers during hot weather (Davies 1982).			
Swift Parrot (*Lathamus discolor*)	CE	E	Likely to occur	0	The required breeding habitats for this species is limited to southeast Tasmania in Eucalypt Forest containing suitable densities of hollow-bearing trees required for nesting (Swift Parrot Recovery Team, 2000). Within the winter period it is present on the mainland foraging on a small variety of winter-flowering Eucalyptus as it stores resources to enable its spring return to Tasmania (Swift Parrot Recovery Team, 2000). 'The Swift Parrot migrates from its Tasmanian breeding grounds to overwinter in the box-ironbark forests and woodlands of Victoria, New South Wales and southern Queensland. The principal wintering grounds are the inland slopes of the Great Dividing Range and along the eastern coastal plains (Saunders et al, 2010; DEWHA, 2009). In Victoria, approximately 38% of the total box-ironbark habitat (including habitat on private and public land) occurs within reserves (Environment Conservation Council, 2001). In New South Wales, only 5% of ironbark and woodland communities are reserved (DSEWPC, 2013). Key habitats for the species on the coast and coastal plains of New South Wales include Spotted Gum (Corymbia aculate), Swamp Mahogany (E. robusta) and Forest Red Gum (E. tereticornis) (Saunders 2002b). These tree species provide foraging and roosting habitat for the species. In northern New South Wales and south-eastern Queensland, Narrow-leaved Red Ironbark (E. crebra), Forest Red Gum forests and Yellow Box forest are commonly utilized (Swift Parrot Recovery Team 2001)' (Department of the Environment, Water, Heritage and the Arts, 2009: 5). Priority habitat in Queensland includes Bowman Park, Bardon; Rafting Creek Reserve Kenmore/Fig Tree Pocket (Brisbane) and Glen Lomond Park (Toowoomba) [Saunders et al, 2011].	Low. Marginal potential foraging habitat present for the species. The species was not recorded during survey efforts. Breeding habitat not present.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No
Western Alaskan Bar-tailed Godwit (*Limosa lapponica bauei*)	V, M, MA	-	Known to occur	9	The bar-tailed godwit (both subspecies combined) has been recorded in the coastal areas of all Australian states. It is widespread in the Torres Strait and along the east and south-east coasts of Queensland, NSW and Victoria. In Tasmania, the bar-tailed godwit has mostly been recorded on the south-east coast. In South Australia it has mostly been recorded around coasts from Lake Alexandrina to Denial Bay. In Western Australia it is widespread around the coast, from Eyre to Derby. Populations have also been recorded in the northern Australia, from Darwin east to the Gulf of Carpentaria. The bar-tailed godwit is a regular migrant to Christmas Island, Norfolk Island, Lord Howe Island. It has also been recorded on subantarctic islands such as Macquarie Island, Snares Islands, Auckland Islands and Campbell Islands (Higgins & Davies 1996). During the non-breeding period, the distribution of bar-tailed godwit (western Alaskan) is predominately New Zealand, northern and eastern Australia (Bamford et al. 2008). In Australia it mainly occurs along the north and east coasts (Garnett et al. 2011).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No

Threatened Species or Ecological Community	Conservation Status		Recorded in Locality		Description / Preferred Habitat*	Likelihood of Occurrence in Proposal Area	Likelihood of Significant Impact	Assessment of Significance Required?
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					At northern hemisphere breeding sites, the bar-tailed godwit (western Alaskan) nests on the ground in open tundra, usually on dry elevated sites and often between clumps of grass (del Hoyo et al. 1996; Woodley 2009). The nest is usually a depression lined with bits of vegetation and lichens (del Hoyo et al. 1996). The bar-tailed godwit (western Alaskan) occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats (Higgins & Davies 1996). The bar-tailed godwit (western Alaskan) usually forages near the edge of water or in shallow water, mainly in tidal estuaries and harbours. They prefer exposed sandy or soft mud substrates on intertidal flats, banks and beaches. On Heron Island, Qld they have been seen feeding on insect larvae among the roots of Casuarina (Higgins & Davies 1996). The bar-tailed godwit (western Alaskan) usually roosts on sandy beaches, sandbars, spits and also in near-coastal saltmarsh (Higgins & Davies 1996). In some conditions, shorebirds may choose roost sites where a damp substrate lowers the local temperature. During periods of cyclonic activity, shorebirds moved to sheltered areas to avoid high winds and heavy rain (Jessop & Collins 2000).			
Southern Giant Petrel (*Macronectes giganteus*)	E, M, MA	E	May occur	39	The TSSC 2011: "The Southern Giant Petrel has a circumpolar pelagic range from Antarctica to approximately 20° S and is a common visitor off the entire length of the New South Wales coast (H. Battam, pers. Comm.; Blakers et al. 1984). Over summer, the species nests in small colonies amongst open vegetation on Antarctic and subantarctic islands, including Macquarie and Heard Islands and in Australian Antarctic territory. A single chick is raised and although breeding occurs annually, approximately 30% of the potential breeding population does not nest (Voisin 1988). The Southern Giant Petrel is an opportunistic scavenger and predator. The species regularly attends fishing vessels and scavenges animal carcasses on land. Southern Giant Petrels are also an active predator of cephalopods and euphausiids, as well as smaller birds (particularly penguins) both at land and at sea. Although representing a small proportion of its total foraging area, potential forage in NSW waters during the winter is nonetheless considered significant for the species." (OEH 2011 online @ http://www.environment.nsw.gov.au/determinations/SouthernGiantPetrelEndSpListing.htm.	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Northern Giant Petrel (*Macronectes halli*)	V, M, MA	V	May occur	6	'The Northern Giant Petrel breeds in the sub-Antarctic, and visits areas off the Australian mainland mainly during the winter months (May-October). Immature and some adult birds are commonly seen during this period in offshore and inshore waters from around Frenamtle (WA) to around Sydney (NSW) (Pizzey & Knight 1999). Banded Northern Giant-Petrels from Macquarie Island are frequently observed in Australian waters (particularly along the southern coast) throughout the colder months, the majority of which (94%) are pre-breeding birds (EABG 1998). The Northern Giant-Petrel is marine and oceanic. It mainly occurs in sub-Antarctic waters, but regularly occurs in Antarctic waters of the southwestern Indian Ocean, the Drake Passage and west of the Antarctic Peninsula (Marchant & Higgins 1990). The range of the Northern Giant-Petrel extends into subtropical waters mainly between winter and spring. It frequents both oceanic and inshore waters near breeding islands and in the non-breeding range. During its first year, it probably occurs mainly on continental shelves, slopes and cold eastern boundary currents off South America, South Africa, Australia and New Zealand. It may be more oceanic from its second year. It is attracted to land at sewage outfalls, and scavenges at colonies of penguins and seals (Marchant & Higgins 1990). The Northern Giant- Petrel breeds on sub-Antarctic islands. Its breeding range extends into the Antarctic zone at South Georgia. It nests in coastal areas where vegetation or broken terrain offers shelter, on sea-facing slopes, headlands, in the lee of banks, under or against vegetation clumps, below cliffs or overhanging rocks, or in hollows. On Campbell Island, it nests on the edge of the coastal plateau. Tussock-grass (*Poa*) is widespread at many breeding sites. Its nests are built in secluded, coastal sites, sheltered by	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No

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					heavy vegetation. On Antipodes Island, it nests under *Senecio antipoda* (Marchant & Higgins 1990). The Northern Giant-Petrel eats seal, whale, and penguin carrion, and seal placentae. It often attends and follow ships to obtain offal. It also eats substantial quantities of euphausiids (krill) and other crustaceans, cephalopods (octopus and squid), and fish. It will kill and eat immature Albatross *Diomedea*, and a variety of other seabirds, which are either consumed as carrion or captured at sea. Kelp is also recorded in its diet (Marchant & Higgins 1990).' (DEE 2017 online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1061).			
Eastern Curlew (*Numenius madagascariensis*)	CE, M, MA	-	Known to occur	5	Within Australia, the eastern curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. Eastern curlews are rarely recorded inland. They have a continuous distribution from Barrow Island and Dampier Archipelago, Western Australia, through the Kimberley and along the Northern Territory, Queensland, and NSW coasts and the islands of Torres Strait. They are patchily distributed elsewhere. During the non-breeding season in Australia, the eastern curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (Zosteraceae). Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes within the mangroves. The birds are also found in coastal saltworks and sewage farms (Marchant & Higgins, 1993). The eastern curlew mainly forages during the non-breeding season on soft sheltered intertidal sandflats or mudflats, open and without vegetation or covered with seagrass, often near mangroves, on saltflats and in saltmarsh, rockpools and among rubble on coral reefs, and on ocean beaches near the tideline. The birds are rarely seen on near-coastal lakes or in grassy areas (Marchant & Higgins, 1993). The eastern curlew roosts during high tide periods on sandy spits, sandbars and islets, especially on beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. They occasionally roost on reef-flats, in the shallow water of lagoons and other near-coastal wetlands. Eastern curlews have occasionally been recorded roosting in trees and on the upright stakes of oyster- racks (Marchant & Higgins, 1993). At Roebuck Bay, Western Australia, birds have been recorded flying from their feeding areas on the tidal flats to roost 5 km inland on a flooded supratidal claypan (Collins et al., 2001). In some conditions, shorebirds may choose roost sites where a damp substrate lowers the local temperature. This may have important conservation implications where these sites are heavily disturbed beaches (Rogers, 1999). It may be possible to create artificial roosting sites to replace those destroyed by development (Harding et al., 1999). Eastern curlews typically roost in large flocks, separate from other shorebirds (Marchant & Higgins, 1993)."	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Fairy Prion (*Pachyptila turtur subantarctica*)	V	-	Known to occur	10	The Fairy Prion is found throughout oceans and coastal areas in the Southern Hemisphere. Fariy prions are mainly found offshore but may move inshore during stormy weather. The species diet is comprised mostly of crustaceans (especially krill), but occasionally includes some fish and squid. It feeds mainly by surface-seizing and dipping but can also catch prey by surface plunging or pattering. It often associates with other prions and storm-petrels when feeding around boats. The breeding season starts in September and the species is highly colonial, creating burrows in coastal sites on oceanic islands (del Hoyo et al. 1992). The global population of the species has been conservatively estimated at five million birds (Brooke 2004). Australia is thought to contain 50 per cent of the global population with most colonies located in Victoria and Tasmania (Brooke 2004).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No

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Sooty Albatross (*Phoebetria fusca*)	V, M, MA	V	May occur	0	The Sooty Albatross has sometimes been observed foraging in inshore waters in southern Australia (Thiele 1977). The Sooty Albatross is a rare, but probably regular migrant to Australia, mostly in the autumn-winter months, occurring north to south-east Queensland, NSW, Victoria, Tasmania and South Australia (Pizzey & Knight 1999). The Sooty Albatross is marine and pelagic. In summer, the species occurs mainly south of 35° S in subtropical and subantarctic waters, but it is most abundant near the Subtropical Convergence (Falla 1937a; Tickell & Woods 1972; Weimerskirch et al. 1986). The species breeds on subtropical and subantarctic islands in the Indian and Atlantic Oceans, on vegetated cliffs and steep slopes that are sheltered from prevailing winds, often amongst tussock grass (Weimerskirch et al. 1986).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Gould's Petrel (*Pterodroma leucoptera leucoptera*)	E	V	May occur	1	The Australian subspecies of the Gould's Petrel breeds in NSW on Cabbage Tree Island and nearby Boondelbah Island, near Port Stephens (Fullagar 1976; Priddel & Carlile 1997, 1997a), and at least one pair on Montague Island, near Narooma (ABC News 2013). Gould's Petrel is a pelagic marine species, spending much of its time foraging at sea and coming ashore only to breed. The Australian subspecies breeds and roosts on two islands off NSW, Cabbage Tree and Boondelbah Islands, and the at-sea distribution is poorly known (NSW 2006a; D'Ombrain 1970; Fullagar 1976; Hindwood & Serventy 1941; Hull 1911b; Priddel & Carlile 1995b, 1997; Priddel et al. 1995).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Kermadec Petrel [western] (*Pterodroma neglecta neglecta*)	V	V	May occur	1	In Australia, the Kermadec Petrel (western) breeds on Balls Pyramid, which lies to the south of Lord Howe Island, and on Phillip Island, in the Norfolk Island group (Baker et al. 2002; Fullagar et al. 1972; Hutton 1991; Mayr & Cottrell 1979; McAllan et al. 2004; Wood 1988). The Kermadec Petrel (western) is a pelagic seabird that occurs in tropical, subtropical and temperate waters of the Pacific Ocean (Gould 1983; Gould & King 1967; Marchant & Higgins 1990; Mayr & Cottrell 1979; Reid et al. 2002; Spear et al. 1992; Wahl 1978).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Australian Painted Snipe (*Rostratula australis*)	E, MA	E	Known to occur	0	Little is known of the ecology, habitat requirements and reproductive biology of the Painted Snipe excepting that they are known to feed within shallow water or at the waters' edge and on mudflats, taking seeds and invertebrates such as insects, worms, molluscs and crustaceans (DSEWPC, 2013). Smith (1991) notes that wetlands containing grasses, lignum and/or samphire cover are favoured while Marchant and Higgins (1993) note that artificial habitats such as dams, sewerage ponds and flooded grassland are sometimes utilized. Within Gold Coast City a population has been previously recorded within marsh (which has been preserved by Energex) at Hope Island to the north (Newsletter of the Australian Painted Snipe Project, 2002; Pacey, 2002). The species is also highly nomadic in response to suitable conditions, such as floods (Pringle 1987, Marchant & Higgins 1993, Smith et al. 1995). Nest sites, consisting of a scrape in the ground (Pringle 1987), are located on the ground amongst tall vegetation, such as grass tussocks or reeds. Nests are often built on small islands (Marchant & Higgins 1993).	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. Wetlands created as a part of the proposal may provide future habitat for this species.	No
Australian Fairy Tern (*Sternula nereis nereis*)	V	-	May occur	0	The Fairy Tern (Australian) nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The subspecies has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands and mainland coastline (Higgins & Davies 1996; Lindsey 1986a). The bird roosts on beaches at night (Higgins & Davies 1996).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Shy Albatross (*Thalassarche cauta*)	V, M, MA	V	May occur	0	In Australian waters the Shy Albatross occurs along the east coast, from Stradbroke Island in Queensland, along the entire south coast of the continent to Carnarvon in Western Australia.	Low. The site does not contain suitable habitat for this species. The species was	Unlikely. No habitat will be impacted as a part of the proposal.	No

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					Although uncommon north of Sydney, the species is commonly recorded off south-east NSW, particularly between July and November (Wood 1992). The pelagic or ocean-going Shy Albatross inhabits sub-antarctic and subtropical marine waters, spending the majority of their time at sea. Occasionally the species occurs in continental shelf waters, in bays and harbours (Wood 1992). Nests are located on rocky islets and stacks with little vegetation and soil. Known breeding locations include Albatross Island off Tasmania, Auckland Island, Bounty Island and The Snares, off New Zealand. Located on sheltered sides of islands, on cliffs and ledges, in crevices and on slopes, nests are used annually and consist of a mound of mud, bones, plant matter and rocks (Marchant & Higgins 1990).	not recorded during survey efforts.		
Indian Yellow-nosed Albatross (*Thalassarche carteri*)	V, M, MA	-	May occur	0	The Indian Yellow-nosed Albatross forages mostly in the southern Indian Ocean where it is particularly abundant off Western Australia (Marchant & Higgins 1990). In the Australasian region, the species occupies inshore and offshore waters (Latham 1980; Storr 1964; Swanson 1983), particularly where there are calm seas and light winds (Cox 1973; Storr 1964).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Chatham Albatross (*Thalassarche eremita*)	E, M, MA	-	May occur	0	Breeding for the Chatham Albatross is restricted to Pyramid Rock, Chatham Islands, off the coast of New Zealand (Gales 1998). The principal foraging range for this species is in coastal waters off eastern and southern New Zealand, and Tasmania (Environment Australia 1999; Marchant & Higgins 1990). The Chatham Albatross is a marine species. It occurs in subantarctic and subtropical waters reaching the tropics in the cool Humboldt Current off South America (Marchant & Higgins 1990). It has been noted in shelf-waters around breeding islands, over continental shelves during the non-breeding season, and occurs inshore and offshore (Cox 1976; Falla 1937; Marchant 1977). It enters harbours and bays (Jehl 1973) and is scarce in pelagic waters (Falla 1937; Jehl 1973). The Chatham Albatross preference for sea-surface temperatures is poorly known. In Chilean waters it has been observed over waters of 11.5 to 15°C (Jehl 1973). The species nests on level or gently sloping ledges, summits, slopes and caves of rocky islets and stacks. It is usually in broken terrain with little soil and vegetation (Brothers 1979a, b; Fleming 1939; Green 1974; Marchant & Higgins 1990; Miskelly 1984).' (DEE 2017 online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64457).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Campbell Albatross (*Thalassarche impavida*)	V, M, MA	V	May occur	0	The Campbell Albatross is a non-breeding visitor to Australian waters. Non-breeding birds are most commonly seen foraging over the oceanic continental slopes off Tasmania, Victoria and New South Wales (EA 2001f). After breeding, birds move north and may enter Australia's temperate shelf waters (Marchant & Higgins 1990). The Campbell Albatross is a marine sea bird inhabiting sub-Antarctic and subtropical waters from pelagic to shelf-break water habitats (Marchant & Higgins 1990). In the Antarctic, it occurs through the belt of icebergs to the edge of the consolidated pack-ice (Falla 1937; Hicks 1973). The Campbell Albatross does not penetrate the ice-packs, perhaps because ice inhibits soaring by dampening sea swells (Ainley et al. 1984). They tolerate sea surface-temperatures from 0–24 °C (Bierman & Voous 1950; Grindley 1981; Jehl 1973) but are mainly found in the sub-Antarctic (Jehl 1973; Johnstone & Kerry 1976). In December, the subspecies southern limit in the Ross Sea is at the 1.0 °C isotherm and in January at the 0.0 °C isotherm (Ainley et al. 1984). In breeding and non-breeding seasons, the Campbell Albatross are specialised shelf feeders, concentrating around breeding islands or over adjacent submarine banks (Weimerskirch et al. 1986, 1988). In winter, they are commonly found in the coastal waters of continents, over up-wellings or boundaries of currents (Brown 1975; Cooke & Mills 1972; Weimerskirch et al. 1985).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No

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					The Campbell Albatross breed on Campbell Island (Marchant & Higgins 1990). They make their nests on tussock-covered ledges and terraces of cliffs, slopes and hills, overlooking the sea or valleys, and on the summits of rocky islets (Bailey & Sorenson 1962; Downes et al. 1959; Weimerskirch et al. 1986).' (DEE 2017 online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64459).			
Black-browed Albatross (*Thalassarche melanophris*)	V, M, MA	V	May occur	0	The Black-browed Albatross breeds within Australian jurisdiction on Heard Island (Kirkwood & Mitchell 1992; Woehler 2006; Woehler et al. 2002), McDonald Islands (Gales 1998; Woehler 2006; Woehler et al. 2002), Macquarie Island (Copson 1988; Gales 1998; Scott 1994c) and Bishop and Clerk Islets (Scott 1994c; Gales 1998). Individuals are mostly confined to subantarctic and Antarctic waters surrounding these islands in the breeding season (Brooke 2004; Lawton 2004; Marchant & Higgins 1990; Terauds et al. 2006). During this time, the species is an uncommon visitor to the continental shelf-break of southern Australia – reaching South Australia, Tasmania and western and eastern Bass Strait in the south-east and Antarctica (Reid et al. 2002; Terauds et al. 2006; Woehler et al. 1991).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Salvin's Albatross (*Thalassarche salvini*)	V, M, MA	-	May occur	0	Salvin's Albatross is a non-breeding visitor to Australian waters. It is a marine species occurring in subantarctic and subtropical waters, reaching the tropics in the cool Humboldt Current, off South America (Marchant & Higgins 1990). The sea-surface temperature preferences of Salvin's Albatross are poorly known. In the southern Indian Ocean the species has been observed over waters of 6.4–13.5 °C (Rand 1963). Birds have been noted in shelf-waters around breeding islands and over adjacent rises. During the non-breeding season, the species occurs over continental shelves around continents. It occurs both inshore and offshore (Cox 1976; Falla 1937; Marchant 1977) and enters harbours and bays (Jehl 1973). Salvin's Albatross is scarce in pelagic waters (Falla 1937; Jehl 1973). Salvin's Albatross nest's on level or gently sloping ledges, summits, slopes and caves of rocky islets and stacks, usually in broken terrain with little soil and vegetation (Brothers 1979a, 1979b; Fleming 1939; Green 1974; Miskelly 1984).' (DEE 2017 online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64463).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
White-capped Albatross (*Thalassarcge steadi*)	V, M, MA	-	Foraging, feeding or related behaviour likely to occur	0	The White-capped Albatross is a marine species and occurs in subantarctic and subtropical waters. It reaches tropical areas associated with the cool Humboldt Current off South America (Marchant & Higgins 1990). The White-capped Albatross probably has a diet of inshore cephalopods (squid) and fish, but this has not been studied (Gales 1993; Marchant & Higgins 1990).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Fish								
Black Rockcod (*Epinephelus daemelii*)	V	-	Likely to occur	0	In Australia, the distribution of black cod ranges from southern Queensland through NSW to northern Victoria. However, records from Queensland and Victoria are rare, and the single specimen recorded from South Australian waters is considered a vagrant. The NSW coastline forms the species' main range, both in Australia and internationally. Black cod generally inhabit near-shore rocky and offshore coral reefs at depths down to 50 m. In coastal waters adult black cod are found in rock caves, rock gutters and on rock reefs. Black cod are an aggressive, territorial species and individuals may occupy one particular cave for most of their adult life. Recently settled juvenile black cod (i.e. individuals that have recently completed the pelagic, drifting larval stage) are often found in coastal rock pools while slightly older juvenile black cod are often found in estuary systems (Hutchins and Swainston, 1986; Pogonoski et al., 2002; Harasti et al., 2004). The use of estuaries may be an important part of the ecology of juvenile black cod, at least in NSW waters. Larger juvenile black cod appear to move into adult habitats but hide in rock structures and remain highly cryptic until at least 40 cm in length (Malcolm and Harasti, 2010). There is a general progression to deeper waters as black cod increase in size.	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No

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					The distribution of this species is not known to overlap with any EPBC Act-listed threatened ecological community. However, black cod frequently utilise the same near-shore rocky reef habitats as the eastern Australian population of grey nurse shark (*Carcharias taurus*), which is listed as critically endangered under the EPBC Act.			
White's Seahorse (*Hippocampus whitei*)	E	-	Likely to occur	0	*H. whitei* is known to occur in estuaries from St Georges Basin, NSW to Hervey Bay, QLD (Kuiter, 2009; Harasti et al., 2012).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Blue Warehou (*Seriolella brama*)	CD	-	Known to occur	-	Globally, the blue warehou is confined to Australian and New Zealand waters (Kaschner et al., 2010). Within the Australian Exclusive Economic Zone, the species occurs predominantly in coastal shelf, upper continental slope and seamount waters offshore from New South Wales, Tasmania, Victoria and South Australia (Bruce et al., 1998; Gomon, 2008).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Southern Bluefin Tuna (*Thunnus maccoyii*)	CD	-	Likely to occur	-	Adult Southern Bluefin Tuna in Australian waters, ranges widely from northern Western Australia (WA) to the southern region of the continent, including Tasmania, and to northern New South Wales, appearing in eastern Australian waters mainly during winter (Caton 1991; CCSBT 2009; Honda et al. 2010; NSW DPI FSC n.d.). Juveniles of one to two years of age inhabit inshore waters in WA and South Australia (Honda et al. 2010).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Frogs								
Wallum Sedgefrog (*Litoria olongburensis*)	V	V	Known to occur	28	This species is known from a variety of coastal sandy vegetation communities associated with wallam (banksia) including heathland, sedgeland, melaleuca forest/woodland and ephemeral wetlands with a preference for acidic (low pH) seasonally inundated sedge swamps for breeding. The known distribution includes such lowland coastal zones from Fraser Island (southeast QLD) to Yuraygir National Park (north-east NSW) including several offshore islands such as Fraser Island, Bribie Island, Moreton Island and North Stradbroke Island (DSEWPC, 2011; Meyer et al, 2006; BSC, 2010). A review of the 19tilize19 distribution of *Litoria olongburensis* (DSEWPC, 2011) notes that the species is neither mapped as 'known/likely to occur' nor 'may occur' on the mainland between approximately Tugun and Beerwah. At swamp sites, the Wallum Sedge Frog can be found sheltering amongst sedges, reeds and ferns all year round (Anstis 2002; Ehmann 1997; Ingram & Corben, 1975; James, 1996; Lewis & Goldingay, 2005; Liem & Ingram, 1977; Neilson, 2000 in DSEWPC, 2012). During wet periods the frog can be found on emergent vegetation (rushes, sedges, ferns) whilst during drier periods it may be found at the base of such vegetation (BSC, 2010). Breeding occurs after rain in spring, summer and autumn within acidic, permanent to ephemeral freshwater wetlands with emergent vegetation, most notably sedges, reeds or ferns in still water 0.5-1.5m deep (Hines et al, 2004). These wetlands (wallum swamps, bogs, lakes or creeks), which are considered habitats critical to the survival of the species, typically overlie deep, low-nutrient, sandy soils where groundwater levels are characteristically high (Wallum Sedge Frog Workshop 2010 in DSEWPC, 2012; Meyer et al, 2006). Consequently, numerous survey guidelines indicate that searches for the species are best undertaken during the warmer months as activity may be increased. It is noted, however, that studies undertaken over a four year period in northeastern NSW (Lewis and Goldingay, 2005) resulted in counts of individuals of *Litoria olongburensis* being higher in winter than in summer. Additional activity information obtained noted that counts of adults were negatively influenced by rain during the previous day, but positively influenced by rain the previous week. Counts of juveniles were influenced by rain during the previous three months (Lewis and Goldingay, 2005). A significant population of the species is noted to occur within restricted wallum habitats on Gold Coast airport lands investigated in association with the Tugun Bypass SIS (PB, 2004; Hero et al, 2001; BAAM, 2005). Breeding habitat is characterised by low pH and relatively deep pools with some capacity to retain water for longer periods with six ponds of breeding importance located proximate to the Gold Coast Airport (Hero et al, 2001). It is noted that purpose built frog	Low. Marginal habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal habitat is unlikely to significantly impact the species. Wetlands created as a part of the proposal may provide future habitat for this species.	No

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					ponds established adjacent the airport site have been re-colinised by the wallum sedgefrog post construction of the Tugun Bypass (QDTMR, 2007). "The context of the Tugun population with respect to other populations of the frog is as follows: • It is an isolated population that is 30-40km to the north of the nearest known population in the Pottsville Area, New South Wales and 45 km to the nearest known population in the north, North Stradbroke Island, Queensland. • It also most likely occurs on South Stradbroke Island, which is about 16km north of Tugun. • The nearest known mainland population in Queensland is at Beerwah about 100km to the north. However, it is known from in between on the major Moreton Bay Islands of Bribie, Moreton and North Stradbroke. The Stradbroke Islands were apparently connected to each other and the mainland at Southport during European memory.			
Fleay's Frog (*Mixophyes fleayi*)	E	E	Likely to occur	0	Disjunct distribution in wet forests over a restricted range from the Conondale Range south-east Queensland (26° 43´S 152° 35´E), south to Trynney Creek in the Richmond Range in north-east New South Wales (28° 48´S, 152° 44´E) at altitudes ranging from 100 - 1000 m above sea level (Hines et al. 1999). Adults are found in leaf litter and along watercourses in rainforest and adjoining wet sclerophyll forests. Males call from rocks in streams or from pools at the margins of these streams (Corben & Ingram 1987) or from the forest floor. Females have been located well away from streams, over hundreds of metres from known breeding sites.	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. Wetlands created as a part of the proposal may provide future habitat for this species.	No
Insects								
Australian Fritillary (*Argynnis hyperbius inconstans*)	CE	E	May occur	1	The Australian fritillary has been recorded in scattered locations across south-eastern Queensland and north-eastern New South Wales (Braby 2000; Sands & New 2002). The subspecies appearsto have had a core distribution between Gympie in Queensland and Port Macquarie in NSW, although there are historical records which extend beyond this range. The subspecies has been recorded as far north as Mt Bellenden Ker in Queensland, and as far south as the Hunter Valley in NSW (Sands & New 2002). The Australian fritillary was, at times, considered to have been common at certain locations (Binns 1976; Sands & New 2002). It was reported to be abundant around Gympie at intervals between 1977 and 1994, and around Port Macquarie in 1977, 1985 and 1994 (Sands & New 2002). However, the subspecies experienced declines throughout the 1980s and 1990s. In 1994, Dunn et al. estimated that the subspecies' distribution had contracted by 80 percent (Dunn et al., 1994). The Australian fritillary is restricted to areas where its larval food plant, Viola betonicifolia (the arrowhead violet), occurs (NSW Scientific Committee 2002). The arrowhead violet is widespread throughout Queensland and NSW, at both high and low altitudes. However, the Australian fritillary appears to only occupy lower altitude sites (<600m), and in these lower altitude regions there has been significant clearing for urban expansion. Modelling indicates that around half of the previously suitable Australian fritillary habitat was cleared by 1997 (Neldner pers. Comm., 2016). In addition to land clearance, the arrowhead violet has declined in abundance due to weed invasion (mostly exotic grasses), trampling by livestock, drought and wetland drainage (Sands pers. Comm., 2016). While the arrowhead violet is widespread, moderate densities of the species are believed to be necessary to sustain breeding populations of the Australian fritillary (Sands & New 2002; Qld DEHP 2010). Aggregations of the arrowhead violet hat would sustain breeding populations have become increasingly rare in areas where the butterfly was formerly known to occur. This lack of aggregations of the plant in suitable coastal locations appears to have impacted upon the Australian fritillary (Andren pers. Comm., 2016).	Low. The site does not contain suitable habitat (i.e. *Viola betonicifolia* is absent) for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No

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					One of the last reliable sightings of the subspecies was in 2001 near Port Macquarie. A sighting was also reported in the vicinity of Caboolture, Queensland at this time (Sands & New 2002). A considerable search effort has been made to find populations of the Australian fritillary by interest groups. Most sites where the subspecies was once well known have been surveyed, many repeatedly (Andren pers. Comm., 2016). However, targeted surveys have repeatedly failed to locate the subspecies. There continues to be sporadic reports of the subspecies, although none have been verified by photographs or specimens or have been able to be repeated by other observers. In 2014, a sighting was reported near the town of Seventeen Seventy in Queensland, and a sighting was reported in 2015 near Port Macquarie. While the Australian fritillary has been successfully bred in captivity in the past, there are no known captive populations of the subspecies (Andren pers. Comm., 2016).			
Pink Underwing Moth (*Phyllodes imperialis smithersi*)	E	E	Breeding may occur	8	The Pink Underwing Moth is distributed from Nambour, south-east Queensland, to Dorrigo in northern NSW (Clarke & Spier-Ashcroft 2003). It is currently known from five locations, of which Mary Cairncross Scenic Reserve, near Maleny (Queensland), contains the only confirmed breeding habitat (NSW SC 2003j). This subspecies occurs within the Burnett Mary and South East (Queensland) and Northern Rivers (NSW) Natural Resource Management Regions (TSSC 2008xy). The Pink Underwing Moth is found below the altitude of 600 m in undisturbed, subtropical rainforest. 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 (Clarke & Spier-Ashcroft 2003; NSW DECC 2005ag). Where *C. multisepalea* attains an upright form, the association with the moth does not occur (TSSC 2002n). The larvae of the Pink Underwing Moth feed on the vine *Carronia multisepalea* which appears to be relatively rare (NSW SC 2003j).	Low. The site does not contain suitable habitat for this species (i.e. presence of *Carronia multisepalea*). The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Mammals								
Blue Whale (*Balaenoptera musculus*)	E, MA	-	May occur	0	Blue whale habitat is variable between the two subspecies found in Australian waters. The Antarctic blue whale tends to remain at higher latitudes and migrate to lower latitudes for feeding, breeding and calving during the Australian summer, whilst some remain within the Antarctic waters year-round (Branch 2007, Širovic et al. 2009). In comparison, the pygmy blue whale habitat is more diverse, expanding throughout the Indian Ocean, with individuals moving between Australia and the warmer waters of Indonesia (Branch et al. 2007, Double et al. 2014).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	V	Likely to occur	0	The Large-eared Pied Bat occurs within drier habitats, including dry sclerophyll forests and woodlands (Hoye and Schulz in Van Dyck and Strahan, 2008) although it has been recorded within a range of habitats, including wet and dry sclerophyll forest, Cyprus pine dominated forest, tall open eucalypt forest with a rainforest sub-canopy, sub-alpine woodland, but typically in association with sandstone relief. In south-eastern Queensland it has been noted primarily within higher altitude moist tall open forest adjacent to rainforest (Schulz et al. 1999) including Main Range National Park and land west of Mt Barney (Hoye 2005). 'Little is known about the habitat and roosting requirements of the Large-eared Pied Bat, but natural roosts may depend heavily on sandstone outcrops. It has been found roosting in disused mine shafts, caves, overhangs and disused Fairy Martin (Hirundo ariel) nests for shelter and to raise young (Hoye & Dwyer 1995; Schulz 1998). It also possibly roosts in the hollows of trees (Duncan et al. 1999).' [in DEWHA, 2009 online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=183.].	Low. Marginal potential foraging habitat present for the species. No roosting habitat occurs within the site. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No
Spotted-tailed Quoll (*Dasyurus maculatus maculatus (SE Mainland population)*)	E	V	Known to occur	3	The species has been recorded from a wide range of habitats such as rainforest, open forest, woodland, coastal heathland, and inland riparian forest (Edgar and Belcher, 2002; Forest Practices Board, 2002). Additional habitat requirements include suitable den sites (such as hollow logs, tree hollows, rock outcrops or caves) and an abundance of food (such as birds and small mammals) (NSWNPWS, 1999; Edgar & Belcher, 2001; Belcher, 2000; Jones & Ross, 1996). Habitat range for males has been estimated to be as large as 2000-2200 hectares per individual, while for females, which are more protective of their dens, this value is considerably less at	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No

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					between 700-850 hectares per individual (Belcher, 2000; NPWS, 1999). In addition Quolls are known to frequently swap dens and disperse large distances on any one night. A radio-tracking survey performed by Andrew (2005) noted that quolls generally moved to a new den each day and 90% of stays for females and 76% of stays for males were for a single day. Population density is therefore naturally quite low and has been estimated at 1 individual per 3 km2 even within optimal 'core' habitat (Jones & Rose, 1996).			
Southern Right Whale (*Eubalaena australis*)	E, MA	E	Likely to occur	0	The southern right whale is seasonally present along the Australian coast between late April and early November. It has been recorded in the coastal waters of all Australian states with the exception of the Northern Territory (Bannister et al. 1996).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*)	V	V	May occur	0	The yellow-bellied glider (south-eastern) occurs in eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests (Kavanagh et al. 1995; Rees et al. 2007). Abundance is highly dependent on habitat suitability, which is in turn determined by forest age and floristics (Woinarski et al. 2014). The subspecies shows a preference for large patches of mature old growth forest that provide suitable trees for foraging and shelter (Milledge et al. 1991; Eyre & Smith 1997; Incoll et al. 2001; Eyre & Goldingay 2003; Eyre 2002, 2004; van der Ree et al. 2004; Kavanagh et al. 2021). There is also a clear preference for forests with a high proportion of winter-flowering and smooth-barked eucalypts (Kavanagh 1987a; Eyre & Smith 1997; Eyre 2004; Irish & Kavanagh 2011; Woinarski et al. 2014). Smooth-barked eucalypts are important due to the range of foraging substrates (and therefore food resources) they provide, as loose bark hanging in strips from these trees provides shelter for insect prey (Eyre & Smith 1997). Yellow-bellied gliders (south-eastern) also require some level of floristic diversity to provide a year-round food supply, and they are unlikely to persist in forests dominated by only one or two tree species (Kavanagh 1987a). Many tree species are found in the subspecies' habitat, with some used for sap feeding. A list of trees known to be used for sap-feeding is provided in Appendix A; note that this list is not comprehensive and local observations should be sought to evaluate habitat use in a given area. During the day, the yellow-bellied glider (south-eastern) shelters in hollows found in large, old trees, usually more than one metre in diameter (Kambouris et al. 2013). Hollow-bearing trees are a critical habitat feature for the yellow-bellied glider (south-eastern) (Goldingay 2011; Goldingay et al. 2019) due to their usage as dens.	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Koala (combined populations of Qld, NSW and the ACT) (*Phascolarctos cinereus*)	E	V	Known to occur	615	This species primarily occurs within Eucalypt Forest and Woodlands containing a suitable density of favoured food trees within coastal eastern and southeastern Australia. Preferred habitat generally contains a high percentage of primary food trees although underlying geology and soil type can be an important factor. Eucalypt Forests associated with drainage lines and floodplains of richer soil types (i.e. moisture and nutrients) can also be favoured due to feed trees containing higher levels of nutrients and less potential for toxicity (Hindell & Lee, 1990; Moore & Foley, 2000). Studies (Biolink, 2007; GCCC, 2014) indicate that *Eucalyptus tereticornis, E. microcorys* and *E. propinqua/E. biturbinata* are the most preferred koala food trees throughout the Gold Coast LGA. Previous research undertaken by Phillips & Callaghan (1996) in Tweed Shire indicates that Swamp Mahogany (*E. robusta*) and Blue Gum (*E. tereticornis*) [including hybrids of the two] on alluvial deposits and Quaternary and Neranleigh-Fernvale Group geomorphologies were considered to be primary habitats. Areas with sub-dominance of these species on Neranleigh-Fernvale alliances supporting Blue Gum (*E. tereticornis*), Tallowwood (*E. microcorys*) and/or Grey Gum (*E. propinqua*) comprise secondary habitat or primary habitat depending on the density of the latter two species. Updated studies by Biolink (2011) indicate *E. robusta, E. tereticornis, E. microcorys* and *E. propinqua* to be the most preferred tree species for koalas within the Tweed Coast study area. Additional local shire studies (Phillips & Callaghan, 1998) noted Tallowwood to be a primary browse species and two types of Grey Gum (*E. propinqua, E. biturbinata)* to be secondary browse species in Currumbin.	Low. Favoured habitat (eucalypt forest) is absent from the site. Eucalypt trees are very scarce throughout the site (<5 individuals). The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No

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					Within utilized Eucalypt Forest habitat the koala spends most of its time in distinct home-ranges which may overlap if available habitat area is reduced. Males are territorial but a dominance-hierarchy exists and they may fight during the summer breeding season. Home ranges of the species are considered to be large and can vary dependent upon habitat quality and extent. Studies have shown various home range sizes exist with the males usually larger than the female (Male 135ha, Female: 110ha [Ellis et al, 2002], Male: 34.4ha, Female: 15ha [White, 1999]).			
Long-nosed Potoroo (northern) (*Potorous tridactylus tridactylus*)	V	V	Likely to occur	6	The Long-nosed Potoroo (SE Mainland) has scattered populations extending from south-eastern Queensland through to NSW. The species has been recorded at Many Peaks Range, south-east of Gladstone, Bellthorpe near Beerwah and in the Border Ranges (Amos 1982). It has also been seen at Bulburin, south-west of Miriam Vale (Lindenmayer & Viggers 1994). In NSW it has been seen at several locations (Mason 1997). The Queensland populations are considered to be reasonably secure (Amos 1982) (online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=66645).' Long-nosed Potoroos are generally restricted to areas with an annual rainfall greater than 760 mm where they inhabit dry and wet sclerophyll forests and woodland with a heathy understorey (Johnson in Strahan, 2002; DEC, 2005). Studies have shown that the species requires a mosaic of mico-habitats within its home range ranging from dense, floristically simple sites for nesting, to open, floristically diverse sites for foraging (Claridge et al, 2007). In all habitats the species requires relatively thick groundcover growing on friable soils (Bennett, 1993). Within these areas the Potoroo digs for its food the main component of which is hypogeal fungi with other important items including hard-bodied arthropods, vascular plant tissues, seeds and fleshy fruits (Bennett & Baxter, 1989; Claridge et al, 2007). It is also noted that a small, disjunct population of Potoroos exists in a small area of Crown land between the northern shore of Cobaki Broadwater and the NSW-Queensland border (Bali et al, 2003; Ecopro, 2004; Warren & Associates, 1992; Hero, 2001). The extensive 2003 survey undertaken by Bali et al notes that "within the Cobaki area, potoroos were most frequently trapped in Scribbly Gum Mallee Heathland followed by, Tree Broom Heathland, Scribbly Gum/Swamp Mahogany Forest, Black She-oak Heathland, Swamp Mahogany Forest and Scribbly Gum Forest. Our results suggest that potoroos prefer Scribbly Gum Mallee Heathland with an understorey of sedges and grasses such as Restio spp., Lomandra spp. And Gahnia spp., which is found along both sides of the Cobaki Lakes" (Bali et al, 2003: 16).	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No
New Holland Mouse (*Pseudomys novaehollandiae*)	V	-	Likely to occur	0	The New Holland Mouse is a small, burrowing native rodent. The species is similar in size and appearance to the introduced house mouse (Mus musculus), although it can be distinguished by its slightly larger ears and eyes, the absence of a notch on the upper incisors and the absence of a distinctive 'mousy' odour. The species is grey-brown in colour and its dusky-brown tail is darker on the dorsal side. The species has a head-body length of approximately 65–90 mm, a tail length of approximately 80–105 mm and a hind foot length of approximately 20–22 mm (Menkhorst and Knight, 2001)' ((Threatened Species Scientific Committee (TSSC), 2010k: 1). The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. At a landscape scale, the species appears to be clumped in its distribution, most likely due to its specific habitat requirements' (Posamentier and Recher, 1974; Braithwaite and Gullan, 1978; Fox and Fox, 1978; Fox and Mckay, 1981 in (Threatened Species Scientific Committee (TSSC), 2010j: 2). Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey and vegetated sand dunes (Keith and Calaby, 1968; Posamentier and Recher, 1974; Fox and Fox, 1978; Hocking, 1980; Fox and Mckay, 1981; Norton, 1987; Pye, 1991; Wilson, 1991; Lazenby et al., 2008). The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals (Kemper, 1980; Lazenby et al., 2008). The home range of the New Holland Mouse ranges from 0.44 ha to 1.4 ha (Lazenby et al., 2008; Lazenby, 1999). The species peaks in abundance during early to mid stages of vegetation succession typically induced by fire (Posamentier and Recher, 1974; Braithwaite and Gullan, 1978; Fox and Fox, 1978; Fox and Mckay, 1981)' ((Threatened Species Scientific Committee (TSSC), 2010k: 2).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No

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					It is likely that the species spends considerable time foraging aboveground for food, predisposing it to predation by native predators and introduced species, including the red fox (Vulpes 24orqua), cat (Felis catus) and dog (Canis familiaris) (Lazenby, 1999 in Threatened Species Scientific Committee (TSSC), 2010j: 2).			
Grey-headed Flying-fox (*Pteropus poliocephalus*)	V	V	Roosting known to occur	45	The Grey-headed Flying-fox inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps (Eby, 1995). Urban gardens and cultivated fruit crops also provide habitat for this species (NSW NPWS 1999c). Grey-headed Flying-foxes forage on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca, Banksia (Eby, 2000) and fruits of rainforest trees and vines (NSW NPWS 1999c). During periods when native food is limited, Grey-headed Flying-foxes disperse from colonial roosts, often foraging in cultivated gardens and fruit crops (NSW NPWS 1999c). This species roosts in large aggregations or camps in close proximity (20 km or less) to a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina forest (Eby, 1995). This species is a canopy-feeding frugivore, blossom-eater and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. As such, it plays an important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species (Eby 1996; Pallin 2000). Grey-headed Flying-foxes roost in large aggregations in the exposed branches of canopy trees (Ratcliffe 1931, Nelson 1965a, Parry-Jones and Augee 1992). The locations of camps are generally stable through time, and several sites have documented histories that exceed 100 years (Lunney and Moon 1997). Camps provide resting habitat, sites of social interactions and refuge for animals during significant phases of their annual cycle, such as birth, lactation and conception (Parry-Jones and Augee 1992, 2001). On the basis of current knowledge, roosting habitat that meets at least one of the following criteria can be explicitly identified as habitat critical to survival, or essential habitat, for Greyheaded Flying-foxes. Roosting habitat that: 1. is used as a camp either continuously or seasonally in > 50% of years 2. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 10 000 individuals, unless such habitat has been used only as a temporary refuge, and the use has been of limited duration (i.e. in the order of days rather than weeks or months) 3. 3. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 2 500 individuals, including reproductive females during the final stages of pregnancy, during lactation, or during the period of conception (i.e. September to May) (in DECCW, 2009).	Recorded. This species was regularly recorded foraging throughout the forested areas of the site. A roosting camp occurs within the western portion of the study area, approximately 300m west of the proposal site.	Unlikely. The removal of a small area of foraging habitat is unlikely to significantly impact the species given the species high mobility and the abundance of available foraging resources throughout the locality.	Yes
Water Mouse (*Xeromys myoides*)	V	-	May occur	0	This species is restricted in distribution to a small number of coastal areas in northern and eastern coastal Australia. Within these areas it is reliant upon mangrove forests and adjacent intertidal sedgelands for foraging and nesting (Strahan, 2002; Van Dyck, 1996). It seems that highly specific habitat requirements limit the distribution of this species, which is naturally rare and patchily distributed. Until recently only nine populations were known for the mainland coast between Noosa and Ballina (Van Dyck, 2000), with the main stronghold populations in the region occurring along the western coastline of North and South Stradbroke Islands (Van Dyck 2000 in GCCC, 2006).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Reptiles								
Loggerhead Turtle (*Caretta caretta*)	E, M, MA	E	Breeding known to occur	104	In Australia, the Loggerhead Turtle occurs in the waters of coral and rocky reefs, seagrass beds and muddy bays throughout eastern, northern and western Australia (Limpus 1995a; Limpus et al. 1992; Prince 1994b). While nesting is concentrated in southern Queensland and from Shark Bay to the North West Cape in Western Australia, foraging areas are more widely distributed. Females tagged at the south-east Queensland nesting areas have been recorded in waters off Indonesia, Papua New Guinea, Solomon Islands, New Caledonia, Northern Territory, Queensland and NSW (Limpus 2008a). Nesting populations are known from southern Queensland and Western Australia (Cogger et al. 1993).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No

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					In Australia, Loggerhead Turtles nest on open, sandy beaches (Spotila 2004). Hatchlings enter the open ocean and begin feeding on small animals. Small Loggerhead Turtles live at or near the surface of the ocean and move with the ocean currents. In eastern Australia, there is evidence that they spend around 15 years or more in the open ocean (M. Chaloupka pers. comm. cited in Bjorndal et al. 2000), with much of their feeding in the top 5 m of water (Spotila 2004), before recruiting to their chosen inshore or neritic feeding area. Loggerhead Turtles choose a wide variety of tidal and sub-tidal habitat as feeding areas (Limpus 2008a). Loggerhead Turtles show fidelity to both their foraging and breeding areas (Limpus 2008a). When ready for breeding, mature turtles migrate to their chosen breeding area. Nesting females stay within an "internesting area" during their nesting period. Once breeding and nesting is complete, turtles return to their favoured foraging areas. Hatchling to subadult loggerheads occur in the open ocean foraging on planktonic organisms (Carr 1986, 1987b; Limpus et al. 1994b). Loggerhead Turtles enter the benthic foraging habitat at a larger size than other hard-shelled sea turtles. Adults and large juveniles with greater than 70 cm curved carapace length (Limpus et al. 1994b) occur in waters with both hard and soft substrates including rocky and coral reefs (Limpus et al. 1984b), muddy bays (Conway 1994), sandflats, estuaries and seagrass meadows (Limpus et al. 1994b; McCauley & Bjorndal 1999; Preen 1996).			
Green Turtle (*Chelonia mydas*)	V, M, MA	V	Known to occur	112	Green Turtles are found in tropical and subtropical waters throughout the world. They usually remain within the 20°C isotherms (Marquez 1990), although individuals may also stray into temperate waters (Cogger et al. 1993). There have been severe declines in numbers of Green Turtles in Indonesia, particularly in Bali, where there is now no nesting (Schulz 1984). However, the global population of Green Turtles is estimated to be very large (2.2 million), and most populations in other countries are thought to be increasing (Broderick et al. 1995). Green Turtles spend their first five to ten years drifting on ocean currents. During this pelagic (ocean-going) phase, they are often found in association with driftlines and rafts of Sargassum (a floating marine plant that is also carried by currents) (Robins et al. 2002; Poiner & Harris 1996; Carr & Meylan 1980). Once Green Turtles reach 30 to 40 cm curved carapace length, they settle in shallow benthic foraging habitats such as tropical tidal and sub-tidal coral and rocky reef habitat or inshore seagrass beds. The shallow foraging habitat of adults contains seagrass beds or algae mats on which Green Turtles mainly feed (Musick & Limpus 1997; Poiner & Harris 1996; Robins et al. 2002; Whiting 2000a).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Three-toed Snake-tooth Skink (Coeranoscincus reticulatus)	V	V	May occur	0	The Three-toed Snake-tooth Skink occurs within rainforest and occasionally moist eucalypt forest, on loamy or sandy soils. Loose soil, leaf litter and rotting logs provide suitable habitat for this skink species. The Three-toed Snake-tooth Skink feeds on earthworms and beetle grubs (NSW DECC, 2005). There are two published records of individuals in logged forest which had tall softwood regrowth. Within forests, this species is found in well-mulched, loose, friable rainforest soil in leaf litter, often immediately adjacent to fallen tree trunks. Much of the lowland closed forest within its range has been cleared for agriculture and grazing, pasture improvement, crop production, tropical fruit production, and native forest logging. Suitable habitat has generally been reduced to patches, especially in lowland areas (DEWHA, 2013).	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No
Leatherback Turtle (*Dermochelys coriacea*)	E, M, MA	E	Congregation or aggregation	0	The Leatherback Turtle is a pelagic feeder, found in tropical, subtropical and temperate waters throughout the world (Marquez 1990).	Low. The site does not contain suitable habitat for this species. The species was	Unlikely. No habitat will be impacted as a part of the proposal.	No

Threatened Species or Ecological Community	Conservation Status		Recorded in Locality		Description / Preferred Habitat*	Likelihood of Occurrence in Proposal Area	Likelihood of Significant Impact	Assessment of Significance Required?
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			Known to occur		The Leatherback Turtles is a highly pelagic species, venturing close to shore mainly during the nesting season (Sarti Martinez 2000). Houghton and colleagues (2008) tracked deep (300–1250 m) and protracted dives (> 1 hour) by Leatherback Turtles in the North Atlantic. It is known from waters all around Australia (Robins et al. 2002) and can be found foraging year round in Australian waters (Limpus in Hamann et al. 2006) over Australian continental shelf waters. Adults feed mainly on pelagic soft-bodied creatures such as jellyfish and tunicates (Bone 1998; Cogger 1992), which occur in greatest concentrations at the surface in areas of upwelling or convergence. The regular appearance of Leatherback Turtles in cool temperate waters is probably due to the seasonal occurrence of large numbers of jellyfish. Leatherback Turtles require sandy beaches to nest, with some evidence that coarser sand is more conducive to successful hatching than finer sand (Limpus et al. 1984). Sand temperatures between 24–34 °C are needed for successful incubation (Limpus et al. 1984). Beaches free from light pollution are required to prevent disorientation, disturbance and to allow nesting females to come ashore. There is no information on post hatchling dispersal although it is presumed that, like other species (except Flatback Turtles), the hatchlings are dispersed by ocean currents. Juveniles through to adults reside in a variety of ocean and coastal habitats and span a large latitudinal range (Hamann et al. 2006). The species is not known to rely on a threatened ecological community. It would co-occupy marine and nesting beach habitat with other marine turtle species.	not recorded during survey efforts.		
Hawksbill Turtle (*Eretmochelys imbricata*)	V, M, MA	-	Known to occur	30	Hawksbill Turtles spend their first five to ten years drifting on ocean currents (Carr 1987a; Limpus et al. 1994e). During this pelagic (ocean-going) phase, they are often found in association with rafts of *Sargassum* (a floating marine plant that is also carried by currents) (Carr 1987a). Once Hawksbill Turtles reach 30 to 40 cm curved carapace length, they settle and forage in tropical tidal and sub-tidal coral and rocky reef habitat. They primarily feed on sponges and algae (Whiting 2000a). They have also been found, though less frequently, within seagrass habitats of coastal waters, as well as the deeper habitats of trawl fisheries (Poiner & Harris 1996; Robins et al. 2002). Hawksbill Turtles have been seen in temperate regions as far south as northern NSW (Limpus 1992; Robins 2002; Whiting 2000).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Olive Ridley Turtle (*Lepidochelys olivacea*)	E, M, MA	-	Breeding likely to occur	0	No concentrated nesting has been found in Australia. A substantial part of the immature and adult population forage over shallow benthic habitats from northern Western Australia to south-east Queensland (Harris 1994 cited in Limpus 2008) though large juvenile and adult Olive Ridley Turtles have been recorded in both benthic and pelagic foraging habitats (Musick & Limpus 1997). Foraging habitat can range from depths of several metres (Conway 1994) to over 100 m (Hughes 1974a; Whiting et al. 2005). However, most individuals captured by trawlers in the East Coast Otter Trawl fishery in Queensland were in depths of between 11–40 m (Robins 2002). Trawling data from the east coast of Queensland indicate that this benthic foraging habitat supports turtles between 20 and 80 cm curved carapace length (Robins 1995). Apart from one exception, Olive Ridley Turtles have not been recorded in coral reef habitat or shallow inshore seagrass flats (Limpus 2008). Olive Ridley Turtles do not rely on a listed threatened ecological community and they are not associated with any listed threatened species.	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Flatback Turtle (*Natator depressus*)	V, M, MA	-	Known to occur	0	All known breeding sites of the flatback turtle occur in tropical Australia, on beaches and islands in Queensland, the Northern Territory and Western Australia. They feed in the northern coastal regions of Australia, ranging as far south as the Tropic of Capricorn. Their feeding grounds also extend to the Indonesian archipelago and the Papua New Guinea coast (DES 2019).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No

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Sharks								
Grey Nurse Shark (east coast population) (*Carcharias taurus*)	CE	CE	Known to occur	0	Grey nurse sharks are found primarily in warm temperate (from subtropical to cool temperate) inshore waters around rocky reefs and islands, in or near deep sandy-bottomed gutters or rocky caves, and occasionally in the surf zone and shallow bays. They are often observed hovering motionless just above the seabed (Pollard et al. 1996). They have been recorded at varying depths down to 230 m on the continental shelf, but are most commonly found between 15–40 m (Otway & Parker 2000). They generally occur either alone or in small to medium sized groups, usually of fewer than 20 sharks (Pollard et al. 1996). When observed alone they are thought to be moving between aggregation sites (Environment Australia 2002).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Great White Shark (*Carcharodon carcharias*)	V, M	V	Known to occur	0	Great White Sharks can be found from close inshore around rocky reefs, surf beaches and shallow coastal bays to outer continental shelf and slope areas (Pogonoski et al. 2002 in DEWHA 2009).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
School Shark (*Galeorhinus galeus*)	CP	-	May occur	0	The School Shark is most abundant in cold to temperate continental seas, from the surfline and very shallow water to well offshore (Compagno et al. 2005).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Whale Shark (*Rhincodon typus*)	V, M	-	May occur	0	The Whale Shark is an oceanic and coastal, tropical to warm-temperate pelagic shark. It is often seen far offshore, but also comes close inshore and sometimes enters lagoons of coral atolls.	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Scalloped Hammerhead (*Sphyrna lewini*)	CP	-	Likely to occur	0	Within Australian waters the scalloped hammerhead extends from New South Wales (approximately from Wollongong, where it is less abundant), around the north of the continent and then south into Western Australia to approximately Geographe Bay, though it is rarely recorded south of the Houtman Abrolhos Islands.	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Snails								
Mitchell's Rainforest Snail (*Thersites mitchellae*)	CE	CE	Known to occur	215	This species was formally widely distributed on coastal alluvia between the Richmond and Tweed Rivers (Stanisic, 1998, 2000; NSWNPWS, 2001). NPWS previously funded surveying within northern NSW to determine the extant distribution of the species in relation to its historical distribution. Surveys conducted (1998-2000) have provided limited success with only one robust population being recorded within the region at Stotts Island and evidence of marginal populations present at four additional sites (Stanisic 1998, 2000). An additional population was more recently discovered within Swamp Sclerophyll Forest in Kingscliff (Planit 2002, Stanisic 2003). Within its range the species is restricted to lowland subtropical rainforest and swamp sclerophyll forest with a rainforest understorey, typically on alluvial soils with a basaltic influence (NPWS, 2001, Stanisic 2002).	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No
Flora								
Scented Acronychia (*Acronychia littoralis*)	E	E	Known to occur	15	Scented Acronychia occurs from Fraser Island in Queensland to Port Macquarie in NSW. In 1996, the species occurred at 42 sites (Benwell, 1996). Most populations occur in NSW, between Ballina and Tweed Heads. The two Queensland populations include two trees at the Gold Coast and a few individuals in Great Sandy National Park (NP) (EPA, 2007). In NSW, populations are conserved in Bongil Bongil NP, Bundjalung NP, Broken Head Nature Reserve (NR), Cape Byron NR, Brunswick Heads NR, Cudgen Lake NR and Cooloola NP. Scented Acronychia is found on sand in humid, high rainfall zones (greater than 1600 mm), within 2 km of the ocean. The species occurs 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 (Harden, 2002). Associated species include *Lophostemon confertus*, *Banksia integrifolia*, *Callitris columellaris*, *Araucaria cunninghamii*, *Eucalyptus intermedia* and *Melaleuca quinquenervia* (Benwell, 1996). Former habitat has been reduced as	Moderate. Potential habitat is available in association coastal sands. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No

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					a result of coastal development, sand mining, waterlogging and land clearing for agriculture (Hunter et al., 1992; Benwell, 1996) [in DSEWPC, 2008:1-2]			
Allocasuarina thalassoscopica	E	-	Known to occur	12	Allocasuarina thalassoscopica is known from only one locality at Mt Coolum, 3 km south of Coolum Beach on the Sunshine Coast, Queensland. No other populations have been found, despite extensive field surveys of the area (Halford, 1993). Mt Coolum is an isolated tertiary comendite/tachy-rhyolite intrusion rising to 207 m above sea level. Allocasuarina thalassoscopica is restricted to the heathland community on the slopes of the summit, exposed to prevailing winds. Approximately 21 000 plants were known in an area of approximately 8.2 hectares, however to what extent a wildfire in 1994 affected the population is unknown. The soil is shallow, heavy textured, with outcropping rock (Halford, 1993). The entire population is protected in a Queensland National Park estate. This species occurs within the South East Queensland Natural Resource Management Region. The heathland community where A. thalassoscopica is found is floristically diverse. Common species include Leptospermum microcarpum, Melaleuca nodosa and Xanthorrhoea latifolia, with A. thalassoscopica occurring as a significant component of the vegetation. This montane heath habitat is confined to a small number of rocky outcrops in the Sunshine Coast region (Halford, 1993).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal. No individuals will be impacted by the proposal.	No
Hairy-joint Grass (*Arthraxon hispidus*)	V	V	Likely to occur	0	"In NSW and Queensland, Hairy-joint Grass is found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps (Queensland CRA/RFA Steering Committee, 1997, 1998; DECC NSW, 2005), as well as woodland (Queensland Herbarium, 2008). In south-east Queensland, Hairy-joint Grass has also been recorded growing around freshwater springs on coastal foreshore dunes, in shaded small gullies, on creek banks, and on sandy alluvium in creek beds in open forests (Queensland CRA/RFA Steering Committee, 1997, 1998), and also with bog mosses in mound springs (Queensland Herbarium, 2008)" [Department of the Environment, Water, Heritage and the Arts 2008:1-2].	Moderate. Potential habitat for the species is present within the site. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Marbled Balogia (*Balogia marmorata*)	V	V	May occur	0	*Baloghia marmorata* has a geographically disjunct distribution (BRI, undated; Quinn et al., 1995) confined to the Lismore district, in north-east NSW, and the Tamborine Mountains and Springbrook, in south-east Queensland (NSW NPWS, 2002; DECC NSW, 2005; Harden, 2005). *Baloghia marmorata* 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 (Queensland Herbarium, 2008). Soils are rich black or dark brown clay and loam derived from basalt (Quinn et al., 1995; Steenbeeke, 1998; Harden, 2005). Associated species can include *Eucalyptus microcorys, Archontophoenix cunninghamiana, Aphananthe philippinensis, Capparis arborea, Planchonella australis, Ficus spp., Olea paniculata, Planchonella myrsinoides, Brachychiton discolor, Mallotus claoxyloides, Drypetes deplancheri,* and *Calamus muelleri* (Queensland Herbarium, 2008).	Low. Marginal potential habitat for the species is present within the site. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Stinking Cryptocarya (*Cryptocarya foetida*)	V	V	Known to occur	236	Cryptocarya foetida is known from Iluka, NSW, to Fraser Island and east of Gympie, southern Queensland where it occurs within littoral rainforest, usually on sandy soils, but mature trees are also known on basalt soils. (DECC, 2005; DSEWPC, 2008). Found in littoral, warm temporate and subtropical rainforest, wet sclerophyll forest and Camphor laural forest usually on sandy soils, but mature trees are also known on basalt soils. The seeds are readily dispersed by fruit-eating birds, and seedlings and saplings have been recorded from other habitats where they are unlikely to develop to maturity. Though seedlings can be fairly numerous, few mature trees are known.	Recorded. This species was recorded within the study area.	Potential. Assessment of significance required.	Yes
Leafless Tongue-orchid (*Cryptostylis hunteriana*)	V	V	May occur	0	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. Little is known about the ecology of the species; being leafless it is expected to have limited photosynthetic capability and probably depends upon a fungal associate to meet its nutritional requirements from either living or dead organic material. In Queensland, Leafless Tongue-orchid is known from a single plant near the village of Tinnanbar and four additional coastal populations north of the Glasshouse Mountains to Tin Can Bay (Logan, 1998).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal. No individuals will be impacted by the proposal.	No
White-flowered Wax Plant (*Cynanchum elegans*)	E	E	May occur	0	White-flowered Wax Plant occurs on a variety of lithologies and soil types, usually on steep slopes with varying degrees of soil fertility (Quinn et al. 1995).	Low. Marginal potential habitat for the species is	Unlikely. The removal of a small area of marginal	No

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					White-flowered Wax Plant occurs mainly at the ecotone between dry subtropical rainforest and sclerophyll forest/woodland communities (NSW NPWS 2002a).	present within the site. The species was not recorded during survey efforts.	potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	
Davidson's Plum (*Davidsonia jerseyana*)	E	E	Likely to occur	36	The Davidson's Plum is restricted to the Brunswick and Tweed River catchments of the north coast of NSW. The southern-most confirmed record of the species is located near Mullumbimby. Records extend only a short distance inland on the Brunswick River. The northern-most and westernmost confirmed record is at Chillingham. There is an unconfirmed record further north near the border gate at Tomewin (Watson 1987). There are no confirmed records for southern Queensland. The species has been documented as occurring at a total of 118 point locations, which can be roughly grouped into 24 naturally occurring sub-populations, The Davidson's Plum is found in coastal and lowland subtropical rainforest and wet sclerophyll forest, often with an overstorey including *Lophostemon confertus* (Brush Box), *Araucaria cunninghamii* (Hoop Pine) and/or eucalypt species. Species commonly occurring at Davidson's Plum sites include *Acacia bakeri* (Marblewood), *Cupaniopsis newmanii* (Longleaved Tuckeroo), *Endiandra 29tilize* (Black Walnut), *Eucalyptus microcorys* (Tallowwood), *Flindersia bennettiana* (Bennett's Ash), *Flindersia schottiana* (Cudgerie), *Pentaceras 29tilize* (Crow's Ash), *Synoum glandulosum* (Scentless Rosewood) and the introduced *Cinnamomum camphora* (Camphor Laurel) (McKinley & Stewart 1999). Several sub-populations of the Davidson's Plum are known from areas of regrowth rainforest with a high percentage of Camphor Laurel, *Lantana camara* (Lantana) and other exotic weeds. Some trees are isolated in paddocks or in road reserves (McKinley & Stewart 1999) [in NPWS, 2004)	Moderate. Potential habitat for the species is present within the site. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Smooth Davidson's Plum (*Davidsonia johnsonii*)	E	E	Likely to occur	0	Current records suggest that the Smooth Davidsonia is found mainly in wet sclerophyll forests, with a smaller number of sites known from subtropical rainforest (complex notophyll vine forest) (McKinley & Stewart 1999). Records of individuals have also been made from land that has been cleared in the past. Plants still persist in these areas as isolated clumps in paddocks or in regrowth dominated by Lantana (*Lantana camara*) and other weed species (DECC, 2004: 5).	Moderate. Potential habitat for the species is present within the site. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Small-leaved Tamarind (*Diploglottis campbellii*)	E	E	May occur	0	"The forest types in which the species occurs varies from lowland subtropical rainforest to drier subtropical rainforest with a *Lophostemon confertus* (Brush Box) open overstorey. Hunter *et al.* (1992) showed that the species occurs on basalt-derived soils and also on poorer soils such as those derived from quartz monzonite" (NPWS, 2004: 6).	Low. Marginal potential habitat for the species is present within the site although preferred soil type is absent. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Hairy Quandong (*Elaeocarpus williamsianus*)	E	E	May occur	0	Hairy Quandong is known from nine populations in far north-east NSW, extending from the Tweed Valley south to the Byron Bay area. The known range covers an area of approximately 50 km north-south by 30 km east-west. Six populations occur on private land, one population occurs within a road reserve managed by Byron Shire Council and two sites occur in Mooball National Park and Inner Pocket Nature Reserve (DEC NSW, 2004). Approximately 60 stems were found growing at Burringbar and 30 at Inner Pocket Nature Reserve (Hunter et al., 1991). Hairy Quandong occurs within the Northern Rivers (NSW) Natural Resource Management Region. According to Floyd (1989), Hairy Quandong is confined to regrowth subtropical/warm temperate rainforest on palaeozoic metamorphics on old landslips on steep hillsides. The species is typically found on steep and eroding slopes at low altitude in gullies, toe slopes, steep drops adjacent to creeks and the headwater areas of creeks (DEC NSW, 2004). The species has been recorded growing in plant communities dominated by an undescribed species of Davidsonia, which is 8–14 m tall (Guymer, 1983). Other commonly associated species include Brush Box (Lophostemon confertus), Flooded Gum (Eucalyptus grandis) and Black Apple (Planchonella australis) and the introduced Camphor Laurel (Cinnimomum camphora) and Lantana (Lantana cammara) (Kooyman, 2003 in DEC NSW, 2004).	Low. Marginal potential habitat for the species is present within the site although preferred geology type is absent. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No

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Floyd's Walnut (*Endiandra floydii*)	E	E	Known to occur	35	'The Crystal Creek Walnut is known from Pimpama, just north of the Queensland Gold Coast, south to Byron Hills, six km south of Cape Byron, NSW. Several large populations are known. Two are in the ranges to the north of Murwillumbah, where numerous other smaller occurrences are also found. At least 50 individuals are known from the Urliup Road area (Barry & Thomas 1994) and 40–50 trees have been reported from Crystal Creek (R. Cremer pers. Comm.). A further concentration of plants is in Mooball National Park where nearly 80 individuals have been recorded (NPWS survey data, 1997). The Crystal Creek Walnut occurs in subtropical (including littoral) rainforest or wet sclerophyll forest, often with *Lophostemon confertus* (Brush Box) in the canopy and occasionally with *Araucaria cunninghamii* (Hoop Pine) 30tilize30. Disturbed and regrowth sites may include *Cinnamomum camphora* (Camphor Laurel) and *Lantana camara* (Lantana) as weed components. Most locations are on soils derived from paleozoic metamorphics, sometimes with basalt nearby. A small number of sites are on alluvium or sand. Sheltered locations are apparently preferred, and landforms including ridgelines, slopes, gullies and creek flats have been documented. The altitude varies between close to sea level up to 430 m above sea level (Floyd 1989)' (in DEC, 2004: 3).	Low. Marginal potential habitat for the species is present within the site although preferred soil type is absent. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Ball Nut (*Floydia praealta*)	V	V	Likely to occur	3	The Ball Nut inhabits floristically-rich, tall, closed riverine to subtropical rainforest (Barry & Thomas 1994; Floyd 1989; Harden 1991, 2000; Quinn et al. 1995; Sheringham & Westaway 1995) or coastal scrub (Foreman 1995a).	Low. Marginal potential habitat for the species is present within the site. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Southern Fontainea (*Fontainea australis*)	V	V	May occur	0	Southern Fontainea is known from the Tweed Valley and a few locations in the upper reaches of the Richmond Valley in NSW (DECC, 2005a), north to Currumbin Valley and Springbrook National Park (NP) in southern Queensland (Barry & Thomas, 1994; Queensland Herbarium, 2008). Recorded occurrences in NSW include Nightcap NP, Numinbah Nature Reserve (NR), Goonengerry State Forest, Limpinwood NR, Mount Warning NP, Inverell Shire, and the Border Ranges (Floyd, 1989; Briggs & Leigh, 1996; NSW NPWS, 2004; Inverell Shire Council, 2006; NHT, 2006). Southern Fontainea occurs in lowland subtropical rainforest and complex notophyll vine forest on basaltic alluvial flats and well drained, bright reddish-brown alluvial clay loam (Jessup & Guymer, 1985; Floyd, 1989; Barry & Thomas, 1994).	Low. Marginal potential habitat for the species is present within the site although preferred soil type is absent. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Macadamia Nut (*Macadamia integrifolia*)	V	-	Known to occur	6	Macadamia integrifolia' was originally associated with subtropical rainforest that was spread along a 600km coastal strip between Grafton in New South Wales and Maryborough in Queensland, extending up to 150km inland. Current distribution of wild M. integrifolia appears to be similar to the initial distribution area, however populations are more sparsely distributed, and overall numbers have declined as a result of agricultural and urban development. Although M. integrifolia is a rainforest species they tend to grow better in partially open areas such as rainforest edges. They can be found at elevations near sea level up to 600m, preferring well-drained sites on hill crests, hill slopes, scree slopes, foot slopes and along the edges of hoop pine Araucaria cunninghamii scrubs and creek beds. M. integrifolia grows best in mild frost-free weather with reasonably high rainfall and has been recorded fruiting as far south as Sydney. At many sites where M. integrifolia occurs there are less than ten plants remaining. The largest populations are recorded in Amamoor State Forest, Bahr's Scrub, Nicoll Scrub and Triunia National Parks, and they also occur in several other national parks and state forests as well as three nature refuges. M. integrifolia grows in complex notophyll vine forest, simple notophyll vine forest and in simple microphyll-notophyll vine forest with emergent Araucaria and Argyrodendron species. It can be found in uniformly dark surface soils that vary in texture from clayey sand through various types of loam to silty clay' [in Ryan, 2006: 2].	Low. Marginal potential habitat for the species is present within the site although preferred soil type is absent. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Rough-shelled Bush Nut (*Macadamia tetraphylla*)	V	V	Known to occur	16	This species of nut tree is confined chiefly to the Richmond and Tweed Rivers in north-east NSW, extending just across the border into Queensland where it occurs within subtropical rainforest, particularly on basaltic soils. (Williams, Harden and McDonald, UNE, 1984; DECC, 2005). The	Low. Marginal potential habitat for the species is present within the site	Unlikely. The removal of a small area of marginal potential habitat is unlikely	No

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					species is also commonly noted as a paddock tree on soils of basaltic influence and as an ornamental or orchard tree associated with residential and/or rural activities (pers.obs.).	although preferred soil type is absent. The species was not recorded during survey efforts.	to significantly impact the species. No individuals will be impacted by the proposal.	
Clear Milkvine (*Marsdenia longiloba*)	V	E	Likely to occur	2	Clear Milkvine is known from scattered sites on the NSW north coast from Hastings River northwards to Mount Nebo in Queensland (Forster, 1996). It is conserved within the Lamington National Park (NP), Main Range NP, Mt Barney NP, and Toonumbar NP (Briggs & Leigh, 1996; NSW NPWS, 2005). This species occurs within the Hunter–Central Rivers, Northern Rivers (NSW) and South East Queensland Natural Resource Management Regions. Clear Milkvine grows in open eucalypt forest, or margins of subtropical and warm temperate rainforest, and in areas of rocky outcrops (Forster, 1996; DECC, 2005a). Associated species include Eucalyptus crebra, E. microcorys, E. acmenoides, E. saligna, E. propinqua, Corymbia intermedia and Lophostemon confertus (QDNR, 2000).	Low. Marginal potential habitat for the species is present within the site. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Onion Cedar (*Owenia cepiodora*)	V	V	Likely to occur	5	This species is known from subtropical and dry rainforest on or near soils derived from basalt from the Richmond River north to just north of the Qld border (DEC, 2005; BSC, 2006).	Low. Marginal potential habitat for the species is present within the site although preferred soil type is absent. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Lesser Swamp-orchid (*Phaius australis*)	E	E	Known to occur	9	This species is known from swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas (NPWS, 2002).	Moderate. Potential habitat for the species is present within the site. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Spiny Gardenia (*Randia moorei*)	E	E	Likely to occur	0	In NSW the species is known from four Nature Reserves: Brunswick Heads Nature Reserve, Broken Head Nature Reserve, Stotts Island Nature Reserve and Wilson Park Nature Reserve. It has also been found in the Mooball State Forest (DEC NSW 2004b; Quinn et al. 1995). Only historic records exist for the latter three Nature Reserves and are yet to be reconfirmed. The species also occurs within Birds Bay Council Reserve (NSW DEC 2004b). Spiny Gardenia grows in subtropical, riverine, littoral and dry stunted rainforests (NSW DEC 2004b; Floyd 1989; Quinn et al 1995; Stanley & Ross 1986) along moist scrubby water courses at altitudes up to 360 m asl, with most records made from below 100 m asl (NSW DEC 2004b).	Moderate. Potential habitat for the species is present within the site. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Scrub Turpentine (*Rhodamnia rubescens*)	CE	CE	Known to occur	25	Rhodamnia rubescens commonly occurs in all rain forest subforms except cool temperate rainforest. The species occupies a range of volcanically derived and sedimentary soils and is a common pioneer species in eucalypt forests (Floyd 2008). Populations and individuals of R. rubescens are often found in wet sclerophyll associations in rainforest transition zones (including open forest of Eucalyptus tereticornis and E. bosistoana in the Sydney region) and creekside riparian associations (Benson and McDougall 1998).	Low. Marginal potential habitat for the species is present within the site. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Native Guava (*Rhodomyrtus psidioides*)	CE	CE	Known to occur	12	Rhodomyrtus psidioides flowers in late spring to early summer and produces fruits in summer (PlantNET, 2018). R. psidioides has been described as a pioneer species in disturbed environments (Williams and Adam 2010). The habitat of R. psidioides is likely to include the following vegetation types: Subtropical Rainforests, Warm Temperate Rainforests, Littoral Rainforest, and Wet Sclerophyll Forests (Keith 2004; Floyd 2008). The species may be found in the adjoining margins of sclerophyll vegetation associated with any of these rainforest formations.	Low. Marginal potential habitat for the species is present within the site. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Red Lilly Pilly (*Syzygium hodgkinsoniae*)	V	V	Likely to occur	9	*Syzygium hodgkinsoniae* occurs in riverine or gallery rainforest on rich alluvial or basaltic soils, from the Richmond River in NSW to Gympie, Queensland, with a disjunct occurrence in north Queensland (Floyd, 1989; NSW NPWS, 2002). The species occurs mostly as scattered individuals along watercourses, where the habitat is frequently limited and degraded (Landmark Ecological Services, Ecograph & Terrafocus, 1999).	Low. Marginal potential habitat for the species is present within the site. The	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. No individuals will	No

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						species was not recorded during survey efforts.	be impacted by the proposal.	
Durobby (*Syzygium moorei*)	V	V	Known to occur	38	The Durobby occurs in warm, protected, fertile soils in riverine and gully rainforests at low altitudes, along sections of the Richmond, Brunswick and Tweed Rivers in NSW, as well as at three sites in Upper Mudgeeraba Creek and Upper Tallebudgera Creek in south-east Queensland (Floyd, 1989). Rose Apple is most commonly found in Subtropical Rainforest *Argyrodendron trifoliatum* Alliance, including sub-alliance 1 (*Argyrodendron trifoliatum*) on lowland krasnozem; suballiance 2 (*Toona-Flindersia* spp.) on lowland alluvium; and sub-alliance 6 (*Archontophoenix-Livistona*) on alluvium with excess moisture (Floyd, 1990). Stands of the *A. trifoliatum* Alliance originally occurred on the best potential agricultural land, so consequently was mostly cleared, with the exception of small patches occurring in floodprone, stony or poorly drained soils (DSEWPC, 2008:1-2).	Low. Marginal potential habitat for the species is present within the site. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Austral Toadflax (*Thesium australe*)	V	V	May occur	0	*Thesium austral* is semi-parasitic on roots of a range of grass species (Copeland 2000 pers. comm.; Leigh et al. 1984). It occurs in subtropical, temperate and subalpine climates over a wide range of altitudes, on soils derived from sedimentary, igneous and metamorphic geology. It can be found in shrubland, grassland or woodland, often on damp sites (George 1984; Harden 1992). Vegetation types include open grassy heath dominated by Swamp Myrtle (*Leptospermum myrtifolium*), Small-fruit Hakea (*Hakea microcarpa*), Alpine Bottlebrush (*Callistemon sieberi*), Woolly Grevillea (*Grevillea lanigera*), Coral Heath (*Epacris microphylla*) and Poa spp. (Griffith 1991); Kangaroo Grass grassland surrounded by Eucalyptus woodland; and grassland dominated by Barbed-wire Grass (*Cymbopogon refractus*) (Leigh et al. 1984; Hunter et al. 1999).	Low. Marginal potential habitat for the species is present within the site. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Tylophora woollsii	E	E	May occur	0	Tylophora woollsii occurs in northern NSW and the Darling Downs in south-east Queensland. This species was known originally from near Parramatta on the Cumberland Plains, west of Sydney, but has since disappeared from this area (Leigh et al., 1984). NSW records are from the Coffs Harbour–Dorrigo area, the upper reaches of Taylors Arm near Nambucca Heads, and along the Queensland border near Tenterfield (NSW Government, 2008). It has been recorded from wet sclerophyll/rainforest margins (Harden, 1992), Eucalypt dominated open forests (Leigh et al., 1984; BRI, n.d.) and disturbed road verges (NPWS, 1999). It grows on brown clay over metasediments at altitudes between 10–750 m above sea level (Quinn et al., 1995).	Low. Marginal potential habitat for the species is present within the site. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. No individuals will be impacted by the proposal.	No
Migratory Terrestrial Species								
Oriental Cuckoo (*Cuculus optatus*)	M	-	May occur	1	The Oriental Cuckoo is a regular migrant to Australia, where it spends the non-breeding season (Sept- May) in coastal regions across northern and eastern Australia as well as offshore islands. The species uses a range of vegetated habitats such as monsoon rainforest, wet sclerophyll forest, open woodlands and appears quite often along edges of forests, or ecotones between forest types (BirdLife International, 2015). This cuckoo feeds arborealy, foraging for invertebrates on loose bark on the trunks and branches of trees, and among the foliage, including in mistletoes. It will forage from the ground, but requires shrubs or trees from which it sallies and returns to consume prey items. Caterpillars are a favoured food (BirdLife International, 2015).	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No
Black-faced Monarch (*Monarcha melanopsis*)	M	-	Known to occur	6	The Black-faced Monarch is a widespread migratory bird species that occurs within Rainforest, riparian forest, wet sclerophyll forest, occasionally in dry sclerophyll forest. It is a common summer migrant found in eucalypt forest, rainforest and coastal scrub (Gold Coast City Council 2006).	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No
Yellow Wagtail (*Motacilla flava*)	M	-	Known to occur	0	The Yellow Wagtail is a regular wet season visitor to northern Australia. Increasing records in NSW suggest this species is an occasional but regular summer visitor to the Hunter River region. The species is considered a vagrant to Victoria, South Australia and southern Western Australia. Habitat requirements for the Yellow Wagtail are highly variable, but typically include open grassy flats near water. 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, dams, waterholes; sewage farms, sometimes utilise tidal mudflats and edges of mangroves.	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No

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Satin Flycatcher (*Myiagra cyanoleuca*)	M	-	Known to occur	0	The Satin Flycatcher is widespread in eastern Australia and vagrant to New Zealand (Blakers et al. 1984). It inhabits heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests (Blakers et al. 1984; Emison et al. 1987). Satin Flycatchers are mainly recorded in eucalypt forests, especially wet sclerophyll forest, often dominated by eucalypts such as Brown Barrel, Eucalypt fastigata, Mountain Gum, E. dalrympleana, Mountain Grey Gum, Narrow-leaved Peppermint, Messmate or Manna Gum, or occasionally Mountain Ash, E. regnans. Such forests usually have a tall shrubby understorey of tall acacias, for example Blackwood, Acacia melanoxylon. In higher altitude Black Sallee, E. stellulata, woodlands, they are often associated with tea-trees and tree-ferns (Emison et al. 1987; Loyn 1985; Mac Nally 1997). They sometimes also occur in dry sclerophyll forests and woodlands, usually dominated by eucalypts such as Blakely's Red Gum, E. blakelyi, Mugga Ironbark, E. sideroxylon, Yellow Box, White Box, E. albens, Manna Gum or stringybarks, including Red Stringybark, E. macrorhyncha and Broad-leaved Stringybark, usually with open understorey (Ford and Bell 1981; Traill et al. 1996). Satin Flycatchers prefer to nest in a fork of outer branches of trees, such as paperbarks, eucalypts, and banksias (BA NRS 2002). Satin Flycatchers are migratory, moving north in autumn to spend winter in northern Australia and New Guinea. They return south in spring to spend summer in south-eastern Australia (Blakers et al. 1984). On the south-eastern mainland of Australia and Tasmania, they appear to be almost entirely deserted in winter, with reporting rates of 7.8% and 13.6%, respectively, in summer, and 0.3% in both in winter (Blakers et al. 1984; Emison et al. 1987).	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No
Rufous Fantail (*Rhipidura rufifrons*)	M	-	Likely to occur	7	The Rufus Fantail occurs throughout coastal northern and eastern Australia and adjacent ranges from the Kimberleys to southwestern Victoria. This bird species favours denser undergrowth of rainforest, wet sclerophyll forests, mangroves and swamp woodlands (Readers Digest, 2002). The fantail has a complex migratory route, along the eastern and northern coastlines of Australia and into the Torres Strait Islands and southern Papua New Guinea. However, only those populations south of the 25th parallel appear to be completely migratory. Breeding populations further north may be entirely sedentary or locally nomadic, such as from higher altitudes to the coast during winter. Migrants generally travel alone within dense understorey (JWA, 2005). The Rufous Fantail builds a small compact cup nest, of fine grasses bound with spider webs, that is suspended from a tree fork about 5 m from the ground. The bottom of the nest is drawn out into a long stem. Both sexes share nest-building, incubation and feeding of the young (Readers Digest, 2002).	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No
Spectacled Monarch (*Monarcha trivirgatus*)	M	-	Known to occur	2	The Spectacled Monarch is a common summer migrant found in rainforest and damper eucalypt forests. It is typically found well below canopy as it favours thick undergrowth. It is moderately common within rainforest, riparian forest, and well vegetated gullies (Gold Coast City Council 2006). Breeding occurs between October and February within a deeply cupshaped nest placed within the upright for of a tree or vine tangle 1-7m above the ground (Readers Digest, 2002).	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No
Migratory Wetland Species								
Common Sandpiper (*Actitis hypoleucos*)	M	-	Known to occur	1	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The population when in Australia is concentrated in northern and western Australia (Blakers et al. 1984; Higgins & Davies 1996). The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags (Geering et al. 2007; Higgins & Davies 1996).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No

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					Generally, the species forages in shallow water and on bare soft mud at the edges of wetlands; often where obstacles project from substrate, e.g. rocks or mangrove roots. Birds sometimes venture into grassy areas adjoining wetlands (Higgins & Davies 1996). Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species is known to perch on posts, jetties, moored boats and other artificial structures, and to sometimes rest on mud or 'loaf' on rocks (Higgins & Davies 1996).			
Sharp-tailed Sandpiper (*Calidris acuminata*)	M	-	Known to occur	9	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage (Cramp 1985; Higgins & Davies 1996). In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. They may be attracted to mats of algae and water weed either floating or washed up around terrestrial wetlands, and coastal areas with much beachcast seaweed. Sometimes they occur on rocky shores and rarely on exposed reefs (Higgins & Davies 1996).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Pectoral Sandpiper (*Calidris melantos*)	M	-	Likely to occur	1	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands (Higgins & Davies 1996).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Latham's Snipe (*Gallinago hardwickii*)	M	-	Likely to occur	12	'In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level (Chapman 1969; Naarding 1981). They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies) (Frith et. al. 1977; Naarding 1983; Weston 2006, pers. comm.). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity (Frith et al. 1977; Naarding 1983). Latham's Snipe occurs in temperate and tropical regions of Australia (Driscoll 1993). Its altitudinal range extends from sea-level (i.e. the coast) or possibly below. For example, there are records from near Lake Eyre (Higgins & Davies 1996) to approximately 2000 m above sea-level (Chapman 1969; Driscoll 1993). In Australia, Latham's Snipe occurs in a wide variety of permanent and ephemeral wetlands (Naarding 1981). They usually occur in open, freshwater wetlands that have some form of shelter (usually low and dense vegetation) nearby (Frith et al. 1977; Naarding 1983; Weston 2006, pers. comm.). They generally occupy flooded meadows, seasonal or semi-permanent swamps, or open waters (Frith et al. 1977; Naarding 1983), but various other freshwater habitats can be used including bogs, waterholes, billabongs, lagoons, lakes, creek or river margins, river pools and floodplains (Frith et al. 1977; Naarding 1981, 1983). The structure and composition of the vegetation that occurs around these wetlands is not important in determining the suitability of habitat (Naarding 1983). As such, snipe may be found in a variety of vegetation types or communities including tussock grasslands with rushes, reeds and sedges, coastal and alpine heathlands, lignum or tea-tree scrub, button grass plains, alpine herbfields and open forest (Chapman 1969; Frith 1970; Frith et al. 1977; Naarding 1983; Wall 1990). Latham's Snipe sometimes occur in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks,	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species.	No

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					around bays and beaches, and at tidal rivers (Frith et al. 1977; Naarding 1983; Patterson 1991). These habitats are most commonly used when the birds are on migration (Frith et al. 1977). They are regularly recorded in or around modified or artificial habitats including pasture, ploughed paddocks, irrigation channels and drainage ditches, ricefields, orchards, saltworks, and sewage and dairy farms (Fielding 1979; Frith et al. 1977; Lane & Jessop 1985; Naarding 1982, 1983). They can also occur in various sites close to humans or human activity (e.g. near roads, railways, airfields, commercial or industrial complexes) (Frith et al. 1977; Naarding 1983). The foraging habitats of Latham's Snipe are characterized by areas of mud (either exposed or beneath a very shallow covering of water) and some form of cover (e.g. low, dense vegetation) (Frith et al. 1977; Todd 2000). The snipe roost on the ground near (or sometimes in) their foraging areas, usually in sites that provide some degree of shelter, e.g. beside or under clumps of vegetation, among dense tea-tree, in forests, in drainage ditches or plough marks, among boulders, or in shallow water if cover is unavailable (Frith et al. 1977; Naarding 1982, 1983)' [DoE, 2016 online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=863]			
Bar-tailed Godwit (*Limosa lapponica*)	M, MA	-	Known to occur	9	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas (Marchant & Higgins 1993). The Bar-tailed Godwit usually forages near the edge of water or in shallow water, mainly in tidal estuaries and harbours. They appear not to forage at high tide and prefer exposed sandy substrates on intertidal flats, banks and beaches. The also prefer soft mud; often with beds of eelgrass *Zostera* or other seagrasses. Occasionally they have been known to forage among mangroves, or on coral reefs or rock platforms among rubble, crevices and holes. They rarely forage in grassy or vegetated areas. On Heron Island they have been seen feeding on insect larvae among the roots of Casuarina (Marchant & Higgins 1993). The Bar-tailed Godwit usually roosts on sandy beaches, sandbars, spits and also in near-coastal saltmarsh. In New Zealand, a few have been recorded roosting in wet grasslands and farmlands. They have been observed roosting at high tide on a claypan 2 km inland of Roebuck Bay, Western Australia (Collins et al. 2001). In some conditions, waders may choose roost sites where a damp substrate lowers the local temperature. In Moreton Bay, inspection of major roosts on opposite sides of the bay during northward migration revealed a marked difference in the proportion of birds in breeding plumage; also, a significantly higher number of moulting males (perhaps breeding adults) were found on islands, as opposed to mainland sites (Thompson 1990b)' [DoE, 2014 online @ http://www.environment.gov.au/cgibin/sprat/public/publicspecies.pl?taxon_id=844]	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Osprey (*Pandion haliaetus*)	M, MA	V	Breeding known to occur	22	Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia (Johnstone & Storr 1998; Marchant & Higgins 1993; Olsen 1995). They require extensive areas of open fresh, brackish or saline water for foraging (Marchant & Higgins 1993). 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 (Czechura 1985; Domm 1977; Fleming 1987; Gosper 1983; Gosper & Holmes 2002; Johnstone & Storr 1998; Olsen 1995; Roberts & Ingram 1976). They exhibit a preference for coastal cliffs and elevated islands in some parts of their range (Boekel 1976; Domm 1977), but may also occur on low sandy, muddy or rocky shores and over coral cays (Marchant & Higgins 1993). They may occur over atypical habitats such as heath, woodland or forest when travelling to and from foraging sites (Czechura 1985; Hembrow 1988; Pruett-Jones & O'Donnell 2004; Roberts & Ingram 1976).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts. No nests were recorded within the site.	Unlikely. No habitat will be impacted as a part of the proposal.	No

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					Eastern Ospreys occur sympatrically and sometimes interact with White-bellied Sea-Eagles (Barrett et al. 2003; Clancy 2006; Dennis & Baxter 2006; Kennard & Kennard 2006), which is also listed as Marine and Migratory under the EPBC Act.			
Common Greenshank (*Tringa nebularia*)	M	-	Likely to occur	2	The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores. The edges of the wetlands used are generally of mud or clay, occasionally of sand, and may be bare or with emergent or fringing vegetation, including short sedges and saltmarsh, mangroves, thickets of rushes, and dead or live trees. It was once recorded with Black-winged Stilts (*Himantopus himantopus*) in pasture, but are generally not found in dry grassland (Higgins & Davies 1996). The species is known to forage at edges of wetlands, in soft mud on mudflats, in channels, or in shallows around the edges of water often among pneumatophores of mangroves or other sparse, emergent or fringing vegetation, such as sedges or saltmarsh. It will occasionally feed on exposed seagrass beds (Higgins & Davies 1996) The Common Greenshank roosts and loafs round wetlands, in shallow pools and puddles, or slightly elevated on rocks, sandbanks or small muddy islets. Occasionally the species will perch and roost on stakes (Higgins & Davies 1996). The species is known to have roosted on an inland claypan near Roebuck Bay, Western Australia; this site may be an important roost site for this species at least during the non-breeding season (Collins et al. 2001) [DoE, 2016 online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=832].	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Migratory Marine Birds								
Common Noddy (*Anous stolidus*)	M, MA	-	Likely to occur	4	In Australia, the Common Noddy occurs mainly in ocean off the Queensland coast, but the species also occurs off the north-west and central Western Australia coast. The species is also rarely encountered off the coast of the Northern Territory, where only one breeding location with about 100-130 birds is known (Chatto 2001). The species also occurs on Norfolk, Lord Howe, Christmas and Cocos-Keeling Islands (Higgins & Davies 1996). During the breeding season, the Common Noddy usually occurs on or near islands, on rocky islets and stacks with precipitous cliffs, or on shoals or cays of coral or sand. When not at the nest, individuals will remain close to the nest, foraging in the surrounding waters. Birds may nest in bushes, saltbush, or other low vegetation. They may also nest on the ground in Pigface (Carpobrotus spp.) or grass, on bare rock, on top of rocks protruding above vegetation, on shingle beaches, among coral rubble or in sand close to grassy areas. The species has also been recorded nesting in the forks of tall trees, at the top of Coconut Palms (Cocos nucifera), in holes in dead timber and on tree-stumps. On Lord Howe, Kermadec and Christmas Islands, many nests are built on cliff ledges (Higgins & Davies 1996). Although the species is obviously quite flexible in regard to nesting locations, pairs appear to select nesting habitat based on a hierarchy of preference (Higgins & Davies 1996). During the non-breeding period, the species occurs in groups throughout the pelagic zone (open ocean) (Higgins & Davies 1996).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Fork-tailed Swift (*Apus pacificus*)	M, MA	-	Likely to occur	4	The Fork-tailed Swift occurs over inland plains but sometimes above foothills or in coastal areas. They often sighted over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They favour dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. They may occur above rainforests, wet sclerophyll forest or open forest or plantations of pines (Higgins 1999).	Low. Marginal potential habitat present for the species. The species was not recorded during survey efforts.	Unlikely. The removal of a small area of marginal potential habitat is unlikely to significantly impact the species. The species will continue to be able to forage in the air space above the site.	No

Threatened Species or Ecological Community	Conservation Status		Recorded in Locality		Description / Preferred Habitat*	Likelihood of Occurrence in Proposal Area	Likelihood of Significant Impact	Assessment of Significance Required?
	EPBC Act Status	BCA Status	PMST	Bionet Records <10km site				
					This migratory bird species forages aerially, up to hundreds of metres above ground, but also less than 1 m above open areas or over water (Cameron 1952). They sometimes feed aerially among tree-tops in open forest (Higgins 1999). The Fork-tailed Swift leaves its breeding grounds in Siberia from August–September and usually arrives in Australia around October; some arrive early in September, however, this is rare (Higgins 1999). The Fork-tailed Swift does not breed in Australia. In their breeding range, they nest on mountain cliffs or island rock caves, inside narrow crevices or in cracks on vertical cliff faces. They are also known to nest in houses and occasionally in holes in trees (Chantler & Driessens, 1995; De Schauensee 1984; Grimmett et al. 1999). They breed from April to July, usually in small colonies, producing two or three eggs per brood (Chantler & Driessens 1995; Grimmett et al. 1999; Robson 2000).			
Flesh-footed Shearwater (*Ardenna carneipes*)	M, MA	-	Likely to occur	0	The Flesh-footed Shearwater is a locally common visitor to waters of the continental shelf and continental slope off southern Australia (south-western Western Australia to south-eastern Queensland) and around Lord Howe Island (Barrett et al. 2003; Johnstone & Storr 1998; Hutton 1991; Marchant & Higgins 1990; Reid et al. 2002; Wood 1990). The Flesh-footed Shearwater mainly occurs in the subtropics over continental shelves and slopes and occasionally inshore waters. Individuals also pass through the tropics and over deeper waters when on migration (Brooke 2004; Marchant & Higgins 1990; Reid et al. 2002).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Sooty Shearwater (*Ardenna grisea*)	M, MA	-	Likely to occur	0	The Sooty Shearwater forages in pelagic (open ocean) sub-tropical, sub-Antarctic and Antarctic waters. The species migrates and forages in the North Pacific and Atlantic Oceans during the non-breeding season. Sooty Shearwaters may forage inshore occasionally, especially during rough weather. In Australian waters, the Sooty Shearwater has been recorded in areas with sea surface-temperatures of 8.7-22.0° C (Reid et al. 2002). Off southern South America, the species occupies ocean with sea-surface temperatures between 0-19° C. In the North Pacific, the species prefers a narrower range of temperature, and birds have been found over cool waters of 8-14° C. The Sooty Shearwater breeds mainly on subtropical and sub-Antarctic islands, as well as on the mainland of New Zealand. Birds nest in burrows or rock crevices on coastal slopes, ridges and cliff tops, in herbfields, tussock grassland or forest. Areas with waterlogged or shallow soils and/or dense vegetation are avoided. At The Snares, Sooty Shearwaters are excluded from areas occupied by Snares Penguins (Eudyptes robustus). Nesting Sooty Shearwaters are known to impact on the vegetation surrounding nesting sites, as they undermine trees, trample seedlings and remove leaf litter and ground vegetation for nest lining (Richdale 1963). Breeding birds roost solitarily at night, either in the burrow or on the ground near burrow entrance. Pre-breeders or failed breeders usually roost on the ground, but sometimes in burrows. Individuals often roost and 'loaf' offshore during the day, except when weather conditions are rough. Most birds leave the roost at dawn; although, some non-paired birds remain in burrows during day (Marchant & Higgins 1990).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Streaked Shearwater (*Calonectris leucomelas*)	M, MA	-	Known to occur	1	This species is pelagic but is also found in inshore waters. It occurs in the Pacific Ocean, nesting in Japan and the Korean Peninsula, predominately on their offshore islands. After breeding, the streaked shearwater migrate south, feeding in the seas off northern New Guinea, the Arafura Sea, and the South China Sea. Calonectris leucomelas have also been reported well off the west coast of the United States, from the southern coast of India, and from New Zealand.	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Lesser Frigatebird (*Fregata ariel*)	M, MA	-	Known to occur	4	The lesser frigatebird is said to be the most common and widespread frigatebird in Australian seas (Lindsey, 1986). It is common in tropical seas, breeding on remote islands, including Christmas Island in the Indian Ocean in recent years. These birds are most likely to be seen from the mainland prior to the onset of a tropical cyclone, and once this abates they disappear again (ALA 2019 online @.ala.org.au/species/urn:lsid:biodiversity.org.au:afd.taxon:42943ce1-a0e6-4fa3-a529-0ff1906568df).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No

Threatened Species or Ecological Community	Conservation Status		Recorded in Locality		Description / Preferred Habitat*	Likelihood of Occurrence in Proposal Area	Likelihood of Significant Impact	Assessment of Significance Required?
	EPBC Act Status	BCA Status	PMST	Bionet Records <10km site				
Greater Frigatebird (*Fregata minor*)	M, MA	-	Likely to occur	0	The great frigatebird has a wide distribution throughout the world's tropical seas. Hawaii is the northernmost extent of their range in the Pacific Ocean, with around 10,000 pairs nesting mostly in the Northwestern Hawaiian Islands. In the Central and South Pacific, colonies are found on most islands groups from Wake Island to the Galapagos to New Caledonia with a few pairs nesting on Australian possessions in the Coral Sea. Colonies are also found on numerous Indian Ocean islands including Aldabra, Christmas Island, the Maldives and Mauritius. The Atlantic population, restricted to Trindade and Martin Vaz, is very small. Great frigatebirds undertake regular migrations across their range, both regular trips and more infrequent widespread dispersals. Birds marked with wing tags on Tern Island in the French Frigate Shoals were found to regularly travel to Johnston Atoll (873 km), one was reported in Quezon City in the Philippines. One male great frigatebird relocated from Europa Island in the Mozambique Channel to the Maldives 4400 km away for four months, where it fed on rich fishing grounds. Despite their extended range, birds also exhibit philopatry, breeding in their natal colony even if they travel to other colonies (ALA 2019 online @ https://bie.ala.org.au/species/urn:lsid:biodiversity.org.au:afd.taxon:97c6c802-079c-4fc0-9910-46cd0debaf07).	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No
Little Tern (*Sternula albifrons*)	M, MA	-	May occur	12	The Australian breeding population can be divided into two major subpopulations: (1) a northern subpopulation that breeds across northern Australia, from about Broome in north-western Western Australia (where first recorded only in December 1995), through coastal Northern Territory (mainly from just west of Darwin to the Queensland border) to the Gulf of Carpentaria and eastern Cape York Peninsula (with an extended breeding season covering most of the year); and (2) an eastern subpopulation that breeds on the eastern and south-eastern coast of the mainland and northern and eastern Tasmania, occasionally extending as far west as western Victoria and south-eastern South Australia (and breeding in the austral spring-summer). In Australia, Little Terns inhabit sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets, especially those with exposed sandbanks or sand-spits, and also on exposed ocean beaches.	Low. The site does not contain suitable habitat for this species. The species was not recorded during survey efforts.	Unlikely. No habitat will be impacted as a part of the proposal.	No

* Description / Preferred Habitat Sources from DAWE's Species Profile and Threats Database.

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Appendix 6 – MNES TEC Field Sheets

LITTORAL RAINFOREST AND COASTAL VINE THICKETS OF EASTERN AUSTRALIA CRITICALLY ENDANGERED ECOLOGICAL COMMUNITY

The following documents outline the key diagnostic and condition threshold criteria (and associated administration/identification advice) to be met by a patch of vegetation to be considered the EEC:

- LISTING ADVICE

Threatened Species Scientific Committee (2008). *Commonwealth Listing Advice on Littoral Rainforest and Coastal Vine Thickets of Eastern Australia*. Department of the Environment, Water, Heritage and the Arts.
Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/76-listing-advice.pdf.

- RECOVERY PLAN

Department of the Environment and Energy (2019). *National Recovery Plan for the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia Ecological Community*. Canberra: Commonwealth of Australia.

Available from: http://www.environment.gov.au/biodiversity/threatened/publications/recovery/littoral-rainforest-coastal-vine-thickets.

- EPBCA POLICY STATEMENT

Department of the Environment, Water, Heritage and the Arts (2009) *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia - EPBC Act policy statement 3.9 - Nationally threatened species and ecological communities*

Available from:
https://www.awe.gov.au/environment/epbc/publications/littoral-rainforest

Following field survey to establish the vegetation communities of the site(s) a patch of vegetation located on Lot 383 on DP 728202 between Cowper and Massinger Street was considered to be a potential candidate for the EEC as described in the above listed documents. Field survey was then performed as follows:

- The results of two 20m x 20m (400m^2) survey plots (T2 and T7) performed in accordance with the Biodiversity Assessment Method were reviewed
- The two existing plots were expanded to 40m x 40m (1600m^2) to enable a representative species diversity analysis to be performed (i.e. 3200m^2 total as opposed to the original 800m^2 total)

To account for variability the patch was traversed first and the field plot then placed within an area reflective of the investigated areas.

GUIDANCE FOR IDENTIFICATION AND ASSESSMENT SECTION 3.4 EPBCA POLICY STATEMENT

Condition varies between patches of Littoral Rainforest owing to the previous and ongoing threats and pressures applying. The listed Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community comprises those patches that meet the key diagnostic characteristics and the condition thresholds described within the *Commonwealth Listing Advice on Littoral Rainforest and Coastal Vine Thickets of Eastern Australia* (TSSC 2008a), with specific reference to Attachment A from the Listing Advice, the Flora Species of Littoral Rainforest and Coastal Vince Thickets of Eastern Australia by Bioregion (TSSC 2008b).The key diagnostic characteristics are described below.

Key Diagnostic Characteristics

- The ecological community occurs in the following IBRA bioregions: Cape York Peninsula (from Princess Charlotte Bay southwards), Wet Tropics, Central Mackay Coast, South Eastern Queensland, New South Wales North Coast, Sydney Basin and South East Corner.
- Patches of the ecological community occur within two kilometres of the east coast, including offshore islands, or adjacent to a large body of salt water, such as an estuary, where they are subject to maritime influence.

- The structure of the ecological community typically is a closed canopy of trees that can be interspersed with canopy gaps that are common in exposed situations or with storm events. Usually, several vegetation strata are present. However, where there is extreme exposure to salt laden winds, these strata may merge into a height continuum rather than occurring as distinct vegetation layers. The canopy forms a mosaic due to canopy regeneration, typically in the form of basal coppice following canopy decapitation due to prevailing salt laden winds and storm events. Wind sheared canopy can be present on the frontal section leading to closed secondary canopies. Emergents may be present, for example, species from the genera *Araucaria* (northern bioregions only), *Banksia* or *Eucalyptus*. The ground stratum of the vegetation typically is very sparse.
- The ecological community contains a range of plant life forms including trees, shrubs, vines, herbs, ferns and epiphytes. To the north, most plant species diversity is in the tree and shrub (i.e. canopy) layers rather than in lower strata. The converse generally occurs from the Sydney Basin Bioregion southwards. Feather palms, fan palms, large leaved vascular epiphytes and species that exhibit buttressing are generally rare. Ground ferns and vascular epiphytes are lower in diversity in littoral rainforests compared to most other rainforest types.
- Plants with xeromorphic and succulent features are generally more common in littoral rainforest than in hinterland rainforest types. Canopy stem sizes also tend to be smaller compared to that in hinterland rainforest. Trunks rarely host mosses though lichens are usually common.
- Whilst species can be regionally predictable, there may be considerable variation in the composition of individual stands of the ecological community within any given bioregion. Attachment A from Listing Advice provides a list of flora species for each relevant bioregion.

Condition thresholds

The condition thresholds of Littoral Rainforest are as follows:

- Small patches can be resilient and viable, but minimum size of a patch needs to be 0.1 ha; and
- The cover of transformer weed species (as identified in Attachment A from the Listing Advice) is 70 percent or less. Transformer weeds are highly invasive taxa with the potential to seriously alter the structure and function of the ecological community. This threshold recognises the relative resilience and recoverability of the ecological community to invasion by weed species; and
- The patch must have:
    - at least 25 percent of the native plant species diversity characteristic of this ecological community in that bioregion (Attachment A from the Listing Advice);

      or
    - at least 30 percent canopy cover of one rainforest canopy (either tree or shrub) species (Attachment A from the Listing Advice; excluding *Banksia* and *Eucalyptus* species that may be part of the ecological community).

Condition Threshold Notes

- Where gaps in the canopy exist, they should be in the process of regenerating with the usual suite of rainforest gap species for the site. Natural regeneration of native gap species may be limited where weed invasion is significant, or where the natural geology and soil condition do not allow for regeneration.
- As species diversity diminishes from northern to southern latitudes, it is important to take into account the natural diversity of a patch in a particular bioregion when examining specific sites. For example, it is possible to find littoral rainforest stands that are dominated by single tree species or a small number of species (Miles & Kendall 2006). If such patches are in good condition, they will be representative of the ecological community and they may also contain rainforest dependent fauna species.
- The flora lists in Attachment A from the Listing Advice are not exhaustive. Additional rainforest species encountered when surveying sites need to be included when determining the condition thresholds. These additional species should added to both the numerator and the denominator when determining percentage of native plant species diversity present in a patch.

The condition criteria outlined above represent the minimum level for patches to be included in the listed ecological community.

Specific additional notes considered to be relevant include:

- While the Listing Advice is slightly unclear regarding the diversity condition criteria percentage requirement (is the 25% threshold related to total plant species diversity or only native plant species diversity?) both the Policy Statement and Recovery Plan indicate that of the native plant species present in the patch, at least 25 per cent of these must occur on the indicative plant Species Lists for the associated bioregion of this ecological community

- The Policy Statement indicates that to be considered the TEC all of the Key Diagnostic Characteristics and Condition Thresholds must be met:

  "If a native vegetation remnant meets ALL the criteria below, then you are likely to be standing in the nationally listed threatened ecological community."

- The administering documents note that "where gaps in the canopy exist, they should be in the process of regenerating with the usual suite of rainforest gap species for the site. Where weed invasion is significant, natural regeneration of native gap species may be limited."

  Such would indicate that where gaps in the canopy occur, native rainforest species will occupy the layers beneath the canopy

- The administering documents all refer to the EEC as typically having a 'closed canopy' although such is not definitively defined. The Recovery Plan indicates more specifically that a closed canopy would be one with > 70 percent projected foliage cover.

EEC ASSESSMENT SUMMARY

The Commonwealth policy statement for this community (DEWHA 2009) provides a list of features that must all be present in order to determine the presence of the Commonwealth-listed protected entity Littoral Rainforest and Coastal Vine Thickets of Eastern Australia. These features in the context of the vegetation surveyed (Plot Data attached) are summarised below:

KEY DIAGNOSTIC CHARACTERISTIC SUMMARY	SITE VEGETATION COMPLIANCE
The ecological community occurs in the following IBRA bioregions: Cape York Peninsula (from Princess Charlotte Bay southwards), Wet Tropics, Central Mackay Coast, South Eastern Queensland, NSW North Coast, Sydney Basin and South East Corner	√ The vegetation is on the NSW north Coast
Patches of the ecological community typically occur within two kilometres of the east coast, or on offshore islands, or adjacent to a large body of salt water, such as an estuary, where they are subject to maritime influences	√ The vegetation is within 2km of the east coast.
Occurs on coastal headlands, dunes, sea-cliffs or other places influenced by the sea.	√ Although previously mined for sand the location of the vegetation is associated with coastal sands.
The structure of the ecological community typically is a closed canopy of trees that can be interspersed with canopy gaps that are common in exposed situations or with storm events. [Patches generally exhibit a closed canopy (with > 70 percent projected foliage cover) but may also be patchy and include emergents, and, due to wind sheering, stand profile generally increases in height with the progression from seaward to landward edge (Keith 2004). Those stands that occur in exposed coastal situations can have many rainforest gaps caused by storm events which, in turn, may lead to canopy decapitation. In these exposed sites, there is often a secondary canopy that has developed below the old canopy (RECOVERY PLAN)]	√ [Marginal] From LRF1 and LRF2 Tree Cover = 85.2% and 69.6%. The site is highly disturbed from previous mining activities, the canopy layer is largely fragmented and dominated by Coastal Banksia. The canopy is an open forest/forest, comprised almost entirely of *Banksia integrifolia*.
Usually, several vegetation layers are present	√

KEY DIAGNOSTIC CHARACTERISTIC SUMMARY	SITE VEGETATION COMPLIANCE
	An observable canopy, sub-canopy, shrub and ground layer are present although the lower strata display fragmentation and weed dominance, particularly the shrub and ground layers).
The Littoral Rainforest and Coastal Vine Thickets of Eastern Australia typically has tall trees as part of the canopy, but not always. The height of the canopy plants varies depending on the degree of exposure and can range from one to 25 metres. [Within Littoral Rainforest, structure can vary from low, closed thickets (approximately 5 m tall) to tall, closed forests (approximately 30 m high), with factors such as the amount of rainfall, shelter from wind and salt spray, and the depth of soil development, all influencing patch structure (RECOVERY PLAN)] [The canopy height varies with the degree of exposure and can range from dwarf to medium (<1-25 m; Specht 1970) (LISTING ADVICE)]	√ The canopy is >1m in height
Emergent trees may be present above the canopy, for example species from the genera *Araucaria* (Bunya and Hoop pines in the northern bioregions only), *Banksia* or *Eucalyptus*	√ Larger Banksia specimens, isolated eucalypts and occasional melaleucas emerge from the Banksia dominant canopy layer.
Plants with drought tolerant and succulent features are generally more common in littoral rainforest than in more inland rainforest types. Trunks often host lichens (but rarely mosses) and canopy stem sizes tend to be smaller compared to that in more inland rainforest. Ground ferns and epiphytes are lower in diversity in littoral rainforests compared to many other rainforest types. Feather palms, fan palms and large leaved epiphytes are generally rare.	√
Plant species are mainly rainforest species and can be regionally predictable. However, there may be considerable variation in the composition of individual stands of the listed community within any given bioregion.	X [Marginal] Across the two x 1600m^2 survey plots characteristic rainforest species account for 41.9% of plant species

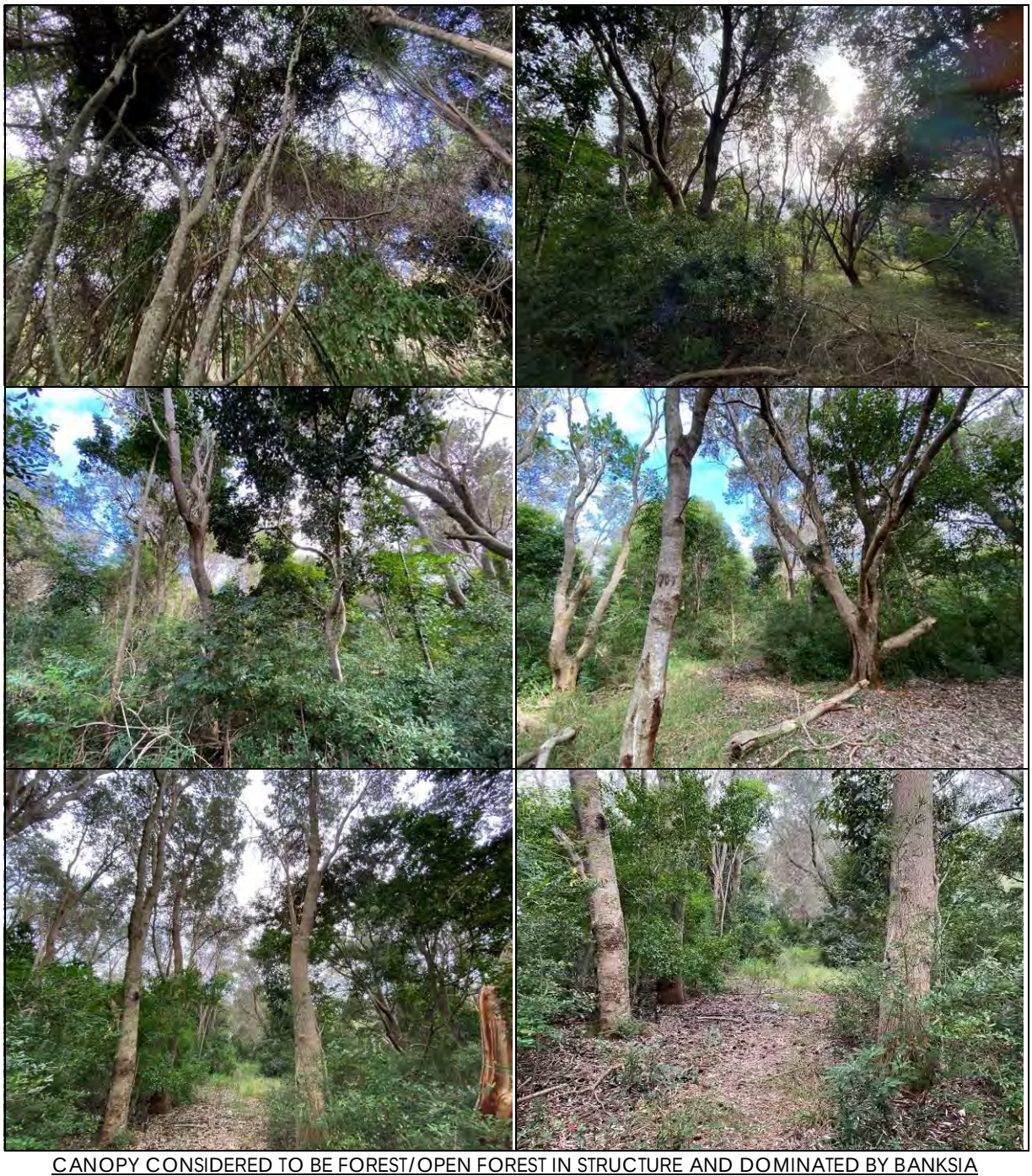
CONDITION THRESHOLD SUMMARY	SITE VEGETATION COMPLIANCE
Minimum patch size of 0.1 hectares	√ Nominated patch area exceeds 0.1 ha.
Cover of transformer weed species is 70% or less.	√ Although weed species are prevalent and suppressive the cover of listed transformer weed species for southern SEQ and NSW north coast does not exceed 70%
Of the native species on the site at least 25% are on the indicative plant list for the bioregion OR At least 30% of the canopy cover provided by one or more of the rainforest canopy species in the indicative list (excluding *Banksia*	√ Of the native plant species recorded within the vegetation 70.5% are listed as characteristic of LRF in southern SEQ and NSW north (surveyed across two 1600m^2 survey sites) X Banksia integrifolia canopy cover exceeds 70% of the vegetation community with other rainforest species (i.e. Tuckeroo, Cheese Tree, Aconychia etc.) comprising

CONDITION THRESHOLD SUMMARY	SITE VEGETATION COMPLIANCE
and *Eucalyptus*).	<30% of the canopy cover.

CONCLUSION

It is considered that the surveyed features of the mapped community on the site does accord with the key diagnostic and condition threshold characteristics defining the Littoral Rainforest EEC and therefore can be regarded as an example of the Commonwealth-listed entity.

CANOPY CONSIDERED TO BE FOREST/OPEN FOREST IN STRUCTURE AND DOMINATED BY BANKSIA INTEGRIFOLIA



CANOPY CONSIDERED TO BE FOREST/OPEN FOREST IN STRUCTURE AND DOMINATED BY BANKSIA INTEGRIFOLIA

LRF2

LRF1

EPBC ACT LITTORAL RAINFOREST EEC

- Study Area
- Development Footprint
- Patch Considered to be Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community
- Patches assessed and surveyed in accordance with Listing Advice on Littoral Rainforest and Coastal Vine Thickets of Eastern Australia

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COASTAL SWAMP SCLEROPHYLL FOREST OF NEW SOUTH WALES AND SOUTH EAST QUEENSLAND

The key diagnostic criteria are considered to be met for this patch/copse including:

- having canopy trees dominated by *Melaleuca quinquenervia*
- having crown cover of at least 10%

Following field survey, the patch area meeting the key diagnostic criteria was ~1.875 hectares. Further Melaleuca Forest has been surveyed to the west but such vegetation is not contiguous (i.e., is separated by other areas meeting the key diagnostic criteria by >30 metres). The patch is part of a larger area of native vegetation of at least five hectares.

Therefore, the patch is assigned a 'small contiguous patch' size class (the patch is at least 0.25 ha and less than 2 ha and is part of a larger area of native vegetation of at least 5 ha [refer Table 2-SSF Conservation Advice]).

A field quadrat survey was then performed in accordance with Section 2.2.5 of the SSF Guidelines. To account for variability the patch was traversed first and the field plot then placed within an area reflective of the investigated areas.

The field survey performed resulted in vegetation condition class of 'moderate.'

Therefore, in accordance with Table 1 of the guideline Patch SSF1_T3 (and connected areas of the same habitat type) is assigned 'Not Protected' status and per Section 2.3 of the Guideline is not considered to meet the criteria to be considered the MNES ecological community.

COASTAL SSF OF NSW/SEQ ECOLOGICAL COMMUNITY FIELD ASSESSMENT

Site No.	SSF1_T3	Recorder:	TR						
Purpose	20M X 20M CONDITION PLOT								
Location:	BDAR FIELD SURVEY SITE T3								
GPS coordinates	Zone	5	6	E	560724	N	6831153	Datum:	MGAZ56

KEY DIAGNOSTICS-CANOPY

REQUIREMENT	OBSERVED VALUE	MEASURED OR ESTIMATED	REQUIREMENT MET
Crown cover of at least 10%	60-70%	E (obviously >10%. Refer Images)	√
Canopy dominated by Melaleuca quinquenervia	>95%	Measured	√
Median canopy height range	11-13m	Measured	√

CONDITION THRESHOLDS-PATCH SIZE CLASS

REQUIREMENT	OBSERVED VALUE	MEASURED OR ESTIMATED	REQUIREMENT MET
Small patch The patch is at least 0.5 ha and less than 2 ha which is isolated or part of a small native vegetation remnant less than 5 ha in total.	1.875ha	Measured via GPS and estimated by GIS	√
Small contiguous patch The patch is at least 0.25 ha and less than 2 ha and is part of a larger area of native vegetation of at least 5 ha.	1.875ha	Measured via GPS and estimated by GIS	√
Medium patch The patch is at least 2 ha and less than 5 ha. It may or may not be contiguous with other native vegetation.	1.875ha	Measured via GPS and estimated by GIS	X
Large patch The patch is at least 5 ha. It may or may not be contiguous with other native vegetation.	1.875ha	Measured via GPS and estimated by GIS	X

CONDITION THRESHOLDS-VEGETATION (BIOTIC) CONDITION THRESHOLDS

MINIMUM REQUIREMENT	OBSERVED VALUE	MEASURED OR ESTIMATED	REQUIREMENT MET
HIGH CONDITION Non-native species comprise < 20% of total ground layer vegetation cover*	~65%	Measured within 20m x 20m survey plot	X
GOOD CONDITION Non-native species comprise 20% to 50% of total ground layer vegetation cover	~65%	Measured within 20m x 20m survey plot	X
MODERATE CONDITION Non-native species comprise 50% - 80% of total ground layer vegetation cover	~65%	Measured within 20m x 20m survey plot	√
LOW CONDITION Non-native species comprise more than 80% of total ground layer vegetation cover	~65%	Measured within 20m x 20m survey plot	√

Minimum vegetation condition class threshold for identified patch size not met. Therefore, not EEC.

*Refers to total perennial ground layer vegetation cover for the patch of the ecological community. Includes vascular plant species with a lifecycle of more than two growing seasons. It includes herbs (graminoids and forbs), grasses, shrubs, and juvenile plants of canopy species, but does not include annual plants, cryptogams, leaf litter or exposed soil.

GROUND LAYER VEGETATION SPECIES (0.04HA QUADRAT)

GROWTH FORM	SPECIES	EST PLOT COVER %
E	*Blechnum indicum*	0.1
E	*Gleichenia dicarpa*	0.5
E	*Pteridium esculentatum*	0.1
F	*Centella asiatica*	0.1
G	*Gahnia clarkei*	2
G	*Isolepis inundata*	0.1
G	*Juncus usitatus*	0.1
P	*Archontophoenix cunninghamiana*	5
L	*Glycine clandestina*	0.1
P	*Livistona australis*	0.1
L	*Parsonsia straminea*	0.1
L	*Smilax australis*	0.1
L	*Stephania japonica*	0.1
L	*Trophis scandens*	0.1
S	*Acronychia imperforata*	1
S	*Ficus coronata*	1
S	*Pittosporum undulatum*	0.5
S	*Synoum glandulosum var. glandulosum*	1
TOTAL NATIVE COVER %		12.1
NATIVE% OF TOTAL GROUND LAYER VEGETATION COVER		35%

Growth form: S=shrub, G= grass, V=sedge, R=rush, E=fern, F=forb/herb, L=vine, P=palm, O=other
Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m

NON-NATIVE UNDERSTOREY SPECIES (0.04HA QUADRAT)

GROWTH FORM	SPECIES	EST PLOT COVER %
S	*Cinnamomum camphora*	2
S	*Citrus spp.*	0.2
S	*Lantana camara*	0.1

GROWTH FORM	SPECIES	EST PLOT COVER %
S	*Ochna serrulata*	0.1
G	*Paspalum dilatatum*	0.1
S	*Senna pendula var. glabrata*	0.2
F	*Sphagneticola trilobata*	20
TOTAL NON-NATIVE COVER %		22.7
NON-NATIVE% OF TOTAL GROUND LAYER VEGETATION COVER		65%

MELALEUCA QUINQUENERVIA DOMINANT

GROUND LAYER IMAGES [DOMINATED BY NON-NATIVE SPECIES]

BELOW IMAGES FROM ELSEWHERE IN PATCH EXTERNAL TO EEC 20M X 20M FIELD SITE

COASTAL SWAMP SCLEROPHYLL FOREST OF NEW SOUTH WALES AND SOUTH EAST QUEENSLAND

The key diagnostic criteria are considered to be met for this patch/copse including:

- having canopy trees dominated by Melaleuca quinquenervia
- having crown cover of at least 10%

Following field survey, the patch area meeting the key diagnostic criteria was ~1.875 hectares. Further Melaleuca Forest has been surveyed to the west but such vegetation is not contiguous (i.e., is separated by other areas meeting the key diagnostic criteria by >30 metres). The patch is part of a larger area of native vegetation of at least five hectares.

Therefore, the patch is assigned a 'small contiguous patch' size class (the patch is at least 0.25 ha and less than 2 ha and is part of a larger area of native vegetation of at least 5 ha [refer Table 2-SSF Conservation Advice]).

A field quadrat survey was then performed in accordance with Section 2.2.5 of the SSF Guidelines. To account for variability the patch was traversed first and the field plot then placed within an area reflective of the investigated areas.

The field survey performed resulted in vegetation condition class of 'low.'

Therefore, in accordance with Table 1 of the guideline Patch SSF2_T4 (and connected areas of the same habitat type) is assigned 'Not Protected' status and per Section 2.3 of the Guideline is not considered to meet the criteria to be considered the MNES ecological community.

COASTAL SSF OF NSW/SEQ ECOLOGICAL COMMUNITY FIELD ASSESSMENT

Site No.	SSF2_T4	Recorder:	TR						
Purpose	20M X 20M CONDITION PLOT								
Location:	BDAR FIELD SURVEY SITE T4								
GPS coordinates	Zone	5	6	E	560683	N	6831191	Datum:	MGAZ56

KEY DIAGNOSTICS-CANOPY

REQUIREMENT	OBSERVED VALUE	MEASURED OR ESTIMATED	REQUIREMENT MET
Crown cover of at least 10%	80%	E (obviously >10%. Refer Images)	√
Canopy dominated by Melaleuca quinquenervia	>95%	Measured	√
Median canopy height rabge	11-13m	Measured	√

CONDITION THRESHOLDS-PATCH SIZE CLASS

REQUIREMENT	OBSERVED VALUE	MEASURED OR ESTIMATED	REQUIREMENT MET
Small patch The patch is at least 0.5 ha and less than 2 ha which is isolated or part of a small native vegetation remnant less than 5 ha in total.	1.875ha	Measured via GPS and estimated by GIS	√
Small contiguous patch The patch is at least 0.25 ha and less than 2 ha and is part of a larger area of native vegetation of at least 5 ha.	1.875ha	Measured via GPS and estimated by GIS	√
Medium patch The patch is at least 2 ha and less than 5 ha. It may or may not be contiguous with other native vegetation.	1.875ha	Measured via GPS and estimated by GIS	X
Large patch The patch is at least 5 ha. It may or may not be contiguous with other native vegetation.	1.875ha	Measured via GPS and estimated by GIS	X

CONDITION THRESHOLDS-VEGETATION (BIOTIC) CONDITION THRESHOLDS

MINIMUM REQUIREMENT	OBSERVED VALUE	MEASURED OR ESTIMATED	REQUIREMENT MET
HIGH CONDITION Non-native species comprise < 20% of total ground layer vegetation cover*	~81%	Measured within 20m x 20m survey plot	X
GOOD CONDITION Non-native species comprise 20% to 50% of total ground layer vegetation cover	~81%	Measured within 20m x 20m survey plot	X
MODERATE CONDITION Non-native species comprise 50% - 80% of total ground layer vegetation cover	~81%	Measured within 20m x 20m survey plot	X
LOW CONDITION Non-native species comprise more than 80% of total ground layer vegetation cover	~81%	Measured within 20m x 20m survey plot	√

Minimum vegetation condition class threshold for identified patch size not met. Therefore, not EEC.

*Refers to total perennial ground layer vegetation cover for the patch of the ecological community. Includes vascular plant species with a lifecycle of more than two growing seasons. It includes herbs (graminoids and forbs), grasses, shrubs, and juvenile plants of canopy species, but does not include annual plants, cryptogams, leaf litter or exposed soil.

GROUND LAYER VEGETATION SPECIES (0.04HA QUADRAT)

GROWTH FORM	SPECIES	EST PLOT COVER %
E	*Blechnum indicum*	0.1
E	*Gleichenia dicarpa*	7
E	*Lygodium microphyllum*	0.2
E	*Pteridium esculentum*	0.1
E	*Selaginella uliginosa*	0.1
F	*Centella asiatica*	0.1
R	*Baumea rubiginosa*	1
G	*Gahnia clarkei*	1
L	*Parsonsia straminea*	3
L	*Stephania japonica var. discolor*	0.5
S	*Callistemon salignus*	0.1
S	*Synoum glandulosum var. glandulosum*	0.1
TOTAL NATIVE COVER %		13.3
NATIVE% OF TOTAL GROUND LAYER VEGETATION COVER		19%

Growth form: S=shrub, G= grass, V=sedge, R=rush, E=fern, F=forb/herb, L=vine, P=palm, O=other
Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m

NON-NATIVE UNDERSTOREY SPECIES (0.04HA QUADRAT)

GROWTH FORM	SPECIES	EST PLOT COVER %
G	*Andropogon virginicus*	0.1
F	*Cuphea carthagenensis*	0.1
S	*Ochna serrulata*	0.1
G	*Paspalum dilatatum/wettsteinii*	50
F	*Polygala paniculata*	0.1
S	*Senna pendula var. glabrata*	0.1
G	*Setaria sphacelata*	0.5
F	*Sphagneticola trilobata*	5
TOTAL NON-NATIVE COVER %		56
NON-NATIVE% OF TOTAL GROUND LAYER VEGETATION COVER		81%

MELALEUCA QUINQUENERVIA DOMINANT

GROUND LAYER IMAGES [DOMINATED BY NON-NATIVE SPECIES]

BELOW IMAGES FROM ELSEWHERE IN PATCH EXTERNAL TO EEC 20M X 20M FIELD SITE

COASTAL SWAMP SCLEROPHYLL FOREST OF NEW SOUTH WALES AND SOUTH EAST QUEENSLAND

The key diagnostic criteria are considered to be met for this patch/copse including:

- having canopy trees dominated by Melaleuca quinquenervia
- having crown cover of at least 10%

Following field survey, the patch area meeting the key diagnostic criteria was ~1.875 hectares. Further Melaleuca Forest has been surveyed to the west but such vegetation is not contiguous (i.e., is separated by other areas meeting the key diagnostic criteria by >30 metres). The patch is part of a larger area of native vegetation of at least five hectares.

Therefore, the patch is assigned a 'small contiguous patch' size class (the patch is at least 0.25 ha and less than 2 ha and is part of a larger area of native vegetation of at least 5 ha [refer Table 2-SSF Conservation Advice]).

A field quadrat survey was then performed in accordance with Section 2.2.5 of the SSF Guidelines. To account for variability the patch was traversed first and the field plot then placed within an area reflective of the investigated areas.

The field survey performed resulted in vegetation condition class of high.'

Therefore, in accordance with Table 1 of the guideline Patch SSF3 (and connected areas of the same habitat type/condition) is assigned 'Class B2' status and per Section 2.3 of the Guideline is considered to meet the criteria to be considered the MNES ecological community.

COASTAL SSF OF NSW/SEQ ECOLOGICAL COMMUNITY FIELD ASSESSMENT

Site No.	SSF3	Recorder:	TR/GD						
Purpose	20M X 20M CONDITION PLOT								
Location:	SANDHILLS. SOUTHWEST OF SSF1. WEST OF MASSINGER STREET								
GPS coordinates	Zone	5	6	E	560,678	N	6,831,135	Datum:	MGAZ56

KEY DIAGNOSTICS-CANOPY

REQUIREMENT	OBSERVED VALUE	MEASURED OR ESTIMATED	REQUIREMENT MET
Crown cover of at least 10%	60-70%	E (obviously >10%. Refer Images)	√
Canopy dominated by Melaleuca quinquenervia	>95%	E (obvious)	√
Median canopy height range	8-11.5m	Measured	√

CONDITION THRESHOLDS-PATCH SIZE CLASS

REQUIREMENT	OBSERVED VALUE	MEASURED OR ESTIMATED	REQUIREMENT MET
Small patch The patch is at least 0.5 ha and less than 2 ha which is isolated or part of a small native vegetation remnant less than 5 ha in total.	1.875ha	Measured via GPS and estimated by GIS	√
Small contiguous patch The patch is at least 0.25 ha and less than 2 ha and is part of a larger area of native vegetation of at least 5 ha.	1.875ha	Measured via GPS and estimated by GIS	√
Medium patch The patch is at least 2 ha and less than 5 ha. It may or may not be contiguous with other native vegetation.	1.875ha	Measured via GPS and estimated by GIS	X
Large patch The patch is at least 5 ha. It may or may not be contiguous with other native vegetation.	1.875ha	Measured via GPS and estimated by GIS	X

CONDITION THRESHOLDS-VEGETATION (BIOTIC) CONDITION THRESHOLDS

MINIMUM REQUIREMENT	OBSERVED VALUE	MEASURED OR ESTIMATED	REQUIREMENT MET
HIGH CONDITION Non-native species comprise < 20% of total ground layer vegetation cover*	<20%	Measured within 20m x 20m survey plot	√
GOOD CONDITION Non-native species comprise 20% to 50% of total ground layer vegetation cover	<20%	Measured within 20m x 20m survey plot	√
MODERATE CONDITION Non-native species comprise 50% - 80% of total ground layer vegetation cover	<20%	Measured within 20m x 20m survey plot	√
LOW CONDITION Non-native species comprise more than 80% of total ground layer vegetation cover	<20%	Measured within 20m x 20m survey plot	√

Minimum vegetation condition class threshold for identified patch size met. Therefore, EEC.

*Refers to total perennial ground layer vegetation cover for the patch of the ecological community. Includes vascular plant species with a lifecycle of more than two growing seasons. It includes herbs (graminoids and forbs), grasses, shrubs, and juvenile plants of canopy species, but does not include annual plants, cryptogams, leaf litter or exposed soil.

GROUND LAYER VEGETATION SPECIES (0.04HA QUADRAT)

GROWTH FORM	SPECIES	EST PLOT COVER %
S	*Glochidion ferndinandi*	0.1
E	*Gleichenia dicarpa*	80
E	*Lygodium microphyllum*	0.5
E	*Pteridium esculentum*	5
E	*Melicope elleryana*	0.5
F	*Centella asiatica*	0.1
R	*Baumea rubiginosa*	0.1
G	*Gahnia clarkei*	0.5
L	*Parsonsia straminea*	3
L	*Hibbertia scandens*	0.1
S	*Cupaniopsis anacardioides*	0.5
S/F	*Dickksonia youngiae*	1
S	*Pittosporum undulatum*	0.5
G	*Entolasia stricta*	0.1
TOTAL NATIVE COVER %		~92%
NATIVE% OF TOTAL GROUND LAYER VEGETATION COVER		~95%

Growth form: S=shrub, G= grass, V=sedge, R=rush, E=fern, F=forb/herb, L=vine, P=palm, O=other
Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m

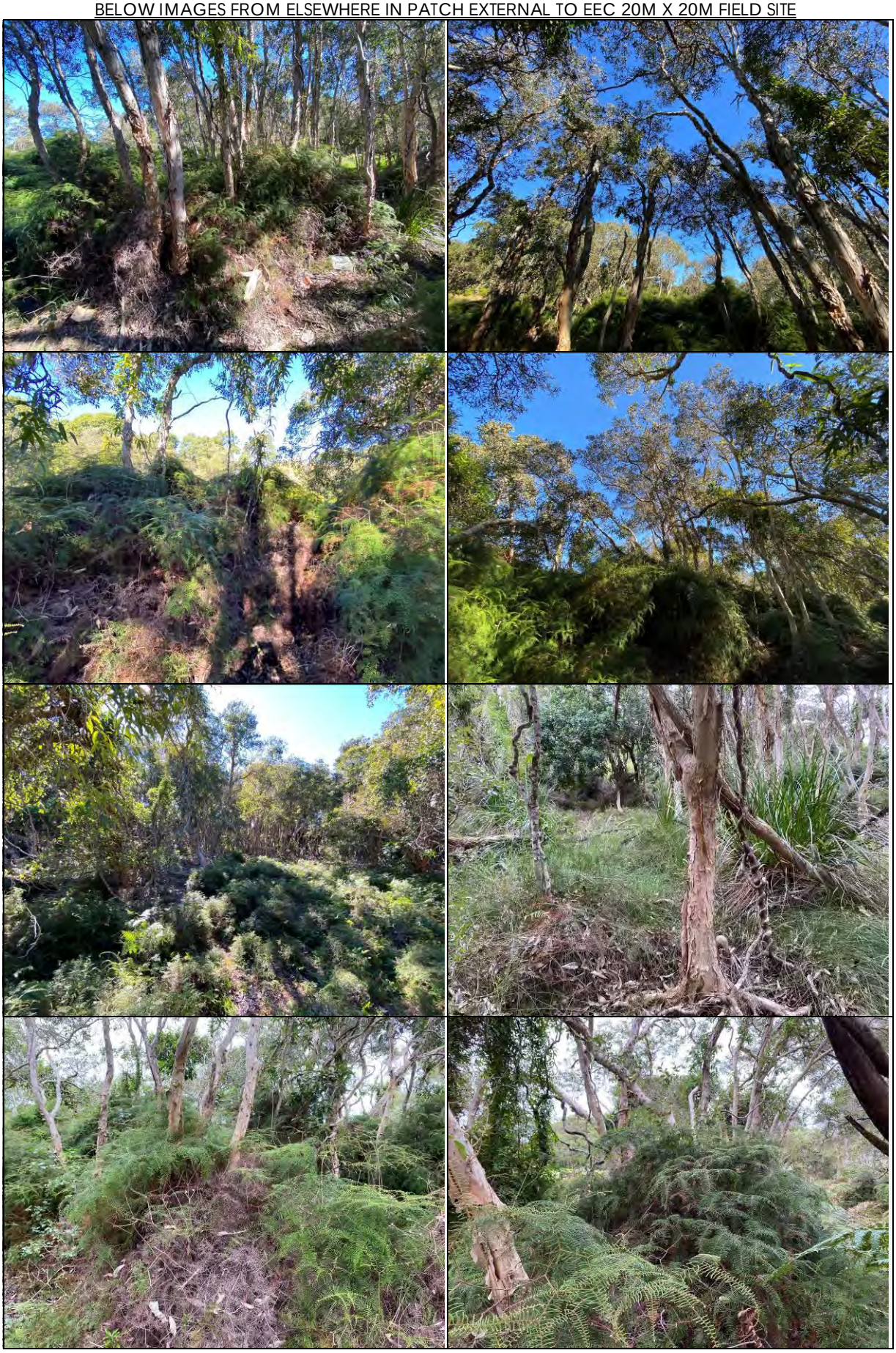
NON-NATIVE UNDERSTOREY SPECIES (0.04HA QUADRAT)

GROWTH FORM	SPECIES	EST PLOT COVER %
S	*Ochna serrulata*	0.1
G	*Paspalum dilatatum/wettsteinii*	4
S	*Senna pendula var. glabrata*	0.1
F	*Sphagneticola trilobata*	0.5
TOTAL NON-NATIVE COVER %		~4.7
NON-NATIVE% OF TOTAL GROUND LAYER VEGETATION COVER		~4.9%

MELALEUCA QUINQUENERVIA DOMINANT

GROUND LAYER IMAGES [DOMINATED BY NATIVE SPECIES]

BELOW IMAGES FROM ELSEWHERE IN PATCH EXTERNAL TO EEC 20M X 20M FIELD SITE



SSF2

SSF1

SSF3

EPBC ACT SWAMP SCLEROPHYLL FOREST EEC

Study Area

Development Footprint

Patch considered to be Coastal Swamp Sclerophyll Forest of NSW and SEQ: Condition Class B2

Patch not considered to be Coastal Swamp Sclerophyll Forest of NSW and SEQ

Patches assessed and surveyed in accordance with Conservation Advice for the Coastal Swamp Sclerophyll Forest of NSW and SEQ

SCALE 1:1750@ A3

5-4-2023

COASTAL SWAMP OAK (CASUARINA GLAUCA) FOREST OF NEW SOUTH WALES AND SOUTH EAST QUEENSLAND ECOLOGICAL COMMUNITY DISCUSSION

The key diagnostic criteria are considered to be met for this patch/copse including:

- having canopy trees dominated by Casuarina glauca
- having crown cover of at least 10%

These are not onerous criteria as this particular EEC contains a low height criteria (10m) so even young regrowth can be considered.

To define the boundary of the patch dominated by *Casuarina glauca* the area was field surveyed and the outer canopy defined with a handheld GPS unit.

Following field survey, the area meeting the key diagnostic criteria was 0.518 ha. Therefore, the patch is assigned a 'small contiguous patch' size class (Small contiguous patch – The patch is at least 0.5 ha and less than 2 ha, and is connected to a larger area of native vegetation of at least 5 ha).

A field quadrat survey was then performed general in accordance with Section 3.2 and Appendix 3 of the Guidelines. Given the small, fragmented areas of the Swamp Oak communities within the area, 10m x 10m plots were utlised instead of the usual 20m x 20m plots. To account for variability the patch was traversed first and the field plot then placed within an area reflective of the overall investigated patch. As nearly all areas were infested with weeds in the lower strata a representative plot within the footprint was surveyed.

The plot did contain some native understorey, although transformer species were >50% of the total understorey vegetation cover. As such, it is considered that this patch does not represent Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland.

SITE FORM: FIELD SITE CONFIRM PRESENCE OF COASTAL SWAMP OAK (*CASUARINA GLUACA*) FOREST OF NSW AND SEQ AND CONDITION

Location

Site No. SO1 Recorder: TR Date: 07/12/2021

Purpose Coastal Swamp Oak Forest NSW & SEQ Endangered Ecological Community Assessment

Location: SO1 – North of Byron Bay Courthouse

GPS coordinates centre plot: Zone 56 E 560194 N 6831328 Datum: MGA94z56

Field Site Information

Landform	Flat.
Mapped Plant Community Type (PCT)	PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion.
Plot Size	Quadrat of 10x10m utilised (Tozer, 2003; Tozer *et al.,* 2010).
eSPADE Geology Mapping	Tyagarah (9540ty) - Quaternary estuarine alluvium overlain by and/or mixed with Quaternary (Pleistocence) sands. The sands are generally Aeolian, originating from the adjacent beach ridge systems.

Surveyor experience	>8 years conducting flora surveys within the locality.

Key Diagnostics – Canopy

Requirement	Observed Value	Measured or Estimated	Requirement Met
Crown cover of at least 10%	75%	Estimated	√
Canopy dominated by Casuarina glauca	Yes	Estimated	√
Median canopy height >10m (i.e. open woodland, woodland, forest or closed forest per Hnatiuk et al, 2009)	12m-14m	Estimated	√

Condition Thresholds – Patch Size Class

Requirement	Observed Value	Measured or Estimated	Requirement Met
Small Patch – At least 0.5 hectares	~0.518 ha	Measured via GPS and estimated by GIS	√
Small contiguous patch – The patch is at least 0.5 ha and less than 2 ha, and is connected to a larger area of native vegetation of at least 5 ha	~0.518 ha	Measured via GPS and estimated by GIS	√
Medium Patch – At least 2 ha and less than 5 ha	~0.518 ha	Measured via GPS and estimated by GIS	X
Large patch – At least 5 ha	~0.518 ha	Measured via GPS and estimated by GIS	X

Condition Thresholds – Vegetation Quality

Minimum Requirement	Observed Value	Measured or Estimated	Requirement Met
HIGH QUALITY Predominately native understorey. Non-native species comprise less than 20% total understorey vegetation cover (all vascular species of all layers below the canopy)	~10-15%	Measured within 10m x 10m survey plot	X
GOOD QUALITY Mostly native understorey Non-native species comprise less than 50% of total understorey vegetation cover AND transformer species comprise less than 30% of total understorey vegetation cover	~10-15%	Measured within 10m x 10m survey plot	X
MODERATE QUALITY Some native understorey Non-native species comprise less than 80% of total understorey vegetation cover AND transformer species comprise less than 50% of total understorey vegetation cover	~10-15%	Measured within 10m x 10m survey plot	X

Minimum vegetation quality class threshold not met. Therefore, not EEC.

Native Understorey Species (10m x 10m plot)

Growth Form	Species	Est Abundance	Est Cover %
G	*Cynodon dactylon*	100	5

Growth Form	Species	Est Abundance	Est Cover %
R	*Lomandra hystrix*	1	<1
S	*Acacia longifolia subsp. sophorae*	1	1
S	*Glochidion ferdinandi*	1	2
S	*Cupaniopsis anacardioides*	2	5
Native % of Total Understorey Vegetation Cover			~10-15%

Growth form: T=tree, S=shrub, G= grass, V=sedge, R=rush, E=fern, F=forb/herb, L=vine, P=palm, O=other
Cover: <1 1,2,3,4,5,10,15,20,25,30,35, etc cover%
Abundance: <5, 5-10, 10-20, 20-50, 50-100, 100-500, 500-1000, >1000

Non-native Understorey Species (10m x 10m plot)

Growth Form	Species	Transformer Species	Est Abundance	Est Cover %
G	*Paspalum dilatatum**	√	200	75
S	*Lantana camara**	√	1	1
S	*Cinnamomum camphora**	√	1	2
F	*Taraxacum officinale*		5	<1
Non-native % of Total Understorey Vegetation Cover				~80%

* Transformer species

Images

COASTAL SWAMP OAK (CASUARINA GLAUCA) FOREST OF NEW SOUTH WALES AND SOUTH EAST QUEENSLAND ECOLOGICAL COMMUNITY DISCUSSION

The key diagnostic criteria are considered to be met for this patch/copse including:

- having canopy trees dominated by Casuarina glauca
- having crown cover of at least 10%

These are not onerous criteria as this particular EEC contains a low height criteria (10m) so even young regrowth can be considered.

To define the boundary of the patch dominated by *Casuarina glauca* the area was field surveyed and the outer canopy defined with a handheld GPS unit.

Following field survey, the area meeting the key diagnostic criteria was 0.518 ha. Therefore, the patch is assigned a 'small contiguous patch' size class (Small contiguous patch – The patch is at least 0.5 ha and less than 2 ha, and is connected to a larger area of native vegetation of at least 5 ha).

A field quadrat survey was then performed general in accordance with Section 3.2 and Appendix 3 of the Guidelines. Given the small, fragmented areas of the Swamp Oak communities within the area, 10m x 10m plots were utlised instead of the usual 20m x 20m plots. To account for variability the patch was traversed first and the field plot then placed within an area reflective of the overall investigated patch. As nearly all areas were infested with weeds in the lower strata a representative plot within the footprint was surveyed.

The plot did contain some native understorey, although did not meet the minimum vegetation quality class threshold as non-native species were >80% of the total understorey cover. Additionally, transformer species were >50% of the total understorey cover. As such, it is considered that this patch does not represent Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland.

SITE FORM: FIELD SITE CONFIRM PRESENCE OF COASTAL SWAMP OAK (*CASUARINA GLUACA*) FOREST OF NSW AND SEQ AND CONDITION

Location

Site No. SO2 Recorder: TR Date: 07/12/2021

Purpose Coastal Swamp Oak Forest NSW & SEQ Endangered Ecological Community Assessment

Location: SO2 – North of Byron Bay Courthouse

GPS coordinates centre plot: Zone 56 E 560215 N 6831357 Datum: MGA94z56

Field Site Information

Landform	Flat.
Mapped Plant Community Type (PCT)	PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion.
Plot Size	Quadrat of 10x10m utilised (Tozer, 2003; Tozer *et al.*, 2010).

eSPADE Geology Mapping	Tyagarah (9540ty) - Quaternary estuarine alluvium overlain by and/or mixed with Quaternary (Pleistocence) sands. The sands are generally Aeolian, originating from the adjacent beach ridge systems.
Surveyor experience	>8 years conducting flora surveys within the locality.

Key Diagnostics – Canopy

Requirement	Observed Value	Measured or Estimated	Requirement Met
Crown cover of at least 10%	60%	Estimated	√
Canopy dominated by Casuarina glauca	Yes	Estimated	√
Median canopy height >10m (i.e. open woodland, woodland, forest or closed forest per Hnatiuk et al, 2009)	12m-14m	Estimated	√

Condition Thresholds – Patch Size Class

Requirement	Observed Value	Measured or Estimated	Requirement Met
Small Patch – At least 0.5 hectares	~0.518 ha	Measured via GPS and estimated by GIS	√
Small contiguous patch – The patch is at least 0.5 ha and less than 2 ha, and is connected to a larger area of native vegetation of at least 5 ha	~0.518 ha	Measured via GPS and estimated by GIS	√
Medium Patch – At least 2 ha and less than 5 ha	~0.518 ha	Measured via GPS and estimated by GIS	X
Large patch – At least 5 ha	~0.518 ha	Measured via GPS and estimated by GIS	X

Condition Thresholds – Vegetation Quality

Minimum Requirement	Observed Value	Measured or Estimated	Requirement Met
HIGH QUALITY Predominately native understorey. Non-native species comprise less than 20% total understorey vegetation cover (all vascular species of all layers below the canopy)	~5%	Measured within 10m x 10m survey plot	X
GOOD QUALITY Mostly native understorey Non-native species comprise less than 50% of total understorey vegetation cover AND transformer species comprise less than 30% of total understorey vegetation cover	~5%	Measured within 10m x 10m survey plot	X
MODERATE QUALITY Some native understorey Non-native species comprise less than 80% of total understorey vegetation cover AND transformer species comprise less than 50% of total understorey vegetation cover	~5%	Measured within 10m x 10m survey plot	X

Minimum vegetation quality class threshold not met. Therefore, not EEC.

Native Understorey Species (10m x 10m plot)

Growth Form	Species	Est Abundance	Est Cover %
P	*Archontophoenix cunninghamiana*	1	2
L	*Stephania japonica*	1	<1
G	*Cynodon dactylon*	10	<1
S	*Acacia longifolia subsp. sophorae*	1	<1
L	*Parsonsia straminea*	5	<1
S	*Cupaniopsis anacardioides*	1	1
Native % of Total Understorey Vegetation Cover			~5%

Growth form: T=tree, S=shrub, G= grass, V=sedge, R=rush, E=fern, F=forb/herb, L=vine, P=palm, O=other
Cover: <1 1,2,3,4,5,10,15,20,25,30,35, etc cover%
Abundance: <5, 5-10, 10-20, 20-50, 50-100, 100-500, 500-1000, >1000

Non-native Understorey Species (10m x 10m plot)

Growth Form	Species	Transformer Species	Est Abundance	Est Cover %
E	*Asparagus aethiopicus*		10-20	5
S	*Senna pendula var. glabrata**	√	20-50	70
S/T	*Schefflera actinophylla**	√	5	10
F	*Ochna serrulata**	√	5	<1
S	*Dracaena spp.*		2	<1
S/T	*Syagrus romanzoffiana*		4	5
S/T	*Cinnamomum camphora**	√	3	2
Non-native % of Total Understorey Vegetation Cover				~90-95%

* Transformer species

Images

COASTAL SWAMP OAK (CASUARINA GLAUCA) FOREST OF NEW SOUTH WALES AND SOUTH EAST QUEENSLAND ECOLOGICAL COMMUNITY DISCUSSION

The key diagnostic criteria are considered to be met for this patch/copse including:

- having canopy trees dominated by Casuarina glauca
- having crown cover of at least 10%

These are not onerous criteria as this particular EEC contains a low height criteria (10m) so even young regrowth can be considered.

To define the boundary of the patch dominated by *Casuarina glauca* the area was field surveyed and the outer canopy defined with a handheld GPS unit.

Following field survey, the area meeting the key diagnostic criteria was 0.518 ha. Therefore, the patch is assigned a 'small contiguous patch' size class (Small contiguous patch – The patch is at least 0.5 ha and less than 2 ha, and is connected to a larger area of native vegetation of at least 5 ha).

A field quadrat survey was then performed general in accordance with Section 3.2 and Appendix 3 of the Guidelines. Given the small, fragmented areas of the Swamp Oak communities within the area, 10m x 10m plots were utlised instead of the usual 20m x 20m plots. To account for variability the patch was traversed first and the field plot then placed within an area reflective of the overall investigated patch. As nearly all areas were infested with weeds in the lower strata a representative plot within the footprint was surveyed.

The plot did contain some native understorey, although did not meet the minimum vegetation quality class threshold as non-native species were >80% of the total understorey cover. As such, it is considered that this patch does not represent Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland.

SITE FORM: FIELD SITE CONFIRM PRESENCE OF COASTAL SWAMP OAK (*CASUARINA GLUACA*) FOREST OF NSW AND SEQ AND CONDITION

Location

Site No. SO3 Recorder: TR Date: 07/12/2021

Purpose Coastal Swamp Oak Forest NSW & SEQ Endangered Ecological Community Assessment

Location: SO3 – East of Byron Bay Courthouse

GPS coordinates centre plot: Zone 5 6 E 560190 N 6831287 Datum: MGA94z56

Field Site Information

Landform	Flat.
Mapped Plant Community Type (PCT)	PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion.
Plot Size	Quadrat of 10x10m utilised (Tozer, 2003; Tozer *et al.,* 2010).

eSPADE Geology Mapping	Tyagarah (9540ty) - Quaternary estuarine alluvium overlain by and/or mixed with Quaternary (Pleistocence) sands. The sands are generally Aeolian, originating from the adjacent beach ridge systems.
Surveyor experience	>8 years conducting flora surveys within the locality.

Key Diagnostics – Canopy

Requirement	Observed Value	Measured or Estimated	Requirement Met
Crown cover of at least 10%	50%	Estimated	√
Canopy dominated by Casuarina glauca	Yes	Estimated	√
Median canopy height >10m (i.e. open woodland, woodland, forest or closed forest per Hnatiuk et al, 2009)	12m-15m	Estimated	√

Condition Thresholds – Patch Size Class

Requirement	Observed Value	Measured or Estimated	Requirement Met
Small Patch – At least 0.5 hectares	~0.518 ha	Measured via GPS and estimated by GIS	√
Small contiguous patch – The patch is at least 0.5 ha and less than 2 ha, and is connected to a larger area of native vegetation of at least 5 ha	~0.518 ha	Measured via GPS and estimated by GIS	√
Medium Patch – At least 2 ha and less than 5 ha	~0.518 ha	Measured via GPS and estimated by GIS	X
Large patch – At least 5 ha	~0.518 ha	Measured via GPS and estimated by GIS	X

Condition Thresholds – Vegetation Quality

Minimum Requirement	Observed Value	Measured or Estimated	Requirement Met
HIGH QUALITY Predominately native understorey. Non-native species comprise less than 20% total understorey vegetation cover (all vascular species of all layers below the canopy)	~5-10%	Measured within 10m x 10m survey plot	X
GOOD QUALITY Mostly native understorey Non-native species comprise less than 50% of total understorey vegetation cover AND transformer species comprise less than 30% of total understorey vegetation cover	~5-10%	Measured within 10m x 10m survey plot	X
MODERATE QUALITY Some native understorey Non-native species comprise less than 80% of total understorey vegetation cover AND transformer species comprise less than 50% of total understorey vegetation cover	~5-10%	Measured within 10m x 10m survey plot	X

Minimum vegetation quality class threshold not met. Therefore, not EEC.

Native Understorey Species (10m x 10m plot)

Growth Form	Species	Est Abundance	Est Cover %
P	*Archontophoenix cunninghamiana*	1	2
R	*Gahnia clarkeii*	1	<1
O	*Asplenium australasicum*	1	<1
T/S	*Melaleuca quinquenervia*	5	3
L	*Parsonsia straminea*	5	<1
S	*Cupaniopsis anacardioides*	2	1
Native % of Total Understorey Vegetation Cover			~5-10%

Growth form: T=tree, S=shrub, G= grass, V=sedge, R=rush, E=fern, F=forb/herb, L=vine, P=palm, O=other
Cover: <1 1,2,3,4,5,10,15,20,25,30,35, etc cover%
Abundance: <5, 5-10, 10-20, 20-50, 50-100, 100-500, 500-1000, >1000

Non-native Understorey Species (10m x 10m plot)

Growth Form	Species	Transformer Species	Est Abundance	Est Cover %
F	*Sphagneticola trilobata*		10-20	85
S/T	*Schefflera actinophylla**	√	2	2
F	*Ochna serrulata**	√	10	<1
S/T	*Erythrina sykesii*		1	1
S/T	*Syagrus romanzoffiana*		2	2
S/T	*Cinnamomum camphora**	√	2	3
Non-native % of Total Understorey Vegetation Cover				~90-95%

* Transformer species

Images

COASTAL SWAMP OAK (CASUARINA GLAUCA) FOREST OF NEW SOUTH WALES AND SOUTH EAST QUEENSLAND ECOLOGICAL COMMUNITY DISCUSSION

The key diagnostic criteria are considered to be met for this patch/copse including:

- having canopy trees dominated by Casuarina glauca
- having crown cover of at least 10%

These are not onerous criteria as this particular EEC contains a low height criteria (10m) so even young regrowth can be considered.

To define the boundary of the patch dominated by *Casuarina glauca* the area was field surveyed and the outer canopy defined with a handheld GPS unit.

Following field survey, the area meeting the key diagnostic criteria was 0.518 ha. Therefore, the patch is assigned a 'small contiguous patch' size class (Small contiguous patch – The patch is at least 0.5 ha and less than 2 ha, and is connected to a larger area of native vegetation of at least 5 ha).

A field quadrat survey was then performed general in accordance with Section 3.2 and Appendix 3 of the Guidelines. Given the small, fragmented areas of the Swamp Oak communities within the area, 10m x 10m plots were utlised instead of the usual 20m x 20m plots. To account for variability the patch was traversed first and the field plot then placed within an area reflective of the overall investigated patch. As nearly all areas were infested with weeds in the lower strata a representative plot within the footprint was surveyed.

The plot did contain some native understorey, although transformer species were >50% of the total understorey vegetation cover. As such, it is considered that this patch does not represent Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland.

SITE FORM: FIELD SITE CONFIRM PRESENCE OF COASTAL SWAMP OAK (*CASUARINA GLUACA*) FOREST OF NSW AND SEQ AND CONDITION

Location

Site No. SO4 Recorder: TR Date: 07/12/2021

Purpose Coastal Swamp Oak Forest NSW & SEQ Endangered Ecological Community Assessment

Location: SO4 – East of Byron Bay Courthouse

GPS coordinates centre plot: Zone 56 E 560242 N 6831284 Datum: MGA94z56

Field Site Information

Landform	Gently sloping towards drain.
Mapped Plant Community Type (PCT)	PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion.
Plot Size	Quadrat of 10x10m utilised (Tozer, 2003; Tozer *et al.,* 2010).
eSPADE Geology Mapping	Tyagarah (9540ty) - Quaternary estuarine alluvium overlain by and/or mixed with Quaternary (Pleistocence) sands. The sands are generally Aeolian, originating from the adjacent beach ridge systems.

Surveyor experience	>8 years conducting flora surveys within the locality.

Key Diagnostics – Canopy

Requirement	Observed Value	Measured or Estimated	Requirement Met
Crown cover of at least 10%	20%	Estimated	√
Canopy dominated by Casuarina glauca	Yes	Estimated	√
Median canopy height >10m (i.e. open woodland, woodland, forest or closed forest per Hnatiuk et al, 2009)	12m-14m	Estimated	√

Condition Thresholds – Patch Size Class

Requirement	Observed Value	Measured or Estimated	Requirement Met
Small Patch – At least 0.5 hectares	~0.518 ha	Measured via GPS and estimated by GIS	√
Small contiguous patch – The patch is at least 0.5 ha and less than 2 ha, and is connected to a larger area of native vegetation of at least 5 ha	~0.518 ha	Measured via GPS and estimated by GIS	√
Medium Patch – At least 2 ha and less than 5 ha	~0.518 ha	Measured via GPS and estimated by GIS	X
Large patch – At least 5 ha	~0.518 ha	Measured via GPS and estimated by GIS	X

Condition Thresholds – Vegetation Quality

Minimum Requirement	Observed Value	Measured or Estimated	Requirement Met
HIGH QUALITY Predominately native understorey. Non-native species comprise less than 20% total understorey vegetation cover (all vascular species of all layers below the canopy)	~20-25%	Measured within 10m x 10m survey plot	X
GOOD QUALITY Mostly native understorey Non-native species comprise less than 50% of total understorey vegetation cover AND transformer species comprise less than 30% of total understorey vegetation cover	~20-25%	Measured within 10m x 10m survey plot	X
MODERATE QUALITY Some native understorey Non-native species comprise less than 80% of total understorey vegetation cover AND transformer species comprise less than 50% of total understorey vegetation cover	~20-25%	Measured within 10m x 10m survey plot	X

Minimum vegetation quality class threshold not met. Therefore, not EEC.

Native Understorey Species (10m x 10m plot)

Growth Form	Species	Est Abundance	Est Cover %
S/T	*Macaranga tanarius*	2	2
S/T	*Glochidion sumatranum*	3	10
L	*Smilax australis*	2	<1

Growth Form	Species	Est Abundance	Est Cover %
E	*Pteridium esculentum*	10	2
G	*Cynodon dactylon*	10	<1
L	*Lygodium microphyllum*	20-50	5
L	*Parsonsia straminea*	2	<1
Native % of Total Understorey Vegetation Cover			~20-25%

Growth form: T=tree, S=shrub, G= grass, V=sedge, R=rush, E=fern, F=forb/herb, L=vine, P=palm, O=other
Cover: <1 1,2,3,4,5,10,15,20,25,30,35, etc cover%
Abundance: <5, 5-10, 10-20, 20-50, 50-100, 100-500, 500-1000, >1000

Non-native Understorey Species (10m x 10m plot)

Growth Form	Species	Transformer Species	Est Abundance	Est Cover %
S/T	*Schefflera actinophylla**	√	2	5
L	*Passiflora spp.*		10	<1
S	*Eugenia uniflora*		10	5
S	*Murraya paniculata*		1	<1
S	*Lantana camara**	√	5	1
G	*Paspalum dilatatum**	√	100-200	30
L	*Ipomoea indica**	√	10	<1
S	*Senna pendula var. glabrata**	√		30
S	*Cinnamomum camphora**	√	5	3
Non-native % of Total Understorey Vegetation Cover				~75-80%

* Transformer species

Images

COASTAL SWAMP OAK (CASUARINA GLAUCA) FOREST OF NEW SOUTH WALES AND SOUTH EAST QUEENSLAND ECOLOGICAL COMMUNITY DISCUSSION

The key diagnostic criteria are considered to be met for this patch/copse including:

- having canopy trees dominated by Casuarina glauca
- having crown cover of at least 10%

These are not onerous criteria as this particular EEC contains a low height criteria (10m) so even young regrowth can be considered.

To define the boundary of the patch dominated by *Casuarina glauca* the area was field surveyed and the outer canopy defined with a handheld GPS unit.

Following field survey, the area meeting the key diagnostic criteria was 0.518 ha. Therefore, the patch is assigned a 'small contiguous patch' size class (Small contiguous patch – The patch is at least 0.5 ha and less than 2 ha, and is connected to a larger area of native vegetation of at least 5 ha).

A field quadrat survey was then performed general in accordance with Section 3.2 and Appendix 3 of the Guidelines. Given the small, fragmented areas of the Swamp Oak communities within the area, 10m x 10m plots were utlised instead of the usual 20m x 20m plots. To account for variability the patch was traversed first and the field plot then placed within an area reflective of the overall investigated patch. As nearly all areas were infested with weeds in the lower strata a representative plot within the footprint was surveyed.

The plot did contain some native understorey, although did not meet the minimum vegetation quality class threshold as non-native species were >80% of the total understorey cover. As such, it is considered that this patch does not represent Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland.

SITE FORM: FIELD SITE CONFIRM PRESENCE OF COASTAL SWAMP OAK (*CASUARINA GLUACA*) FOREST OF NSW AND SEQ AND CONDITION

Location

Site No. SO5 Recorder: TR Date: 07/12/2021

Purpose Coastal Swamp Oak Forest NSW & SEQ Endangered Ecological Community Assessment

Location: SO5 – East of Byron Youth Service building

GPS coordinates centre plot:	Zone	5	6	E	560334	N	6831286	Datum:	MGA94z56

Field Site Information

Landform	Flat.
Mapped Plant Community Type (PCT)	PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion.
Plot Size	Quadrat of 10x10m utilised (Tozer, 2003; Tozer *et al.,* 2010).

eSPADE Geology Mapping	Tyagarah (9540ty) - Quaternary estuarine alluvium overlain by and/or mixed with Quaternary (Pleistocence) sands. The sands are generally Aeolian, originating from the adjacent beach ridge systems.
Surveyor experience	>8 years conducting flora surveys within the locality.

Key Diagnostics – Canopy

Requirement	Observed Value	Measured or Estimated	Requirement Met
Crown cover of at least 10%	75%	Estimated	√
Canopy dominated by Casuarina glauca	Yes	Estimated	√
Median canopy height >10m (i.e. open woodland, woodland, forest or closed forest per Hnatiuk et al, 2009)	12m-14m	Estimated	√

Condition Thresholds – Patch Size Class

Requirement	Observed Value	Measured or Estimated	Requirement Met
Small Patch – At least 0.5 hectares	~0.518 ha	Measured via GPS and estimated by GIS	√
Small contiguous patch – The patch is at least 0.5 ha and less than 2 ha, and is connected to a larger area of native vegetation of at least 5 ha	~0.518 ha	Measured via GPS and estimated by GIS	√
Medium Patch – At least 2 ha and less than 5 ha	~0.518 ha	Measured via GPS and estimated by GIS	X
Large patch – At least 5 ha	~0.518 ha	Measured via GPS and estimated by GIS	X

Condition Thresholds – Vegetation Quality

Minimum Requirement	Observed Value	Measured or Estimated	Requirement Met
HIGH QUALITY Predominately native understorey. Non-native species comprise less than 20% total understorey vegetation cover (all vascular species of all layers below the canopy)	~15%	Measured within 10m x 10m survey plot	X
GOOD QUALITY Mostly native understorey Non-native species comprise less than 50% of total understorey vegetation cover AND transformer species comprise less than 30% of total understorey vegetation cover	~15%	Measured within 10m x 10m survey plot	X
MODERATE QUALITY Some native understorey Non-native species comprise less than 80% of total understorey vegetation cover AND transformer species comprise less than 50% of total understorey vegetation cover	~15%	Measured within 10m x 10m survey plot	X

Minimum vegetation quality class threshold not met. Therefore, not EEC.

Native Understorey Species (10m x 10m plot)

Growth Form	Species	Est Abundance	Est Cover %
S/T	*Melaleuca quinquenervia*	2	10
S	*Cupaniopsis anacardioides*	2	5
G	*Cynodon dactylon*	5	<1
Native % of Total Understorey Vegetation Cover			~15%

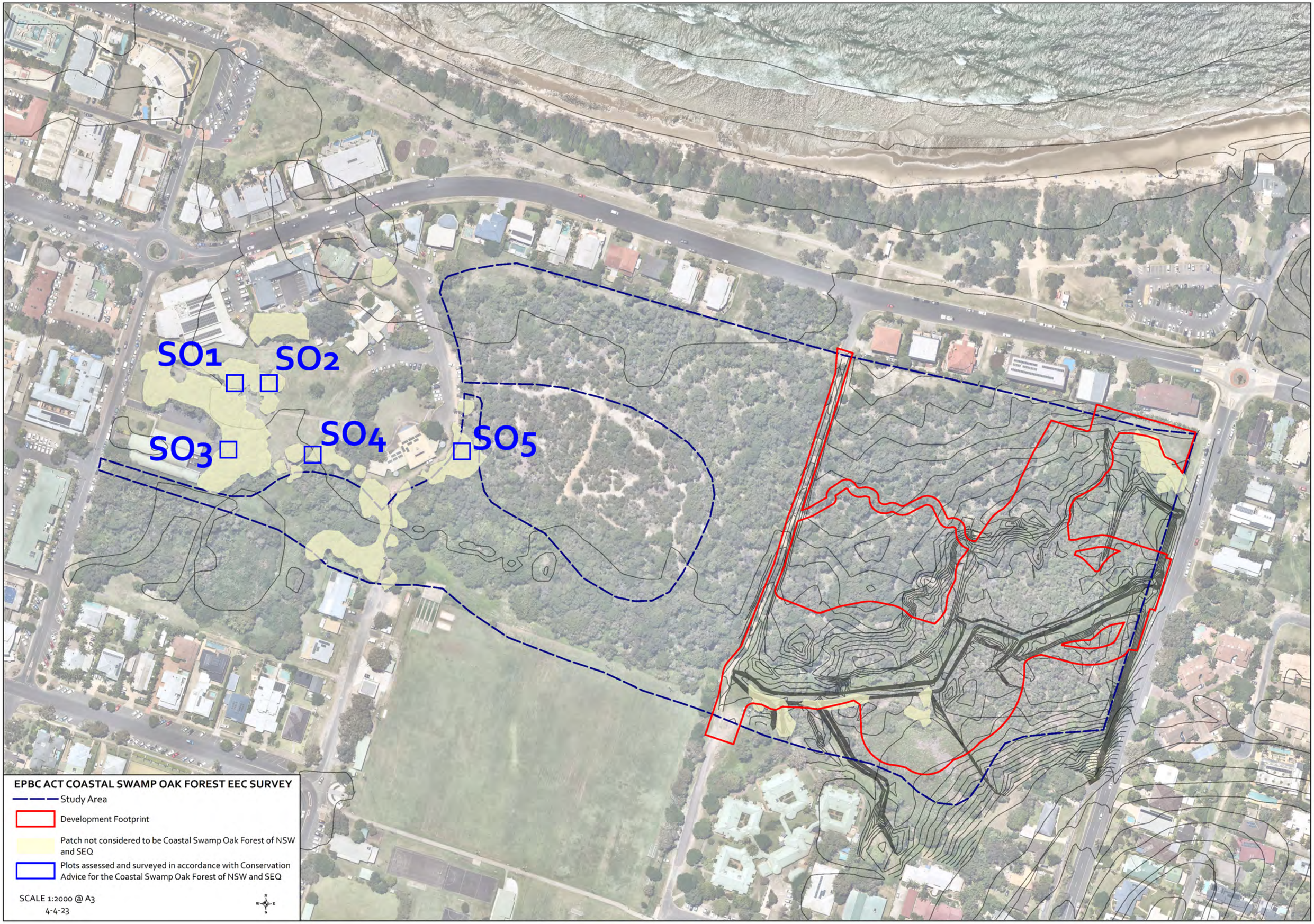
Growth form: T=tree, S=shrub, G= grass, V=sedge, R=rush, E=fern, F=forb/herb, L=vine, P=palm, O=other
Cover: <1 1,2,3,4,5,10,15,20,25,30,35, etc cover%
Abundance: <5, 5-10, 10-20, 20-50, 50-100, 100-500, 500-1000, >1000

Non-native Understorey Species (10m x 10m plot)

Growth Form	Species	Transformer Species	Est Abundance	Est Cover %
L	*Ipomoea cairica**	√	10	1
G	*Paspalum dilatatum**	√	20	2
G	*Setaria sphacelata*		100	60
S	*Solanum mauritianum*		1	1
S	*Lantana camara**	√	5	1
S	*Senna pendula var. glabrata**	√	10	20
L	*Asparagus aethiopicus*		2	<1
L	*Passiflora spp.*		20	1
S	*Ochna serrulata**	√	2	<1
Non-native % of Total Understorey Vegetation Cover				~85%

* Transformer species

Images


SO1
SO2
SO3
SO4
SO5
EPBC ACT COASTAL SWAMP OAK FOREST EEC SURVEY
Study Area
Development Footprint
Patch not considered to be Coastal Swamp Oak Forest of NSW and SEQ
Plots assessed and surveyed in accordance with Conservation Advice for the Coastal Swamp Oak Forest of NSW and SEQ
SCALE 1:2000 @ A3
4-4-23

Appendix 7 – MNES Significant Impact Assessment

The section applies the Significant Impact Guidelines 1.1. – Matters of National Environmental Significance (2013) to MNES known to occur within the site.

The following MNES communities/species have been assessed:

- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland [Endangered];
- Littoral Rainforest and Coastal Vine Thickets of Eastern Australia [Critically Endangered];
- Stinking Cryptocarya (*Cryptocarya foetida*) [Vulnerable]; and
- Grey-headed Flying-fox (*Pteropus poliocephalus*) [Vulnerable].

Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland [Endangered]

Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland is identified by the EPBC Act as being Endangered.

Distribution and Habitat

The Coastal Swamp Sclerophyll Forest ecological community occurs on the mainland and islands near to the coast (within 20 km) within the following IBRA2 Bioregions: South East Queensland (SEQ); NSW North Coast (NNC); Sydney Basin (SYB); and the Bateman subregion of the South East Corner (SEC2).

The ecological community typically occurs in low-lying coastal alluvial areas with minimal relief, such as swamps, floodplain pockets, depressions, alluvial flats, back-barrier flats, fans, terraces, and behind fore-dunes (DPI 2016; Queensland Government 2019a). The ecological community most commonly occurs at elevations below 20m above sea-level (ASL) but may occur occasionally up to 220m ASL on hill slopes, for example in association with perched swamps and lakes, or a naturally high-water table.

The Coastal Sclerophyll Swamp Forest often has a layered canopy, dominated by melaleucas and/or Eucalyptus robusta (Bell & Driscoll 2016; DELWP 2016; DPI 2016; Miles 2006; Queensland Government 2019a; Sheringham et al. 2008).

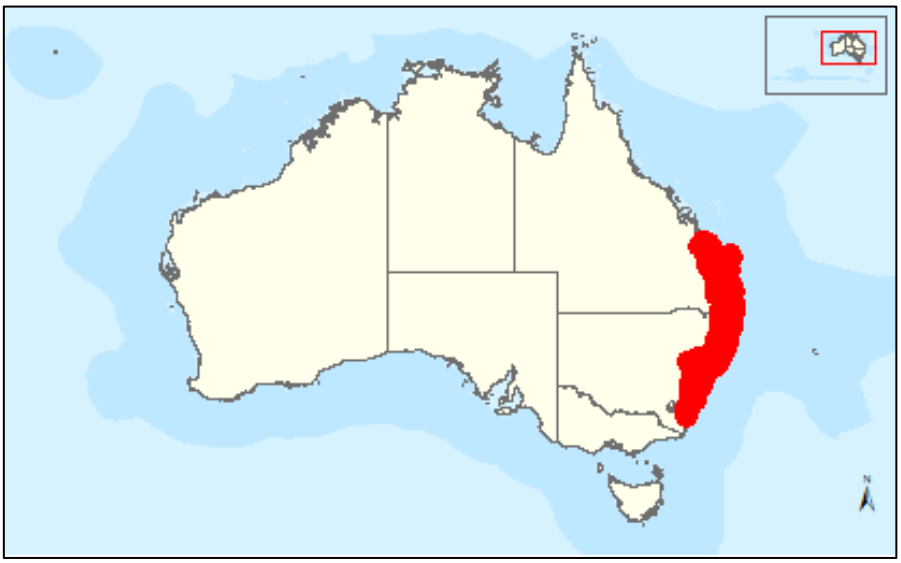


Figure 1: Figure 2: Coastal SSF of NSW and SEQ Distribution Map (DAWE, 2022)

Desktop Assessment Results

The Protected Matters Search Tool (PMST) identified the community as 'known to occur within area'.

Field Survey Results

Within the Study Area, ~0.3422 ha of 'Condition Class B2' Coastal Swamp Sclerophyll Forest has been identified following site assessments. Approximately 0.13 ha will be required to be removed to facilitate the proposal.

Significant Impact Criteria

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

Reduce the extent of an ecological community

Approximately 0.13 ha of vegetation representative of a small contiguous patch of high quality Swamp Sclerophyll Forest (Condition Class B2) will be cleared as a part of the proposal.

A Planting Plan (AWC, 2023) has been prepared for the project which aims to landscape more than 1.5 ha of the site following the construction works. These landscape works will plant out the constructed wetlands utilising a variety of aquatic and semi-aquatic native species. The majority of proposed landscape works will comprise of Swamp Sclerophyll Forest type species which are currently present within the site.

Offsets for the unavoidable loss of native vegetation have been calculated in accordance with the requirements of the NSW Biodiversity Offsets Scheme (BOS).

Therefore, the proposal will not result in a significant reduction in the extent of the ecological community in the long-term.

Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for road or transmission lines

The proposal occurs within an area already significantly affected by past clearing (i.e. sand mining) and urbanisation. The proposal site is surrounding by existing roads and structures, fragmenting the vegetation from neighbouring bushland.

The two small patches of Class B2 Swamp Sclerophyll Forests occurring within the site are already highly fragmented from other areas of this EEC.

Post construction landscape works will consist of swamp sclerophyll forest type plantings which will restore areas impacted by the proposal.

The proposal is therefore not considered to result in any additional impacts on connectivity between habitat areas. As such, the proposal is unlikely to fragment or increase fragmentation of this community.

Adversely affect habitat critical to the survival of an ecological community

No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat at the time of Conservation Advice for this community was published.

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

Currently there is an incised artificial drain that is likely to be actively lowering local groundwater levels. This is fed by a number of shallow drains running from the south of the site.

The main hydrological control on the site is the existing RCP pipe at the intersection of the main drainage feature and the pathway along the Cowper Street alignment that runs to the east and Clarkes Beach. The outlet condition and tides therefore impact on the Sandhills site groundwater levels. The outlet is frequently covered in sand restricting flows out of the site.

The wetland has been designed in consideration of local groundwater levels and the existing outlet pipe invert along the Cowper Street alignment that runs to the east will be retained. The invert (floors and outlets) of the wetland cells have been designed to ensure that there is no further lowering of local groundwater levels or interaction with underlying PASS materials. The wetland design is intended to slow and spread out surface flows this will then allow for some interaction between surface and groundwater on the site. Impacts to groundwater are likely to be localised and will be determined by climatic conditions and flows into the site. It is possible that there may be some local increase in groundwater levels in the immediate vicinity of the wetland but these effects are unlikely to extend beyond the wetland footprint.

The status of the outlet on Clarkes Beach (covered by sand or not) will remain unchanged and thus the impact on local groundwater levels will largely be unchanged.

As such, it is considered unlikely that the proposal will significantly modify or destroy abiotic factors necessary for an ecological community's survival.

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

The removal of 0.13 ha of the EEC is unlikely to cause a substantial change in the species composition of an occurrence of an ecological community. The individual flora species removed are common within the broader EEC and the EEC will continue to meet the key diagnostic criteria and condition thresholds.

Post construction landscape works will utilise a broad range of species typically found within this EEC.

Cause a substantial reduction in quality or integrity of an occurrence of an ecological community, including but not limited to:

- *Assisting invasive species, that are harmful to the listed ecological community, to become established, or*
- *Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhabit the growth of species in the ecological community, or*

The project will not facilitate the establishment of invasive species (which are currently present in the locality) or facilitate other impacts to the EEC which may cause a substantial reduction in the quality or integrity of an occurrence of the EEC.

Works associated with the proposed action are not anticipated to result in regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the EEC. Best of practice mechanisms and standards will be implemented during works associated with the proposed action to ensure no runoff with the potential to inhibit or kill the growth of species associated with the EEC occur. Further, the future planting areas will enhance water filtration processes and support ecosystem health and functionality.

Interfere with the recovery of an ecological community

There are no recovery plans prepared for this ecological community.

Approximately 0.13 ha of a small contiguous patch of high quality swamp sclerophyll forest (Class B2) will be cleared as a part of the proposal. Offsets for the unavoidable loss of native vegetation have been calculated in accordance with the NSW Biodiversity Offsets Scheme (BOS). In addition, the future landscaping works comprises of swamp sclerophyll species typically found within this ecological community.

As such it is considered unlikely that the proposal will interfere with the recovery of this ecological community.

Conclusion

Reviewing the above, it is considered unlikely that the proposal will have a significant impact on the Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland ecological community.

Littoral Rainforest and Coastal Vine Thickets of Eastern Australia [Critically Endangered]

Littoral Rainforest and Coastal Vine Thickets of Eastern Australia is identified by the EPBC Act as being Critically Endangered.

Distribution and Habitat

The ecological community represents a complex of rainforest and coastal vine thickets, including some that are deciduous, on the east coast of Australia. Typically, the ecological community occurs within two kilometres of the coast or adjacent to a large salt water body, such as an estuary and, thus, is influenced by the sea. It is naturally distributed as a series of disjunct and localised stands occurring on a range of landforms derived from coastal processes that can include dunes and flats, cheniers, berms, cobbles, headlands, scree, seacliffs, marginal bluffs, spits, deltaic deposits, coral rubble and islands. As a result, the ecological community is not associated with a particular soil type and can occur on a variety of geological substrata.

The ecological community occurs from Princess Charlotte Bay, Cape York Peninsula to the Gippsland Lakes in Victoria as well as on offshore islands on the east coast. The latitudinal range where the ecological community occurs encompasses warm temperate, sub-tropical and tropical climate zones. In terms of temperature and humidity, the climate is more equable than sites further inland.

The ecological community is defined by habitat expressed in terms of structure, floristic composition and ecology in response to coastal processes. The unifying feature of its habitat is the salinity, derived from the ecological community's proximity to the sea. Saline influence is delivered via aerosols, saline water-tables or occasional inundation. Whilst the ecological community's canopy species are well adapted to coastal exposure (e.g. strong and persistent salt-laden winds and storm events), the canopy protects less tolerant species and propagules in the understorey. The canopy height varies with the degree of exposure and can range from dwarf to medium (<1-25 m; Specht 1970). Due to extreme exposure to salt laden winds, the canopy often demonstrates a continuum of heights. Highly exposed patches will display the effect of windshear in the canopy. In more sheltered sites, for example, around estuaries, wind shear may not be evident in the canopy.

The diversity of plant taxa (particularly canopy species) generally declines in a north to south direction, i.e. with increasing latitude. However, species richness of adjacent patches may vary considerably within one latitudinal zone.

The ecological community provides important stepping stones along the eastern Australian coast for various migratory and marine birds. For example, the nationally listed marine species Ducula bicolor (Pied Imperial Pigeon), a migratory species from north of New Guinea, feeds on fruit associated with mainland littoral rainforests and disperses the seeds on offshore islands where it roosts. Given its proximity to the sea, seabirds may also be associated with some stands of littoral rainforest, e.g. the nationally endangered migratory Pterodroma leucoptera leucoptera (Gould's Petrel) has one significant breeding locality at Cabbage Tree Island off the coast at Port Stephens in New South Wales (NSW) (DEC 2006a).

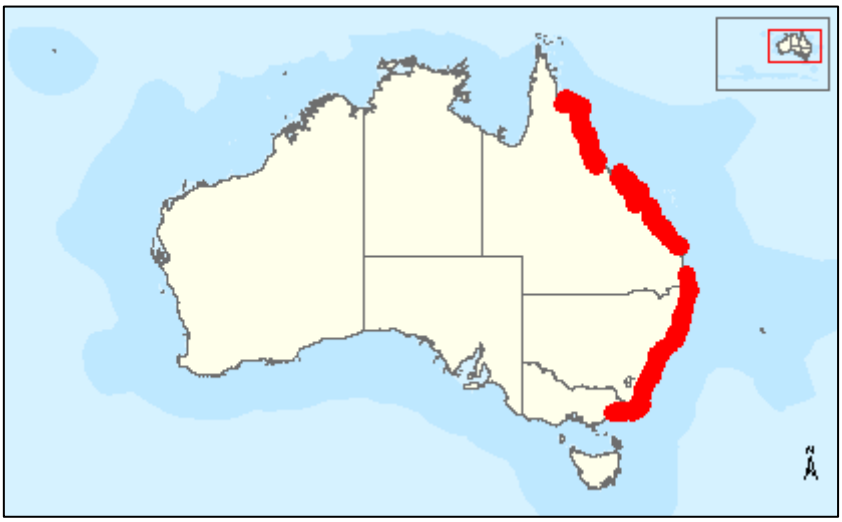


Figure 3: Figure 4: Littoral Rainforest and Coastal Vine Thickets of Eastern Australia Distribution Map (DAWE, 2022)

Desktop Assessment Results

The Protected Matters Search Tool (PMST) identified the community as 'likely to occur within area'.

Field Survey Results

Whilst the vegetation within the site is highly disturbed and immature due to the previous sand mining activities occurring over the site, field surveys determined that areas of the site is likely to be reflective of this CEEC. Within the study area, approximately 3.865 ha of Littoral Rainforest has been identified following site assessments. Within the development footprint, approximately 0.3878 ha of this community occurs.

Significant Impact Criteria

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

Reduce the extent of an ecological community

Approximately 0.5646 ha of vegetation representative of Littoral Rainforest and Coastal Vine Thickets of Eastern Australia will be cleared as a part of the proposal.

While the majority of the Littoral Rainforest community will be retained within the site, unavoidable clearing will still be required in order to facilitate the works. More than 3.2 ha of vegetation reflective of Littoral Rainforest will be retained and protected within the site.

A Planting Plan (AWC, 2023) has been prepared for the project post construction works. These landscape works will plant out the constructed wetlands utilising a variety of aquatic and semi-aquatic native species. Whilst primarily consisting of Swamp Sclerophyll Forest type species, the plantings will also utilise numerous species typically found within Littoral Rainforest within the NSW north coast. The landscape works will also incorporate weed removal which will enhance the quality of the site's vegetation, which are currently dominated by exotic weeds within the ground and shrub layers.

Offsets for the unavoidable loss of native vegetation have been calculated in accordance with the requirements of the NSW Biodiversity Offsets Scheme (BOS).

It is considered that the proposal will not result in a significant reduction in the extent of the ecological community in the long-term.

Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for road or transmission lines

The proposal occurs within an area already significantly affected by past clearing (i.e. sand mining) and urbanisation. The proposal site is surrounding by existing roads and structures, fragmenting the vegetation from neighbouring bushland.

The proposal footprint is located at the very edge of the mapped Littoral Rainforest community within the overall site. Approximately 0..5646 ha of this community (~10% within the overall site) will be required to be removed to facilitate the proposal.

Following the construction activities, the site will be subject to landscape works. These landscape works will restore areas impacted by the works and help provide a vegetated buffer between the proposal footprint and the retained Littoral Rainforest areas of the site.

The development is therefore not considered to result in additional impacts on connectivity between habitat areas.

Adversely affect habitat critical to the survival of an ecological community

The National Recovery Plan (DoEE, 2019) notes the following in regards to habitat critical to the survival of Littoral Rainforest:

> *'Current knowledge indicates that significant areas of Littoral Rainforest that existed at the time of European settlement have been cleared or converted to other land uses. Remaining remnants of the ecological community are highly fragmented and isolated across the natural distribution range; many remnants are degraded and in lower condition states.*
>
> *The Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community is rated nationally as Critically Endangered. Given the small area remaining, all sites that meet the criteria for the listed community should be considered habitat critical to the survival of the ecological community.*
>
> *From an ecological perspective, derived native vegetation structures (or patches on the pathway of succession towards Littoral Rainforest) may also be habitat critical to survival of the ecological community, if they adjoin, buffer or connect high integrity remnants, provide habitat critical for functionally important or threatened species, expand the potential habitat available to some species, or have good potential for restoration.'*

Reviewing the above, it is considered that all mapped areas of Littoral Rainforest is representative of habitat critical to the survival of the species.

The project will require the removal of approximately 0.5646 ha of Littoral Rainforest considered to represent habitat critical to the survival of Littoral Rainforest. It is noted that more than 3.3 ha of this community will be retained within throughout the study area. Whilst it is acknowledged that the community is critically endangered, littoral rainforest communities are reasonably common within the locality, which includes Cape Byron, Broken Head and the foreshore areas. The majority of these area are protected within Reserves.

Due to the relatively small nature of the proposal, in addition to the proposed rehabilitation works, it is considered unlikely that the project will adversely affect habitat critical to the survival of this CEEC. Furthermore, impacts upon this CEEC will be compensated through the retirement of credits in accordance with the Biodiversity Offsets Scheme.

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

As noted above within the Swamp Sclerophyll Forest EEC assessment, the proposed works will unlikely significantly modify or destroy abiotic factors.

The works will not significantly reduce ground water levels or alter the surface water drainage patterns. Areas external to the project footprint will remain largely unchanged.

A suite of management plans will be incorporated within a site-specific Construction Environment Management Plan (CEMP) to ensure impacts are retained within the designated works footprint.

As such, it is considered unlikely that the proposal will significantly modify or destroy abiotic factors necessary for an ecological community's survival.

Cause a substantial reduction in quality or integrity of an occurrence of an ecological community, including but not limited to:

- *Assisting invasive species, that are harmful to the listed ecological community, to become established, or*
- *Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhabit the growth of species in the ecological community, or*

The National Recovery Plan (DoEE, 2019) identifies weed invasion, feral animals and exotic pathogens as a key threat to this CEEC.

Weeds are well established throughout the site, in particularly within the ground and shrub layers which are dominated by exotic grasses and herbaceous weeds. It is considered unlikely that the project will further exacerbate the presence of weeds within this area. Weed control measures are to be incorporated within the site-specific CEMP to ensure there is no further weed invasion occurring throughout the retained areas of the site. Additionally, the landscape works associated with the project will involve weed removal activities which will result in an improvement of quality of the local occurrence of the community within the site.

Feral animals which are known to impact this community through trampling and grazing (i.e. pig, deer, rabbits etc.) were not recorded during survey efforts of the site. Given the nature of the project (i.e.

creation of wetlands and stormwater management), it is considered unlikely that the proposal will introduce these feral animals which are harmful to this community.

Exotic pathogen such as Myrtle Rust may impact the integrity and survival of patches of Littoral Rainforest. No obvious signs of a Myrtle Rust outbreak was noticed during field work. In association with revegetation on site all nursery stock introduced to the property must come only from plant nurseries following the hygiene protocols as set out within the Nursery Industry *Myrtle Rust Management Plan-2011* for the prevention of spread of this fungus.

Phytophthora is a microscopic soil borne organism which causes environmental damage in natural ecosystems including root rot of a wide variety of native plant species. Where there is a risk of *Phytophthora*, bush Regeneration contractors/landscapers must follow hygiene related processes with equipment prior to entering the landscape zones/retained areas including:

- Cleaning off all dirt from boots on arrival and departure from site;
- Disinfect boots with mentholated spirits;
- Scrub boot with stiff brush and follow similar principle for tools
- Use of Metholated spirits in spray bottle for secateurs, loppers, knifes, etc.
- Plants identified to be infected by *Phytophthora* should be treated with a fungicide containing potassium phosphonate in accordance with best practice guidelines.

The abovementioned procedures should be incorporated within the site-specific CEMP.

Works associated with the proposed action are not anticipated to result in regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the CEEC.

Reviewing the above, it is considered unlikely that the project will substantial reduce the quality or integrity of occurrence towards this community.

Interfere with the recovery of an ecological community

The overarching objective of the Recovery Plan (DoEE, 2019) is to:

> *'Provide for the management and research actions necessary to stop the decline, and support the recovery, of Littoral Rainforest so that its chances of long term survival are maximised.'*

While the proposal will require the removal of ~0.5646 ha of this CEEC, more than 3.3 ha will be retained and protected within the overall site.

Whilst the project has been designed and located to avoid the majority of this community, minor areas of this CEEC will still be required to be cleared for the project to work from an engineering perspective.

These unavoidable impacts are proposed to be offset through the retirement of credits in accordance with the Biodiversity Offsets Scheme. Additionally, the proposed plantings works will enhance the quality of the vegetation within the site which are currently heavily infested with weeds.

Best-practise soil and sediment control, and biosecurity measures will be implemented through a site specific CEMP, to avoid, manage and mitigate risks to the retained areas of this CEEC.

Reviewing the above, it is considered unlikely that the project will significantly interfere with the recovery of this ecological community.

Conclusion

Reviewing the above, it is considered unlikely that the proposal will have a significant impact on the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community.

Stinking Cryptocarya (*Cryptocarya foetida*) [Vulnerable]

Stinking Cryptocarya (*Cryptocarya foetida*) is identified by the EPBC Act as being Vulnerable.

Distribution and Habitat

The Stinking Cryptocarya has been recorded from near Iluka, on the north coast of New South Wales, to Fraser Island in Queenland (Floyd 1989; Quinn et al. 1995). Young plants are relatively common in littoral rainforest & sub-littoral open forest North from Richmond River, but mature specimens are fairly rare, mostly occurring at Brunswick Heads, Fingal and North of Terranora Broadwater (Hunter pers. comm. in Quinn et al. 1995).

The Stinking Cryptocarya is restricted to coastal sands, or if not, then close to the coast (Queensland Herbarium 1999 pers. comm.), occurring in littoral rainforest on old sand dunes and subtropical rainforests over slate and occasionally on basalt to an altitude of 150 m (Floyd 1989; Hyland 1989; Quinn et al. 1995; Sheringham & Westaway 1995).

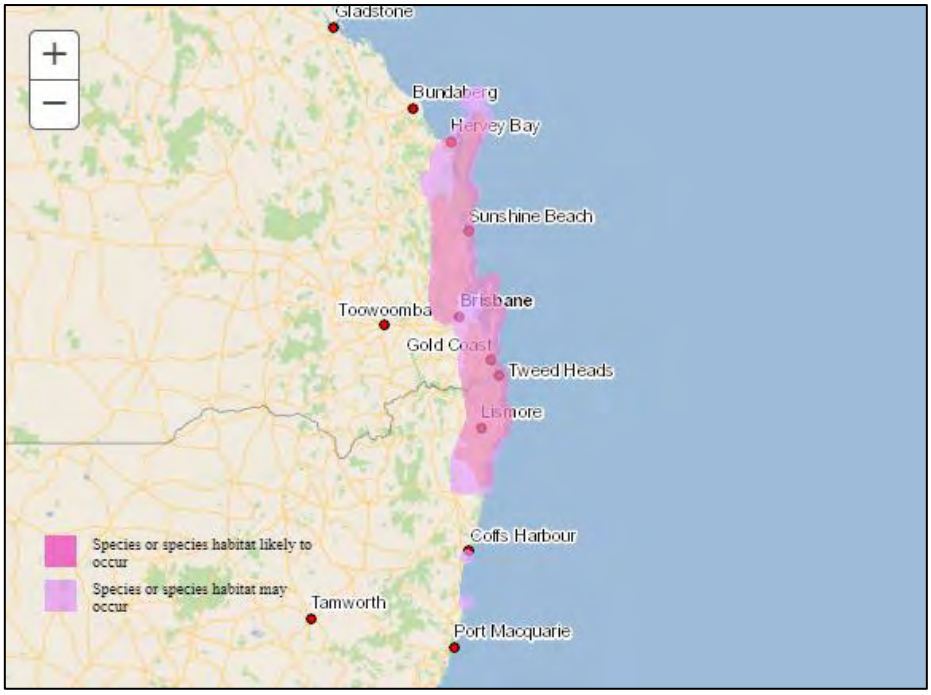


Figure 5: Stinking Cryptocarya Distribution Map (DAWE, 2022)

Desktop Assessment Results

A search of BioNet identified 236 Stinking Cryptocarya recordings within 10 km of the site.

Field Survey Results

Stinking Cryptocarya was recorded on forty-three (43) occasions throughout the study area during targeted surveys, ranging from small saplings to immature trees ~5m in height. The majority of these were recorded within Vegetation Zones 1 and 4, although several specimens were also recorded within Vegetation Zone 2 and Closed Camphor Laurel Forest.

Significant Impact Criteria

An action is likely to have a significant impact on a vulnerable species 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

The proposal seeks to remove eleven (11) individuals of Stinking Cryptocarya, while retaining thirty-two (32) individuals recorded from the study area.

Stinking Cryptocarya habitat is often recorded within the locality with 236 records of the species occurring within 10km of the site (BioNet Atlas).

The proposal will require the removal of ~2 ha of potential Stinking Cryptocarya habitat (Zones 1-4), whilst retaining over 7 ha of potential habitat within the Study Area.

Following the completion of the wetlands, native vegetation will be planted throughout the proposal footprint providing potential habitat for this species. Additionally, Stinking Cryptocarya will be utilised within the landscape design to ensure there is no net loss of the species within the site. The unavoidable loss of individuals are replaced at a 5:1 ratio (gain/loss) within the site (refer to the landscape drawings prepared by AWC, 2023).

The unavoidable removal of eleven (11) Stinking Cryptocarya individuals is also proposed to be compensated through the Biodiversity Offsets Scheme.

A long-term decrease in the size of an important population of a species is not expected.

Reduce the area of occupancy of an important population

A reduction in area of occupancy of an important population will not occur as Stinking Cryptocarya will continue to occur within the study area. The proposal seeks to remove eleven (11) individuals of Stinking Cryptocarya, while retaining thirty-two (32) recorded individuals from the study area.

The unavoidable loss of individuals are replaced at a 5:1 ratio (gain/loss) within the site (refer to the landscape drawings prepared by AWC, 2023). This will ensure that there is no net loss of this population within the locality.

Fragment an existing important population into two or more populations

Stinking Cryptocarya occurs sporadically throughout the study area. The proposal seeks to remove eleven (11) Stinking Cryptocarya, while retaining thirty-two (32) individuals. It is considered unlikely that the proposal will fragment an existing important population into two or more populations.

Adversely affect habitat critical to the survival of a species

The proposal will require the removal of ~2 ha of potential Stinking Cryptocarya habitat (Zones 1-4), whilst retaining over 7 ha of potential habitat within the study area.

No critical habitat has been declared for Stinking Cryptocarya.

Habitat in the project area is unlikely to represent critical habitat as these areas are not necessary for the survival of the species in terms of breeding/dispersal, the long-term maintenance of the species, maintaining genetic diversity or reintroduction/recovery. The proposal is therefore considered unlikely to adversely affect habitat critical to the survival of Stinking Cryptocarya.

Disrupt the breeding cycle of an important population

The proposal is unlikely to 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

The proposal will require the removal of ~2 ha of potential Stinking Cryptocarya habitat, whilst retaining over 7 ha of potential habitat within the study area. Landscape works incorporating more than 1.5 ha will provide potential habitat for this species post construction works. This will include replacing those individuals lost at a 5:1 (gain/loss) ratio within the site.

Following the completion of the wetlands, native vegetation will be planted throughout the proposal footprint providing potential habitat for this species.

Therefore, a reduction in the availability or quality of habitat to the extent that the species is likely to decline is not expected to occur within the site.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable ***species' habitat***

Invasive weeds is a known threat to the Stinking Cryptocarya. Weeds are abundant throughout the study area, in particularly exotic grasses and herbaceous weeds. The proposal has the potential to result in the spread of weed species into retained areas of vegetation within the study area. A site-specific CEMP with specific weed controls will prevent invasive species becoming established within and adjacent to the study area. As such, it is considered unlikely that the proposal would result in an increase in invasive species that are harmful towards Stinking Cryptocarya habitat.

Introduce disease that may cause the species to decline, or

The proposal is not expected to introduce any disease to the site which may impact the retained Stinking Cryptocara. Exotic pathogen protocols are to be implemented within the site specific CEMP to ensure disease is not introduced within the site.

Interfere substantially with the recovery of the species.

There is no recovery plan for this species. The proposal is unlikely to interfere substantially with the recovery of this species. Extensive areas of the site will be retained with restoration works post construction proposed.

Conclusion

Reviewing the above, it is considered unlikely that the proposal will have a significant impact upon the Stinking Cryptocarya.

Grey-headed Flying-fox (*Pteropus poliocephalus*) [Vulnerable]

Grey-headed Flying-fox (*Pteropus poliocephalus*) is identified by the EPBC Act as being Vulnerable.

Life History and Ecology

The Grey-headed Flying-Fox is one of the largest bats in the world with a weight of 600–1000 g and a head-body length of 230–289 mm (Eby & Lunney 2002; Tidemann 1998). It is the only Australian flying-fox that has a collar of orange/brown fully encircling its neck (Hall 1987). Thick leg fur extends to the ankle, in contrast to other Pteropus species in which it only reaches the knee (Hall 1987; Tidemann 1998). As its name implies, the head is covered by light grey fur (Hall 1987). The belly fur is grey, often with flecks of white and ginger. The fur on the back shows two morphs which could be related to age, moult or sub-population (Hall & Richards 2000). One morph has dark grey fur and the other has a pronounced silver or frosted appearance (Luckoff undated pers. comm. cited in Hall 1987).

The Grey-headed Flying-fox is Australia's only endemic flying-fox and occurs in the coastal belt from Rockhampton in central Queensland to Melbourne in Victoria (Tidemann 1998). However, only a small proportion of this range is used at any one time, as the species selectively forages where food is available. As a result, patterns of occurrence and relative abundance within its distribution vary widely between seasons and between years. At a local scale, the species is generally present intermittently and irregularly (Eby & Lunney 2002). At a regional scale, broad trends in the distribution of plants with similar flowering and fruiting times support regular annual cycles of migration (Eby & Lunney 2002).

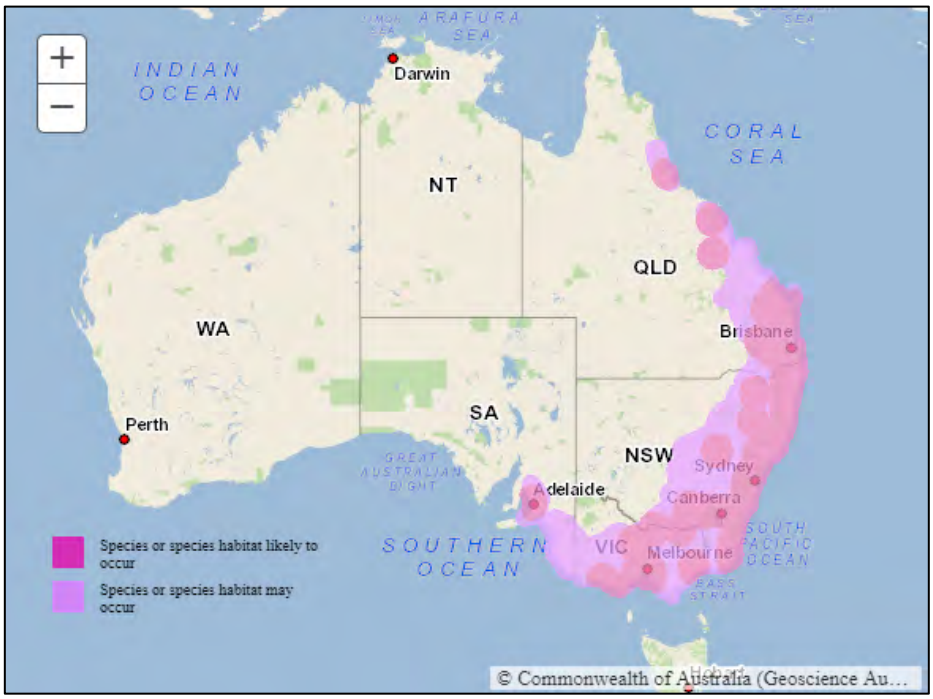


Figure 6: Grey-headed Flying-fox Distribution Map (DAWE, 2022)

The Grey-headed Flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. It also feeds on commercial fruit crops and on introduced tree species in urban areas. The primary food source is blossom from Eucalyptus and related genera but in some areas it also utilises a wide range of rainforest fruits (Eby 1998). None of the vegetation communities used by the Grey-headed Flying-fox produce continuous foraging resources throughout the year. As a result, the species has adopted complex migration traits in response to ephemeral and patchy food resources (Duncan et al. 1999; Eby 1996, 1998; Nelson 1965a; Parry-Jones & Augee 1992; Spencer et al. 1991).

The Grey-headed Flying-fox roosts in aggregations of various sizes on exposed branches. Roost sites are typically located near water, such as lakes, rivers or the coast (van der Ree et al. 2005). Roost vegetation includes rainforest patches, stands of Melaleuca, mangroves and riparian vegetation (Nelson 1965; Ratcliffe 1931), but colonies also use highly modified vegetation in urban and suburban areas (Birt et al. 1998; Tidemann & Vardon 1997; van der Ree et al. 2005). The species can maintain fidelity to roost sites for extended periods (Lunney & Moon 1997), although new sites have been colonised (Tidemann & Vardon 1997).

Mating occurs in early autumn, after which time the larger camps begin to break up, reforming in late spring/early summer, as food resources become more abundant (Hall & Richards 2000). Males and females segregate in October when females usually give birth. For a period of four to five weeks after giving birth, the mother carries her single young with her to feeding sites. Once the young are completely furred, they are left in maternal camps and continue to be nursed until they are independent after around 12 weeks (Hall & Richards 2000). During this nursery phase, males rejoin the females for courting with pair bonds being formed (Hall & Richards 2000).

The Grey-headed Flying-Fox has a diverse native diet, which it supplements with introduced plants (Eby 1995, 1998; Hall & Richards 2000; Parry-Jones & Augee 1991). Nectar and pollen from the flowers of eucalypts (genera Eucalyptus, Corymbia and Angophora), melaleucas and banksias are the primary food for the species (Duncan et al. 1999). Most eucalypts have regular seasonal flowering schedules but do not flower every year, and there are a few areas within the range of the Grey-headed Flying-fox where nectar is available continuously (House 1997; Law et al. 2000; Wilson & Bennett 1999). The species has no adaptations for withstanding food shortages, and migrates in response to changes in the amount and location of flowering (Eby 1991; Eby & Lunney 2002; Spencer et al. 1991).

The Grey-headed Flying-fox is highly mobile (Menkhorst 1995; Tidemann 1998) and the national population is fluid, moving up and down the east coast in search of food. For example, two individuals fitted with satellite tracking devices made round trips of more than 2000 km over a nine-month period (Tidemann & Nelson 2004; van der Ree et al. 2005).

Grey-headed Flying-foxes commute daily to foraging areas, usually within 15 km of the day roost site (Tidemann 1998). Grey-headed Flying-foxes are capable of nightly flights of up to 50 km from their roost to different feeding areas as food resources change (Eby unpubl. cited in Eby 1991). With suitable winds, Grey-headed Flying-foxes can cruise at speeds in excess of 35 km per hour for extended periods (Tidemann 1998). At most times of the year there is a complete exodus from the colony site at dusk. The exception to this rule occurs in spring and early summer when juveniles are left in the nursery colony sites at night. During this time small groups of adult flying-foxes leave the site more than an hour after the majority of bats fly out. In nursery colonies flying-foxes fly in and out of the site throughout the night (Parry-Jones & Augee 1992).

Previous studies of movements of the species in northern NSW and southern Queensland have indicated that various seasonal movements occur among camps. It is believed that Grey-headed Flying-foxes

respond to changes in the amount of available food by migrating between camps in irregular patterns (Eby 2000).

Ratcliffe (1931), working on Pteropus in eastern Australia, considered that annual southerly movements occurred from northern and central Queensland into NSW in spring and summer, with return migrations in late autumn. Nelson (1965a) suggested a pattern of dispersal from large summer breeding camps near Brisbane (Queensland) to small winter groups in the same region, and suggested that the movements were a response to the availability of food. McWilliam (1986), working in the Richmond River catchment area in north-eastern NSW, observed a seasonal migration from the coast to inland areas, which he attributed to both temperature and food availability (Eby 1991).

The movements and numbers of Grey-headed Flying-foxes were recorded in and around a colony site at Matcham, Gosford, NSW, between 1986 and 1990 (Parry-Jones & Augee 1992). During all four years of the study, population numbers were high during the period March to May, corresponding with the mating season reported by McGuckin and Blackshaw (1987). After mating, there was a rapid or gradual abandonment of the Matcham site, depending on the year, as the bats dispersed to scattered sites within the surrounding area (Parry-Jones & Augee 1992).

The Grey-headed Flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands (DoE 2018). It also feeds on commercial fruit crops and on introduced tree species in urban areas. The primary food source is blossom from Eucalyptus and related genera but in some areas it also utilises a wide range of rainforest fruits (Eby 1998).

Grey-headed Flying Fox Stages of Lifecycle

Species	Habitat Preference	Roosting/Breeding
Grey-headed Flying-fox	The Grey-headed Flying-fox inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps (Eby, 1995). Urban gardens and cultivated fruit crops also provide habitat for this species (NSW NPWS 1999c). Grey-headed Flying-foxes forage on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca, Banksia (Eby, 2000) and fruits of rainforest trees and vines (NSW NPWS 1999c). During periods when native food is limited, Grey-headed Flying-foxes disperse from colonial roosts, often foraging in cultivated gardens and fruit crops (NSW NPWS 1999c). This species is a canopy-feeding frugivore, blossom-eater and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia	This species roosts in large aggregations or camps in close proximity (20 km or less) to a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina forest (Eby, 1995). Camps provide resting habitat, sites of social interactions and refuge for animals during significant phases of their annual cycle, such as birth, lactation and conception (Parry-Jones and Augee 1992, 2001). "Roosting habitat critical to survival: Grey-headed Flying-foxes roost in large aggregations in the exposed branches of canopy trees (Ratcliffe 1931, Nelson 1965a, Parry-Jones and Augee 1992). The locations of camps are generally stable through time, and several sites have documented histories that exceed 100 years (Lunney and Moon 1997). Camps provide resting habitat, sites of social interactions and refuge for animals during significant phases of their annual cycle, such as birth, lactation and conception (Parry-Jones and Augee 1992, 2001). On the basis of current knowledge, roosting habitat that meets at least one of the following criteria can be explicitly identified as habitat critical to survival, or essential habitat, for Grey-headed Flying-foxes. Roosting habitat that: 1. is used as a camp either continuously or seasonally in > 50% of years 2. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained >

Species	Habitat Preference	Roosting/Breeding
	woodlands. As such, it plays an important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species (Eby 1996; Pallin 2000).	10 000 individuals, unless such habitat has been used only as a temporary refuge, and the use has been of limited duration (i.e. in the order of days rather than weeks or months) 3. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 2 500 individuals, including reproductive females during the final stages of pregnancy, during lactation, or during the period of conception (i.e. September to May) (in DECCW, 2009).

Desktop Assessment Results

A search of BioNet identified 45 Grey-headed Flying-fox recordings within 10 km of the site.

The National Flying-fox monitoring viewer has recorded two (2) Grey-headed Flying-fox camps within 5 km of the proposed site:

Table 1: Recorded GHFF Camps within 5km of the site

Roost Location	Distance from The Site (Approx.)	Estimated GHFF Numbers
Middleton Street, Byron Bay	Within western section of study area, ~300m west of proposal site	1-499
Somerset Street, Byron Bay	~1km	0 (since 2016 surveys)

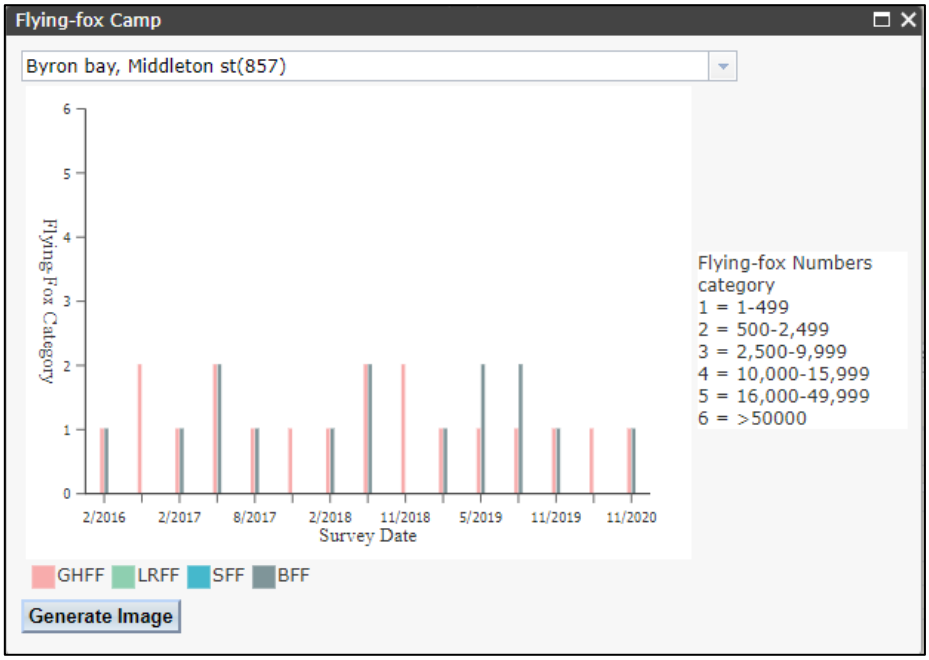


Figure 7: Grey-headed Flying-fox Numbers at Middleton St Camp (DAWE, 2022)

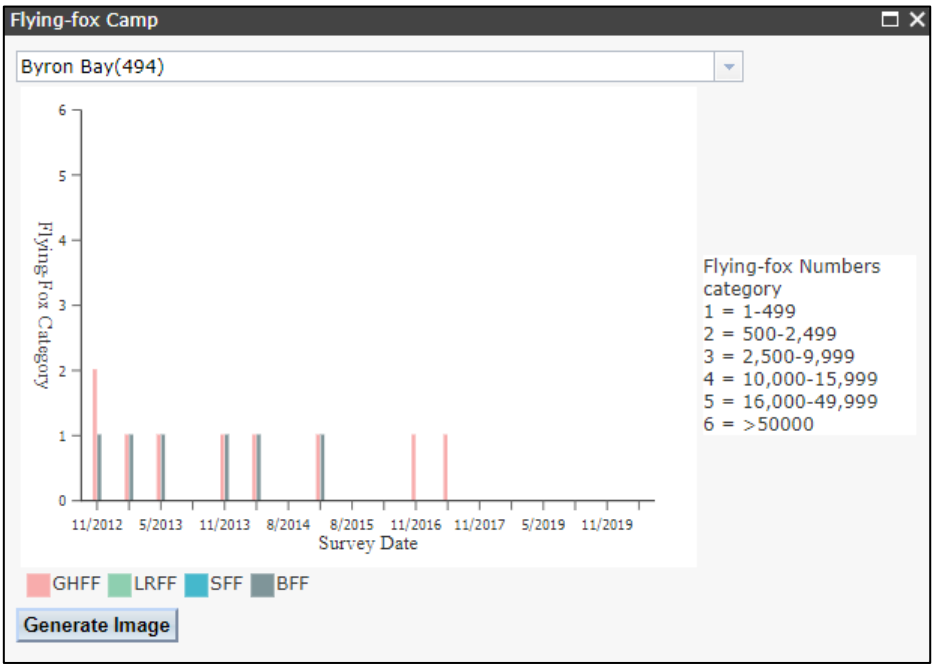


Figure 8: Grey-headed Flying-fox Numbers at Somerset St Camp (DAWE, 2022)

Field Survey Results

The Grey-headed Flying-fox is common to the locality and is regularly recorded. Within the site, the Grey-headed Flying-fox was regularly recorded foraging throughout the study area and the development site. A flying-fox camp occurs within the western section of the study area, along Middleton Street. This camp is approximately 300m to the west of the proposed development site. It is estimated that this camp contains 1-499 individuals of Grey-headed Flying-fox and is therefore not considered to be a 'nationally important camp' for Grey-headed-flying fox (DAWE, 2022). Maternity activities were not observed within this camp.

Significant Impact Criteria

An action is likely to have a significant impact on a vulnerable species 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

The study area contains >9 ha of potential Grey-headed Flying Fox foraging/roosting habitat (all forested areas, of which ~2 ha will be required to be cleared to facilitate the proposed development. It is noted that forage material (e.g. paperbarks, banksias, lophostemons) occur in abundance throughout the locality and the greater region.

More than 7 ha of the study area is proposed for retention, of which the vast majority of this area consists of foraging trees for this species.

Following the completion of the wetlands, native vegetation will be planted throughout the proposal footprint providing potential foraging habitat for this species.

While a roost camp occurs within the study area, this camp is ~300m west of the proposed development footprint. It is noted that this camp is not considered to be a nationally important camp for the Grey-headed Flying-fox. Additionally, no maternity activities were observed within this camp.

Given that no nationally important roosting camps occurs within the development site, potential foraging habitat occurs in abundance throughout the region, and the species is capable of flying long distances in search of foraging material, it is considered that the proposal will lead in a long-term decrease in the size of an important population of this species.

Reduce the area of occupancy of an important population

While it is likely that the site is intermittently used by foraging individuals of this species, the site does not support an important population of this species. This species is likely to continue using the retained vegetation within the study area and in the surrounding locality following development. Therefore, the proposal will not reduce the area of occupancy of an important population of this species.

Fragment an existing important population into two or more populations

The proposed action will not fragment a population of Grey-headed Flying-foxes into two or more populations given the species high mobility.

Adversely affect habitat critical to the survival of a species

The Grey-headed Flying-fox recovery plan (DAWE 2021) identifies habitat critical to the survival of the species as communities that contain specific winter/spring flowering species, two of which were commonly identified within the study area. Vegetation Zone 1 (PCT 751) contained an abundance of Coastal Banksia (*Banksia integrifolia*) within the canopy layer, while Vegetation Zone 4 (PCT 1064) contained an abundance of Broad-leaved Paperbark (*Melaleuca quinquenervia*) within the canopy layer.

The proposal removes ~0.5646 ha of vegetation zone 1 and ~1.199 ha of vegetation zone 4.

Over 5ha of vegetation that is consistent with habitat critical to the survival of the species will be retained within the study area. It is further noted that >300ha of similar Paperbark Forest occurs within 5km of the site (refer to Figure 9). As such, it is considered unlikely that the proposal would adversely affect habitat critical to the survival of this species.

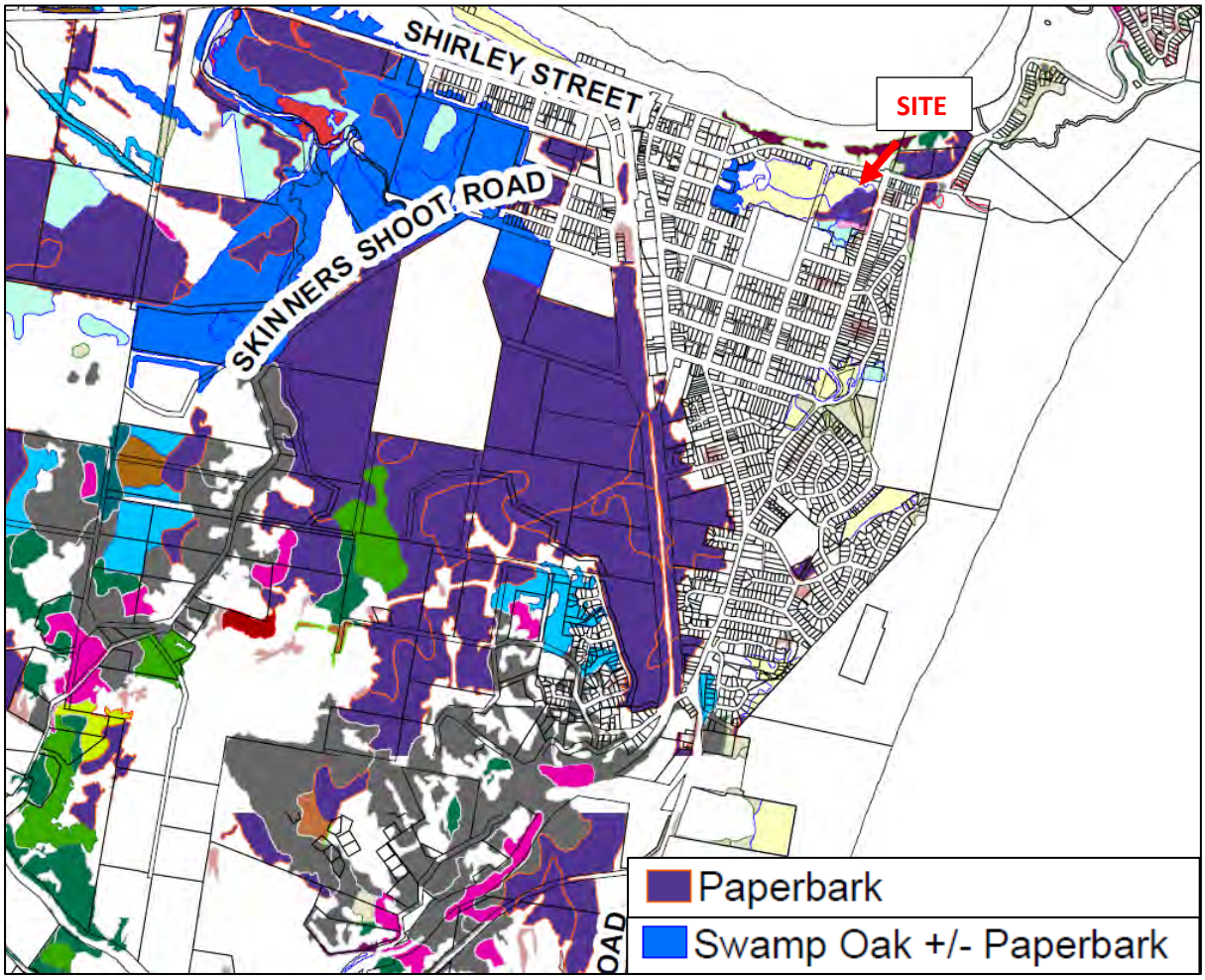


Figure 9: Byron Shire Vegetation Mapping Illsutrating Mapped Paperbark Forest within the Locality

Disrupt the breeding cycle of an important population

Whilst a Grey-headed Flying-fox camp occurs within the study area, the proposed development site occurs ~300m east of this camp. This roost camp is not a nationally important roosting camp for the species and is not considered to be an important population for the species. Additionally, no breeding activities were noted within this camp. With adequate measures provided within a site-specific CEMP, it is considered unlikely that the proposal will impact this camp.

As such, it is considered that the proposal will not 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

The proposal will removal approximately 1.7636 ha (Zones 1 and 4) of native vegetation that is potential foraging habitat for the species. This highly mobile and broad ranging species is not likely to decline due to the removal of this small area of intermittently used foraging habitat. An abundance of available foraging habitat occurs throughout the locality (i.e. Cumbebin Swamp Nature Reserve, Arakwal National Park, Tyagarah Nature Reserve, private properties etc.).

Landscape works post construction activities will provide potential habitat for this species.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable ***species' habitat***

The proposal has the potential to result in the spread of weed species into retained areas of vegetation within the study area. A site-specific CEMP with specific weed controls will prevent invasive species becoming established within and adjacent to the study area. Moreover, the establishment of weeds would not affect the affect the canopy trees of which this species feeds such that this species would become unlikely to utilise the subject land or surrounding locality for foraging.

Introduce disease that may cause the species to decline, or

The effects of the pathogens, Australian bat Lyssavirus (ABL), Bat Paramyxovirus and Menangle Pig virus (Hoar et al. 1998), on the Grey-headed Flying-fox are unknown. However, the proposed action is unlikely to introduce the disease or accelerate the disease load among individuals.

Interfere substantially with the recovery of the species

Habitat loss is listed as a key threat to the Grey-headed Flying-fox in the *National Recovery Plan for the Grey-headed Flying-fox* (DAWE, 2022). The proposal would require in the removal of ~ 1.7636 ha of potential foraging habitat for the species which would decrease the availability of potential forage material for the species. It is noted that more than 5ha of vegetation that is consistent with habitat critical to the survival of the species will be retained within the study area. It is further noted that >300ha of similar Paperbark Forest occurs within 5km of the site. As such, it is considered unlikely that the proposal will interfere with the recovery of the species.

Landscape works post construction activities will provide potential habitat for this species.

Conclusion

Reviewing the above, it is considered unlikely that the proposal will have a significant impact upon the Grey-headed Flying-fox.

Appendix 8 – Planting Plan

1 INTRODUCTION AND BACKGROUND

The Sandhills reserve is a vegetated reserve located behind Clarkes beach at the parcel of land identified as Lot 383 DP728202 and Lot 457 DP 1087879 ('the site' herein). Byron Shire Council (BSC) seek to reinstate a wetland system within and around existing drainage features in the eastern portion of the site to achieve a range of environmental objectives including, improving the site's environmental and cultural values, mitigating flood impacts, stormwater treatment, integration with catchment water cycle management objectives, provide education and recreation opportunities and creating pedestrian connectivity between key sites in and around the town centre.

The Sandhills site is currently undeveloped with the exception of a pedestrian track connecting Cowper Street to Lawson Steet and underground services (sewer, stormwater and recycled water main).

AWC have prepared detailed design for the wetland which will consider additional studies and information that have been undertaken since the development of the wetland concept design (AWC, 2019). The detailed design drawings are provided in Appendix A.

1.1 Project Overview

The aim of this project is to develop a stormwater management system including constructed wetland at the site that provide flood storage, improve water quality at the Clarkes beach outlet and enhances local environmental and cultural values.

The objectives for the Sandhills wetland project are:

- Protect and enhance Aboriginal cultural values of the area
- Allow access to water and sewer infrastructure for maintenance and emergency purposes
- Showcase best practice water sensitive urban design
- Improve water quality including at the stormwater outlet to Clarkes beach
- Maximise flood storage to mitigate flooding
- Improve visual and environmental amenity of the site
- Ensure acid sulfate soils (actual and potential) are appropriately accounted for and managed
- Protect and enhance environmental values at the site
- Provide an accessible pedestrian link to the Arakwal Cultural Heritage Centre site
- Provide an accessible open space recreational area that supports passive activation, social connection and community well being
- Support delivery of the key actions from the Belongil Creek Floodplain Risk Management Plan (WBM BMT, 2015), Byron Bay Town Centre Masterplan (Macgregor Coxall, 2015) and Byron Shire Council and Arakwal Memorandum of Understanding.

1.2 Reference Documents

The following table (Table 1_1) details the key documents to be read in combination with this specification document.

Study / Information	Description / Relevant findings	Authors	Date
Concept Design	A concept design for a constructed stormwater wetland system at the site was developed and, following consultation with Council and Arakwal Aboriginal Lands Council, revised to include three layout options and a preferred option chosen.	AWC	June 2019
Revised Concept Design		AWC	2021
Detailed Design Report	Summarises the detailed design, the information used to prepare the detailed design and relevant information	AWC	November 2022
Contamination Assessment	The site is considered suitable from a contamination perspective for the proposed wetland development (i.e. recreational use).	ENV solutions	July 2021
Acid Sulfate Management Plan	Laboratory analysis of 6 boreholes within the site indicated the presence of Actual Acid Sulfate Soil (AASS) and Potential Acid Sulfate Soil (PASS). The plan provides management and treatment measures to be employed during excavation at the site.	ENV solutions	August 2021
Biodiversity Development Assessment Report (BDAR)	Outlines the measures taken to avoid, minimise and mitigate impacts to the vegetation and habitats present within the development site during the design, construction, and operation of the development. The residual unavoidable impacts of the proposed development were calculated using the Biodiversity Assessment Method Credit Calculator (BAM-C).	Planit Consulting	August 2022

2 GENERAL NOTES

1. All works and materials shall be in accordance with Byron Shire Council (BSC) policies then relevant Australian Standards;
2. The contractor will prepare a Construction Phase Environmental Management Plan (CEMP) at least two weeks prior to the start up meeting. Any requests for changes will be compiled by the Superintendent and incorporated by the Contractor.
3. The contractor may be required to undertake an Aboriginal Cultural Heritage Site Induction (which will be arranged by Byron Shire Council) prior to commencement of any works. During excavation and tree/weed removal works the contract9or is required to ensure that its staff are experienced and skilled to ensure compliance with legal obligations to identify and protect Aboriginal Cultural Heritage. Should an Aboriginal Cultural Heritage item or object be identified during works, the contractor will immediately cease work and report it to BSC and, will no recommence work without BSC approval. The contractor will need to accommodate any Aboriginal Cultural Heritage monitors to be present on site to observe components of the works, particularly during excavation or vegetation management works. Aboriginal Cultural Heritage Monitors can arise at the request of a Local Aboriginal Land Council to independently observe works or be contracted directly by BSC (under a separate contract)
4. The contractor shall take all necessary measures to protect nearby property owners from dust pollution during all phases of works construction. Finished areas of earthworks shall be kept watered where necessary until a satisfactory grass cover is achieved.
5. All construction works are to be joined neatly to existing works.
6. Public utilities - Not withstanding that the positions of public utilities, fittings, pipes, poles, manholes etc may be indicated on the drawings, no responsibility will be accepted by the principal for the accuracy of the representation or the omission thereof.
7. Location and level of existing services and structures has been plotted from available records and is indicative only. The contractor shall accurately locate these on site prior to commencing works and shall protect all existing services during construction. Any damage to existing services shall be repaired at the contractors expense;
8. Vegetation outside work areas shall not be disturbed unless specifically authorised by the superintendent.
9. It is the contractor's responsibility to comply with all relevant legislation.
10. It is the responsibility of the contractor to maintain the stability of any temporary works on the site.
11. The contractor shall confirm the currency of the set out & levels with the superintendent prior to commencing construction.
12. These drawings are to be read in conjunction with the local authority specifications and the project specifications. In the event of a discrepancy refer to the superintendent for clarification.
13. All dimensions relevant to setting out and off-site work shall be as indicated on drawings and shall be verified by the contractor before construction and/or fabrication is commenced. The engineers' drawings shall not be scaled, unless specifically noted otherwise.
14. During construction, the contractor shall be responsible for maintaining proposed and existing works in a stable condition and ensuring no part shall be over stressed under construction activities. In particular in the zone of influence of sewer network.
15. The approval for a substitution shall be sought from the superintendent but is not an authorisation for a variation. Any variation must be approved by the superintendent before work commences.
16. Site access must be confirmed and determined in discussion with Byron Shire Council and the contractor shall obtain all necessary and relevant permits.
17. The contractor's compound shall be located as approved by superintendent.
18. The contractor shall undertake all works in proximity to existing services and infrastructure in accordance with the relevant utility/authority policies and procedures.
19. It is the responsibility of the contractor to ensure that any relevant council approvals or work permits relating to the works documented in these drawings have been obtained prior to commencing the related works
20. These works are to be adopted by a local authority / adopting authority, all works are to be completed to their satisfaction and accepted on maintenance prior to practical completion being issued.

2.2 As Constructed Information

1. As constructed information is to reflect the actual construction and is to be endorsed by a licensed surveyor - the survey points and levels shall be taken at least the same points and levels locations shown on construction drawings and any other relevant points to allow assessment against the proposed design intent;
2. The contractor is to supply an 'as constructed' survey plan in 3d dwg and pdf format and in accordance with the local council and authority standards, detailing location and levels of all civil works detailed in these drawings, including but not limited to stormwater, sewer and finished pavement and hardstand areas.
3. No more than 2 weeks prior to the 'on maintenance' inspection, the contractor shall undertake a condition report to demonstrate that the stormwater systems are in accordance with the design and specification and acceptable to council and the engineer.

2.3 Groundworks

A Contamination Assessment for the project referred to in the notes and an Acid Sulphate Soil Management Plan has been prepared by Env Solutions (2021).

1. All earthworks shall be carried out in accordance with AS3798 and supervision to level 1 shall be supplied by the contractor. The contractor shall employ a qualified geotechnical engineer who is a certified practicing engineer of with a minimum $10 million professional indemnity insurance, to undertake level 1 supervision of earthworks and whose certification in writing shall include the following:

   - Engineering certification that all general earthworks operations (ie. stripping, proof rolling of subgrade, subgrade treatment, etc) have been carried out in accordance with earthworks specifications and recommendations provided by Env Solutions
   - Engineering certification that fill has been placed and compacted to the required minimum density in accordance with the earthwork's specification
   - Engineering certification that any areas of cut have been compacted to the required minimum density in accordance with the earthwork's specification
   - If required, engineering certification that the controlled fill material is suitable to support a conventional slab on ground floor or pavement system
   - Engineering certification that the areas of cut have been subject to proof roll and compacted under geotechnical supervision to the same standards as fill areas

2. The contractor shall employ a qualified geotechnical engineer who is a certified practising engineer with a minimum $10 million professional indemnity insurance, to undertake geotechnical supervision for duration of earthworks, who shall provide regular site reports detailing:

   - That the stability of all cut-fill batters is adequate
   - That contractors temporary works do not compromise the stability of any temporary or permanent slopes, buildings, or site features

3. Notwithstanding the requirement for the builder to obtain geotechnical certification, the builder is to advise the superintendent and seek approval before proceeding with any earthworks or pavement construction that is likely to give rise to a variation claim.
4. Unless directed otherwise by the geotechnical engineer on site or by the relevant local authority specification (for works subject to approval adoption by the local authority) filling shall be compacted to appropriate standards as determined by Byron Shire Council.
5. Unless directed otherwise in the Geotechnical Report for the project, or by the geotechnical engineer on site, filling and subgrade areas shall be compacted in maximum lifts of 250mm loose thickness.
6. Compaction to 95% standard Maximum Dry Density is required for subgrade and base layers
7. The contractor must provide a Sediment and Erosion Control Plan and implement sediment and erosion control measures prior to commencing works on site. The contractor must maintain sediment and erosion control mechanisms in working order.
8. Topsoil and other organic matter is to be stripped from groundwork areas prior to commencing groundworks and shall be stockpiled on site. Earth stockpiles shall be suitably protected from erosion and weed infestation by covering with weed mat or other means. Topsoil is to be respread to finished surface levels and vegetated to specification prior completion. Excess topsoil is to be removed from site.
9. Unless confirmed by the supervising geotechnical engineer, maximum batter slopes should be as Detailed Design Drawings
10. Contractor shall allow for addressing site trafficability considering weather conditions likely to prevail during the earthworks period.
11. Contractor to consider the implications of disturbed ground conditions when working in close proximity to existing services and shall employ a suitable methodology to address service stability.

3 PRELIMINARY WORKS

3.1 Mobilisation

A pre contract meeting will be held with Byron Shire Council before works commence on the site.
The location and establishment and demarcation of works compound, site office, temporary fencing, power supply, traffic management plans, security surveillance etc will be discussed and a draft CEMP including all planned sediment and erosion controls discussed.
The works program and key issues such as management of water movement through the site during construction covered.

3.2 Start Up

An inception meeting will be held prior to construction commencing with minutes recorded and circulated by the head contractor.
The Landscape Contractor shall attend to ensure timing and communication with the other contractors

- Responsibilities and scope of works are to be delineated
- Once all bulk earthworks and hydraulic structures have been completed a meeting will occur at a nominated hold point with the Principal Contractor to assess site and design details
- Prior to commencement of the construction, landscaping and planting the following details shall be defined:

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Australian Wetlands Consulting Pty Ltd
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www.awconsult.au

CLIENT: Byron Shire Council

DRAWING: CIVIL & LANDSCAPING SPECIFICATION

PROJECT: SANDHILLS WETLAND DETAILED DESIGN PACKAGE

REV.	ISSUE / AMENDMENTS	DATE
A	*PRE -DETAILED DESIGN PACKAGE COUNCIL REVIEW*	*17.11.2021*
B	*DETAILED DESIGN PACKAGE 70%*	*28.02.2022*
C	*DETAILED DESIGN PACKAGE 100%*	*02.11.2022*
D	*DETAILED DESIGN PACKAGE AMENDMENTS 100%*	*17.11.2022*
E	*DETAILED DESIGN PACKAGE AMENDMENTS 100%*	*13.12.2022*
F	*FOR TENDER*	*25.08.2023*

SCALE NA

REV. F

DESIGNED KC

DRAWN RS/TC

CHECKED DM

CAD FILE No. 1-91194_SANDHILLS_DD.DWG

SHEET No. 1-191194_DD_401

- Verify existing site and design levels
- Services locations where relevant
- Fencing
- Amenities
- Safety issues and WHS (OHS) requirements
- Sensitive environmental zones
- Sediment and erosion controls
- Any other design features, concerns, problems or other information that may arise

3.3 Erosion and Sediment Control

Appropriate sediment and erosion and sediment control must be clearly documented in the CEMP - Site access, sediment fences, controlled stockpile areas, wheel wash water supply, etc will be detailed by the contractor.

3.4 Site Setout

The contractor must engage surveyor to set out datums and project parameters.

3.5 Clearing and Demolition

Demolition will follow the sequence below in Table 1_1unless confirmed otherwise with the Superintendent.

Item	Stage	Tasks
1	Pre-clearing tree survey	Identify and locate extent of works and trees to be retained and removed
2	Fauna clearance	Capture and relocate fauna in trees/vegetation to be removed
3	Tree clearing	Removal of nominated trees - stockpile for re-use within works
4	Weed removal	Remove weed material and dispose of at an approved waste facility
5	Rubbish and debris	Remove rubbish and debris from within works area

Only contractors that are experienced and trained in plant identification and weed removal techniques shall be employed to remove native vegetation and weeds

3.6 Public Access /Safety

Public access to be maintained throughout existing throughfares. If not possible provide alternate routes in consultation with the Superintendent.

3.7 Construction Access

Construction access will be via existing public roads however a detailed site access and traffic management plan will be prepared by the Contractor and submitted to the Superintendent at the inception meeting. The plan will be reviewed and the contractor will make any amendments requested by the Superintendent prior to construction commencing.

4 CIVIL AND LANDSCAPING

4.1 Sediment & Erosion Control

Appropriate sediment and erosion control measures must be installed and maintained throughout the construction and establishment phase of the wetland in accordance with the “Blue Book”, Managing Urban Stormwater: Soils and Construction.

4.2 Earthworks

Earthworks levels must be in accordance with the Civil Design and Northern Rivers Development Construction Specifications, allowing for a minimum of 300mm lightly compacted topsoil as the finished design level. Local depressions must be minimised so that small puddles do not develop on the wetland cell floors.

4.3 Hydraulic structures

All structures must be constructed in accordance with the design documentation. Any potential changes to the design must be confirmed in writing with BSC before construction starts. Once constructed, the hydraulic structures should be surveyed and reviewed by BSC before finer shaping of the earthworks are undertaken.
All concrete pits are to be as per the dimensions shown in the drawings unless approved by the Superintendent including pipework, openings and orifices.

4.4 Pipework

All connections to existing and newly installed structures are to be sealed to the satisfaction of the superintendent.
The contractor shall make adequate provision for runoff flows during construction to prevent damage avoid, scour, sedimentation, and erosion.
Pipework is to be 250mmPVC or smaller to allow for access, maintenance and water level control of the wetland.
Screw on end caps as shown on the drawings are required to allow for maintenance draining of wetlands.
Orifice holes are to be drilled in pipework as shown on the drawings to control the flow of water through the wetland cells. The level at which the orifice is drilled is critical to the operation of the wetland.
Note: very fine tolerances are required for all hydraulic structures (See Section 4.4)

4.5 Holdpoint

Once all bulk earthworks and hydraulic structures have been completed a meeting will occur at a nominated hold point with the Principal Contractor to assess site and design details

4.6 Tolerances

Hydraulic structures within the wetlands control the movement of stormwater through the system. The construction of these structures must ensure that design levels are achieved. A vertical tolerance of +/-25mm and horizontal tolerance of +/- 200mm applies to all pipework and hydraulic structures including:

- inlet pipes
- inlet zone connections (pit and pipe)
- outlet riser
- outlet pipes (upstream and downstream)
- bypass weirs

A vertical tolerance of +/-50mm applies to earthworks including the wetland cell floors and all earthen embankments and bunds.

4.7 Rockwork

The contractor shall import rock sizes as specified on the drawings or as outlined in this section if not shown on the drawings. Rock and granular materials for vehicular access tracks should be DGB20.
The contractor should provide samples to BSC for approval of the rock mulch for headwalls, rip rap, outlets and swales.
The rock lining for the swale is to consist of

- Rip rap rock D50 250 -400mm
- Pebble mulch 40-70mm between rip rap
- Underlain by 100mm crushed rock
- Underlain by 20mm of fine crushed rock

The hand pack stone headwall swale rock size is to meet the following size requirements (unless otherwise stated on the drawings):

- D50: 250-600mm

All rockwork must be from a locally derived source.

4.6 Soils

Within the wetland macrophyte zones, topsoil should be placed to a minimum depth of 300 mm. Design levels for wetlands are inclusive of topsoil, therefore, when earthworks are occurring, allowance for topsoil is required.
Soils for planting must be of loose, friable consistency and of suitable fertility for plant growth. Soil lumps must be of a maximum 50mm dimension.
Soils for planting must be free from weeds, rocks, debris, and contaminants.
The application of lime may be required where the soil testing identifies a potential soil pH problem (pH < 5) or where acid sulphate soils are detected. The rate of application should be guided by soil test results, and the Acid Sulphate Management Plan (Env Solutions, 2021).
Stockpiled topsoil should be tested and approved by a certified laboratory and wetland designer and may need to be screened to remove any coarse organic matter.

1.1.1 Contamination

In the scenario that fuel, oil, cement or other phytotoxic material is spilt on subsoil or topsoil, excavate the contaminated soil, dispose of to the satisfaction of Byron Shire Council and replace with site soil or imported topsoil.

1.1.2 Installation and Aeration

Spread the media on the prepared surface and grade evenly.

- Fill areas of subsistence to achieve finished levels
- Avoid over compaction
- In areas of high compaction de-compact (rip to 100mm prior to planting)

4.9 Mulch and Jute Mesh

Mulch is to be used as specified to retain moisture in the soil and suppress weeds. Jute mesh is to be installed and used on batters,
A sample of the woodchip mulch is to be provided to BSC for approval prior to supply and installation.

- Wood chip mulch is to be used in areas of dry batter and shoulder planting, or as outlined within the construction drawings. Above top of bank. Approx 75mm thick
- It is not to be used in areas of overland flow or within flood prone areas. In these instances, replace with specified jute matting.
- Recycled woodchip mulch from chipped trees on site may be used if agreed with council representative
- Wood chip mulch should be a 15.40 forest blend and if it is to be imported, a sample is to be provided to BSC for approval prior to supply and installation
- Ensure mulch is free of deleterious fungus, pest, disease, soil, weeds and toxins
- 700gsm minimum jute matt should be installed on berms and batters. Overlap adjacent sections of jute by 200mm min and fix using 4mm x 300mm long pins at 6 per m²
- Jute matt must have a minimum of 6 slits per sqm. Purchase of Jute matt with 8 slits is preferable if available

4.10 Seating Nodes

Each seating node is a varying shape. Refer to drawings for location and dimension. Final extents to be determined on site. Adjustment may be made in response to site constraints and agreed with BSC and the site superintendent.

4.11 Pathways

Concrete pathways are to be constructed as shown on the site layout plan (1-191194_DD_02) and as detailed in 1-191194_DD_02/702.
Concrete paths are to be white in colour with a broom finish.
Concrete paths are to be rated to 32MPa and 150mm thick and laid over compacted subgrade as detailed in 1-191194_DD_02/702.

1.1.1 Deco Granitic Sand

The finished surface material within pathways as shown on site layout plan (1-191194_DD_002) and seating node areas (1-191194_DD_701) is to be decomposed granitic sand.

- Colour to be a consistent golden yellow.
- Size to be fines and sand to 5mm.
- Compact the ground to 95% Standard Maximum Dry Density to AS 1289.5.4.1, prior to installation.
- Deco granitic sand to be rolled and compacted in layers 30mm thick to a depth of 150mm.
- Ensure granitic surface is even with 1% cross fall responding to finished levels of each location.
- Paths shall be retained by Corten steel edging as detailed on sheet 702

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F	*FOR TENDER*	*25.08.2023*

SCALE NA

REV. F

DESIGNED KC
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SHEET No. 1-191194_DD_402

P1 - Macrophyte planting (300mm Deep, Density 6 plants/m²)		TOTAL	1043
Botanical Name	Common Name	% Prop	Qty
AQUATIC PLANTS (tubestock)			
Baumea articulata	Jointed Rush	30%	1877
Baumea rubiginosa	Soft Twig Rush	35%	2190
Bolboschoenus fluviatilis	River bulrush	10%	626
Eleocharis dulcis	Spike Rush	25%	1565
		100%	**6258**

P2- Macrophyte planting (300mm Deep, Density 6 plants/m²)		TOTAL	180
Botanical Name	Common Name	% Prop	Qty
AQUATIC PLANTS (tubestock)			
Baumea articulata	Jointed Rush	10%	108
Eleocharis sphacelata	Spike Rush	20%	216
Lepironia articulata	Grey Sedge	70%	756
		100%	**1080**

P3 - Shrub & Grass like plantings (Density 4 plants/m²)		TOTAL	415
Botanical Name	Common Name	% Prop	Qty
SHRUBS, FERNS and LILLIES (tubestock)			
Banksia robur	Swamp Banksia	5%	83
Christella dentata	Binung	10%	166
Crinum pedunculatum	Swamp Lily	5%	83
Dianella caerulea	Blue Flax-lily	5%	83
Melastoma affine	Blue Tongue	5%	83
		30%	**498**
NATIVE GRASSES & SEDGES (tubestock)			
Bolboschoenus fluviatilis	River bulrush	5%	83
Carex appressa	Tall Sedge	10%	166
Ficinia nodosa	Knobby Club Rush	10%	166
Gahnia sieberiana	Red-fruit Saw-sedge	5%	83
Juncus usitatus	Salt Marsh Rush	5%	83
Leersia hexandra	Cutgrass	5%	83
Lomandra confertifolia	Mat Rush	5%	83
Lomandra longifolia	Spiny-head Mat-rush	10%	166
Philydrum lanuginosum	Frogsmouth	5%	83
Themeda australis	Kangaroo Grass	5%	83
		65%	**1079**
GROUNDCOVERS (150mm pot size)			
Tetragonia tetragonioides	Native Spinach	5%	83
		5%	**83**
		100%	**1660**

P4 - Terrestrial Planting Zone Dry Batter (Density 4 plants/m²)		TOTAL	2626
Botanical Name	Common Name	% Prop	Qty
TREES (forestry stubestock)			
Banksia integrifolia	Coastal Banksia	1%	105
Casuarina glauca	Swamp Sheoak	0.50%	53
Cryptocarya foetida	Stinking Cryptocarya	0.50%	53
Ficus coronata	Sandpaper Fig	1%	105
Lophostemon suaveolens	Swamp Box	1%	105
Melaleuca quinquenervia	Broad-leaved Paperbark	1%	105
		5%	**525**
SHRUBS (tubestock)			
Austromyrtus dulcis	Midgen Berry	2%	210
Banksia robur	Swamp Banksia	5%	525
Callistemon pachyphyllus	Wallum Bottlebrush	5%	525
Christella dentata	Binung	2%	210
Crinum pedunculatum	Swamp Lily	2%	210
Dianella caerulea	Blue Flax-lily	5%	525
Melastoma affine	Blue Tongue	3%	315
		24%	**2521**
NATIVE GRASSES & SEDGES (tubestock)			
Carex appressa	Tall Sedge	2%	210
Ficinia nodosa	Knobby Club Rush	2%	210
Gahnia sieberiana	Red-fruit Saw-sedge	5%	525
Imperata cylindrica	Cogon Grass	10%	1050
Juncus kraussii	Salt Marsh Rush	2%	210
Leersia hexandra	Cutgrass	10%	1050
Lomandra confertifolia	Mat Rush	10%	1050
Lomandra longifolia	Spiny-head Mat-rush	5%	525
Themeda australis	Kangaroo Grass	10%	1050
		56%	**5882**
GROUNDCOVERS (150mm pot size)			
Hibbertia scandens	Snake Vine	5%	525
Carpobrotus glaucescens	Native Pig Face	5%	525
Tetragonia tetragonioides	Native Spinach	5%	525
		15%	**1576**
		100%	**10504**

P5 - Macrophyte planting (200mm Deep, Density 6 plants/m²)		TOTAL	573
Botanical Name	Common Name	% Prop	Qty
AQUATIC PLANTS (tubestock)			
Baumea articulata	Jointed Rush	10%	344
Eleocharis sphacelata	Spike Rush	20%	688
Lepironia articulata	Grey Sedge	70%	2407
		100%	**3438**

P6 - Macrophyte planting (200mm Deep, Density 6 plants/m²)		TOTAL	3126
Botanical Name	Common Name	% Prop	Qty
AQUATIC PLANTS (tubestock)			
Baumea articulata	Jointed Rush	25%	4689
Baumea rubiginosa	Soft Twig Rush	25%	4689
Baloskion tetraphyllum	Tassel Cord Rush	10%	1876
Eleocharis dulcis	Spike Rush	20%	3751
Lepironia articulata	Grey Sedge	20%	3751
		100%	**18756**

P7 - Macrophyte plantings (100mm Deep, Density 6 plants/m²)		TOTAL	258
Botanical Name	Common Name	% Prop	Qty
AQUATIC PLANTS (tubestock)			
Baumea articulata	Jointed Rush	25%	387
Baumea rubiginosa	Soft Twig Rush	25%	387
Bolboschoenus fluviatilis	River bulrush	25%	387
Eleocharis dulcis	Spike Rush	25%	387
		100%	**1548**

P8 - Shallow Macrophyte Plantings (100mm Deep, Density 6 plants/m²)		TOTAL	1578
Botanical Name	Common Name	% Prop	Qty
AQUATIC & GRASS LIKE PLANTS (tubestock)			
Baumea rubiginosa	Soft Twig Rush	20%	1894
Baloskion tetraphyllum	Tassel Cord Rush	20%	1894
Eleocharis dulcis	Spike Rush	20%	1894
Juncus utistatus	Marsh Rush	20%	1894
Rhynchospora brownii	Beak Rush	20%	1894
		100%	**9468**

P9 - Frog Marsh Plantings (100mm Deep, Density 6 plants/m²)		TOTAL	2620
Botanical Name	Common Name	% Prop	Qty
NATIVE GRASSES & SEDGES (tubestock)			
Baloskion tetraphyllum	Tassel Cord Rush	20%	3144
Blechnum indicum	Swamp Water Fern	20%	3144
Baumea rubiginosa	Soft Twig Rush	20%	3144
Rhynchospora brownii	Beak Rush	30%	4716
Philydrum lanuginosum	Frogsmouth	10%	1572
		100%	**15720**

P10 - Wetland Forest Plantings (100mm Deep, Density 4 plants/m²)		TOTAL	4759
Botanical Name	Common Name	% Prop	Qty
TREES (45L)			
Lophostemon suaveolens	Swamp Box	2.5%	476
Melaleuca quinquenervia	Broad-leaved Paperbark	2.5%	476
		5%	**952**
SHRUBS, FERNS and LILLIES (tubestock)			
Banksia robur	Swamp Banksia	3%	571
Blechnum indicum	Swamp Water Fern	3%	571
Christella dentata	Binung	2%	381
Crinum pedunculatum	Swamp Lily	2.5%	476
Melastoma affine	Blue Tongue	2%	381
		12.5%	**2380**
NATIVE GRASSES & SEDGES (tubestock)			
Baumea articulata	Jointed Rush	10%	1904
Carex appressa	Tall Sedge	15%	2855
Ficinia nodosa	Knobby Club Rush	14.5%	2760
Gahnia sieberiana	Red-fruit Saw-sedge	13%	2475
Juncus kraussii	Salt Marsh Rush	12%	2284
Lomandra confertifolia	Mat Rush	9%	1713
Philydrum lanuginosum	Frogsmouth	9%	1713
		82.5%	**15705**
1 tree / 5m2, 1 shrub / 2m2, grasses & sedges @ 4/m2		**100%**	**19036**

P11- Shoulder Planting (Density 5 plants/m²)		TOTAL	2681
Botanical Name	Common Name	% Prop	Qty
Shrubs (tubestock)			
*Austromyrtus dulcis**	Midgen Berry	1%	134
*Banksia robur**	Swamp Banksia	1%	134
		2%	**268**
NATIVE GRASSES, SEDGES & FERNS (tubestock)			
Christella dentata	Binung	5%	670
Carex appressa	Tall Sedge	10%	1341
Dianella caerulea	Blue Flax-lily	20%	2681
Ficinia nodosa	Knobby Club Rush	15%	2011
Imperata cylindrica	Cogon Grass	15%	2011
Lomandra confertifolia	Mat Rush	15%	2011
Lomandra longifolia	Spiny-head Mat-rush	10%	1341
		90%	**12065**
GROUNDCOVERS (150mm pot size)			
Hibbertia scandens	Snake Vine	4%	536
Carpobrotus glaucescens	Native Pig Face	4%	536
		8%	**1072**
		100%	**13405**
* Plant min 2m from any path, access track or seating node			

FEATURE TREES 100L		CODE	37
Botanical Name	Common Name		Qty
Banksia integrifolia	Coastal Banksia	Bi	11
Cryptocarya foetida	Stinking Cryptocarya	Cf	4
Ficus coronata	Sandpaper Fig	Fc	5
Lophostemon suaveolens	Swamp Box	Ls	7
Melaleuca quinquenervia	Broad-leaved Paperbark	Mq	10
			37
*Plant in locations shown on plans 501-503			
*Minimum 5m spacing between feature trees			

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CLIENT: Byron Shire Council

DRAWING:
LANDSCAPE
PLANTING SCHEDULES

PROJECT:
SANDHILLS WETLAND
DETAILED DESIGN PACKAGE

REV.	ISSUE / AMENDMENTS	DATE
A	*PRE -DETAILED DESIGN PACKAGE COUNCIL REVIEW*	*17.11.2021*
B	*DETAILED DESIGN PACKAGE 70%*	*28.02.2022*
C	*DETAILED DESIGN PACKAGE 100%*	*02.11.2022*
D	*DETAILED DESIGN PACKAGE AMENDMENTS 100%*	*17.11.2022*
E	*DETAILED DESIGN PACKAGE AMENDMENTS 100%*	*13.12.2022*
F	*FOR TENDER*	*25.08.2023*

SCALE
NA

REV.
F

DESIGNED KC
DRAWN RS/TC
CHECKED DM

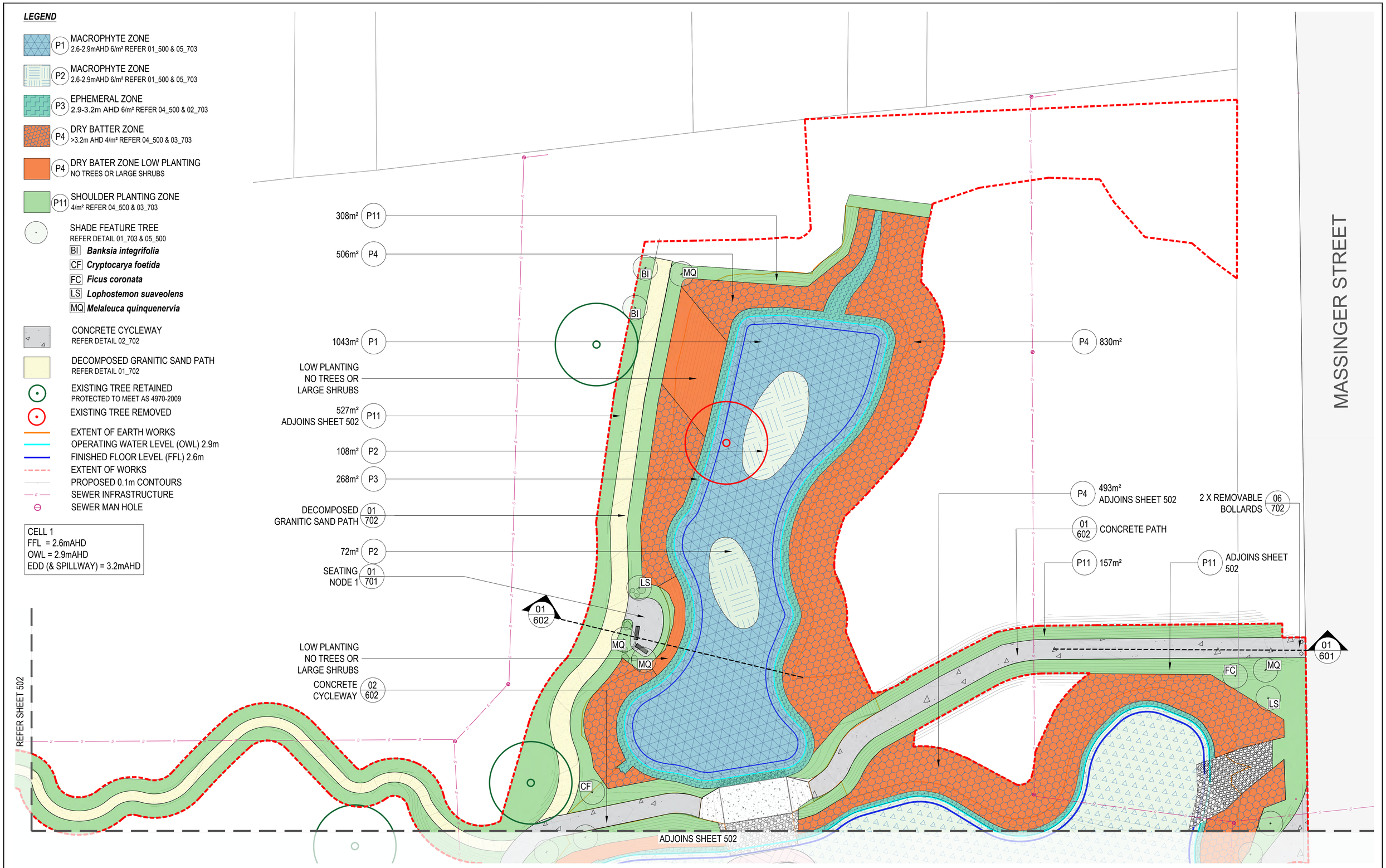
CAD FILE No.
1-91194_SANDHILLS_DD.DWG

SHEET No.
1-191194_DD_500

LEGEND

- P1 MACROPHYTE ZONE 2.6-2.9mAHD 6/m² REFER 01_500 & 05_703
- P2 MACROPHYTE ZONE 2.6-2.9mAHD 6/m² REFER 01_500 & 05_703
- P3 EPHEMERAL ZONE 2.9-3.2m AHD 6/m² REFER 04_500 & 02_703
- P4 DRY BATTER ZONE >3.2m AHD 4/m² REFER 04_500 & 03_703
- P4 DRY BATER ZONE LOW PLANTING NO TREES OR LARGE SHRUBS
- P11 SHOULDER PLANTING ZONE 4/m² REFER 04_500 & 03_703
- SHADE FEATURE TREE REFER DETAIL 01_703 & 05_500
  - BI *Banksia integrifolia*
  - CF *Cryptocarya foetida*
  - FC *Ficus coronata*
  - LS *Lophostemon suaveolens*
  - MQ *Melaleuca quinquenervia*
- CONCRETE CYCLEWAY REFER DETAIL 02_702
- DECOMPOSED GRANITIC SAND PATH REFER DETAIL 01_702
- EXISTING TREE RETAINED PROTECTED TO MEET AS 4970-2009
- EXISTING TREE REMOVED
- EXTENT OF EARTH WORKS
- OPERATING WATER LEVEL (OWL) 2.9m
- FINISHED FLOOR LEVEL (FFL) 2.6m
- EXTENT OF WORKS
- PROPOSED 0.1m CONTOURS
- SEWER INFRASTRUCTURE
- SEWER MAN HOLE

CELL 1
FFL = 2.6mAHD
OWL = 2.9mAHD
EDD (& SPILLWAY) = 3.2mAHD



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DRAWING: LANDSCAPE MATERIALS & PLANTING 01

PROJECT: SANDHILLS WETLAND DETAILED DESIGN PACKAGE

REV.	ISSUE / AMENDMENTS	DATE
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D	DETAILED DESIGN PACKAGE AMENDMENTS 100%	17.11.2022
E	DETAILED DESIGN PACKAGE AMENDMENTS 100%	13.12.2022
F	FOR TENDER	25.08.2023

N

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SCALE 1:250 @ A1

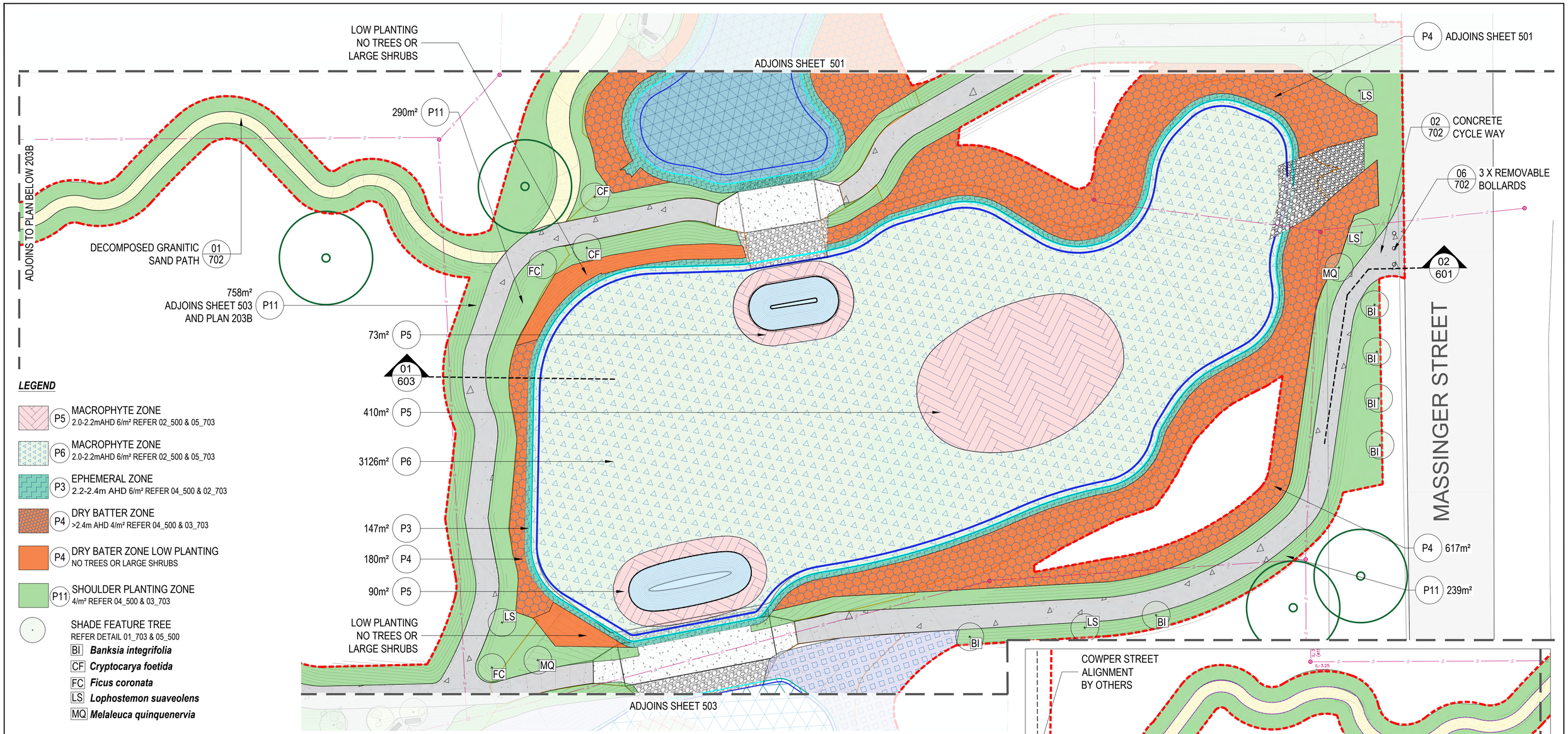
0 1 2 4 6 10m

REV. F

DESIGNED KC
DRAWN RS/TC
CHECKED DM

CAD FILE No. 1-91194_SANDHILLS_DD.DWG

SHEET No. 1-191194_DD_ 501

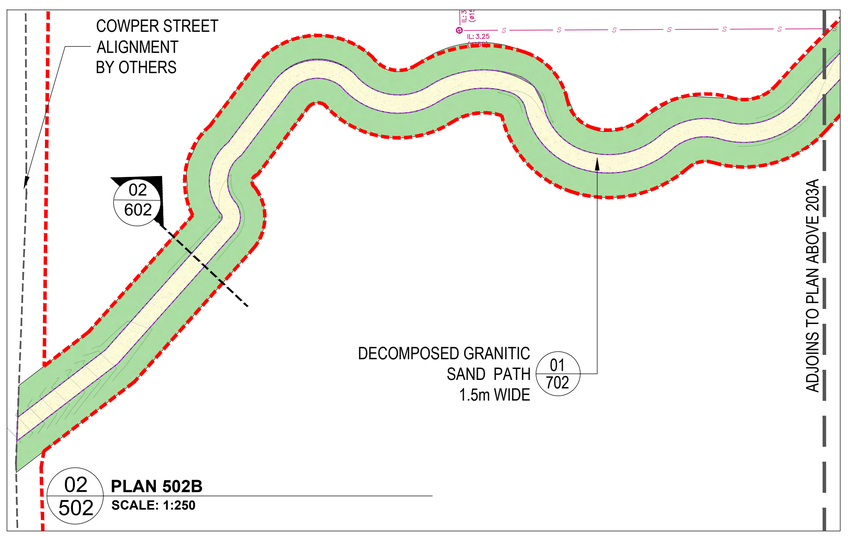


LEGEND

- P5 MACROPHYTE ZONE 2.0-2.2mAHD 6/m² REFER 02_500 & 05_703
- P6 MACROPHYTE ZONE 2.0-2.2mAHD 6/m² REFER 02_500 & 05_703
- P3 EPHEMERAL ZONE 2.2-2.4m AHD 6/m² REFER 04_500 & 02_703
- P4 DRY BATTER ZONE >2.4m AHD 4/m² REFER 04_500 & 03_703
- P4 DRY BATER ZONE LOW PLANTING NO TREES OR LARGE SHRUBS
- P11 SHOULDER PLANTING ZONE 4/m² REFER 04_500 & 03_703
- SHADE FEATURE TREE REFER DETAIL 01_703 & 05_500
  - BI *Banksia integrifolia*
  - CF *Cryptocarya foetida*
  - FC *Ficus coronata*
  - LS *Lophostemon suaveolens*
  - MQ *Melaleuca quinquenervia*
- CONCRETE CYCLEWAY REFER DETAIL 02_702
- DECOMPOSED GRANITIC SAND PATH REFER DETAIL 01_702
- EXISTING TREE RETAINED PROTECTED TO MEET AS 4970-2009
- EXTENT OF EARTH WORKS
- OPERATING WATER LEVEL (OWL) 2.2m
- FINISHED FLOOR LEVEL (FFL) 2.0m
- EXTENT OF WORKS
- PROPOSED 0.1m CONTOURS
- SEWER INFRASTRUCTURE
- SEWER MAN HOLE

01 502 **PLAN 502A**
SCALE: 1:250

CELL 2
FFL = 2.0m
OWL = 2.2m
EDD (& SPILLWAY) = 2.4m



02 502 **PLAN 502B**
SCALE: 1:250

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DRAWING: LANDSCAPE MATERIALS & PLANTING 02

PROJECT: SANDHILLS WETLAND DETAILED DESIGN PACKAGE

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F	*FOR TENDER*	*25.08.2023*

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SCALE 1:250 @ A1

0 1 2 4 6 10m

REV. F

DESIGNED	KC
DRAWN	RS/TC
CHECKED	DM

CAD FILE No. **1-91194_SANDHILLS_DD.DWG**

SHEET No. **1-191194_DD_502**

LEGEND

- P7 MACROPHYTE ZONE 1.8-1.9mAHD 6/m² REFER 03_500 & 05_703
- P8 MACROPHYTE ZONE 1.8-1.9mAHD 6/m² REFER 03_500 & 05_703
- P9 FROG MARSH ZONE 1.8-1.9mAHD 6/m² REFER 03_500 & 05_703
- P10 FOREST PLANTING ZONE >1.8m AHD 4/m² REFER 03_500 & 05_703
- P10 FOREST PLANTING ZONE LOW NO TREES OR LARGE SHRUBS
- P11 SHOULDER PLANTING ZONE 4/m² REFER SCHEDULES 04_500 & 03_703
- SHADE FEATURE TREE REFER DETAIL 01_703 & 05_500
  - BI *Banksia integrifolia*
  - CF *Cryptocarya foetida*
  - FC *Ficus coronata*
  - LS *Lophostemon suaveolens*
  - MQ *Melaleuca quinquenervia*
- CONCRETE CYCLE WAY REFER DETAIL 02_702
- DECOMPOSED GRANITE SAND PATH REFER DETAIL 01_702
- DEEP WATER ZONES NO PLANTING
- EXISTING TREE RETAINED PROTECTED TO MEET AS 4970-2009
- EXTENT OF EARTH WORKS
- OPERATING WATER LEVEL (OWL) 2.9m
- FINISHED FLOOR LEVEL (FFL) 2.6m
- EXTENT OF WORKS
- PROPOSED 0.2m CONTOURS
- SEWER INFRASTRUCTURE
- SEWER MAN HOLE

ADJOINS SHEET 502

03/701 SEATING NODE 3

SEATING NODE 2 02/701

P11 ADJOINS SHEET 502

LOW PLANTING NO TREES OR LARGE SHRUBS

02/603

CONCRETE CYCLE WAY 02/702

P7 258m²

P8 1578m²

LOW PLANTING NO TREES OR LARGE SHRUBS

LOW PLANTING NO TREES OR LARGE SHRUBS

402m² P11

COWPER STREET

P10 166m²

P10 105m²

P9 2620m²

NO JUTE MAT TO NOT BELOW OPERATING WATER LEVEL 1.9m AHD

P10 4739m²

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DRAWING: LANDSCAPE MATERIALS & PLANTING 03

PROJECT: SANDHILLS WETLAND DETAILED DESIGN PACKAGE

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F	*FOR TENDER*	*25.08.2023*

N

SCALE 1:250 @ A1

0 1 2 4 6 10m

REV. F

DESIGNED KC

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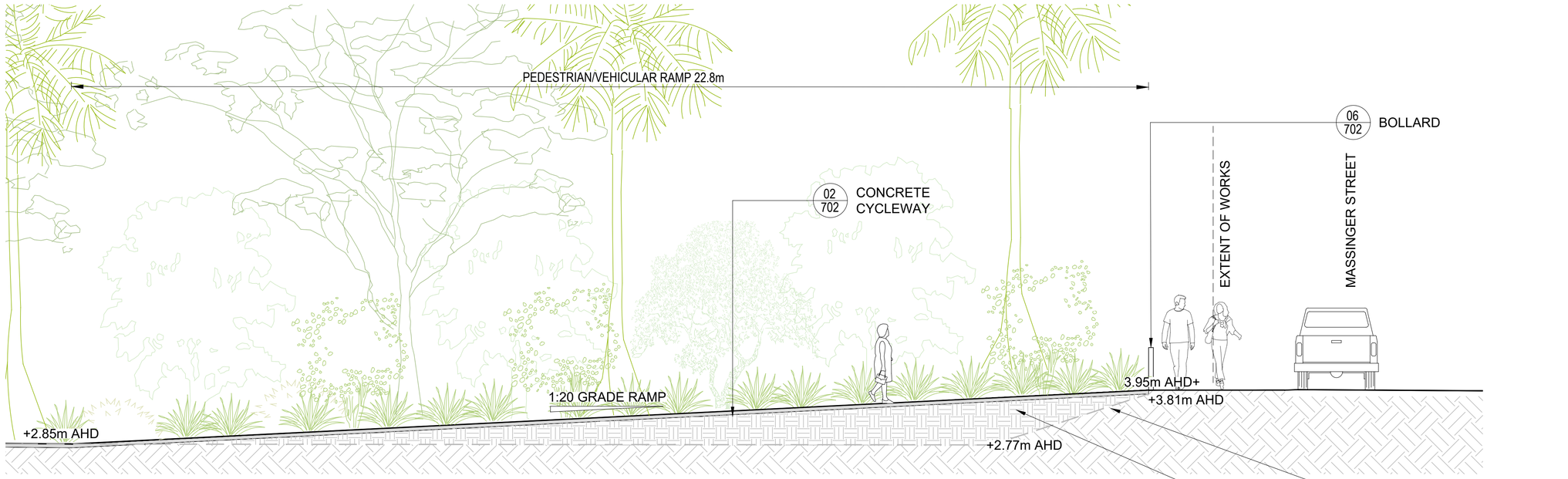
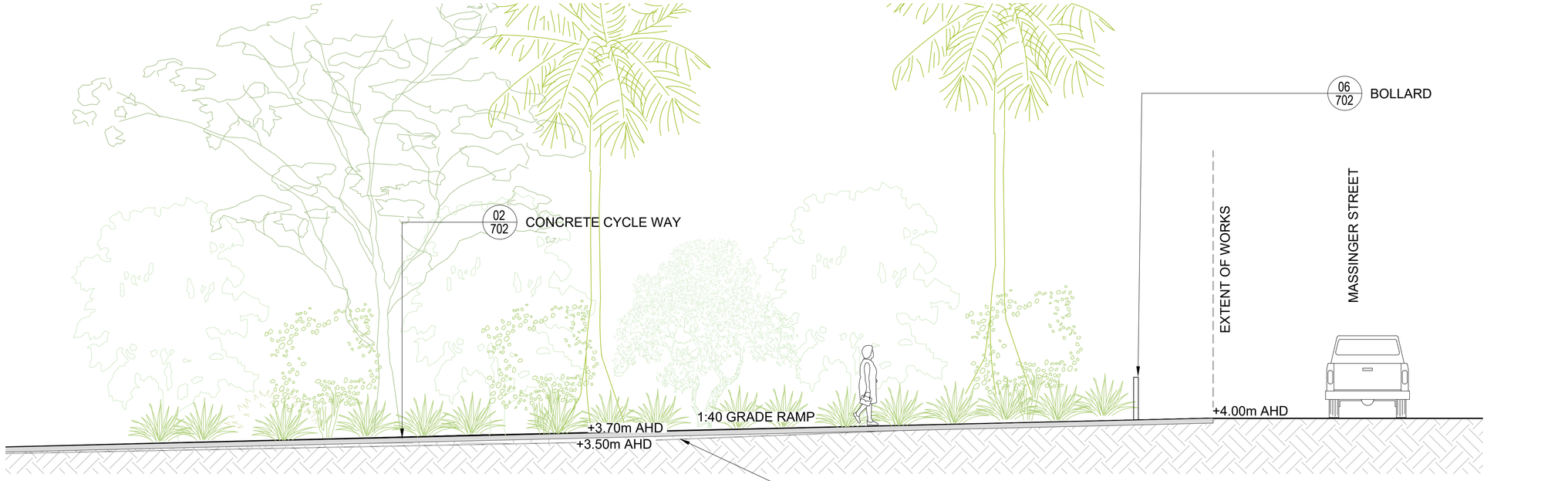
SHEET No. 1-191194_DD_503



01
601
PATH FROM MASSINGER STREET 1
SCALE: 1:50



02
601
PATH FROM MASSINGER STREET 2
SCALE: 1:50

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DRAWING:
LANDSCAPE
SECTIONS

PROJECT:
SANDHILLS WETLAND
DETAILED DESIGN PACKAGE

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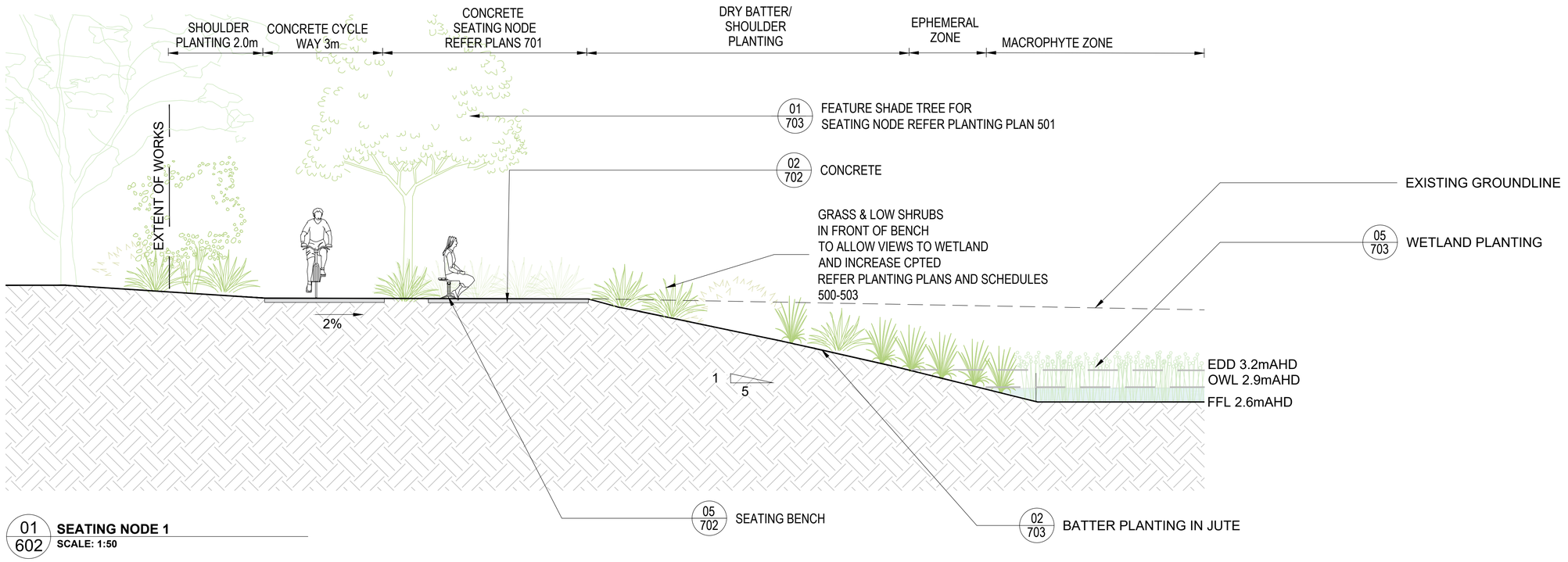
F	*FOR TENDER*	*25.08.2023*

SCALE
1:50 @ A1
0 0.5 1 2 3m
REV. **F**

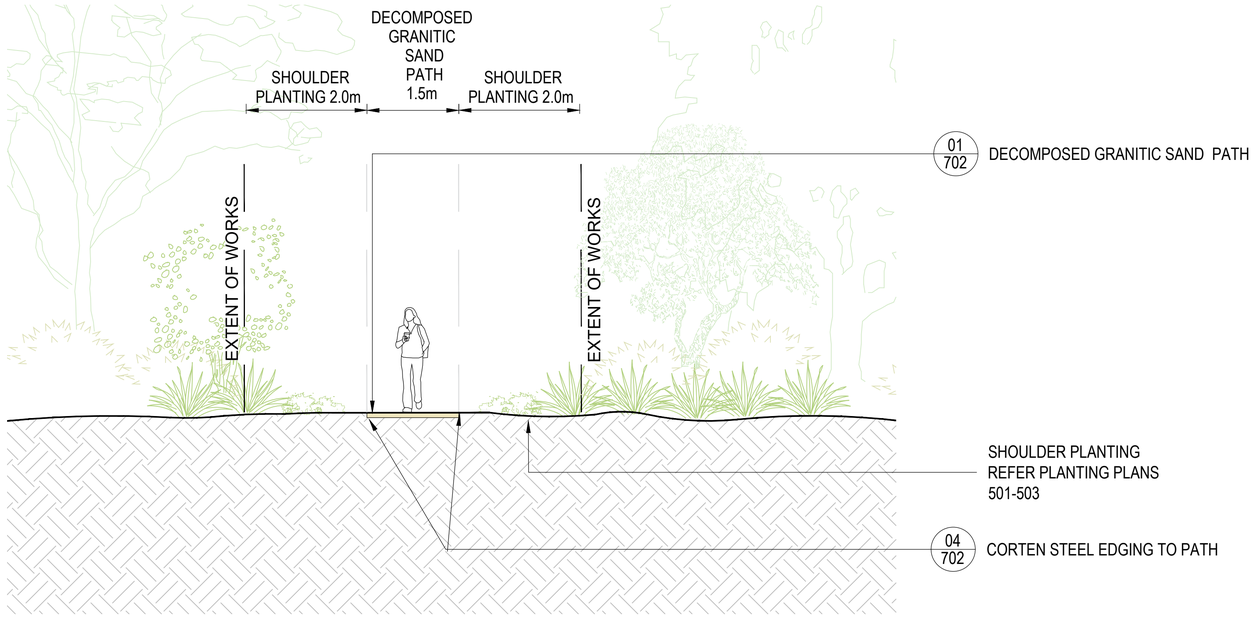
DESIGNED KC
DRAWN RS/TC
CHECKED DM

CAD FILE No.
1-91194_SANDHILLS_DD.DWG

SHEET No.
1-191194_DD_601



01 602 **SEATING NODE 1**
SCALE: 1:50



02 602 **DECOMPOSED GRANITIC SAND PEDESTRIAN PATH**
SCALE: 1:50

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DRAWING: LANDSCAPE SECTIONS

PROJECT: SANDHILLS WETLAND DETAILED DESIGN PACKAGE

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F	*FOR TENDER*	*25.08.2023*

SCALE 1:50 @ A1
0 0.5 1 2 3m
REV. F

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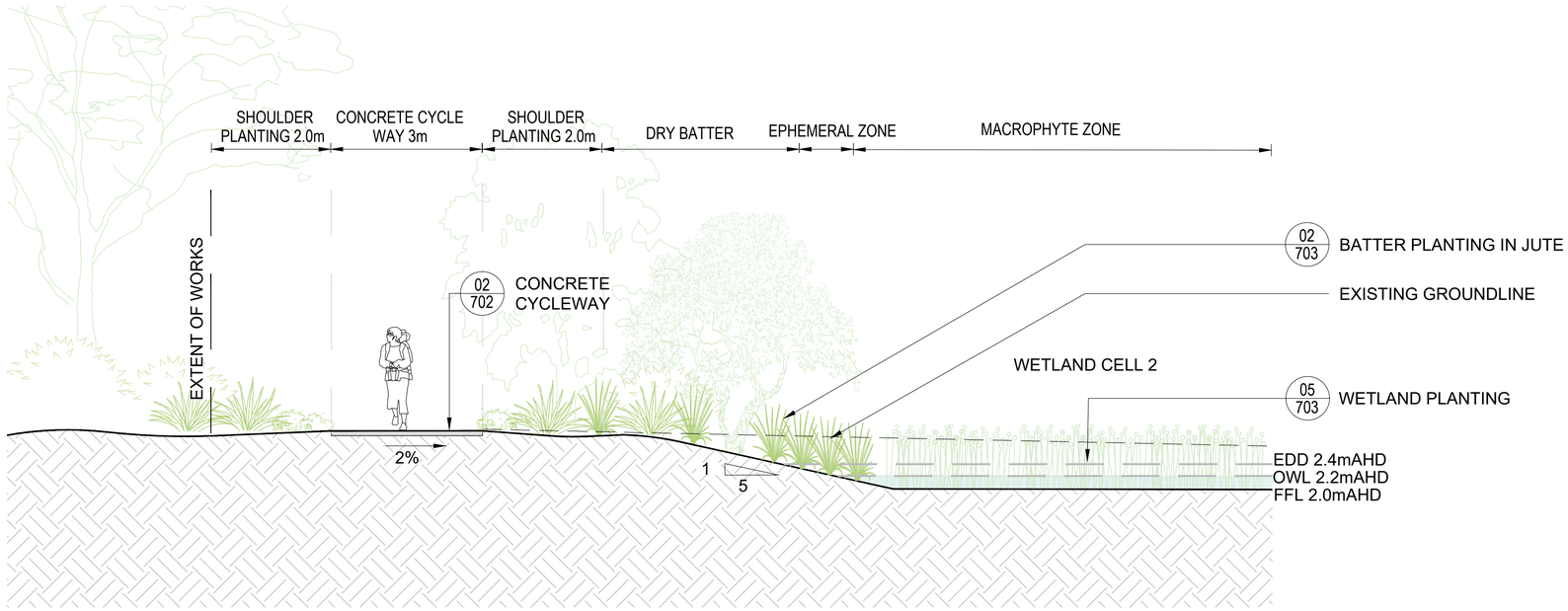
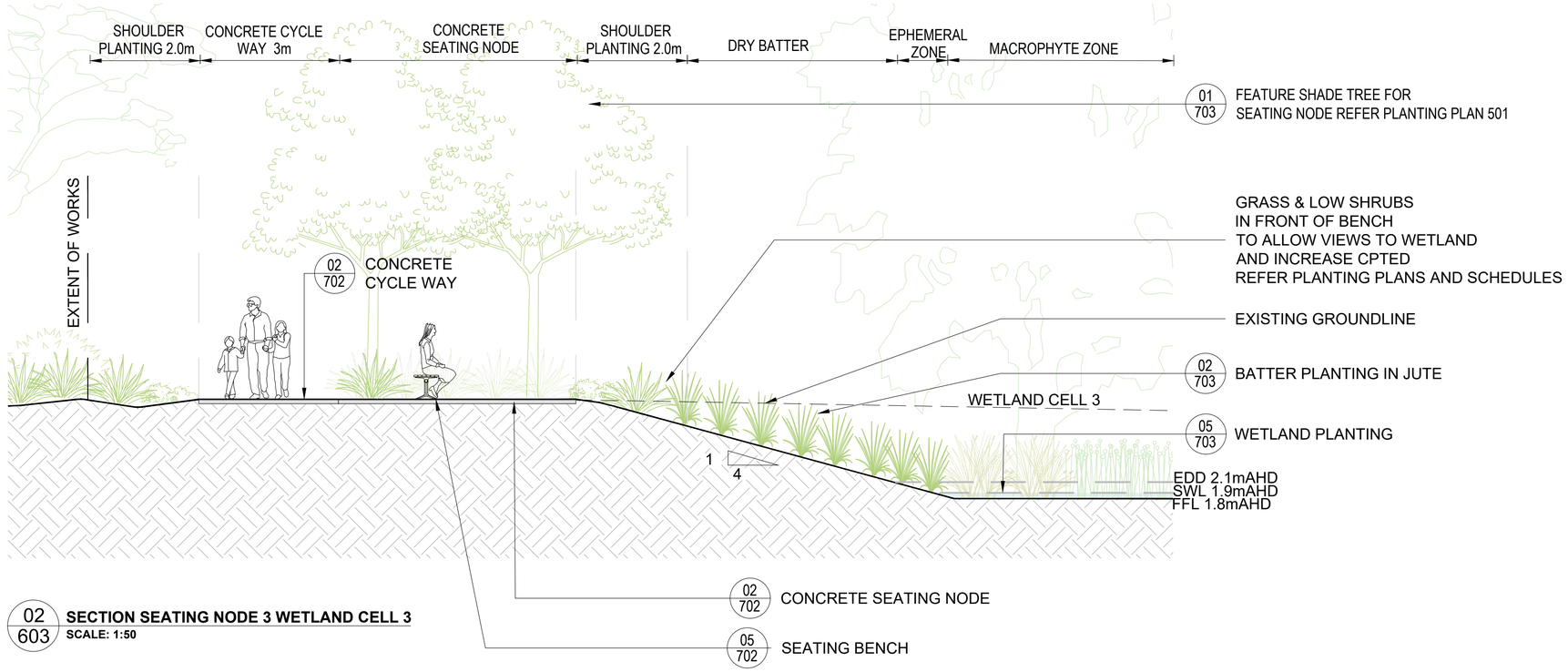
CHECKED DM

CAD FILE No. 1-91194_SANDHILLS_DD.DWG
SHEET No. 1-191194_DD_602



01 603 CONCRETE PATH WETLAND CELL 2
SCALE: 1:50



02 603 SECTION SEATING NODE 3 WETLAND CELL 3
SCALE: 1:50

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DRAWING: LANDSCAPE SECTIONS

PROJECT: SANDHILLS WETLAND DETAILED DESIGN PACKAGE

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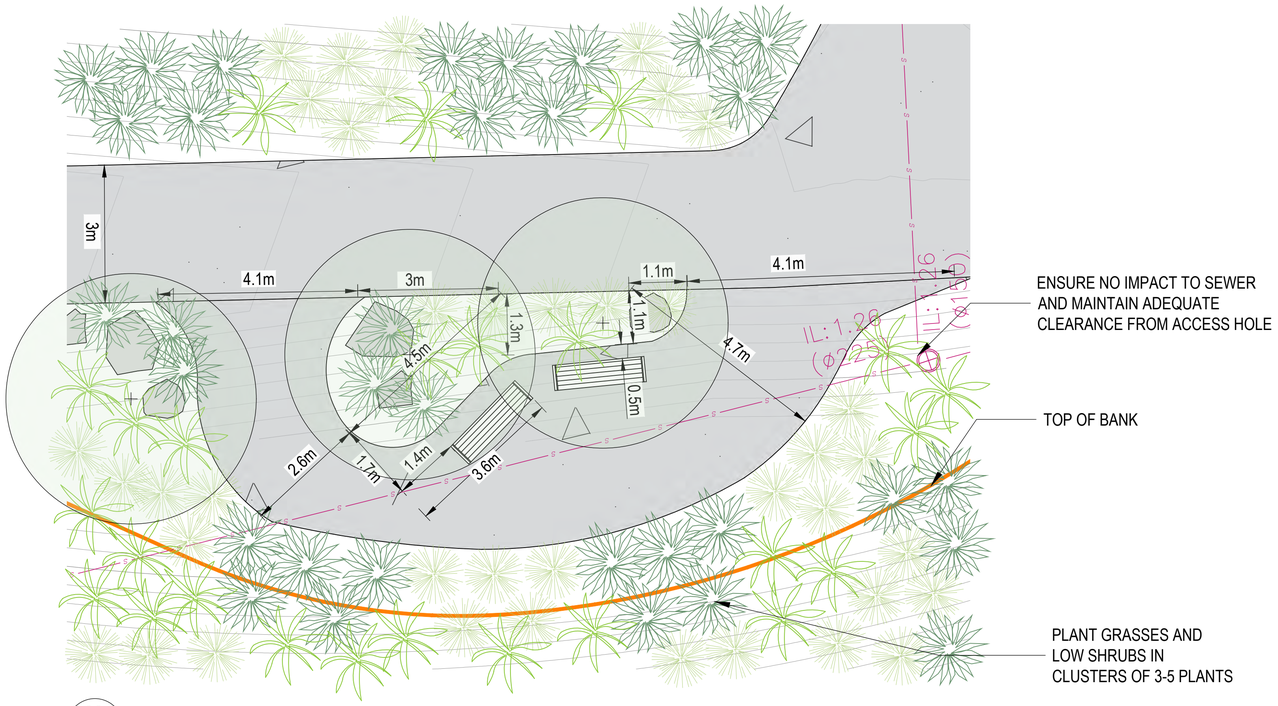
SCALE 1:50 @ A1 (0 0.5 1 2 3m)
REV. F

DESIGNED	KC
DRAWN	RS/TC
CHECKED	DM

CAD FILE No. 1-91194_SANDHILLS_DD.DWG
SHEET No. 1-191194_DD_603

01/701 **SEATING NODE 1 DETAIL PLAN**
SCALE:1:75



02/701 **SEATING NODE 2 DETAIL PLAN**
SCALE:1:75

03/701 **SEATING NODE 3 DETAIL PLAN**
SCALE:1:75

PLANTING PLAN NOTE:
REFER SHEETS 501 - 503 FOR
PLANTING ZONES.
ONLY LOW GROWING SPECIES TO 1.2m HIGH SHALL BE
PLANTED IN FRONT OF THE SEATING NODE BENCHES

CORTEN STEEL EDGING NOTE:
CORTEN STEEL EDGING TO BE INSTALLED TO THE SIDE
OF ALL DECOMPOSED GRANITIC SAND PATHS
REFER PLANS 501-503 AND DETAILS 702_03/04

SETOUT NOTE:
FINAL SETOUT TO THE PROJECT SURVEYOR THROUGH
GPS COORDINATES
ANY DISCREPANCIES IN MEASUREMENTS SHALL
REPORTED TO THE PROJECT LANDSCAPE ARCHITECT
BEFORE INSTALLATION

LEGEND

- PROSED FEATURE SHADE TREE — REFER DETAIL 01_703
- GRASS + LOW SHRUB PLANTING — REFER PLANTING SCHEDULES SHEET 500
- FEATURE ROCKS — REFER DETAIL 03_702
- SEATING BENCH — REFER DETAIL 05_702
- CONCRETE CYCLE WAY/SEATING NODE — REFER DETAIL 02_702
- DECOMPOSED GRANITIC SAND PATH — REFER DETAIL 01_702
- CORTEN STEEL EDGING — REFER DETAIL 04_702
- EXTENT OF EARTH WORKS (TOP OF BANK)
- PROPOSED 0.2m CONTOURS
- SEWER INFRASTRUCTURE
- SEWER ACCESS HOLE

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DRAWING: LANDSCAPE DETAILS
SEATING NODES

PROJECT: SANDHILLS WETLAND
DETAILED DESIGN PACKAGE

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SCALE: AS SHOWN
REV.: F

DESIGNED KC
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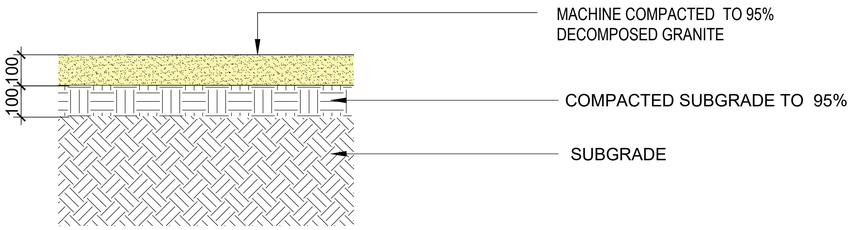
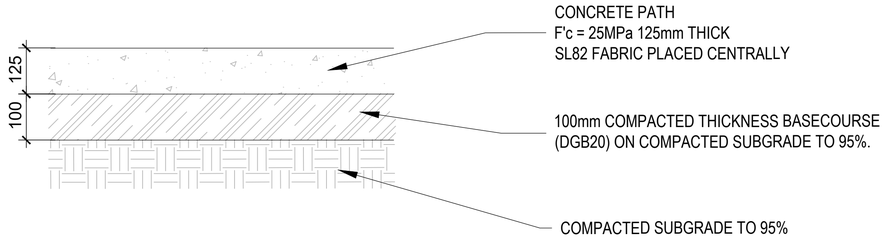
CHECKED DM

CAD FILE No.: 1-91194_SANDHILLS_DD.DWG
SHEET No.: 1-191194_DD_701



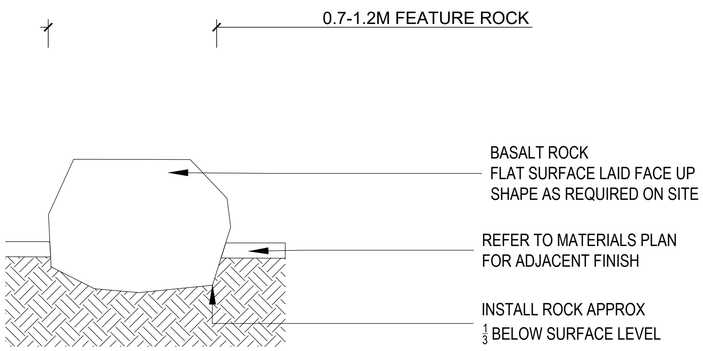
NOTES:
1. COLOUR TO BE CONSISTENT GOLDEN YELLOW
2. SIZE - FINES AND SAND TO 5mm
3. DECOMPOSED GRANITIC SAND TO BE ROLLED AND COMPACTED IN LAYERS 30mm THICK TO A DEPTH OF 100mm.
4. ENSURE SURFACE EVEN WITH 1:100 CROSS FALL RESPONDING TO FINISHED LEVELS OF LOCATION.
5. MIX STABILIZER A01 BINDER AT RATE OF 3% DRY WEIGHT
6. ALL DECO PATHS TO HAVE STEEL EDGING REFER DETAIL 04_702

01 / 702 DECOMPOSED GRANITIC SAND PATH
SCALE: 1:10



NOTES:
1. COLOUR: WHITE
2. BROOM FINISH
3. CONTRACTION JOINTS SHALL BE INSTALLED EVERY 3m TO PREVENT CRACKING.
4. EXPANSION JOINTS TO BE INSTALLED AT EVERY 12m.
5. ENSURE SURFACE EVEN WITH 1:100 CROSS FALL RESPONDING TO FINISHED LEVELS OF LOCATION.

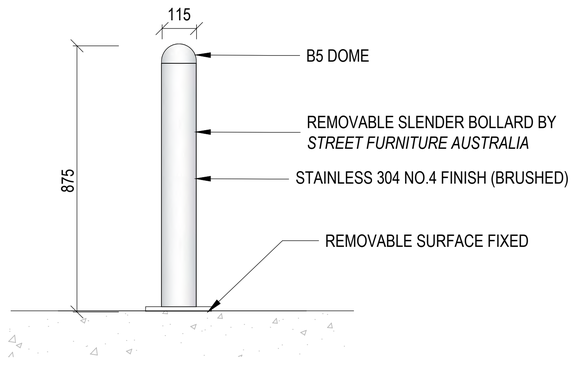
02 / 702 CONCRETE CYCLE WAY
SCALE: 1:10



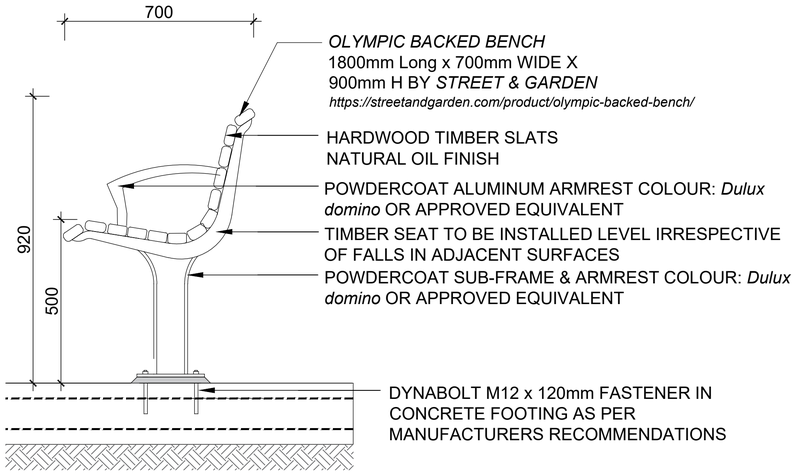
03 / 702 FEATURE ROCKS
SCALE: 1:10

04 / 702 CORTEN STEEL EDGE DETAIL
SCALE: 1:10

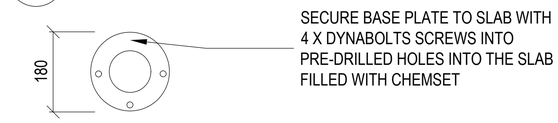
05 / 702 TIMBER SEATING BENCH RENDER
SCALE: NTS



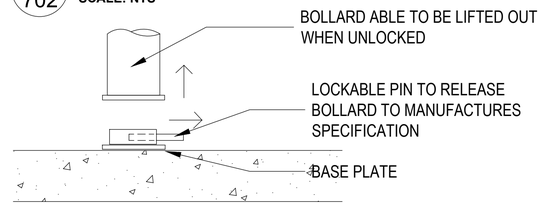
06 / 702 REMOVABLE BOLLARD
SCALE: NTS



06 / 702 TIMBER SEATING BENCH DETAIL
SECTION: 1:10



07 / 702 BOLLARD BASE PLATE PLAN
SCALE: NTS



08 / 702 REMOVABLE SURFACE FIXED
SCALE: NTS

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DRAWING: LANDSCAPE DETAILS HARDWORKS

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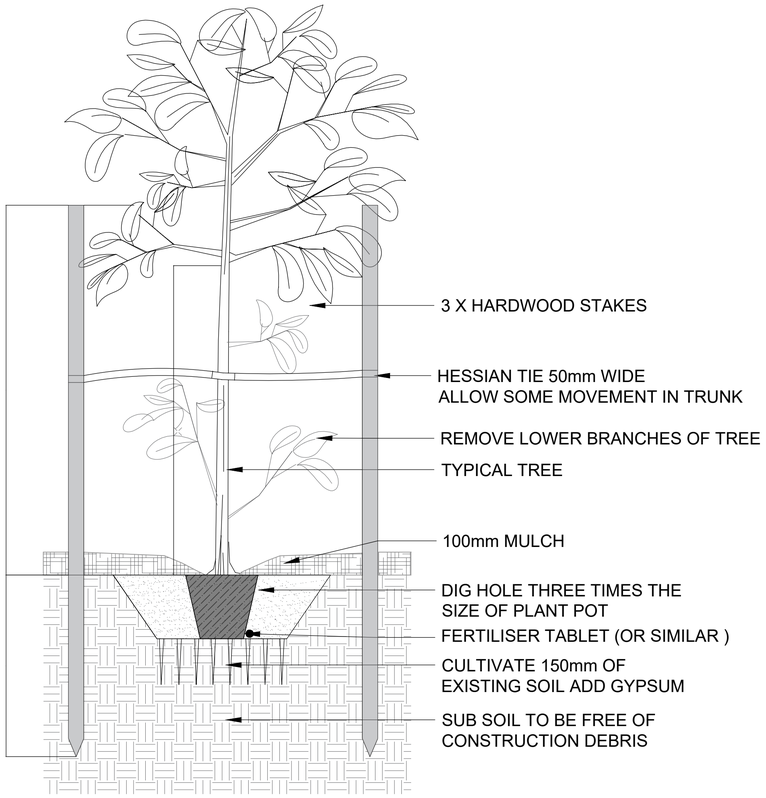
E	*DETAILED DESIGN PACKAGE AMENDMENTS 100%*	*13.12.2022*
F	*FOR TENDER*	*25.08.2023*

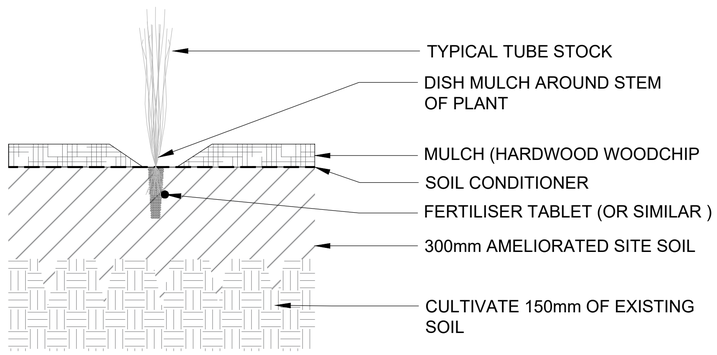
SCALE: AS SHOWN
REV. F

DESIGNED KC
DRAWN RS/TC
CHECKED DM

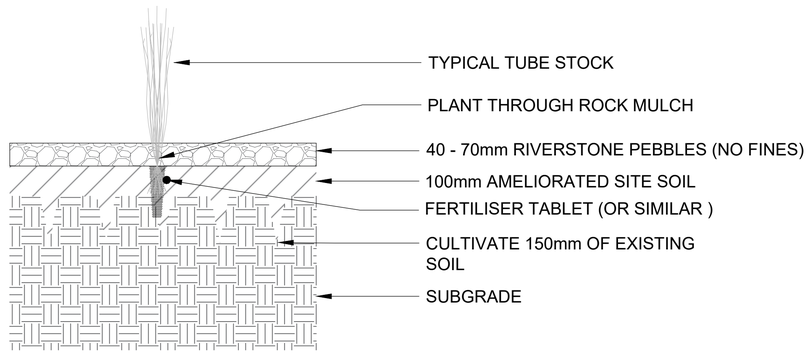
CAD FILE No. 1-91194_SANDHILLS_DD.DWG
SHEET No. 1-191194_DD_702



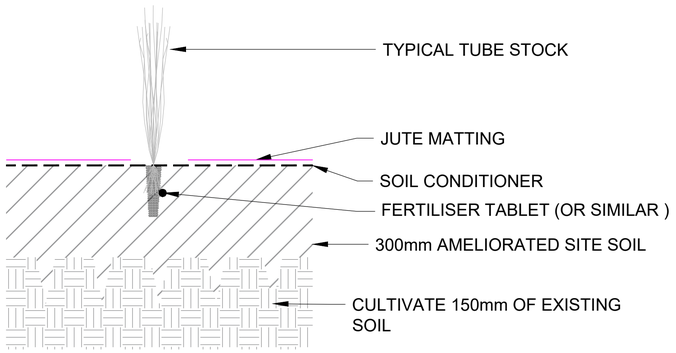
01 703 **FEATURE TREE PLANTING**
SCALE: 1:10



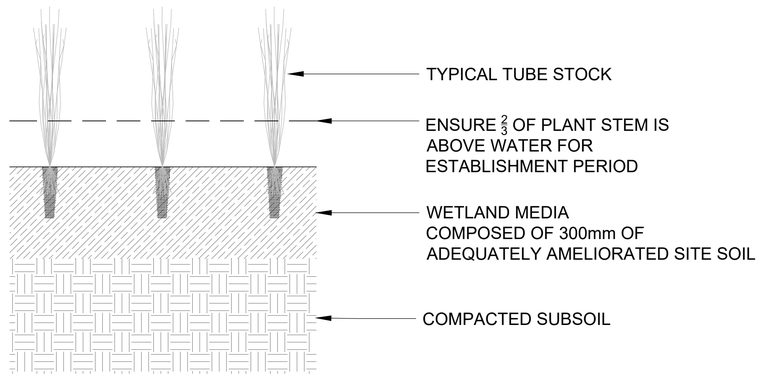
03 703 **PLANTING IN MULCH**
SCALE: 1:10



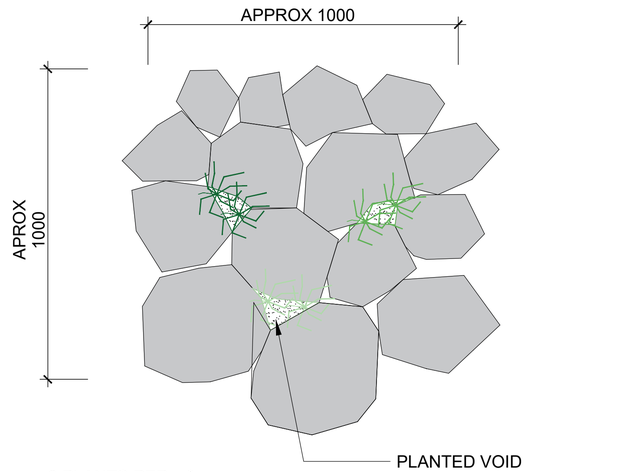
04 703 **PLANTING IN ROCK MULCH**
SCALE: 1:10



02 703 **PLANTING IN JUTE**
SCALE: 1:10



05 703 **PLANTING IN WETLAND**
SCALE: 1:10



6 PLANTS PER m²
2 PLANTS PER PLANTED VOID

06 703 **PLANTING IN ROCK VOIDS**
SCALE: 1:10

PLANTING NOTE:
ALL PLANTING ON BATTERS IS TO BE JUTTED
ALL PLANTING ABOVE THE TOP OF BATTERS IS TO BE MULCHED

AWC
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www.awconsult.com.au

CLIENT: Byron Shire Council

DRAWING:
LANDSCAPE DETAILS
SOFTWORKS - PLANTING

PROJECT:
SANDHILLS WETLAND
DETAILED DESIGN PACKAGE

REV.	ISSUE / AMENDMENTS	DATE
A	*PRE -DETAILED DESIGN PACKAGE COUNCIL REVIEW*	*17.11.2021*
B	*DETAILED DESIGN PACKAGE 70%*	*28.02.2022*
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F	*FOR TENDER*	*25.08.2023*

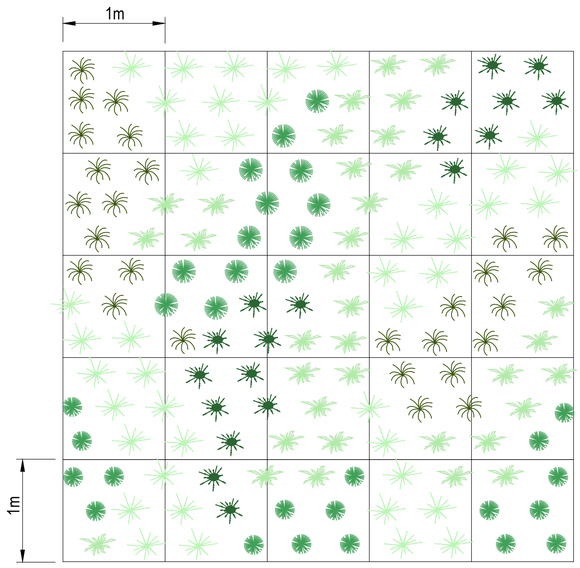
SCALE
AS SHOWN

REV.
F

DESIGNED KC
DRAWN RS/TC
CHECKED DM

CAD FILE No.
1-91194_SANDHILLS_DD.DWG

SHEET No.
1-191194_DD_703

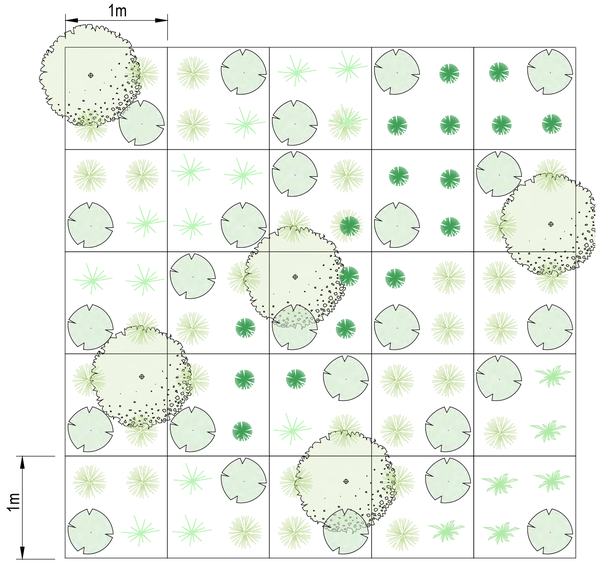


LEGEND

6 X PLANTS/1m²

DENSITY 6 PLANTS/m²
GROUP SPECIES in APPROXIMATELY 10 - 20 PLANTS

01 704 **PLANTING MATRIX ZONES P1, P2, P5, P6, P7, P8, P9**
SCALE: 1:30



LEGEND

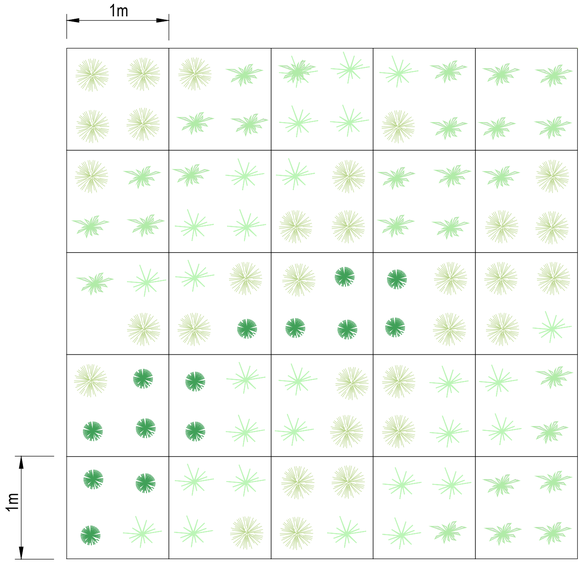
1 X TREE/5m² (APPROXIMATELY)

1 X SHRUB/1m² (APPROXIMATELY)

3 X GRASS/GROUNDCOVER/1m² (APPROXIMATELY)

DENSITY 4 PLANTS/m²
GROUP SPECIES in APPROXIMATELY 10 - 20 PLANTS

02 704 **PLANTING MATRIX ZONES P4 & P10**
SCALE: 1:30



LEGEND

4 X PLANTS /1m²

DENSITY 4 PLANTS/m²
GROUP SPECIES APPROXIMATELY 10 - 20 PLANTS

03 704 **PLANTING MATRIX ZONE P3 & P11**
SCALE: 1:30

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CLIENT: Byron Shire Council

DRAWING: LANDSCAPE DETAILS
PLANTING MATRIXES

PROJECT: SANDHILLS WETLAND
DETAILED DESIGN PACKAGE

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E	*DETAILED DESIGN PACKAGE AMENDMENTS 100%*	*13.12.2022*
F	*FOR TENDER*	*25.08.2023*

SCALE: AS SHOWN
REV.: F

DESIGNED: KC
DRAWN: RS/TC
CHECKED: DM

CAD FILE No.: **1-91194_SANDHILLS_DD.DWG**
SHEET No.: **1-191194_DD_704**

1 Planting specification

- The planting is to be carried out by qualified and experienced contractors and all plants are to be sourced from local provenance.
- All plants material is to be in accordance with the species, variety, height and container size specified.

1.1 Planting

Specification as per drawing details and reiterated below.

- The contractor is to supply all plants and turf shown on the drawings (refer to design drawings) and as required to make good all disturbed surfaces
    - The contractor is responsible for undertaking planting of all plants shown on the planting plan as well as replacing all other surfaces that have been damaged due to construction works with 'like for like'
- All plants to be used are required to have a normal growth habit and must be sound, healthy and vigorous and free from pests and infections
- All turf must be provided by the Contractor to make good all disturbed turf areas
- Plants must be grown in the containers of the size stated in the planting schedule and must have sufficient roots to hold earth together intact after removal from containers without being rootbound
- Plants/turf must have large healthy root systems with no evidence of root curl, restriction or damage
- Plants that meet the measurements specified but do not possess a normal balanced height and spread will be rejected
- Plants must be hardened off, not soft or forced, and suitable for planting in the natural climate conditions existing at the site

1.2 Plant Supply

- The contractor is to supply all plants in required species in the available numbers with sufficient time prior to undertaking planting
- The contractor should liaise with the Superintendent to replace any plants that fail or are damaged at any stage of the work under the contract
- Provenance: Plants supplied will be of local provenance, and from the appropriate vegetation community, and as close to site as practical, preferably within a 20 km radius of the site
    - Certificate of provenance: Supply confirmation of provenance of the species as seed is collected/sown, so acceptability of sourced material can be confirmed

1.3 Plant Schedule

- Refer to the planting plans for details

1.4 Execution

- The plants are to be planted by suitably landscape specialists with knowledge of planting methods and be able to identify species to allow for the landscaping plan to be properly implemented

1.5 Planting Set out

- The Contractor must install plants to the extent as shown on drawings
- The zones to be planted are to be marked out on site prior to planting and the set out is to be approved by the Superintendent prior to any planting commencing
- The Contractor is to confirm extent of areas to be planted on site after completion of civil works. Refer to drawings for locations, species, quantities and container sizes.

1.6 Planting conditions

- Planting should be carried out when weather and soil conditions are favourable to plant establishment
    - Do not plant in unsuitable weather conditions including such as extreme heat, cold, frost, wind or rain
- The plants must be planted using appropriate horticultural techniques and in accordance with the drawings

1.7 Storage

- All delivered plants are to be maintained by the Contractor
    - The storage of plants is to be approved by the superintendent, to suit the plant delivery program

  Where possible plant immediately after delivery
- Protect plants at all times from sun or drying winds
- Plants that cannot be planted immediately on delivery must be kept in the shade, well protected and adequately watered
- Plants must be handled in such a manner to avoid any damage

1.8 Placing

- Planting holes should be at least twice the size of the plant root ball
- The hole should be heavily watered immediately prior to planting and should have ample loose soil to ensure that root soil contact is complete and that no air gaps exist
- A slight depression should be made around the plant to assist in the trapping and infiltration of water
- Install plant stock to the areas indicated at the densities shown, in random pattern, insuring complete coverage

1.9 Fertilising and additives

- Appropriate fertiliser may be added to the plantings at the discretion of the contractor to ensure successful establishment.

1.10 Plant Establishment

- The Contractor is to maintain all plants for an establishment/maintenance period of 6 months from the date that all plants have been installed
- Records of all watering and maintenance carried out during the establishment period are to be maintained by the Contractor and supplied to the Superintendent
- Irrigate plantings throughout the establishment period unless the site receives adequate rainfall
- Plants should be irrigated as required to maintain growth rates free of stress
- Less frequent heavy watering is preferable to light watering
- The soil moisture content needs to be assessed daily and watering regime adjusted accordingly

1.11 Replacement

- Replace damaged or failed plants with plants of the same type and size
- Plant replacement will be at the cost of the contractor during the establishment/maintenance period.

1.12 Soil

Within the wetland macrophyte zones, topsoil should be placed to a minimum depth of 300 mm. Design levels for wetlands are inclusive of topsoil, therefore, when earthworks are occurring, allowance for topsoil is required.

Soils for planting must be of loose, friable consistency and of suitable fertility for plant growth. Soil lumps must be of a maximum 50mm dimension.

Soils for planting must be free from weeds, rocks, debris, and contaminants.

The application of lime may be required where the soil testing identifies a potential soil pH problem (pH < 5) or where acid sulphate soils are detected. The rate of application should be guided by soil test results, and the Acid Sulphate Management Plan (Env Solutions, 2021).

Stockpiled topsoil should be tested and approved by a certified laboratory and wetland designer and may need to be screened to remove any coarse organic matter.

1.1.1 Contamination

In the scenario that fuel, oil, cement or other phytotoxic material is spilt on subsoil or topsoil, excavate the contaminated soil, dispose of to the satisfaction of Byron Shire Council and replace with site soil or imported topsoil.

1.1.2 Installation and Aeration

Spread the media on the prepared surface and grade evenly.

- Fill areas of subsistence to achieve finished levels
- Avoid over compaction
- In areas of high compaction de-compact (rip to 100mm prior to planting)

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CLIENT: Byron Shire Council

DRAWING:
LANDSCAPE
SPECIFICATION - SOFTWORKS

PROJECT:
SANDHILLS WETLAND
DETAILED DESIGN PACKAGE

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SCALE NA

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SHEET No. 1-191194_DD_801