

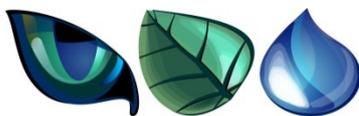
February  
2021

# LITTLE MINDIL

## Desktop Biological Assessment

### Little Mindil Beach, DARWIN

Prepared on behalf of KTT Investment Pty Ltd by:



**Animal Plant Mineral Pty Ltd**

Site Name:

Parcel 7651 Town of Darwin

25 Gilruth Avenue, The Gardens

Northern Territory

Australia, 0820.

Completed by: Animal Plant Mineral Pty Ltd

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## EXECUTIVE SUMMARY

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KTT Investments Pty Ltd (**KTT**) proposes to develop a multi-story hotel resort, apartment and luxury villa precinct at Lot 7651 on Little Mindil Beach foreshore in Darwin, Northern Territory (**NT**). KTT commissioned Animal Plant Mineral Pty Ltd (**APM**) to undertake a Desktop Biological Assessment to support a referral to the Northern Territory Environmental Protection Authority (**NT EPA**) for the proposed development. The Desktop Biological Assessment provides information on the likelihood of vegetation, flora, and fauna listed under State and Federal legislation to occur within the development area and their potential to be impacted by the proposal.

The site is located directly adjacent to Little Mindil Beach foreshore, approximately two kilometres north-west of Darwin's central business district (**CBD**). The site is 51,300 m<sup>2</sup> in size and is partially developed as an at-grade carpark with associated landscaping and a large lawn area that encompasses the majority of the site. The site is highly integrated into the surrounding pedestrian network and provides a direct access point for pedestrians and cyclists from Gilruth Avenue to Mindil Beach Foreshore, Mindil Beach Casino and Myilly Terrace.

A number of databases were searched to identify any known occurrences of conservation significant communities, flora or fauna within a 10 kilometre (**km**) radius of the site.

The results of the Desktop Assessment regarding vegetation and flora found that:

- No Threatened Ecological Communities (**TEC**) or flora of conservation status are known or expected to occur in or adjacent to the site.
- Two patches of vegetation within the site are sensitive and significant vegetation under the NT Land Clearing Guidelines. These are Mangrove vegetation fringing the tidal creek on the northern boundary of the site and the vegetation along the escarpment on the southern boundary that has elements of monsoon forest.

The results of the Desktop Assessment regarding terrestrial fauna found that:

- Fifteen records for threatened fauna occur within Parcel 7651 on the NT Fauna Atlas, however the records are predominantly historic and have low spatial validity; consequently, there is reasonable doubt as to the records occurring within Parcel 7651.
- The majority of available habitat is in a completely degraded state in that it does not support native vegetation or landforms and is in a highly urbanised setting with frequent human disturbance.
- The site contains habitats potentially suitable for the Yellow Spotted Monitor, Far Eastern Curlew, Lesser Sand Plover and Bar-tailed Godwit. The Yellow Spotted Monitor is a habitat generalist and may use all habitats. The three Threatened shorebirds may use the mangrove and tidal creek habitat at high tide.
- The beach and intertidal sand flats adjacent to the site are suitable for the Far Eastern Curlew, Lesser Sand Plover and Bar-tailed Godwit and also the Red Knot, Great Knot, Greater Sand Plover and Curlew Sand Plover.
- Twenty-six migratory shorebirds are known to regularly occur in the Greater Darwin area. There are no Significant Aggregation of Migratory shorebirds at Mindil Beach or Little Mindil Beach.

The area required to be developed for the proposal is confined to the area currently covered by the mowed grass and carpark with garden plantings. As a result, the Project is not expected to have a direct or indirect impact on TEC's or flora of conservation significance. No vegetation clearing is proposed to occur within the sensitive and significant vegetation or in habitats suitable for the threatened and migratory shorebirds or Yellow Spotted Monitor and as a result the Project is not expected to impact these vegetation types or fauna habitats directly or indirectly. Potential impacts of the Project are expected to be predominantly limited to within Parcel 7651. Impacts from human disturbance, marine debris and erosion and sedimentation may impact the areas

immediately adjacent Parcel 7651 and potentially reduce the suitability of these habitats for the threatened and migratory shorebirds.

Prior to mitigation these impacts are expected to have a medium risk of occurrence. It is expected that mitigations will be applied in line with local and NT Government policy and guidance and the risk will be reduced.

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## Project Terms

Abbreviation	Meaning
KTT	KTT Investments Pty Ltd
The Project	Multi-story hotel resort, apartment and luxury villa precinct
The Site	Lot 7651 Town of Darwin
The Guidelines	Guidelines for Assessment of Impacts on Terrestrial Biodiversity

## Units of Measure

Unit	Measure
%	Percentage
°C	Degrees Celsius
ha	Hectare
km	Kilometre
L/s	Litres per second
m	Metre
M	Mole per litre
mbgl	Metres below ground level
mg/L	Milligram per litre
mm	Millimetre
Mt	Million tonnes

## List of Abbreviations

Abbreviation	Meaning
AEP	Annual Exceedance Probability
ANZECC/ ARMCANZ	Australian and New Zealand Environment and Conservation Council/ Agriculture and Resource Management Council of Australia and New Zealand
APM	Animal Plant Mineral Pty Ltd
BoM	Bureau of Meteorology
CBD	Central Business District
CR	Critically Endangered
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biological Conservation and Attractions
DENR	Department of Environment and Natural Resources
DEPWS	Department of Environment, Parks and Water Security

Abbreviation	Meaning
DIPL	Department of Infrastructure, Planning and Logistics
EAAF	East Asian-Australasian Flyway
EN	Endangered
EP Act	<i>Environment Protection Act 2019</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EP Regulations	Environment Protection Regulations 2020
KTP	Key Threatening Process
MNES	Matters of National Environmental Significance
NT	Northern Territory
NTEPA	Northern Territory Environmental Protection Authority
NTPS	Northern Territory Planning Scheme
Planning Act	<i>Northern Territory Planning Act 2016</i>
PMST	Protected Matters Search Tool
SoCS	Site of Conservation Significance
The Act	Weeds Management Act
TPWC Act	<i>Territory Parks and Wildlife Conservation Act 2006</i>
VU	Vulnerable
WMB	Weed Management Branch
WoNS	Weed of National Significance

## 1 INTRODUCTION

### 1.1 PROJECT AND LOCATION

KTT Investments Pty Ltd (**KTT**) proposes to develop a multi-story hotel resort, apartment and luxury villa precinct (**the Project**) on Lot 7651 Town of Darwin (**the site**). The site is located at 25 Gilruth Avenue, The Gardens, Northern Territory (**NT**), directly adjacent to Little Mindil Beach foreshore and approximately two kilometres (**km**) north-west of Darwin's central business district (**CBD**). In total, the site is 51,300 m<sup>2</sup> in size and is predominantly within Zone TC (Tourist Commercial) with small areas of Zone PS (Public Open Space) adjacent to the Mindil Beach foreshore. The site falls within the recreational precinct of Mindil Beach which is a mixed-use area comprising tourism, entertainment and recreational facilities and attractions. The site is bounded by the following features and land uses:

- Western boundary: Mindil Beach;
- North-east boundary: Mindil Beach Casino and Resort which features restaurants, bars, pools and business amenities;
- Eastern boundary: Gilruth Avenue and Garden Park Golf Links; and
- South-west: National Trust-listed Myilly Point heritage precinct.

Figure 1-1 shows the location of the site and adjacent land uses.

The purpose of the Project is to create a mixed-use development consisting of a hotel, commercial premises and residential offerings. The development will consist of five buildings comprising the following:

- 168 hotel rooms;
- 53 serviced apartments;
- Six retail spaces;
- 277 carpark spaces; and
- Beachfront food and beverage venue.

In addition, the development will provide for new and existing public walkways to maintain access to the site itself, Mindil Beach and the creek. Public open spaces will be created for public events and activities, including a space for communal markets. As part of the development, KTT proposes to rezone a substantial area of TC land that encapsulates the existing tidal creek, sacred site and public footpath to Zone PS. Figure 1-2 shows the site plan for the proposed development.

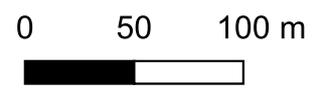
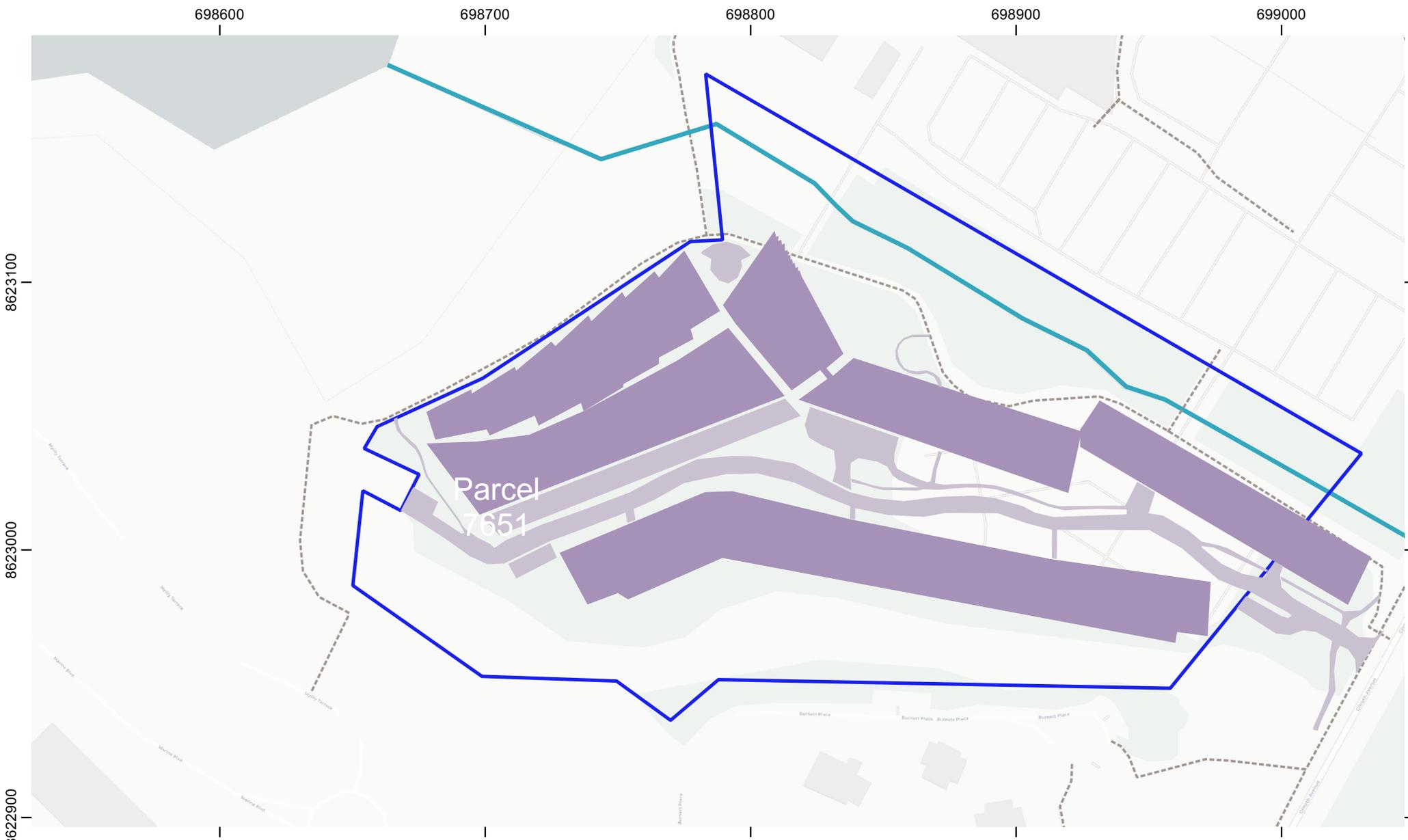


Figure 1-1. Project Location

Parcel 7651 boundary

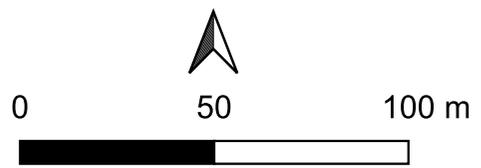
Date: 26/02/2021  
 CRS: GDA 1994 MGA Zone 52  
 Author: eleanor@animalplantmineral.com.au



**Legend**

- Parcel 7651 boundary
- Proposed Building
- Proposed support Infrastructure
- Path
- Creek

**Figure 1-2. Proposed Little Mindil development site plan**



Date: 26/02/2021  
 CRS: GDA 1994 MGA Zone 52  
 Author: eleanor@animalplantmineral.com.au

## 1.2 SCOPE OF WORK

KTT Investments Pty Ltd commissioned Animal Plant Mineral Pty Ltd (**APM**) to undertake a Desktop Biological Assessment for terrestrial ecosystems to support a referral to the Northern Territory Environmental Protection Authority (**NT EPA**). The Desktop Biological Assessment provides information on the likelihood of vegetation, flora, and fauna listed under State and Commonwealth legislation to occur within the development area and their potential to be impacted by the proposal.

The scope of the Desktop Biological Assessment is governed by the *Guidelines for Assessment of Impacts on Terrestrial Biodiversity* (NTEPA, 2013) (**the Guidelines**). The overall objectives of the Guidelines are to enable developers to focus their biodiversity assessments on significant impacts potentially caused by their projects and to develop information sufficient to allow planning for mitigation of potential impacts and future rehabilitation of the development site.

The Guidelines state that a project that involves any impact on NT biodiversity is likely to require assessment under the NT *Environment Protection Act 2019* (**EP Act**) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (**EPBC Act**).

All flora and fauna in the NT are protected under the EP Act, with special categories assigned to threatened flora and fauna (Appendix A). The EPBC Act provides protection for Matters of National Environmental Significance (**MNES**). The terrestrial MNES of relevance to the Project are:

- Nationally threatened animal and plant species and ecological communities; and
- Internationally protected migratory species.

Databases have been searched to identify any known occurrences of conservation significant communities, flora or fauna, and the landforms, soils and vegetation expected to occur on the Project site or any biological attributes that may be indirectly influenced by the Project.

Based on the results of the database searches APM then conducted a ‘likelihood of occurrence’ investigation of threatened communities, flora and fauna in relation to the expected landforms and associated habitats available in the Project area.

The significance of impacts of the proposed Project has been determined using standard risk assessment procedures (e.g. AS/NZS ISO 31000:2009).

### 1.2.1 Vegetation

The objectives of the Biological Desktop Assessment regarding terrestrial vegetation are to determine and document:

- the vegetation of the proposed Project site and the immediately adjacent area;
- the presence and distribution of critical habitats (NT *Territory Parks and Wildlife Act 2006* [**TPWC Act**]) or listed ecological communities EPBC Act that conforms to a vegetation type or group of vegetation types;
- the local and regional conservation status of vegetation types present in Project site;
- the potential impacts of the Project on vegetation in, adjacent to, and downstream from the Project site;
- the conservation significance of the Project’s impacts on vegetation at local and regional levels; and
- compliance with Northern Territory Land Clearing Guidelines (DENR 2020).

### 1.2.2 Flora

The objectives of the Biological Desktop Assessment regarding terrestrial flora are to determine and document:

- the threatened flora species (as listed under the TPWC Act and/or EPBC Act) of the Project site and immediately adjacent areas;
- the local and regional conservation status of threatened flora present in the Project site;
- the potential impacts of the Project on threatened flora in, adjacent to, and downstream from the Project site;
- Species of introduced weeds listed under the *Weeds Management Act 2001*, as a Weed of National Significance (**WoNS**) or as a Key Threatening Process (**KTP**) will be identified from the NT Flora Atlas; and
- the conservation significance of the Project's impacts on threatened flora at local and regional levels.

### 1.2.3 Terrestrial Fauna

The objectives of the Biological Desktop Assessment regarding terrestrial fauna are to determine and document:

- the threatened fauna (as listed under the TPWC Act and/or EPBC Act) of the Project site and immediately adjacent areas;
- congregations, large populations or important sites for listed migratory fauna (EPBC Act) found on the Project site;
- important fauna sites (e.g. major breeding areas, fauna congregations, isolated permanent water sources, geological features such as caves, large boulder piles or escarpments) on the Project site;
- the local and regional conservation status of threatened fauna, listed migratory fauna, or important fauna congregations or sites present on the Project site;
- the potential impacts of the Project on threatened fauna, listed migratory fauna, or important fauna congregations or sites in, adjacent to, and downstream from the Project site; and
- the conservation significance of the Project's impacts on threatened fauna, listed migratory fauna, important fauna congregations or sites at local and regional levels.

## 2 BACKGROUND AND SUPPORTING INFORMATION

### 2.1 RELEVANT LEGISLATION

#### 2.1.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act, administered by the Department of Agriculture, Water and the Environment (**DAWE**), is the primary piece of environmental legislation at the federal level and protects MNES. Any action that is considered likely to have a significant impact on MNES must be referred to the DAWE for assessment under the Act.

The interactive map device Protected Matters Search Tool (**PMST**), available on the DAWE website, displays the known spatial distribution of threatened species and communities listed under the Act.

This study assesses the likelihood of flora and fauna listed under the Act to occur within the Study area and their potential to be impacted by the proposal.

#### 2.1.2 Territory Parks and Wildlife Conservation Act 2006

The TPWC Act is:

*“An Act to make provision for and in relation to the establishment of Territory Parks and other Parks and Reserves and the study, protection, conservation and sustainable utilisation of wildlife.”*

The TPWC Act requires that approval be obtained to take or interfere with any protected wildlife, as defined under the Act. Essential habitats may be declared under the Act. Permission to undertake certain activities in these areas must be sought from the Minister for Environment. Plant and animal species listed as endangered, rare, or threatened are afforded special protection. Under Section 74 of the Act, the Territory Parks and Wildlife Commission may negotiate and enter into agreements with a landowner relating to schemes for the protection and conservation of wildlife in, and the protection of the natural features of, the land. Applications for clearing must demonstrate consideration of the presence of threatened wildlife and/or essential habitats declared pursuant to this Act.

This study assesses the likelihood of vegetation, flora, and fauna listed under the Act to occur within the Study area and their potential to be impacted by the proposal.

#### 2.1.3 Northern Territory Environment Protection Act 2019

The purpose of the EP Act is to enable and promote development in the Northern Territory that is ecologically sustainable. The EP Act and Environment Protection Regulations 2020 (**EP Regulations**) set out the process for environmental impact assessment, to ensure matters that may have a significant impact on the environment are fully examined and taken into account in decisions made about a proposed action.

The following documents allow self-assessment as to whether a proposal may have a significant impact on the environment and therefore require referral to the NTEPA for consideration under the EP Act.

- Guide to Environmental Impact Assessment and Approvals in the NT;
- Referring a Proposed Action to the NT EPA – Environmental Impact Assessment Guidance for Proponents; and
- NT EPA Environmental Factors and Objectives.

#### 2.1.4 Northern Territory Planning Act 2016

The *Northern Territory Planning Act 2016 (Planning Act)* is administered by the Department of Infrastructure, Planning and Logistics (**DIPL**) and the Department of Environment, Parks and Water Security (**DEPWS**). The NT Planning Scheme is formalised under the Act.

The Act formally recognises the NT Land Clearing Guidelines (DENR, 2020). The NT Planning Scheme (Clause 10.3 Clearing of Native Vegetation – Performance Criteria) specifies that applications for the clearing of native vegetation are to demonstrate consideration of:

- the Land Clearing Guidelines;
- the presence of threatened wildlife as declared under the TPWC Act;
- the presence of sensitive or significant vegetation communities such as rainforest, vine thicket, closed forest, or riparian vegetation;
- the presence of essential habitats, within the meaning of the TPWC Act;
- the impact of the clearing on regional biodiversity;
- whether the clearing is necessary for the intended use;
- whether there is sufficient water for the intended use;
- whether the soils are suitable for the intended use;
- whether the slope is suitable for the intended use;
- the presence of permanent and seasonal water features such as billabongs and swamps;
- the retention of native vegetation adjacent to waterways, wetlands, and rainforests;
- the retention of native vegetation buffers along boundaries;
- the retention of native vegetation corridors between remnant native vegetation;
- the presence of declared heritage places or archaeological sites within the meaning of the *Heritage Conservation Act*; and
- the presence of any sacred sites within the meaning of the *NT Aboriginal Sacred Sites Act*.

#### 2.1.5 Northern Territory Land Clearing Guidelines

The Northern Territory Land Clearing Guidelines establish standards for the management (i.e. clearing and retention) of native vegetation. Version 1.2 of the Land Clearing Guidelines was released on 31 July 2020. The guidelines are formally recognised under the *Planning Act 1999* and are referenced in Schedule 5 of the Northern Territory Planning Scheme 2020 (**NTPS**). Accordingly, the guidelines must be applied for ‘development applications for the purpose of clearing of native vegetation’ under the Planning Act 1999.

The NTPS definition of Land Clearing is: the removal or destruction, by any means, of native vegetation on an area of land other than:

- a) the removal or destruction of a declared weed within the meaning of the *Weeds Management Act 2001* or of a plant removed under the *Plant Health Act 2008*;
- b) the lopping of a tree;
- c) incidentally through the grazing of livestock;
- d) the harvesting of native vegetation planted for harvest;
- e) in the course of Aboriginal traditional use, including the gathering of food or the production of cultural artefacts;
- f) by fire;
- g) the removal or destruction of native vegetation occurring on a site previously cleared in accordance with a permit issued under the Planning Act 1999; or

- h) incidentally through mowing an area previously cleared of native vegetation and includes the selective removal of a species of plant, a group of species of plants, a storey or group of storeys in whole or in part.

Note: the definition excludes clearing of native vegetation which was cleared prior to the introduction of controls or subject to a permit.

### 2.1.6 Northern Territory Weeds Management Act 2001

The Minister may declare a plant to be a declared weed and may classify the declared or potential weed for the purposes of managing the plant in the Territory or a part of the Territory.

A declared weed may be classified having regard to whether it is:

- a) necessary to eradicate the declared weed;
- b) necessary to prevent the growing and spreading of the declared weed; or
- c) necessary to prevent the introduction of the declared weed into the Territory

The Weed Management Branch (**WMB**) in the Rangelands Division of the DEPWS has administrative responsibility for the *Weeds Management Act (WM Act)*. The *Weeds Management Act: Compliance Policy Version 4.0* was released on the 28 October 2020. Section 5.3.2 contains an assessment framework for the risk of weed spread and/or impact.

The NT is divided into Weed Management Zones. Parcel 7651 is within the Darwin Zone (NTG 2014).

#### 2.1.6.1 Weeds of National Significance

Australian governments have agreed on 32 WoNS from an assessment process that prioritised these weeds based on their invasiveness, potential for spread, and environmental, social and economic impacts. Consideration was also given to their ability to be successfully managed. A list of 20 WoNS was endorsed in 1999 and a further 12 were added in 2012. Landowners and land managers at all levels are responsible for managing WoNS.

The WoNS were selected as they require coordination among all levels of government, organisations, and individuals with weed management responsibilities. A strategic plan for each WoNS was developed to define responsibilities and identify strategies and actions to control the weed species. Coordination of these plans at a national level improves linkages between research and on-going control and encourages commitment from a wide range of stakeholders. State and territory governments remain responsible for legislation, regulation and administration of WoNS.

### 2.1.7 Soil Conservation and Land Utilisation Act 2016

The *Soil Conservation and Land Utilisation Act 2016* provides for the prevention of soil erosion, and the conservation and reclamation of soil. The Commissioner for Soil Conservation may issue a soil conservation order if they determine that actions on an area of land would create a danger of soil erosion.

## 2.2 LAND USE

The current approved zoning of the site is a combination of Tourist Commercial use and Public Open Space. At present it is utilised for leisure and recreation including area for outdoor entertainment, landscaping and car parking. The site is in a mixed-use area that includes tourism, entertainment and recreation activities. To the immediate north-east is the Mindil Beach Casino and Resort and to the immediate south is the National Trust-listed Myilly Point heritage precinct.

The site is partially developed as an at-grade carpark with associated landscaping and a large lawn area that encompasses the majority of the site. The site is highly integrated into the surrounding pedestrian network and

provides one of the most major direct access points for pedestrians and cyclists from Gilruth Avenue to Mindil Beach Foreshore, Mindil Beach Casino and Myilly Terrace. The grassed area is often used by local residents and visitors to the area for leisure and recreational activities such as picnics, sunbathing and informal sporting activities. The tidal creek along the north-eastern boundary of the site is highly valued by anglers and is regularly utilised for fishing. The car park is used as overflow parking for the adjacent Mindil Beach Casino at times when major events occur and also for other events that are held in the vicinity, such as the Mindil Beach Markets.

With the exclusion of the Mindil Beach Markets, dogs are allowed access to Mindil Beach under the City of Darwin dog exercise rules.



Plate 2-1. Site photos



Figure 2-1. Bing Street View – south across Parcel 7651 towards the escarpment



Figure 2-2. Bing Street View – north across Parcel 7651 to the tidal creek and Little Mindil/Mindil Beach

## 2.3 CLIMATE

The climate for the site is described by the Köppen classification system as Tropical Savanna. This is typified by monthly mean temperatures above 18 degrees Celsius for every month of the year and the driest month having less than 60 mm of rain. Of the four types of tropical savanna climates, the site is typified by a pronounced wet and dry season of relatively equal duration, with summer dominant rainfall.

### 2.3.1 Temperature

Darwin Airport (Site No. 014015) has a recorded mean maximum temperature of 32.4 degrees Celsius and a mean minimum temperature of 23.3 degrees Celsius. Mean monthly maximum temperatures only vary by approximately three degrees Celsius between the summer and winter extremes, however mean monthly minimum temperature extremes vary by up to six degrees Celsius. Figure 2-3 presents the mean monthly maximum and minimum temperatures using data from 1991 to 2020.

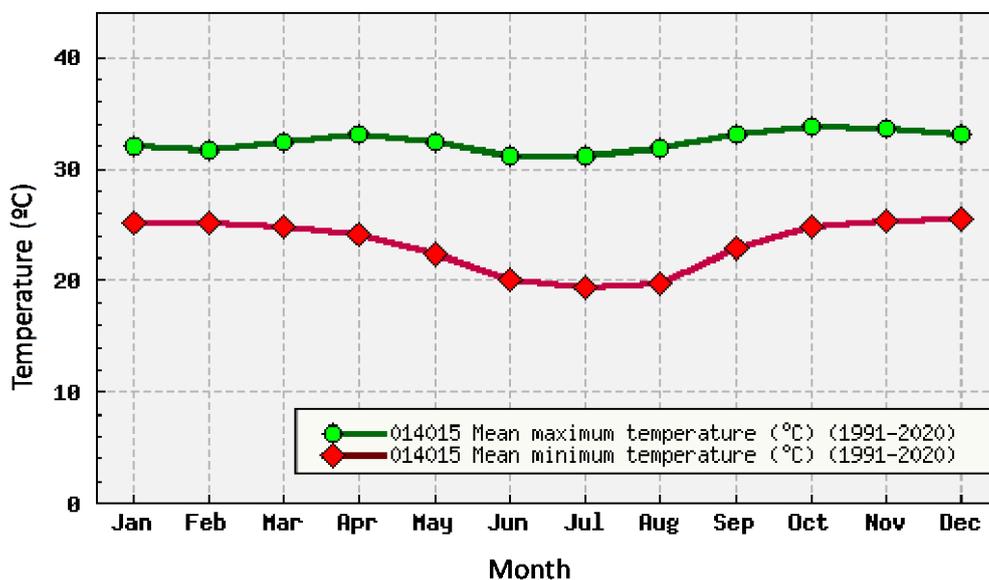


Figure 2-3. Mean maximum and minimum monthly temperatures (°C) for the Darwin Airport for the period from 1991 to 2020.

### 2.3.2 Rainfall

Darwin Airport (Site No. 014015) has a recorded mean annual rainfall of 1832 millimetres (mm). Approximately 94 % of this annual total falls in the months between November and April. The distinct wet and dry seasons are typically of equal duration (six months each). Mean monthly rainfall and 30 year mean rainfall statistics for the period 1991 – 2020 are presented in Figure 2-4.

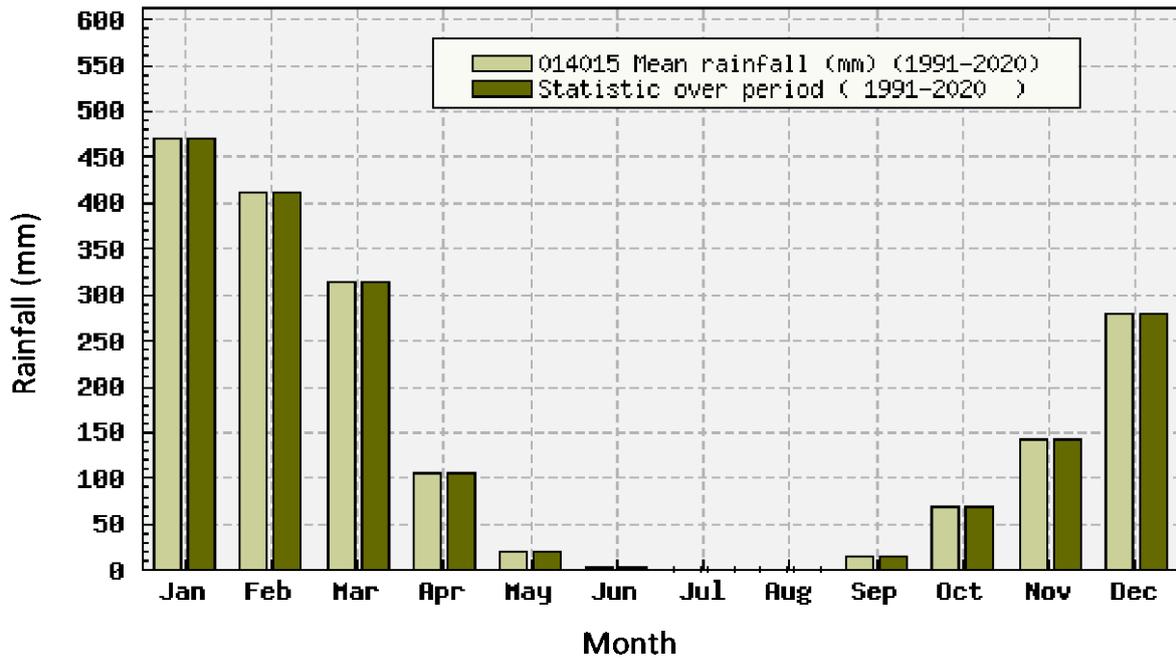


Figure 2-4. Mean monthly rainfall (mm) for the Darwin Airport for the period from 1991 to 2020.

### 2.3.3 Humidity

Darwin Airport (Site No. 014015) has a recorded mean 9 am relative humidity of 70 % and a mean 3 pm relative humidity of 53 %. During the wet season months of January to March, the humidity levels are higher with a mean 9 am and 3 pm relative humidity of approximately 80 % and 70 % respectively. The mean 9 am and 3 pm relative humidity monthly statistics are presented in Figure 2-5.

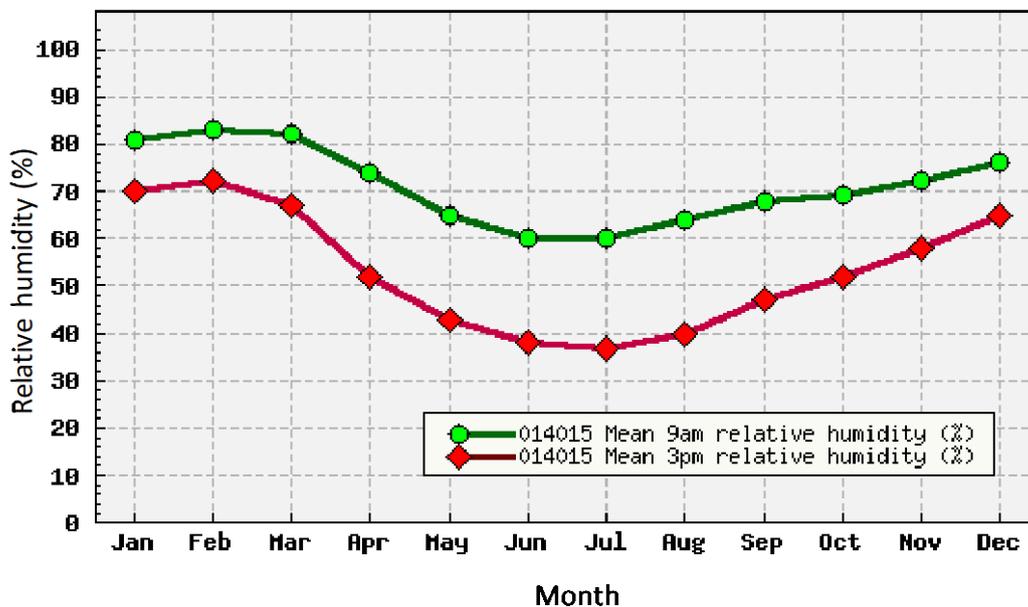


Figure 2-5. Mean 9 am and 3 pm relative humidity (%) monthly statistics from 1991 to 2020.

#### **2.3.4 Evaporation**

The BoM gridded mean annual pan evaporation dataset indicates the mean annual pan evaporation for the site is 2,345 mm. Mean daily evaporation rate is 6.7 mm based on the 30-year average from 1991 to 2020 (BoM 2021).

#### **2.3.5 Tropical Cyclones**

The tropical cyclone season for the northern region is defined as being from November to April, with cyclones forming from lows within the monsoon trough. The BoM indicates that there are on average 7.7 days per season when a cyclone exists in the Northern Region (BoM 2021). Typically, the Arafura and Timor Seas average one cyclone per year.

### 3 METHODS

#### 3.1 DATABASE SEARCHES

The databases listed in Table 3-1 were searched to identify any known occurrences of conservation significant communities, flora or fauna. Searches were conducted over an area 1 to 10 km radius from a point central to Parcel 7651. Database searches are included in full in the Appendices indicated in Table 3-1. Conservation codes are described in Appendix A.

**Table 3-1. Database Searches**

Attribute	Search Area*	Database	Database Owner
Threatened Flora	10 km radius with a central coordinate of 698816, 8623040	NT Flora Atlas Threatened Flora Database	DEPWS
Introduced Flora			
Threatened Fauna			
Introduced Fauna	1 km radius with a central coordinate of -12.44962, 130.829	PMST	DAWE
Threatened Ecological Communities	1 km radius circle with a central coordinate of -12.44962, 130.829	PMST	DAWE
Sites of Conservation Significance, Wetlands	Parcel 7651	Natural Resources Map Viewer	DEPWS

\*Coordinate Reference System: GDA94, MGA Zone 52

#### 3.2 SITE PHOTOGRAPHY

Site photography was provided by KTT Investments Pty Ltd from site visits by Urbanscope Pty Ltd. Site photos were taken on 31 February 2021.

#### 3.3 LIKELIHOOD OF OCCURRENCE CRITERIA

To assess the likelihood of occurrence of threatened fauna and flora in relation to the landforms, vegetation and fauna habitat expected to occur in Parcel 7651, a likelihood of occurrence criteria was applied. The criteria are listed in Table 3-2.

**Table 3-2. Criteria used to define likelihood of occurrence**

Likelihood of occurrence	Criteria
High	Species has previously been recorded within 1 km of Parcel 7651 and preferred habitat is expected to be present.
Moderate	Species has been recorded between 1 and 10 km of the Parcel 7651 and suitable habitat is expected to be present.
Low	Species previously recorded within 10 km of Parcel 7651 but suitable habitat is not expected to occur in Parcel 7651
Unlikely	Species returned from the database searches (without a record within 10 km i.e. modelled as may occur) but suitable habitat is not expected to occur in Parcel 7651.

The definitions of suitable habitat are identified on a species by species basis from a number of sources including material published by the Commonwealth and NT governments (e.g. NT Flora Atlas, Threatened Species of the NT information sheet series, Conservation Advice and Listing Advice), peer reviewed journals and record collection notes included with database records or accessible on the Atlas of Living Australia. Where no such descriptive material is available, broad habitat preferences may be inferred through the correlation of record locations with NT Land Systems or Land Units mapping and aerial imagery.

### 3.4 RISK ASSESSMENT

The risk that potential Project impacts will result in one or more NT EPA objectives for an Environmental Factor being compromised was assessed in accordance with qualitative risk management principles described in *ISO 31000:2018 Risk Management – Principles and Guidelines* (International Standards Organisation, 2018).

Risk is a function of the likelihood of an impact occurring and the consequence of that impact on Environmental Factor objectives. The consequence and likelihood categories adopted are listed in Table 3-3 and Table 3-4, respectively. The consequence assessment is informed by consideration of the magnitude, scale and duration of the expected impact. Likelihood and consequence ratings are combined to derive an overall risk rating using the matrix shown in Table 3-5.

**Table 3-3: Consequence Categories Adopted in Risk Assessment**

Consequence or Severity of Impact	Description
Severe	<p>A Severe impact has two or more of the following characteristics:</p> <ul style="list-style-type: none"> <li>Widespread - Impact occurs at a NT, national, international or global scale;</li> <li>High Intensity - Impact irreversibly compromises the integrity of environmental values; and/or</li> <li>Permanent - environmental values will not recover on human time scales.</li> </ul>
Major	<p>A Major impact has two or more of the following characteristics:</p> <ul style="list-style-type: none"> <li>Regional - Impact extends to the Darwin region, and/ or greater Darwin Harbour/Timor Sea;</li> <li>Moderate - Integrity of environmental values altered but impact can practicably be reversed; and/or</li> <li>Long term – Impact that is measurable post-Project.</li> </ul>

Consequence or Severity of Impact	Description
Moderate	<p>A Moderate impact has two or more of the following characteristics:</p> <ul style="list-style-type: none"> <li>• Localised - Impact is confined to the Site and areas directly adjacent to the Site;</li> <li>• Low - Impact alters the quality, abundance or distribution of environmental values without compromising their integrity, and can be easily and cheaply reversed; and/or</li> <li>• Medium term - Impact that is felt up to completion of operations.</li> </ul>
Minor	<p>A Minor impact has two or more of the following characteristics:</p> <ul style="list-style-type: none"> <li>• Limited - Impact limited to the Site;</li> <li>• Very Low - Impact does not significantly alter the quality, distribution or abundance of environmental values; and/or</li> <li>• Short term - Impact that is felt up to completion of construction.</li> </ul>
Insignificant	No noticeable/ measurable impact to values.

**Table 3-4: Likelihood Categories Adopted in Risk Assessment**

Likelihood category	Description
Almost certain	The event/ impact will occur or is expected to occur. The impact occurs regularly in association with similar projects and/ or in similar environments.
Likely	The impact will probably occur in most circumstances but there is some uncertainty about the likelihood. The impact has occurred on more than one occasion in association with similar projects and/ or in similar environments.
Possible	The impact could occur in some circumstances. The impact has occurred infrequently on similar projects and/ or in similar environments.
Unlikely	The impact is not expected to occur. The impact occurs very infrequently on similar projects and/ or in similar environments.
Rare	The impact is very unlikely to occur. The impact has not occurred on similar projects and/ or in similar environments.

**Table 3-5: Risk Matrix Adopted in Risk Assessment**

			Consequence				
			1	2	3	4	5
			Insignificant	Minor	Moderate	Major	Severe
Likelihood	5	Almost Certain	Medium	Medium	High	Very High	Very High
	4	Likely	Medium	Medium	High	Very High	Very High
	3	Possible	Low	Medium	Medium	High	Very High
	2	Unlikely	Low	Low	Medium	Medium	High
	1	Rare	Low	Low	Low	Medium	High

## 4 RESULTS

### 4.1 VEGETATION

#### 4.1.1 Land Systems

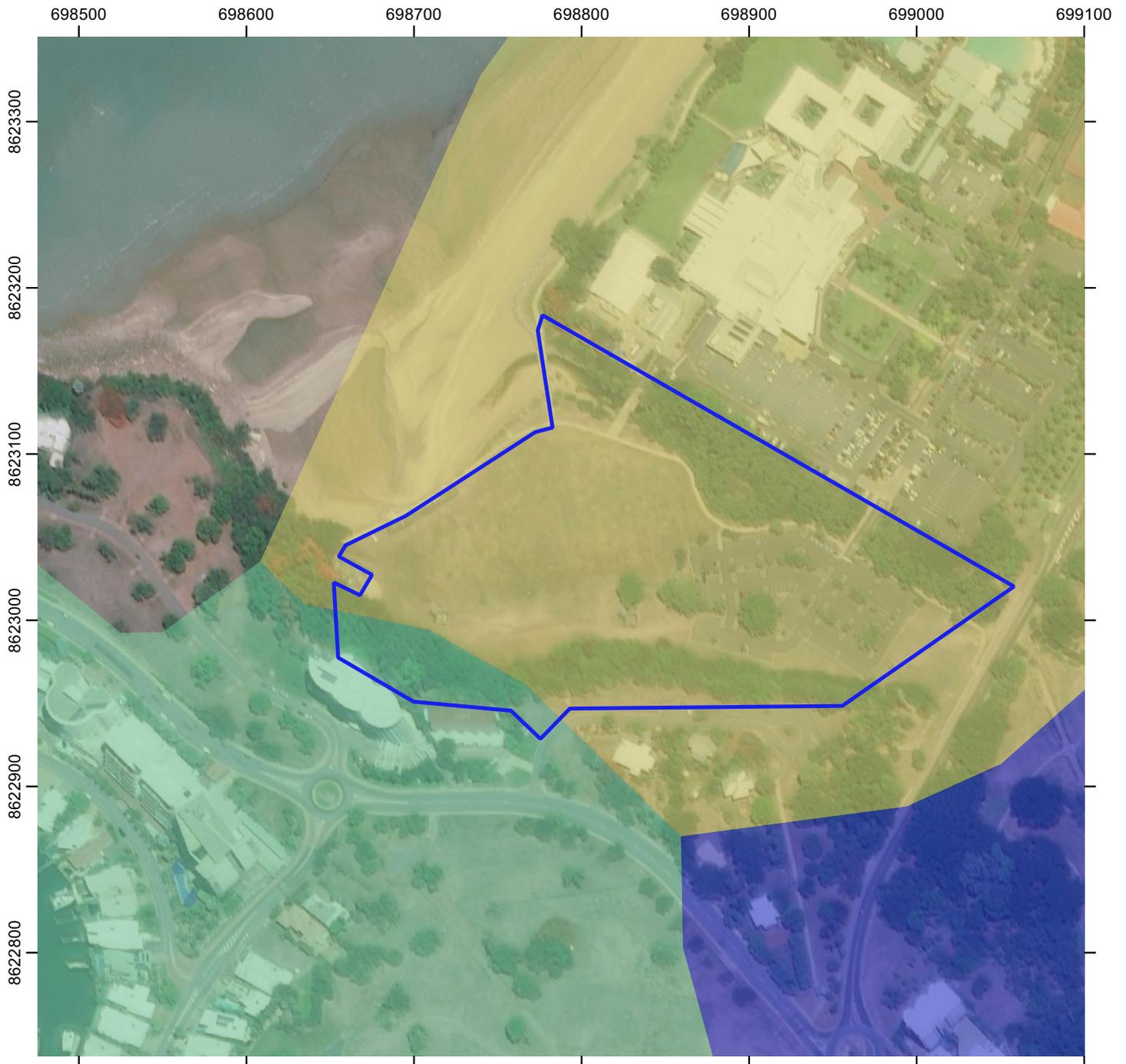
The Land Systems of the Darwin Region report (Wood *et al.*, 1985) documents a broadscale land resource inventory of the Darwin region, and an evaluation of the capability of the land to support numerous forms of land use. The study serves as a basis for regional planning decisions and aims to promote land uses that accord with the continuing ability of the land to support them.

The foundation of the report is a classification of the survey area into Land Systems. A Land System is defined as an area of land which has a distinctive and recurring pattern of landform, soils, and vegetation. A Land System is composed of a sequence of land units, the latter being relatively homogeneous in land attributes.

The Wood *et al.* (1985) study has been adapted to a 1:250,000 spatial layer by the NT Government, as described by Lynch *et al.* (2012). The NT Government NR Maps resource identifies two Land Systems as occurring within Parcel 7651. Land Systems within and surrounding Parcel 7651 are in the Darwin Coastal Geo Zone and are listed in Table 4-1 and shown in Figure 4-1.

**Table 4-1. Land Systems**

Land System	Class	Landform	Soil	Typical Vegetation of the Land System
Kay	Lateritic plains and rises: plains and rises associated with deeply weathered profiles (laterite) including sand sheets and other depositional products; sandy and earth soils	Level to gently undulating plains on deeply weathered rocks	Lateritic red and yellow earths; Ferric Red, Brown and Yellow Kandosols	Tall open woodland of <i>C. bleeseri</i> , <i>Erythrophleum chlorostachys</i> , <i>E. tetradonta</i> , <i>E. miniata</i> , <i>E. tectifera</i> over <i>Sorghum</i> spp, <i>Chrysopogon fallax</i> , <i>Eriachne</i> spp
Krans		Steep, dissected terrain forming the edge of the deeply weathered plateau	Shallow lithosols and gravelly yellow earths; Leptic Rudosols and gravelly Yellow Kandosols	Mid-high woodland of <i>E. tetradonta</i> , <i>E. miniata</i> , <i>C. bleeseri</i> , <i>Erythrophleum chlorostachys</i> , <i>E. tectifera</i> over tropical tall grass ( <i>Heteropogon triticeus</i> , <i>Chrysopogon fallax</i> , <i>Sorghum</i> spp)
Littoral 1	Tidal flats: tidal mudflats and coastal floodplains with channels and estuaries; subject to tidal inundation; poorly drained clays and muds	Level tidal flats with channels and estuaries and minor dunes	Saline muds and grey cracking clays; Supratidal and Intertidal Hydrosols	Samphire, sedgeland, or mangrove low closed forest



**Legend**

 Parcel 7651 boundary

**Land Systems**

 Kay

 Krans

 Littoral 1



**Figure 4-1. Land Systems**



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#### 4.1.2 Land Units

The Land Resources of the Elizabeth, Darwin, and Blackmore Rivers – Greater Darwin Area, NT dataset (DENR, 2000) is a compilation of eight land resource surveys. The dataset provides polygon information on the map units boundaries of the Elizabeth, Darwin, and Blackmore Catchments in the Greater Darwin Area. The main purpose of the survey is an inventory and an evaluation of the land resources for planning rural and urban use. The original Darwin Land Unit survey report was published by Fogarty *et al.* (1979), with survey data prepared at a scale of 1:25,000. Land Unit descriptions are sourced from the original report and adjacent surveys and are now covered by Fogarty *et al.* (1984).

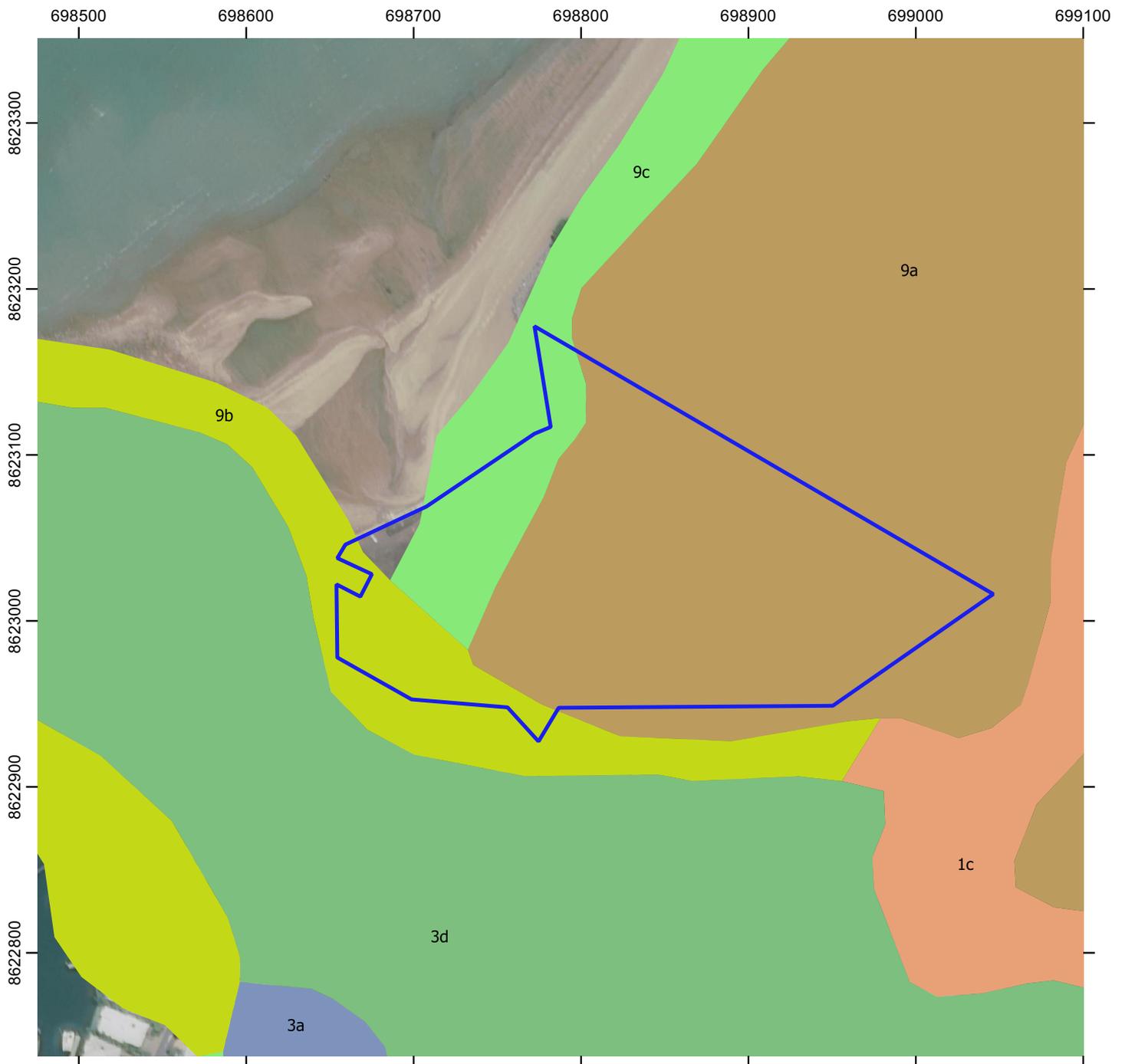
The dataset was digitised by DENR in 2000. The Land Units mapped as present in the Study area in 1985 are listed in Table 4-2 and shown in Figure 4-2. The area within the Parcel and in the Region are calculated from the DENR (2000) dataset. All Land Units are well represented in the region.

Table 4-2. Land Units

Map Unit	Landform	Soil Description	Vegetation Description	Drainage Description	Area in Parcel (ha)	Area in region (ha)
1c	Low scarps and short steep slopes, mostly on lateritic material 5-20 % relief 5-20 m Extensive outcrop and surface stone (30-60% cover)	Parent material of lateritised siltstones and sandstones Leptic Rudosols Shallow gravelly lithosols. Coarse textured. 50-70% stone and gravel throughout. Rapidly drained.	Woodland; dominant species are generally thin <i>Eucalyptus miniata</i> , <i>E. bleeseri</i> with <i>E. tetrodonta</i> , <i>E. tectifera</i> , <i>E. foelscheana</i> as associated species; open shrub understory of <i>Xanthostemon paradoxus</i> , <i>Terminalia ferdinandiana</i> , <i>Buchanania obovata</i> , <i>Cycas armstrongii</i> , <i>Livistona humilis</i> ; open grass cover with <i>Sorghum plumosum</i> , <i>Eriachne avenacea</i> , <i>Chrysopogon latifolius</i> , <i>Heteropogon contortus</i> as major species.	Nil to low level of seasonal soil waterlogging.	0 <sup>+</sup>	7543
3d	Gently undulating upland surface. Gradient 1-3%. Ferruginous and quartz gravel pavement, minor laterite outcrop.	Parent material of ferricrete and quartz. Leptic Rudosols Shallow gravelly lithosols. Loamy sand to sandy loam. 40-60% ferruginous gravel throughout.	Open Woodland, minor Woodland; thin <i>Eucalyptus miniata</i> as dominant with <i>Eucalyptus tetrodonta</i> , <i>E. bleeseri</i> ; usually open shrub layer with <i>Acacia spp.</i> , <i>Cochlospermum fraseri</i> , <i>Calytrix exstipulata</i> , <i>Buchanania obovata</i> , with patches of dense <i>Xanthostemon paradoxus</i> and <i>Petalostigma quadriloculare</i> ; medium dense grasses including Annual sorghum, <i>Sorghum plumosum</i> , <i>Plectrachne pungens</i> , <i>Schizachyrium fragile</i> , <i>Heteropogon triticeus</i> .	Rapidly drained	0 <sup>+</sup>	9262
9a	Estuarine fringe. Gradient negligible, <0.5%. Firm surfaced with saline crusting.	Parent material of Quaternary sediments. Supratidal Hydrosol. Saline muds and clays, variable morphology. Silty loam to silty clays.	Usually bare, with small areas of <i>Arthrocnemum</i> sp. (samphire) and <i>Sporobolus virginicus</i> .	Very poorly drained, subject to peak tidal inundation.	3.8	8824

9b	Estuarine fringe. Gradient negligible, <0.5%. Muddy and soft surfaced	Parent material of Quaternary sediments. Intertidal Hydrosol. Saline muds and clays. Silty clays, unconsolidated marine muds.	Low Closed Forest of mangrove species; <i>Avicennia marina</i> on seaward fringe with dense <i>Ceriops tagal</i> dominating much of community to landwards.	Very poorly drained, subject to intertidal inundation.	0.5	39415
9c	Dunes and Beach Ridges. Seaward gradient to 8%, landward gradient 2-4%. Generally loose with occasional outcrop of calcareous beach rock.	Parent material of Quaternary sediments. Orthic Tenosol. Calcareous sands. Siliceous and calcareous sands.	Grassland; with <i>Sporobolus virginicus</i> , <i>Ipomea pescaprea</i> ; with minor pockets of Low Closed Forest, variable tree and vine species.	Rapidly drained, subject to periodic wave action.	0.7	1992

† Vegetation type occurs outside of Parcel 7651.



Legend

 Parcel 7651 boundary

Land Units

-  1c - Rises and short steep slopes
-  3d - Gently undulating upland surface
-  9a - Esturine fringes
-  9b - Esturine fringes
-  9c - Dunes and beach ridges

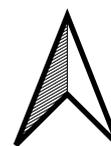


Figure 4-2. Land Units



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### 4.1.3 Critical Habitats and Threatened Ecological Communities

There are no Critical Habitats listed under the TPWC Act or Threatened Ecological Communities listed under the EPBC Act known to occur in Parcel 7651. The expected vegetation does not conform to a vegetation type or group of vegetation types that resemble these listed habitats and communities.

### 4.1.4 Wetlands and Sites of Significance

Parcel 7651 does not drain to any Wetlands of National or International Significance.

Darwin Harbour is a Site of Conservation Significance (**SOCS**) and is rated as being of International Significance. Parcel 7651 is within the boundaries of the SOCS (Figure 4-3).

Qualities that contribute to the significance of the Darwin Harbour are:

- Darwin Harbour supports a range of estuarine, freshwater, and terrestrial environments, including extensive areas of tidal mudflats and one of the largest and most diverse areas of mangroves in the NT.
- The shoreline of the Harbour is dominated by mangroves, which largely remain in undisturbed condition, and the Darwin Harbour SOCS contains more than 5 % of the NT's entire mangrove area. The mangroves of Darwin Harbour support a highly specialised fauna and 14 bird species that are entirely restricted to mangrove environments (e.g. Chestnut Rail, White-breasted Whistler, and Mangrove Golden Whistler).
- Darwin Harbour has one of the richest coastal environments anywhere in the Asia Pacific region and occurs within one of the world's least impacted marine regions. The Harbour itself supports a diverse range of marine species including dugongs, dolphins, marine turtles, and a large variety of fish.
- Fifteen threatened species have been identified from the Darwin Harbour including two flora species listed as Vulnerable under the *TPWC Act* – *Cycas armstrongii* and *Utricularia singeriana*. Eighty species recorded from the Darwin Harbour SOCS are listed under international conventions or bilateral agreements protecting migratory animals.

Future urban and industrial developments around Darwin Harbour represent a major management issue for the Darwin Harbour SOCS. The north-eastern part of Darwin Harbour catchment is already highly developed, and native vegetation and tidal flats have been cleared and drained (DNRETAS, 2013).

There are no sites of botanical significance recorded within Parcel 7651.



Legend

-  Parcel 7651 boundary
-  Darwin Harbour Site of Conservation Significance

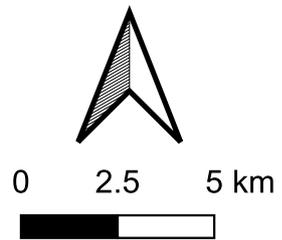


Figure 4-3. Darwin Harbour Site of Conservation Significance



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#### 4.1.5 Sensitive Areas

Two sensitive areas occur within Parcel 7651.

A densely vegetated unnamed tidal creek runs along the north eastern boundary of the site. The Creek contains mangrove vegetation (Plate 4-1). Riparian areas are considered to be a Sensitive and Significant vegetation under the NT Land Clearing Guidelines.

An escarpment runs along the southern boundary of the site which is identified in the NT Register of Significant Trees as 'D Area 11: Gilruth Avenue Cliffs'. The description provided on the Register states:

*This is a diverse group of trees. Some are native and of the original peninsula vegetation. Others have been planted by the Darwin City Council. While some have had their seeds brought into the area by visiting birds and animals. The trees help in cliff retention, provide shelter and forage for birds small mammals and reptiles and is aesthetically pleasing to the users of this main road.*

This vegetation has elements that are reflective of the Monsoon Vine Thicket vegetation (**Plate 4-2**) considered Significant and Sensitive under the NT Land Clearing Guidelines.

The guidelines recommend these vegetation types are allocated a buffer where disturbance is excluded, however the land adjacent these vegetation types is Completely Degraded (WA EPA 2016), hosting non-native grass maintained in a mowed state and contains walking tracks, carparks, bridges and infrastructure corridors.

The areas are shown in relation to Parcel 7651 in Figure 4-4.



**Plate 4-1. Riparian vegetation and tidal creek**



**Plate 4-2. Vegetation along the escarpment**



Legend

-  Parcel 7651
-  Tidal Creek Riparian vegetation
-  Escarpment vegetation



Figure 4-4. Sensitive and Significant Vegetation

#### 4.1.6 General Site Description

The sensitive and significant vegetation bordering Parcel 7651 on the north eastern and southern borders are shown in Section 4.1.5. The remainder of the site is disturbed consisting of grassed area maintained in a mowed condition (Plate 4-3), bitumen carpark with some established garden plantings and concrete paths.

Presuming the existing modification of the site was delivered under a permit issued under the *Planning Act 1999*, the removal or destruction of native vegetation occurring in the garden plantings does not require a permit under the NT Land Clearing Guidelines.



**Plate 4-3. General site photo**

## 4.2 FLORA

### 4.2.1 Threatened Flora

No threatened flora listed under the EPBC Act or TPWC Act are known to occur in Parcel 7651.

No threatened flora listed under the EPBC Act is known to occur within 10 km of Parcel 7651.

Three threatened flora listed under the TPWC Act have been recorded within 10 km of Parcel 7651. These are listed in Table 4-3 and the location of records shown in Figure 4-5.

**Table 4-3. Threatened flora occurring within 10 km of Parcel 7651**

Species	Common name	Conservation Code	Year of record	Record locations
<i>Cycas armstrongii</i>	Darwin Cycad	Vulnerable	1963-2007	33 records in Charles Darwin National Park One record in The Gardens Cemetery
<i>Hibiscus brenanii</i>	Hibiscus	Vulnerable	2014-2019	Two records in the Botanic Gardens
<i>Utricularia singeriana</i>	Bladderwort	Vulnerable	1889	One record in The Gardens Cemetery

There are no records of Near Threatened or Data Deficient flora within Lot 7651.

The likelihood of the Threatened flora listed in Table 4-3 occurring in Parcel 7651 is assessed in Table 4-4.

**Table 4-4. Likelihood of occurrence – Threatened Flora**

Species	Habitat	Likelihood of occurrence
<i>Cycas armstrongii</i>	Occurs mainly in Eucalyptus woodland on yellow and red earths but avoids areas of poor drainage.	Low. No suitable habitat
<i>Hibiscus brenanii</i>	Found in shrubland with Acacia and Grevillea, on sandy soil associated with sandstone slopes, and among outcrops. Restricted to a few square kilometres on the Mt Brockman outlier in Kakadu National Park.	Low. Nearby records likely planted
<i>Utricularia singeriana</i>	Occurs along the margins of freshwater drainage flats among sparse mixed grasses and sedges.	Low. No suitable habitat



Legend

TPWC Act Threatened flora

- *Cycas armstrongii*
- *Hibiscus brennanii*
- ★ *Utricularia singeriana*

Parcel 7651 boundary

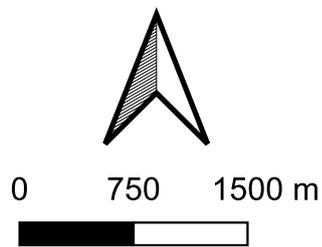


Figure 4-5. Threatened flora within 10 km of Parcel 7651



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## 4.2.2 Introduced Flora

No weeds Declared under the *Weeds Management Act*, identified as WoNS or listed as a Key Threatening Process are known to occur in or immediately adjacent to Parcel 7651.

Two subspecies of the weed species *Leucaena leucocephala* (subsp. *leucocephala* and *glabrata*) have been recorded in Parcel 7651 in 2010 and 2003 respectively. There are no Statutory Weed Management Plans for these subspecies and they have no legislated control category in the NT.

Given the species and occurrence of weeds in Parcel 7651, using the risk of weed spread and/or impact framework in 5.3.2 of the *Weed Management Act Compliance Policy*, the risk rating is Low.

The NT Flora Atlas returned 186 weed species as being previously recorded within 10 km of Parcel 7651. Of these, 30 are Declared under the Weeds Management Act. These Declared weeds and the control Category in the Darwin Region are listed in Appendix B.

No additional weeds were identified for the area from the PMST.

## 4.3 FAUNA

### 4.3.1 Threatened Fauna

There are 15 records for Threatened Fauna within Parcel 7651 on the NT Fauna Atlas. Record notes were examined and those incorrectly spatially assigned were removed. Remaining records are listed in Table 4-5.

**Table 4-5. Threatened Fauna records within Parcel 7651**

Species	Common Name	Conservation Code		Record notes
		TPWC Act	EPBC Act	
<i>Calidris canutus</i>	Red Knot	VU	EN	1 Historic Bird Atlas record. No dates or notes.
<i>Charadrius leschenaultii</i>	Greater Sand Plover	VU	VU	2 Historic Bird Atlas records. No dates or notes.
<i>Charadrius mongolus</i>	Lesser Sand Plover	VU	EN	1 Historic Bird Atlas record. No dates or notes.
<i>Erythrura gouldiae</i>	Gouldian Finch	VU	EN	A museums Victoria record – record location states Port Darwin.
<i>Limosa lapponica</i>	Bar-tailed Godwit	VU	subspecies L.I.menzbieri CR, L.I.baueri VU.	1 Historic Bird Atlas record. No dates or notes.
<i>Mesembriomys gouldii gouldii</i>	Black-footed Tree-rat	VU	EN	Location note Darwin. Museum and Art Gallery of the Northern Territory Mammal Collection
<i>Numenius madagascariensis</i>	Far Eastern Curlew	VU	CR	An eBird Australia record with location stated as The Gardens, record date 2015-12-06 plus 3 Historic Bird Atlas records. No dates or notes.
<i>Tyto novaehollandiae kimberli</i>	Masked Owl	VU	VU	Museums Victoria Ornithology collection. Record location Port Darwin

The lack of detail in the records suggests they are historic and unlikely to have been recorded with spatial accuracy high enough to be certain the record occurred within the Parcel. The exception is the eBird Australia record for Far Eastern Curlew that is likely to have been recorded with a higher level of accuracy.

In the adjacent properties there are three records from the Casino site all prior to 1967 and 46 records from the Golf Course, all prior to 2005, and predominantly prior to the Golf Course being built in 1974. Modern records include Curlew Sandpiper, Lesser Sand Plover, Far Eastern Curlew and Bar-tailed Godwit from a survey in December 2004 and one record for Yellow Spotted Monitor in 2005.

As records are generally historic and of dubious spatial accuracy, the value of Parcel 7651 as threatened fauna habitat is more suitably assessed through a likelihood of occurrence assessment. The Threatened fauna species returned from the NT Fauna Atlas and the PMST were assessed for likelihood of occurrence in Parcel 7651 based upon the habitats likely to be present. Habitats are inferred from the vegetation expected to be within and adjacent to the Parcel based upon the information in Section 4.1. The full likelihood of occurrence assessment is included as Appendix C. Table 4-6 lists the species with a High likelihood of occurrence and discusses the likely nature of the occurrence.

**Table 4-6. Conservation significant fauna with a High likelihood of occurrence in or near Parcel 7651**

Common Name	Cons. Code		Nature of Occurrence
	EPBC Act	TPWC Act	
<b>Suitable Habitat within Parcel 7651</b>			
Lesser Sand Plover	EN	VU	A known visitor to the coastal waters surrounding Darwin and likely to use the sandflats adjacent to Little Mindil Beach for foraging at low tides and possibly the beach for roosting. Possibly uses the tidal creek and mangrove vegetation in Parcel 7651 during high tides, and likely to use the adjacent beach, sandspit and intertidal zone periodically in low numbers. No breeding habitat as breeding occurs in the northern hemisphere.
Bar-tailed Godwit*	VU/ CR	VU	A known visitor to the coastal waters surrounding Darwin and likely to use the sandflats adjacent to Little Mindil Beach for foraging at low tides and possibly the beach for roosting. Possibly uses the tidal creek and mangrove vegetation in Parcel 7651 during high tides, and likely to use the adjacent beach, sandspit and intertidal zone periodically in low numbers. No breeding habitat as breeding occurs in the northern hemisphere.
Far Eastern Curlew	CR	VU	A known visitor to the coastal waters surrounding Darwin and likely to use the sandflats adjacent to Little Mindil Beach for foraging at low tides. Possibly uses the tidal creek and mangrove vegetation in Parcel 7651 during high tides, and likely to use the adjacent beach, sandspit and intertidal zone periodically in low numbers. No breeding habitat as breeding occurs in the northern hemisphere.
Yellow-spotted Monitor	-	VU	The species has broad habitat suitability and is likely an infrequent visitor to Parcel 7651 and the surrounding beaches, escarpment, Golf Course and Botanic Gardens.
<b>Suitable Habitat near to Parcel 7651</b>			
Red Knot	EN	VU	A known visitor to the coastal waters surrounding Darwin and likely to use the sandflats adjacent to Little Mindil Beach for foraging at low tides and possibly the beach for roosting. Unlikely to use the land in Parcel 7651 as habitat is not suitable, but likely to use the adjacent beach and intertidal zone periodically in low numbers. No breeding habitat.
Curlew Sandpiper	CR	VU	A known visitor to the coastal waters surrounding Darwin and likely to use the sandflats adjacent to Little Mindil Beach for foraging at low tides and possibly the beach for roosting.

Common Name	Cons. Code		Nature of Occurrence
	EPBC Act	TPWC Act	
			Unlikely to use the land in Parcel 7651 as habitat is not suitable, but likely to use the adjacent beach and intertidal zone periodically in low numbers. No breeding habitat.
Great Knot	CR	VU	A known visitor to the coastal waters surrounding Darwin and likely to use the sandflats adjacent to Little Mindil Beach for foraging at low tides and possibly the beach for roosting. Unlikely to use the land in Parcel 7651 as habitat is not suitable, but likely to use the adjacent beach and intertidal zone periodically in low numbers. No breeding habitat.
Greater Sand Plover	VU	VU	A known visitor to the coastal waters surrounding Darwin and likely to use the sandflats adjacent to Little Mindil Beach for foraging at low tides and possibly the beach for roosting. Unlikely to use the land in Parcel 7651 as habitat is not suitable, but likely to use the adjacent beach, sandspit and intertidal zone periodically in low numbers. No breeding habitat.

\* EPBC Act recognises 2 subspecies.

### 4.3.2 Important Fauna Sites

#### 4.3.2.1 Migratory Shorebird Habitat

No congregations, large populations or important sites for migratory fauna listed under the EPBC Act are found in or adjacent to Parcel 7651.

Twenty-six species of migratory shorebird have been regularly recorded across the Darwin Harbour region (Lilleyman & Garnett, 2019; Table 4-7). The twenty-six species are listed under international conventions and bilateral agreements and are considered MNES under the EPBC Act. Seven are listed threatened species under the EPBC Act and are also considered in Appendix C and Section 4.3.1.

Under the EPBC Act, 'important habitat' is a key concept for migratory species, as identified in EPBC Act *Policy Statement 1.1 Significant Impact Guidelines – Matters of National Environmental Significance 2009*. Defining this term for migratory shorebirds in Australia is important to ensure that habitat necessary for the ongoing survival of migratory species is appropriately managed (CoA 2017).

Important habitats in Australia for migratory shorebirds under the EPBC Act include those recognised as nationally or internationally important. The widely accepted and applied approach to identifying internationally important shorebird habitat throughout the world has been through the use of criteria adopted under the Ramsar Convention.

According to this approach, wetland habitat should be considered internationally important if it regularly supports:

- one percent of the individuals in a population of one species or subspecies of waterbird; or
- a total abundance of at least 20,000 waterbirds.

Nationally important habitat for migratory shorebirds is defined using a similar approach to these international criteria, i.e. if it regularly supports:

- 0.1 % of the flyway population of a single species of migratory shorebird; or
- 2,000 migratory shorebirds; or
- 15 migratory shorebird species.

Regular shorebird monitoring occurs across six sites in the Greater Darwin area. Surveys at East Point, Spot on Marine, Nightcliff, Sandy Creek and Lee Point-Buffalo Creek have been conducted by Chatto (2012), in 1996, 2010 and 2011 and there has also been a regular monitoring program conducted by BirdLife Australia since 2010. East Arm Wharf is an artificial site within Darwin Harbour Proper and has also been systematically surveyed since 2013. Lilleyman et al. (2018, 2020b), aerielly surveyed Darwin Harbour Proper on two occasions at Spring Tide. These locations have been selected for survey as they consistently host large numbers of birds by regional standards. These locations are shown in Figure 4-6.

Chatto (2012) reports total migratory shorebird numbers in the Greater Darwin area, specifically from Lee Point through Shoal Bay, 15 km northeast of the Project (Figure 4-6), in numbers that qualify as a Nationally significant aggregation of waterbirds for total population size. Darwin Harbour Proper qualifies as a nationally significant aggregation of waterbirds for diversity Lilleyman et al. (2018, 2020b). Table 4-7 identifies locations that qualify as National or International sites of significant aggregation for migratory species in the Greater Darwin Area based upon the abundance of specific species. As indicated, Parcel 7651 is not included as a site of significant aggregation for migratory species.



Legend

 Parcel 7651 boundary



0 2.5 5 km



Figure 4-6. Locations of significant sites for migratory shorebirds in the Greater Darwin area



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CRS: GDA 1994 MGA Zone 52

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**Table 4-7. Population estimates for migratory shorebirds in the Northern Territory (NT), Australia, and the East Asian-Australasian Flyway (EAAF), and sites of significance in the Greater Darwin region**

Shorebird	Scientific name	Significant sites (max count)	NT population <sup>a</sup>	Australian population <sup>b</sup>	EAAF population <sup>b</sup> (1 % pop.; 0.1 % pop.)
Common Sandpiper	<i>Actitis hypoleucos</i>		180	2,501	190,000 (1,900; 190)
<b>Ruddy Turnstone</b>	<b><i>Arenaria interpres</i></b>	<b>East Point to Lee Point (≈62)<sup>c</sup></b>	5,000	20,800	30,000 (300; 30)
<b>Sharp-tailed Sandpiper</b>	<b><i>Calidris acuminata</i></b>	<b>East Arm Wharf (≈220)<sup>c</sup></b>	20,100	85,809	85,000 (850; 85)
<b>Sanderling</b>	<b><i>Calidris alba</i></b>	<b>East Point to Lee Point (≈180)<sup>c</sup></b>	890	15,082	30,000 (300; 30)
Red Knot	<i>Calidris canutus</i>		24,200	68,927	110,000 (1,100; 110)
Curlew Sandpiper	<i>Calidris ferruginea</i>		17,800	45,485	90,000 (900; 90)
Red-necked Stint	<i>Calidris ruficollis</i>		44,400	389,206	475,000 (4,750; 475)
Long-toed Stint	<i>Calidris subminuta</i>		100 <sup>b</sup>	553	230,000 (2,300; 230)
<b>Great Knot</b>	<b><i>Calidris tenuirostris</i></b>	<b>†Lee Point (8000)<sup>c</sup></b>	122,000	381,854	425,000 (4,250; 425)
Little Ringed Plover	<i>Charadrius dubius</i>		20 <sup>b</sup>	10	150,000 (1,500; 150)
<b>Greater Sand Plover</b>	<b><i>Charadrius leschenaultii</i></b>	<b>†Lee Point (2000)<sup>c</sup></b> <b>East Arm Wharf (≈530)<sup>c</sup></b> <b>Greater Darwin area (1,024)<sup>a</sup></b>	40,300	126,616	200,000 – 300,000 (2,000; 200)
<b>Lesser Sand Plover</b>	<b><i>Charadrius mongolus</i></b>	<b>East Arm Wharf (≈280)<sup>c</sup></b> <b>Greater Darwin area (1,440)<sup>a</sup></b>	39,000	27,551	180,000 – 275,000 (1,800; 180)
Oriental Plover	<i>Charadrius veredus</i>		130	232,124	230,000 (2,300; 230)
Asian Dowitcher	<i>Limnodromus semipalmatus</i>		190	473	14,000 (140; 14)
Bar-tailed Godwit	<i>Limosa lapponica</i>		53,000	189,146	325,000 (3,250; 325)
<b>Black-tailed Godwit</b>	<b><i>Limosa limosa</i></b>	<b>†Lee Point (1600)<sup>c</sup></b>	44,000	50,508	160,000 (1,600; 160)

Shorebird	Scientific name	Significant sites (max count)	NT population <sup>a</sup>	Australian population <sup>b</sup>	EAAF population <sup>b</sup> (1 % pop.; 0.1 % pop.)
<b>Far Eastern Curlew</b>	<b><i>Numenius madagascariensis</i></b>	<b>East Arm Wharf (≈280)<sup>c</sup></b>	6,800	26,405	35,000 (350; 35)
		<b>Darwin Harbour Proper (329)<sup>d</sup></b>			
		<b>Darwin Harbour Middle Arm (102)<sup>e</sup></b>			
Little Curlew	<i>Numenius minutus</i>		12,500	76,908	110,000 (1,100; 110)
<b>Whimbrel</b>	<b><i>Numenius phaeopus</i></b>	<b>East Point to Lee Point (≈100)<sup>c</sup></b>	5,100	24,972	65,000 (650; 65)
		<b>East Arm Wharf (≈400)<sup>c</sup></b>			
		<b>Darwin Harbour Middle Arm (77)<sup>e</sup></b>			
<b>Pacific Golden Plover</b>	<b><i>Pluvialis fulva</i></b>	<b>East Arm Wharf (≈145)<sup>c</sup></b>	200	9,091	120,000 (1,200; 120)
<b>Grey Plover</b>	<b><i>Pluvialis squatarola</i></b>	<b>East Point to Lee Point (≈160)<sup>c</sup></b>	5,400	12,120	80,000 (800; 80)
<b>Grey-tailed Tattler</b>	<b><i>Tringa brevipes</i></b>	<b>East Point to Lee Point (≈75)<sup>c</sup></b>	16,000	64,360	70,000 (700; 70)
		<b>East Arm Wharf (≈410)<sup>c</sup></b>			
		<b>Darwin Harbour Middle Arm (101)<sup>e</sup></b>			
Wood Sandpiper	<i>Tringa glareola</i>		40	1,790	130,000 (1,300; 130)
<b>Common Greenshank</b>	<b><i>Tringa nebularia</i></b>	<b>East Arm Wharf (150)<sup>c</sup></b>	7,600	27,463	110,000 (1,100; 110)
Marsh Sandpiper	<i>Tringa stagnatilis</i>		12,100	53,481	130,000 (1,300; 130)
<b>Terek Sandpiper</b>	<b><i>Xenus cinereus</i></b>	<b>East Point to Lee Point (≈64)<sup>c</sup></b>	15,000	19,115	50,000 (500; 50)
		<b>East Arm Wharf (≈280)<sup>c</sup></b>			
		<b>Darwin Harbour Middle Arm (100)<sup>e</sup></b>			

<sup>a</sup> Chatto, 2003; <sup>b</sup> Hansen et al., 2016; <sup>c</sup> Lilleyman et al (2020a), <sup>d</sup>Lilleyman et al. (2018), <sup>e</sup>Lilleyman et al. (2020b).

Internationally significant (1 % EAAF pop.) and nationally significant (0.1 % EAAF pop.) population estimates are presented in brackets.

Species with a nationally or internationally significant site in the Greater Darwin region based upon maximum count data are presented in bold.

† Internationally significant.

≈ approximately.

#### 4.3.2.2 Escarpment

The escarpment that runs along the southern boundary of the site (Figure 4-4) is likely to host common fauna (Least Concern) such as rats and mice which may attract reptiles such as snakes and lizards. The Yellow Spotted Monitor may utilise the area for foraging.

#### 4.3.2.3 Seagrass beds

Seagrass beds are known to occur in coastal waters off Casuarina beach between Lee Point and Rapid Creek, up to around 2.5 km offshore (INPEX 2009 chapter 7 reported as N. Smit, Marine Biodiversity Group, NRETAS, pers.comm. July 2009). These areas are 15 km from the Project.

#### 4.3.3 Introduced Fauna

Asian house gecko (*Hemidactylus frenatus*), black rat (*Rattus rattus*), cane toad (*Rhinella marina*), cat (*Felis catus*), House Sparrow (*Passer domesticus*) Eurasian Tree Sparrow (*Passer montanus*), Flower Pot Blind Snake (*Indotyphlops braminus*), House Mouse (*Mus musculus*) and Rock Dove (*Columba livia*) are commonly recorded introduced fauna in Darwin. The pig (*Sus scrofa*) is common in the outlying rural areas but infrequently recorded in the urban areas.

In addition to these introduced fauna, the PMST lists the Water Buffalo (*Bubalus bubalis*) and Horse (*Equus caballus*) as possibly occurring in the area, however due to the urban setting this is unlikely. The domestic dog (*Canis familiaris*) is also listed and is likely to occur as both domestic and wild individuals.

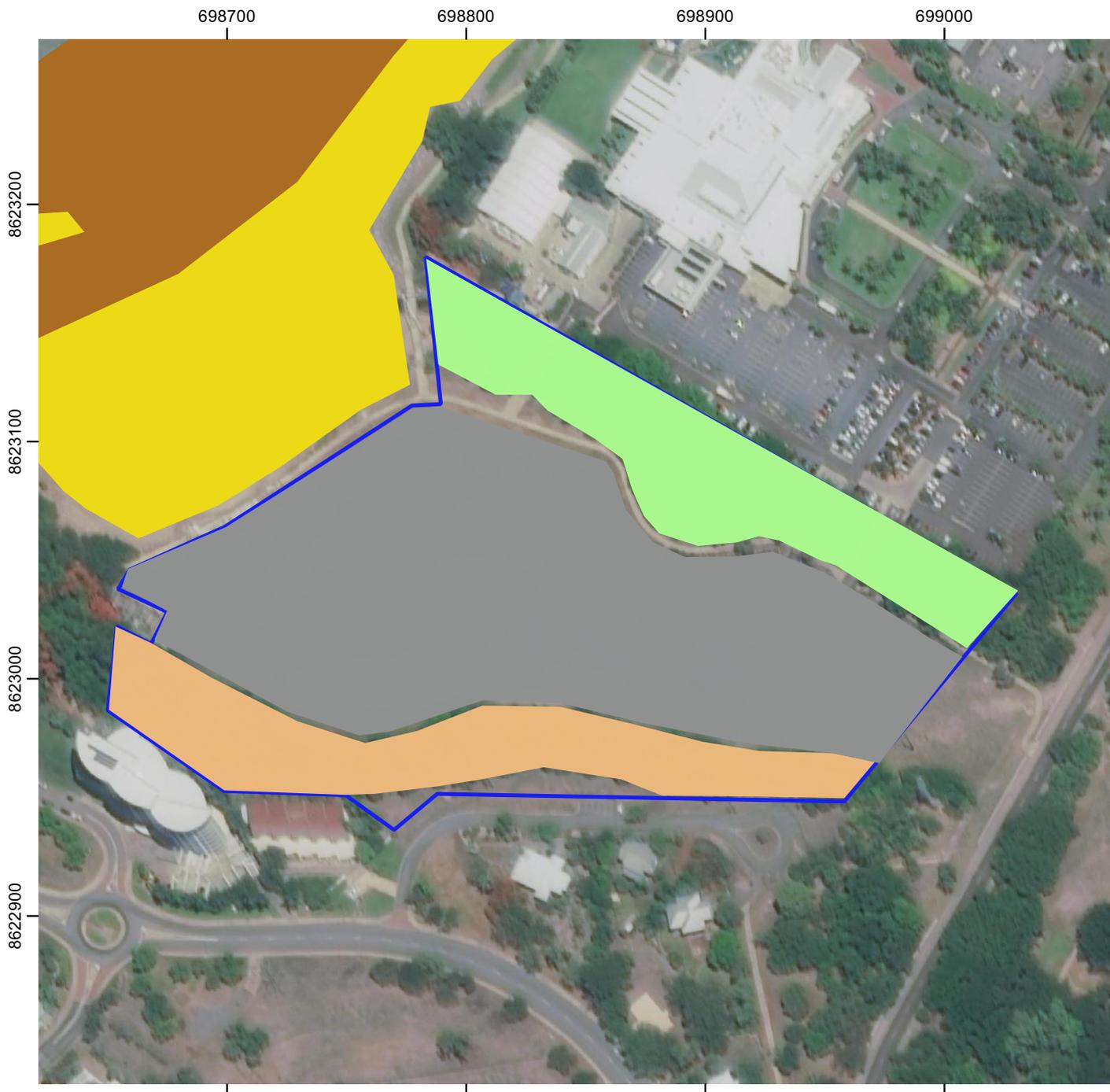
## 5 IMPACTS

No flora of conservation significance is likely to occur in Parcel 7651. There is no impact to conservation significant flora expected as a result of the Project.

Sensitive and significant vegetation as defined under the NT Land Clearing Guidelines occurs adjacent to the development footprint. Threatened fauna are likely to use the habitats in the Sensitive and significant vegetation, and in the habitats adjacent to Parcel 7651. A number of potential impacts to the sensitive and significant vegetation and threatened fauna may arise from the construction and operation of the Project. These are discussed in the sections below in regard to the conservation significant fauna that were assessed with a high likelihood of occurrence on or near Parcel 7651, and the sensitive and significant vegetation known to occur.

### 5.1 VEGETATION CLEARING

The clearing area required for the construction and operation of the Project is shown in **Figure 5-1**. This is confined to the area currently covered by the mowed grass and carpark area with garden plantings. No vegetation clearing is proposed to occur in the sensitive and significant vegetation or in habitats suitable for the threatened and migratory shorebirds or Yellow Spotted Monitor (**Figure 5-1**).



Legend

-  Parcel 7651 boundary
-  Vegetation clearing area
-  Tidal creek with mangrove vegetation
-  Beach habitat
-  Intertidal sandflats
-  Escarpment



Figure 5-1. Vegetation Clearing Area

## 5.2 HUMAN DISTURBANCE

Human disturbance can cause shorebirds to interrupt their feeding or roosting and may influence the area of otherwise suitable feeding habitat that is actually used. Disturbance from human recreation activities may force migratory shorebirds to increase the time devoted to vigilance and anti-predator behaviour and/or may compel the birds to move to alternative, less favourable feeding areas (Goss-Custard et al. 2006, Taylor & Bester 1999).

The existing level of human disturbance at Little Mindil is high. The current land use is as an overflow carpark for the Casino and for passive recreational activity by local residents and visitors to the area through the use of the grassed area and footpaths. The area is permitted as a dog exercise area and is a major access to the Mindil Beach for pedestrian and cyclist traffic.

Human disturbance will increase from high baseline levels through both the construction and operations phases of the Project. Increased human activity in the construction phase will be concentrated within Parcel 7651 or in nearby areas where infrastructure (such as supply of services) is required to support the Project.

During operations, an increase in human disturbance will occur within Parcel 7651 as capacity rates of the supplied accommodation are filled and in adjoining areas as guests to the accommodation use the Little Mindil and Mindil Beach environments.

The impact is expected to be localised in scale, low intensity and medium term. It is unlikely to cause significant additional impact in addition to the high level of pre-existing human disturbance.

## 5.3 VEHICLE STRIKE

The Project will increase the vehicle traffic in the locality during both the construction and operations phases. This increases the possibility of vehicle strike for fauna that may occur in the traffic areas. This is limited to the Yellow Spotted Monitor as shorebirds generally remain in the non-traffic areas and fly between destinations.

The impact is expected to be localised in scale and medium term. Vehicle strike in this urban setting is expected to be rare.

## 5.4 INTRODUCED SPECIES

There is a risk that the Construction and Operations phases of the Project will increase the presence, diversity and abundance of introduced fauna. Due to the urban setting there is a high likelihood that introduced fauna are already present in Parcel 7651.

The generation of putrescible waste is a common attractant to introduced fauna, both domestic and feral, that scavenge the waste or prey upon those that scavenge. Migratory shorebirds are susceptible to impacts from predation and can incur a high energy burden in the avoidance of predators (Lilleyman *et al* 2020a).

The provision of shallow seasonal water can provide breeding habitat to Cane Toads, a known threatening process for Yellow Spotted Monitor.

The impact is expected to be limited in scale and very low in intensity. It is unlikely to cause significant additional impact in addition to the high level of introduced species already present.

## 5.5 NOISE AND LIGHT

There is little research available on the impacts of noise and light to fauna locally, nationally or internationally. Baseline noise and light in the locality is relatively high due to the highly urbanised setting. Project noise impacts are likely to be highest during construction but limited in scale and short in duration. Noise and light impacts during operations are likely to be limited to Parcel 7651 and very low in intensity. It is unlikely to cause significant additional impact in addition to the high level of noise and light already present in this highly urbanised environment.

## 5.6 ALTERED HYDROLOGY AND IMPACTS ON SURFACE WATER AND GROUNDWATER SYSTEMS

The increase in impervious surfaces as a result of the Project will alter the partitioning of surface water and groundwater in the local area. The surface water drains from the site into the tidal creek on the northern boundary and then into the Timor Sea (ADG 2021).

In the area to be developed the existing impervious surfaces cover 30 %. Under the development scenario this will increase to 49 % as the total area expected to be altered is small and the overall change is expected to be limited in scale and very low in intensity.

## 5.7 MARINE DEBRIS

Marine debris pose a threat to threatened and migratory shorebirds through entanglement and ingestion (CoA 2016). The construction phase has the potential to increase marine debris through the production of industrial waste and domestic waste generated by construction workers. Through the operations phase the Project poses a risk of increasing marine debris through the generation of domestic waste both within Parcel 7651 and from visitors using the accommodation in Parcel 7651 visiting the beach environments at Little Mindil and Mindil Beach and inappropriately disposing waste.

The generation of marine debris would be exacerbated under a storm surge scenario. A Stormwater Management Plan has been developed for the Project in which all relevant standards and guidelines are addressed and includes provision of infrastructure to capture litter in stormwater infrastructure, preventing it from entering the marine environment.

The impact is possible to occur, at which time it would be expected to be localised, of low intensity and medium term.

## 5.8 EROSION AND SEDIMENTATION

Erosion and sedimentation risks are expected to be highest during the construction phase of the Project. Clearing, excavation and site levelling activities have the potential to facilitate migration of sediments into inland surface water bodies or site runoff. This is predominantly anticipated during the wet season. The Project has developed a Stormwater Management Plan to instruct this activity.

Potential impacts from increases in surface runoff are scour from runoff velocity, terrestrial erosion, smothering of aquatic flora and fauna and loss of aquatic habitat. Without mitigation, the risk of stormwater leading to sedimentation of surface water that enters the tidal creek is high.

The generation of suspended sediments would be exacerbated under a storm surge scenario occurring during the construction phase.

A Stormwater Management Plan has been developed for the Project in which all relevant standards and guidelines are addressed including criteria from the City of Darwin Subdivision and Development Guidelines, QUDM and Water by Design Guidelines as well as the requirement of AS 3500.3.

## 6 RISK ASSESSMENT

Table 6-1 contains the risk assessment for the Project. Each pathway is assessed to determine the level of risk that the Project will cause significant impact to significant and sensitive vegetation or threatened fauna. The risk is calculated prior to mitigation. As mitigations are applied routinely in the Development Application process and through the application of local and NT Government regulations and guidelines, it is expected the residual risk will be lower than the initial risk assessed in Table 6-1.

**Table 6-1. Risk assessment**

Risk Pathways	Likelihood	Consequence	Risk Rating	Level of Certainty
Vegetation clearing	1	2	Low	High
Human disturbance	2	3	Medium	High
Vehicle strike	1	3	Low	Medium
Increase in introduced species	2	2	Low	High
Increased noise and light	2	2	Low	Medium
Altered Hydrology	2	2	Low	High
Increase in Marine Debris	3	3	Medium	High
Erosion and sedimentation	2	3	Medium	High

## 7 SIGNIFICANT IMPACT ASSESSMENTS

For species considered MNES, significant impact criteria developed by DAWE (DoE, 2013) are used to assess impacts.

For this Assessment, the definition of a 'significant impact' follows that of the DAWE, being: an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts (DoE, 2013). The DoE (2013) state that for an impact to be 'likely', it is not necessary for a significant impact to have a greater than 50 % chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility.

For this Assessment, species listed as threatened species under the EPBC Act that are assessed as having a High likelihood of occurrence (Table 4-6) have been assessed in accordance with DoE guidelines (DoE, 2013) to determine whether the Project will have a significant impact (Table 7-1 to Table 7-6). Migratory shorebirds have been assessed together as a group.

DoE (2013) defines an 'important population' as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

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

Habitat critical to the survival of a species refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community.

**Table 7-1. Significant Impact Assessment for the Red Knot (*Calidris canutus*)**

**Endangered species Significant impact criteria. An action is likely to have a significant impact on an Endangered species if there is a real chance or possibility that it will:**

Impact	Expected	Discussion
Lead to a long-term decrease in the size of a population	No	The Project will not impact the size of the population for this species. No individuals of this species will be killed as a result of the Project. The Red Knot is a regular but infrequent visitor to the Darwin area and whilst potentially suitable roosting habitat exists on the beach and potential foraging habitat occurs in the intertidal sandflats adjacent to Parcel 7651, the species has not frequently been recorded as occurring there. Sporadic records for the species occur at the Palmerston Sewerage Treatment Ponds and at the East Arm Wharf. More frequent records occur between East Point and Lee Point-Buffalo Creek. The Project is not expected to impact any of these locations.

Reduce the area of occupancy of the species	No	The Project will have no direct impact upon the habitats of this species. Indirect impacts may be the increase in human disturbance, marine debris or suspended sediments in the habitats adjacent to Parcel 7651. As the species is not known to occur in the locality frequently the impact is not expected to be significant.
Fragment an existing population into two or more populations	No	The Project will not fragment the habitat of this species
Adversely affect habitat critical to the survival of a species	No	The Project is not expected to adversely affect habitat critical to the survival of this species. The species is not known to occur frequently in the locality. This indicates there is no important habitat or key roosting and feeding sites within or near to the Project. The habitats that may be indirectly impacted by the Project are well represented in other parts of the Darwin Harbour and are not necessary in that similar or higher quality resources are available nearby.
Disrupt the breeding cycle of a population	No	This species does not breed in Australia, the Project will not disrupt the breeding cycle
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	The Project is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat for this species.  No habitat suitable for the Red Knot will be directly impacted. No indirect impacts originating from the project will cause habitat degradation for the Red Knot that would cause the species to decline. There is no important habitat or key roosting and feeding sites within or adjacent to the Project.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	No	Due to the urban setting it is expected the presence of invasive species that are likely to pose a threat to Red Knot are already present. The Project is unlikely to increase the risk of establishment of further invasive species that are harmful to Red Knot.
Introduce disease that may cause the species to decline	No	There are no disease risks associated with the Project.
Interfere with the recovery of the species.	No	Conservation Advice for the Red knot (TSSC 2016) lists the habitat Conservation and Management Actions for the species. The Project is not in contravention of these actions as described below:  The Project will not reduce the protection of roosting and feeding sites for threatened migratory shorebird species. The Project will not reduce the area of potentially suitable habitat threatened migratory shorebird species may occupy in the Darwin region.  The Project may result in increased human disturbance in the locality, however this is not in a location of known significance for the Red Knot and as there is already a high level of human disturbance in the highly urbanised setting, the increase is unlikely to cause a significant further impact.

**Table 7-2. Significant Impact Assessment for the Curlew Sandpiper (*Calidris ferruginea*)**

Critically endangered species Significant impact criteria. An action is likely to have a significant impact on a critically endangered species if there is a real chance or possibility that it will:		
Impact	Expected	Discussion
Lead to a long-term decrease in the size of a population	No	The Project will not impact the size of the population for this species. No individuals of this species will be killed as a result of the Project. The Curlew Sandpiper is a regular but infrequent visitor to the Darwin area and whilst potentially suitable roosting habitat exists on the beach and potential foraging habitat occurs in the intertidal sandflats adjacent to Parcel 7651, the species has not frequently been recorded as occurring there. Frequent records for the species occur at the Palmerston Sewerage Treatment Ponds and infrequent records at the East Arm Wharf. The Project is not expected to impact any of these locations.
Reduce the area of occupancy of the species	No	The Project will have no direct impact upon the habitats of this species. Indirect impacts may be the increase in human disturbance, marine debris or suspended sediments in the habitats adjacent to Parcel 7651. As the species is not known to occur in the locality frequently the impact is not expected to be significant.
Fragment an existing population into two or more populations	No	The Project will not fragment the habitat of this species
Adversely affect habitat critical to the survival of a species	No	The Project is not expected to adversely affect habitat critical to the survival of this species. The species is not known to occur frequently in the locality. This indicates there is no important habitat or key roosting and feeding sites within or near to the Project. The habitats that may be indirectly impacted by the Project are well represented in other parts of the Darwin Harbour and are not necessary in that similar or higher quality resources are available nearby.
Disrupt the breeding cycle of a population	No	This species does not breed in Australia, the Project will not disrupt the breeding cycle
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	The Project is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat for this species.  No habitat suitable for the Curlew Sandpiper will be cleared. There is no important habitat or key roosting and feeding sites within or adjacent to the Project. Any indirect impacts are expected to be limited to localised in scale.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	No	Due to the urban setting it is expected the presence of invasive species that are likely to pose a threat to Curlew Sandpiper are already present. The Project is unlikely to increase the risk of establishment of further invasive species that are harmful to Curlew Sandpiper.
Introduce disease that may cause the species to decline,	No	There are no disease risks associated with the Project.
Interfere with the recovery of the species.	No	Conservation Advice for the Curlew Sandpiper (DoE 2015) lists the habitat Conservation and Management Actions for the species. The Project is not in contravention of these actions as described below.

The Project will not reduce the protection of roosting and feeding sites for threatened migratory shorebird species. The Project will not reduce the area of potentially suitable habitat threatened migratory shorebird species may occupy in the Darwin region.

The Project may result in increased human disturbance in the locality, however this is not in a location of known significance for the Curlew Sandpiper and as there is already a high level of human disturbance in the highly urbanised setting, the increase is unlikely to cause a significant further impact.

**Table 7-3. Significant Impact Assessment for the Great Knot (*Calidris tenuirostris*)**

**Critically endangered species Significant impact criteria. An action is likely to have a significant impact on a critically endangered species if there is a real chance or possibility that it will:**

Impact	Expected	Discussion
Lead to a long-term decrease in the size of a population	No	<p>The Project will not impact the size of the population for this species. No individuals of this species will be killed as a result of the Project. The Great Knot is a frequent visitor to the Darwin area and whilst potentially suitable roosting habitat exists on the beach and potential foraging habitat occurs in the intertidal sandflats adjacent to Parcel 7651, the species has not frequently been recorded as occurring there.</p> <p>Great Knot have been recorded in numbers exceeding the threshold for internationally significant aggregation at Lee Point. The Project is not expected to impact this location.</p>
Reduce the area of occupancy of the species	No	<p>The Project will have no direct impact upon the habitats of this species. Indirect impacts may be the increase in human disturbance, marine debris or suspended sediments in the habitats adjacent to Parcel 7651. As the species is not known to occur frequently in the locality the impact is not expected to be significant.</p>
Fragment an existing population into two or more populations	No	<p>The Project will not fragment the habitat of this species</p>
Adversely affect habitat critical to the survival of a species	No	<p>The Project is not expected to adversely affect habitat critical to the survival of this species. The species is not known to occur frequently in the locality. This indicates there is no important habitat or key roosting and feeding sites within or near to the Project. The habitats that may be indirectly impacted by the Project are well represented in other parts of the Darwin Harbour and are not necessary in that similar or higher quality resources are available nearby.</p>
Disrupt the breeding cycle of a population	No	<p>This species does not breed in Australia, the Project will not disrupt the breeding cycle</p>
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	<p>The Project is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat for this species.</p> <p>No habitat suitable for the Great Knot will be cleared. There is no important habitat or key roosting and feeding sites within or adjacent to the Project. Any indirect impacts are expected to be limited to localised in scale.</p>
Result in invasive species that are harmful to a critically endangered	No	<p>Due to the urban setting it is expected the presence of invasive species that are likely to pose a threat to Great Knot are already present. The</p>

or endangered species becoming established in the endangered or critically endangered species' habitat		Project is unlikely to increase the risk of establishment of further invasive species that are harmful to Great Knot.
Introduce disease that may cause the species to decline,	No	There are no disease risks associated with the Project.
Interfere with the recovery of the species.	No	<p>The Project will not reduce the protection of roosting and feeding sites for threatened migratory shorebird species. The Project will not reduce the area of potentially suitable habitat threatened migratory shorebird species may occupy in the Darwin region.</p> <p>The Project may result in increased human disturbance in the locality, however this is not in a location of known significance for the Great Knot and as there is already a high level of human disturbance in the highly urbanised setting, the increase is unlikely to cause a significant further impact.</p>

**Table 7-4. Significant Impact Assessment for the Greater Sand Plover (*Charadrius leschenaultii*)**

**Vulnerable species Significant impact criteria. An action is likely to have a significant impact on a Vulnerable species if there is a real chance or possibility that it will:**

Impact	Expected	Discussion
Lead to a long-term decrease in the size of an important population	No	<p>The Project will not impact the size of the population for this species. No individuals of this species will be killed as a result of the Project. The Greater Sand Plover is a frequent visitor to the Darwin area and whilst potentially suitable roosting habitat exists on the beach and potential foraging habitat occurs in the intertidal sandflats adjacent to Parcel 7651, the species has not frequently been recorded as occurring there.</p> <p>Greater Sand Plover has been recorded in numbers exceeding the threshold for Internationally Significant Aggregation at Lee Point, and for Nationally Significant Aggregation at East Arm Wharf. The Project is not expected to impact these locations.</p>
Reduce the area of occupancy of an important population	No	<p>The Project will have no direct impact upon the habitats of this species. Indirect impacts may be the increase in human disturbance, marine debris or suspended sediments in the habitats adjacent to Parcel 7651. As the species is not known to occur frequently in the locality the impact is not expected to be significant.</p>
Fragment an existing important population into two or more populations	No	<p>The Project will not fragment the habitat of this species</p>
Adversely affect habitat critical to the survival of a species	No	<p>The Project is not expected to adversely affect habitat critical to the survival of this species. The species is not known to occur frequently in the locality. This indicates there is no important habitat or key roosting and feeding sites within or near to the Project. The habitats that may be indirectly impacted by the Project are well represented in other parts of the Darwin Harbour and are not necessary in that similar or higher quality resources are available nearby.</p>

Disrupt the breeding cycle of an important population	No	This species does not breed in Australia, the Project will not disrupt the breeding cycle
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	The Project is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat for this species.  No habitat suitable for the Greater Sand Plover will be cleared. There is no important habitat or key roosting and feeding sites within or adjacent to the Project. Any indirect impacts are expected to be limited to localised in scale.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	No	Due to the urban setting it is expected the presence of invasive species that are likely to pose a threat to Greater Sand Plover are already present. The Project is unlikely to increase the risk of establishment of further invasive species that are harmful to Greater Sand Plover.
Introduce disease that may cause the species to decline,	No	There are no disease risks associated with the Project.
Interfere with the recovery of the species.	No	Conservation Advice for the Greater Sand Plover (TSSC, 2016) lists the habitat Conservation and Management Actions for the species. The Project is not in contravention of these actions as described below.  The Project will not reduce the protection of roosting and feeding sites for threatened migratory shorebird species. The Project will not reduce the area of potentially suitable habitat threatened migratory shorebird species may occupy in the Darwin region.  The Project may result in increased human disturbance in the locality, however this is not in a location of known significance for the Greater Sand Plover and as there is already a high level of human disturbance in the highly urbanised setting, the increase is unlikely to cause a significant further impact.

**Table 7-5. Significant Impact Assessment for the Lesser Sand Plover (*Charadrius mongolus*)**

**Endangered species Significant impact criteria. An action is likely to have a significant impact on an Endangered species if there is a real chance or possibility that it will:**

Impact	Expected	Discussion
Lead to a long-term decrease in the size of a population	No	The Project will not impact the size of the population for this species. No individuals of this species will be killed as a result of the Project. The Lesser Sand Plover is a frequent visitor to the Darwin area. Potentially suitable roosting habitat exists on the beach and potential foraging habitat occurs in the intertidal sandflats adjacent to Parcel 7651. Potentially suitable high tide roosting and foraging area occurs in the tidal creek and mangrove vegetation on the northern edge of Parcel 7651. The species has not frequently been recorded as occurring within these habitats.  Lesser Sand Plover has been recorded in numbers exceeding the threshold for Nationally Significant Aggregation at the East Arm Wharf specifically and in the Greater Darwin Area more generally. Frequent records occur between East Point and Lee Point-Buffalo Creek. The Project is not expected to impact any of these locations.

Reduce the area of occupancy of the species	No	The Project will have no direct impact upon the habitats of this species. Indirect impacts may be the increase in human disturbance, marine debris or suspended sediments in the habitats adjacent Parcel 7651. As the species is not known to occur frequently in the locality the impact is not expected to be significant
Fragment an existing population into two or more populations	No	The Project will not fragment the habitat of this species.
Adversely affect habitat critical to the survival of a species	No	The project is not expected to adversely affect habitat critical to the survival of this species. The species is not known to occur frequently in the locality. This indicates there is no important habitat or key roosting and feeding sites within or near to the Project. The habitats that may be indirectly impacted by the Project are well represented in other parts of the Darwin Harbour and are not necessary in that similar or higher quality resources are available nearby.
Disrupt the breeding cycle of a population	No	This species does not breed in Australia, the Project will not disrupt the breeding cycle
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	<p>The project is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat for this species.</p> <p>No habitat suitable for the Lesser Sand Plover will be cleared. There is no important habitat or key roosting and feeding sites within or adjacent to the Project. Any indirect impacts are expected to be limited to localised in scale.</p>
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	No	Due to the urban setting it is expected the presence of invasive species that are likely to pose a threat to Lesser Sand Plover are already present. The Project is unlikely to increase the risk of establishment of further invasive species that are harmful to Lesser Sand Plover.
Introduce disease that may cause the species to decline,	No	There are no disease risks associated with the Project.
Interfere with the recovery of the species.		<p>Conservation Advice for the Lesser Sand Plover (TSSC, 2016) lists the habitat Conservation and Management Actions for the species. The Project is not in contravention of these actions as described below.</p> <p>The Project will not reduce the protection of roosting and feeding sites for threatened migratory shorebird species. The Project will not reduce the area of potentially suitable habitat threatened migratory shorebird species may occupy in the Darwin region.</p> <p>The Project may result in increased human disturbance in the locality, however this is not in a location of known significance for the Great Knot and as there is already a high level of human disturbance in the highly urbanised setting, the increase is unlikely to cause a significant further impact.</p>

**Table 7-6. Significant Impact Assessment for the Far Eastern Curlew (*Numenius madagascariensis*)**

Critically endangered species Significant impact criteria. An action is likely to have a significant impact on a critically endangered species if there is a real chance or possibility that it will:

Impact	Expected	Discussion
Lead to a long-term decrease in the size of a population	No	<p>The Project will not impact the size of the population for this species. No individuals of this species will be killed as a result of the Project. The Far Eastern Curlew is a frequent visitor to the Darwin area. Potentially suitable foraging habitat occurs in the intertidal sandflats adjacent to Parcel 7651. Potentially suitable high tide roosting and foraging area occurs in the tidal creek and mangrove vegetation on the northern edge of Parcel 7651. The species has not frequently been recorded as occurring within these habitats.</p> <p>Far Eastern Curlew have been recorded in numbers exceeding the threshold for Nationally Significant Aggregation at the East Arm Wharf and Darwin Harbour Middle Arm within Darwin Harbour Proper. The Project is not expected to impact any of these locations.</p>
Reduce the area of occupancy of the species	No	<p>The Project will have no direct impact upon the habitats of this species. Indirect impacts may be the increase in human disturbance, marine debris or suspended sediments in the habitats adjacent Parcel 7651. As the species is not known to occur frequently in the locality the impact is not expected to be significant</p>
Fragment an existing population into two or more populations	No	<p>The Project will not fragment the habitat of the Far Eastern Curlew.</p>
Adversely affect habitat critical to the survival of a species	No	<p>The project is not expected to adversely affect habitat critical to the survival of this species. The species is not known to occur frequently in the locality. This indicates there is no important habitat or key roosting and feeding sites within or near to the Project. The habitats that may be indirectly impacted by the Project are well represented in other parts of the Darwin Harbour and are not necessary in that similar or higher quality resources are available nearby.</p>
Disrupt the breeding cycle of a population	No	<p>This species does not breed in Australia, the Project will not disrupt the breeding cycle</p>
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	<p>The project is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat for this species.</p> <p>No habitat suitable for the Far Eastern Curlew will be cleared. There is no important habitat or key roosting and feeding sites within or adjacent to the Project. Any indirect impacts are expected to be limited to localised in scale.</p>
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	No	<p>Due to the urban setting it is expected the presence of invasive species that are likely to pose a threat to Far Eastern Curlew are already present. The Project is unlikely to increase the risk of establishment of further invasive species that are harmful to Far Eastern Curlew.</p>
Introduce disease that may cause the species to decline,	No	<p>There are no disease risks associated with the Project.</p>

Interfere with the recovery of the species.	No	<p>Conservation Advice for the Eastern Curlew (DoE 2015) lists the habitat Conservation and Management Actions for the species. The Project is not in contravention of these actions as described below.</p> <p>The Project will not reduce the protection of roosting and feeding sites for threatened migratory shorebird species. The Project will not reduce the area of potentially suitable habitat threatened migratory shorebird species may occupy in the Darwin region.</p> <p>The Project may result in increased human disturbance in the locality, however this is not in a location of known significance for the Far Eastern Curlew and as there is already a high level of human disturbance in the highly urbanised setting, the increase is unlikely to cause a significant further impact.</p>
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**Table 7-7. Significant Impact Assessment for the Bar-tailed Godwit (*Limosa lapponica*)**

Critically endangered species Significant impact criteria. An action is likely to have a significant impact on a critically endangered species if there is a real chance or possibility that it will:		
Impact	Expected	Discussion
Lead to a long-term decrease in the size of a population	No	<p>The Project will not impact the size of the population for this species. No individuals of this species will be killed as a result of the Project. The Bar-tailed Godwit is a regular visitor to the Darwin area. Potentially suitable foraging habitat occurs in the intertidal sandflats adjacent to Parcel 7651. Potentially suitable high tide roosting and foraging area occurs in the tidal creek and mangrove vegetation on the northern edge of Parcel 7651. The species has not frequently been recorded as occurring within these habitats.</p> <p>Bar-tailed Godwit have not been recorded in numbers exceeding the threshold for Nationally Significant Aggregation in the Greater Darwin area.</p>
Reduce the area of occupancy of the species	No	The Project will have no direct impact upon the habitats of this species. Indirect impacts may be the increase in human disturbance, marine debris or suspended sediments in the habitats adjacent Parcel 7651. As the species is not known to occur frequently in the locality the impact is not expected to be significant
Fragment an existing population into two or more populations	No	The Project will not fragment the habitat of the Bar-tailed Godwit.
Adversely affect habitat critical to the survival of a species	No	The project is not expected to adversely affect habitat critical to the survival of this species. The species is not known to occur frequently in the locality. This indicates there is no important habitat or key roosting and feeding sites within or near to the Project. The habitats that may be indirectly impacted by the Project are well represented in other parts of the Darwin Harbour and are not necessary in that similar or higher quality resources are available nearby.
Disrupt the breeding cycle of a population	No	This species does not breed in Australia, the Project will not disrupt the breeding cycle

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	<p>The project is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat for this species.</p> <p>No habitat suitable for the Bar-tailed Godwit will be cleared. There is no important habitat or key roosting and feeding sites within or adjacent to the Project. Any indirect impacts are expected to be limited to localised in scale.</p>
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	No	<p>Due to the urban setting it is expected the presence of invasive species that are likely to pose a threat to Bar-tailed Godwit are already present. The Project is unlikely to increase the risk of establishment of further invasive species that are harmful to Bar-tailed Godwit.</p>
Introduce disease that may cause the species to decline,	No	<p>There are no disease risks associated with the Project.</p>
Interfere with the recovery of the species.	No	<p>Consultation Document on Listing Eligibility and Conservation Actions for the Bar-tailed Godwit (DoE 2015) lists the habitat Conservation and Management Actions for the species. The Project is not in contravention of these actions as described below.</p> <p>The Project will not reduce the protection of roosting and feeding sites for threatened migratory shorebird species. The Project will not reduce the area of potentially suitable habitat threatened migratory shorebird species may occupy in the Darwin region.</p> <p>The Project may result in increased human disturbance in the locality, however this is not in a location of known significance for the Bar-tailed Godwit and as there is already a high level of human disturbance in the highly urbanised setting, the increase is unlikely to cause a significant further impact.</p>

**Table 7-8. Significant Impact Assessment for migratory shorebirds**

**Migratory species Significant impact criteria. An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:**

Impact	Expected	Discussion
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	No	<p>Locations of Internationally or Nationally Significant Aggregations in the Greater Darwin area have been identified in Section 4.3.2.1.</p> <p>No Internationally or Nationally Significant Aggregations occur within the area likely to be impacted by the Project.</p>
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	No	<p>Due to the urban setting it is expected the presence of invasive species that are likely to pose a threat to migratory shorebirds are already present. The Project is unlikely to increase the risk of establishment of further invasive species that are harmful to migratory shorebirds.</p>

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Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	No	Migratory shorebirds do not breed in Australia.  Feeding, migrating and resting behaviour is not expected to be seriously disrupted for an ecologically significant proportion of the population as the Project impacts are limited to local in scale and no significant aggregations are within the area of impact. The Project will not cause a significant proportion of the populations of migratory shorebirds that visit the Greater Darwin area to be disturbed.
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## 8 CONCLUSIONS

### 8.1 VEGETATION OF CONSERVATION SIGNIFICANCE

No TEC's are known or expected to occur in or adjacent to Parcel 7651. The Project is not expected to have a direct or indirect impact on TEC's.

Two patches of vegetation within Parcel 7651 are sensitive and significant vegetation under the NT Land Clearing Guidelines. These are Mangrove vegetation fringing the tidal creek on the northern boundary of the site and the vegetation along the escarpment on the southern boundary that has elements of monsoon forest.

No vegetation clearing is proposed to occur within the sensitive and significant vegetation. The Project is not expected to impact these vegetation types directly or indirectly.

Vegetation clearing for the Project is proposed to occur within an area previously cleared of native vegetation and currently containing garden plantings and mowed introduced grass. If the current land use has been performed under permit, a Vegetation Clearing Permit is not required.

### 8.2 FLORA OF CONSERVATION SIGNIFICANCE

No flora of conservation significance are known or expected to occur in Parcel 7651. The Project is not expected to impact any flora of conservation significance directly or indirectly.

### 8.3 FAUNA OF CONSERVATION SIGNIFICANCE

Fifteen records for threatened fauna occur within Parcel 7651 on the NT Fauna Atlas, however the records are predominantly historic and have low spatial validity in that they were collected and recorded with minimal spatial accuracy prior to the availability of modern mapping tools such as Global Positioning Systems and Geographic Information Systems. Consequently, there is reasonable doubt as to the records occurring within Parcel 7651.

Significant modification of the land has occurred from its natural state and the majority of available habitat is in a completely degraded state in that it does not support native vegetation or landforms and is in a highly urbanized setting with frequent human disturbance.

The most valuable habitats are the escarpment on the southern boundary, tidal creek/mangrove areas on the northern boundary and the beach and intertidal sandflats adjacent Parcel 7651 to the west.

A likelihood of occurrence assessment found that Parcel 7651 contains habitats potentially suitable for the Yellow Spotted Monitor, Far Eastern Curlew, Lesser Sand Plover and Bar-tailed Godwit. The Yellow Spotted Monitor is a habitat generalist and may use all habitats. The three Threatened shorebirds may use the mangrove and tidal creek habitat at high tide.

The beach and intertidal sandflats are suitable for the Far Eastern Curlew, Lesser Sand Plover and Bar-tailed Godwit and also the Red Knot, Great Knot, Greater Sand Plover and Curlew Sand Plover.

No direct impacts (e.g. vegetation clearing) are proposed to occur within these potentially suitable habitats. Indirect impacts that may reduce the suitability of these habitats are human disturbance, increase in marine debris and erosion and sedimentation. Prior to mitigation these impacts are expected to have a medium risk of occurrence. It is expected that mitigations will be applied in line with local and NT Government policy and guidance and the risk will be reduced.

The Project is not expected to have a significant impact on threatened fauna.

Twenty-six migratory shorebirds are known to regularly occur in the Greater Darwin area. There are no Significant Aggregation of Migratory shorebirds at Mindil Beach or Little Mindil Beach. The Project impacts are expected to be predominantly limited to within Parcel 7651. Impacts from human disturbance, marine debris and erosion and sedimentation have the potential to be localised in that they may impact the areas immediately adjacent to Parcel 7651. These impacts have a low likelihood of impacting the locations where Internationally or Nationally Significant Aggregations of migratory shorebirds occur.

## 9 REFERENCES

- ADG (2021) Little Mindil Beach Stormwater Management Plan. Prepared for KTT Investments by ADG Engineers (Aust) Pty. Ltd. Ref: 23085 C R001 REV01 01.02.2021.docx 01 February 2021.
- Atlas of Living Australia (2018) Atlas of Living Australia. Available online: <https://www.ala.org.au/> [accessed December 2018]
- BirdLife Australia, (2020), BirdData <https://birddata.birdlife.org.au/> [accessed 01/03/2021].
- Bureau of Meteorology (2021) Climate Data Online. [www.bom.gov.au](http://www.bom.gov.au) [accessed 01/03/2021].
- Bureau of Meteorology (2021) Past Tropical Cyclones <http://www.bom.gov.au/cyclone/tropical-cyclone-knowledge-centre/history/past-tropical-cyclones/> [accessed 01/03/2021].
- Chatto, R. (2003). *The distribution and status of shorebirds around the coast and coastal wetlands of the Northern Territory*. Parks and Wildlife Commission of the Northern Territory, Palmerston. Technical Report No. 73.
- Chatto, R. (2012) Status of Northern Territory Migratory Shorebirds . Final Report to Department of Sustainability, Environment, Water, Population and Communities. Department of Natural Resources, Environment, The Arts and Sport, Darwin.
- Cogger, H.G. (2014). *Reptiles and amphibians of Australia*. CSIRO Publishing: Collingwood.
- Commonwealth of Australia (CoA) (2016) The threat of marine plastic pollution in Australia. Senate Standing Committees on Environment and Communications Report. 20 April 2016 ISBN 978-1-76010-400-9.
- Commonwealth of Australia (CoA). (2017). EPBC Act Policy Statement 3.21 –Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species. Australian Government, Department of the Environment and Energy, Canberra.
- Czechura, G.V., Hobson, R.G., and Stewart, D.A. (2009). Observations on the biology of the Red Goshawk *Erythrotriorchis radiatus* in Queensland. *Australian Field Ornithology*, 26(4), 148.
- Department of Agriculture, Water and the Environment (DAWE) (2020) Species profile and threats dataset. <http://www.environment.gov.au/sprat> [accessed 01/03/2021].
- Department of Environment and Natural Resources (DENR). (2000). *Land Resources of the Elizabeth, Darwin and Blackmore Rivers – Greater Darwin Area, Northern Territory*. Northern Territory Government, Darwin. [http://www.ntlis.nt.gov.au/metadata/export\\_data?metadata\\_id=2DBC771203606B6E040CD9B0F274EFE&type=html](http://www.ntlis.nt.gov.au/metadata/export_data?metadata_id=2DBC771203606B6E040CD9B0F274EFE&type=html) [accessed 26/02/2021].
- Department of Environment and Natural Resources. 2020. Land Clearing Guidelines. Technical Report LRM2020/0092~0001, NT Government, Darwin.
- Department of the Environment (DoE) (2013) Significant Impact Guidelines. [https://www.environment.gov.au/system/files/resources/42f84df4-720b-4dcf-b262-48679a3aba58/files/nsg-guidelines\\_1.pdf](https://www.environment.gov.au/system/files/resources/42f84df4-720b-4dcf-b262-48679a3aba58/files/nsg-guidelines_1.pdf) [accessed 01.03/2021].
- Department of the Environment (DoE) (2015) Consultation Document on Listing Eligibility and Conservation Actions *Limosa lapponica menzbieri* (bar-tailed godwit (northern Siberian)). <https://www.environment.gov.au/system/files/pages/dda5908b-c31f-4bb9-8dca-8a9da2f973d5/files/limosa-lapponica-menzbieri-consultation.pdf> [accessed 02/03/2021].
- Department of the Environment (DoE). (2015a). *Conservation Advice Calidris ferruginea curlew sandpiper*. Commonwealth Government of Australia, Canberra. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/856-conservation-advice.pdf>.

- Department of the Environment (DoE). (2015b). *Conservation Advice Numenius madagascariensis eastern curlew*. Commonwealth Government of Australia, Canberra. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/847-conservation-advice.pdf>.
- Department of Natural Resources, Environment, The Arts and Sport (DNRETAS). (2013). Darwin Harbour – Site of Conservation Significance. Northern Territory Government, Darwin. [www.nt.gov.au/nretas](http://www.nt.gov.au/nretas)
- Firth, R.S., Brook, B.W., Woinarski, J.C., and Fordham, D.A. (2010). Decline and likely extinction of a northern Australian native rodent, the Brush-tailed Rabbit-rat *Conilurus penicillatus*. *Biological Conservation*, 143(5), 1193-1201.
- Fogarty P.J., Howe D., and Dunlop C.R. (1979). *The land resources of the Darwin area*. Northern Territory Government. Land Conservation Unit, Conservation Commission of the Northern Territory, Darwin.
- Fogarty, P.J., Lynch, B., and Wood, B.G. (1984). *Land Resources of The Elizabeth, Darwin and Blackmore Rivers*. Report Number 15/84d. Northern Territory Government. Land Conservation Unit, Conservation Commission of the Northern Territory, Darwin. <http://hdl.handle.net/10070/229286>
- Goss-Custard, J.D., P. Triple., F. Sueur & A.D. West. (2006). Critical thresholds of disturbance by people and raptors in foraging wading birds. *Biological Conservation* 127, 88-97.
- Hansen, B.D., Fuller, R.A., Watkins, D., Rogers, D.I., Clemens, R.S., Newman, M., Woehler, E.J. and Weller, D.R. (2016) Revision of the East Asian-Australasian Flyway Population Estimates for 37 listed Migratory Shorebird Species. Unpublished report for the Department of the Environment. BirdLife Australia, Melbourne
- Higgins, P.J. (Ed.) (1999). *Handbook of Australian, New Zealand and Antarctic birds. Volume 4: Parrots to Dollarbirds*. Oxford University Press: Melbourne.
- International Standards Organisation, 2018 - *ISO 31000:2018 Risk Management – Principles and Guidelines*
- Lilleyman, A., Alley, A. Jackson, D., O'Brien, G., & Garnett, S.T. (2018). Distribution and abundance of migratory shorebirds in Darwin Harbour, Northern Territory, Australia. *Northern Territory Naturalist*, 28, 30-42.
- Lilleyman, A., & Garnett, S.T. (2019). *Shorebird values and knowledge gaps in Darwin Harbour, Northern Territory*. A report to the Department of Environment and Natural Resources, Northern Territory Government. By Research Institute for the Environment and Livelihoods, Charles Darwin University.
- Lilleyman, A., Rogers, D.I., Jackson, M.V., Fuller, R.A., O'Brien, G., & Garnett, S.T. (2020a). An artificial site provides valuable additional habitat to migratory shorebirds in a tropical harbour. *Pacific Conservation Biology*. doi: 10.1071/PC19036
- Lilleyman, A., Millar, G., Hunt Lew-Fatt, K., Yunupingu, B., Anderson, J., Que-Noy, J., Williams, B., Bray, T., Burn, S., Dawson, S., Talbot, A., Smith, B., and Garnett, S.T. (2020b) Shorebird values and knowledge gaps in Darwin Harbour, Northern Territory – Report II. A report to the Department of Environment and Natural Resources, Northern Territory Government. By Research Institute for the Environment and Livelihoods, Charles Darwin University.
- Lynch, B., Cuff, N., and Green, C. (2012) *Summary of the Origin and Derivation of the 1:250,000 Land System Descriptions for the Northern Part of the Northern Territory* (DRAFT). Northern Territory Government. Land Resource Assessment Unit, Department of Land Resource Management, Darwin.
- Menkhorst, P., and Knight, F. (2009). *A Field Guide to the Mammals of Australia, 2nd Ed*. Oxford University Press: Melbourne.
- Northern Territory Government (NTG 2014). Weed Management – Zones Map – 4 March 2014. [https://nt.gov.au/\\_\\_data/assets/pdf\\_file/0008/193562/weed-management-zones-map.pdf](https://nt.gov.au/__data/assets/pdf_file/0008/193562/weed-management-zones-map.pdf) [accessed 28/02/2021].

Northern Territory Environment Protection Authority (NT EPA) (2020) Environmental Impact Assessment and Environmental Approval in the Northern Territory.

[https://depws.nt.gov.au/\\_\\_data/assets/pdf\\_file/0003/816906/g01-guide-nt-environment-impact-assessment-approval-process.pdf](https://depws.nt.gov.au/__data/assets/pdf_file/0003/816906/g01-guide-nt-environment-impact-assessment-approval-process.pdf)

Northern Territory Environment Protection Authority (NT EPA) (2021). Referring a proposed action to the NT EPA guideline. [https://ntepa.nt.gov.au/\\_\\_data/assets/pdf\\_file/0009/805167/referring-proposed-action-to-ntepa-guideline.pdf](https://ntepa.nt.gov.au/__data/assets/pdf_file/0009/805167/referring-proposed-action-to-ntepa-guideline.pdf)

Northern Territory Environment Protection Authority (NT EPA) (2021). Environmental Factors and Objectives. [https://depws.nt.gov.au/\\_\\_data/assets/pdf\\_file/0020/804602/guide-ntepa-environmental-factors-objectives.pdf](https://depws.nt.gov.au/__data/assets/pdf_file/0020/804602/guide-ntepa-environmental-factors-objectives.pdf)

O'Malley, C. (2006). *National recovery plan for the Gouldian finch (Erythrura gouldiae)*. WWF Australia, Sydney; and Parks and Wildlife NT, Department of Natural Resources, Environment and the Arts, Northern Territory, Palmerston.

Palmer, C. Taylor, R. and Burbidge, A. (2003). Recovery plan for the Golden Bandicoot *Isodon auratus* and Golden-backed Tree-rat *Mesembriomys macrurus* 2004 - 2009. Northern Territory Department of Infrastructure Planning and Environment, Darwin.

Pizzey, G., and Knight, F. (2012). *The Field Guide to the Birds of Australia*. Harper Collins Publishers: Sydney.

Rankmore, B.R. (2006). Impacts of habitat fragmentation on the vertebrate fauna of the tropical savannas of northern Australia; with special reference to medium-sized mammals. PhD Thesis. School of Environmental Research, Charles Darwin University, Darwin, Northern Territory

Taylor, I.R. & A. Bester (1999). The response of foraging waders to human recreation disturbance at Rhyll, Phillip Island, Victoria. *Stilt* 35, 67.

Thackway, R. and Cresswell, I. D. (1995) An Interim Biogeographic Regionalisation for Australia. Available online: <https://www.environment.gov.au/system/files/resources/4263c26f-f2a7-4a07-9a29-b1a81ac85acc/files/ibra-framework-setting-priorities-nrs-cooperative-program.pdf> [accessed September 2018]

Threatened Species Scientific Committee (TSSC). (2015a). *Conservation Advice Erythrotriorchis radiatus Red goshawk*. Commonwealth of Australia, Canberra. Department of the Environment. <http://www.environment.gov.au/biodiversity/threatened/species/pubs/942-conservation-advice-31102015.pdf>

Threatened Species Scientific Committee (TSSC). (2015b). *Conservation Advice Mesembriomys gouldii gouldii Black-footed tree-rat (Kimberley and mainland Northern Territory)*. Commonwealth of Australia, Canberra. Department of the Environment. <http://www.environment.gov.au/biodiversity/threatened/species/pubs/87618-conservation-advice.pdf>

Threatened Species Scientific Committee (TSSC). (2016a). *Conservation Advice Calidris canutus Red knot*. Commonwealth of Australia, Canberra. Department of the Environment. <http://www.environment.gov.au/biodiversity/threatened/species/pubs/855-conservation-advice-05052016.pdf>

Threatened Species Scientific Committee (TSSC). (2016b). *Conservation Advice Calidris tenuirostris Great knot*. Commonwealth of Australia, Canberra. Department of the Environment. <http://www.environment.gov.au/biodiversity/threatened/species/pubs/862-conservation-advice-05052016.pdf>

Threatened Species Scientific Committee (TSSC). (2016c). *Conservation Advice Charadrius leschenaultii Greater sand plover*. Commonwealth of Australia, Canberra. Department of the Environment. <http://www.environment.gov.au/biodiversity/threatened/species/pubs/877-conservation-advice-05052016.pdf>

Threatened Species Scientific Committee (TSSC). (2016d). *Conservation Advice Charadrius mongolus Lesser sand plover*. Commonwealth of Australia, Canberra. Department of the Environment. <http://www.environment.gov.au/biodiversity/threatened/species/pubs/879-conservation-advice-05052016.pdf>

Threatened Species Scientific Committee (TSSC). (2016e). *Conservation Advice Macroderma gigas Ghost bat*. Commonwealth of Australia, Canberra. Department of the Environment. <http://www.environment.gov.au/biodiversity/threatened/species/pubs/174-conservation-advice-05052016.pdf>

Threatened Species Scientific Committee (TSSC). (2016f). *Conservation Advice Limosa lapponica baueri Bar-tailed godwit (western Alaskan)*. Commonwealth Government of Australia, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/86380-conservation-advice-05052016.pdf>.

Threatened Species Scientific Committee (TSSC). (2016g). *Conservation Advice Limosa lapponica menzbieri Bar-tailed godwit (northern Siberian)*. Commonwealth Government of Australia, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/86432-conservation-advice-05052016.pdf>.

Tidemann, C.R., Priddel, D.M., Nelson, J.E., and Pettigrew, J.D. (1985). Foraging behaviour of the Australian ghost bat, *Macroderma gigas* (Microchiroptera: Megadermatidae). *Australian Journal of Zoology*, 33(5), 705-713.

Van Dyck, S., and Strahan, R. (Eds.). (2008). *The Mammals of Australia* (3rd ed.). New Holland Publishers: Sydney.

WA EPA (2016) Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment. [https://www.epa.wa.gov.au/sites/default/files/Policies\\_and\\_Guidance/EPA%20Technical%20Guidance%20-%20Flora%20and%20Vegetation%20survey\\_Dec13.pdf](https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA%20Technical%20Guidance%20-%20Flora%20and%20Vegetation%20survey_Dec13.pdf)

Ward S (2012) Mitchell's Water Monitor *Varanus mitchelli*. Threatened Species of the Northern Territory. [https://nt.gov.au/\\_\\_data/assets/pdf\\_file/0019/206461/mitchells-water-monitor.pdf](https://nt.gov.au/__data/assets/pdf_file/0019/206461/mitchells-water-monitor.pdf) [accessed 01/03/2021].

Ward, S., Woinarski, J., Griffiths, T., and McKay, L. (2012a). *Threatened Species of the Northern Territory: Yellow-spotted Monitor, Varanus panoptes*. Northern Territory Government. Department of Environment and Natural Resources, Darwin. [https://nt.gov.au/\\_\\_data/assets/pdf\\_file/0006/206466/floodplain-monitor.pdf](https://nt.gov.au/__data/assets/pdf_file/0006/206466/floodplain-monitor.pdf)

Wilson, S., and Swan, G. (2003). *A Complete Guide to Reptiles of Australia* (2nd ed.). New Holland Publishers: Sydney.

Woinarski, J., and Ward, S. (2012). *Threatened Species of the Northern Territory: Northern Brush-tailed Phascogale (Northern Territory subspecies) Phascogale pirata*. Northern Territory Government. Department of Environment and Natural Resources, Darwin. [https://nt.gov.au/\\_\\_data/assets/pdf\\_file/0003/205509/brush-tailed-phascogale.pdf](https://nt.gov.au/__data/assets/pdf_file/0003/205509/brush-tailed-phascogale.pdf)

Wood, B.G., Fogarty, P.J., and Day, K.J. (1985). *The Land Systems of the Darwin Region*. Technical Report No. 24. Northern Territory Government. Conservation Commission of the Northern Territory, Darwin.

## 10 APPENDICES

## **APPENDIX A: CONSERVATION CATEGORIES**

## Chapter 5 Conservation of biodiversity and heritage

### Part 13 Species and communities

#### Division 1 Listed threatened species and ecological communities

##### 179 Categories of threatened species

- (1) 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.
- (2) 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, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
- (3) 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.
- (4) 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.
- (5) 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.
- (6) 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.
- (7) In subsection (6):
  - (a) **fish** includes all species of bony fish, sharks, rays, crustaceans, molluscs and other marine organisms, but does not include marine mammals or marine reptiles.

### 182 Critically endangered, endangered and vulnerable communities

- (1) 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.
- (2) 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.
- (3) 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.

## Chapter 5 Conservation of biodiversity and heritage

### Part 13 Species and communities

#### Division 2 Migratory species

### 209 Listed migratory species

- (1) In this Act:

***migratory species*** has the meaning given by Article I of the Bonn Convention.

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#### Convention on the Conservation of Migratory Species of Wild Animals

##### Article I

##### Interpretation

1. For the purpose of this Convention:
  - a) "Migratory species" means the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries.

From: Convention on the Conservation of Migratory Species 1979. Bonn, Germany.

**Chapter 5** Conservation of biodiversity and heritage

**Part 13** Species and communities

**Division 4** Listed marine species

**248 Listed marine species**

- (1) The Minister must, by legislative instrument, establish a list of marine species for the purposes of this Part.
- (2) The list, as first established, must contain only the following:
  - (a) all species in the Family Hydrophiidae (sea-snakes);
  - (b) all species in the Family Laticaudidae (sea-snakes);
  - (c) all species in the Family Otariidae (eared seals);
  - (d) all species in the Family Phocidae (“true” seals);
  - (e) all species in the Genus *Crocodylus* (crocodiles);
  - (f) all species in the Genus *Dugong* (dugong);
  - (g) all species in the Family Cheloniidae (marine turtles);
  - (h) the species *Dermochelys coriacea* (leatherback turtles);
  - (i) all species in the Family Syngnathidae (seahorses, sea-dragons and pipefish);
  - (j) all species in the Family Solenostomidae (ghost pipefish);
  - (k) all species in the Class Aves (birds) that occur naturally in Commonwealth marine areas.

**Box 2.1. The IUCN Red List Categories****EXTINCT (EX)**

A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycles and life form.

**EXTINCT IN THE WILD (EW)**

A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

**CRITICALLY ENDANGERED (CR)**

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild.

**ENDANGERED (EN)**

A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.

**VULNERABLE (VU)**

A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.

**NEAR THREATENED (NT)**

A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

**LEAST CONCERN (LC)**

A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are often included in this category.

**DATA DEFICIENT (DD)**

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, or a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

**NOT EVALUATED (NE)**

A taxon is Not Evaluated when it has not yet been evaluated against the criteria.

## **APPENDIX B: DECLARED WEEDS**

Table B-1. Declared weed species recorded on the NT Flora Atlas within 10 km of Parcel 7651.

FAMILY	SCIENTIFIC	COMMON NAME	Weed Management Category in Darwin	Statutory Management Plan
ASTERACEAE	<i>Acanthospermum hispidum</i>	Acanthospermum, Starburr, Star Burr, Goats Head	B	
AMARANTHACEAE	<i>Alternanthera pungens</i>	Alternanthera, Khaki Weed	B	
POACEAE	<i>Andropogon gayanus</i>	Andropogon, Gamba Grass	B	Yes
MELIACEAE	<i>Azadirachta indica</i>	Azadirachta, Neem Tree, Neem	B	Yes
ACANTHACEAE	<i>Barleria prionitis</i>	Barleria	A	
POACEAE	<i>Cenchrus echinatus</i>	Cenchrus, Mossman River Grass, Burr-grass, Burr Grass, Galland's Curse	B	
POACEAE	<i>Cenchrus polystachios</i>	Pennisetum	B	
APOCYNACEAE	<i>Cryptostegia madagascariensis</i>	Cryptostegia, Rubber Vine	A	
SOLANACEAE	<i>Datura ferox</i>	Datura, Fierce Thornapple, Longspine Thornapple	A	
PONTEDERIACEAE	<i>Eichhornia crassipes</i>	Eichhornia, Water Hyacinth	A	
POACEAE	<i>Hyparrhenia rufa</i>	Hyparrhenia	A	
EUPHORBIACEAE	<i>Jatropha gossypifolia</i>	Jatropha, Belly Ache Bush, Bellyache Bush	A	Yes
VERBENACEAE	<i>Lantana camara</i>	Lantana	B	
LAMIACEAE	<i>Mesosphaerum suaveolens</i>	Hyptis, Hyptis, Mint Weed	B	
FABACEAE	<i>Mimosa pigra</i>	Mimosa, Sensitive Plant, Giant Sensitive Plant	B	Yes
FABACEAE	<i>Mimosa pudica</i> var. <i>hispid</i>	Mimosa, Common Sensitive Plant	B	
FABACEAE	<i>Parkinsonia aculeata</i>	Parkinsonia, Parkinsonia, Jerusalem Thorn	B	

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SALVINIACEAE	<i>Salvinia molesta</i>	Salvinia	B	
FABACEAE	<i>Senegalia chundra</i>	Senegalia	A	
FABACEAE	<i>Senna alata</i>	Senna, Cassia, Candlebush, Cassia	B	
FABACEAE	<i>Senna obtusifolia</i>	Senna, Cassia	B	
FABACEAE	<i>Senna occidentalis</i>	Senna, Coffee Senna, Sickle Pod	B	
MALVACEAE	<i>Sida acuta</i>	Sida, Spiny-head Sida	B	
MALVACEAE	<i>Sida cordifolia</i>	Sida, Flannel Weed	B	
MALVACEAE	<i>Sida rhombifolia</i>	Sida, Paddy Lucerne, Common Sida, Queensland Hemp, Jelly Leaf	B	
VERBENACEAE	<i>Stachytarpheta australis</i>	Stachytarpheta, Snakeweed	B	
VERBENACEAE	<i>Stachytarpheta cayennensis</i>	Stachytarpheta, Snakeweed	B	
VERBENACEAE	<i>Stachytarpheta jamaicensis</i>	Stachytarpheta, Snakeweed	B	
POACEAE	<i>Themeda quadrivalvis</i>	Themeda, Grader Grass	B	Yes
RHAMNACEAE	<i>Ziziphus mauritiana</i>	Ziziphus, Chinese Apple	A	Yes

## APPENDIX C: LIKELIHOOD OF OCCURRENCE – FAUNA

**Table C-1: Likelihood of Occurrence - Conservation Significant Fauna**

Species	Common Name	Cons. Code		Habitat and Distribution	Likelihood of Occurrence
		EPBC Act	TPWC Act		
<b>Birds</b>					
<i>Calidris canutus</i>	Red Knot	EN	VU	<p>During low tide Red Knot forage in exposed soft substrate on intertidal mudflats and sandflats. At high tide, it forages at nearby lakes, sewage ponds, and floodwaters. The species roosts on sandy beaches, spits and islets, and mudflats, preferentially in open areas (to avoid ambush by predators) near feeding areas (TSSC, 2016a).</p> <p>Lilleyman et al. (2018) recorded the species across the Darwin Harbour Proper as part of the ‘small birds’ collection which included 167 combined records of 10 species. The EAAF population is estimated as 110,000 birds, the Australian population is estimated at 61,000 birds and the NT population estimated as 24,200 birds. BirdLife Australia (2020) report the annual monitoring from five locations between East Point and Lee Point-Buffer Creek as part of the National Shorebird Monitoring (former Shorebirds 2020 Project). They report a maximum of 36 records for the species from any single survey period. It is unlikely that Darwin is a nationally significant aggregation of this species.</p>	<p><b>High.</b> A known visitor to the coastal waters surrounding Darwin and likely to use the sandflats adjacent Little Mindil Beach for foraging at low tides and possibly the beach for roosting. Unlikely to use the land in Parcel 7651 as habitat is not suitable, but likely to use the adjacent beach and intertidal zone periodically in low numbers.</p> <p>No breeding habitat as breeding occurs in the northern hemisphere.</p>
<i>Calidris ferruginea</i>	Curlew Sandpiper	CR	VU	<p>Curlew Sandpiper predominantly inhabits intertidal mudflats in sheltered coastal areas, including estuaries, bays, inlets, and lagoons, as well as non-tidal swamps and lakes near the coast, and saltworks and sewage farms. It is less frequently recorded inland, around ephemeral and permanent water bodies, usually with bare edges of mud or sand. It utilises both fresh and brackish waters. It forages on intertidal mudflats and the edges of nearby shallow water. At high tide, it may forage among low sparse emergent vegetation. This species roosts in open areas with damp substrate, particularly on beaches, or sandspits and islets near coastal lagoons and other wetlands. It has also been recorded roosting in dunes during very high tides, in saltmarsh, and in mangroves (DoE, 2015a).</p>	<p><b>High..</b> A known visitor to the coastal waters surrounding Darwin and likely to use the sandflats adjacent Little Mindil Beach for foraging at low tides and possibly the beach for roosting. Unlikely to use the land in Parcel 7651 as habitat is not suitable, but likely to use the adjacent beach and intertidal zone periodically in low numbers.</p> <p>No breeding habitat as breeding occurs in the northern hemisphere.</p>

Species	Common Name	Cons. Code		Habitat and Distribution	Likelihood of Occurrence
		EPBC Act	TPWC Act		
				<p>It is estimated that 44,000 birds are in Australia, where the species is widespread around the coasts, and in smaller numbers inland. The population that visits the Northern Territory is estimated to be 17,800 birds (Chatto 2003). The species is frequently recorded at the Palmerston Sewage Treatment Ponds and to occur in low numbers at the East Arm Wharf (Lilleyman et al., 2020). Aggregations (i.e. occurrences of <math>\geq 0.1</math> % of the total global population) are not known to occur in Darwin.</p>	
<i>Calidris tenuirostris</i>	Great Knot	CR	VU	<p>Great Knot inhabits coastal areas with large intertidal mudflats or sandflats. It is occasionally recorded on exposed reefs or rock platforms, shores near mangroves, swamps near the coast, salt lakes, and non-tidal lagoons. It is often recorded in mixed congregations with other small shorebirds. The species roosts in open areas, typically near the edge of the water close to feeding grounds. Roosting sites house large groups (TSSC, 2016b). In hot conditions, the species will seek roost sites with damp substrates that lower the local temperature (DAWE, 2020).</p> <p>An estimated 343,000 birds (90% of the global population) spend the non-breeding period in Australia. A population of 122,000 birds are estimated in the NT. The species is a frequent user of the East Arm Wharf where a maximum of 124 birds have been counted in one year over the 2013-2018 period, with the highest monthly counts occurring in February and September (Lilleyman &amp; Garnett, 2019). Aggregations (i.e. occurrences of <math>\geq 0.1</math> % of the total global population) consistently occur at Lee Point (Lilleyman et al. 2020a) 15 km to the northeast of Parcel 7651.</p>	<p><b>High.</b> A known visitor to the coastal waters surrounding Darwin and likely to use the sandflats adjacent Little Mindil Beach for foraging at low tides and possibly the beach for roosting. Unlikely to use the land in Parcel 7651 as habitat is not suitable, but likely to use the adjacent beach and intertidal zone periodically in low numbers.</p> <p>No breeding habitat as breeding occurs in the northern hemisphere.</p>
<i>Charadrius leschenaultii</i>	Greater Sand Plover	VU	VU	<p>Greater Sand Plover inhabits a variety of coastal habitats, including sheltered beaches, large intertidal mudflats, salt marshes, tidal lagoons, and coral reefs. It forages in wet sand or mud exposed by tides on mudflats of sheltered embayments, lagoons, or estuaries. It roosts on sandspits and banks on beaches or in tidal lagoons. It typically roosts further away from water on beaches than other shorebirds; however, like other species in hot conditions,</p>	<p><b>High..</b> A known visitor to the coastal waters surrounding Darwin and likely to use the sandflats adjacent Little Mindil Beach for foraging at low tides and possibly the beach for roosting. Unlikely to use the land in Parcel 7651 as habitat is not suitable, but likely to use the adjacent beach, sandspit and intertidal zone periodically in low numbers.</p>

Species	Common Name	Cons. Code		Habitat and Distribution	Likelihood of Occurrence
		EPBC Act	TPWC Act		
				<p>it seeks areas with wet substrates that have lower local temperatures (TSSC, 2016c).</p> <p>An estimated 119,000 birds migrate to Australia and an estimated 40,300 birds that visit the NT. The Greater Darwin area is considered an internationally significant site (DAWE, 2020), although recent count data do not exceed 1 % of the population (Chatto 2012). Surveys at Lee Point (15 km to the northeast of Parcel 7651) have recorded Greater Sand Plover in numbers exceeding the benchmark for nationally significant aggregation on one occasion between 1980 and 2018 (Lilleyman et al. 2020a).</p>	No breeding habitat as breeding occurs in the northern hemisphere.
<i>Charadrius mongolus</i>	Lesser Sand Plover	EN	VU	<p>Lesser Sand Plover inhabits coastal areas, especially sandy beaches, mudflats of coastal bays and estuaries, sandflats, and dunes near the coast. It also occasionally utilises mangrove mudflats. It forages on the exposed water edges of intertidal sand- and mudflats, and occasionally on coral reefs, or sandy or muddy river margins. It roosts on beaches, banks, and spits near foraging areas (TSSC, 2016d). Hansen et al. (2016) estimated 27,500 birds overwintering in Australia. It has been recorded from most of the coastline of the NT, with Chatto (2003) estimating 39,000 birds visiting the NT. Although the Chatto (2003) data is cited in Hansen (2016) as the source of abundance data for the NT, there is a significant discrepancy in the estimated NT and Australian population sizes. This may be due to the difference in time period between the 2003 NT bird counts and the 2016 estimate of global habitat availability. The Greater Darwin area is considered a nationally significant aggregation, where maximum counts have recorded 1,440 birds (DAWE, 2020).</p>	<p><b>High.</b> A known visitor to the coastal waters surrounding Darwin and likely to use the sandflats adjacent Little Mindil Beach for foraging at low tides and possibly the beach for roosting. Possibly uses the tidal creek and mangrove vegetation in Parcel 7651 during high tides, and likely to use the adjacent beach, sandspit and intertidal zone periodically in low numbers.</p> <p>No breeding habitat as breeding occurs in the northern hemisphere.</p>
<i>Erythroriorchis radiatus</i>	Red Goshawk	VU	VU	<p>The Red Goshawk occurs in coastal and subcoastal areas of northern and eastern Australia. This species occupies a range of open forest woodlands, particularly near rivers and wetlands, rainforests, and areas with abundant prey populations (including water birds, pigeons, parrots, and large passerines) (Pizzey and Knight, 2012). Nesting trees are generally emergent, within 1 km of permanent water (e.g. rivers, swamps, and pools) (Czechura</p>	<p><b>Low.</b> No suitable habitat due to high level of urbanisation and fragmentation of remnant patches. 1990</p>

Species	Common Name	Cons. Code		Habitat and Distribution	Likelihood of Occurrence
		EPBC Act	TPWC Act		
				<i>et al.</i> , 2009). This species is sensitive to disturbance, and rarely breeds in areas with fragmented native vegetation (TSSC, 2015a).	
<i>Erythrura gouldiae</i>	Gouldian Finch	EN	VU	Gouldian Finch breeding habitat is characterised by rocky hills with hollow-bearing smooth-barked gums, <i>Eucalyptus brevifolia</i> or <i>Corymbia dichromphloia</i> , within 2 – 4 km of small waterholes or springs that persist throughout the dry season (O'Malley, 2006).	<b>Low.</b> Suitable habitat not present.
<i>Geophaps smithii smithii</i>	Partridge Pigeon (eastern)	VU	-	The Partridge Pigeon is a small dull-brown pigeon that occupies woodland with low grass, open rocky or sandy ground by streams, water courses, roadsides, and areas of recently burnt grass, but seldom far from water (Pizzey and Knight, 2012).	<b>Low.</b> Suitable habitat not present.
<i>Limnodromus semipalmatus</i>	Asian Dowitcher	-	VU	Asia Dowitcher is a regular but uncommon visitor to northwest Australia, especially between Port Hedland and Broome. In the NT, it is found in Darwin and Arnhem Land.  General habitat occurs in sheltered coastal environments, including embayments, coastal lagoons, estuaries, and tidal creeks. Inhabits exposed mudflats or sandflats and forages on intertidal mudflats (DAWE, 2020).	<b>Medium.</b> A known but infrequent visitor to the coastal waters surrounding Darwin and likely to use the sandflats adjacent Little Mindil Beach for foraging at low tides and possibly the beach for roosting. Possibly uses the tidal creek and mangrove vegetation in Parcel 7651 during high tides and likely to use the intertidal zone periodically in low numbers.  No breeding habitat as breeding occurs in the northern hemisphere.
<i>Limosa lapponica</i>	Bar-tailed Godwit	-	VU	Bar-tailed Godwit inhabits coastal areas, including large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, and bays. It forages near the edge of water on exposed sandy substrates of intertidal flats, banks, and beaches, and occasionally among mangroves. It roosts on sandy beaches, sandbars, spits, and near-coastal saltmarsh. Like other waders, in hot conditions it seeks moist substrates below roosts, where local temperatures are cooler than surrounding areas (DAWE, 2020; TSSC, 2016f, g).	<b>High.</b> A known visitor to the coastal waters surrounding Darwin and likely to use the sandflats adjacent Little Mindil Beach for foraging at low tides and possibly the beach for roosting. Possibly uses the tidal creek and mangrove vegetation in Parcel 7651 during high tides, and likely to use the adjacent beach, sandspit and intertidal zone periodically in low numbers.
<i>Limosa lapponica baueri</i>	Western Alaskan Bar-tailed Godwit	VU			

Species	Common Name	Cons. Code		Habitat and Distribution	Likelihood of Occurrence
		EPBC Act	TPWC Act		
<i>Limosa lapponica menzieri</i>	Northern Siberian Bar-tailed Godwit	CR		The Australian population is estimated to be 189,146 and the NT population at 53,000. Surveys at Lee Point (15 km to the northeast of Parcel 7651) have recorded Bar-tailed Godwit in numbers exceeding the benchmark for nationally significant aggregation (i.e. occurrences of $\geq 0.1\%$ of the total EAAF population) on one occasion between 1980 and 2018 (Lilleyman et al. 2020a).	No breeding habitat as breeding occurs in the northern hemisphere.
<i>Numenius madagascariensis</i>	Far Eastern Curlew	CR	VU	<p>Far Eastern Curlew inhabits sheltered coasts with large intertidal mudflats or sandflats, and often with beds of seagrass (Zosteraceae), in estuaries, bays, harbours, inlets, and coastal lagoons. It is also known to use saltmarsh or mudflats fringed by mangroves, as well as the mangroves. It forages on open/vegetation-free intertidal sandflats or mudflats, or ones covered with seagrass, often near mangroves. It roosts during high tide on sandy spits, sandbars, and islets, especially on beach sand, and among coastal vegetation, including mangroves. As with other species, it seeks roost sites where damp substrate lowers local temperatures in hot conditions (DoE, 2015b). Historically, in the NT, it has most commonly been recorded in mangrove habitat (Ward, 2012).</p> <p>The Australian population is estimated to be 26,405 and the NT population 6,800. Darwin Harbour Proper is a nationally Significant Aggregation, within the Harbour, East Arm Wharf and Middle Arm have also had counts above the threshold for Nationally Significant Aggregation.</p>	<p><b>High.</b> A known visitor to the coastal waters surrounding Darwin and likely to use the sandflats adjacent Little Mindil Beach for foraging at low tides and possibly the beach for roosting. Possibly uses the tidal creek and mangrove vegetation in Parcel 7651 during high tides, and likely to use the adjacent beach, sandspit and intertidal zone periodically in low numbers.</p> <p>No breeding habitat as breeding occurs in the northern hemisphere.</p>
<i>Rostratula australis</i>	Australian Painted Snipe	EN	-	The Australian Painted Snipe occurs throughout most of Australia and is part-migratory, moving into tropical Queensland in autumn-winter (Pizzey and Knight, 2012). They inhabit well vegetated shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps, and claypans. Until recently, <i>R. australis</i> was considered a subspecies of <i>R. benghalensis</i> ; however, it is now considered a separate species.	<b>Unlikely.</b> No records on NT Fauna Atlas within the Darwin area. No suitable habitat within Parcel 7651.

Species	Common Name	Cons. Code		Habitat and Distribution	Likelihood of Occurrence
		EPBC Act	TPWC Act		
<i>Tyto novaehollandiae kimberli</i>	Masked Owl (northern mainland)	VU	VU	While the distribution of the Masked Owl is widespread, it occurs only sparsely throughout much of coastal Australia (Pizzey and Knight, 2012). In northern Australia, the species has been recorded from riparian forest, rainforest, open forest, Melaleuca swamps, and the edges of mangroves, as well as along the margins of sugar cane fields (Higgins, 1999).	<b>Unlikely.</b> Records on NT Fauna Atlas in Darwin are from 1902. Whilst potential habitat may occur in the mangroves and escarpment vegetation, it is unsuitable due to the high level of surrounding urbanisation and the highly fragmented nature of the small remnant patches.
<b>Mammals</b>					
<i>Antechinus bellus</i>	Fawn antechinus	VU	EN	Fawn Antechinus is a terrestrial, or partly arboreal, dasyurid. It is crepuscular, and shelters in tree hollows or fallen logs. As such, it prefers habitat exposed to cooler and less frequent fires during the dry season, when much of its habitat burns. This species is primarily insectivorous, although it may also consume small geckos. This species inhabits tall, open forests in tropical, monsoonal regions in the NT (Menkhorst and Knight, 2009).	<b>Unlikely.</b> No records on NT Fauna Atlas in Darwin and suitable habitat is not present in Parcel 7651.
<i>Conilurus penicillatus</i>	Brush-tailed Tree-rat	VU	-	The Brush-tailed Tree-rat is a medium-sized (up to 190 g), nocturnal, semi-arboreal rat found in coastal parts of northern WA and NT. This species inhabits moist areas, with thick grassy understoreys, coastal sheoak woodlands, sclerophyll forest, and <i>Pandanus</i> stands, and dens in hollow trees (> 24 cm DBH) and fallen logs (van Dyck and Strahan, 2008). This species is threatened by inappropriate fire regimes, specifically intense, late-dry-season fires, that often occur annually (Firth <i>et al.</i> , 2010).	<b>Unlikely.</b> No records on NT Fauna Atlas in Darwin and suitable habitat is not present in Parcel 7651.
<i>Dasyurus hallucatus</i>	Northern Quoll	EN	CR	Northern Quoll is generally nocturnal, both terrestrial and arboreal, and prefers broken country, rocky areas, and open Eucalypt forest within 150 km of the coast (Van Dyck and Strahan, 2008). They den in hollow tree trunks but will use other spaces, such as rock crevices and openings in old termite mounds.	<b>Low.</b> Frequently recorded in Darwin in the 1990's the species has suffered rapid and widespread decline with the arrival of the Cane Toad. Large hollow bearing Eucalypt trees not present in Parcel 7651.

Species	Common Name	Cons. Code		Habitat and Distribution	Likelihood of Occurrence
		EPBC Act	TPWC Act		
<i>Isoodon auratus</i>	Golden Bandicoot	VU	EN	The Golden Bandicoot is a small omnivorous marsupial which is now restricted to rocky sandstone spinifex habitats and vine thickets in the north Kimberley region, four Western Australian (WA) islands (two Pilbara, two Kimberley) and one island off the northeast Arnhem Land coast of the Northern Territory (NT) (Palmer et al 2003).	<b>Unlikely.</b> Records on NT Fauna Atlas are historic and not spatially valid. The species is now restricted to a remote Island.
<i>Macroderma gigas</i>	Ghost Bat	VU		The Ghost Bat is Australia's only carnivorous bat (van Dyck and Strahan, 2008), and the largest microbat (Menkhorst and Knight, 2009). This species is an obligate troglodyte, and its occurrence is dependent on the provision of natural diurnal roosts in caves, crevices, and deep overhangs, and artificial roosts, such as underground mines (Tidemann <i>et al.</i> , 1985) These sites are generally in deep natural caves, rock crevices, and old mines, with a stable temperature (23 – 28 °C), and high relative humidity (50 – 100 %) (TSSC, 2016e). At night, they leave these roosts to hunt for large insects, frogs, lizards, small birds, and mammals, including other bats (van Dyck and Strahan, 2008). Disturbance of roost sites is a key threatening factor for the Ghost Bat.	<b>Unlikely.</b> No records for Darwin on NT Fauna Atlas and suitable habitat not present. While there may be shallow caves and crevices in the escarpment, it is unlikely to support large deep caves. The highly urbanised surroundings are unsuitable.
<i>Mesembriomys gouldii gouldii</i>	Black-footed Tree-rat	EN	VU	The Black-footed Tree-rat typically inhabits lowland open forests and woodlands dominated by Darwin Woollybutt ( <i>Eucalyptus miniata</i> ) and Darwin Stringybark ( <i>E. tetradonta</i> ), preferentially with a relatively dense shrubby understorey (Hill, 2012; TSSC, 2015b).  This species is known to occur in the Darwin region including within the Charles Darwin National Park (Hill, 2012). The species may persist in remnant vegetation in developed areas if the patches are of sufficient size or a network of smaller patches is available (Rankmore 2006). It is threatened by inappropriate fire regimes and predation by feral cats (TSSC, 2015b).	<b>Low.</b> Suitable habitat not present. Whilst suitable habitat may have historically been present in the adjoining plains vegetation the highly urbanised and fragmented surroundings are unsuitable. The size of the remnant habitat patches in and around Parcel 7651 are unlikely to be large enough to support Black-footed Tree-rat (Rankmore 2006).
<i>Phascogale pirata</i>	Northern Brush-tailed Phascogale	VU		The Northern Brush-tailed Phascogale is dark grey above and paler below, with pinkish-white limbs. This arboreal species prefers tall, open forests dominated by Eucalyptus and occurs only in the Top End of the NT (Woinarski and Ward, 2012).	<b>Unlikely.</b> No records exist on the NT Fauna Atlas in Darwin and no suitable habitat in Parcel 7651.

Species	Common Name	Cons. Code		Habitat and Distribution	Likelihood of Occurrence
		EPBC Act	TPWC Act		
<i>Rattus tunneyi</i>	Pale Field-rat	-	VU	The Pale Field Rat occurs in a diverse range of habitats from damp grasslands, woodlands, and monsoon forests that contain dense sedge understoreys on the margins of seasonal water courses (Menkhorst and Knight, 2009). It inhabits much of northern coastal Australia and is known to occur within the Charles Darwin National Park.	<b>Low.</b> The species is known to occur within the Charles Darwin National Park approximately 4 km away and the vegetation on the escarpment is potential habitat, however is unlikely to contain the soils suitable for tunnelling and required dense understory vegetation on seasonal water courses.
<b>Reptiles</b>					
<i>Acanthophis hawkei</i>	Plains Death Adder	VU	VU	The Plains Death Adder is a nocturnal snake, believed to dwell in earth fissures during the dry season and beneath ground debris during the wet season. This species is found in QLD and the NT, particularly Barkly Tablelands (Cogger, 2014).	<b>Unlikely.</b> The single record on the NT Fauna Atlas from Darwin was in 1959. No suitable cracking substrates occur within Parcel 7651.
<i>Varanus mertensi</i>	Mertens' Water Monitor	-	VU	The Mertens' Water Monitor occurs near water bodies, basking on rocks and logs overhanging rivers, swamps, and lagoons. This species is distributed across northern Australia, throughout coastal and inland waters (Cogger, 2014).	<b>Low.</b> No suitable habitat within Parcel 7651.
<i>Varanus mitchelli</i>	Mitchell's Water Monitor	-	VU	Mitchell's water monitor is semi-aquatic and arboreal and inhabits margins of watercourses, swamps and lagoons in Northern Australia. It rests and shelters in hollows and under bark on trees next to water. It basks on rocks and overhanging limbs and readily takes to the water when disturbed. It is a strong swimmer and feeds largely on aquatic insects, fish, small lizards and frogs (Ward 2012).	<b>Low.</b> No suitable habitat within Parcel 7651.
<i>Varanus panoptes</i>	Yellow-spotted Monitor	-	VU	The Yellow Spotted Monitor has been recorded broadly in the Darwin Region including at Charles Darwin National Park. It inhabits a range of environments, including coastal beaches, floodplains, grasslands, and woodlands (Ward et al., 2012; Wilson & Swan, 2010).  The species has suffered declines with the arrival of the Cane Toad.	<b>High.</b> The species has broad habitat suitability and is likely an infrequent visitor to Parcel 7651 and the surrounding beaches, escarpment, Golf Course and Botanic Gardens.