Technical Memorandum

16 September 2022

[redacted]

1 Introduction

1.1 Background

The Department of Defence is proposing to upgrade the Cocos (Keeling) Islands (CKI) airfield. The airfield is a Commonwealth of Australia asset falling under the jurisdiction of the Department of Infrastructure, Transport, Regional Development and Communications and managed by Toll Remote Logistics Pty Ltd. Upgrades to the CKI airfield are required to enable the Royal Australian Air Force to support P-8A Poseidon capability on the runway, reduce the safety risks associated with operating Code D aircraft on the airfield, and address non-compliances identified by the Civil Aviation Safety Authority. The enabling works proposed to support the project includes a accommodation compound to house the construction workforce at Lot 3003.

1.2 Scope of works and purpose of this memorandum

GHD Pty Ltd (GHD) was engaged by Fulton Hogan Construction Pty Ltd (Fulton Hogan) to conduct an inspection of Lot 3003 to provide information on the existing terrestrial flora and fauna values present. This memorandum provides a summary of the methods and results from the inspection completed during the site visit conducted in July 2022.

1.3 Investigation area

Lot 3003 (Investigation area) is the proposed accommodation area that required a flora and fauna site inspection. The investigation area is located on West Island. The location of the investigation area is shown in Figure 1.

1.4 Limitations and assumptions

This memorandum has been prepared by GHD for Fulton Hogan and may only be used and relied on by Fulton Hogan for the purpose agreed between GHD and Fulton Hogan as set out in Section 1.2 of this memorandum.

GHD otherwise disclaims responsibility to any person other than Fulton Hogan arising in connection with this memorandum. GHD also excludes implied warranties and conditions, to the extent legally permissible. The services undertaken by GHD in connection with preparing this memorandum were limited to those

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2. Methodology

2.1 Desktop assessment

Prior to the site visit a desktop assessment was undertaken to identify relevant flora and fauna information pertaining to the investigation area. The desktop assessment involved a review of:

– Previous reports relevant to the investigation area including:
  - Cocos (Keeling) Islands Airport Runway Refurbishment Project flora, avifauna and intertidal fauna assessment (GHD 2009)
  - Cocos (Keeling) Islands Airfield Upgrade Environmental Report (AECOM 2019).
– Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool (PMST) to identify communities and species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) potentially occurring within the investigation area (DCCEEW 2022a).
– The Department of Biodiversity, Conservation and Attractions (DBCA) *NatureMap* database for Threatened and Priority Ecological Communities (TECs and PECs) and flora and fauna species (including those listed under the Western Australian (WA) *Biodiversity Conservation Act 2016* (BC Act) or as a Priority by the DBCA) previously recorded from the investigation area (DBCA 2007–).

2.2 Field survey

GHD senior ecologist Angela Benkovic (Flora collection licence: FB62000080-2) completed a survey of the investigation area on 30 July to 2 August 2022. The survey was undertaken to identify and describe the dominant vegetation types, fauna habitats and their condition. Inventories of vascular flora and terrestrial vertebrate fauna species were also recorded at the time of survey.

The survey methodology employed by GHD was undertaken with reference to the WA Environmental Protection Authority (EPA) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) and *Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2020).

2.2.1 Vegetation and flora

Field survey methods involved traversing the investigation area by foot and recording vegetation type and condition as well as taking representative photographs. It is noted the investigation area was densely vegetated and access was limited to existing roads and adjacent cleared areas/tracks. Vegetation types were identified and boundaries delineated using field data/observations and aerial imagery. The vegetation condition was assessed and mapped in accordance with the vegetation condition rating scale for the Eremaean and Northern Botanical Provinces (EPA 2016). A flora inventory was compiled from opportunistic

records made throughout the investigation area. Species were identified in the field and by the use of taxonomic literature and online electronic databases. The conservation status of all recorded flora was compared against the current lists available on *FloraBase* (WA Herbarium 1998–) and the EPBC Act Threatened species database provided by (DCCEEW 2022b). Nomenclature used in this report follows that used by the WA Herbarium as reported on *FloraBase*.

2.2.2 Fauna

Field survey methods involved traversing the inspection area by foot and recording fauna habitat types as well as taking representative photographs. Similarly to the flora and vegetation survey, as the investigation area was densely vegetated, access was limited to existing roads and adjacent cleared areas/tracks. A fauna inventory was compiled from opportunistic records made throughout the investigation area. This included fauna observed, heard and noted from secondary evidence such as tracks, scats etc. Identification of fauna species was made in the field using available field guides and electronic guides (e.g. Morcombe 2004). Nomenclature used in this report follows that used by the WA Museum and the DBCA *NatureMap* database (DBCA 2007–).

3. Results

3.1 Site description

The investigation area is located within the central area of West Island, bound by Sydney Highway and the south west coastal strip of West Island. Although most of Lot 3003 is densely vegetated, Beacon Heights Road dissects the southern portion with several tracks branching north to Sydney Highway. The vegetation within these tracks has been cut down and mostly removed.. The topography of the investigation area is flat and soils were white to grey beach sand.

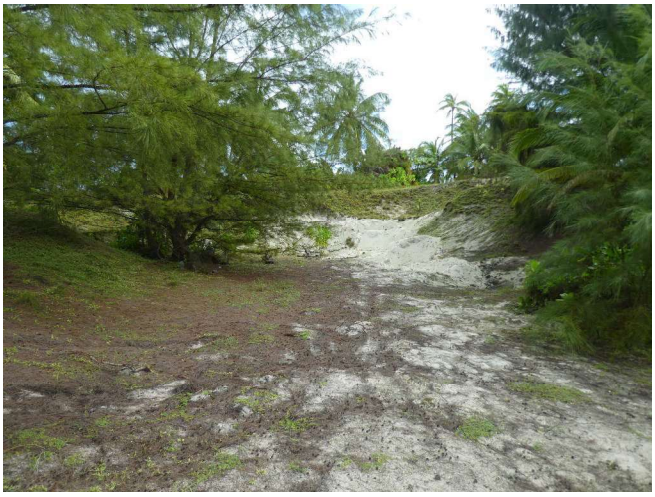
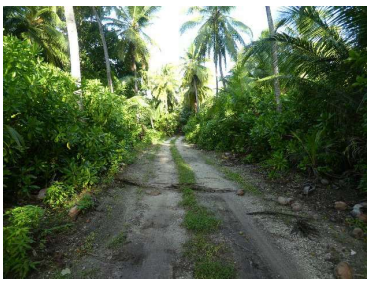
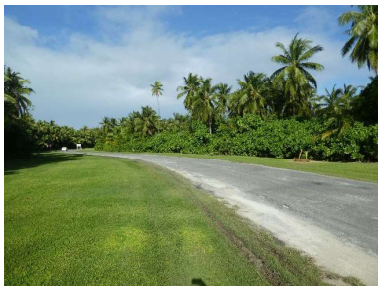
3.2 Vegetation types and condition

Two vegetation types were recorded within the investigation area, VT01 - *Cocos* palm closed forest and VT02 – Occasional natives over weeds (Table 1 and Figure 2). Within the investigation area was Beacon Heights Road and several tracks. Beacons Heights Road was a dirt road, whilst the tracks were cut down vegetation that had been coarsely mulched. These areas have been mapped as Access tracks/road.

Three *Terminalia catappa* trees were growing at the eastern entrance to the investigation area off Beacon Heights Road. Past these trees the vegetation becomes quite homogenous and is dominated by *Cocos nucifera* open forest over *Scaevola taccada* and *Morinda citrifolia* tall closed shrubland over **Turnera ulmifolia* low open shrubland. The access tracks were mostly devoid of vegetation however the edges were dominated by various grassy and herbaceous weeds.

The vegetation condition at the investigation area ranged from Completely Degraded to Very Good (Figure 2). Access tracks were rated Completely Degraded due to little to no native species present. A small disturbed area towards the coast was mapped as Degraded, this area had scattered occurrences of native shrubs and trees but the understorey was cleared and looked to be being used as a playground. The remainder of the investigation area was rated Very Good; the vegetation structure was intact and in most places impenetrable, the ground was covered in dense leaf and debris, which has reduced weed incursion.

Table 1 Vegetation types recorded from the investigation area

Vegetation type description	Representative photograph
VT01 - *Cocos nucifera* open forest *Cocos nucifera* open forest over *Scaevola taccada* and *Morinda citrifolia* tall closed shrubland over **Turnera ulmifolia* low open shrubland.	
VT02 - Occasional natives over weeds Occasional isolated occurrences of *Cocos nucifera* and/ or *Casuarina equisetifolia* over various grassy and herbaceous weeds, however **Tridax procumbens,* *Cynodon arcuatus and *Cyanthillium cinereum* were dominant	
Roads and access areas	 

3.3 Flora

Twenty one flora species were recorded from the investigation area (Table 2). This total included ten introduced (weed) species and eleven native species. No species listed under the EPBC Act or BC Act were recorded.

The investigation area is considered to have low floristic diversity.

Table 2 Flora species recorded at the investigation area

Family	Status	*Taxa*	VT01	VT02
Amaranthaceae	*	*Alternanthera bettzichiana*		X
Arecaceae		*Cocos nucifera*	X	X
Asteraceae	*	*Cyanthillium cinereum*		X
Asteraceae	*	*Tridax procumbens*		X
Brassicaceae	*	*Lepidium virginicum*		X
Casuarina	*	*Casuarina equisetifolia*	X	X
Combretaceae		*Terminalia catappa*	X	
Convolvulaceae		*Ipomoea micrantha*	X	
Cyperaceae		*Cyperus sp.*	X	
Cyperaceae		*Mariscus javanicus*	X	
Euphorbiaceae	*	*Euphorbia cyathophora*		X
Goodeniaceae		*Scaevola taccada*	X	X
Lauraceae		*Cassytha filiformis*	X	X
Malvaceae		*Thespesia populnea/ Hibiscus tiliaceus* subsp. *tiliaceus*[1]	X	
Passifloraceae	*	*Turnera ulmifolia*	X	X
Poaceae	*	*Cenchrus echinatus*		X
Poaceae	*	*Cynodon arcuatus*		X
Poaceae	*	*Paspalum vaginatum*		X
Poaceae		*Thuarea involuta*		X
Rubiaceae		*Morinda citrifolia*	X	
Sapindaceae		*Dodonaea viscosa*		X

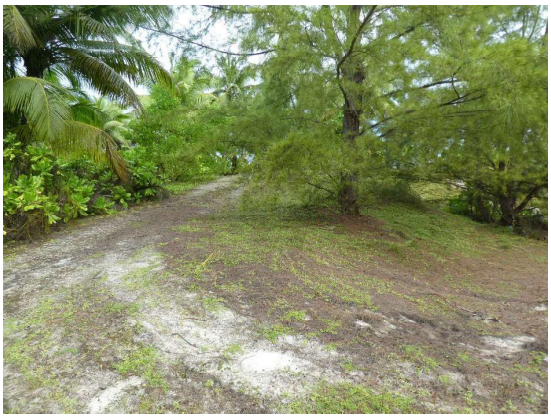
* indicates introduced species

[1] No flowering or fruiting material was available to identify

3.4 Fauna habitats

The investigation area comprised of two fauna habitats, Coconut palm forest with tall shrubs and Isolated trees/ grassland (Table 3 and Figure 3).The fauna habitats align with the mapped vegetation type. The habitat provided moderate to low value to fauna.

Table 3 Fauna habitat recorded at the investigation area

Fauna habitat description	Representative photograph
Coconut palm forest with tall shrubs This habitat contains a forest of Coconut palms over a dense tall shrubland. Not much light can penetrate through the shrub layer. The ground layer is comprised fallen palm fronds, coconuts and an very thick layer of leaf litter This habitat provides moderate value to fauna and may be used by avian and ground dwelling species for foraging. The vegetation would be too dense for the nesting of significant fauna. This habitat may provide foraging habitat for listed species including *Hirundo rustica* (Barn swallow), *Motacilla flava* (Yellow wagtail) and *Motacilla cinerea* (Grey wagtail).	
Isolated trees/ grassland This habitat contained the occasional isolated stands of Coconut palms and Sheoak over grass. This habitat provides low value to fauna it was used by ground dwelling fauna for foraging. This habitat is unlikely to be used by significant fauna.	

3.5 Fauna

Five fauna species were observed at the investigation area, the White tern (*Gygis alba*), White-breasted waterhen (*Amauronis phoenicurus*), Green jungle fowl (*Gallus varius*), Land crab (*Cardisoma carnifex*) and a Feral Cat (*Felis catus*). A pair of White terns in a large Sheoak became agitated when approached within the investigation area. They swooped a number of times so its assumed they had laid eggs on some branches nearby (Plate 1).

White-breasted waterhens and Green jungle fowl were observed foraging in the grassed areas and darting in and out of the vegetated areas adjacent to Sydney Highway. Land crabs were observed throughout the investigation area. A juvenile Feral cat, no more than a few months old was recorded in the Isolated trees/ grassland habitat.

Plate 1 *A pair of White terns observed resting in a large Casuarina equisetifolia*

4. Discussion and Conclusions

Two vegetation types were identified during the flora and fauna survey along with disturbed areas mapped as access tracks and roads.

Vegetation condition across the investigation areas ranged from Very Good to Completely Degraded. Most of the vegetation was mapped Very Good due to minimal weed incursion. Areas that had partial clearing for roads and access tracks were mapped as Completely Degraded as most species recorded in these areas were grassy and herbaceous weeds

Overall, species diversity on West Island is considered low, however this is to be expected on a purely coralline oceanic island. A historical detailed survey conducted by Williams (1994) recording only 130 native species across the 22 islands. Of all the islands West island was higher in diversity of exotic species with 32 out of 63 exotic species recorded. West Island is known to have only one endemic flora species, *Pandanus tectorius* var. *cocosensis* (Australian Government Publishing Service 1993). This species was not recorded within the investigation area. Most of the species diversity from the investigation area came from introduced grasses and herbs recorded within VT02 and access tracks. No EPBC Act or BC Act listed flora species were recorded within the investigation area during the survey.

One species recorded during the survey that may want to be considered for retention for aesthetic reasons is *Terminalia cappata*. Three individuals were recorded at the eastern entrance to the investigation area. This species is a common street scape species on West island and would provide a continuance to the current street scape of Beacon Heights Road.

Two fauna habitat types was identified during the flora and fauna survey. The fauna habitats recorded during the survey align with the vegetation types described. Overall, the fauna habitat types recorded from the investigation area are well represented across West Island.

The diversity of terrestrial fauna on West Island is limited, largely due to the lack of diversity in habitats as well as human impact. While there was a lack of habitat diversity recorded from the investigation area, the habitats present provide likely foraging habitat for the fauna species recorded during the survey. The fauna recorded during the survey included avian species, a cat and a crab. No significant fauna species were recorded within the investigation area during the survey The vegetation within the investigation area would be either too dense or too open and not suitable for nesting of significant fauna. However, the habitats present within the investigation area may provide foraging habitat for a number of significant fauna.

Regards

Angela Benkovic

Angela Benkovic
Senior Ecologist

References

AECOM Australia Pty Ltd (AECOM) 2019, Cocos (Keeling) Islands Airfield Upgrade Environmental Report, unpublished report prepared for Department of Defence.

Department of Biodiversity, Conservation and Attractions (DBCA) 2007–, NatureMap: Mapping WA's Biodiversity, retrieved July 2022, from http://naturemap.dpaw.wa.gov.au/default.aspx/.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2022a, Environmental Protection and Biodiversity Conservation Act 1999 Protected Matters Search Tool Results, retrieved July 2022, from https://www.dcceew.gov.au/environment/epbc/protected-matters-search-tool

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2022b, Environment Protection and Biodiversity Act 1999 List of Threatened Flora and Fauna, retrieved July 2022, from https://www.dcceew.gov.au/environment/biodiversity/threatened

Environmental Protection Authority (EPA) 2016, Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment, EPA, WA.

Environmental Protection Authority (EPA) 2020, Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment, EPA, WA.

Australian Government Publishing Service 1993, *Flora of Australia Volume 50, Oceanic islands 2*, Canberra

GHD Pty Ltd (GHD) 2009, Cocos (Keeling) Islands Airport Runway Refurbishment Project, Ecology Report, unpublished report prepared for Attorney General's Department.

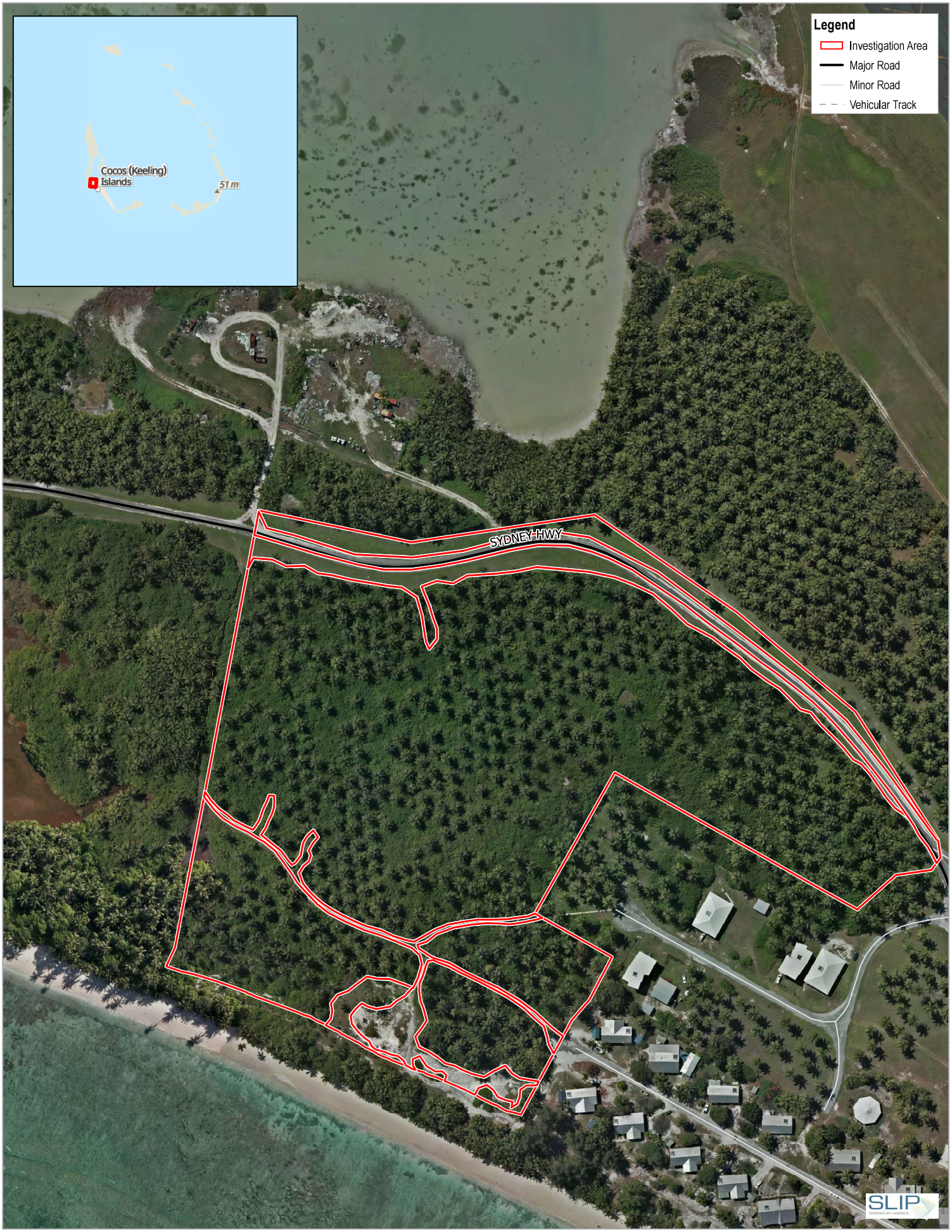
Morcombe M 2004, Field Guide to Australian Birds, Queensland, Australia, Steve Parish Publishing Archer Field.

WA Herbarium 1998–, FloraBase–the Western Australian Flora, Department of Biodiversity, Conservation and Attractions, retrieved September 2020, from http://florabase.dpaw.wa.gov.au/.

Williams DG 1994, Vegetation and Flora of the Cocos (Keeling) Islands. National Museum of Natural History, Smithsonian Institution, Washington DC, USA.

Attachment 1

Figures



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GHD

Fulton Hogan
COCOS (KEELING) ISLAND
AIRFIELD UPGRADE

Project Location

Project No. 12525136
Revision No. 0
Date 9/08/2022

FIGURE 1

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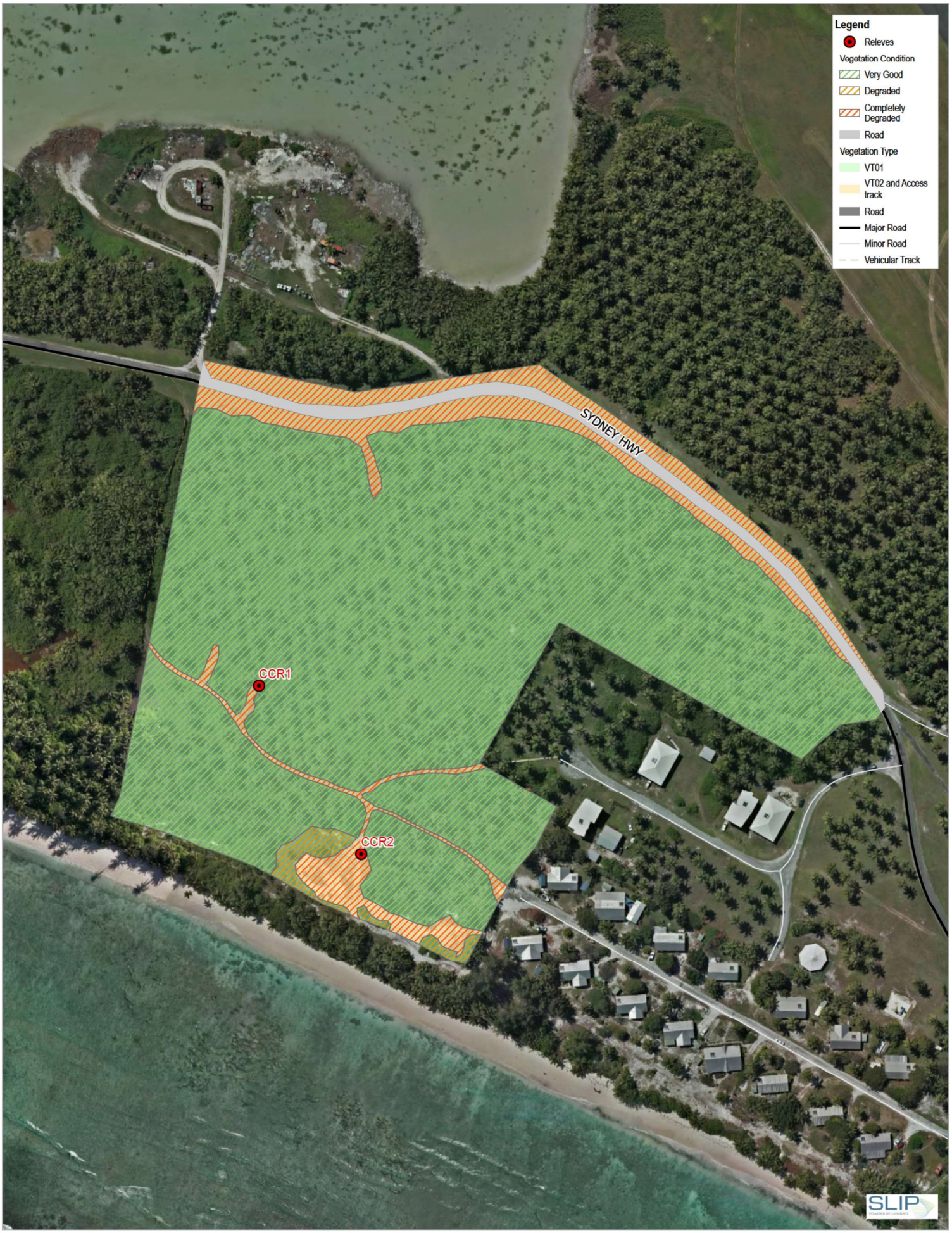
World Hillshade: Esri, NASA, NGA, USGS. Created by: wwang3



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Fulton Hogan
COCOS (KEELING) ISLAND
AIRFIELD UPGRADE

Project No. **12525136**
Revision No. **0**
Date **9/08/2022**

Vegetation Types & Condition

FIGURE 2

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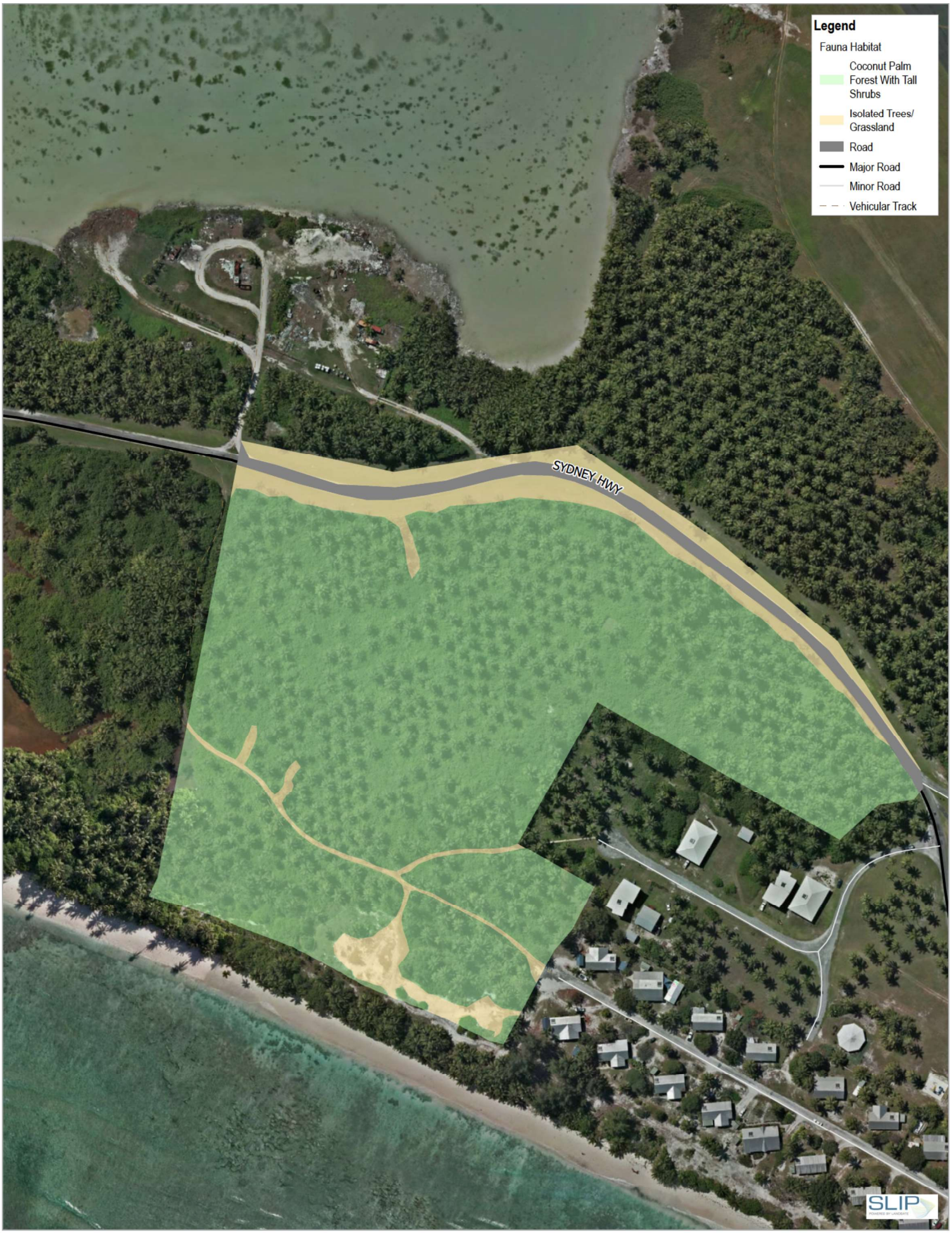

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GHD

Fulton Hogan
COCOS (KEELING) ISLAND
AIRFIELD UPGRADE

Fauna Habitat

Project No. **12525136**
Revision No. **0**
Date **9/08/2022**

FIGURE 3

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