



EPBC Act Significant Impact Assessment

Berrimah Freight Terminal Expansion

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Basis of Report

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1.0 Introduction

1.1 Purpose and Objectives of the Report

The *Matters of National Environmental Significance Significant Impact Guidelines 1.1 EPBC Act* (Significant Impact Guidelines) is designed to inform proponents who propose to undertake an action (development), to decide whether or not to submit a referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW).

The purpose of the significant impact assessment is to inform an EPBC Referral to the Commonwealth Minister of Environment to assess the Project's eligibility as a controlled action under the EPBC Act. Under the EPBC Act an action will require approval from the Minister if the action has, will have, or is likely to have, a significant impact on an MNES.

A significant impact is defined as an impact which is important, notable, or of consequence, having regard to its context or intensity.

This report has been developed in accordance with the *Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (the Guidelines (DoE 2013)).

1.2 Relevant Legislation

1.2.1 Matters of National Environmental Significance

The EPBC Act provides a legal framework for the protection of nationally significant (protected) animals, plants, habitat and places. The EPBC Act covers nine protected matters, also known as MNES, those relevant to this action have been highlighted:

- **Listed threatened species and communities**
- Listed migratory species
- Ramsar wetlands of international importance
- Commonwealth marine environment
- World heritage properties
- National heritage places
- The Great Barrier Reef Marine Park
- Nuclear actions
- A water resource, in relation to coal seam gas development and large coal mining development.

1.2.2 Environment Protection Act

The Northern Territory (NT) *Environment Protection Act 2019* (NT EPA) aims to protect the environment through sustainable development and manage significant disturbances through an environmental approval process. Under the Act, the NT EPA regulates the environment impact assessment process to identify potential environmental impacts of development proposals. This initial step is undertaken through a referral in which the NT EPA then determines if further assessment is required. Further environmental assessment may require the submission of an Environmental Impact Assessment (EIA) under a tiered assessment pathway.



1.2.3 Territory Parks and Wildlife Conservation Act

The NT Territory Parks and Wildlife Conservation Act 1976 (TPWC Act) is administered by the NT Department of Environment, Parks and Water Security (DEPWS). The TPWC Act makes provisions for the establishment of Territory Parks and other Parks and Reserves and promotes the study, protection, conservation and sustainable utilisation of wildlife. This Act also covers the classification and management of wildlife, classification and control of feral animals, permits for taking wildlife, and designation and management of protected areas and private sanctuaries.

1.3 Project Description

Aurizon Operations Limited (Aurizon) are proposing to expand the Berrimah Freight Terminal at East Arm, near Darwin. The expanded terminal will have an integrated logistics focus, which provides an ability to service both bulk and containerised freight, large container storage area and potential for warehousing or colocation with incumbent freight forwarders.

The Berrimah Freight Terminal Expansion Project site (Project site) is situated approximately 6.5 km east of the Darwin Central Business District and approximately 2 km north-east of the East Arm Wharf, on the East Arm Peninsula. Road access to the site is via Berrimah Road, which links the site to the Darwin road network, including the Stuart Highway and Tiger Brennan Drive.

The site for the proposed extension is located on:

- 338 Berrimah Road, East Arm (existing rail terminal, Section 5411 Hundred of Bagot on plan S2000/191B);
- 330 Berrimah Road, East Arm (Section 5412 Hundred of Bagot on plan S2000/191B); and
- part of 270 Berrimah Road, East Arm (Section 6082 Hundred of Bagot on plan S2008/197B).

The construction of the Berrimah Freight Terminal Expansion Project will involve:

- Clearing – approximately 40 ha of mangrove and terrestrial vegetation
- Seawall construction – reuse of existing rock with import of approximately 12,000 m³ of quarry rock
- Reclaim – import of approximately 600,000 m³ of clean fill
- Services – installation of power, communications, water and sewage infrastructure
- Hardstand, roads and rail line – import of approximately 190,000 m³ of engineered material for the installation of transport infrastructure and work surfaces
- Buildings – construction of security gatehouse.

1.4 Areas of investigation

The areas of targeted investigation and assessment discussed herein for the Proposed Action, include:

- *Project Footprint* – the area of proposed permanent and temporary ground disturbance associated with the Proposed Action (approximately 41 ha).
- *Study Area* – Project footprint and up to 20 m buffer zone.
- *Locality* – the extent of 10 km radius of the Study Area.



2.0 Description of the Study Area

2.1 Current Land Use

The Project site currently supports mostly areas of terrestrial and mangrove vegetation within Sections 5412 and 6082, Hundred of Bagot.

Section 5411, Hundred of Bagot is part of the Alice Springs to Darwin Railway corridor and includes the existing Berrimah Freight Terminal and associated rail sidings, supporting infrastructure and rollingstock maintenance facility.

2.2 Previous Studies

A field assessment was conducted between May and June 2023 to identify conservation significant species and their habitat that occur within the study area. Full methodologies and results of the survey can be found in the *Migratory Shorebird Survey Report* (SLR, 2024a), *Terrestrial Vertebrate Fauna Survey* (SLR, 2024b) and the *Mangrove and Terrestrial Flora Studies* (EcoScience NT, 2023) reports. The outcome of the field assessments included the identification of seven mangrove assemblage or communities including:

- Mixed *Rhizophora stylosa/Camptostemon schultzei* low to mid closed-forest/open-forest
- Mixed *Rhizophora stylosa/Bruguiera* spp/*Ceriops* spp low closed-forest/low open-forest
- *Ceriops australis* low closed-forest/low open-forest
- Mixed species low closed-forest
- *Avicennia marina/Ceriops australis* low open-forest/low closed-forest
- Mixed species low open-forest/low closed-forest
- Salt flats.

The field survey also identified eight terrestrial vegetation communities including:

- Five communities dominated by *Melaleuca leucadendra* with various sub-canopy species and varying densities of invasive groundcover species. These ranged from rises and side slopes with shallow gravelly lithosol soils to areas of the constructed rock batter and constructed drains.
- A *Peltophorum pterocarpum* dominated community over tussock grassland
- An *Acacia auriculiformis* dominated community over tussock grassland
- A *Corymbia polycarpa* community with tussock grassland on lowland plains and sandy clay soils

No threatened ecological communities or critical habitat listed under the EPBC Act were recorded. Two individuals of the threatened species, Darwin Cycad (*Cycas armstrongii*) listed as vulnerable under the TPWC Act, were identified.

Three broad fauna habitats were identified and mapped within the study area:

- Mangrove habitat (27.75 ha, 68.06%) covers the majority of the study area and extends outside the study area to form part of a larger ecosystem.
- Woodland habitat (11.59 ha, 28.43%) provides value to a variety of fauna, including conservation significant fauna, however the understorey is degraded. The habitat



occurs within a limited extent within the study area and lacks connectivity to similar woodland habitat. Larger patches of similar habitat occur outside the study area.

- Intertidal mudflat habitat (1.43 ha, 3.51%) occur in small, isolated patches within the study area. A larger 12-ha patch of similar intertidal mudflat habitat occurs southwest of the study area.

Three conservation significant fauna species and one conservation significant flora species listed under the EPBC Act and/or the TPWC Act were either recorded within the Project site during the field assessment or records of the species occurred within the study area that were identified during desktop assessment (**Table 1**). While not recorded during the field assessment, one migratory species listed under the EPBC Act and one vulnerable species under TPWC Act were identified as having moderate likelihood of occurring within the study area during the initial desktop assessment (SLR, 2024).

Table 1 Threatened fauna located within the Project site

Scientific Name	Common Name	Status ¹	
		TPWC Act	EPBC Act
<i>Saccolaimus saccolaimus nudicluniatus</i>	Bare-rumped Sheath-tailed Bat	NT	VU
<i>Trichosurus vulpecula arnhemensis</i>	Northern Brushtail Possum/ Common Brushtail Possum (northwestern)	NT	VU
<i>Varanus mitchelli</i>	Mitchell's Water Monitor	VU	CR
<i>Crocodylus porosus</i>	Estuarine Crocodile	LC	MI
<i>Varanus panoptes</i>	Yellow-spotted Monitor	VU	Not listed
<i>Cycas armstrongii</i>	Darwin Cycad	VU	Not listed

¹ NT = Near Threatened, VU = Vulnerable, CR = Critically Endangered, MI = Migratory, LC = Least Concern



3.0 Significant Impact Criteria

The significance of potential impacts to conservation significant species under the EPBC Act are assessed using the *MNES Significant Impact Guidelines, version 1.1* (DoE, 2013). Although the Guidelines do not formally apply to species listed under the TPWC Act, they provide a useful guide for assessment of impacts to these species, and the EPBC Act guidelines have been applied to those relevant conservation significant species.

3.1 MNES Critically Endangered Species

For critically endangered and endangered species, an action is likely to have a significant impact if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of a population
- Reduce the area of occupancy of the species
- Fragment an existing population into two or more populations
- Adversely affect habitat critical to the survival of a species
- Disrupt the breeding cycle of a population
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
- Introduce disease that may cause the species to decline
- Interfere with the recovery of the species.

3.2 MNES Vulnerable Species criteria

An action is likely to have a significant impact on the species if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of an important population of a species
- Reduce the area of occupancy of an important population
- Fragment an existing important population into two or more populations
- Adversely affect habitat critical to the survival of a species
- Disrupt the breeding cycle of an important population
- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in invasive species that are harmful to the vulnerable species becoming established in the vulnerable species' habitat
- Introduce disease that may cause the species to decline
- Interfere substantially with the recovery of the species.



3.3 Migratory

For migratory species, an action is likely to have a significant impact if there is a real chance or possibility that it will:

- 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
- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species
- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

4.0 Significant impact assessment definitions

The Significant Impact Guidelines provide definitions for the significant impact assessment criteria used herein:

- Population of a species
- Important population
- Habitat critical to the survival of a species or ecological community
- Important habitat for migratory species
- Ecologically significant proportion (migratory species)
- Population of a migratory species
- Invasive species.

These definitions are key considerations when conducting a significant impact assessment for threatened and migratory species listed under the EPBC Act. The definition for each is presented below.

4.1.1 Population of a species

A *'population of a species'* is defined under the EPBC Act as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to:

- a geographically distinct regional population, or collection of local populations, or
- a population, or collection of local populations, that occurs within a particular bioregion.

4.1.2 Important population

An *'important population'* is 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.

4.1.3 Habitat critical to the survival of a species or ecological community

'Habitat critical to the survival of a species or ecological community' 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.

Such habitat may be, but is not limited to:

- habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/ or
- habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.

Critical habitat can be further explained as an identified area of viable habitat that contains habitat attributes that are essential for the conservation of a threatened species. These areas are typically under a regime of special protection and management to ensure the critical habitat remains a stronghold for the species to ensure its long-term survival and viability in the wild. Critical habitat may also include an area of land not currently occupied by the species but can act as a sanctuary by possessing the necessary whole of life cycle habitat attributes to facilitate the recovery of a declining population of the species.

4.1.4 Important habitat for a migratory species

An area of '*important habitat for a migratory species*' is:

- a) habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or
- b) habitat that is of critical importance to the species at particular life-cycle stages, and/or
- c) habitat utilised by a migratory species which is at the limit of the species range, and/or
- d) habitat within an area where the species is declining.

4.1.5 Ecologically significant proportion (migratory species)

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an '*ecologically significant proportion*' of the population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species-specific behavioural patterns (for example, site fidelity and dispersal rates).

4.1.6 Population of a migratory species

'*Population*', in relation to 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 including Australia.

4.1.7 Invasive species

An '*invasive species*' is an introduced species, including an introduced (translocated) native species, which out-competes native species for space and resources or which is a predator of native species. Introducing an invasive species into an area may result in that species becoming established. An invasive species may harm listed threatened species or ecological communities by direct competition, modification of habitat or predation.



5.0 Significant Impact Assessment Conservation Significant Species

The below assessments include the assessment of significant impacts to fauna species at the Commonwealth level, where relevant. Guideline criteria for determining if a project will have a significant impact on a species or its habitat is available for the Commonwealth government level and is detailed below.

5.1 Bare-rumped Sheath-tailed Bat

Conservation Status

The Bare-rumped Sheath-tailed Bat is listed as Vulnerable under the EPBC Act and Near Threatened under TPWC Act.

Distribution and ecology

The Bare-rumped Sheath-tailed Bat is known to occur in north-eastern Queensland and the monsoonal tropics of the Northern Territory and is likely to occur in areas of the Kimberley in Western Australia (TSSC 2016). In Queensland, it occurs from Ayr to the Iron Range, including Magnetic and possibly Prince of Wales Islands (TSSC 2016). Most records are near-coastal, but one record (at Jasper Gorge, Northern Territory) has been found 150 km inland (TSSC 2016).

Habitat for this species is variable and includes northern tropical savanna woodlands and forests, coastal sand dunes, mangroves, paperbark woodlands, riparian forests and lowland rainforests, as well as sandstone and limestone ranges and gorges. (Baker & Gynther, 2023). In the NT, specimens have been collected from open *Pandanus* woodland fringing the sedgeland of the South Alligator River in Kakadu National Park, and from eucalypt woodlands and forests extending from coastal and adjacent inland areas (DEPWS 2021a). In Queensland, it is known mainly from coastal lowlands, including eucalypt woodlands and rainforests (DEPWS 2021a).

The Bare-rumped Sheath-tailed Bat is a high-flying insectivorous bat and forages for flying insects above the canopy (TSSC 2016). It has been observed foraging within metres of the canopy in riverine gallery forest and *Melaleuca*-dominated swamps in Queensland. It is known to fly at altitudes up to and above 400 m and is likely capable of moving long distances (TSSC 2016). This species prefers to roost in groups, ranging from 10 to 100 individuals, in large trees with deep, hollow pipes, where the hollow is at least 18cm in diameter and the entrance to the hollow is at least 6m above the ground. (Baker & Gynther, 2023).

Known threats

The threats to the Bare-rumped Sheath-tailed Bat listed by the conservation advice (TSSC 2016) include:

- habitat loss and fragmentation. The preferred habitat (tall eucalypt open forest) is subject to localised development, mostly for horticulture and urban development (TSSC 2016). The small number of confirmed roosts located in Australia have been in tree hollows; roost sites in trees have been destroyed during clearing (TSSC 2016).
- competition for tree hollows by bees, non-native and native birds;
- disease, and;
- too frequent burning



Species specific habitat assessment

Habitat for the Bare-rumped Sheath-tailed Bat is variable and includes northern tropical savanna woodlands and forests, coastal sand dunes, mangroves, paperbark woodlands, riparian forests and lowland rainforests, as well as sandstone and limestone ranges and gorges. The Bare-rumped Sheath-tailed Bat was identified at one ARU location, site S4U14268 (-12.46642680, 130.91764510) located on the boundary of mangrove and intertidal mudflat habitat.

The habitat types identified on site where the species may be found include all three broad habitat types comprising mangrove, woodland, and intertidal mudflats.

Within the Study Area it was determined that Bare-rumped Sheath-tailed Bat habitat comprises the following habitat types:

- Mangrove: 28.55 ha
- Woodland: 11.08 ha

Important population

Population data is limited for this species, and only a small amount of data is available relating to historic and current roost sites. Individuals recorded foraging within the Study Area likely belong to a local population meeting the definition of an important population. Due to the possibly low number of existing populations throughout the species range, every population within Australia can be considered a key source population for breeding and/or dispersal, and necessary for maintaining genetic diversity of the species as a whole.

Potential project related impacts

Impacts of the Proposed Action on this species includes direct impacts to 39.5 ha of habitat suitable for foraging and dispersal.



5.1.1 Significant Impact Assessment for the Bare-rumped Sheath-tailed Bat

Significant Impact Criteria	Impact Assessment	Significant impact likely
<p>Lead to a long-term decrease in the size of an important population of a species</p>	<p>Individuals were recorded foraging in the Study Area in 2017 and 2023, however, the Study Area likely does not support preferred habitat for roosting and breeding, as evidenced by a lack of hollow bearing trees.</p> <p>The Project site contains 28.55ha of mangrove and 11.08ha of woodland habitats, which is located on the edge of a large polygon (approximately 1,900ha) of similar habitat extending to the northwest that includes Charles Darwin National Park.</p> <p>The loss of up to 39.5 ha equates to a 1.7% decrease in the total extent of foraging habitat for this species at a landscape scale and therefore would be considered insignificant in relation to the extent of retained suitable habitat which will remain available for foraging.</p> <p>Therefore, the Proposed Action will not lead to a long-term decrease in the size of an important population of Bare-rumped Sheath-tail Bat.</p>	<p>No</p>
<p>Reduce the area of occupancy of an important population</p>	<p>The Study Area provides foraging habitat for the species, which forms a small part of a much larger area of surrounding remnant mangrove and woodland habitat. The species is highly mobile and likely to utilise a large portion of the surrounding area for foraging. Additionally, the Study Area is unlikely to provide suitable roosting and breeding habitat as evidenced by the lack of hollow bearing trees recorded during the field assessment.</p> <p>The loss of up to 39.5 ha of foraging habitat, which forms part of a much larger patch of adjacent remnant habitat (1,900 ha) is insignificant in relation to the size of retained available foraging area.</p> <p>Therefore, the removal of habitat as a result of the action will not reduce the area of occupancy for an important population of the Bare-rumped Sheath-tailed Bat.</p>	<p>No</p>
<p>Fragment an existing important population into two or more populations</p>	<p>The Bare-rumped Sheath-tailed Bat foraging habitat proposed to be cleared is located adjacent to the existing freight terminal to the south, with extensive (1,900 ha) of mangrove woodland habitat immediately adjacent to the north. The connectivity with retained habitat and lack of fragmentation will continue to provide dispersal opportunities for this species. This species is highly mobile and may utilise areas above more open woodland or cleared habitat while dispersing.</p> <p>No habitat fragmentation or isolation will occur as a result of the Proposed Action.</p> <p>As such, the Proposed Action will not fragment an existing important population of this species into two or more populations.</p>	<p>No</p>



Significant Impact Criteria	Impact Assessment	Significant impact likely
Adversely affect habitat critical to the survival of a species	<p>In accordance with the Conservation Advice (TSSC, 2016) habitat critical to the survival of the Bare-rumped Sheath-tail Bat has not been identified, due to limited data on the species.</p> <p>The loss of up to 39.5 ha of mixed mangrove and woodland habitat from the action, will not adversely affect long-term maintenance of the species, genetic diversity or long-term evolutionary development, and is not suitable for reintroduction of individuals or recovery of the species, due to its small size and position amongst the broader extensive suitable foraging habitat.</p> <p>Although the habitat is suitable for foraging and dispersal, breeding and roosting are considered unlikely. The removal of 39.5 ha of this foraging and dispersal habitat is insignificant in relation to the availability of the extensive (1,900 ha) adjacent habitat. The loss from the proposed action equates to a 1.7% decrease in total habitat availability.</p> <p>Whilst limited suitable roosting and foraging habitat occurs within the Project site, it is likely that more suitable habitat exists in surrounding areas.</p> <p>Therefore, the proposed action will not adversely affect habitat critical to the survival of the species.</p>	No
Disrupt the breeding cycle of an important population	<p>The habitat offers very limited breeding places for the Bare-rumped Sheath-tailed Bat due to the limited amount of hollow bearing trees.</p> <p>The location of the habitat to be removed by the Proposed Action will not result in reduced connectivity or dispersal opportunities (and therefore the ability to find a mate). Extensive areas of remnant adjacent habitat will be retained which will continue to provide dispersal opportunities for the species during breeding season.</p> <p>Therefore, the Proposed Action will not disrupt the breeding cycle of an important population for this species.</p>	No
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>In total 39.5 ha will be cleared in the Project site. However, there is over 1,900ha of contiguous habitat directly adjacent to proposed action. This will continue to facilitate extensive foraging opportunities for the species. Furthermore, the Proposed Action will not result in the fragmentation or isolation of suitable habitat in which the species are known to forage in.</p> <p>Therefore, the Project will not modify, destroy or isolate or decrease the availability or quality of habitat for the Northern Brushtail Possum, and is unlikely to contribute to the decline of the species.</p>	No
Result in invasive species that are harmful to a vulnerable	<p>The proposed action will result in the construction of artificial structures such as a seawall, rail line, road and associated infrastructure, neither of which will not contribute to an increase in invasive species.</p>	No



Significant Impact Criteria	Impact Assessment	Significant impact likely
species becoming established in the vulnerable species' habitat	<p>Threatening process of the Bare-rumped Sheath-tailed Bat include habitat loss and degradation, including: vegetation change (invasion by exotic species (such as <i>Mimosa pigra</i>)), timber collection and targeted tree removal, competition for tree hollows, disease and climate change (DEPWS 2021, TSSC 2016). Among the 17 weed species recorded during the field surveys, <i>Mimosa pigra</i> was not identified.</p> <p>With the implementation of standard environmental mitigation measures detailed within the Construction Environmental Management Plan, the Project is unlikely to result in the introduction of invasive species that may cause the species to decline in the Project site.</p> <p>The Proposed Action is unlikely to introduce or exacerbate the spread any invasive species that are not already present within or adjacent to the Study Area.</p>	
Introduce disease that may cause the species to decline	<p>The impact of diseases on the Bare-rumped sheath tail bat is unknown (Schulz & Thomson 2007). However, Australian Bat Lyssavirus (ABLV), has been recorded in the closely related yellow-bellied sheath tail bat (<i>Saccolaimus flaviventris</i>) (Barrett 2004) and may also occur in the Bare-rumped sheath tail bat.</p> <p>At present there is no known biosecurity mitigation which can be applied to reduce the transmission of ABLV.</p> <p>The proposed action is not expected to introduce or exacerbate the spread of disease or pathogens such as ABLV that may lead to population decline or reduce the carrying capacity of the habitat.</p>	No
Interfere substantially with the recovery of the species	<p>The bare-rumped sheath tail bat has the largest extralimital distribution of any bat occurring in Australia.</p> <p>Recovery plan for this species is currently in place. The National recovery plan for the Bare-rumped Sheath-tailed bat (Schulz & Thomson 2007) was developed by the State of Queensland and adopted as a national recovery plan under the EPBC Act in 2008.</p> <p>One of the conservation actions for the Bare-rumped Sheath-tailed bat targets the protection of roosts from known threatening processes.</p> <p>The Proposed Action is unlikely to interfere with the recovery of this species, as the Study Area is highly unlikely to support breeding and roosting habitat. Therefore, the loss of 39.5 ha of foraging habitat will not have an immediate or direct impact to the species given the extensive area (1,900 ha) of high availability of adjacent suitable habitat.</p> <p>The Proposed Action will not exacerbate key threats, and the Project Footprint is not located in an area being considered for relocation or rehabilitation.</p>	No



Significant Impact Criteria	Impact Assessment	Significant impact likely
Conclusion	<p>Evidence recorded during the field survey identified a single call associated to this species at -12.46642680, 130.91764510. This call was recorded on a single static acoustic bat detector however, no other deployed detectors picked up this species. It is considered most likely that this call was received from a foraging individual, and this assumption is further supported by the lack hollow bearing trees within the study area.</p> <p>Although the proposed action will result in the loss of 39.5 ha of suitable foraging habitat, on a landscape scale 1,900 ha of suitable mangrove and woodland habitat is to remain, unimpacted, to facilitate foraging opportunities. The total habitat loss equates to a decrease of 1.7% of the total contiguous habitat adjacent to the impact area. The proposed action will not reduce habitat connectivity and fragmentation, and therefore, the species will not have to travel further for suitable foraging opportunities. Impacts to foraging habitat from the Proposed Action will not lead to a significant impact on breeding cycles and maintaining genetic diversity leading to a decline in the species.</p>	



5.2 Northern Brushtail Possum

Conservation status

The Northern Brushtail Possum is listed as Vulnerable under the EPBC Act and Near Threatened under TPWC Act (where the species is commonly known as Common Brushtail Possum (north-western)).

Distribution and ecology

The species occurs discontinuously from the Gulf of Carpentaria hinterland near Borroloola, Northern Territory, westward to the Kimberley, Western Australia. Most of the current population appears to be in the Northern Territory, with limited sightings recorded in WA (TSSC, 2021b). The Northern Brushtail Possum has undergone broad-scale decline over the past few decades, and numbers continue to decrease across much of its formerly extensive range (TSSC, 2021b). There are several data sources that suggest the Northern Brushtail Possum is declining in the Top End (TSSC 2021b).

The Northern Brushtail Possum is a nocturnal semi-arboreal marsupial. This subspecies mainly occurs in tall eucalypt open forests with large hollow-bearing trees, particularly where the understorey includes some shrubs that bear fleshy fruits. However, it also occurs in some mangrove communities (especially where these contain hollow-bearing trees), some rainforests, and some semi-urban areas (notably around Darwin) (TSSC 2021b). In the monsoonal tropics its diet mostly comprises fruits, flowers and foliage (for example mistletoe species such as *Lysiana spathulata* (Northern Mistletoe), *Amyema miquelii* and *Amyema bifurcate*, as well as *Erythrophleum chlorostachys* (Cooktown Ironwood) (TSSC, 2021b). In forests of northern Australia it shelters mostly in tree hollows (and in some cases, human infrastructure) (TSSC, 2021b).

The Northern Brushtail Possum is mainly threatened by frequent, intense fires, predation by feral cats and habitat modification from invasive grasses (African Gamba Grass (*Andropogon gayanus*) and Mission Grass (*Pennisetum polystachion*). These threats do not act in isolation, as each threat may exacerbate another. For example, a positive-feedback loop may occur between invasive grasses and fire (the grass-fire cycle), whereby invasive grasses increase fuel loads, leading to an increase in fire intensity, which reduces tree cover, which facilitates an increase in invasive grasses. Predation by feral cats may also increase in landscapes that are burnt frequently in extensive, intense fires, as cats are attracted to these burnt areas, and these fires can remove shelter sites for the possum, further increasing predation risk (TSSC, 2021b).

Known threats

Threats to this species include:

- Fire
 - frequent, extensive, intense fires
- Invasive species
 - predation by Feral Cats
 - habitat degradation due to invasive grasses
 - disease carried by black rats (*Rattus rattus*)
- Habitat loss and fragmentation
 - Land clearing
 - Grazing



- Climate change
 - Increased temperatures

Species specific habitat assessment

The Northern Brushtail Possum is known to occur in some mangrove communities (especially where these contain hollow-bearing trees), and some semi-urban areas (notably around Darwin) (TSSC 2021b). The subspecies was recorded by camera trap 46 times during the current field survey and is likely to use the mangrove and woodland habitats primarily for foraging. Tree hollows of sufficient size to provide shelter may occur within these habitats, however, were not observed during the field survey. It is also possible that the possums may use shelter within neighbouring urban structures.

Within the Study Area it was determined that Northern Brushtail Possum habitat comprises all areas of habitat on-site which includes:

- Mangrove: 28.55 ha
- Woodland: 11.08 ha

Important population

At the time of writing this Significant Impact Assessment, there is currently no recognised definition of what constitutes an important population for this species within the Approved Conservation Advice (TSSC 2021).

Potential project related impacts

Impacts of the Proposed Action on this species includes direct impacts to 39.5 ha of habitat suitable for foraging and dispersal.



5.2.1 Significant Impact Assessment for the Northern Brushtail Possum

Significant Impact Criteria	Impact Assessment	Significant impact likely
<p>Lead to a long-term decrease in the size of an important population of a species</p>	<p>There were no ‘important populations’ of Northern Brushtail Possum identified in the Approved Conservation Advice (TSSC 2021), whereby no populations were identified as being important to the long-term survival and recovery of this species.</p> <p>The subspecies is typically found in open Eucalyptus woodlands; however, also occurs in mangroves, rainforests, and urban areas. It usually shelters in tree hollows, but also use other forms of shelter including urban infrastructure.</p> <p>The subspecies was recorded by camera trap 46 times during the current field survey and is likely to use the mangrove and woodland habitats primarily for foraging. It is not known how many individuals are represented by the 46 camera trap captures. During the field surveys, no hollow bearing trees suitable for denning for this species were recorded, which infers that the habitat is principally a foraging resource. It is likely that possums recorded within the Project Footprint will likely seek denning/shelter opportunities in adjacent urban structures.</p> <p>The Project site contains 28.55ha of mangrove and 11.08ha of woodland habitats, which adjoins of a large polygon (approximately 1,900ha) of similar habitat extending to the northwest that includes Charles Darwin National Park. This species is highly mobile and will likely also use the adjacent areas for foraging and denning.</p> <p>The population is unlikely to be genetically distinct or isolated as records of this species are present nearby and scattered throughout the broader area (ALA, 2023). Furthermore, dispersal opportunities will not be limited from the proposed action as the impact area is connected to large areas of contiguous suitable habitat.</p> <p>Therefore, the proposed action will not lead to a long-term decrease in the size of an important population of a species.</p>	<p>No</p>
<p>Reduce the area of occupancy of an important population</p>	<p>There were no ‘important populations’ of Northern Brushtail Possum identified in the Approved Conservation Advice (TSSC 2021), whereby no populations were identified as being important to the long-term survival and recovery of this species.</p> <p>The impact area is only likely to offer a foraging opportunity to the species and is connected to an extensive area (1,1900 ha) of suitable contiguous foraging habitat. The species is highly mobile whilst foraging and it is highly likely to utilise this broader habitat. The loss of this habitat at a landscape scale equates to a 1.7% reduction in foraging habitat. Therefore, the proposed action will not reduce the area of occupancy of an important population.</p>	<p>No</p>



Significant Impact Criteria	Impact Assessment	Significant impact likely
<p>Fragment an existing important population into two or more populations</p>	<p>There were no 'important populations' of Northern Brushtail Possum identified in the Approved Conservation Advice (TSSC 2021), whereby no populations were identified as being important to the long-term survival and recovery of this species.</p> <p>The area of suitable foraging habitat proposed to be cleared to facilitate the proposed action will follow a linear nature against the existing seawall and will extend northward from an existing heavily developed industrialised area. The proposed action is located adjoining an extensive area (1,900 ha) of mixed mangrove and woodland habitat. Whilst the proposed action will result in the loss of up to 33.5 ha of suitable foraging habitat, it will not sever any connectivity pathways which the species currently use as retained vegetation will be present adjacent to the proposed action.</p> <p>Therefore, the Proposed Action will not limit the movement and dispersal of the relatively mobile Northern Brushtail Possum across the wider Locality and fragment an existing population into two or more populations.</p>	<p>No</p>
<p>Adversely affect habitat critical to the survival of a species</p>	<p>The Common Brushtail Possum can live in a wide range of habitats and in accordance with the Conservation Advice (TSSC, 2016) habitat critical to the survival of the Northern Brushtail Possum has not been identified.</p> <p>Although no critical habitat is formally described for this species, critical habitat value general relates to an area which is required enable foraging, breeding and dispersal, for the long-term maintenance of species survival and to maintain species genetic diversity.</p> <p>During the field surveys, no hollow bearing trees suitable for denning for this species were recorded. This infers that the habitat is principally a foraging resource. It is likely that possums recorded within the Project Footprint will likely seek denning/shelter opportunities in adjacent urban structures. Therefore, the proposed action will not result in impacts to breeding habitat.</p> <p>The Project site contains 28.55ha of mangrove and 11.08ha of woodland habitats, which adjoins of a large polygon (approximately 1,900ha) of similar habitat extending to the northwest that includes Charles Darwin National Park. This species is highly mobile and will likely also use the extensive adjacent areas for ongoing foraging. On a landscape scale, the clearing will result in the loss of 1.7% of the total extent of suitable habitat for this species. Due to the relatively insignificant extent of loss at a landscape scale, an abundance of suitable foraging habitat will be available to the species, in areas which are likely already utilised by the individuals encountered during the camera trapping survey. Therefore, the proposed action will not result in an impact foraging habitat.</p>	<p>No</p>



Significant Impact Criteria	Impact Assessment	Significant impact likely
	<p>The area of suitable foraging habitat proposed to be cleared to facilitate the proposed action will follow a linear nature against the existing seawall and will extend northward from an existing heavily developed industrialised area.</p> <p>Whilst the proposed action will result in the loss of mangrove and woodland habitat, it will not sever any connectivity pathways which the species currently use as retained vegetation will be present adjacent to the proposed action. Therefore, the proposed action will not result fragmentation leading to a reduction in dispersal opportunities. This ongoing connectivity will also facilitate ongoing maintenance of genetic diversity which will lead to the long-term maintenance of species survival.</p> <p>Therefore, the Proposed Action will not adversely affect habitat critical to the survival of the Northern Brushtail Possum.</p>	
<p>Disrupt the breeding cycle of an important population</p>	<p>There were no ‘important populations’ of Northern Brushtail Possum identified in the Approved Conservation Advice (TSSC 2021), whereby no populations were identified as being important to the long-term survival and recovery of this species.</p> <p>During the field surveys, no hollow bearing trees suitable for denning for this species were recorded. This infers that the habitat is principally a foraging resource. The location of the habitat to be removed by the Proposed Action will not result in reduced connectivity or dispersal opportunities (and therefore the ability to find a mate). Extensive areas of remnant adjacent mangrove and woodland habitat will be retained which will continue to provide dispersal opportunities for the Northern Brushtail Possum during the breeding season.</p> <p>Therefore, the Proposed Action will not disrupt the breeding cycle of an important population for this species.</p>	<p>No</p>
<p>Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>	<p>Although habitat loss is a threat to the species, the clearing associated to the Proposed Action alone is unlikely to cause a decline of the species in the wider area given the extensive habitat adjacent to the impact area (1,900 ha) and number of existing records of the Northern Brushtail Possum in the surroundings areas. Furthermore, the Proposed Action will not result in the fragmentation or isolation of suitable habitat which the species are known to forage in.</p> <p>Therefore, the Project will not modify, destroy or isolate or decrease the availability or quality of habitat for the Northern Brushtail Possum, and is unlikely to contribute to the decline of the species.</p>	<p>No</p>
<p>Result in invasive species that are harmful to a vulnerable</p>	<p>Predation by Feral Cats and habitat modification by invasive grass (Gamba Grass (<i>Andropogon gayanus</i>)) are key threats to this species (TSSC, 2021). These two species are already</p>	<p>No</p>



Significant Impact Criteria	Impact Assessment	Significant impact likely
species becoming established in the vulnerable species' habitat	<p>established within the Project site, and biosecurity measures will be established within the Construction Environmental Management Plan to manage this impact.</p> <p>Therefore, the Project is unlikely to result in the introduction of invasive species that may cause the species to decline.</p>	
Introduce disease that may cause the species to decline	<p>Black Rats are identified as having the potential to spread epizootic diseases, which may result in major population declines in the Common Brushtail Possum (TSSC 2021). Black Rats were recorded to occur within the project footprint, as documented through camera trap studies. Increased human activity and the potential transport of goods may unintentionally introduce Black Rats from other locations to the Project site. However, as the surrounding area is characterised by existing industrial estate, the potential for this to occur may already present. It is considered that development of the Project site is unlikely to significantly increase the risk of potential disease spread that is already present within the local area.</p>	No
Interfere substantially with the recovery of the species	<p>There is currently no recovery plan for this species. Key threatened processes have been detailed above. The Proposed Action will not exacerbate key threats to the species and the area is not located in an area being considered for relocation or rehabilitation. Therefore, the Proposed Action will not interfere with the recovery of the species.</p>	No
Conclusion	<p>The species was recorded by camera trap 46 times during the field survey and is likely to use the mangrove and woodland habitats primarily for foraging. Tree hollows of sufficient size to provide shelter were not observed during the field survey.</p> <p>Although the proposed action will result in the loss of 39.5 ha of suitable foraging habitat, on a landscape scale 1,900 ha of suitable mangrove and woodland habitat is to remain, unimpacted, to facilitate foraging opportunities. The total habitat loss equates to a decrease of 1.7% of the total contiguous habitat adjacent to the impact area. The proposed action will not reduce habitat connectivity and fragmentation, and therefore, the species will not have to travel further for suitable foraging opportunities. Impacts to foraging habitat from the Proposed Action will not lead to a significant impact on breeding cycles and maintaining genetic diversity leading to a decline in the species.</p>	



5.3 Mitchell's Water Monitor

Conservation status

The Mitchell's Water Monitor (*Varanus mitchelli*) is listed as Critically Endangered under the EPBC Act and Vulnerable under the TPWC Act.

Distribution and ecology

The main factor that makes Mitchell's Water Monitor eligible for listing in the EPBC Critically Endangered category is a very severe and sustained population reduction over the last three generations, which is predicted to continue as the cane toad (*Rhinella marina*) advances across the remainder of this species' range (DCCEEW 2023e).

Mitchell's Water Monitor occurs across the wet-dry tropics of northern Australia from YampiSound Training Area in the far west Kimberley of Western Australia (WA) across the Kimberley and Top End of the Northern Territory (NT), to approximately the Boodjamulla National Park area of far northwest Queensland (Qld) (DCCEEW 2023e). There are unconfirmed records of this species from southern Cape York Peninsula (AROD 2024). Mitchell's Water Monitor inhabits freshwater and saline wetlands that range from seasonal gorges in upper catchments to large rivers and coastal floodplains. It is recorded from rivers, creeks, riffle zones, gorges, springs, lagoons, swamps, mangroves, and foreshores (DCCEEW 2023e). Mitchell's Water Monitor has a strong association with *Pandanus* and other areas of woody vegetation that are directly adjacent to waterbodies, e.g. rainforest, *Melaleuca*, mangroves (DCCEEW 2023e).

Mitchell's Water Monitor is both arboreal and semi-aquatic. It is a capable climber and swimmer that either climbs a tree or takes to the water when disturbed (Shine 1986; Wilson & Swan 2021). Shine (1986) estimated that 40 % of the biomass ingested by Mitchell's water monitor is from aquatic sources, mainly fishes, freshwater crabs and frogs. The rest of this species' diet consists of terrestrial invertebrates or eggs.

De Laive et al. (2021) provide evidence that the Mitchell's Water Monitor is persisting in the saline foreshore and mangrove habitats in numerous areas across the greater Darwin region, Northern Territory, including areas adjacent to the city. The species is near impossible to detect during active surveys due to its exceptionally cryptic nature, its possession of a distinct seasonal activity period during the 'wet season' months, (De Laive et al. 2021) and its detection may be made more difficult following the arrival of the cane toad (DCCEEW 2023e). If the saline mangrove and littoral habitats in the NT described by De Laive et al. (2021) are providing a refuge from the impact of cane toads, these habitats could be critical in supporting the persistence of recovery of *Varanus mitchelli* (De Laive et al. 2021).

Known threats

The threats to the Mitchell's Water Monitor listed by DCCEEW (2023e) include:

- impacts from invasive species (particularly the cane toad, as well as cattle, Asian water buffalo, feral pig);
- fire regimes (frequent severe fire);
- habitat loss, disturbance and modification (urban expansion, mining) and;
- natural water resource use (water drawdown, inundation).

Species specific habitat assessment

No evidence of Mitchell's Water Monitor was recorded within the Study Area during the field survey. After it was listed as conservation significant species in accordance with the EPBC Act in Dec 2023, the Conservation Advice documentation was cross checked. De Laive *et al.* 2021 detailed the potential presence of the species within the Study Area, and subsequent dialogue with the author resulted in evidence of a report within the Project Footprint at co-ordinates -12.4667, 130.9175. Within the Study Area it was determined that Mitchell's Water Monitor habitat comprises the following habitat types:

- Mangrove: 28.55 ha
- Woodland: 11.08 ha
- Intertidal mudflat: 1.14 ha

Important population

In accordance with the Approved Conservation Advice (DCCEEW 2023), "*all remnant populations of Mitchell's water monitor within the distribution of the cane toad are important populations*". The individual sighting from 2010 within the Study Area (as detailed in de Laive *et al.*, 2021), in combination with the sightings of Cane Toad during the field survey means that the individual record meets the definition of an important population.

Potential project related impacts

Impacts of the Proposed Action on this species includes direct impacts to 40.77 ha of habitat suitable for foraging and dispersal.

5.3.1 Significant impact assessment for Mitchell’s Water Monitor

Significant Impact Criteria	Impact Assessment	Significant impact likely
Lead to a long-term decrease in the size of a population	In the Darwin area, this species has been recorded in saline foreshore and riparian areas adjacent to the city (de Laive <i>et al.</i> , 2021). There is one record of this species in the study area and the entire study area (approximately 40.77ha) is considered habitat for this species. The study area is the edge of a large polygon (approximately 1,900ha) of similar habitat extending to the northwest that includes Charles Darwin National Park. The study area does not contain any unique habitat features for this species that are not found in the local area. Development of the study area will impact 40.77ha of habitat for this species however, it is unlikely that it will lead to a long-term decrease in the size of a population as individuals will move into the adjacent area that contains vast areas of similar habitat.	No
Reduce the area of occupancy of the species	The study area is not on the edge of the species distribution and the study area does not fragment other areas of potential habitat for this species in the local area. Development of the study area will not reduce the area of occupancy for this species.	No
Fragment an existing population into two or more populations	The study area is the edge of a large polygon (approximately 1,900ha) of similar habitat extending to the northwest that includes Charles Darwin National Park. Development of the study area is unlikely to impeded movement of Mitchell's Water Monitor and no populations will be fragmented.	No
Adversely affect habitat critical to the survival of a species	Conservation advice for this species states that all remnant populations within Cane Toad distributions are important populations, as they are a source population for breeding/dispersal and support recovery of the species (DCCEEW, 2023) but no habitat critical to the survival of the species has been mapped. The study area is habitat for this species and Cane Toads were recorded on site. As this species is persisting in an area where Cane Toads are present, this habitat is considered critical habitat for the recovery of this species. Development of the study area will adversely affect habitat critical to the survival of this species.	Yes
Disrupt the breeding cycle of a population	Breeding habitat for this species is unknown, however, breeding habitat may occur in the study area as the vegetation communities present are known habitat for this species to occur in. The study area is the edge of a large polygon (approximately 1,900ha) of similar habitat extending to the northwest that includes Charles Darwin National Park. As similar habitats occur in northwest of the study area, it likely contains similar breeding habitat to that of the study area. Development of the study area is unlikely to impeded movement of Mitchell's Water Monitor and its unlikely to disrupt the breeding cycle of the population as extensive similar habitat occurs adjacent to the study area.	No



Significant Impact Criteria	Impact Assessment	Significant impact likely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	This is a highly cryptic species, and the size of the population is unknown. Prior to Cane Toad arrival this species had a trap rate of 2.6 lizards per 100 camera trap nights (DCCEEW, 2023) and it is likely that the population is sparser in areas that overlap with Cane Toads. A total of 30 camera traps over four nights were established during the field assessment and no Mitchell's Water Monitors were recorded. It's likely that the population is very low in the study area and the local surrounding area. The study area is the edge of a large polygon (approximately 1,900ha) of similar habitat extending to the northwest that includes Charles Darwin National Park. It is unlikely that the small amount of impact (approximately 40.77ha) to the edge of this larger polygon of similar habitat, coupled with an existing sparse population in the local area would lead to the decline of this species.	No
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	Cane Toads are the main threat to this species and were recorded in the study area during field assessments. Development of the study area does not include water storage areas that could provide additional habitat for Cane Toad. Additionally, Cane Toad tadpole traps will be deployed during the wet season in seasonally inundated freshwater areas to reduce existing Cane Toad populations in the local area that may benefit this species.	No
Introduce disease that may cause the species to decline	There are no known diseases that cause a decline in the population of this species, and it is unlikely that development of the study area would introduce any diseases that would threaten this species.	No
Interfere with the recovery of the species	As stopping the spread of Cane Toad is unlikely, the main recovery objective is to maintain the presence of Mitchell's Water Monitor in toad-invaded areas (DEPWS, 2024). The record of this species in the study area is from 2020, after Cane Toad invasion and its likely that Mitchell's Water Monitor maintain a presence in the study area. Development of the study area has the potential to interfere with the recovery of this species.	Yes
Conclusion	<p>In the Darwin area, this cryptic species has been recorded in saline foreshore and riparian areas adjacent to the city (de Laive <i>et al.</i>, 2021) and there is one record of this species in the study area. The study area (approximately 40.77ha) is considered habitat for this species. Development of the study area is likely to:</p> <ul style="list-style-type: none"> • adversely affect habitat critical to the survival of this species and • interfere with the recovery of this species. 	



5.4 Estuarine Crocodile

Conservation status

The Estuarine Crocodile (*Crocodylus porosus*) is a listed Migratory species under the EPBC Act and is listed as Least Concern under the TPWC Act.

Distribution and ecology

The species is a large generally solitary reptile that inhabits a wide variety of salt, brackish and freshwater environments. Estuarine Crocodiles are found primarily along the coast from approximately Rockhampton in QLD to Broome in Western Australia, however, periodically shows up south of these regions and can extend inland along major tributaries. Studies from Arnhem Land in the Northern Territory indicated that this species mostly occurs in tidal rivers, coastal floodplains and channels, billabongs and swamps up to 150km in land from the coast.

The Estuarine Crocodile typically inhabits the lower (estuarine) reaches of rivers, while the upper reaches are inhabited by the Freshwater Crocodile (*Crocodylus johnstoni*); although, areas of overlap occur in some rivers. In Queensland, this species is usually restricted to coastal waterways and floodplain wetlands (DCCEEW, 2024c). The inland distribution seems to be constrained by the presence of major geographical features that inhibit individuals travelling upstream (Curtis et al. 2012). Where there is no barrier, inland distribution may extend to over 100 km. Animals have been recorded approximately 130 km upstream in the Fitzroy River and in the Gulf of Carpentaria as far inland as Georgetown (Curtis et al. 2012) and into inland waterways across the Top End in the Northern Territory (DCCEEW, 2024c). They have also been recorded at almost every island and cay within the northern Great Barrier Reef and at its outer edge (Curtis et al. 2012).

Known threats

In Australia, threats to the Estuarine Crocodile include mortality due to fishing nets and the effects of habitat destruction. In Arnhem Land, Northern Territory, feral animals such as the Buffalo (*Bubalus bubalis*) destroy wetland habitat by increasing drainage and reducing vegetation (DCCEEW, 2024c). Globally, habitat destruction and illegal harvesting of the species are the major threats (DCCEEW, 2024c).

Species specific habitat assessment

The Saltwater Crocodile inhabits coastal rivers and swamps in northern Australia, sometimes extending inland along major drainage systems (Wilson & Swan, 2021). The Estuarine Crocodile was not recorded during the current survey, however the habitat types identified on site where the species may be found include mangrove and intertidal mudflat habitat types.

Within the Study Area it was determined that Estuarine Crocodile habitat comprises the following habitat types:

- Mangrove: 28.55 ha
- Intertidal mudflat: 1.14 ha

Important population

At the time of writing this Significant Impact Assessment, there is currently no recognised definition of what constitutes an important population for this species and no Approved Conservation Advice.

Potential project related impacts

Habitat for this species in the study area consists of small areas of tidally influenced watercourses, with dense mangrove cover. The study area does not contain important foraging, breeding or basking habitat and therefore any impacts are likely in-direct (i.e., noise and light pollution).

5.4.1 Significant impact assessment for Estuarine Crocodile

Significant Impact Criteria	Impact Assessment	Significant impact likely
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	There are numerous records of this species in the Darwin area. However, the majority of these are confined to tidal rivers, coastal floodplains and swamps/billabongs. The study area is not considered an important habitat for this species as it does not contain important foraging, breeding or basking habitat. Habitat for this species in the study area consists of small areas of tidally influenced watercourses, with dense mangrove cover. It is unlikely that development of the study area would destroy or modify any important habitat for this species.	No
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The study area is not considered an important habitat for this species as it does not contain important foraging, breeding or basking habitat. Habitat for this species in the study area consists of small areas of tidally influenced watercourses, with dense mangrove cover. There are no known invasive species that are harmful to this species and development in the study area is unlikely to increase the abundance of existing weeds in the local area or introduce any novel species.	No
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The study area is not considered an important habitat for this species as it does not contain important foraging, breeding or basking habitat. Habitat for this species in the study area consists of small areas of tidally influenced watercourses, with dense mangrove cover. Additionally, the study area does not contain an ecologically significant proportion of the population of Estuarine Crocodile. The vast majority of records in the local area are concentrated on large watercourses (Adelaide River) with few in the immediate area near the study area. It is unlikely that development of the study area will seriously disrupt the lifecycle of an ecologically significant proportion of this species.	No
Conclusion	There are numerous records of this species in the Darwin area. However, the majority of these are confined to tidal rivers, coastal floodplains and swamps/billabongs. The study area is not considered an important habitat for this species as it does not contain important foraging, breeding or basking habitat. Habitat for this species in the study area consists of small areas of tidally influenced watercourses, with dense mangrove cover. Additionally, the study area does not contain an ecologically significant proportion of the population of Estuarine Crocodile. It is unlikely that development of the study area would significantly impact this species.	



5.5 Yellow-spotted Monitor

Conservation status

Yellow-spotted Monitor (*Varanus panoptes*) is listed as Vulnerable under the TPWC Act.

Distribution and ecology

Varanus panoptes has a broad geographic range across the far North of Australia from the Kimberley to Cape York Peninsula, and southwards through most of Queensland. In the Northern Territory (NT), it has been recorded across most of the Top End and the Gulf Region (South to Katherine, Judbarra/Gregory National Park and the Gulf hinterland). A distinct subspecies occurs in the Pilbara and Gascoyne regions of Western Australia (DEPWS 2012).

The species inhabits woodlands, floodplains, blacksoil plains and urban areas (Jolly C et al. 2023). Their diet is variable, feeding on invertebrates, vertebrates and carrion (Jolly C et al. 2023). It has an excellent sense of smell and often digs up prey, especially eggs of marine and freshwater turtles (DEPWS 2012). It lays a clutch of eggs in a burrow in the ground, with egg-laying usually in the wet season (DEPWS 2012).

Known threats

The most important conservation issue the Yellow-spotted Monitor faces is its propensity to eat cane toads and to die from the ingested toxins (DEPWS 2012). Tests of the effects of ingesting cane toad toxins have found that *V. panoptes* is very susceptible (DEPWS 2012). Comparison of the size of the mouth and the toxin load per cane toad shows that these monitors are easily able to eat a cane toad large enough to kill them (DEPWS 2012).

Species specific habitat assessment

The Yellow-spotted Monitor is a robust ground-dwelling monitor occupying a variety of habitats, including coastal beaches, floodplains, grasslands and woodlands (DEPWS 2012). The habitat types identified on site where the species may be found include all three broad habitat types comprising mangrove, woodland, and intertidal mudflats.

Within the Study Area it was determined that Yellow-spotted Monitor habitat comprises the following habitat types:

- Mangrove: 28.55 ha
- Woodland: 11.08 ha
- Intertidal mudflat: 1.14 ha

Potential project related impacts

Impacts of the Proposed Action on this species includes direct impacts to 40.77 ha of habitat suitable for foraging and dispersal.



5.5.1 Significant impact assessment for Yellow-spotted Monitor

Significant Impact Criteria	Impact Assessment	Significant impact likely
Lead to a long-term decrease in the size of an important population of a species	There are no important populations listed for this species. This species ranges throughout northern Australia in a variety of habitat types including coastal beaches, floodplains, grasslands and woodlands (Ward <i>et. al.</i> , 2012). The study area contains potential foraging habitat for this species, however, extensive areas (approximately 1,900ha) of similar habitat incorporating Charles Darwin National Park, adjoin to the northwest of the study area. The study area itself encompasses approximately 2.1% of potential habitat for this species in the immediate area. Field assessments concluded that a large portion of the study area (73.8%) contained evidence of previous land clearing activities and subsequent weed invasion. Although foraging habitat may be present, it would be considered of lower value. It is unlikely that development of the study area will lead to a long-term decrease in the size of the population of this species.	No
Reduce the area of occupancy of an important population	There are no important populations listed for this species. This species ranges throughout northern Australia, specifically in the Northern Territory, it's been recorded across most of the Top End and the Gulf Region (Ward <i>et. al.</i> , 2012). Extensive areas (approximately 1,900ha) of similar habitat incorporating Charles Darwin National Park, adjoin to the northwest of the study area. The clearing of approximately 40.77ha of potential foraging habitat for this species is unlikely to result in a reduction in the occupancy of this species.	No
Fragment an existing important population into two or more populations	The study area is an approximate 40.77ha extension of the existing East Arm development. The study area occurs as the edge of an extensive polygon of remnant vegetation to the northwest. It's unlikely that the development of the study area will fragment any population of this species as a large area of potential habitat will be retained and only the edge of this habitat (approximately 40.77ha) is proposed for development.	No
Disrupt the breeding cycle of an important population	The majority of the study area are mangrove communities and small areas of salt flats. These do not represent breeding habitat for this species. The small areas of eucalypt woodland (approximately 11.59ha) potentially provide breeding habitat, however, the majority were impacted by historical clearing activities and weed invasion during field assessments. In particular, Gamba Grass and Annual Mission Grass occurred throughout the area reducing the quality of the habitat for Yellow-spotted Monitor. Similar habitat occurs throughout a larger expanse of potential habitat adjoining the study area to the northwest. It is unlikely that the development will disrupt the breeding cycle of this species.	No



Significant Impact Criteria	Impact Assessment	Significant impact likely
Adversely affect habitat critical to the survival of a species	The study area does not provide critical habitat for this species. Yellow-spotted Monitor occur throughout northern Australia and the habitat in the study area does not contain any unique features for this species. It is unlikely that development in the study area will adversely affect habitat critical to the survival of this species.	No
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Land clearing is not considered a main threat leading to a decline in the population of this species. The study area is an edge of a large polygon (approximately 1,900ha) containing extensive areas of similar habitat. Foraging habitat in the study area is likely low quality due to evidence of previous clearing and weed incursion. The small reduction in low quality foraging habitat for this species is unlikely to cause a decline to the population of this species.	No
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Cane Toads are the main threat to this species and were recorded in the study area during field assessments. Development of the study area does not include water storage areas that could provide additional habitat for Cane Toad. Additionally, Cane Toad tadpole traps will be deployed during the wet season in seasonally inundated freshwater areas to reduce existing Cane Toad populations in the local area.	No
Introduce disease that may cause the species to decline	There are no known diseases that are relevant to this species and the development of the study area is unlikely to introduce any novel disease or increase the presence of any potentially existing disease.	No
Interfere substantially with the recovery of the species	Cane toads are main threat to this species. Recovery objective for this species include monitoring depleted population to examine for evidence of recovery and preventing Cane Toads from spreading to offshore island with population of monitors. It is unlikely that development in the study area will interfere with any recovery objectives for this species. Additionally, mitigation to reduce Cane Toad tadpoles may decrease the threat to this species and aid in recovery.	No
Conclusion	The study area provides some foraging habitat for this species however the quality is likely of low value to evidence of previous clearing and weed incursion. The study area is the edge of an approximately 1,900ha polygon of remnant vegetation that includes Charles Darwin National Park that contains similar habitat requirements for Yellow-spotted Monitor. The study area itself does not contain any unique features for this species and development in the study area is unlikely to increase the main threat to this species, Cane Toad abundance, which are already present in the local area. Additional measures to reduce Cane Toad abundance during and after development may benefit this species. The development of approximately 40.77ha is unlikely to cause a significant impact to Yellow-spotted Monitor.	



5.6 Darwin Cycad

Conservation status

Cycas armstrongii is endemic to the Northern Territory. This species is listed as Vulnerable under the TPWC Act.

Distribution and ecology

It is known from Gunn Point to Hayes Creek, west to within 50 km of the coast and east to the Wildman River catchment. It also occurs on the Tiwi Islands and Cobourg Peninsula (DEPWS 2021).

Cycas armstrongii occurs mainly in open grassy woodland on yellow and red earths, limited in the area by drainage. It is a medium-sized cycad up to 6m tall with a slender trunk 6-12 cm in diameter. Branching occurs along with occasional offsets and basal suckers. Leaves form an obliquely erect to spreading crown. Each has 160-300 leaflets attached to the rachis at about 70 with a prominent midrib above. Easily confused with several other species of *Cycas*. The species flowers in August, with fruit apparent most months (DEPWS 2021).

Known threats

The key threatening processes include land clearing due to the expansion of Darwin, rural residential living, horticulture, agriculture and forestry is a major threat to the species. Available habitat in and around Darwin and the Litchfield Shire has been reduced and further land clearing is expected as Darwin expands (DEPWS 2021). In particular, prime cycad habitat with deep loamy soil has been identified as land suitable for horticulture and agriculture. Substantial areas of prime habitat on the Tiwi Islands will be cleared for forestry. In areas not subject to clearing, there is a major threat from the combined impact of introduced grasses and fire whereby increased fuel loads lead to increased mortality of adult stems and subsequent decline (DEPWS 2021). Mortality in excess of 50% of adult stems per fire event has been recorded when subject to fuel loads of 20 t/ha (DEPWS 2021). While adult stem mortality is substantial with these high intensity fire events, many plants resprout from the base (DEPWS 2021). Despite this capacity to resprout, a frequency of intense fire in excess of around 1 in 5 years is predicted to result in long-term population decline. Fires commonly occur more frequently than 1 in 5 years throughout the range of *Cycas armstrongii* and the occurrence of intense fire is set to increase as exotic grasses spread rapidly across the landscape (DEPWS 2021). The exotic pasture species, Gamba Grass (*Andropogon gayanus*), supports fuel loads up to 20 t/ha and the exotic Perennial Mission Grass (*Pennisetum polystachyon*), supports fuel loads up to 27 t/ha, both far higher than the fuel loads of native grasses (DEPWS 2021). These exotic species have the potential to extend over the full range of *C. armstrongii*. Fire also reduces seed viability in *C. armstrongii* (DEPWS 2021).

Species specific habitat assessment

Darwin Cycads occurs mainly in open grassy woodland on yellow and red earths, limited in the area by drainage. Previous surveys (EcoScience NT 2023) for this species have identified two individuals and suitable vegetation community on site where the species may be found. This vegetation community is described and mapped by EcoScience NT (2023) as Community 1 consisting of *Melaleuca leucadendra*, *Corymbia confertiflora* woodland, over *Terminalia ferdinandiana*, *Xanthostemon paradoxus*, *Planchonia careya* open shrubland, over tussock grassland.

Within the Study Area it was determined that Darwin Cycad habitat comprises the following habitat type:



- Community 1 (EcoScience NT 2023): 0.34 ha

Potential project related impacts

Impacts of the Proposed Action on this species includes the direct loss of two individual specimens.



5.6.1 Significant impact assessment for Darwin Cycad

Significant Impact Criteria	Impact Assessment	Significant impact likely
Lead to a long-term decrease in the size of an important population of a species	Two Darwin Cycads were recorded in the study area during the field assessments and 0.34ha was mapped as habitat for this species. The study area occurs on the western edge of the species known distribution and its unlikely that the small amount of habitat and the two individuals in the study area constitute an important population of this species. It is unlikely that development in the study area would impact an important population of this species and the removal of 0.34ha of habitat on the extremities of this species range is unlikely to lead to a long-term decrease in the population.	No
Reduce the area of occupancy of an important population	Two Darwin Cycads were recorded in the study area during the field assessments and 0.34ha was mapped as habitat for this species. The study area occurs on the western edge of the species known distribution and its unlikely that the small amount of habitat and the two individuals in the study area constitute an important population of this species. It is unlikely that development of the study area will reduce the area of occupancy of an important population.	No
Fragment an existing important population into two or more populations	Two Darwin Cycads were recorded in the study area during the field assessments and 0.34ha was mapped as habitat for this species. The study area occurs on the western edge of the species known distribution and its unlikely that the small amount of habitat and the two individuals in the study area constitute an important population of this species. The study area occurs on the extremity of the populations range and development in the study area is unlikely to lead to the fragmentation of any population of this species.	No
Adversely affect habitat critical to the survival of a species	Two Darwin Cycads were recorded in the study area during the field assessments and 0.34ha was mapped as habitat for this species. The study area occurs on the western edge of the species known distribution and its unlikely that the small amount of habitat and the two individuals in the study area constitute an important population of this species. It is unlikely that the small amount of habitat present in the study area is considered habitat critical to the species survival and development of the study area is unlikely to adversely affect critical habitat for this species.	No
Disrupt the breeding cycle of an important population	Two Darwin Cycads were recorded in the study area during the field assessments and 0.34ha was mapped as habitat for this species. The study area occurs on the western edge of the species known distribution and its unlikely that the small amount of habitat and the two individuals in the study area constitute an important population of this species. Development of the study area is unlikely to disrupt the breeding cycle of an important population.	No



Significant Impact Criteria	Impact Assessment	Significant impact likely
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The study area contains 0.34ha of habitat for this species and the study area is located on the western edge of the species known distribution. It is unlikely that the small amount of impact to this species habitat in the study area would lead to long-term decline in the species population.	No
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	Both Gamba Grass and perennial Mission Grass are known invasive flora species that are threats to this species by increasing fuel loads and increasing the frequency of fire (DEPWS, 2021). These invasive grass species were recorded on site and its unlikely that development of the study area will lead to an increase in the abundance in these species.	No
Introduce disease that may cause the species to decline	There are no known diseases that are leading to the decline of this species. It is unlikely that the development of the study area would introduce diseases that may impact this species.	No
Interfere substantially with the recovery of the species	<p>The main recovery objectives for this species include:</p> <ul style="list-style-type: none"> • the reservation of high-quality habitat • control of exotic grasses and fire management • maintaining the cycad monitoring program <p>It is unlikely that they small amount of impact (0.34ha) to this species will substantially interfere with the recover objectives.</p>	No
Conclusion	Two Darwin Cycads were recorded in the study area during the field assessments and 0.34ha was mapped as habitat for this species. The study area occurs on the western edge of the species known distribution and its unlikely that the small amount of habitat and the two individuals in the study area constitute an important population of this species. It is unlikely that a significant impact to Darwin Cycad will occur from the development of the study area.	



6.0 Summary

The findings of the complete Significant Impact Assessment have been summarised in **Table 2**.

Table 2 Summary of Significant Impact Assessment

Species	EPBC Status	NT Conservational status	Suitable habitat availability (ha)	Significant impact
Bare-rumped Sheath-tail Bat	Vulnerable	Near Threatened	39.5	No
Northern Brushtail Possum	Vulnerable	Near Threatened	39.5	No
Mitchell's Water Monitor	Critically Endangered	Vulnerable	40.8	Yes
Estuarine Crocodile	Migratory	Least Concern	29.7	No
Yellow-spotted Monior	N/A	Vulnerable	40.8	No
Darwin Cycad	N/A	Vulnerable	2 individual specimens	No



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Appendix A Conservation Significant Species Map

EPBC Act Significant Impact Assessment

Berrimah Freight Terminal Expansion

Aurizon Operations Limited

SLR Project No.: 680.030156.00000

21 February 2024

BERRIMAH FREIGHT TERMINAL EXPANSION

HABITAT MAPPING AND THREATENED FAUNA/FLORA RECORDED

FIGURE 18

LEGEND

Threatened Fauna

- Bare-rumped Sheath-tailed Bat (NT/VU)
- Common Brushtail Possum (north-western) (NT/VU)
- Mitchells Water Monitor (VU/CR)

Threatened Flora

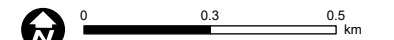
- Cycad armstrongii (VU/-)

- Survey Area

Fauna Habitat

- Intertidal mudflat
- Mangrove
- Woodland

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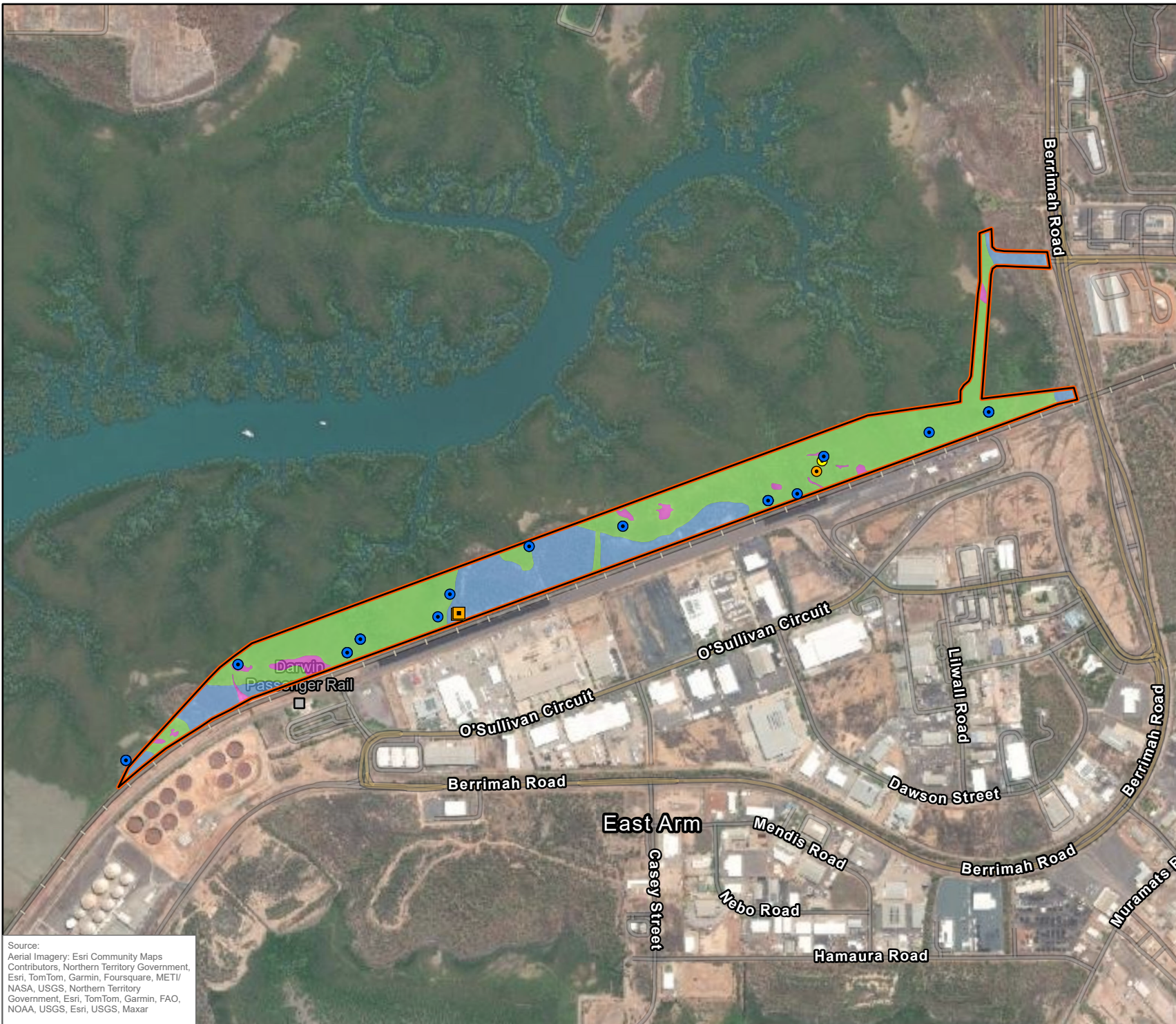
Coordinate System: GDA2020 MGA Zone 52

Scale: 1:15,000 at A4

Project Number: 680.030156

Date Drawn: 22-Feb-2024

Drawn by: RB



Source:
Aerial Imagery: Esri Community Maps Contributors, Northern Territory Government, Esri, TomTom, Garmin, Foursquare, METI/ NASA, USGS, Northern Territory Government, Esri, TomTom, Garmin, FAO, NOAA, USGS, Esri, USGS, Maxar





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