Christmas Island Housing Support – Phosphate Hill - Environmental Assessment Report (EAR)

Shire of Christmas Island

Report

JBS&G 67277 | 167,617

11 February 2026

We acknowledge the Traditional Custodians of Country throughout Australia and their connections to land, sea and community.

We pay respect to Elders past and present and in the spirit of reconciliation, we commit to working together for our shared future.

Caring for Country The Journey of JBS&G
Artist: Patrick Caruso, Eastern Arrernte

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1. Introduction

1.1 Background

The Shire of Christmas Island, through the Australian Government's Housing Support Program Stream 1 have received funds to implement preliminary works to support the development of its Christmas Island Housing Futures Masterplan. The proposed works are to safeguard the future of Christmas Islanders, by providing social housing, affordable housing and alternative housing locations to facilitate the ultimate relocation of the Kampong community, which is currently at risk from sea level rises, cyclonic storm surge induced inundations and landslides/rockfalls caused by heavy monsoon rains. This approach requires the development of a Structure Plan at Phosphate Hill (Figure 1.1) as per the requirements of the Western Australian Planning Commission (WAPC) and aligns with Commonwealth Department of Home Affairs and Australian Institute for Disaster Resilience (2020) Land Use Planning for Disaster Resilient Communities.

1.2 Purpose, Scope and Structure of this Document

This Environmental Assessment Report (EAR) has been prepared to support the Local Structure Plan for the Phosphate Hill proposed development.

The purpose of this EAR is to demonstrate that all environmental considerations associated with the future land use and development scenarios can be managed in accordance with policy requirements. As such the EAR addresses:

- applicable legislation, policy, and guidance;
- the environmental, bushfire, and heritage values of the site;
- potential impacts to the above characteristics associated with the proposed development; and
- the spatial and management response of the development to ensure that any identified potential impacts can be mitigated or managed to avoid 'significant' impacts.

Legend

- Structure Plan Boundary
- Mining Lease (DMIRS-003)
- Ramsar site
- Christmas Island National Park
- Cadastral boundary (LGATE - 002)

Roads (LGATE - 195)

- Minor road
- Track

JBS&G

0 200 metres

Job Number: 67277		Scale 1:10,000 at A3		**Phosphate Hill, Christmas Island**
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48		**SITE LOCATION**
Drawn By: droberts	Checked By: RP	Version: Rev A	Date: 10-Feb-2026	**FIGURE: 1.1**

Document Path: C:\Users\droberts\JBS&G Australia\DCS - Internal - V2\Projects\Shire of Christmas Island\67277 CI Housing\GIS\02_MapProjects\67277 CI Housing EAR Phosphate Hill R05.aprx

Image Reference: World Terrain Base: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
World Hillshade: Esri, USGS and 2011 Orthoimage

2. Legislation, Policies, and Guidelines

The legislative framework for Christmas Island is complex. The Christmas Island Act 1958 outlines the governance arrangements for the island. Section 8E of the Act makes provision for all laws of Western Australia and the Commonwealth to apply in Christmas Island. The Minister lists selected Western Australian laws to be excluded or amended in the *Applied Laws (Implementation) Ordinance 1992*. The island is governed under Commonwealth legislation and administered by the Department of Infrastructure, Transport, Regional Development, Communications and the Arts (DITRDCA). Applied Western Australian laws are administered by the relevant Commonwealth Minister, by Commonwealth officers acting under ministerial delegations, or by State officers exercising delegated power and acting pursuant to inter-government service agreements under Section 8h of the Act. The community is represented in the Federal Parliament by the Member for Lingiari in the House of Representatives and the two Senators for the Northern Territory in the Senate with local Government (i.e. Shire of Christmas Island) utilising Western Australia legislation.

2.1 Federal Legislation

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Department of Climate Change, Energy, the Environment and Water (DCCEEW). The EPBC Act aims to protect and manage nine Matters of National Environmental Significance (MNES) throughout Australia including:

- World Heritage Properties;
- National Heritage Places;
- wetlands of international importance (listed under the Ramsar Convention);
- listed threatened species and ecological communities;
- migratory species protected under international agreements;
- Commonwealth Marine Areas;
- Great Barrier Reef Marine Park;
- nuclear actions (including uranium mines); and
- a water resource, in relation to coal seam gas development and large coal mining development.

2.2 State Legislation

The key environmental legislation in Western Australia is detailed below:

- *Environmental Protection Act 1986* (EP Act) and Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (Clearing Regulations);
- *Biodiversity Conservation Act 2016* (BC Act);
- *Biosecurity and Agriculture Management Act 2007* (BAM Act);
- *Rights in Water and Irrigation Act 1914* (RIWI Act);
- *Metropolitan Water Supply, Sewerage and Drainage Act 1909* (MWSSD Act);
- *Aboriginal Heritage Act 1972* (AH Act);
- *Contaminated Sites Act 2003* (CS Act) and Regulations (2006); and
- *Planning and Development Act 2005* (PD Act).

2.2.1 Environmental Protection Act 1986

The EP Act is the primary environmental legislation in Western Australia and is administered by the Environmental Protection Authority (EPA) and the Department of Water and Environmental Regulation (DWER). The Act provides for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing.

Part IV of the EP Act makes provisions for the EPA to undertake environmental impact assessment of significant proposals, strategic proposals and land use planning schemes. The EPA uses environmental principles, factors and associated objectives as the basis for assessing whether a proposal or land use planning scheme's impact on the environment is acceptable.

2.2.2 Biodiversity Conservation Act 2016

The BC Act has replaced the *Wildlife Conservation Act 1950*. On 3 December 2016, several parts of the new Act were enacted by the State Governor. The remaining parts of the Act and the associated Regulations came into effect on 1 January 2019.

In addition to providing for the protection of flora and fauna, the Biodiversity Conservation Act 2016 includes provisions for threatened ecological communities, threatening processes, critical habitats and environmental pests.

2.3 Environmental Protection Authority (EPA) Guidance

EPA regulatory guidance that is given consideration during the assessment process is listed below:

- *Environmental Factor Guideline – Social Surroundings* (EPA, 2023)*;*
- *Environmental Factor Guideline – Human Health* (EPA, 2016b)*;*
- *Environmental Factor Guideline – Inland Waters* (EPA, 2018a)*;*
- *Environmental Factor Guideline – Terrestrial Fauna* (EPA, 2016d)*;*
- *Environmental Factor Guideline – Terrestrial Environmental Quality* (EPA, 2016c)*;*
- *Environmental Factor Guideline – Landforms* (EPA, 2018b)*;*
- *Environmental Factor Guideline – Flora and Vegetation* (EPA, 2016a)*;*
- *Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA, 2020)*;*
- *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016e)*;*
- *Guidance Statement No. 33 Environmental Guidance for Planning and Development* (EPA, 2008)*;* and
- *Guidance for planning and development: Protection of naturally vegetated areas in urban and peri-urban areas* (EPA, 2021)*.*

2.3.1 State Planning Policies

The WAPC prepares and adopts state planning policies under statutory procedures set out in Part 3 of the *Planning and Development Act 2005* (WAPC, 2005). State planning policies relevant to the project are listed below:

- State Planning Policy 2.0: *Environment and natural resources policy* (SPP 2.0) (WAPC, 2003);
- State Planning Policy 2.9 *Planning for Water* (SPP 2.9) (WAPC, 2025) and *Planning for Water Guidelines* (WAPC, 2025)*;* and

- State Planning Policy 3.0 *Urban Growth and Settlement* (SPP 3.0) (WAPC, 2006).

2.4 Local Government Policies, Strategies and Guidance

The Shire of Christmas Island has developed numerous polices, strategies and guidelines relevant to planning and the environment, as listed below. Reference to these documents has been made throughout the report where applicable to a specific environmental factor.

- Shire of Christmas Island Local Planning Strategy 2015; and
- Shire of Christmas Island Local Planning Scheme No. 2.

The Shire of Christmas Island Local Planning Strategy was endorsed in May 2015. Local Planning Scheme No. 2 received approval in accordance with the requirements of the *Planning and Development Act 2005* (WA) (CI) in February 2016. The new scheme includes a stated objective "*to enhance and diversify the island's economic base through the provision of land for a range of economic activities,*" (Shire of Christmas Island, 2016) which also included urban development and possible new tourism opportunities.

3. Overview of Existing Environmental Attributes

3.1 Land Use

The current land use for the development area is “unimproved”. The site is zoned “Residential”, “Rural” and “Crown Reserve”. Road reserve connection through the proposed Future Environmental Conservation area is also planned to provide connection through to the existing road network.

3.2 Climate

Christmas Island lies on the southern edge of the inter-tropical convergence zone and the climate is dominated by a low-pressure trough that seasonally circles the equator. The Island has a tropical monsoonal climate with distinct wet and dry seasons and little seasonal variation in temperature. The dry season (May to November) is dominated by low and sporadic rainfall (see Figure 3.1) with consistent south-east trade winds (BOM, 2024). The wet season generally occurs from December to April with the Island receiving most of its rainfall during this period.

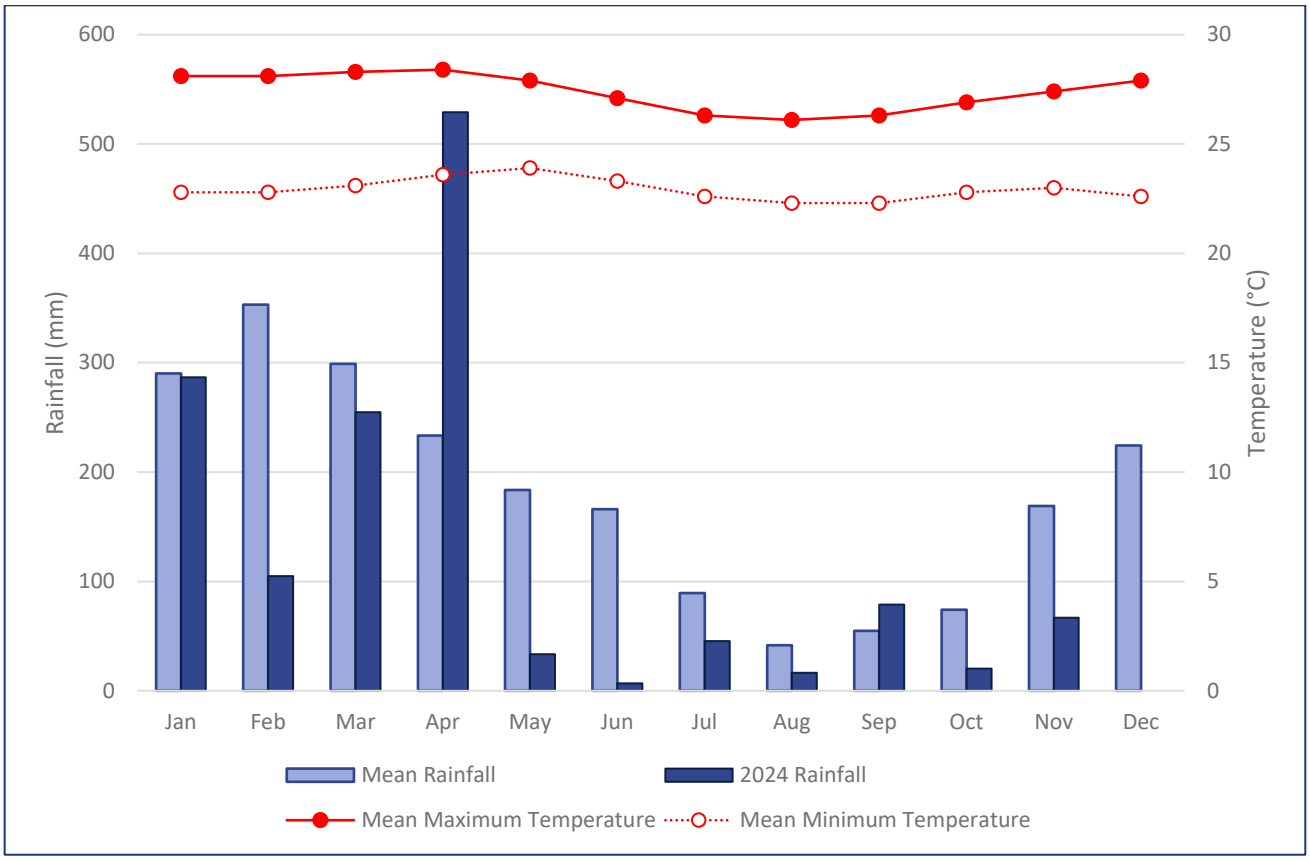

Figure 3.1 Climate data from Christmas Island Aero weather station (200790)

3.3 Soils and Landforms

Christmas Island is one of a series of submarine seamounts that rise above the 5,500 m deep abyssal areas of the West Australian Basin. The topography of the Survey Area is shown in Figure 3.3. At the core of the Island are volcanic rocks, mainly composed of basalt with a layer of limestone generally covering these volcanic rocks (Figure 3.2) which occasionally outcrops, particularly along the present coastline (Grimes, 2001).

The Island is characterised by sea cliffs that rise via a series of terraces to a central plateau (Figure 3.2)which peaks at approximately 361 m above sea level (Grimes, 2001). The shoreline is dominated by cliffs and

extensive shore platforms with a few small beaches and Flying Fish Cove, which has a relatively large beach and shallow platform, being the only safe harbour for much of the year. The Island's natural landscape is dominated by karstic surface landforms and cave systems (Grimes, 2001).

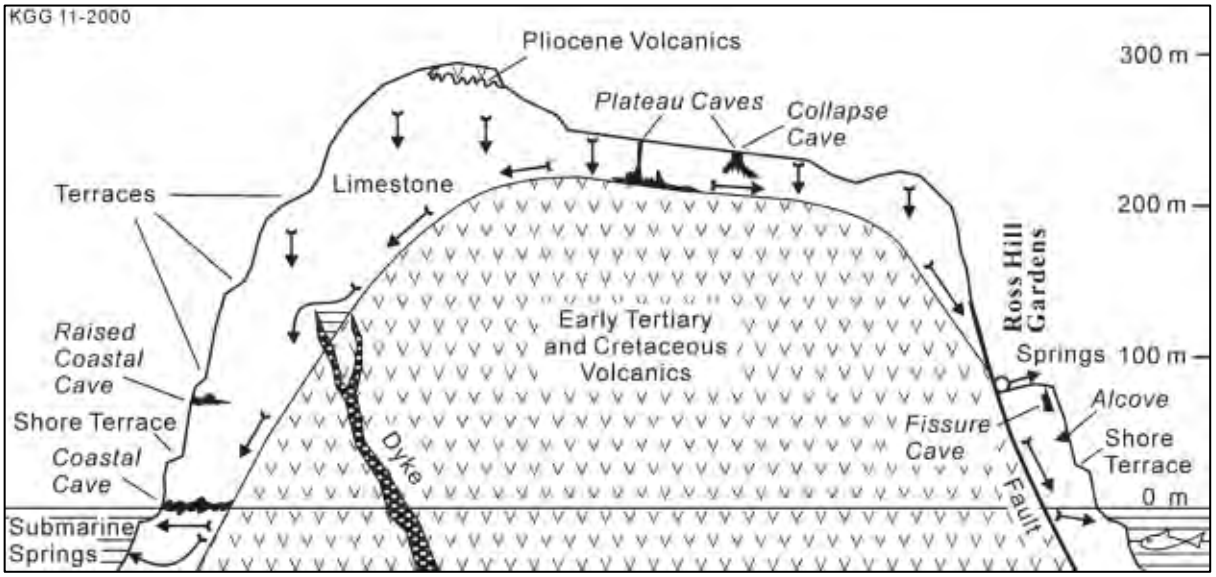

Figure 3.2 Diagrammatic cross section of Christmas Island

Terrace areas on the Island reflect the height above sea level in different geologic periods. Renewed vulcanism and a series of geological uplifts at different periods have resulted in a tiered effect. The oldest limestones near the peak of the Island formed during the Eocene period (Grimes, 2001). Most the Island's limestone deposits were formed during the Tertiary (late Oligocene to mid Miocene age), with the youngest limestones deposited on the lowest terrace in the late Quaternary (Grimes, 2001).

The limestone is mixed with dolomite sediments, basalts and tuffs. A layer of phosphate-rich soil material covers the limestone over about half of the Island. Marine sediments and guano deposition have formed the Island's phosphatic soils.

The red crab (Gecarcoidea natalis) is the principle agent of organic matter turnover and incorporation into the soil, with consequent low levels of leaf litter on the island. Crab activity is a key feature of water and nutrient availability in the subsoil, with burrows also providing a preferred pathway for water drainage into the soil (Hollingsworth, 2003).

The proposed clearing areas range from the island's older terraces to the plateau. These areas contain a combination of exposed limestone and deeper phosphatic soils. Geoscience Australia has mapped the JBS&G (2025) Survey Areas as being dominated by limestone pinnacles with varying amounts of soil (Table 3.1 and Figure 3.4). The broader Structure Plan area was composed of the same three geological units (Geoscience Australia, 2003).

Table 3.1 Geological units within the Survey Area (Geoscience Australia, 2003))

Geological Unit	Phosphate Hill	Total
Czp: Unconsolidated material – mostly phosphatic soil containing >20% P2O5	6.28 ha	**6.28 ha**
Tz: Limestone - undifferentiated	2.65 ha	**2.65 ha**
Tzp: Pinnacles of limestone with variable amounts of unconsolidated material (Czp)	14.83 ha	**14.83 ha**
Total	**23.76 ha**	**23.76 ha**

Christmas island is not included in Western Australian soil-landscape mapping.

Legend

- Clearing Area - Stage 1
- Clearing Area - Stages 2-7
- Future Environmental Conservation
- Structure Plan Boundary
- JBS&G (2025) Survey Area
- Cadastral boundary (LGATE-002)
- Topographic contours in m AHD (DataWA-2011)

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 200 metres

Job Number: 67277		Scale 1:8,000 at A3		**Phosphate Hill, Christmas Island**
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48		**TOPOGRAPHY**
Drawn By: droberts	Checked By: RP	Version: Rev A	Date: 10-Feb-2026	**FIGURE: 3.3**

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Image Reference: 2011 Orthoimage

573000 573200 573400 573600 573800 574000 574200 574400 574600 574800 575000

8847800 8847600 8847400 8847200 8847000 8846800 8846600 8846400 8846200 8846000 8845800 8845600 8845400 8845200

Legend

- Clearing Area - Stage 1
- Clearing Area - Stages 2-7
- Future Environmental Conservation
- Structure Plan Boundary
- JBS&G (2025) Survey Area

Geology

- Czl,Pellet limestone, contains pellets and pebbles of phosphate rock
- Czp,Unconsolidated material - mostly phosphatic soil containing >20% P2O5
- Limestone/Talus,Limestone/Talus
- Tb,Volcanics - mostly basalt, some tuff, scoria - undifferentiated
- Tel,Limestone
- Tz,Limestone - undifferentiated
- Tzp,Pinnacles of limestone with variable amounts of unconsolidated material (Czp)

JBS&G

0 200 metres

Phosphate Hill, Christmas Island

SOILS AND LANDFORMS

Job Number: 67277		Scale 1:8,000 at A3		
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48		
Drawn By: droberts	Checked By: RP	Version: Rev A	Date: 10-Feb-2026	**FIGURE: 3.4**

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Image Reference: 2011 Orthoimage

3.4 Hydrology

A major feature of the Christmas Island geomorphology is the lack of surface drainage. Rainfall mostly infiltrates the land surface and is utilised by plants, contributes to soil water stores or recharges to groundwater. There is therefore no significant surface drainage network except down gradient of springs that arise at the interface between limestone and basalt formations.

Christmas Island's soils are generally highly permeable and there is consequently little runoff or erosion (Hollingsworth, 2003). In the Wet Season when the soils are saturated, runoff can occur during heavy rainfall providing some risk of erosion and sedimentation. However, given the high natural infiltration rates the risk of erosion and sedimentation is generally localised to compacted areas such as roads and stockpile pads. Infiltration tests by Puhalovich et al. (2003) indicate that soil infiltration rates are typically substantially higher than hourly rainfall intensities.

There are three key hydrogeological units on the Island; shallow, residual soils, which overlie fractured, unconfined – semi-confined aquifers within the karstic limestone rocks, which in turn overlie relatively impermeable volcanic basement rocks (Puhalovich, et al., 2003).Groundwater levels on the Island are reflected by the location of the unconfined water table within the karst limestone aquifers. Limestone aquifers can be recharged when rainfall permeates through the soil zone into the underlying aquifers or by direct runoff of rainfall into karst features such as dolines and sinkholes that occur across the Island (Puhalovich, et al., 2003).Assessments suggest that approximately half of all incident rainfall passes through the soil zone and recharges the underlying limestone aquifers (Hollingsworth, 2003; Falkland, 1999) . Groundwater discharge occurs at surface springs such as Hosnie's Spring and offshore springs such as those found at Flying Fish Cove (Puhalovich, et al., 2003).The complex behaviour and extent of weathered/fractured rock aquifers on the Island are not well understood.

Perennial (permanent) surface aquatic habitats (freshwater) on Christmas Island are limited to a number of spring-fed streams found along coastal or sloping areas of the Island. Hosnie's Spring and The Dales are both listed as a Wetland of International Importance under the Convention on Wetlands of International Importance, Water Fowl Habitat 1971 (known as the 'Ramsar Convention') and are listed in the Directory of Important Wetlands in Australia. These two sites are approximately 5.0 km and 12.5 km respectively from the Phosphate Hill proposal area at closest point. Neither wetland is expected to be impacted due to any potential surface flow from the development area, which is likely to flow away from Hosnie's Spring, and the distance to The Dales.

3.5 Regional Vegetation

JBS&G (2025) prepared a *Christmas Island Housing Support Flora, Fauna and Vegetation Assessment*. The report identified that three features of the ecology of the Island's native vegetation are notable (Environment Australia, 2014):

- The occurrence of many of the widespread Indo-Malesian species in habitats that would be considered extremely atypical elsewhere in their natural ranges, and associated with this, the exceptionally large stature of some of these species;
- The low diversity of canopy and sub-canopy species and the lack of structural complexity (e.g. relatively poor development of robust woody vines and rattans, the absence of aroids and of gingers in the understorey) in the Island's rainforests; and
- The very low diversity and lack of speciation amongst plant genera that elsewhere in the region is characteristic of early successional, and frequently disturbed, rainforest environments (e.g. *Macaranga, Claoxylon* and *Pipturus*).

In contrast to mainland vegetation, plant species occurring on Christmas Island are not sclerophyllous, have a high moisture content, larger leaves and fewer volatile organic compounds.

573000 573200 573400 573600 573800 574000 574200 574400 574600 574800 575000

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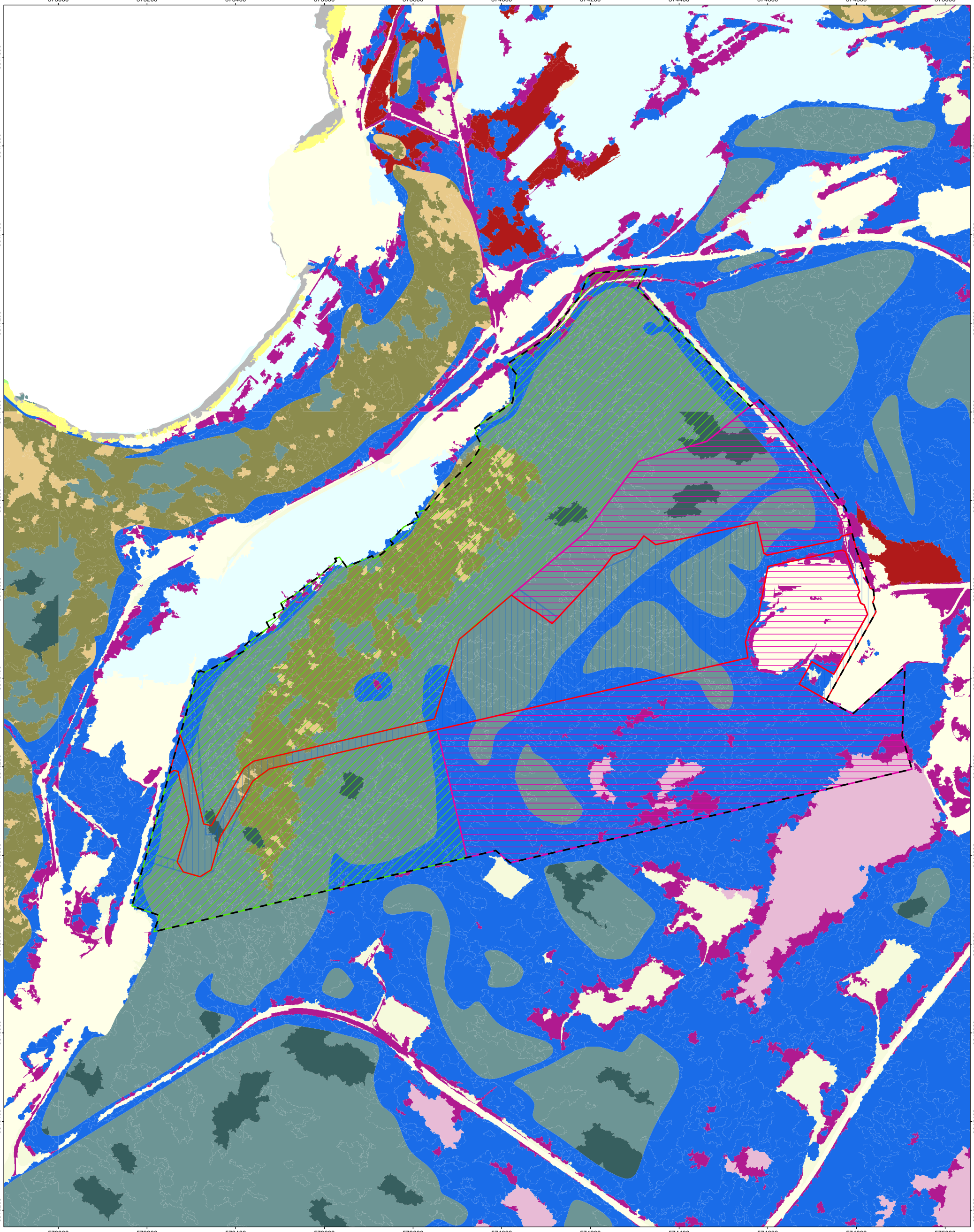

Legend

- Clearing Area - Stage 1
- Clearing Area - Stages 2-7
- Future Environmental Conservation
- Structure Plan Boundary
- JBS&G (2025) Survey Area

- Closed canopy evergreen forest (tall)
- Closed canopy evergreen forest (moderate)
- Semi-deciduous forest
- Semi-deciduous scrub
- Regrowth
- Coastal shrubland
- Coastal herbland

- Leaucanea leucocephala dominant
- Mixed weed and pioneer species
- Fern field
- Coastal pinnacles/sand
- Bare ground
- Residential
- Infrastructure

JBS&G

0 200 metres

Job Number: 67277

Scale 1:8,000 at A3

Client: Shire of Christmas Island

Coord. Sys. GDA2020 MGA Zone 48

Drawn By: droberts | Checked By: RP | Version: Rev A | Date: 10-Feb-2026

Phosphate Hill, Christmas Island

REGIONAL VEGETATION

FIGURE: 3.5

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Image Reference: Vegetation mapping Geoscience Australia

The geology, geomorphology and climate on Christmas Island create the biophysical environment and constraints for the vegetation communities. These factors determine the soil nutrient status, the seasonal availability of moisture and the degree of exposure to wind, which in turn control the distribution, structure and functioning of the natural vegetation (Director of National Parks, 2014a).

Vegetation mapping of the Island was initially undertaken by Mitchell (1985) for the Australian Nature Conservation Agency. This mapping had limited use due to its broad scale and spatial inaccuracy. Flora of Australia Volume 50 (1993) listed eight vegetation types for the Island.

A vegetation mapping project was undertaken from 2011 to 2014 to attempt to map vegetation with better spatial accuracy, to determine height categories and to apply these consistently across the Island. The process included a Light Detection and Ranging (LiDAR) survey, review of historic aerial photography which captured past clearing, and ground truthing. Additional categories were added to include wetland vegetation and regrowth in cleared areas. The Christmas Island Vegetation and Clearing Map was developed through a collaborative project by Geoscience Australia, Christmas Island Phosphates, Christmas Island National Park and the Commonwealth Department of the Environment (Geoscience Australia, 2014). The map classified the full extent of Christmas Island into vegetation and land cover classes (Table 3.2 and Figure 3-5) though boundaries are not always perfectly geographically accurate. Flora of Australia's vegetation types, which are still referred to in some documents, were recategorized thus:

- 'Primary rainforest' became closed canopy evergreen forest;
- 'Marginal rainforest' became semi-deciduous forest;
- 'Areas with surface water' became perennial wetland forest;
- 'Open forest, scrubby forest and vine forest' and 'inland cliffs' became semi-deciduous scrub;
- 'Coastal fringe' and 'shore cliffs and spray zone' became coastal fringe vegetation; and
- 'Mined areas' became rehabilitation, regrowth and weed dominated veg and pioneer regrowth.

Some 25% of the Island's original vegetation has been cleared for mining and infrastructure (Director of National Parks, 2014a).

Table 3.2 Vegetation of Christmas Island

Level 1	Level 2	Description
Closed canopy evergreen forest	Closed canopy evergreen forest (tall or moderate)	Generally found on the plateau and terraces, with a closed uneven canopy up to 40 m in height. Some trees emerge up to 10 m above the canopy. Often supports ferns and orchids, young palms and lilies in the understorey. **Indicator species:** *Bolbitis heteroclita, Syzygium nervosum, Hernandia ovigera, Planchonella nitida, Pisonia umbellifera, Corymborkis veratrifolia, Ehretia javanica*
Semi-deciduous forest	Semi-deciduous forest	Generally found on the slopes and terraces down to the coast - and some plateau areas. Higher occurrence of semi-deciduous trees compared to Closed Canopy Evergreen, which lose a portion of leaves during the dry season. Tree height generally 10-25 m. **Indicator species:** *Terminalia, Gyrocarpus, Erythrina variegata, Premna serratifolia, Pisonia grandis, Ochrosia ackeringae*
Semi-deciduous scrub	Semi-deciduous scrub	Found on the terraces, steep slopes and inland cliffs. Semi-deciduous canopy with vines and shrub understorey Tree height generally <10 m. **Indicator species:** §*Colubrina pedunculata, Canavalia cathartica, Carmona retusa*, Cycads
Perennial wetland forest	*Inocarpus fagifer* dominant	Areas of fresh water runoff on the lower terraces dominated by *Inocarpus fagifer*. **Indicator species:** *Inocarpus fagifer*

Level 1	Level 2	Description
	Hibiscus tiliaceus dominant	Areas of fresh water runoff on the shore terrace dominated by *Hibiscus tiliaceus*. **Indicator species:** *Hibiscus tiliaceus*
	Bruguiera dominant	A single patch of vegetation dominated by *Bruguiera* at Hosnie's Spring. Occurring in an area of fresh water runoff on the shore terrace. **Indicator species:** *Bruguiera gymnorhiza*
Coastal fringe vegetation	Coastal herbland	Found between the coastal scrub and coastal cliffs in exposed areas. Class is dominated by low-lying herbs, sedges and grasses. **Indicator species:** *Portulaca tuberosa,* §*Ischaemum nativitatis, Oplismenus compositus, Sporobolus virginicus*
	Coastal shrubland	Dense salt-tolerant vegetation growing between the coastal herbland and the terrace cliffs. **Indicator species:** §*Pandanus christmatensis, Scaevola, Pemphis, Argusia argentea, Cordia cordata, Guettarda*
Rehabilitation	Rehabilitation	Areas where forest rehabilitation has taken place. The standard of forest varies depending on the type of rehabilitation completed, species planted and management regime. **Indicator species:** A mix of up to 30 native tree species when initially planted, dependent on characteristic of the site and year of rehabilitation. *Macaranga, Dysoxylum, Calophyllum, Tristiropsis*
Regrowth	Regrowth	Generally well-developed regrowth vegetation over 5 m mean tree height. May include some introduced or weed species. **Indicator species:** Various species – dependent on adjacent vegetation
Weed dominated veg and pioneer regrowth	**Leucaena leucocephala*	Monoculture of **Leucaena leucocephala*. Often occurring as regrowth in previously cleared areas. **Indicator species:** **Leucaena leucocephala*
	Fern field	Expanse of low-lying ferns often growing on limestone pinnacles. **Indicator species:** *Nephrolepis biserrata*, *Microsorum scolopendria, Psilotum nudum*
	Mixed weed and pioneer regrowth	Regrowth vegetation with a mean tree height of <5 m. Can vary between native and introduced species depending on the location and time since clearing. Tends to have a higher occurrence of weed species compared to the 'Regrowth' category. **Indicator species:** **Muntingia calabura, *Psidium* sp. (guava), **Mimosa*, Passionfruit, *Macaranga*

Sources: Du Puy, 1993a and Geoscience Australia (2014)

3.6 Significant Communities, Flora and Fauna

3.6.1 Ecological Communities

There are no Threatened Ecological Communities (TEC's) listed under the EPBC Act or BC Act occurring on Christmas Island.

3.6.2 Significant Flora

Three conservation-significant vascular terrestrial flora taxa were identified by PMST searches (DBCA does not maintain records of significant flora on Christmas Island) as potentially occurring within the JBS&G (2025) Survey Area (refer to Figure 2.8 of Appendix 1). The likelihood of these taxa occurring within the Survey Area was assessed against their habitat preferences and regional distribution. Of the three, two were considered as possibly occurring within the JBS&G (2025) Survey Area (refer to Table 3-3).

Table 3.3 Significant flora likelihood of occurrence

Genus (& Family)	Conservation Status		Description	Likelihood of Occurrence
	EPBC Act	BC Act		
Asplenium listeri (Aspleniaceae)	CR	Not listed	A lithophytic fern with short erect fronds, 3.5–9 cm long, which grow in a crown. Occurs in Limestone rock crevices in dry, exposed areas.	**Possible** – preferred habitat occurs within the Survey Area
Tectaria devexa var. *minor* (Dryopteridaceae)	EN	Not listed	A small, tufted, terrestrial fern with pale green fronds. Occurs in Primary rainforest (tall and largely undisturbed), above 80 metres elevation; both in deeper soils and as a lithophyte (on mossy pinnacles at the base of a slope, a wet site).	**Possible** – preferred habitat occurs within the Survey Area
Pneumatopteris truncata (Thelypteridaceae)	CR	Not listed	A large terrestrial fern with an erect rhizome and fronds growing in a crown to 120 cm long. The fronds have aerophores (respiratory structures) at the base of the pinnae. Occurs in permanently moist sites in semi-deciduous closed forest.	**Unlikely** – preferred habitat occurs within the Survey Area but known occurrences are distant.

Asplenium listeri is listed as Critically Endangered under the EPBC Act and is endemic to Christmas Island. *Tectaria devexa* var. *minor* is listed as Endangered under the EPBC Act and occurs in Sri Lanka as well as Christmas Island. *Pneumatopteris truncata*, which is listed as Critically Endangered under the EPBC Act, has a fragmented distribution over Asia and Malaysia as well as being known from two sites on Christmas Island.

Plate 1 *Asplenium listeri, Tectaria devexa* var. *minor* and *Pneumatopteris truncata* (from left to right)[1]

Records of these are maintained by Christmas Island Phosphates and Parks Australia.

[1] Sources: Khaliesha Amin, Butz (2004), http://www.phytoimages.siu.edu/

Legend

- Clearing Area - Stage 1
- Clearing Area - Stages 2-7
- Future Environmental Conservation
- Structure Plan Boundary
- JBS&G (2025) Survey Area
- Cadastral boundary (LGATE-002)

Significant Flora (Source: Phosphate Resources)

- *Asplenium listeri*
- *Tectaria devexa var. minor*

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 500 metres

Job Number: 67277		Scale 1:14,000 at A3	
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48	
Drawn By: droberts	Checked By: RP	Version: Rev A	Date: 10-Feb-2026

Phosphate Hill, Christmas Island

DESKTOP SIGNIFICANT FLORA

FIGURE: 3.6

Document Path: C:\Users\droberts\JBS&G Australia\DCS - Internal - V2\Projects\Shire of Christmas Island\67277 CI Housing\GIS\02_MapProjects\67277 CI Housing EAR Phosphate Hill R05.aprx

Image Reference: 2011 Orthoimage

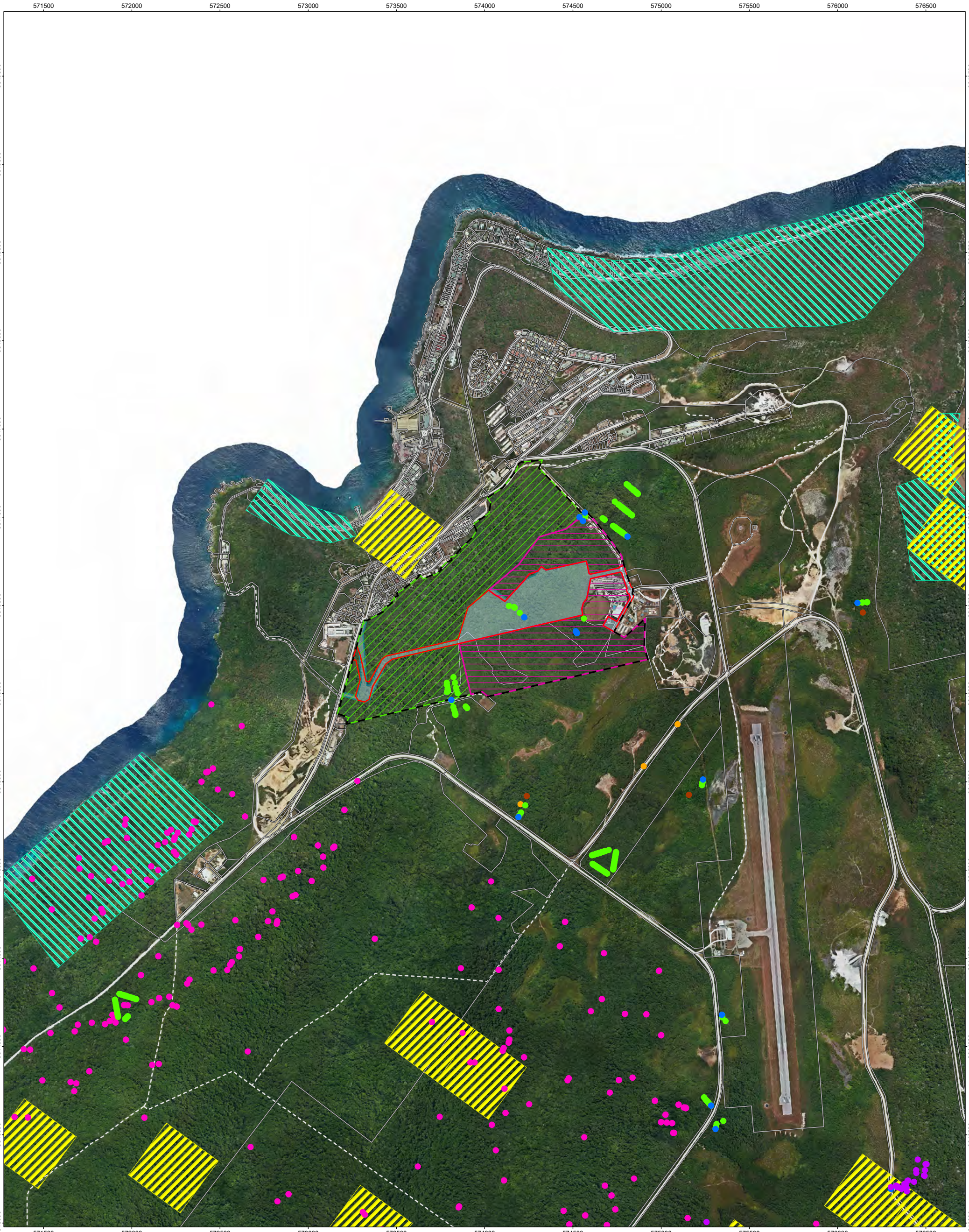
3.6.3 Significant Fauna

JBS&G (2025) identified twenty-nine significant fauna species were listed in the Protected Matters Search Tool as occurring or having potential to occur at Christmas Island. Of these, 12 taxa were marine fauna, including sharks, whales and turtles. These were excluded from the assessment. The remaining 17 taxa and their likelihood of occurrence in the JBS&G (2025) Survey Area are listed in Table . The taxa most likely to occur in the Survey Area are:

- Christmas Island Goshawk;
- Christmas Island Emerald Dove;
- Christmas Island Hawk Owl;
- Golden Bosunbird;
- Christmas Island Thrush;
- Christmas Island Flying Fox; and
- Christmas Island Giant Gecko.

Seven taxa were considered likely to occur in the JBS&G (2025) Survey Area and a further four were considered to possibly occur in the Survey Area.

Fauna records on the Island are predominantly maintained by Parks Australia, although previous surveys undertaken for Phosphate Resources have also resulted in some records of significant fauna. Known locations of significant fauna species are provided by permission of Phosphate Resources in Figure 3.7.



Legend

- Clearing Area - Stage 1
- Clearing Area - Stages 2-7
- Future Environmental Conservation
- Structure Plan Boundary
- JBS&G (2025) Survey Area
- Cadastral boundary (LGATE-002)
- *Fregata andrewsi* colony (CI Frigatebird)

Source: Christmas Island Biodiversity Conservation Plan - DRAFT 2014

- *Pteropus natalis*roost" (Christmas Island Flying Fox)

Source: Range to Reef Environmental - various surveys up to 2018

- *Accipiter hiogaster natalis*
- *Cyrtodactylus sadleiri*
- *Ninox natalis*
- *Papasula abbotti*
- *Pteropus nativus*
- *Sula sula*

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 500 metres

Job Number: 67277

Scale 1:20,000 at A3

Client: Shire of Christmas Island

Coord. Sys. GDA2020 MGA Zone 48

Drawn By: droberts | Checked By: RP | Version: Rev A | Date: 10-Feb-2026

Phosphate Hill, Christmas Island

DESKTOP SIGNIFICANT FAUNA

FIGURE: 3.7

Document Path: C:\Users\droberts\JBS&G Australia\DCS - Internal - V2\Projects\Shire of Christmas Island\67277 CI Housing\GIS\02_MapProjects\67277 CI Housing EAR Phosphate Hill R05.aprx

Image Reference: 2011 Orthoimage

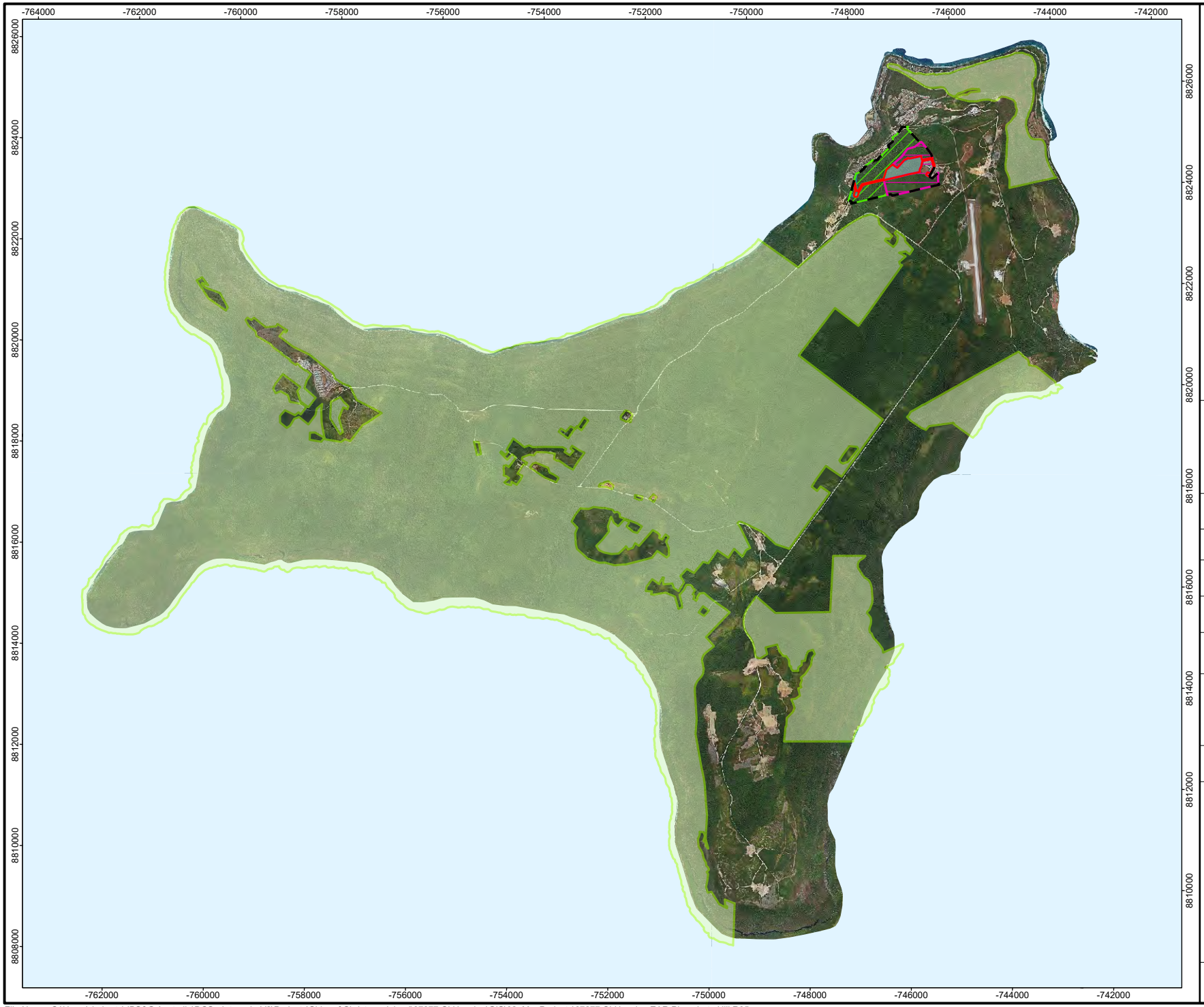
Table 3.4 Database search results

Scientific Name Common Name	Conservation Status	Habitat	Likelihood of Presence
BIRDS			
Accipiter hiogaster natalis Christmas Island Goshawk	EN	Endemic to Christmas Island. Nests in forks of forest trees. Widespread but uncommon on the island. Highly mobile species.	Likely – preferred habitat occurs in the Survey Area
Calidris acuminata Sharp-tailed Sandpiper	VU/MI	Tidal mudflats, saltmarshes, mangroves; shallow fresh, brackish or saline inland wetlands; floodwaters, irrigated pastures and crops; sewage ponds, saltfields.	Unlikely – no preferred habitat occurs in the Survey Area
Calidris canutus Red Knot, Knot	VU/MI	Tidal mudflats, sandflats, beaches, saltmarshes, flooded pastures and ploughed lands.	Unlikely – no preferred habitat occurs in the Survey Area
Calidris ferruginea Curlew Sandpiper	CR/MI	Tidal mudflats, saltmarsh, saltfields; fresh, brackish or saline wetlands and sewage ponds.	Unlikely – no preferred habitat occurs in the Survey Area
Chalcophaps indica natalis Christmas Island Emerald Dove	EN	Endemic to Christmas Island. Nests in trees, shrubs and vines. Highly mobile species.	Likely – preferred habitat occurs in the Survey Area
Fregata andrewsi Christmas Island Frigatebird	EN/MI	Confined to island cliffs and shore terraces where it breeds in the canopy.	Unlikely – no preferred habitat occurs in the Survey Area
Ninox natalis Christmas Island Hawk-Owl	VU	Nests in hollows in large, mature trees. Nocturnal.	Likely – preferred habitat occurs in the Survey Area
Papasula abbotti Abbott's Booby	EN	A sea bird which nests in the canopy in mature, usually emergent trees. The only known extant nesting colony of this species is on Christmas Island. Nest sites for Abbott's booby have been mapped in island wide surveys.	Possible –preferred habitat occurs in the Survey Area, but there are very few records of nests at Phosphate Hill and this taxon has a high fidelity to nest site location
Phaethon lepturus fulvus Golden Bosunbird	EN	Nests in large mature trees and limestone cliffs.	Likely – preferred habitat occurs in the Survey Area
Phaethon rubricauda westralis Indian Ocean Red-tailed Tropicbird	EN	Tropical pelagic waters, rarely near land unless breeding. Large numbers breed on Christmas Island, with nests commonly located on the Island's rocky terraces under shrubs.	Unlikely – no preferred habitat occurs in the Phosphate Hill Survey Area
Turdus poliocephalus erythropleurus Christmas Island Thrush	EN	Widespread and common species on the Island and is a habitat generalist being prolific in disturbed areas. Little information on breeding ecology is available. Highly mobile species.	Likely – preferred habitat occurs in the Survey Area

Scientific Name Common Name	Conservation Status	Habitat	Likelihood of Presence
MAMMALS			
Crocidura trichura Christmas Island Shrew	CR	Considered extinct	Absent
Pteropus natalis Christmas Island Flying-fox	CR	Endemic to Christmas Island. All recorded roosts have been located on the coastal terrace or around the first land cliff and semi-deciduous forest. Highly mobile and forages through the forest canopy so is unlikely to be impacted by understorey vegetation clearing.	Likely – preferred habitat occurs in the Survey Area
REPTILES			
Cryptoblepharus egeriae Christmas Island Blue-tailed Skink	CR	Considered extinct in the wild prior to recent releases of captive-bred individuals.	Possible – preferred habitat occurs in the Survey Area but this taxon has only been released in select locations
Cyrtodactylus sadleiri Christmas Island Giant Gecko	EN	Endemic to Christmas Island. Found in all island habitats, except areas lacking trees and shrubs. Evergreen tall, closed forest is considered critical habitat for this species (Director of National Parks, 2014b).	Likely – preferred habitat occurs in the Survey Area
Lepidodactylus listeri Christmas Island Gecko, Lister's Gecko	CR	Considered extinct in the wild.	Absent
Ramphotyphlops exocoeti Christmas Island Blind Snake	VU	A cryptic, fossorial species. No specimen has been found since 2009.	Possible – preferred habitat occurs in the Survey Area

3.7 Conservation Areas

The Christmas Island National Park, which covers 63% of the Island, is assigned to IUCN reserve category II, most of which is uncleared primary rainforest (Director of National Parks, 2014a) as shown in Figure 3.8.



Legend

- Clearing Area - Stage 1
- Clearing Area - Stages 2-7
- Future Environmental Conservation
- Structure Plan Boundary
- JBS&G (2025) Survey Area
- Christmas Island National Park (CAPAD 2024)

JBS&G

Job No: 67277

Client: Shire of Christmas Island

Version: A	Date: 10/02/2026
Drawn By: droberts	Checked By: RP

Scale 1:100,000 at A4

0 2,000 4,000
metres

Coord. Sys. GDA2020 MGA Zone 48

Silver City, Phosphate Hill

CHRISTMAS ISLAND NATIONAL PARK

FIGURE 3.8

File Name: C:\Users\droberts\JBS&G Australia\DCS - Internal - V2\Projects\Shire of Christmas Island\67277 CI Housing\GIS\02_MapProjects\67277 CI Housing EAR Phosphate Hill R05.aprx
Image Reference: World Terrain Base: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

3.8 Contamination

The CS Act defines contamination as having a substance present in land or water above background concentrations that presents a risk of harm to human health or the environment. The act also provides for the identification, recording, management and remediation of contaminated sites. Contamination commonly occurs through accidental leakage and spillage, or poor site management practices.

No contaminated sites are identified on the Contaminated Sites Database for the whole of Christmas Island (DWER, 2025).

3.9 Heritage

3.9.1 Indigenous Heritage

The AH Act aims to protect Aboriginal heritage by registering Aboriginal sites (places and/or objects) that are of cultural importance to Aboriginal people. Any proposal to use or alter an area of land, for purposes such as research or development, must first determine if Aboriginal sites occur within the proposed area. If an Aboriginal site is found to occur, permission must be sought from the Minister for Aboriginal Affairs before that land can be used or altered in any way.

A search of the Department of Planning, Lands and Heritage – Aboriginal Heritage Places mapping tool found no registered Aboriginal heritage sites within or immediately adjacent to the site.

3.9.2 European Heritage

A search of the Commonwealth Heritage Places (sites) identified one Place that will be impacted. Place ID 105187 Christmas Island Natural Areas covers the majority of the island and coastal area out to 500 m.

Council of Western Australia's *InHerit* database identified 88 Places on Christmas Island and no State Registered Places. No State Heritage Places will be impacted by the proposed development.

3.10 Landscape Features

Phosphate Hill is in a high part of the northern end of the island reaching 313 mAHD. The nearby Irvine Hill is the highest point at 329 mAHD which is approximately 150 m to the west. The dominant feature of the surrounds is remnant and regrowth vegetation.

3.11 View Shed

Even though Phosphate Hill is in a high part of the northern end of the island, view sheds from the Recreation Centre and surrounds are limited by the very tall and extensive surrounding vegetation. There are no known lookouts or vantage points in the vicinity.

4. Potential Impacts and Proposed Management Measures

The potential impacts of proposed development within the Structure Plan area have been assessed based on the applicable policy considerations, receiving environment, potential impacts, management measures to be implemented, and the predicted outcomes.

The key direct impact of the Structure Plan is the clearing of 63.72 ha of native vegetation and fauna habitat. Only Stage 1, containing 22.20 ha of native vegetation, is proposed to be cleared at this stage to meet the immediate homing needs of the community. Development of subsequent stages would require additional funds from the Commonwealth.

Of the Stage 1 area, 14.43 ha of Closed Canopy Evergreen Forest and 0.45 ha of Semideciduous forest and scrub has not been previously cleared, 7.32 ha is regrowth Closed Canopy Evergreen Forest and the remainder is cleared or weed dominated vegetation (Geoscience Australia, 2014).

Table 4.1 Structure Plan Areas

Structure Plan Areas	Area (ha)
Future Environmental Conservation (66.69 ha)	
Closed canopy evergreen forest	42.52
Regrowth (of closed canopy evergreen forest)	7.27
Semi-deciduous forest and scrub	15.90
Weed dominated vegetation & pioneer regrowth (0.65 ha) and Unvegetated (0.35 ha)	1.00
Clearing Area - Stage 1 (23.13 ha)	
Closed canopy evergreen forest	14.43
Regrowth (of closed canopy evergreen forest)	7.32
Semi-deciduous forest and scrub	0.45
Weed dominated vegetation & pioneer regrowth (0.27 ha) and Unvegetated (0.66 ha)	0.93
Clearing Area - Stages 2-7 and historic clearing (49.44 ha)	
Closed canopy evergreen forest	12.91
Regrowth (of closed canopy evergreen forest)	27.71
Weed dominated vegetation & pioneer regrowth (3.92 ha) and Unvegetated (4.9 ha)	3.92
Total	**133.27**

Based on the findings of the assessment, the following Key Environmental Factors are considered relevant to the proposal:

- Flora and Vegetation; and
- Fauna and Habitat.

4.1 Benthic Communities and Habitats

Due to the greater than 1000 m distance to the coast, the existing urban areas of Drumsite and Flying Fish Cove and the extensive forested areas, no marine or coastal impacts are expected from this development.

4.2 Coastal Processes

Due to the greater than 1000 m distance to the coast, the existing urban areas of Drumsite and Flying Fish Cove and the extensive forested areas, no marine or coastal impacts are expected from this development.

4.3 Marine Environmental Quality

Due to the greater than 1000 m distance to the coast, the existing urban areas of Drumsite and Flying Fish Cove and the extensive forested areas, no marine or coastal impacts are expected from this development.

4.4 Marine Fauna

Due to the greater than 1000 m distance to the coast, the existing urban areas of Drumsite and Flying Fish Cove and the extensive forested areas, no marine or coastal impacts are expected from this development.

4.5 Flora and Vegetation

4.5.1 Potential impacts

The Christmas Island Housing Support Flora, Fauna and Vegetation Assessment (JBS&G, 2025) describes the flora and vegetation of the survey area as "generally unremarkable." Within the JBS&G (2025) Survey Area, 34.5% had previously been cleared and most of the vegetation was in Excellent to Pristine Condition. No conservation significant flora were identified (noting some limitations to the survey extent).

The proposal has the potential to affect flora and vegetation values through:

- Clearing of vegetation for the establishment of the proposed development;
- Introduction and spread of weeds due to edge effects and spread of propagules by machinery. Opening the forest up can cause germination from the soil seedbank, with many weed species already having abundant propagules in regrowth forest. Propagules of these can then spread into surrounding forest;
- Edge drying effects caused by microclimate changes; and
- Fragmentation could be increased minimally by the proposal, though these areas are already cleared and abut cleared areas.

4.5.2 Policy and Management Objectives

Flora and vegetation on Christmas Island is protected formally and informally by various legislative measures as described in Section 2, which include:

- EPBC Act and Environment Protection and Biodiversity Conservation Regulations 2000;
- BC Act (WA), and Biodiversity Conservation Regulations 2018;
- EP Act (WA) and Clearing Regulations; and
- BAM Act (WA).

The Department of Infrastructure, Transport, Regional Development, Communications, Sport and the Arts (DITRDCSA) is preparing the Christmas Island Strategic Assessment (CISA) to ensure the impact of development can be avoided, mitigated or offset where necessary (DITRDCSA, 2026).

4.5.3 Proposed Management

The following mitigation and management measures (Table 4.1) have been identified to ensure impacts to flora and vegetation are appropriately managed as development of the site progresses.

Table 4.1: Management measures for vegetation and flora

Parameter	Proposed scheme provisions / Management actions	Timing / responsibility
Management of weed infestation	The introduction and/or spread of weeds could potentially impact on the values of the Christmas Island National Park. A Weed Management Plan should be prepared to mitigate the potential risks from weed introduction or spread.	Prior to ground disturbing activities to the satisfaction of the Shire of Christmas Island.

4.5.4 Predicted Environmental Outcomes

Clearing will remove up to 22.20 ha of native vegetation, refer to Figure 4.1. No flora species of conservation significance are known to occur in the proposed clearing area and all species identified within the proposal area are well represented within the Christmas Island National Park.

The Island's rainforest is remarkably resistant to weed invasion (Green, et al., 2004) so minimal impacts are anticipated as a consequence of the proposal, impacting only the immediate edge of surrounding vegetation, with little likelihood of weeds spreading further into the forest or pushing back the edge of the forest.

The clearing of any native vegetation will require a permit under the under the Clearing Regulations (WA). There are no applicable exemptions under the EP Act or the Clearing Regulations that apply to this proposal.

Legend

- Clearing Area - Stage 1
- Clearing Area - Stages 2-7
- Future Environmental Conservation
- Structure Plan Boundary
- JBS&G (2025) Survey Area

Vegetation Unit

- Cleared
- Closed Canopy Evergreen Forest/ Regrowth
- Leucaena thicket
- Semi-deciduous Forest/Scrub/Regrowth
- Cadastral boundary (LGATE-002)

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 200 metres

Job Number: 67277

Scale 1:6,200 at A3

Client: Shire of Christmas Island

Coord. Sys. GDA2020 MGA Zone 48

Drawn By: droberts | Checked By: RP | Version: Rev A | Date: 10-Feb-2026

Phosphate Hill, Christmas Island

VEGETATION - PHOSPHATE HILL

FIGURE: 4.1

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Image Reference: 2011 Orthoimage

Legend

- Clearing Area - Stage 1
- Clearing Area - Stages 2-7
- Future Environmental Conservation
- Structure Plan Boundary
- JBS&G (2025) Survey Area
- Cadastral boundary (LGATE-002)

Vegetation Condition

- Pristine
- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 200 metres

Job Number: 67277		Scale 1:6,200 at A3	
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48	
Drawn By: droberts	Checked By: RP	Version: Rev A	Date: 10-Feb-2026

Phosphate Hill, Christmas Island

VEGETATION CONDITION - PHOSPHATE HILL

FIGURE: 4.2

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Image Reference: and 2011 Orthoimage

4.6 Terrestrial Fauna

4.6.1 Potential Impacts

A fauna survey was undertaken by JBS&G in 2024 and the results are provided in *Christmas Island Housing Support Flora, Fauna and Vegetation Assessment* (JBS&G, 2025). The Protected Matter Search Tool (PMST) identified 29 significant species as potentially occurring on the Island and seven considered likely to occur. Seven Threatened Fauna species were identified during the survey, of which three were located within the JBS&G (2025) Survey Area for Phosphate Hill, and 3 fauna habitats occur, refer to Figures 4-3 and 4-4.

Stage 1 of this project will potentially see the loss of 22.20 ha of native vegetation, compared to the overall area of Christmas Island (approximately 13,500 ha) of which approximately 8,505 ha is protected within Christmas Island National Park.

4.6.2 Policy and Management Objectives

Fauna on Christmas Island is protected formally and informally by various legislative measures as described in Section 2, which include:

- EPBC Act and Environment Protection and Biodiversity Conservation Regulations 2000;
- BC Act (WA), and Biodiversity Conservation Regulations 2018;
- EP Act (WA) and Clearing Regulations; and
- BAM Act (WA).

The Department of Infrastructure, Transport, Regional Development, Communications, Sport and the Arts (DITRDCSA) is preparing a Strategic Assessment for Christmas Island to ensure the impact of development can be avoided, mitigated or offset where necessary (DITRDCSA, 2026).

Legend

- Clearing Area - Stage 1
- Clearing Area - Stages 2-7
- Future Environmental Conservation
- Structure Plan Boundary
- JBS&G (2025) Survey Area
- Cadastral boundary (LGATE-002)

Conservation Significant Fauna

- *Accipiter natalis* (EN)
- EN,*Chalcophaps indica natalis*
- EN,*Cyrtodactylus sadleiri*
- EN,*Papasula abbotti*
- EN,*Phaethon lepturus fulvus* (EN)
- EN,*Plegadis falcinellus* (MI)
- EN,*Turdus erythropleurus*
- VU,*Ninox natalis*

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 200 metres

Job Number: 67277		Scale 1:6,200 at A3	
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48	
Drawn By: droberts	Checked By: RP	Version: Rev A	Date: 10-Feb-2026

Phosphate Hill, Christmas Island

SIGNIFICANT FAUNA

FIGURE: 4.3

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Image Reference: 2011 Orthoimage

Legend

- Clearing Area - Stage 1
- Clearing Area - Stages 2-7
- Future Environmental Conservation
- Structure Plan Boundary
- JBS&G (2025) Survey Area
- Cadastral boundary (LGATE-002)

Fauna Habitat

- Closed Canopy Evergreen Forest/Regrowth
- Leucaena thicket
- Semi-deciduous Forest/ Scrub/Regrowth
- Cleared

Roads (LGATE-195)

- Minor road
- Track

- Large tree

JBS&G

0 200 metres

Job Number: 67277		Scale 1:6,200 at A3	
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48	
Drawn By: droberts	Checked By: RP	Version: Rev A	Date: 10-Feb-2026

Phosphate Hill, Christmas Island

FAUNA HABITATS

FIGURE: 4.4

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Image Reference: 2011 Orthoimage

4.6.3 Proposed Management

The Structure Plan will set aside a large area of Proposed Environmental Conservation to restore a habitat link to the northern end of the Christmas Island National Park.

The following management measures have been identified to ensure potential impacts to terrestrial fauna are appropriately managed as development progresses.

Table 4-2: Management requirements for terrestrial fauna

Parameter	Proposed scheme provisions / Management actions	Timing / responsibility
Fauna	Preparation of a Fauna Management Plan including the following elements: inductions and pre-start meetings to include fauna management requirements pre-clearing fauna inspections, as well as trapping and relocation of fauna, if required, staged fencing of site	Prior to site works. Developer in consultation with Shire of Christmas Island
Habitat retention	Retention of corridors and culverts to facilitate red-crab movements during their annual migration.	Developer in consultation with Shire of Christmas Island.
	Installation of nesting boxes for Golden Bosunbirds within the Structure Plan area.	Developer in consultation with Shire of Christmas Island.

4.6.4 Predicted Environmental Outcomes

There were 7 EPBC Act Threatened fauna species identified within the JBS&G (2025) Survey Area. This will trigger the need to refer the proposal to DCCEEW for consideration of the proposal as a controlled action, under the EPBC Act.

It is anticipated that the implementation of the management measures specified in Table 4-2, the reservation of an area for Future Environmental Conservation which includes an extensive areas of excellent quality, protected vegetation; the potential impact to terrestrial fauna can be managed such that the biological diversity and ecological integrity of the terrestrial fauna assemblage can be maintained.

4.7 Landforms

4.7.1 Potential Impacts

Inappropriate development could potentially impact on the distinctive physical landforms of Christmas Island described in Section 3.3, through the loss of land if excessive bulk earthworks are required during construction or by exposing cleared areas to erosion.

4.7.2 Policy and Management Objectives

The Shire of Christmas Island Local Planning Strategy was endorsed in May 2015. The new scheme includes a stated objective "*to enhance and diversify the island's economic base through the provision of land for a range of economic activities*," (Shire of Christmas Island, 2016) which also included urban development and possible new tourism opportunities. Any new proposed development should not compromise long term opportunities across the island.

The EPA environmental objective for the Landform factor is "To maintain the variety and integrity of significant physical landforms so that environmental values are protected."

4.7.3 Proposed Management

The proposed Structure Plan will see significant areas of land incorporated into an environmental conservation reserve to maintain the natural rain forest values of the island with managed drainage and minimal earthworks in accordance with the LPS and consistent with the EPA objective for Landforms.

4.7.4 Predicted Environmental Outcomes

The development can be undertaken so that final landforms will be visually consistent with the current undisturbed landforms of the Island in this location, in order to maintain the current integrity of the Christmas Island landforms and associated environmental values.

4.8 Terrestrial Environmental Quality

4.8.1 Potential Impacts

The key risk to land and soil quality arising from the proposal, in particular land clearing activities, is erosion. Erosion may result in loss of soil through water and/or wind.

4.8.2 Policy and Management Objectives

The Shire of Christmas Island *Local Planning Strategy* was endorsed in May 2015. The LPS has controls to ensure best practice design and construction techniques can be used in development proposals, and will include the requirement for a drainage and stormwater management plan (refer to Table 4.1).

4.8.3 Proposed Management

Management conditions to control drainage, footprint delineation, vehicle and pedestrian access, management of streetscapes and Public Open Space areas will be incorporated into the proposal design and can be required via standard subdivision conditions.

4.8.4 Predicted Environmental Outcomes

Land clearing and construction activities can be planned and managed to minimise the risk of erosion through stormwater and drainage management and adequate prevention of wind blown soil from cleared area.

4.9 Inland Waters

4.9.1 Potential Impacts

Christmas Island is characterised by a lack of surface water drainage (Puhalovich, et al., 2003). There are no surface water features in the proposed clearing area. The proposed development will not intercept groundwater, and drainage design will be close to source infiltration such that is unlikely to cause changes to groundwater levels or quality.

There are two notable wetlands on the island, Hosnie's Spring on the east coast or The Dales on the west coast. The proposed development does not intersect either of these wetlands.

4.9.2 Policy and Management Objectives

In addition to the legislative protection afforded by the WA EP Act and the Commonwealth EPBC Act, the two wetland features identified above are protected the provisions of the Ramsar Convention and therefore the EPBC Regulations 2000.

4.9.3 Proposed Management

These two sites are approximately 5.0 km and 12.5 km respectively from the Phosphate Hill proposal area at closest point. Neither wetland is expected to be impacted due to any potential surface flow from the development area as surface flow will be away from Hosnie's Spring and separated by distance to The Dales.

Drainage associated with development at Phosphate Hill can be managed through the development and implementation of a Drainage and Stormwater Management Plan.

Table 4.2 Management requirements for inland waters.

Parameter	Proposed scheme provisions / Management actions	Timing / responsibility
Site drainage	Prepare and implement a Drainage and Stormwater Management Plan.	Prior to finalisation of subdivision design. Developer in consultation with Shire of Christmas Island

4.9.4 Predicted Environmental Outcomes

The environmental values of the Dales and Hosnie's Spring wetlands will not be impacted by the proposed development.

4.10 Subterranean fauna

4.10.1 Potential Impacts

Christmas Island has a diverse subterranean environment with freshwater, marine, anchialine and terrestrial habitats. Subterranean animals are found in air-filled (troglofauna) and water-filled (stygofauna) voids. Christmas Island is host to at least 12 endemic species of cave fauna (Humphreys & Eberhard, 1998). From the mapping work prepared by Humphreys (2014), no on-shore karst features have been identified in the vicinity of the Phosphate Hill development proposal with the closest approximately 900 m to the south within the Christmas Island National Park .

4.10.2 Policy and Management Objectives

Fauna on Christmas Island are protected formally and informally by various legislative measures, which are as follows:

- EPBC Act and Regulations (2000); and
- BC Act (WA) and associated Regulations (2018).

A Management Plan for the Christmas Island National Park is currently in development to ensure the protection of the Island's unique natural values.

The EPA's objective for the environmental factor of Subterranean Fauna is "*To protect subterranean fauna so that biological diversity and ecological integrity are maintained*".

In the context of this objective ecological integrity is the composition, structure, function and processes of ecosystems, and the natural range of variation of these elements.

4.10.3 Proposed Management

Management for the potential impacts from development to the values of the National Park, including subterranean fauna, can be managed through existing Planning and Environmental approval processes, which protect the habitat for subterranean fauna (including groundwater quality):

- Management of drainage;
- Management of potentially polluting activities to prevent contamination of groundwater; and
- Ensuring adequate separation from high value areas of the National Park.

On-going operation and protection of the Park will be detailed in the Christmas Island National Park Management Plan that is currently in development.

4.10.4 Predicted Environmental Outcomes

The implementation of management strategies to prevent loss of habitat through physical loss or contamination of groundwater associated with project activities during construction and operations, will ensure the ongoing protection of subterranean fauna so that their biological diversity and ecological integrity are maintained.

4.11 Air Quality

4.11.1 Potential Impacts

The air quality during construction activities and clearing in particular may be temporarily impacted due to nuisance dust. Dust from unsealed road surfaces, particularly crushed limestone on Christmas Island, have been observed to result in minor dust impacts to vegetation adjacent to the roads.

4.11.2 Policy and Management Objectives

The EP Act (WA) provides for the consideration and protection of the social surroundings of a proposal, which includes protection of 'amenity'. Noise, odour and dust all have the potential to unreasonably interfere with the health, welfare and convenience and comfort of sensitive receptors.

Amenity of users of the nearby communities should be maintained to an acceptable level during clearing and construction.

4.11.3 Proposed Management

Dust emissions are considered to be temporary in nature and limited to the immediate vicinity of construction and clearing activities.

Nuisance dust can be adequately managed through existing mechanisms available to the Shire such as the requirement for use of water based dust suppression (e.g. use of a water cart) and prompt complaint resolution process.

4.11.4 Predicted Environmental Outcomes

The maintenance of local amenity and protection of adjacent vegetation can be adequately managed to an acceptable level through standard dust management measures used on construction sites, primarily being water based dust suppression.

4.12 Greenhouse Gas Emissions

This proposal is not expected to exceed the 100,00 tonnes CO_2-e of Scope 1 emissions or 100,000 tonnes of CO_2-e of Scope 2 emissions in any year and is not considered to be a significant factor.

4.13 Social Surroundings

The key risk to social surroundings at this location:

- Natural or historical heritage – the Christmas Island natural areas is located within the site (that is, the rainforest); up to 22.20 ha will be lost as a result of clearing for Stage 1;
- Amenity – arising from construction noise and dust (see section 4.11 for air quality). Noise is required to be managed in accordance with the Environment Protection (Noise) Regulations 1997, which may required a Construction Noise Management Plan; and Other - Christmas Island is not considered a Bushfire Prone Area. The development will improve human health by moving people away from flood prone areas along the coast.

4.14 Human Health

The EPA (WA) guideline for the human health environmental factor provides the specific framework for considering the possible impacts to human health arising from the emission of radiation.

There are no known radiation risks to human health arising from this proposal.

5. Conclusion

This Environmental Assessment Report (EAR) has been prepared to support the Local Structure Plan for the Phosphate Hill precinct.

All environmental considerations associated with the proposed Structure Plan can be managed in accordance with applicable regulatory and policy requirements subject to the additional management provisions. The management provisions are summarised in Table 5.1below.

Table 5.1 Proposed management provisions.

Parameter	Proposed scheme provisions / Management actions	Timing / responsibility
Management of weed infestation	The introduction and/or spread of weeds could potentially impact on the values of the Christmas Island National Park. A Weed Management Plan should be prepared to mitigate the potential risks from weed introduction or spread.	Prior to ground disturbing activities to the satisfaction of the Shire of Christmas Island.
Fauna	Preparation of a Fauna Management Plan including the following elements: • inductions and pre-start meetings to include fauna management requirements; • pre-clearing fauna inspections, as well as trapping and relocation of fauna, if required; and • staged fencing of site.	Prior to site works. Developer in consultation with Shire of Christmas Island
Tree retention	Retention of corridors and culverts to facilitate red-crab movements during their annual migration.	Prior to construction. Developer in consultation with Shire of Christmas Island.
	Installation of nesting boxes for Golden Bosunbirds within the Structure Plan area.	Prior to clearing. Developer in consultation with Shire of Christmas Island.
Site drainage	Prepare and implement a Drainage and Stormwater Management Plan.	Prior to finalisation of subdivision design. Developer in consultation with Shire of Christmas Island

The proposed development will require referral to DWER for a permit under the under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

The proposed development will require referral to DCCEEW under the EPBC Act as it has the potential to impact Matters of National Environmental Significance.

6. Limitations

Scope of services

This report ("the report") has been prepared by JBS&G in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and JBS&G. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

Reliance on data

In preparing the report, JBS&G has relied upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise expressly stated in the report, JBS&G has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. JBS&G has also not attempted to determine whether any material matter has been omitted from the data. JBS&G will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to JBS&G. The making of any assumption does not imply that JBS&G has made any enquiry to verify the correctness of that assumption.

The report is based on conditions encountered and information received at the time of preparation of this report or the time that site investigations were carried out. JBS&G disclaims responsibility for any changes that may have occurred after this time. This report and any legal issues arising from it are governed by and construed in accordance with the law as at the date of this report.

Environmental conclusions

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made, including to any third parties, and no liability will be accepted for use or interpretation of this report by any third party.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

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APPENDIX A: Flora and Vegetation and Fauna Assessment

Christmas Island Housing Support Flora, Fauna and Vegetation assessment

Shire of Christmas Island

Report

JBS&G 67277 | 164,449

14 May 2025

We acknowledge the Traditional Custodians of Country throughout Australia and their connections to land, sea and community.

We pay respect to Elders past and present and in the spirit of reconciliation, we commit to working together for our shared future.

Caring for Country The Journey of JBS&G
Artist: Patrick Caruso, Eastern Arrernte

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1. Introduction

1.1 Background

Shire of Christmas Island, through the Australian Government's Housing Support Program Stream 1 have received funds to implement preliminary works to support the development of its Christmas Island Housing Futures Masterplan. The proposed works are to safeguard the future of Christmas Islanders, by providing social housing, affordable housing and alternative housing locations to facilitate the ultimate relocation of the Kampong community, which is currently at risk from sea level rises, cyclonic storm surge induced inundations and landslides/rockfalls caused by heavy monsoon rains. This approach requires the formation of Structure Plans at Phosphate Hill and Silver City as per the requirements of the Western Australian Planning Commission and aligns with the Commonwealth Department of Home Affairs 2020 Land Use Planning for Disaster Resilient Communities.

1.2 Survey Area

The Survey Area comprises three land parcels, two in Silver City, totalling 11.32 ha and one on Phosphate Hill totalling 23.65 ha (Figure 1-1). Most of the proposal area is currently zoned Urban Development, with a small portion of the Phosphate Hill area zoned Rural and Crown Reserve under Local Planning Scheme Number 2.

1.3 Scope of Work

The scope of work was to undertake a Reconnaissance flora and vegetation survey and a Basic fauna survey within the Survey Area.

1.4 Legislative Context

The legislative framework for Christmas Island is complex. The *Christmas Island Act 1958* outlines the governance arrangements for the island. Section 8E of the Act makes provision for all laws of Western Australia and the Commonwealth to apply in Christmas Island. The Minister lists selected Western Australian laws to be excluded or amended in the *Applied Laws (Implementation) Ordinance 1992*. The island is governed under Commonwealth legislation and administered by the Department of Infrastructure, Transport, Regional Development, Communications and the Arts (DITRDCA). Applied Western Australian laws are administered by the relevant Commonwealth Minister, by Commonwealth officers acting under ministerial delegations, or by State officers exercising delegated power and acting pursuant to inter-government service agreements under Section 8h of the Act. The community is represented in the Federal Parliament by the Member for Lingiari in the House of Representatives and the two Senators for the Northern Territory in the Senate with local Government (i.e. Shire of Christmas Island) utilising Western Australia legislation.

Flora and fauna on Christmas Island are protected formally and informally by various legislative measures, which are as follows:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) – Australian Government, and Environment Protection and Biodiversity Conservation Regulations 2000;
- *Biodiversity Conservation Act 2016* (BC Act) – State, and Biodiversity Conservation Regulations 2018;
- *Environmental Protection Act 1986* (EP Act) – State, and Environmental Protection (Clearing of Native Vegetation) Regulations 2004; and
- *Biosecurity and Agriculture Management Act 2007* (BAM Act) – State, and Biosecurity and Agriculture Management (Declared Pest Account) Regulations 2014.

A short description of each legislative measure is given below. Other definitions, including species conservation categories, are provided in Appendix A.

1.4.1 EPBC Act

The EPBC Act aims to protect matters of national environmental significance. Under the EPBC Act, the Commonwealth Department of Climate Change, Energy the Environment and Water (DCCEEW) lists protected species and Threatened Ecological Communities (TECs) by criteria set out in the Act. Species are conservation significant if they are listed as Threatened (i.e. Critically Endangered, Endangered and Vulnerable) or Migratory.

1.4.2 BC Act

The Minister for the Environment lists taxa (flora and fauna) under the provisions of the BC Act as protected and are classified as according to their need for protection. The BC Act makes it an offence to 'take' threatened species without an appropriate licence. There are financial penalties for contravening the BC Act.

1.4.3 EP Act

Threatened flora, fauna (and significant habitat necessary for the maintenance of indigenous fauna) and Threatened Ecological Communities (TECs) are given special consideration in environmental impact assessments and have special status as Environmentally Sensitive Areas (ESAs) under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. Most exemptions for a clearing permit do not apply in an ESA.

Clearing of Native Vegetation

Clearing of native vegetation on Christmas Island is regulated under provisions in s.51 of the *Environmental Protection Act 1986* (WA) (CI) (EP Act).

1.4.4 BAM Act

The BAM Act provides for management and control of listed organisms, including introduced flora species (weeds). Species listed as declared pests under the BAM Act are classified under three categories:

- C1 Exclusion: Pests assigned under this category are not established in Western Australia, and control measures are to be taken to prevent them entering and establishing in the State;
- C2 Eradication: Pests assigned under this category are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility; and
- C3 Management: Pests assigned under this category are established in Western Australia, but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area that is currently free of that pest.

Under the BAM Act, land managers are required to manage populations of declared pests as outlined under the relevant category.

Legend

- Survey Area
- Ramsar site
- Christmas Island National Park
- Cadastral boundary (LGATE-002)

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 500 metres

Christmas Island

SURVEY AREA AND REGIONAL LOCATION

Job Number: 67277		Scale 1:15,000 at A3	
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48	
Drawn By: bsunderland	Checked By: RP	Version: Rev A	Date: 13-May-2025

FIGURE: 1.1

Document Path: C:\Users\bsunderland\JBS&G Australia\JBS&G - DCS - Internal - Documents\Projects\Shire of Christmas Island\67277 CI Housing\GIS\02_MapProjects\67277_ClHousingDraftReport_ECOLOGY.aprx

Image Reference: 2011 Orthoimage

2. Existing Environment

2.1 Biogeography

Christmas Island is included in the Interim Biogeographic Regionalisation of Australia (IBRA v. 7) as the Indian Tropical Islands Bioregion (DEE, 2012).

2.2 Climate

Christmas Island lies on the southern edge of the inter-tropical convergence zone and the climate is dominated by a low-pressure trough that seasonally circles the equator. The Island has a tropical monsoonal climate with distinct wet and dry seasons and little seasonal variation in temperature. The dry season (May to November) is dominated by low and sporadic rainfall (see Figure 2-1) with consistent south-east trade winds (BOM, 2024). The wet season generally occurs from December to April with the Island receiving most of its rainfall during this period.

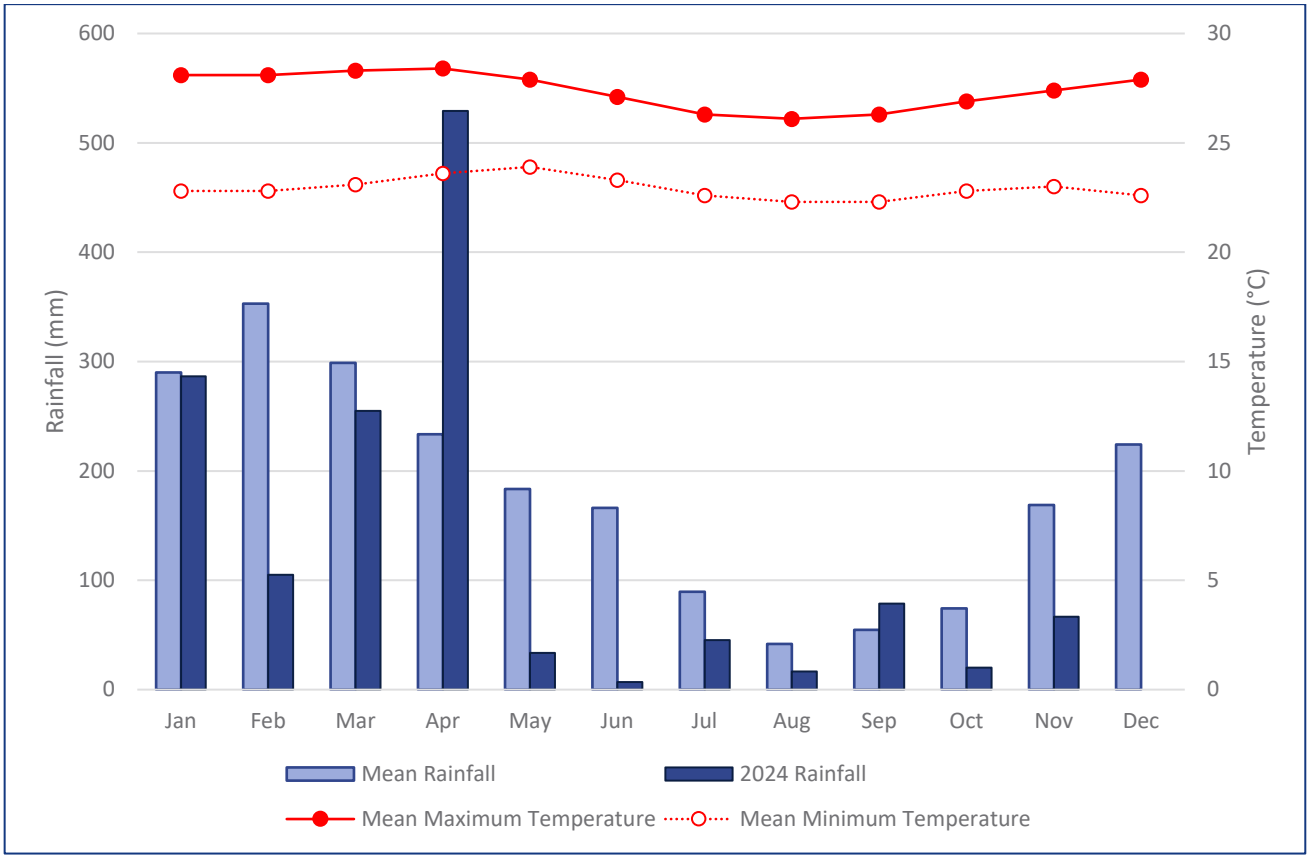

Figure 2-1 Climate data from Christmas Island Aero weather station (200790)

2.3 Soils and Landforms

Christmas Island is one of a series of submarine seamounts that rise above the 5,500 m deep abyssal areas of the West Australian Basin. The topography of the Survey Area is shown in Figure 2-3. At the core of the Island are volcanic rocks, mainly composed of basalt with a layer of limestone generally covering these volcanic rocks (Figure 2-2) which occasionally outcrops, particularly along the present coastline (Grimes, 2001).

The Island is characterised by sea cliffs that rise via a series of terraces to a central plateau (Figure 2-2) which peaks at approximately 361 m above sea level (Grimes, 2001). The shoreline is dominated by cliffs and extensive shore platforms with a few small beaches and Flying Fish Cove, which has a relatively large beach and shallow platform, being the only safe harbour for much of the year. The Island's natural landscape is dominated by karstic surface landforms and cave systems (Grimes, 2001).

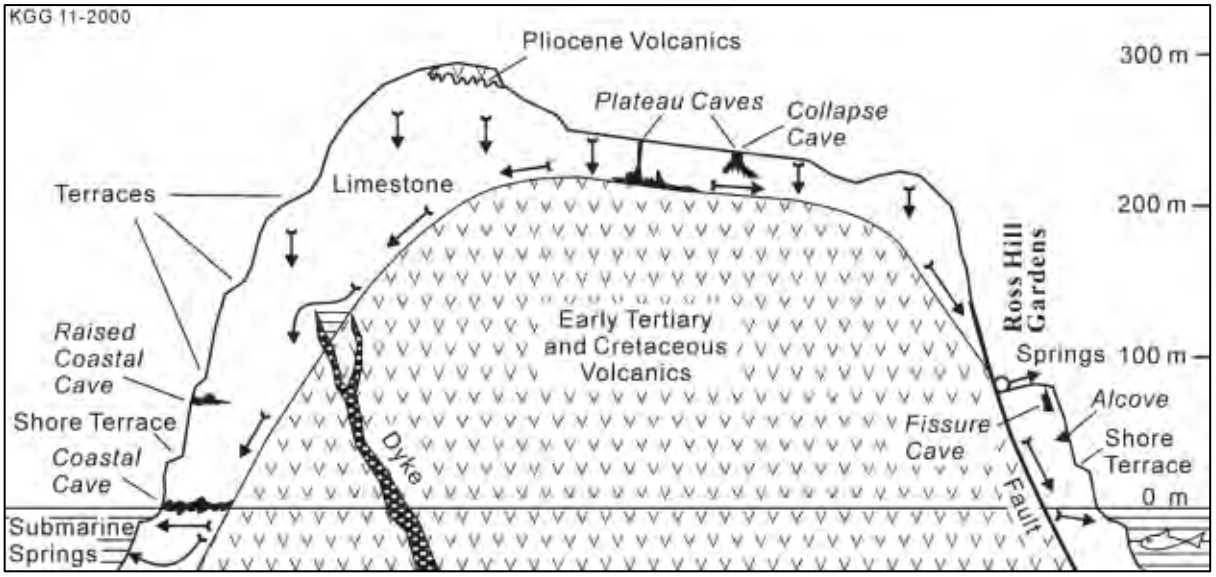

Figure 2-2. Diagrammatic cross-section of Christmas Island[1]

Terrace areas on the Island reflect the height above sea level in different geologic periods. Renewed vulcanism and a series of geological uplifts at different periods have resulted in a tiered effect. The oldest limestones near the peak of the Island formed during the Eocene period (Grimes, 2001). Most the Island's limestone deposits were formed during the Tertiary (late Oligocene to mid Miocene age), with the youngest limestones deposited on the lowest terrace in the late Quaternary (Grimes, 2001).

The limestone is mixed with dolomite sediments, basalts and tuffs. A layer of phosphate-rich soil material covers the limestone over about half of the Island. Marine sediments and guano deposition have formed the Island's phosphatic soils. A breakdown of the surface geology of the Survey Areas is presented in Table 2.1 and Figure 2-4 (Geoscience Australia, 2003).

The red crab (*Gecarcoidea natalis*) is the principle agent of organic matter turnover and incorporation into the soil, with consequent low levels of leaf litter on the island. Crab activity is a key feature of water and nutrient availability in the subsoil, with burrows also providing a preferred pathway for water drainage into the soil (Hollingsworth, 2003).

The proposed clearing areas range from the island's older terraces to the plateau. These areas contain a combination of exposed limestone and deeper phosphatic soils, with the deepest soils present in the Phosphate Hill are. Geoscience Australia has mapped the Survey Areas as being dominated by limestone pinnacles with varying amounts of soil (Table 2.1).

Table 2.1 Geological units within the Survey Area (Geoscience Australia, 2003)

Geological Unit	Phosphate Hill	Silver City	Total
Czp: Unconsolidated material – mostly phosphatic soil containing >20% P2O5	6.28 ha		**6.28 ha**
Tz: Limestone - undifferentiated	2.65 ha	4.26 ha	**6.91 ha**
Tzp: Pinnacles of limestone with variable amounts of unconsolidated material (Czp)	14.72 ha	7.06 ha	**21.78 ha**
Total	**23.65 ha**	**11.32 ha**	**34.97 ha**

Christmas island is not included in Western Australian soil-landscape mapping.

[1] *Source: Grimes* (2001): (Figure shows volcanic core, limestone capping, water flow lines (arrows) and typical cave development. Vertical scale is exaggerated x10).

Legend

- Survey Area
- Cadastral boundary (LGATE-002)
- Topographic contours in m AHD (DataWA-2011)

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 500 metres

Christmas Island

TOPOGRAPHY

Job Number: 67277		Scale 1:15,000 at A3		
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48		
Drawn By: bsunderland	Checked By: RP	Version: Rev A	Date: 13-May-2025	FIGURE: 2.3

Document Path: C:\Users\bsunderland\JBS&G Australia\JBS&G - DCS - Internal - Documents\Projects\Shire of Christmas Island\67277 CI Housing\GIS\02_MapProjects\67277_ClHousingDraftReport_ECOLOGY.aprx
Image Reference: 2011 Orthoimage

572500 573000 573500 574000 574500 575000 575500 576000

8849500 8849000 8848500 8848000 8847500 8847000 8846500 8846000 8845500 8845000

Legend

- Survey Area
- Czl,Pellet limestone, contains pellets and pebbles of phosphate rock
- Czp,Unconsolidated material - mostly phosphatic soil containing >20% P2O5
- Limestone/Talus,Limestone/Talus
- Tb,Volcanics - mostly basalt, some tuff, scoria - undifferentiated
- Tel,Limestone
- Tz,Limestone - undifferentiated
- Tzp,Pinnacles of limestone with variable amounts of unconsolidated material (Czp)

JBS&G

0 500 metres

Christmas Island

SOILS AND LANDFORMS

Job Number: 67277		Scale 1:15,000 at A3		
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48		
Drawn By: bsunderland	Checked By: RP	Version: Rev A	Date: 13-May-2025	**FIGURE: 2.4**

Document Path: C:\Users\bsunderland\JBS&G Australia\JBS&G - DCS - Internal - Documents\Projects\Shire of Christmas Island\67277 CI Housing\GIS\02_MapProjects\67277_ClHousingDraftReport_ECOLOGY.aprx

Image Reference: 2011 Orthoimage

2.4 Hydrology

A major feature of the Christmas Island geomorphology is the lack of surface drainage. Rainfall mostly infiltrates the land surface and is utilised by plants, contributes to soil water stores or recharges to groundwater. There is therefore no significant surface drainage network except down gradient of springs that arise at the interface between limestone and basalt formations.

Christmas Island's soils are generally highly permeable and there is consequently little runoff or erosion (Hollingsworth, 2003). In the Wet Season when the soils are saturated, runoff can occur during heavy rainfall providing some risk of erosion and sedimentation. However, given the high natural infiltration rates the risk of erosion and sedimentation is generally localised to compacted areas such as roads and stockpile pads. Infiltration tests by Puhalovich et al. (2003) indicate that soil infiltration rates are typically substantially higher than hourly rainfall intensities.

There are three key hydrogeological units on the Island; shallow, residual soils, which overlie fractured, unconfined – semi-confined aquifers within the karstic limestone rocks, which in turn overlie relatively impermeable volcanic basement rocks (Puhalovich et al., 2003). Groundwater levels on the Island are reflected by the location of the unconfined water table within the karst limestone aquifers. Limestone aquifers can be recharged when rainfall permeates through the soil zone into the underlying aquifers or by direct runoff of rainfall into karst features such as dolines and sinkholes that occur across the Island (Puhalovich et al., 2003). Assessments suggest that approximately half of all incident rainfall passes through the soil zone and recharges the underlying limestone aquifers (Hollingsworth, 2003; Falkland, 1999). Groundwater discharge occurs at surface springs such as Hosnie's Spring and offshore springs such as those found at Flying Fish Cove (Puhalovich et al., 2003). The complex behaviour and extent of weathered/fractured rock aquifers on the Island are not well understood.

Perennial (permanent) surface aquatic habitats (freshwater) on Christmas Island are limited to a number of spring-fed streams found along coastal or sloping areas of the Island. Hosnie's Spring and The Dales are both listed as a Wetland of International Importance under the Convention on Wetlands of International Importance, Water Fowl Habitat 1971 (known as the 'Ramsar Convention') and are listed in the Directory of Important Wetlands in Australia.

2.5 Regional Vegetation

Three features of the ecology of the Island's native vegetation are notable (Environment Australia, 2014):

- The occurrence of many of the widespread Indo-Malesian species in habitats that would be considered extremely atypical elsewhere in their natural ranges, and associated with this, the exceptionally large stature of some of these species;
- The low diversity of canopy and sub-canopy species and the lack of structural complexity (e.g. relatively poor development of robust woody vines and rattans, the absence of aroids and of gingers in the understorey) in the Island's rainforests; and
- The very low diversity and lack of speciation amongst plant genera that elsewhere in the region is characteristic of early successional, and frequently disturbed, rainforest environments (e.g. *Macaranga, Claoxylon* and *Pipturus*).

In contrast to mainland vegetation, plant species occurring on Christmas Island are not sclerophyllous, have a high moisture content, larger leaves and fewer volatile organic compounds.

The geology, geomorphology and climate on Christmas Island create the biophysical environment and constraints for the vegetation communities. These factors determine the soil nutrient status, the seasonal availability of moisture and the degree of exposure to wind, which in turn control the distribution, structure and functioning of the natural vegetation (Director of National Parks, 2014a).

Vegetation mapping of the Island was initially undertaken by Mitchell (1985) for the Australian Nature Conservation Agency. This mapping had limited use due to its broad scale and spatial inaccuracy. Flora of Australia Volume 50 (Du Puy, 1993a) listed eight vegetation types for the Island.

A vegetation mapping project was undertaken from 2011 to 2014 to attempt to map vegetation with better spatial accuracy, to determine height categories and to apply these consistently across the Island. The process included a Light Detection and Ranging (LiDAR) survey, review of historic aerial photography which captured past clearing, and ground truthing. Additional categories were added to include wetland vegetation and regrowth in cleared areas. The Christmas Island Vegetation and Clearing Map was developed through a collaborative project by Geoscience Australia, Christmas Island Phosphates, Christmas Island National Park and the Commonwealth Department of the Environment (Geoscience Australia, 2014). The map classified the full extent of Christmas Island into vegetation and land cover classes (Figure 2-6 and Table 2.2), though boundaries are not always perfectly geographically accurate. Flora of Australia's vegetation types, which are still referred to in some documents, were recategorized thus:

- 'Primary rainforest' became closed canopy evergreen forest;
- 'Marginal rainforest' became semi-deciduous forest;
- 'Areas with surface water' became perennial wetland forest;
- 'Open forest, scrubby forest and vine forest' and 'inland cliffs' became semi-deciduous scrub;
- 'Coastal fringe' and 'shore cliffs and spray zone' became coastal fringe vegetation; and
- 'Mined areas' became rehabilitation, regrowth and weed dominated veg and pioneer regrowth.

Some 25% of the Island's original vegetation has been cleared for mining and infrastructure (Director of National Parks, 2014a).

Table 2.2 Vegetation of Christmas Island

Level 1	Level 2	Description
Closed canopy evergreen forest	Closed canopy evergreen forest (tall or moderate)	Generally found on the plateau and terraces, with a closed uneven canopy up to 40 m in height. Some trees emerge up to 10 m above the canopy. Often supports ferns and orchids, young palms and lilies in the understorey. **Indicator species:** *Bolbitis heteroclita, Syzygium nervosum, Hernandia ovigera, Planchonella nitida, Pisonia umbellifera, Corymborkis veratrifolia, Ehretia javanica*
Semi-deciduous forest	Semi-deciduous forest	Generally found on the slopes and terraces down to the coast - and some plateau areas. Higher occurrence of semi-deciduous trees compared to Closed Canopy Evergreen, which lose a portion of leaves during the dry season. Tree height generally 10-25 m. **Indicator species:** *Terminalia, Gyrocarpus, Erythrina variegata, Premna serratifolia, Pisonia grandis, Ochrosia ackeringae*
Semi-deciduous scrub	Semi-deciduous scrub	Found on the terraces, steep slopes and inland cliffs. Semi-deciduous canopy with vines and shrub understorey Tree height generally <10 m. **Indicator species:** §*Colubrina pedunculata, Canavalia cathartica, Carmona retusa*, Cycads
Perennial wetland forest	*Inocarpus fagifer* dominant	Areas of fresh water runoff on the lower terraces dominated by *Inocarpus fagifer*. **Indicator species:** *Inocarpus fagifer*
	Hibiscus tiliaceus dominant	Areas of fresh water runoff on the shore terrace dominated by *Hibiscus tiliaceus*. **Indicator species:** *Hibiscus tiliaceus*
	Bruguiera dominant	A single patch of vegetation dominated by *Bruguiera* at Hosnie's Spring. Occurring in an area of fresh water runoff on the shore terrace. **Indicator species:** *Bruguiera gymnorhiza*
Coastal fringe vegetation	Coastal herbland	Found between the coastal scrub and coastal cliffs in exposed areas. Class is dominated by low-lying herbs, sedges and grasses. **Indicator species:** *Portulaca tuberosa,* §*Ischaemum nativitatis, Oplismenus compositus, Sporobolus virginicus*

Level 1	Level 2	Description
	Coastal shrubland	Dense salt-tolerant vegetation growing between the coastal herbland and the terrace cliffs. **Indicator species:** §*Pandanus christmatensis, Scaevola, Pemphis, Argusia argentea, Cordia cordata, Guettarda*
Rehabilitation	Rehabilitation	Areas where forest rehabilitation has taken place. The standard of forest varies depending on the type of rehabilitation completed, species planted and management regime. **Indicator species:** A mix of up to 30 native tree species when initially planted, dependent on characteristic of the site and year of rehabilitation. *Macaranga, Dysoxylum, Calophyllum, Tristiropsis*
Regrowth	Regrowth	Generally well-developed regrowth vegetation over 5 m mean tree height. May include some introduced or weed species. **Indicator species:** Various species – dependent on adjacent vegetation
Weed dominated veg and pioneer regrowth	**Leucaena leucocephala*	Monoculture of **Leucaena leucocephala*. Often occurring as regrowth in previously cleared areas. **Indicator species:** **Leucaena leucocephala*
	Fern field	Expanse of low-lying ferns often growing on limestone pinnacles. **Indicator species:** *Nephrolepis biserrata*, *Microsorum scolopendria, Psilotum nudum*
	Mixed weed and pioneer regrowth	Regrowth vegetation with a mean tree height of <5 m. Can vary between native and introduced species depending on the location and time since clearing. Tends to have a higher occurrence of weed species compared to the 'Regrowth' category. **Indicator species:** **Muntingia calabura, *Psidium* sp. (guava), **Mimosa*, Passionfruit, *Macaranga*

Sources: Du Puy, 1993a and Geoscience Australia (2014)

There are seven major structural types of secondary vegetation (i.e. vegetation that has established in areas that have been cleared of the original natural forest) on Christmas Island (Figure 2-5). The occurrence of these secondary vegetation types in specific disturbed areas on Christmas Island reflects the influence of four main factors:

- The areal extent and the severity/intensity of the original disturbance (especially whether the soil profile has been disrupted or removed);
- Proximity to the nearest forest boundaries and/or to weed-infested areas;
- The subsequent disturbance or management history of the area (especially the frequency and intensity of further disturbances including fire); and
- The time since the last major disturbance occurred.

Whether or not the soil profile has been removed or disturbed, the proximity to forest and/or to weed infested areas and the occurrence of further disturbance are the major environmental determinants of secondary vegetation type and successional pathways. There are four main successional pathways:

- Arrested successions dominated by ferns;
- Stagnant successions dominated by thickets of exotic shrubs and vines;
- Reconstructive successions dominated by *Macaranga tanarius*; and
- Retrogressive successions leading to fernlands.

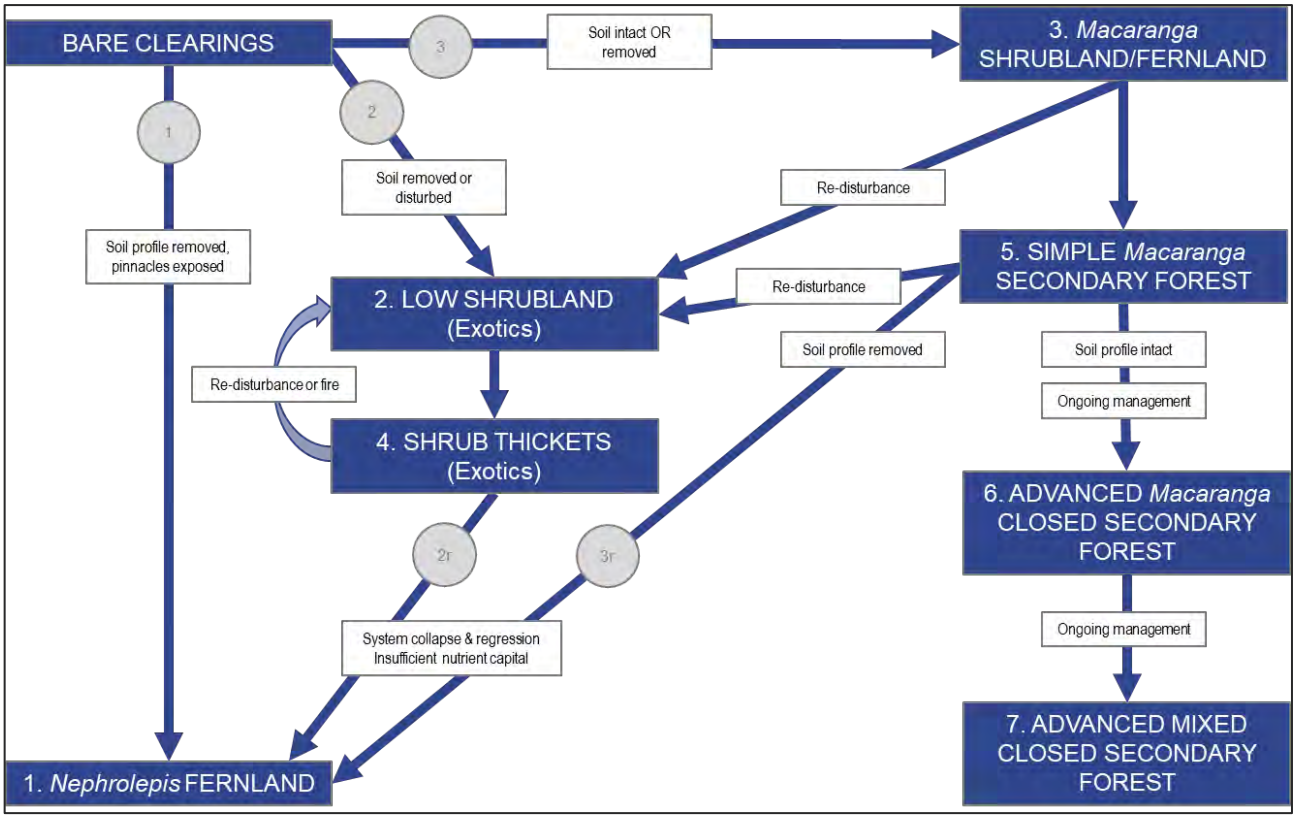

Figure 2-5 The seven major secondary (regrowth) structural types occurring on Christmas Island, adapted from Bennett (2010)

From the 34.97 ha proposed clearing envelope, 10.83 ha is mapped as previously cleared and the remainder is a combination of Closed canopy evergreen forest and semi-deciduous forest/scrub (Table 2.3). The soil profile is intact for the majority of the Survey Area (Geoscience Australia, 2011).

Table 2.3 The vegetation in the Survey Area as mapped by Geoscience Australia (2014)

Vegetation Type	Phosphate Hill (ha)	Silver City (ha)	Total (ha)	Proportion of Survey Area
Remnant native vegetation				
Closed canopy evergreen forest	14.64	Nil	14.64	41.85%
Semi-deciduous forest	0.40	4.94	5.34	15.28%
Semi-deciduous scrub	0.07	4.10	4.17	11.91%
Previously cleared				
Regrowth	7.61	0.55	8.17	23.36%
Weed dominated vegetation & pioneer regrowth	0.27	1.36	1.63	4.66%
Not vegetated	0.66	0.37	1.03	2.94%
Total	**23.65**	**11.32**	**34.97**	

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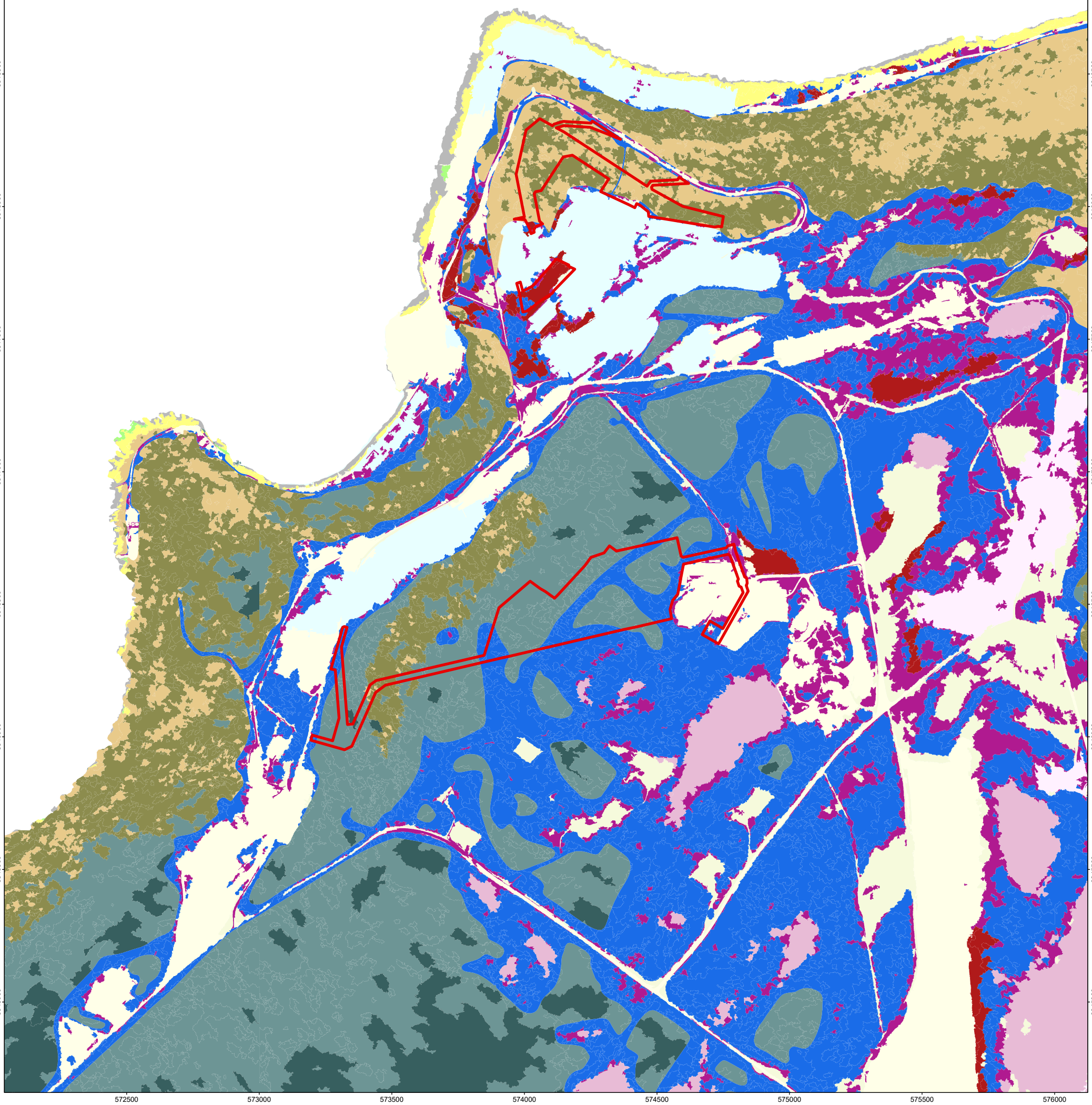

572500 573000 573500 574000 574500 575000 575500 576000

Legend

- Survey Area
- Closed canopy evergreen forest (tall)
- Closed canopy evergreen forest (moderate)
- Semi-deciduous forest
- Semi-deciduous scrub
- Rehabilitation
- Regrowth
- Coastal shrubland
- Coastal herbland
- Leaucanea leucocephala dominant
- Mixed weed and pioneer species
- Fern field
- Coastal pinnacles/sand
- Bare ground
- Mining
- Residential
- Infrastructure

JBS&G

0 500 metres

Christmas Island

GEOSCIENCE AUSTRALIA VEGETATION MAPPING

Job Number: 67277		Scale 1:15,000 at A3		
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48		
Drawn By: bsunderland	Checked By: RP	Version: Rev A	Date: 13-May-2025	**FIGURE: 2.6**

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Image Reference: Vegetation mapping Geoscience Australia

2.6 Significant Communities, Flora and Fauna

2.6.1 Ecological Communities

There are no Threatened Ecological Communities listed under the EPBC Act or BC Act occurring on Christmas Island.

2.6.2 Significant Flora

Three conservation-significant vascular terrestrial flora taxa were identified by PMST searches (DBCA does not maintain records of significant flora on Christmas Island) as potentially occurring within the Survey Area (Table 2.4, Figure 2-7 and Appendix B). The likelihood of these taxa occurring within the Survey Area was assessed against their habitat preferences and regional distribution. Of the three, two were considered as possibly occurring within the Survey Area.

Table 2.4 Significant flora likelihood of occurrence

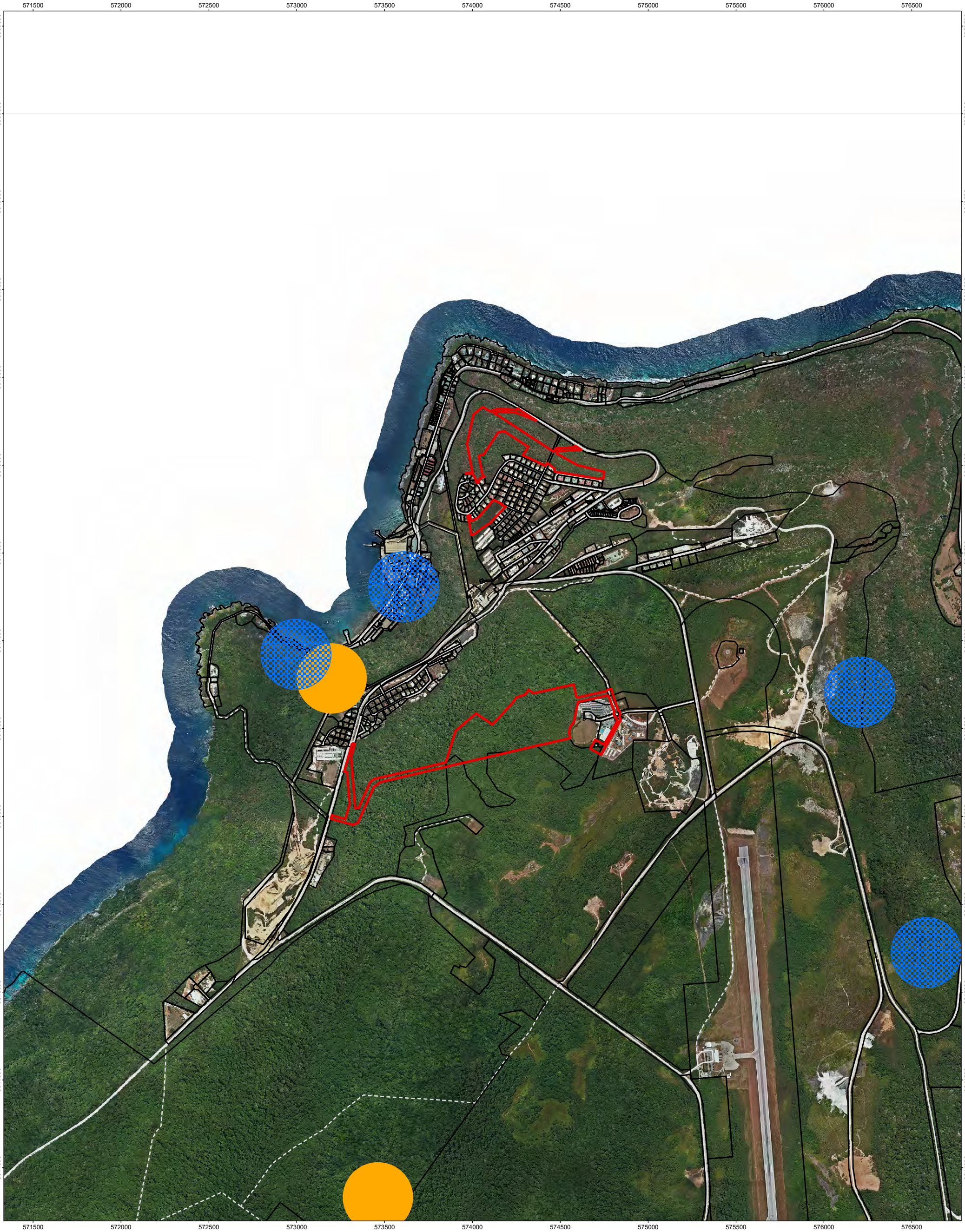
Genus (& Family)	Conservation Status		Description	Likelihood of Occurrence
	EPBC Act	BC Act		
Asplenium listeri (Aspleniaceae)	CR	Not listed	A lithophytic fern with short erect fronds, 3.5–9 cm long, which grow in a crown. Occurs in Limestone rock crevices in dry, exposed areas.	**Possible** – preferred habitat occurs within the Survey Area
Tectaria devexa var. *minor* (Dryopteridaceae)	EN	Not listed	A small, tufted, terrestrial fern with pale green fronds. Occurs in Primary rainforest (tall and largely undisturbed), above 80 metres elevation; both in deeper soils and as a lithophyte (on mossy pinnacles at the base of a slope, a wet site).	**Possible** – preferred habitat occurs within the Survey Area
Pneumatopteris truncata (Thelypteridaceae)	CR	Not listed	A large terrestrial fern with an erect rhizome and fronds growing in a crown to 120 cm long. The fronds have aerophores (respiratory structures) at the base of the pinnae. Occurs in permanently moist sites in semi-deciduous closed forest.	**Unlikely** – preferred habitat occurs within the Survey Area but known occurrences are distant.

Asplenium listeri is listed as Critically Endangered under the EPBC Act and is endemic to Christmas Island. *Tectaria devexa* var. *minor* is listed as Endangered under the EPBC Act and occurs in Sri Lanka as well as Christmas Island. *Pneumatopteris truncata*, which is listed as Critically Endangered under the EPBC Act, has a fragmented distribution over Asia and Malaysia as well as being known from two sites on Christmas Island.

Plate 1 *Asplenium listeri, Tectaria devexa* var. *minor* and *Pneumatopteris truncata* (from left to right)[2]

Records of these are maintained by Christmas Island Phosphates and Parks Australia.

[2] Sources: Khaliesha Amin, Butz (2004), http://www.phytoimages.siu.edu/



Legend

- Survey Area
- Cadastral boundary (LGATE-002)
- Significant Flora (Source: Phosphate Resources)
  - *Asplenium listeri*
  - *Tectaria devexa var. minor*

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 500 metres

Christmas Island

DESKTOP SIGNIFICANT FLORA

Job Number: 67277		Scale 1:20,000 at A3		
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48		
Drawn By: bsunderland	Checked By: RP	Version: Rev A	Date: 13-May-2025	**FIGURE: 2.8**

Document Path: C:\Users\bsunderland\JBS&G Australia\JBS&G - DCS - Internal - Documents\Projects\Shire of Christmas Island\67277 CI Housing\GIS\02_MapProjects\67277_ClHousingDraftReport_ECOLOGY.aprx

Image Reference: 2011 Orthoimage

2.6.3 Significant Fauna

Twenty-nine significant fauna species were listed in the Protected Matters Search Tool as occurring or having potential to occur at Christmas Island. Of these, 12 taxa were marine fauna, including sharks, whales and turtles. These were excluded from the assessment. The remaining 17 taxa and their likelihood of occurrence in the Survey Area are listed in Table 2.5. The taxa most likely to occur in the Survey Area are:

- Christmas Island Goshawk;
- Christmas Island Emerald Dove;
- Christmas Island Hawk Owl;
- Golden Bosunbird;
- Red-tailed Tropicbird;
- Christmas Island Thrush;
- Christmas Island Flying Fox; and
- Christmas Island Giant Gecko.

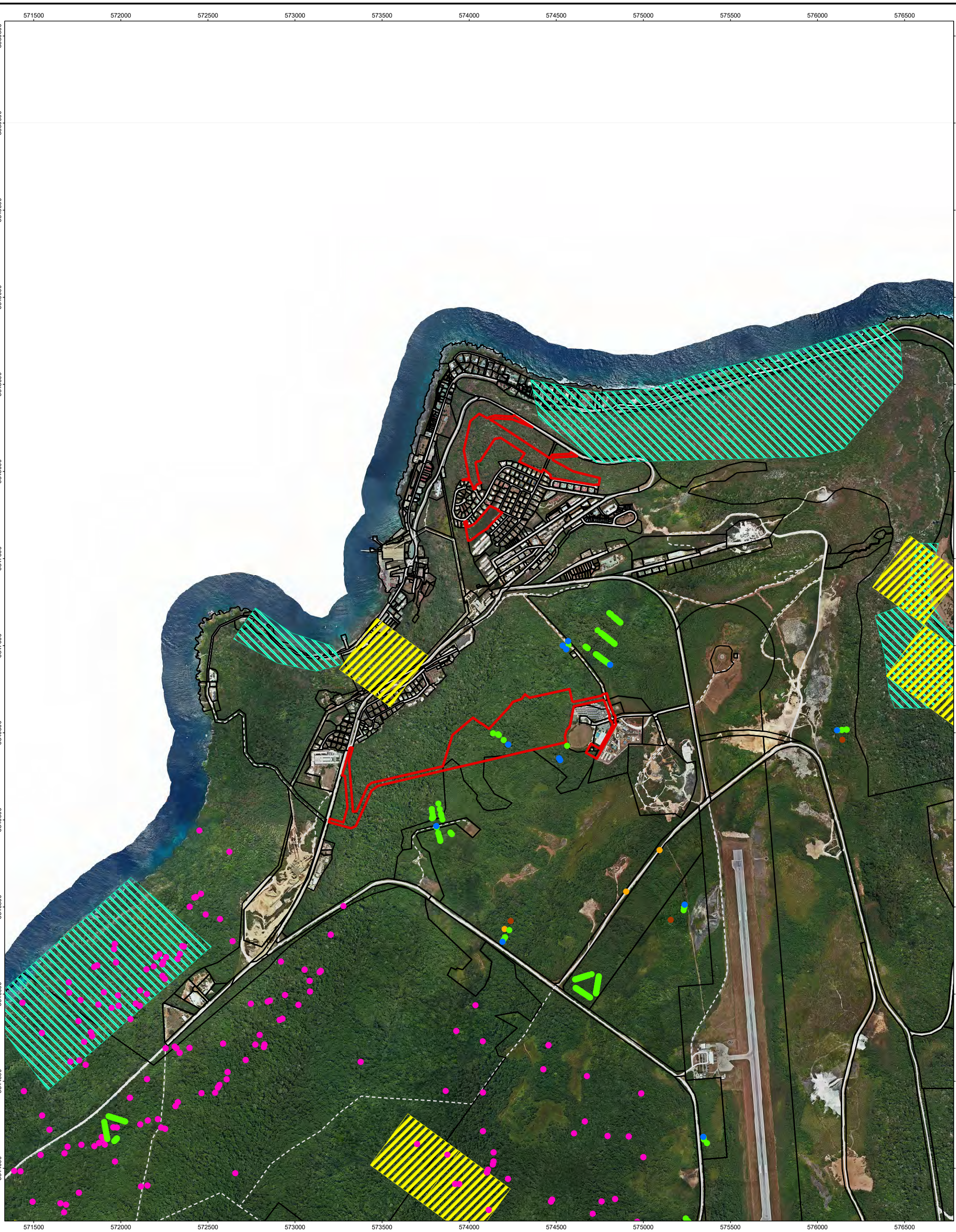
Eight taxa were considered likely to occur in the Survey Area and a further four were considered to possibly occur in the Survey Area.

Fauna records on the Island are predominantly maintained by Parks Australia, although previous surveys undertaken for Phosphate Resources have also resulted in some records of significant fauna. Known locations of significant fauna species are provided by permission of Phosphate Resources in Figure 2-8.

Table 2.5 Database search results

Scientific Name Common Name	Conservation Status	Habitat	Likelihood of Presence
BIRDS			
Accipiter hiogaster natalis Christmas Island Goshawk	EN	Endemic to Christmas Island. Nests in forks of forest trees. Widespread but uncommon on the island. Highly mobile species.	Likely – preferred habitat occurs in the Survey Area
Calidris acuminata Sharp-tailed Sandpiper	VU/MI	Tidal mudflats, saltmarshes, mangroves; shallow fresh, brackish or saline inland wetlands; floodwaters, irrigated pastures and crops; sewage ponds, saltfields.	Unlikely – no preferred habitat occurs in the Survey Area
Calidris canutus Red Knot, Knot	VU/MI	Tidal mudflats, sandflats, beaches, saltmarshes, flooded pastures and ploughed lands.	Unlikely – no preferred habitat occurs in the Survey Area
Calidris ferruginea Curlew Sandpiper	CR/MI	Tidal mudflats, saltmarsh, saltfields; fresh, brackish or saline wetlands and sewage ponds.	Unlikely – no preferred habitat occurs in the Survey Area
Chalcophaps indica natalis Christmas Island Emerald Dove	EN	Endemic to Christmas Island. Nests in trees, shrubs and vines. Highly mobile species.	Likely – preferred habitat occurs in the Survey Area
Fregata andrewsi Christmas Island Frigatebird	EN/MI	Confined to island cliffs and shore terraces where it breeds in the canopy.	Possible – preferred habitat occurs in the Survey Area
Ninox natalis Christmas Island Hawk-Owl	VU	Nests in hollows in large, mature trees. Nocturnal.	Likely – preferred habitat occurs in the Survey Area

Scientific Name Common Name	Conservation Status	Habitat	Likelihood of Presence
Papasula abbotti Abbott's Booby	EN	A sea bird, which does not utilise the understory as habitat. The only known extant nesting colony of this species is on Christmas Island. Nest sites for Abbott's booby have been mapped in island wide surveys. Mature, usually emergent, trees are essential for nesting.	Possible – preferred habitat occurs in the Survey Area
Phaethon lepturus fulvus Golden Bosunbird	EN	Nests in large mature trees and limestone cliffs.	Likely – preferred habitat occurs in the Survey Area
Phaethon rubricauda westralis Indian Ocean Red-tailed Tropicbird	EN	Tropical pelagic waters, rarely near land unless breeding. Large numbers breed on Christmas Island, with nests commonly located on the Island's rocky terraces under shrubs.	Likely – preferred habitat occurs in the Survey Area
Turdus poliocephalus erythropleurus Christmas Island Thrush	EN	Widespread and common species on the Island and is a habitat generalist being prolific in disturbed areas. Little information on breeding ecology is available. Highly mobile species.	Likely – preferred habitat occurs in the Survey Area
MAMMALS			
Crocidura trichura Christmas Island Shrew	CR	Considered extinct	Absent
Pteropus natalis Christmas Island Flying-fox	CR	Endemic to Christmas Island. All recorded roosts have been located on the coastal terrace or around the first land cliff and semi-deciduous forest. Highly mobile and forages through the forest canopy so is unlikely to be impacted by understorey vegetation clearing.	Likely – preferred habitat occurs in the Survey Area
REPTILES			
Cryptoblepharus egeriae Christmas Island Blue-tailed Skink	CR	Considered extinct in the wild prior to recent releases of captive-bred individuals.	Possible – preferred habitat occurs in the Survey Area but this taxon has only been released in select locations
Cyrtodactylus sadleiri Christmas Island Giant Gecko	EN	Endemic to Christmas Island. Found in all island habitats, except areas lacking trees and shrubs. Evergreen tall, closed forest is considered critical habitat for this species (Director of National Parks, 2014b).	Likely – preferred habitat occurs in the Survey Area
Lepidodactylus listeri Christmas Island Gecko, Lister's Gecko	CR	Considered extinct in the wild.	Absent
Ramphotyphlops exocoeti Christmas Island Blind Snake	VU	A cryptic, fossorial species. No specimen has been found since 2009.	Possible – preferred habitat occurs in the Survey Area



Legend

- Survey Area
- Cadastral boundary (LGATE-002)

Source: Christmas Island Biodiversity Conservation Plan - DRAFT 2014

- *Pteropus natalis*
- Frigatebird colonies

Source: Range to Reef Environmental - various surveys up to 2018

- *Accipiter hiogaster natalis*
- *Cyrtodactylus sadleiri*
- *Ninox natalis*
- *Papasula abbotti*
- *Pteropus nativus*

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 500 metres

Job Number: 67277

Scale 1:20,000 at A3

Client: Shire of Christmas Island

Coord. Sys. GDA2020 MGA Zone 48

Drawn By: bsunderland | Checked By: RP | Version: Rev A | Date: 13-May-2025

Christmas Island

DESKTOP SIGNIFICANT FAUNA

FIGURE: 2.9

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Image Reference: 2011 Orthoimage

2.7 Conservation Areas

The Christmas Island National Park, which covers 63% of the Island, is assigned to IUCN reserve category II, most of which is uncleared primary rainforest (Director of National Parks, 2014a) (Figure 1-1).

3. Methods

The field assessment of the Survey was conducted by Associate Ecologist Rachael Pratt from JBS&G, and independent Zoologist Jeff Turpin from 11-16 September 2024, with the survey effort shown in .

The survey was conducted in accordance with guidelines provided in *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016), with some allowances and modifications made to accommodate the unique tropical environment on Christmas Island. This included the use of relevés instead of quadrats, the undertaking of a single season of sampling and the use of a modified vegetation condition scale. The justification behind these changes are outlined below.

3.1 Flora and vegetation survey

3.1.1 Data collection

Christmas Island has been comprehensively surveyed in the past. In the late 1800s, Christmas Island was the subject of one of the world's first baseline environmental surveys, later published as *A monograph of Christmas Island* (Andrews, 1900). Parks Australia North undertakes an island-wide survey on a 300 m grid biennially, and from 2013-2014 Geoscience Australia teamed with Parks Australia North and Phosphate Resources to produce an island-wide vegetation map. In consideration of the survey history, DWER has historically accepted Reconnaissance survey data in combination with Targeted surveys as adequate information for clearing permit applications. There is no established optimum survey season on Christmas Island because the island's flora do not have a peak flowering season. Surveys are instead limited by the red crab migration and the monsoon.

Data was collected from seven relevés, and opportunistically. Indicative site locations were identified prior to commencement of the field survey using aerial photography, topographic maps and existing vegetation maps, to ensure that all broad vegetation types and landforms within the Survey area would be sampled.

At each sample site, data collected included:

- site identifier;
- location, with GPS coordinates and datum;
- sample site type, size and marking method;
- a photograph from the centre of the relevé;
- landform and soil description;
- a vegetation description compatible with the National Vegetation Information System (NVIS Technical Working Group, 2017);
- any other location information that might be useful in vegetation classification including slope, aspect, litter, fire history, vegetation/landform/soil correlations;
- assessment of vegetation condition in accordance with a modified vegetation condition scale adapted for Christmas Island, and description of disturbances; and
- a comprehensive inventory of vascular terrestrial flora and an average height and percentage foliage cover for each taxon.

Any additional flora taxa observed opportunistically around sample sites or while traversing on foot within the Survey Area were recorded.

Targeted flora survey

Prior to the field survey, conservation significant flora taxa identified by the desktop assessment as potentially occurring within the Survey Area were reviewed by field staff to ensure familiarity with these taxa. Three species of EPBC Act listed Threatened flora occur on Christmas Island. All three are ferns which do not have a flowering period, so targeted surveys can be undertaken at any time of year.

No targeted flora survey was undertaken during the Survey, in part due to terrain constraints, with large portions of the Survey Area being dangerous to traverse due to extensive pinnacle formations. Instead suitable habitat was identified for pre-clearance surveys if required.

Flora identification and nomenclature

All plants were identified on site and through photographic records, with reference to *Flora of Australia Volume 50: Oceanic Islands 2* (1993) and *Native Plants of Christmas Island* (Claussen, 2005), due to quarantine requirements and an absence of reference specimens in Western Australia. Nomenclature of the species recorded is in accordance with Western Australian Herbarium (1998-).

Vegetation condition

Vegetation condition was recorded at all sample sites, and opportunistically within the Survey Area during the field assessment where required. Vegetation condition polygon boundaries were developed using this information in conjunction with aerial photography interpretation and were digitised as for vegetation type mapping polygon boundaries.

Vegetation condition was assessed using an adapted scale developed for Christmas Island's rainforest vegetation, based on condition rating scales developed by Keighery (1994). The adapted scale examines regrowth development, retention of structural features present in undisturbed rainforest, weediness and landform disturbance. The vegetation condition rating scale is provided in Table 3.1.

Table 3.1 Vegetation Condition Scale (adapted from Keighery 1994)

Condition Rating	Keighery (1994)	Adapted scale
Pristine	Pristine or nearly so, no obvious signs of disturbance.	Mature, undisturbed rainforest or very advanced secondary regrowth. Disturbance is limited to cyclone damage. Climax species dominate and full structural complexity is present with epiphytic orchids and ferns, terrestrial orchids and ferns, *Pandanus*, palms, buttressing and woody lianes. 
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.	Little to no weed species and a largely intact landform with few signs of disturbance. The vegetation structure is beginning to develop the full complexity and diversity expected in rainforest, with climax species present and a range of features included such as buttressing, palms, ferns, epiphytes and orchids, but the canopy is likely to be more open than in undisturbed rainforest. 
Very Good	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the	Low diversity vegetation with few signs of disturbance or moderately diverse vegetation on a disturbed landform, a canopy dominated by pioneer species, though recruitment of climax species may be evident, an open canopy or poor structural complexity. Few weeds present or weeds are limited to less aggressive species.

Condition Rating	Keighery (1994)	Adapted scale
	presence of some more aggressive weeds, dieback, logging and grazing.	
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.	Multiple signs of disturbance or with low diversity and no structural complexity. Typically displays little to no recruitment of climax tree species. Numerous weeds present or a dense understorey dominated by one or two native fern species. 
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.	Vegetation at very early successional stages with a canopy of one to two species and an understorey dominated by ferns or weeds, typically adjacent to completely degraded land. May have the potential to develop into better quality vegetation as the canopy develops if weeds are managed. 
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often referred to as parkland cleared with the flora composing weed or crop species with isolated native trees or shrubs.	The structures of primary rainforest are no longer present and native species are limited to only a few species, for example, weed dominated shrubland with sparse emergent *Macaranga* or a near monoculture *Nephrolepis biserrata* fernland. The landscape may be highly disturbed, often with significantly reduced soil and pinnacles exposed. Predominantly lacking a native canopy and with little to no potential to develop one due to dense groundcover or shallow soil. 

3.1.2 Data Analysis and Vegetation Mapping

Vegetation units

Vegetation units were delineated using a combination of sample site data and site observations. Aerial photography interpretation and field notes taken during the survey were then used to develop vegetation mapping polygon boundaries over the Survey Area. These polygon boundaries were then digitised using Geographic Information System (GIS) software.

Vegetation descriptions (through floristic in origin) have been adapted from the National Vegetation Information System (NVIS) Australian Vegetation Attribute Manual Version 7.0 (NVIS Technical Working Group 2017), a system of describing structural vegetation units (based on dominant taxa). This model follows nationally-agreed guidelines to describe and represent vegetation types, so that comparable and consistent data is produced nation-wide.

3.1.3 Survey Constraints and Limitations

The flora and vegetation assessment has been evaluated against a range of potential limitations (Table 3.2). Based on this evaluation, the assessment has been subject to minor limitations or constraints that have affected the thoroughness of the assessment and the conclusions reached.

Table 3.2 Flora and vegetation survey constraints and limitations

Potential Limitation	Impact on Assessment	Comment
Availability of contextual information at a regional and local scale	**Not a constraint**	Contextual information for the site is readily available, and was utilised were necessary during the preparation of this report. This includes review of previous flora survey reports and island wide vegetation mapping.
Proportion of flora Recorded and/or collected, any identification issues	**Minor constraint**	The upper canopy on Christmas Island reaches above 40 m and includes vines and epiphytes which cannot be easily identified from the ground. Where possible binoculars are used as an aid to identification of canopy species, and fruits and leaves present on the ground are examined.
Was the appropriate area fully surveyed (extent and effort)	**Moderate constraint**	Parts of the Survey Area, particularly in Silver City could not be safely accessed due to extensive pinnacle formations.
Survey timing, rainfall, season of survey	**Not a constraint**	In the six months preceding the Survey, Christmas Island received above average rainfall. There is no specific flowering season on Christmas Island.
Disturbance that may have affected the results of the survey such as fire, flood or clearing	**Not a constraint**	The Survey Area was not subject to recent disturbances that would impact the outcomes of the survey.
Access restrictions within the survey area	**Moderate constraint**	Parts of the Survey Area, particularly in Silver City could not be safely accessed due to extensive pinnacle formations.
Competency/experience of the team carrying out the survey, including experience in the bioregion surveyed	**Not a constraint**	Survey personnel have the appropriate training in sampling and identifying the flora of the region.

3.2 Fauna survey

3.2.1 Data Collection

Bird Census

Bird census data was collected at 11 locations over five days, with each location monitored for approximately 20 minutes (Table 3.3).

Table 3.3 Bird census sites

Site	Date	Time monitored for (Minutes)	Latitude	Longitude
B01	9/11/2024	20	-10.418556	105.679762
B02	9/11/2024	20	-10.422961	105.677674
B03	9/11/2024	20	-10.419923	105.681471
B04	9/11/2024	20	-10.421110	105.682071
B05	9/11/2024	20	-10.421110	105.682071
B06	9/12/2024	20	-10.437094	105.670077
B07	9/12/2024	20	-10.434682	105.675713
B08	9/12/2024	20	-10.434807	105.68038
B09	9/13/2024	20	-10.436688	105.669515
B10	9/14/2024	20	-10.436469	105.669498
B11	9/16/2024	20	-10.43681	105.669673

Habitat Trees

Potential habitat trees were recorded opportunistically while traversing the Survey Area. Trees were identified as a habitat tree if they were mature canopy trees over 500 mm diameter at breast height (DBH) or had suitable hollows. Location data was recorded with a Garmin GPS in GDA2020.

Spotlighting

Night spotlighting was undertaken on 12 September (Silver City) and 15 September (Phosphate Hill) by Jeff Turpin and Rachael Pratt. Recorded calls of Christmas Island Hawk-Owl were played intermittently during spotlighting. All fauna recorded were marked with a waypoint using a Garmin GPS in GDA2020.

Opportunistic Fauna Records

The Survey Area was thoroughly traversed on foot and opportunistic fauna records were captured with a Garmin GPS. For all fauna, the species, quantity and type of observation was noted.

3.2.2 Data Analysis and Habitat Mapping

Potential fauna habitat was mapped based on vegetation mapping, soils, terrain, waypoints and notes.

3.2.3 Survey Constraints and Limitations

The fauna assessment has been evaluated against a range of potential limitations (Table 3.4). Based on this evaluation, the assessment has been subject to minor limitations or constraints that have affected the thoroughness of the assessment and the conclusions reached.

Table 3.4 Fauna survey constraints and limitations

Potential Limitation	Impact on Assessment	Comment
Availability of data and information	No constraint	The survey was undertaken on Christmas Island, which has been well surveyed and for which a large volume of contextual information exists.
Competency/experience of the survey team, including experience in the bioregion surveyed	No constraint	The survey was undertaken by field staff with adequate experience in the bioregion.
Scope of the survey, e.g. where faunal groups were excluded from the survey	No constraint	No terrestrial faunal groups were excluded.
Timing, weather and season	No constraint	The survey was undertaken in September 2024 in fine and mild conditions.
Disturbance that may have affected results, e.g. fire, flood	No constraint	No recent disturbances were present which may have affected results.
The proportion of fauna identified, recorded or collected	No constraint	A basic fauna survey focuses primarily on habitats present and desktop information.
Adequacy of the survey intensity and proportion of survey achieved, e.g. the extent to which the area was surveyed	Minor constraint	The survey intensity was adequate to describe the likely impacts to terrestrial fauna potentially present at the Survey Area, however, there were parts of the Survey Area which were inaccessible due to extensive limestone pinnacles.
Access problems	Minor constraint	Parts of the Survey Area which were inaccessible due to extensive limestone pinnacles.
Problems with data and analysis, including sampling biases.	No constraint	There were no problems with data or analysis.

Legend

- Survey Area
- Cadastral boundary (LGATE-002)

Flora and vegetation

- Releve
- Traverse

Vertebrate fauna

- Bird census; Bird Census
- Call playback

Terrestrial fauna

- Spotlight by vehicle
- Traverse

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 200 metres

Job Number: 67277		Scale 1:6,200 at A3	
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48	
Drawn By: bsunderland	Checked By: RP	Version: Rev A	Date: 13-May-2025

Christmas Island

SURVEY EFFORT - PHOSPHATE HILL - CLEARING PERMIT AREA

FIGURE: 3.1A

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Image Reference: 2011 Orthoimage

Legend

- Survey Area
- Cadastral boundary (LGATE-002)

Flora and vegetation

- Releve
- Traverse

Vertebrate fauna

- Bird census; Bird Census
- Call playback

Terrestrial fauna

- Traverse

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 100 metres

Christmas Island

SURVEY EFFORT - SILVER CITY - CLEARING PERMIT AREA

Job Number: 67277		Scale 1:3,500 at A3	
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48	
Drawn By: bsunderland	Checked By: RP	Version: Rev A	Date: 13-May-2025

FIGURE: 3.1B

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Image Reference: 2011 Orthoimage

4. Results

4.1 Flora and Vegetation

4.1.1 Flora Assemblage

During the survey 54 terrestrial vascular flora species were identified from 53 genera and 37 families, including 14 introduced taxa. The most common families were Fabaceae (four taxa), Euphorbiaceae (four taxa) Malvaceae and Meliaceae (each with three taxa).

4.1.2 Introduced Taxa

Fourteen introduced taxa were found during the Survey:

- *Asystasia gangetica* (Chinese Violet);
- *Carica papaya* (Paw-paw);
- *Clausena excavata* (False Curry Leaf Bush);
- *Varonia curassavica* (Black Sage);
- *Delonix regia* (Poinciana);
- *Euphorbia cyathiflora* (Painted Spurge);
- *Hyptis capitata* (knobweed);
- *Leucaena leucocephala* (White Leadtree/White Popinac/Horse Tamarind);
- *Mikania micrantha* (Mile-a-Minute);
- *Mimosa pudica* (Sensitive Plant);
- *Muntingia calabura* (Jamaica cherry);
- *Musa* sp. (Bananas);
- *Stachytarpheta jamaicensis* (Blue Snakeweed); and
- *Turnera ulmifolia* (Ramgoat Dashalong/Yellow Alder).

Mimosa pudica is a Declared Pest plant listed under the BAM Act and *Mikania micrantha* is a Northern Australian Quarantine Strategy watch species. None of the above weeds are weeds of national significance.

4.1.3 Threatened species

No threatened flora taxa were identified in the Survey Areas, however, areas of potentially suitable habitat were identified for both *Asplenium listeri* (limestone cliffs and pinnacles, of which there were many in both Survey Areas) and *Tectaria devexa* (primary rainforest, throughout the Phosphate Hill Survey Area). *Pneumatopteris truncata* has not been recorded near the Survey Areas so although the habitat at Phosphate Hill was suitable, it is highly unlikely to occur in the Survey Areas.

4.1.4 Vegetation

Three vegetation units were identified in the Survey Area, as well as gardens and cleared areas (Table 4.1 and Figure 4-1). One of these,* *Leucaena leucocephala* thicket was dominated by weed species. Both the closed canopy evergreen forest and the semi-deciduous forest/scrub had areas which had been historically cleared and contained adventitious regrowth (see Figure 2-6) at varying ages and condition (Figure 4-2).

Closed canopy evergreen forest occupied the majority of the Phosphate Hill Survey Area (22.44 ha) and semi-deciduous forest/scrub occupied the majority of the Silver City Survey Area (9.56 ha). The area of each vegetation unit is presented in Table 4.2.

Table 4.1 Vegetation units present in the Survey Area

Vegetation Type	Sites	Photo
Closed canopy evergreen forest/regrowth Closed forest of *Tristiropsis acutangula, Dysoxylum gaudichaudianum, Barringtonia racemosa* and *Inocarpus fagifer,* with emergent *Syzygium nervosum,* over an open subcanopy of *Arenga listeri* and *Pandanus elatus,* over a sparse groundcover of *Corymborkis veratrifolia, Davalia solida* and *Nephrolepis bisserata,* with epiphytic *Asplenium nidus, Vittaria elongata, Pyrrosia lanceolata* and lianes of *Maclura cochinchinensis* and *Schefflera elliptica* at all strata.	R04, R05, R06	
Semi-deciduous forest/scrub/regrowth Open to closed forest of *Celtis timorensis, Tristiropsis acutangula* over a subcanopy of *Arenga listeri* and *Ochrosia ackeringae*, with numerous other species subdominant, with little to no groundcover, and epiphytic *Pyrrosia lanceolata* and lianes of *Maclura cochinchinensis* at all strata.	R01, R02, R03, R07	
Leucaena thicket Tall closed shrubland of **Leucaena leucocephala* with emergent **Delonix regia* over low mixed forbs.	No sites (impenetrable thicket)	
Garden Planted species over introduced grasses and forbs.		No image
Cleared areas Introduced grasses and forbs or hardstand.		No image

Table 4.2 Area of each vegetation unit

Vegetation Type	Phosphate Hill	Silver City	Total[3]
Closed canopy evergreen forest/regrowth	22.44 ha	Nil	**22.44 ha**
Semi-deciduous forest/scrub/regrowth	0.58 ha	9.56 ha	**10.14 ha**
Leucaena thicket	Nil	1.28 ha	**1.28 ha**
Garden	Nil	0.26 ha	**0.26 ha**
Cleared areas	0.63 ha	0.22 ha	**0.85 ha**

4.1.5 Vegetation Condition

The majority of the Survey Area was in Excellent condition, with the Phosphate Hill Survey Area containing 13.25 ha of vegetation in Pristine condition and 9.22 ha of vegetation in Excellent condition, and the Silver City Survey Area containing 6.50 ha of vegetation in Excellent condition, although approximately 40% of the Silver City area was in worse condition (Table 4.3).

Table 4.3 Vegetation condition in the Survey Areas

Condition	Phosphate Hill	Silver City	Total[4]
Pristine	13.25 ha	Nil	**13.25 ha**
Excellent	9.22 ha	6.50 ha	**15.72 ha**
Very Good	0.04 ha	1.20 ha	**1.24 ha**
Good	0.29 ha	1.68 ha	**1.97 ha**
Degraded	0.21 ha	0.18 ha	**0.40 ha**
Completely Degraded	0.63 ha	1.76 ha	**2.39 ha**

[3] Note minor discrepancies when tallying columns are an artifact of trivial rounding errors cause by rounding to two decimal places.

Legend

- Survey Area
- Vegetation Unit
  - Cleared
  - Closed Canopy Evergreen Forest/ Regrowth
  - Leucaena thicket
  - Semi-deciduous Forest/Scrub/Regrowth
- Cadastral boundary (LGATE-002)
- Roads (LGATE-195)
  - Minor road
  - Track

JBS&G

0 200 metres

Job Number: 67277		Scale 1:6,200 at A3	
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48	
Drawn By: bsunderland	Checked By: RP	Version: Rev A	Date: 13-May-2025

Christmas Island

VEGETATION - PHOSPHATE HILL - CLEARING PERMIT AREA

FIGURE: 4.1A

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Image Reference: 2011 Orthoimage

Legend

- Survey Area
- Vegetation Unit
  - Cleared
  - Garden
  - Leucaena thicket
  - Semi-deciduous Forest/Scrub/Regrowth
- Cadastral boundary (LGATE-002)
- Roads (LGATE-195)
  - Minor road
  - Track

JBS&G

0 100 metres

Job Number: 67277

Scale 1:3,500 at A3

Client: Shire of Christmas Island

Coord. Sys. GDA2020 MGA Zone 48

Drawn By: bsunderland | Checked By: RP | Version: Rev A | Date: 13-May-2025

Christmas Island

VEGETATION - SILVER CITY - CLEARING PERMIT AREA

FIGURE: 4.1B

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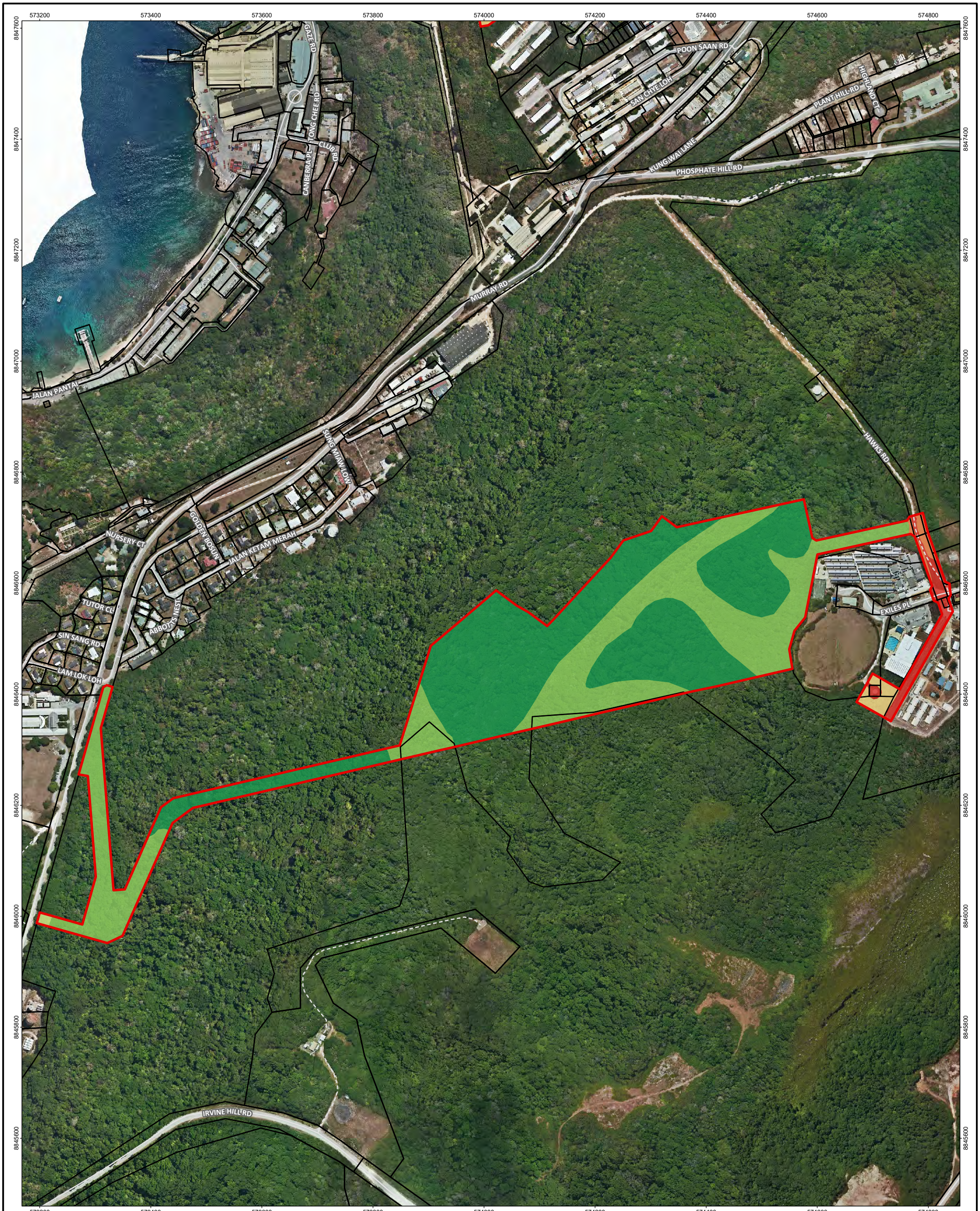
Image Reference: 2011 Orthoimage



Legend

- Survey Area
- Vegetation Condition
  - Pristine
  - Excellent
  - Very Good
  - Good
  - Degraded
  - Completely Degraded
- Cadastral boundary (LGATE-002)
- Roads (LGATE-195)
  - Minor road
  - Track

JBS&G

0 200 metres

Job Number: 67277		Scale 1:6,200 at A3	
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48	
Drawn By: bsunderland	Checked By: RP	Version: Rev A	Date: 13-May-2025

Christmas Island

VEGETATION CONDITION - PHOSPHATE HILL - CLEARING PERMIT AREA

FIGURE: 4.2A

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Image Reference: and 2011 Orthoimage

Legend

- Survey Area

Vegetation Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

- Cadastral boundary (LGATE-002)

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 100 metres

Christmas Island

VEGETATION CONDITION - SILVER CITY - CLEARING PERMIT AREA

Job Number: 67277		Scale 1:3,500 at A3	
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48	
Drawn By: bsunderland	Checked By: RP	Version: Rev A	Date: 13-May-2025

FIGURE: 4.2B

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Image Reference: 2011 Orthoimage

4.2 Fauna

4.2.1 Fauna Assemblage

During the survey, 15 birds, five invertebrates, three mammals and three reptiles were identified, including eight introduced species (Table 4.4). Numerous additional invertebrates were seen, including spiders and butterflies, but these were not identified as part of this survey. Most of the fauna identified were bird species.

Table 4.4 Fauna taxa identified during the survey

Taxon Common name	EPBC Act	Phosphate Hill	Silver City	Nearby
BIRD				
Accipiter natalis Christmas Island Goshawk	EN	+		
Chalcophaps indica natalis Christmas Island Emerald Dove	EN	+		
Collocalia esculenta natalis Christmas Island Swiftlet	Not listed	+	+	
Ducula whartoni Christmas Island Imperial Pigeon	Not listed	+	+	
Falco cenchroides Nankeen Kestrel	(Introduced)		+	
Fregata andrewsi Christmas Island Frigate Bird	EN/MI			+ (nesting – distant)
Fregata minor Great Frigate Bird	MI	+ (nesting)		+ (nesting)
Gallus gallus Red Junglefowl	(Introduced)	+	+	
Ninox natalis Christmas Island Hawk-Owl	VU	+		
Papasula abbotti Abbott's Booby	EN			+ (nesting)
Phaethon lepturus fulvus Golden Bosun	EN	+ (nesting)[4]	+ (nesting)	
Plegadis falcinellus Glossy Ibis	MI			+
Sula sula Red-footed Booby	MI			+ (nesting)
Turdus erythropleurus Christmas Island Thrush	EN	+	+	
Zosterops natalis Christmas Island White-eye	Not listed	+	+	
INVERTEBRATE				
Birgus latro Robber Crab	Not listed	+		

[4] Golden bosuns were nesting in a nest box installed within the broader Structure Plan area.

Taxon Common name	EPBC Act	Phosphate Hill	Silver City	Nearby
Gecarcoidea natalis Christmas Island Red Crab	Not listed	+	+	
Gecarcoidea humei Purple Crab	Not listed	+		
Lissachatina fulica Giant African Snail	(Introduced)	+	+	
Scolopendra subspinipes (Giant Centipede)	(Introduced)	+		
MAMMAL				
Felis catus Domestic rat	(Introduced)			
Pteropus natalis Christmas Island Flying-fox	CR	+		
Rattus rattus Common rat	(Introduced)	+	+	
REPTILE				
Cyrtodactylus sadleiri Christmas Island Giant Gecko	EN	+		
Hemidactylus frenatus Asian House Gecko	(Introduced)	+	+	
Lycodon capucinus Wolf Snake	(Introduced)	+		

Table 4.5 Bird census results

Species	Sites										
	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
Christmas Island White-eye	0	0	8	24	8	14	9	26	18	20	16
CI Thrush	8	0	3	9	6	6	4	6	5	8	6
CI Pigeon	6	3	4	2	4	5	9	12	11	9	0
CI Swiftlet	2	1	0	0	0	2	0	0	0	1	0
Golden Bosun	2	0	0	0	0	0	0	1	0	1	1
Red Junglefowl	0	2	0	2	4	0	0	0	0	3	4
Nankeen Kestrel	0	0	2	0	0	0	0	0	0	0	0
Emerald Dove	0	0	0	0	16	1	1	1	2	0	0

4.2.2 Introduced Fauna

Seven introduced fauna species were identified in the Survey Areas:

- Domestic cat;
- Giant African Snail;
- Giant Centipede.
- Nankeen Kestrel;
- Rats;
- Red Jungle Fowl; and

- Wolf Snake.

All are common on the Island, although there is a cat eradication program underway.

4.2.3 Significant Fauna

Seven threatened fauna species listed under the EPBC Act were identified in the Survey Areas (Table 4.4 and Figure 4-3):

- Christmas Island Giant Gecko (Endangered)
- Christmas Island Flying Fox (Critically Endangered)
- Christmas Island Goshawk (Endangered)
- Christmas Island Emerald Dove (Endangered)
- Christmas Island Hawk-Owl (Vulnerable)
- Golden Bosun (Endangered)
- Christmas Island Thrush (Endangered)

Additional threatened bird species and species listed as Migratory under the EPBC Act were identified nearby (Table 4.4 and Figure 4-3).

4.2.4 Fauna Habitats

Four fauna habitats were identified in the Survey Area (Table 4.6 and Figure 4-4). The majority of the Phosphate Hill Survey Area (94.9%) was Closed Canopy Evergreen Forest/Regrowth (22.44 ha) and 84.5% of the Silver City Survey Area was Semi-deciduous Forest/Scrub/Regrowth (9.56 ha).

Table 4.6 Fauna habitats

Habitat	Sites	Photo
Closed Canopy Evergreen Forest/Regrowth Habitat features: deep phosphatic sands with minor limestone outcropping and rocks. Large trees, often emergent. Sparse understory. Limited leaf-litter due to Red Crab foraging. Many small Red Crab burrows. Tree hollows and loose bark. Epiphytic ferns provide arboreal habitat. Pandanus groves provide shelter for Robber Crabs. Water pools collect in Pandanus fronds. Fallen fruit abundant.	B06, B07, B10, B11 (B05, B08, B09, CPB3, CPB2 just outside)	

Habitat	Sites	Photo
Semi-deciduous Forest/Scrub/Regrowth Habitat features: shallow phosphatic sands with significant limestone outcropping and rocks. Rock crevices abundant. Semi-deciduous trees suitable for sea bird nesting. Sparse understory. Limited leaf-litter due to Red Crab foraging. Some Red Crab burrows. Some fallen fruit.	B04, B12, B13 (B01, B03, CPB1 just outside)	
Leucaena thicket Compact, shallow, gravelly soils. No large trees. Dense, leguminous vegetation. Deciduous Poinciana may provide sea bird nesting habitat. Few fallen fruit. Few red crab burrows.	(B02 just outside)	
Cleared Few habitat features. Forbs may provide butterfly and other invertebrates with habitat.	No sites	No image

Table 4.7 Area of fauna habitats

Fauna Habitat	Phosphate Hill	Silver City	Total
Closed Canopy Evergreen Forest/Regrowth	22.44 ha	Nil	**22.44 ha**
Semi-deciduous Forest/Scrub/Regrowth	0.58 ha	9.56 ha	**10.14 ha**
Leucaena thicket	Nil	1.28 ha	**1.28 ha**
Cleared	0.63 ha	0.48 ha	**1.11 ha**
Total	**23.65 ha**	**11.32 ha**	**34.97 ha**

Legend

- Survey Area
- Cadastral boundary (LGATE-002)

Conservation Significant Fauna

- EN,*Accipiter natalis*
- EN,*Chalcophaps indica natalis*
- EN,*Cyrtodactylus sadleiri*
- EN,*Papasula abbotti*
- EN,*Phaethon lepturus fulvus*
- EN,*Plegadis falcinellus*
- EN,*Turdus erythropleurus*
- VU,*Ninox natalis*
- VU,*Papasula abbotti*

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 200 metres

Job Number: 67277

Scale 1:6,200 at A3

Client: Shire of Christmas Island

Coord. Sys. GDA2020 MGA Zone 48

Drawn By: bsunderland | Checked By: RP | Version: Rev A | Date: 13-May-2025

Christmas Island

SIGNIFICANT FAUNA - PHOSPHATE HILL - CLEARING PERMIT AREA

FIGURE: 4.3A

Document Path: C:\Users\bsunderland\JBS&G Australia\JBS&G - DCS - Internal - Documents\Projects\Shire of Christmas Island\67277 CI Housing\GIS\02_MapProjects\67277_ClHousingDraftReport_ECOLOGY.aprx

Image Reference: 2011 Orthoimage

Legend

- Survey Area
- Cadastral boundary (LGATE-002)

Conservation Significant Fauna

- EN,*Phaethon lepturus fulvus*
- EN/MI,*Fregata andrewsi*
- MI,*Hemidactylus frenatus*

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 100 metres

Job Number: 67277		Scale 1:3,500 at A3	
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48	
Drawn By: bsunderland	Checked By: RP	Version: Rev A	Date: 13-May-2025

Christmas Island

SIGNIFICANT FAUNA - SILVER CITY - CLEARING PERMIT AREA

FIGURE: 4.3B

Document Path: C:\Users\bsunderland\JBS&G Australia\JBS&G - DCS - Internal - Documents\Projects\Shire of Christmas Island\67277 CI Housing\GIS\02_MapProjects\67277_ClHousingDraftReport_ECOLOGY.aprx

Image Reference: 2011 Orthoimage

Legend

- Survey Area

Fauna Habitat

- Closed Canopy Evergreen Forest/ Regrowth
- Leucaena thicket
- Semi-deciduous Forest/Scrub/Regrowth
- Cleared
- Cadastral boundary (LGATE-002)
- Large tree

Roads (LGATE-195)

- Minor road
- Track

JBS&G

0 200 metres

Job Number: 67277		Scale 1:6,200 at A3	
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48	
Drawn By: bsunderland	Checked By: RP	Version: Rev A	Date: 13-May-2025

Christmas Island

FAUNA HABITATS - PHOSPHATE HILL - CLEARING PERMIT AREA

FIGURE: 4.4A

Document Path: C:\Users\bsunderland\JBS&G Australia\JBS&G - DCS - Internal - Documents\Projects\Shire of Christmas Island\67277 CI Housing\GIS\02_MapProjects\67277_ClHousingDraftReport_ECOLOGY.aprx

Image Reference: 2011 Orthoimage

Legend

- Survey Area
- Fauna Habitat
  - Leucaena thicket
  - Semi-deciduous Forest/Scrub/Regrowth
  - Cleared
- Cadastral boundary (LGATE-002)
- Large fig
- Large tree
- Roads (LGATE-195)
  - Minor road
  - Track

JBS&G

0 100 metres

Christmas Island

FAUNA HABITATS - SILVER CITY - CLEARING PERMIT AREA

Job Number: 67277		Scale 1:3,500 at A3	
Client: Shire of Christmas Island		Coord. Sys. GDA2020 MGA Zone 48	
Drawn By: bsunderland	Checked By: RP	Version: Rev A	Date: 13-May-2025

FIGURE: 4.4B

Document Path: C:\Users\bsunderland\JBS&G Australia\JBS&G - DCS - Internal - Documents\Projects\Shire of Christmas Island\67277 CI Housing\GIS\02_MapProjects\67277_ClHousingDraftReport_ECOLOGY.aprx
Image Reference: 2011 Orthoimage

5. Discussion

5.1 Flora and Vegetation

The flora and vegetation of the Survey Areas were generally unremarkable, being reasonably consistent with vegetation mapped by Geoscience Australia (2014). From the 34.97 ha proposed clearing envelope, 10.83 ha (30.96%) has been previously cleared and the remainder was a combination of closed canopy evergreen forest and semi-deciduous forest/scrub. Most of the vegetation in the Survey Areas was in Excellent to Pristine condition. The Silver City Survey Area contained one block of Completely Degraded vegetation which would be highly suited to development. Other areas in Silver City were somewhat degraded by their proximity to housing, with gardens encroaching and numerous dilapidated structures such as chicken pens, and copious trash.

No conservation significant flora taxa were identified, however, these cannot be ruled out since a targeted flora survey was not a component of the survey. Large sections of the Survey Areas, particularly in Silver City contained dense areas of sharp limestone pinnacles which are hazardous to traverse. These areas could not be safely accessed but may provide habitat for the threatened fern *Asplenium listeri*, which prefers such locations.

Two significant weed species were identified during the Survey, *Mikania micrantha*, which is a NAQS watch species and *Mimosa pudica*, which is a Declared Pest plant under the BAM Act (WA).

5.2 Fauna

The Survey Areas contained four fauna habitats. Of these, the two most valuable to fauna were:

- **Closed Canopy Evergreen Forest/Regrowth**
  Habitat features: deep phosphatic sands with minor limestone outcropping and rocks. Large trees, often emergent. Sparse understory. Limited leaf-litter due to Red Crab foraging. Many small Red Crab burrows. Tree hollows and loose bark. Epiphytic ferns provide arboreal habitat. Pandanus groves provide shelter for Robber Crabs. Water pools collect in Pandanus fronds. Fallen fruit abundant.
- **Semi-deciduous Forest/Scrub/Regrowth**
  Habitat features: shallow phosphatic sands with significant limestone outcropping and rocks. Rock crevices abundant. Semi-deciduous trees suitable for sea bird nesting. Sparse understory. Limited leaf-litter due to Red Crab foraging. Some Red Crab burrows. Some fallen fruit.

Closed canopy evergreen forest is home to most of the island's bird species, with the exception of shore-nesting species such as the Red-tailed Tropicbird, Red-footed Boobies and Frigatebirds. It is also home to the Christmas Island Giant Gecko (Endangered) and Christmas Island Flying Fox (Critically Endangered).

The Christmas Island Flying Fox has several known roost sites but utilises much of the island for foraging and can often be seen over the townsite. Previous studies of the Christmas Island Giant Gecko indicate that it is most abundant in the north-east of the Island, in closed canopy evergreen forest.

Golden Bosuns (Endangered) are known to nest in tree hollows in these areas and Abbott's Booby (Endangered) nests exclusively in tall rainforest trees, although no Abbott's Booby are known to occur in the Survey Areas. Abbott's Booby nests were located near the Survey Area, in sub-optimal breeding habitat above Drumsite. Abbott's Booby nests are vulnerable to strong winds and turbulence and consequently have a preference for nest sites on the plateau in the south and south-east of the island. Green corridors planned for the Phosphate Hill development area may assist with mitigation of turbulence and reducing wind speeds by increasing surface roughness.

Many forest birds are highly mobile, and widespread on the island, including the Christmas Island Goshawk (Endangered), Christmas Island Emerald Dove (Endangered), Christmas Island Hawk-Owl (Vulnerable) and Christmas Island Thrush (Endangered).

Semi-deciduous forest and scrub contains numerous limestone cliffs and pinnacles, which provide nesting habitat to bosun birds and swiftlets. Deciduous trees are preferred nesting habitat for numerous seabirds and

Christmas Island Frigatebird colonies are largely restricted to the shore terraces. Although Christmas Island Frigatebird colonies occur not far from the Survey Areas, there was a reasonable distance to the nearest colony north east of Silver City.

Seven threatened fauna species listed under the EPBC Act were identified in the Survey Areas:

- Christmas Island Giant Gecko (Endangered);
- Christmas Island Flying Fox (Critically Endangered);
- Christmas Island Goshawk (Endangered);
- Christmas Island Emerald Dove (Endangered);
- Christmas Island Hawk-Owl (Vulnerable);
- Golden Bosun (Endangered); and
- Christmas Island Thrush (Endangered).

Of these, the Christmas Island Flying Fox, Christmas Island Goshawk, Christmas Island Emerald Dove, Christmas Island Hawk-Owl and Christmas Island Thrush are unlikely to be significantly disturbed by clearing, being highly mobile and able to relocate. Little is known about the nesting habits of the Christmas Island Hawk-Owl, but it is believed to nest in hollows in mature trees.

The Christmas Island Giant Gecko is an arboreal reptile which forages on trees and shrubs in most island habitats. Individuals have a small range and would be impacted by clearing. The Phosphate Hill area is preferred habitat for the Christmas Island Giant Gecko and they are relatively abundant in this area.

The Golden Bosun is relatively common on Christmas Island and nests in both the Silver City and Phosphate Hill Survey Areas in tree hollows and rock crevices. Bosuns were observed returning to their nests during the Survey.

6. Conclusion

The key findings of the Survey were:

- The Survey comprised two areas:
  - Silver City (11.32 ha); and
  - Phosphate Hill (23.65 ha).
- Geoscience Australia vegetation mapping indicates that 30.96% of the Survey Areas has been previously cleared;
- During the survey 54 terrestrial vascular flora species were identified from 53 genera and 37 families, including 14 introduced taxa;
- One NAQS weed and one Declared Pest plant under the BAM Act were identified;
- No significant flora taxa were identified, however no targeted flora survey was conducted;
- Three vegetation units were identified;
- Most of the Survey Area was in Excellent condition;
- Fifteen birds, five invertebrates, three mammals and three reptiles were identified in the Survey Areas, including eight introduced species;
- Seven threatened fauna listed under the EPBC Act were identified in the Survey Areas; and
- Four fauna habitats were identified.

7. Limitations

Scope of services

This report ("the report") has been prepared by JBS&G in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and JBS&G. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

Reliance on data

In preparing the report, JBS&G has relied upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise expressly stated in the report, JBS&G has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. JBS&G has also not attempted to determine whether any material matter has been omitted from the data. JBS&G will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to JBS&G. The making of any assumption does not imply that JBS&G has made any enquiry to verify the correctness of that assumption.

The report is based on conditions encountered and information received at the time of preparation of this report or the time that site investigations were carried out. JBS&G disclaims responsibility for any changes that may have occurred after this time. This report and any legal issues arising from it are governed by and construed in accordance with the law as at the date of this report.

Environmental conclusions

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made, including to any third parties, and no liability will be accepted for use or interpretation of this report by any third party.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G or reproduced other than in full, including all attachments as originally provided to the client by JBS&G.

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Appendix A Conservation Code Definitions

Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)

Threatened Species

Threatened fauna and flora may be listed under Section 178 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in any one of the following categories.

A.1 Commonwealth listed Threatened Species categories

Code	Conservation Category
EX	**Extinct Species** A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
EW	**Extinct in the Wild Species** A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: a. it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or b. it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, d
CR	**Critically Endangered Species** A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
EN	**Endangered Species** A native species is eligible to be included in the endangered category at a particular time if, at that time: a. it is not critically endangered; and b. it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
VU	**Vulnerable Species** A native species is eligible to be included in the vulnerable category at a particular time if, at that time: a. it is not critically endangered or endangered; and b. it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent Species** A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: a. the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or b. the following subparagraphs are satisfied: i. the species is a species of fish; ii. the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; iii. the plan of management is in force under a law of the Commonwealth or of a State or Territory; iv. cessation of the plan of management would adversely affect the conservation status of the species.

Threatened Ecological Communities

Threatened Ecological Communities may be listed under Section 181 of the EPBC Act in any one of the following categories.

A.2 Commonwealth listed Threatened Ecological Community categories

Code	Conservation Category
CR	**Critically Endangered Communities** An ecological community is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
EN	**Endangered Communities**

Code	Conservation Category
	An ecological community is eligible to be included in the endangered category at a particular time if, at that time: a. it is not critically endangered; and b. it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
VU	**Vulnerable Communities** An ecological community is eligible to be included in the vulnerable category at a particular time if, at that time: a. it is not critically endangered nor endangered; and b. it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

CONSERVATION CATEGORY DEFINITIONS

For Western Australian Fauna and Flora

Threatened, Extinct and Specially Protected fauna or flora[1] are species[2] which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

Categories of Threatened, Extinct and Specially Protected fauna and flora are:

T Threatened species

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is the species of fauna that are listed as critically endangered, endangered or vulnerable threatened species.

Threatened flora is the species of flora that are listed as critically endangered, endangered or vulnerable threatened species.

The assessment of the conservation status of threatened species is in accordance with the BC Act listing criteria and the requirements of Ministerial Guideline Number 1 and Ministerial Guideline Number 2 that adopts the use of the International Union for Conservation of Nature (IUCN) Red List of Threatened Species Categories and Criteria[3], and is based on the national distribution of the species.

CR Critically endangered species

Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines.

Examples of use:

- The western ringtail possum (*Pseudocheirus occidentalis*) is listed as a critically endangered threatened species under the *Biodiversity Conservation Act 2016.*
- Western ringtail possum is listed as critically endangered under the *Biodiversity Conservation Act 2016.*
- Listing reference in a table: column heading: BC Act, row text: CR.

EN Endangered species

Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines.

Examples of use:

- *Caladenia hopperiana* is listed as an endangered threatened species under the *Biodiversity Conservation Act 2016.*
- *Caladenia hopperiana* is listed as endangered under the *Biodiversity Conservation Act 2016.*
- Listing reference in a table: column heading: BC Act, row text: EN.

VU Vulnerable species

Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines.

Examples of use:

- The forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*) is listed as a vulnerable threatened species under the *Biodiversity Conservation Act 2016.*
- Forest red-tailed black cockatoo is listed as vulnerable under the *Biodiversity Conservation Act 2016.*
- Listing reference in a table: column heading: BC Act, row text: VU.

Extinct species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

EX Extinct species

Species where "*there is no reasonable doubt that the last member of the species has died*", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Examples of use:

- *Acacia kingiana* is listed as an extinct species under the *Biodiversity Conservation Act 2016.*
- *Acacia kingiana* is listed as extinct under the *Biodiversity Conservation Act 2016.*
- Listing reference in a table: column heading: BC Act, row text: EX.

EW Extinct in the wild species

Species that *"is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no fauna or flora species listed as extinct in the wild.

SP Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered, or vulnerable) or extinct species under the BC Act cannot also be listed as specially protected species.

MI Migratory species

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Migratory species include birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA)[4], China (CAMBA)[5] or The Republic of Korea (ROKAMBA)[6], and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention)[7], an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Examples of use:

- The wedge-tailed shearwater (*Ardenna pacifica*) is listed as a specially protected migratory species under the *Biodiversity Conservation Act 2016.*
- Wedge-tailed shearwater is listed as migratory under the *Biodiversity Conservation Act 2016.*
- Listing reference in a table: column heading: BC Act, row text: MI.

CD **Species of special conservation interest (conservation dependent)**

Species of special conservation need that are dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Currently only fauna are listed as species of special conservation interest.

Examples of use:

- The wambenger, south-western brush-tailed phascogale (*Phascogale tapoatafa wambenger*) is listed as a specially protected species of special conservation interest under the *Biodiversity Conservation Act 2016.*
- Wambenger, south-western brush-tailed phascogale, is listed as conservation dependent under the *Biodiversity Conservation Act 2016.*
- Listing reference in a table: column heading: BC Act, row text: CD.

OS **Species otherwise in need of special protection (other specially protected)**

Species otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Currently only fauna are listed as species otherwise in need of special protection.

Examples of use:

- The dugong (*Dugong dugon*) is listed as a specially protected species otherwise in need of special protection under the *Biodiversity Conservation Act 2016.*
- Dugon is listed as other specially protected fauna under the *Biodiversity Conservation Act 2016.*
- Listing reference in a table: column heading: BC Act, row text: OS.

P **Priority species**

Priority is not a listing category under the BC Act. The Priority Flora and Fauna lists are maintained by the department and are published on the department's website.

All fauna and flora are protected in WA following the provisions in Part 10 of the BC Act. The protection applies even when a species is not listed as threatened or specially protected, and regardless of land tenure (State managed land (Crown land), private land, or Commonwealth land).

Species that may possibly be threatened species that do not meet the criteria for listing under the BC Act because of insufficient survey or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of prioritisation for survey and evaluation of conservation status so that consideration can be given to potential listing as threatened.

Species that are adequately known, meet criteria for near threatened, or are rare but not threatened, or that have been recently removed from the threatened species list or conservation dependent or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of priority status is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

1 **Priority 1: Poorly-known species - known from few locations, none on conservation lands**

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, for example, agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation.

Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements for threatened listing and appear to be under immediate threat from known threatening processes. These species are in urgent need of further survey.

Examples of use:

- *Borya stenophylla* is listed as a Priority 1 species by the Department of Biodiversity, Conservation and Attractions.
- *Borya stenophylla* is listed as Priority 1 on the DBCA Priority Flora List.
- Listing reference in a table: column heading: DBCA, row text: P1.

2 Priority 2: Poorly-known species - known from few locations, some on conservation lands

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, for example, national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation.

Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements for threatened listing and appear to be under threat from known threatening processes. These species are in urgent need of further survey.

Examples of use:

- *Caladenia nivalis* is listed as a Priority 2 species by the Department of Biodiversity, Conservation and Attractions.
- *Caladenia nivalis* is listed as Priority 2 on the DBCA Priority Flora List.
- Listing reference in a table: column heading: DBCA, row text: P2.

3 Priority 3: Poorly-known species - known from several locations

Species that are known from several locations and the species does not appear to be under imminent threat or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat.

Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. These species need further survey.

Examples of use:

- *Acacia nitidula* is listed as a Priority 3 species by the Department of Biodiversity, Conservation and Attractions.
- *Acacia nitidula* is listed as Priority 3 on the DBCA Priority Flora List.
- Listing reference in a table: column heading: DBCA, row text: P3.

4 Priority 4: Rare, Near Threatened and other species in need of monitoring

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.

(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as a conservation dependent specially protected species.

(c) Species that have been removed from the list of threatened species or lists of conservation dependent or other specially protected species, during the past five years for reasons other than taxonomy.

(d) Other species in need of monitoring.

Examples of use:

- *Banksia aculeata* is listed as a Priority 4 species by the Department of Biodiversity, Conservation and Attractions.
- *Banksia aculeata* is listed as Priority 4 on the DBCA Priority Flora List.
- Listing reference in a table: column heading: DBCA, row text: P4.

[1] The definition of flora includes algae, fungi, and lichens.

[2] Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

[3] Western Australia has assigned species to threat categories using the *IUCN Red List of Threatened Species Categories and Criteria* since 1996 (referencing all criteria).

[4] JAMBA - first included in the WA migratory species list in 1980.

[5] CAMBA - first included in the WA migratory species list in 2010.

[6] ROKAMBA - first included in the WA migratory species list in 2010.

[7] Bonn Convention (Birds) - first included in the WA migratory species list in 2015.

Appendix B PMST Search

Australian Government

Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 04-Dec-2024

Summary

Details

- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat

Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	2
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	32
Listed Migratory Species:	34

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	85
Commonwealth Heritage Places:	10
Listed Marine Species:	58
Whales and Other Cetaceans:	24
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	1
Australian Marine Parks:	1
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	2
EPBC Act Referrals:	63
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands)	[Resource Information]
Ramsar Site Name	Proximity
Hosnies spring	Within Ramsar site
The dales	Within Ramsar site

Commonwealth Marine Area	[Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
Commonwealth Marine Areas (EPBC Act)

Listed Threatened Species	[Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Accipiter hiogaster natalis		
Christmas Island Goshawk [82408]	Endangered	Species or species habitat known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Vulnerable	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Chalcophaps indica natalis		
Christmas Island Emerald Dove, Emerald Dove (Christmas Island) [67030]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Fregata andrewsi Christmas Island Frigatebird, Andrew's Frigatebird [1011]	Endangered	Breeding known to occur within area
Ninox natalis Christmas Island Hawk-Owl, Christmas Boobook [66671]	Vulnerable	Species or species habitat known to occur within area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat known to occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Breeding known to occur within area
Phaethon rubricauda westralis Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824]	Endangered	Breeding known to occur within area
Turdus poliocephalus erythropleurus Christmas Island Thrush [67122]	Endangered	Species or species habitat likely to occur within area
MAMMAL		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Crocidura trichura Christmas Island Shrew [86568]	Critically Endangered	Species or species habitat likely to occur within area
Pteropus natalis Christmas Island Flying-fox, Christmas Island Fruit-bat [87611]	Critically Endangered	Species or species habitat known to occur within area
PLANT		

Scientific Name	Threatened Category	Presence Text
Asplenium listeri Christmas Island Spleenwort [65865]	Critically Endangered	Species or species habitat known to occur within area
Pneumatopteris truncata fern [68812]	Critically Endangered	Species or species habitat known to occur within area
Tectaria devexa Cave Fern [14767]	Endangered	Species or species habitat likely to occur within area
REPTILE		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Cryptoblepharus egeriae Christmas Island Blue-tailed Skink, Blue-tailed Snake-eyed Skink [1526]	Critically Endangered	Species or species habitat likely to occur within area
Cyrtodactylus sadleiri Christmas Island Giant Gecko [86865]	Endangered	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat likely to occur within area
Lepidodactylus listeri Christmas Island Gecko, Lister's Gecko [1711]	Critically Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area
Ramphotyphlops exocoeti		
Christmas Island Blind Snake, Christmas Island Pink Blind Snake [1262]	Vulnerable	Species or species habitat likely to occur within area
SHARK		
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sphyrna lewini		
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area

Listed Migratory Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Fregata andrewsi		
Christmas Island Frigatebird, Andrew's Frigatebird [1011]	Endangered	Breeding known to occur within area
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor		
Great Frigatebird, Greater Frigatebird [1013]		Breeding known to occur within area
Phaethon lepturus		
White-tailed Tropicbird [1014]		Breeding known to occur within area
Phaethon rubricauda		
Red-tailed Tropicbird [994]		Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Sula leucogaster Brown Booby [1022]		Breeding known to occur within area
Sula sula Red-footed Booby [1023]		Breeding known to occur within area
Migratory Marine Species		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat may occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Cecropis daurica Red-rumped Swallow [80610]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Vulnerable	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State
Environment and Heritage	
Commonwealth Land - Christmas Island National Park [94102]	CI
Commonwealth Land - Christmas Island National Park [94103]	CI
Commonwealth Land - Christmas Island National Park [94105]	CI
Commonwealth Land - Christmas Island National Park [94104]	CI
Commonwealth Land - Christmas Island National Park [94101]	CI
Unknown	
Commonwealth Land - [94202]	CI

Commonwealth Land Name	State
Commonwealth Land - [94213]	CI
Commonwealth Land - [94212]	CI
Commonwealth Land - [94211]	CI
Commonwealth Land - [94217]	CI
Commonwealth Land - [94214]	CI
Commonwealth Land - [94240]	CI
Commonwealth Land - [94218]	CI
Commonwealth Land - [94244]	CI
Commonwealth Land - [94201]	CI
Commonwealth Land - [94204]	CI
Commonwealth Land - [94210]	CI
Commonwealth Land - [94242]	CI
Commonwealth Land - [94216]	CI
Commonwealth Land - [94221]	CI
Commonwealth Land - [94209]	CI
Commonwealth Land - [94206]	CI
Commonwealth Land - [94249]	CI
Commonwealth Land - [94226]	CI
Commonwealth Land - [94225]	CI
Commonwealth Land - [94239]	CI
Commonwealth Land - [94254]	CI
Commonwealth Land - [94280]	CI
Commonwealth Land - [94232]	CI
Commonwealth Land - [94234]	CI
Commonwealth Land - [94260]	CI
Commonwealth Land - [94233]	CI
Commonwealth Land - [94230]	CI

Commonwealth Land Name	State
Commonwealth Land - [94250]	CI
Commonwealth Land - [94228]	CI
Commonwealth Land - [94251]	CI
Commonwealth Land - [94223]	CI
Commonwealth Land - [94262]	CI
Commonwealth Land - [94224]	CI
Commonwealth Land - [94227]	CI
Commonwealth Land - [94220]	CI
Commonwealth Land - [94222]	CI
Commonwealth Land - [94229]	CI
Commonwealth Land - [94238]	CI
Commonwealth Land - [94243]	CI
Commonwealth Land - [94235]	CI
Commonwealth Land - [94215]	CI
Commonwealth Land - [94241]	CI
Commonwealth Land - [94247]	CI
Commonwealth Land - [94278]	CI
Commonwealth Land - [94208]	CI
Commonwealth Land - [94205]	CI
Commonwealth Land - [94275]	CI
Commonwealth Land - [94245]	CI
Commonwealth Land - [94248]	CI
Commonwealth Land - [94258]	CI
Commonwealth Land - [94207]	CI
Commonwealth Land - [94246]	CI
Commonwealth Land - [94273]	CI
Commonwealth Land - [94270]	CI

Commonwealth Land Name	State
Commonwealth Land - [94274]	CI
Commonwealth Land - [94272]	CI
Commonwealth Land - [94219]	CI
Commonwealth Land - [94269]	CI
Commonwealth Land - [94271]	CI
Commonwealth Land - [94279]	CI
Commonwealth Land - [94277]	CI
Commonwealth Land - [94276]	CI
Commonwealth Land - [94265]	CI
Commonwealth Land - [94264]	CI
Commonwealth Land - [94267]	CI
Commonwealth Land - [94266]	CI
Commonwealth Land - [94203]	CI
Commonwealth Land - [94268]	CI
Commonwealth Land - [94263]	CI
Commonwealth Land - [94261]	CI
Commonwealth Land - [94259]	CI
Commonwealth Land - [94257]	CI
Commonwealth Land - [94236]	CI
Commonwealth Land - [94231]	CI
Commonwealth Land - [94253]	CI
Commonwealth Land - [94252]	CI
Commonwealth Land - [94256]	CI
Commonwealth Land - [94255]	CI
Commonwealth Land - [94237]	CI

Commonwealth Heritage Places		[Resource Information]
Name	State	Status
Historic		

Name	State	Status
Administrators House Precinct	EXT	Listed place
Drumsite Industrial Area	EXT	Listed place
Industrial and Administrative Group	EXT	Listed place
Malay Kampong Group	EXT	Listed place
Malay Kampong Precinct	EXT	Listed place
Phosphate Hill Historic Area	EXT	Listed place
Poon Saan Group	EXT	Listed place
Settlement Christmas Island	EXT	Listed place
South Point Settlement Remains	EXT	Listed place
Natural		
Christmas Island Natural Areas	EXT	Listed place

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat may occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Cecropis daurica as Hirundo daurica Red-rumped Swallow [80610]		Species or species habitat known to occur within area overfly marine area
Fregata andrewsi Christmas Island Frigatebird, Andrew's Frigatebird [1011]	Endangered	Breeding known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Breeding known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area overfly marine area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat known to occur within area overfly marine area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area overfly marine area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat known to occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Breeding known to occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
[Phaethon rubricauda](#) Red-tailed Tropicbird [994]		Breeding known to occur within area
[Sula leucogaster](#) Brown Booby [1022]		Breeding known to occur within area
[Sula sula](#) Red-footed Booby [1023]		Breeding known to occur within area
Fish		
[Choeroichthys brachysoma](#) Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
[Choeroichthys sculptus](#) Sculptured Pipefish [66197]		Species or species habitat may occur within area
[Corythoichthys amplexus](#) Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
[Corythoichthys flavofasciatus](#) Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
[Corythoichthys haematopterus](#) Reef-top Pipefish [66201]		Species or species habitat may occur within area
[Corythoichthys intestinalis](#) Australian Messmate Pipefish, Banded Pipefish [66202]		Species or species habitat may occur within area
[Corythoichthys schultzi](#) Schultz's Pipefish [66205]		Species or species habitat may occur within area
[Cosmocampus banneri](#) Roughridge Pipefish [66206]		Species or species habitat may occur within area
[Cosmocampus maxweberi](#) Maxweber's Pipefish [66209]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Doryrhamphus baldwini Redstripe Pipefish [66718]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		Species or species habitat may occur within area
Halicampus macrorhynchus Whiskered Pipefish, Ornate Pipefish [66222]		Species or species habitat may occur within area
Halicampus mataafae Samoan Pipefish [66223]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippichthys spicifer Belly-barred Pipefish, Banded Freshwater Pipefish [66232]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Micrognathus brevirostris thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Trachyrhamphus bicoarctatus		
Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris		
Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Reptile		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
Lepidochelys olivacea		
Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat likely to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area

Whales and Other Cetaceans		[Resource Information]
Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat likely to occur within area

Current Scientific Name	Status	Type of Presence
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
[Balaenoptera physalus](#) Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
[Delphinus delphis](#) Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
[Feresa attenuata](#) Pygmy Killer Whale [61]		Species or species habitat may occur within area
[Globicephala macrorhynchus](#) Short-finned Pilot Whale [62]		Species or species habitat may occur within area
[Grampus griseus](#) Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
[Indopacetus pacificus](#) Longman's Beaked Whale [72]		Species or species habitat may occur within area
[Kogia breviceps](#) Pygmy Sperm Whale [57]		Species or species habitat may occur within area
[Kogia sima](#) Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
[Lagenodelphis hosei](#) Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
[Megaptera novaeangliae](#) Humpback Whale [38]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon ginkgodens Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Commonwealth Reserves Terrestrial [Resource Information]

Name	State	Type
Christmas Island	EXT	National Park (Commonwealth)

Australian Marine Parks [Resource Information]

Park Name	Zone & IUCN Categories
Christmas Island	Habitat Protection Zone (IUCN IV)

Extra Information

Nationally Important Wetlands [Resource Information]

Wetland Name	State
"The Dales", Christmas Island	EXT
Hosine's Spring, Christmas Island	EXT

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Marine Route Survey for Subsea Fibre Optic Data Cable System - Australia West	2024/09826		Completed
Controlled action			
Christmas Island Airport Expansion	2001/434	Controlled Action	Post-Approval
Christmas Island Port Facility	2001/435	Controlled Action	Post-Approval
Construction of mobile phone tower	2002/694	Controlled Action	Completed
Cultural Appearance Upgrade of the Chinese Literary Association Building	2007/3568	Controlled Action	Completed
East Christmas Island Phosphate Mines (9 sites)	2001/487	Controlled Action	Completed
Exploration for Mineable Phosphate, Christmas Island	2000/43	Controlled Action	Completed
Lily Beach Recreational Facilities	2001/395	Controlled Action	Post-Approval
Lily Beach Rock Pool Development	2001/400	Controlled Action	Completed
Phosphate Mining in South Point Christmas Island	2012/6653	Controlled Action	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Proposed exploration drilling programme for Christmas Island	2016/7779	Controlled Action	Completed
Road Upgrade/Construction between Lily Beach Road and Port Faci	2001/436	Controlled Action	Post-Approval
Salvage, transport and processing of phosphate resource with extended airport si	2003/1217	Controlled Action	Post-Approval
Yellow Crazy Ant Biological Control	2013/6836	Controlled Action	Post-Approval
Not controlled action			
96-108 Gaze Road - Residential upgrade	2006/2632	Not Controlled Action	Completed
Aerial Baiting, Yellow Crazy Ant Supercolonies, Christmas Island, WA	2019/8492	Not Controlled Action	Completed
Boat Ramp Construction	2001/237	Not Controlled Action	Completed
Building of a carport adjacent to residential house	2004/1538	Not Controlled Action	Completed
Christmas Island/Construction of a double storey shed/carport at MQ387 Gaze Road	2004/1561	Not Controlled Action	Completed
Christmas Island Fuel Consolidation Project, Christmas Island	2012/6454	Not Controlled Action	Completed
Community Recreation Centre	2003/1279	Not Controlled Action	Completed
courtyard shower & handbasin facilities	2006/2803	Not Controlled Action	Completed
Dwelling demolition, maintenance and carpark/carport/storage shed works	2004/1837	Not Controlled Action	Completed
Extension of a Masonary Brick Wall adjacent to the Poon Saan Club by 500 mm	2004/1564	Not Controlled Action	Completed
Flying Fish Cove Christmas Island Boat Ramp Maintenance	2021/8924	Not Controlled Action	Completed
Flying Fish Cove Landslide Mitigation Project	2020/8616	Not Controlled Action	Completed
Garage and Office Facilities	2004/1919	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Housing and Garden Maintenance Works	2004/1487	Not Controlled Action	Completed
Hydroponics Research Program	2007/3338	Not Controlled Action	Completed
Identification of unmarked grave, exhumation/identification of remains which may belong to a sailor	2006/2992	Not Controlled Action	Completed
Internal and external modifications Lot 1014 Gaze Road	2004/1807	Not Controlled Action	Completed
Light Industrial Subdivision Development	2004/1799	Not Controlled Action	Completed
Lot 1056 Extensions and Alterations	2004/1801	Not Controlled Action	Completed
Maintenance of Tai Jin House, Smith Point	2009/4933	Not Controlled Action	Completed
Mobile Radio Communications System Upgrade	2002/718	Not Controlled Action	Completed
Placement of bitumen/ concrete on rail sections of heritage listed incline, Christmas Island	2013/7009	Not Controlled Action	Completed
Power Station Diesel Generator Replacement	2009/4685	Not Controlled Action	Completed
Proposed sale or lease of Crown land, 11 lots, Christmas Island	2018/8220	Not Controlled Action	Completed
Realignment of Gaze Road Service Road and Gaze Road Junction	2004/1735	Not Controlled Action	Completed
Refurbishment and Extension of Seaview Lodge	2012/6353	Not Controlled Action	Completed
renovate free-standing servant's quarters	2006/2811	Not Controlled Action	Completed
Replacement of deteriorating flat roof at rear of Mosque and extending side verandahs, Christmas Is	2013/6851	Not Controlled Action	Completed
Residential upgrade, 2 Coconut Grove	2007/3295	Not Controlled Action	Completed
Stormwater Remediation Project, Christmas Island	2019/8467	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Subdivision of Lot 571 on DP 26701	2008/4230	Not Controlled Action	Completed
Subdivision of Part 7 of Lot 1014	2009/4851	Not Controlled Action	Completed
Supermarket Extensions	2006/2515	Not Controlled Action	Completed
Upgrade of Residence, Coconut Grove	2006/2728	Not Controlled Action	Completed
Verandah Extension to Existing Breezeway Unit, Gaze Road	2005/1970	Not Controlled Action	Completed
Not controlled action (particular manner)			
Addition of Verandah to Block of Four Units	2005/2315	Not Controlled Action (Particular Manner)	Post-Approval
Aerial Baiting of Yellow Crazy Ants	2012/6438	Not Controlled Action (Particular Manner)	Post-Approval
Asbestos Removal from Commonwealth Owned Assests including Commonwealth Heritage	2009/4873	Not Controlled Action (Particular Manner)	Post-Approval
Baiting Efficacy Trial of Feral Cat Bait and PAPP Toxicant	2008/4383	Not Controlled Action (Particular Manner)	Post-Approval
Commonwealth Marine/Flying Fish Cove Jetty Extension	2012/6675	Not Controlled Action (Particular Manner)	Post-Approval
Crazy Ant Aerial Baiting Control Program	2002/722	Not Controlled Action (Particular Manner)	Post-Approval
Helicopter baiting of exotic yellow crazy ant supercolonies, Christmas Island, Indian Ocean	2009/5016	Not Controlled Action (Particular Manner)	Post-Approval
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval
New Housing Program	2011/6056	Not Controlled Action	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		(Particular Manner)	
Swimming Pool modification	2007/3312	Not Controlled Action (Particular Manner)	Post-Approval
Trials of a bait delivery system for the control of Yellow Crazy Ants	2009/4763	Not Controlled Action (Particular Manner)	Post-Approval
Water supply upgrade	2005/2269	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
Alterations and Improvements to existing residence at Lot 3015 Gaze Rd, Christmas Island	2009/5039	Referral Decision	Completed
Rocky Point Dwelling Redevelopment	2005/2203	Referral Decision	Referral Decision

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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Appendix C Flora Species List

Family		Taxon	Status
ACANTHACEAE	*	*Asystasia gangetica*	
APOCYNACEAE		*Hoya aldrichii*	
		Ochrosia ackeringae	
ARALIACEAE		*Schefflera elliptica*	
ARECACEAE		*Arenga listeri*	
ASPLENIACEAE		*Asplenium nidus*	
ASTERACEAE	*	*Mikania micrantha*	NAQS target species
BORAGINACEAE		*Carmona retusa*	
		Ehretia javanica	
	*	*Varronia curassavica*	
CANNABACEAE		*Celtis timorensis*	
CARICACEAE	*	*Carica papaya*	
COMBRETACEAE		*Terminalia catappa*	
DAVALLIACEAE		*Davalia solida*	
		Nephrolepis biserrata	
DIOSCOREACEAE		*Dioscorea alata*	
EUPHORBIACEAE		*Alchornia rugosa*	
		Aleurites mollucana	
	*	*Euphorbia cyathoflora*	
		Macaranga tanarius	
FABACEAE		*?Caesalpinia pulcherrima*	
	*	*Delonix regia*	
		Inocarpus fagifer	
		Pongamia pinata	
FLACOURTIACEAE	*	*Muntingia calabura*	
HERNANDIACEAE		*Hernandia ovigera*	
LAMIACEAE	*	*Hyptis capitata*	
LECTHYTHIDACEAE		*Barringtonia racemosa*	
LOMARIOPSIDACEAE		*Bolbitis heteroclita*	
MALVACEAE		*Berrya cordifolia*	
		Grewia insularis	
		Kleinhovia hospita	
MELIACEAE		*?Melia azedarach*	
		Dysoxylum gaudichaudianum	
MENISPERMACEAE		*Pachygone ovata*	
MIMOSACEAE	*	*Leucaena leucocephala*	
MIMOSACEAE	*	*Mimosa pudica*	Declared Pest s12 (C2 Prohibited)
MORACEAE		*Ficus microcarpa*	
		Maclura cochinchinensis	
MUSACEAE	*	*Musa sp.*	

Family		Taxon	Status
MYRTACEAE		*Syzygium nervosum*	
NYCTAGINACEAE		*Pisonia grandis*	
		Pisonia umbellifera	
ORCHIDACEAE		*Corymborkis veratrifolia*	
PANDANACEAE		*Pandanus elatus*	
POLYPODIACEAE		*Pyrrosia lanceolata*	
RUTACEAE	*	*Clausena excavata*	
		Triphasia trifolia	
SAPINDACEAE		*Tristiropsis acutangula*	
SAPOTACEAE		*Planchonella nitida*	
TURNERACEAE		*Turnera ulmifolia*	
VERBENACEAE	*	*Stachytarpheta jamaicensis*	
VITACEAE		*Leea angulata*	
VITTARIACEAE		*Vittaria elongata*	

Appendix D Site-Species Matrix (Flora)

	Taxon	R01	R02	R03	R04	R05	R06	R07	Opp
	Alchornia rugosa			+			+		+
	Aleurites mollucana								+
	Arenga listeri	+	+	+	+	+	+	+	
	Asplenium nidus				+	+	+		
*	*Asystasia gangetica*								+
	Barringtonia racemosa				+	+	+		
	Berrya cordifolia								+
	?Berrya cordifolia								+
	Bolbitis heteroclita								+
	?Caesalpinia pulcherrima								+
	Carica papaya								+
	Carmona retusa							+	
	Celtis timorensis	+	+	+			+		
	Clausena excavata	+	+	+				+	
	Corymborkis veratrifolia				+	+			
	Davalia solida				+		+		
	Delonix regia								+
	Dioscorea alata		+	+				+	
	Dysoxylum gaudichaudianum				+	+	+		
	?Dysoxylon gaudichaudianum							+	
	Ehretia javanica				+				
*	*Euphorbia cyathoflora*								+
	Ficus microcarpa	+	+				+		
	Grewia insularis							+	
	Hernandia ovigera								+
	Hoya aldrichii		+		+				
*	*Hyptis capitata*								+
	Indet. Seedling with serrate leaves		+						
	Inocarpus fagifer				+	+	+		
	Kleinhovia hospita		+					+	
	Leea angulata								+
	Leucaena leucocephala		+						+
	Macaranga tanarius	+							+
	Maclura cochinchinensis	+		+	+			+	
	?Melia azedarach			+					
*	*Mikania micrantha*								+
*	*Mimosa pudica*								+
*	*Muntingia calabura*								+
	Musa sp.								+
	Nephrolepis biserrata				+	+			

	Taxon	R01	R02	R03	R04	R05	R06	R07	Opp
	?Nephrolepis bisserata						+		
	Ochrosia ackeringae		+	+				+	
	Pachygone ovata								+
	Pandanus elatus				+	+	+		
	Pisonia grandis		+						
	Pisonia umbellifera								+
	Planchonella nitida			+					
	Pongamia pinata			+					
	Pyrrosia lanceolata	+					+	+	
	Schefflera elliptica				+	+	+		
*	*Stachytarpheta jamaicensis*								+
	Syzigium nervosum								+
	Syzygium nervosum			+		+	+		
	Terminalia catappa								+
	Triphasia trifolia	+							
	Tristiropsis acutangula	+	+	+	+	+	+	+	
	Turnera ulmifolia	+							+
*	*Varronia curassavica*								+
	Vittaria elongata				+				

Appendix E Relevé Data

Project: 67277 **Date:** 2024-09-11

Site: R01 **Coordinates:** -10.4200149, 105.6763253 **Datum:** WGS84 **Site Type:** Releve

Site Size: 10 x 10 m **Site Marker:** No marker (temporary site) **Photo Location:** NW Corner

Landform: terrace **Aspect:** **Slope:**

Outcropping: yes **Rock Type:** Limestone

Soil Type: Phosphatic loam **Soil Notes:** Loam

Surface: 3% bare ground, 85% outcropping, 12% litter **Years Since Fire:** yrs

Large Trees Present (>500 mm DBH):

Condition: Very Good **Disturbance Notes:** Weeds

Vegetation Description: Semi-deciduous forest

	Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
*	*Clausena excavata*	300	3		
	Celtis timorensis	10	20		
	Macaranga tanarius	2000	15		
	Ficus microcarpa	18	10		
	Arenga listeri	12	15		
	Tristiropsis acutangula	150	1		
	Maclura cochinchinensis		3		

Taxon		Height (cm)	Cover (%)	Cover (Dead %)	Comment
*	*Turnera ulmifolia*	150	0		
	Pyrrosia lanceolata	Epiphyte			
	Triphasia trifolia				Opp

Project: 67277 **Date:** 2024-09-11

Site: R02 **Coordinates:** -10.4198465, 105.6814042 **Datum:** WGS84 **Site Type:** Releve

Site Size: **Site Marker:** No marker (temporary site) **Photo Location:** from east looking west

Landform: slope **Aspect:** N **Slope:** 5

Outcropping: yes **Rock Type:** Limestone

Soil Type: Phosphatic loam **Soil Notes:** Loam

Surface: 1% bare ground, 60% outcropping, 39% litter **Years Since Fire:** yrs

Large Trees Present (>500 mm DBH):

Condition: Excellent **Disturbance Notes:** Weeds

Vegetation Description: Semi-deciduous forest

Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
Ochrosia ackeringae	1200	75		
Hoya aldrichii	Epiphyte	0		
Arenga listeri	150	2		
Ficus microcarpa	1800	30		
Tristiropsis acutangula	1800	10		
Alchornia rugosa	100	0		
Berrya cordifolia	1800	10		

	Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
	Indet.	90	0		Seedling with serrate leaves
	Dioscorea alata	40	0		
*	*Leucaena leucocephala*	600	1		
*	*Clausena excavata*	100	1		
	Celtis timorensis	35	0		Seedling
	Pisonia grandis	800	0		
	Kleinhovia hospita	1800	0		
	Berrya cordifolia				Opp
	Alchornia rugosa				Opp
*	*Turnera ulmifolia*				Opp

Project: 67277 **Date:** 2024-09-11

Site: R03 **Coordinates:** -10.421034, 105.681972 **Datum:** WGS84 **Site Type:** Releve

Site Size: **Site Marker:** No marker (temporary site) **Photo Location:** Centre

Landform: slope **Aspect:** N **Slope:** 5

Outcropping: yes **Rock Type:** Limestone

Soil Type: Phosphatic loam **Soil Notes:** Loam

Surface: 15% bare ground, 40% outcropping, 45% litter **Years Since Fire:** yrs

Large Trees Present (>500 mm DBH):

Condition: Very Good **Disturbance Notes:** Trash, weeds

Vegetation Description: Semi-deciduous forest

	Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
	Syzygium nervosum	1500	2		
	Dioscorea alata	30	0		
	Arenga listeri	400	15		
	Maclura cochinchinensis	Liane	5		
	Tristiropsis acutangula	1500	5		
	Ochrosia ackeringae	1200	30		
*	*Clausena excavata*	50	0		

Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
Planchonella nitida	300	0		Saplings
Pongamia pinata				
Celtis timorensis	1000	3		
Alchornia rugosa	300	0		
?Caesalpinia pulcherrima				Opp, sterile
?Melia azedarach				Too many canopy species with leaves mixing to confidently ID
Pisonia umbellifera				Opp

Project: 67277 **Date:** 2024-09-12

Site: R04 **Coordinates:** -10.4346309, 105.676317 **Datum:** WGS84 **Site Type:** Releve

Site Size: 10 x 10 m **Site Marker:** No marker (temporary site) **Photo Location:** NW Corner

Landform: slope **Aspect:** NW **Slope:** 2

Outcropping: yes **Rock Type:** Limestone

Soil Type: Phosphatic loam **Soil Notes:** Loam

Surface: 60% bare ground, 15% outcropping, 25% litter **Years Since Fire:** yrs

Large Trees Present (>500 mm DBH): yes

Condition: Very Good **Disturbance Notes:** ?young, check veg map

Vegetation Description: Closed canopy evergreen forest regrowth

Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
Inocarpus fagifer	2000	40	0	
Ehretia javanica	30000	20		
Asplenium nidus	Epiphyte	1		
Davalia solida	Epiphyte	0		
Tristiropsis acutangula	1500	5		
Hoya aldrichii	Epiphyte	0		
Barringtonia racemosa	1200	10		

Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
Dysoxylum gaudichaudianum	1000	1		
Vittaria elongata	Epiphyte	0		
Arenga listeri	1500	1		
Pandanus elatus	400	0		
Corymborkis veratrifolia	100	0		
Maclura cochinchinensis	Liane	0		
Schefflera elliptica	Liane	1		
Asplenium nidus	Epiphyte			
Nephrolepis biserrata	Epiphyte			

Project: 67277 **Date:** 2024-09-12

Site: R05 **Coordinates:** -10.4334548, 105.6799128 **Datum:** WGS84 **Site Type:** Releve

Site Size: 10 x 10 m **Site Marker:** No marker (temporary site) **Photo Location:** Centre

Landform: slope **Aspect:** N **Slope:** 1

Outcropping: yes **Rock Type:** Limestone

Soil Type: Phosphatic loam **Soil Notes:** Loam

Surface: 70% bare ground, 5% outcropping, 25% litter **Years Since Fire:** yrs

Large Trees Present (>500 mm DBH): yes

Condition: Excellent,Pristine **Disturbance Notes:** Minor Trash

Vegetation Description: Closed canopy evergreen forest

Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
Nephrolepis biserrata	100	3		
Corymborkis veratrifolia	70	1		
Tristiropsis acutangula	120	1		
Arenga listeri	150	1		
Pandanus elatus	200	1		
Syzygium nervosum	3000	35		
Barringtonia racemosa	1800	80		

Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
Dysoxylum gaudichaudianum	2500	2		
Asplenium nidus	Epiphyte	0.5		
Schefflera elliptica	Liane	2		
Inocarpus fagifer	400	0		

Project: 67277 **Date:** 2024-09-13

Site: R06 **Coordinates:** -10.4374289, 105.669785 **Datum:** WGS84 **Site Type:** Releve

Site Size: 10 x 10 m **Site Marker:** No marker (temporary site) **Photo Location:** NW Corner

Landform: slope **Aspect:** NW **Slope:** 10

Outcropping: yes **Rock Type:** Limestone

Soil Type: Phosphatic loam **Soil Notes:** Loam

Surface: 60% bare ground, 30% outcropping, 10% litter **Years Since Fire:** yrs

Large Trees Present (>500 mm DBH): yes

Condition: Excellent **Disturbance Notes:**

Vegetation Description: Closed canopy evergreen forest

Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
Ficus microcarpa	2000	70		
Inocarpus fagifer	1500	60		
Arenga listeri	1000	10		
Pyrrosia lanceolata	Epiphyte	0		
Tristiropsis acutangula	150	0		
Schefflera elliptica	Liane	1		
Pandanus elatus	100	1		

Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
Asplenium nidus	Epiphyte	0		
Syzygium nervosum		2		
Barringtonia racemosa	1000	5		
Alchornia rugosa	250	1		
?Celtis timorensis	120	0		Seedling
Dysoxylum gaudichaudianum	2500	1		
Davalia solida	Epiphyte	0		
?Nephrolepis bisserata	Epiphyte	0		Growing in U2

Project: 67277 **Date:** 2024-09-16

Site: R07 **Coordinates:** -10.4199228, 105.6796412 **Datum:** WGS84 **Site Type:** Releve

Site Size: 10 x 10 m **Site Marker:** No marker (temporary site) **Photo Location:** facing south

Landform: slope **Aspect:** N **Slope:** 3

Outcropping: yes **Rock Type:** Limestone

Soil Type: Phosphatic loam **Soil Notes:** Shallow gritty loam

Surface: 1% bare ground, 70% outcropping, 29% litter **Years Since Fire:** yrs

Large Trees Present (>500 mm DBH): no

Condition: Good **Disturbance Notes:** Weeds, trash, chicken coop

Vegetation Description: Semi-deciduous forest/scrub

	Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
	Ochrosia ackeringae	800	60		
*	*Clausena excavata*	300	0		
	Kleinhovia hospita	900	2		
	Tristiropsis acutangula	600	3		
	Arenga listeri	250	2		
	?Dysoxylon gaudichaudianum		0		Seedling
	Maclura cochinchinensis	Liane	1		

	Taxon	Height (cm)	Cover (%)	Cover (Dead %)	Comment
*	*Carica papaya*				Opp
*	*Musa* sp.				Opp
	Grewia insularis	700	2		
	Dioscorea alata	Liane	0.5		
*	*Leucaena leucocephala*				Opp
	Pyrrosia lanceolata	Epiphyte	0		
	Carmona retusa				Opp

1.1.1.1 Document Distribution

Rev No.	Copies	Recipient	Date
1	1 x electronic	Hervé Calmy	14 May 2025

1.1.1.2 Document Status

Rev No.	Author	Reviewer	Approved for Issue		
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