

# Marine Environment Report

New Marine Facilities to Service  
Mandorah and Cox Peninsula

ZMD01890



Prepared for  
Department of Infrastructure, Planning and  
Logistics

30 January 2022

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Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

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# 1 Introduction

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## 1.1 Project Background

The existing Mandorah Jetty and Boat Ramp are key infrastructure facilities servicing the Mandorah, Wagait and Belyuen communities, as well as visitors to the area from Darwin and surrounds. Mandorah Jetty supports the only ferry service from Darwin to the Cox Peninsula. The Mandorah boat ramp is located just south of the Jetty, with both facilities sharing a common onshore carpark facility.

Previous studies (e.g. Jacobs, 2016 and 2019) identified shortcomings in the design of the existing facilities, such as Disability Discrimination Act (DDA) non-compliance of the existing Jetty, and investigated various options to improve the ferry berthing facility and boat ramp. The Department of Infrastructure, Planning and Logistics (DIPL) commissioned Cardno to develop and assess options for new marine facilities at Mandorah. The key project objectives included selection and design of a facility that:

- > Addresses issues faced by the existing Mandorah Jetty and boat ramp. These issues include the highly exposed nature of the site, DDA non-compliance, passenger safety issues and safety and sedimentation issues of the existing boat ramp;
- > Minimises construction and whole-of-life costs;
- > Allows for uninterrupted ferry service operation during construction; and
- > Provides a safe and enjoyable passenger experience.

DIPL and Cardno have now developed, assessed and designed a preferred option for new marine facilities at Mandorah. The facilities comprise a dredged basin, two large breakwaters, boat ramp, gangway and pontoon, and onshore ferry terminal and parking facilities (**Figure 1-1**).

## 1.2 Site Location and Study Areas

Mandorah is located near the eastern tip of the Cox Peninsula in the Northern Territory, approximately six kilometres to the west of Darwin (**Figure 1-1**). Access to Mandorah from Darwin is via the regular ferry service, or by driving approximately 120 km along the road network.

Study areas have been defined for marine environment assessment and investigations based on the potential area of project impacts (**Figure 1-2**). This includes the direct project footprint, potential areas of dredge disposal and extents of dispersion, and operational areas. Two study areas have been defined:

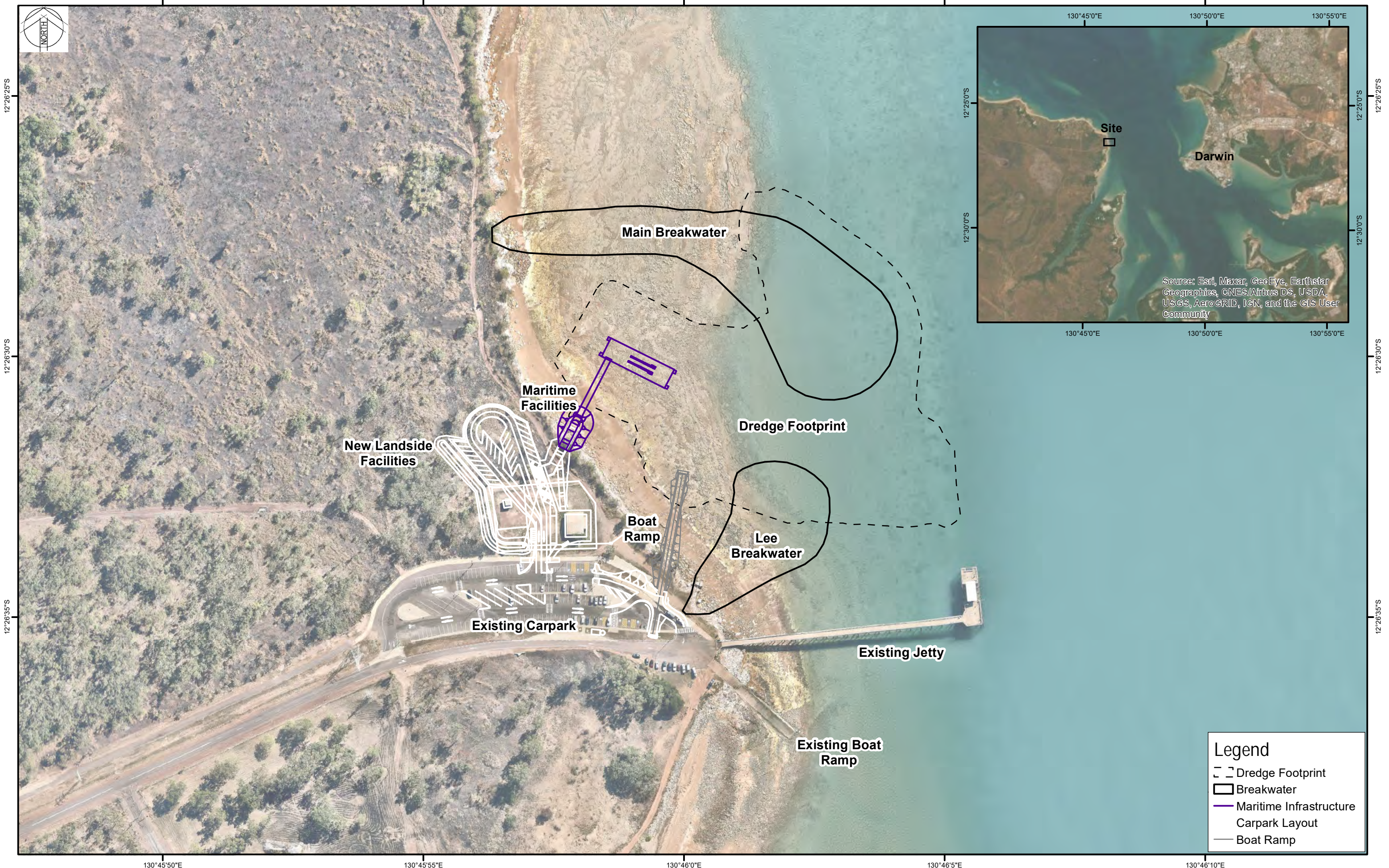
- > Project Site Study Area: Captures the direct project footprint and areas of likely dredge dispersion and deposition, as well as changes associated with coastal processes and vessel activity during construction. This was defined based on preliminary project layouts and dredge dispersion modelling; and
- > Broader Project Study Area: Captures areas of potential dredge disposal (i.e. within the range of piping) and associated dispersion, and incorporates a broader range of marine environment data in the project assessment.

## 1.3 Relevant Legislation

The reason for developing an understanding of the marine environment at the project site is so that potential environmental impacts can be identified and mitigated. Northern Territory and Commonwealth legislation is in place to stipulate the requirement for such environmental risk assessment and management.

The NT *Environment Protection Act 2019* (EP Act) 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.

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides for the protection and management of nationally and internationally important flora, fauna, ecological communities and heritage



**Legend**

- Dredge Footprint
- Breakwater
- Maritime Infrastructure
- Carpark Layout
- Boat Ramp



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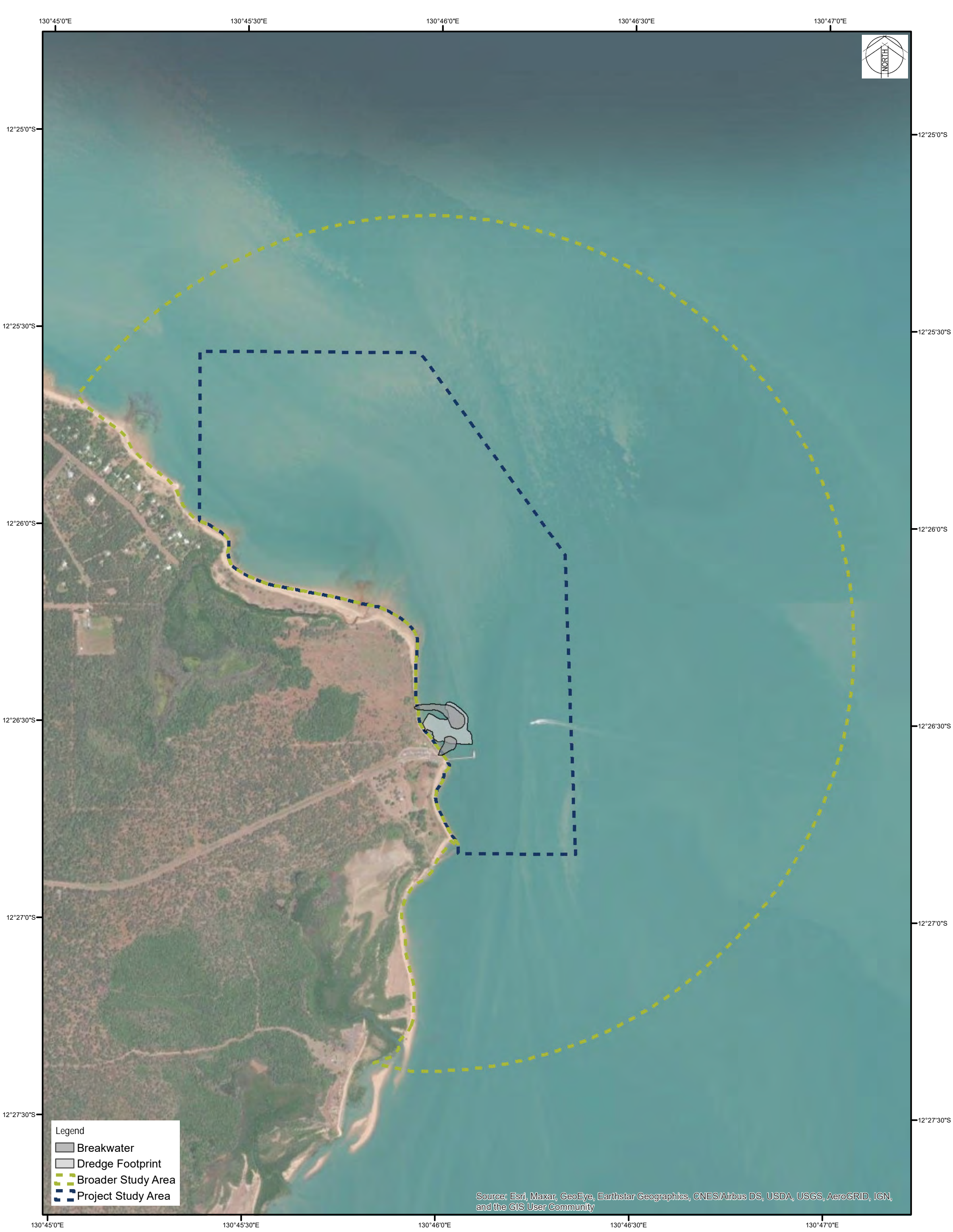
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**SITE LOCALITY**  
MANDORAH MARINE FACILITIES  
MARINE ENVIRONMENT REPORT  
FIGURE 1-1



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- Legend**
-  Breakwater
  -  Dredge Footprint
  -  Broader Study Area
  -  Project Study Area

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



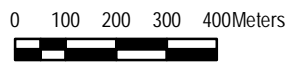
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# MARINE ENVIRONMENT STUDY AREA

MANDORAH MARINE FACILITIES  
MARINE ENVIRONMENT REPORT

FIGURE 1-2

sites, referred to as Matters of National Environmental Significance. Developments likely to have significant impact on these matters require referral under the provisions of the EPBC Act.

Territory and Commonwealth legislation applicable to the project and this referral is summarised in **Table 1-1** and **Table 1-2**, respectively.

Table 1-1 Relevant Territory Legislation

Document	Purpose / Objectives	Agency
<i>Environment Protection Act 2019 (EP Act)</i>	<ul style="list-style-type: none"> <li>&gt; Protect the environment of the Territory;</li> <li>&gt; Promote ecologically sustainable development so that the wellbeing of the people of the Territory is maintained or improved without adverse impact on the environment of the Territory;</li> <li>&gt; Recognise the role of environmental impact assessment and environmental approval in promoting the protection and management of the environment of the Territory;</li> <li>&gt; Provide for broad community involvement during the process of environmental impact assessment and environmental approval;</li> <li>&gt; Recognise the role that Aboriginal people have as stewards of their country as conferred under their traditions and recognised in law, and the importance of participation by Aboriginal people and communities in environmental decision-making processes.</li> </ul>	Department of Environment, Parks and Water Security
<i>Environment Protection Regulations 2020 (EP Regulations)</i>	Support and guide the implementation of the EP Act.	Department of Environment, Parks and Water Security
<i>Northern Territory Environment Protection Authority Act 2012 (NT EPA Act)</i>	<ul style="list-style-type: none"> <li>&gt; Promote ecologically sustainable development;</li> <li>&gt; Protect the environment, having regard to the need to enable ecologically sustainable development;</li> <li>&gt; Promote effective waste management and waste minimisation strategies; and</li> <li>&gt; Enhance community and business confidence in the environmental protection regime of the Territory.</li> </ul>	Department of Environment, Parks and Water Security
<i>Waste Management and Pollution Control Act 1998</i>	<ul style="list-style-type: none"> <li>&gt; Protect, and where practicable to restore and enhance the quality of, the Territory environment by:                             <ul style="list-style-type: none"> <li>– Preventing pollution;</li> <li>– Reducing the likelihood of pollution occurring;</li> <li>– Effectively responding to pollution;</li> <li>– Avoiding and reducing the generation of waste;</li> <li>– Increasing the re-use and re-cycling of waste; and</li> <li>– Effectively managing waste disposal;</li> </ul> </li> <li>&gt; Encourage ecologically sustainable development; and</li> <li>&gt; To facilitate the implementation of national environment protection measures made under the National Environment Protection Council (Northern Territory) Act 1994 (described below).</li> </ul>	Department of Environment, Parks and Water Security

Document	Purpose / Objectives	Agency
<i>Waste Management and Pollution Control (Administration) Regulations 1998</i>	Details regulations to administer the <i>Waste Management and Pollution Control Act 1998</i> .	Department of Environment, Parks and Water Security
<i>Marine Pollution Act 1999</i>	<p>The overall purpose of this Act is to protect the Territory's marine and coastal environment by minimising intentional and negligent discharges of ship-sourced pollutants into coastal waters.</p> <p>This purpose is to be achieved primarily by giving effect to relevant provisions of the following annexes of MARPOL:</p> <ul style="list-style-type: none"> <li>&gt; Annex I (which deals with pollution by oil);</li> <li>&gt; Annex II (which deals with pollution by noxious liquid substances in bulk);</li> <li>&gt; Annex III (which deals with pollution by harmful substances in packaged form);</li> <li>&gt; Annex V (which deals with pollution by garbage).</li> </ul> <p>The purpose is also to be achieved by:</p> <ul style="list-style-type: none"> <li>&gt; Providing an approach to protecting the Territory's marine and coastal environment from ship-sourced pollutants complementary to the approach of the Commonwealth and the States of the Commonwealth;</li> <li>&gt; Making provision about the discharge of sewage from ships;</li> <li>&gt; Enabling shipping casualties that are polluting, or threatening to pollute, coastal waters, to be dealt with; and</li> <li>&gt; Imposing severe penalties on persons who pollute the Territory's marine and coastal environment in contravention of this Act.</li> </ul>	Department of Environment, Parks and Water Security
<i>Marine Pollution Regulations 2003</i>	Details regulations under the <i>Marine Pollution Act 1999</i> .	Department of Environment, Parks and Water Security
<i>National Environment Protection Council (Northern Territory) Act 1994</i>	<p>The object of this Act is to ensure that, by means of the establishment and operation of the National Environment Protection Council:</p> <ul style="list-style-type: none"> <li>&gt; People enjoy the benefit of equivalent protection from air, water or soil pollution and from noise, wherever they live in Australia; and</li> <li>&gt; Decisions of the business community are not distorted, and markets are not fragmented, by variations between participating jurisdictions in relation to the adoption or implementation of major environment protection measures.</li> </ul>	Department of Environment, Parks and Water Security
<i>Territory Parks and Wildlife Conservation Act 1976</i>	<ul style="list-style-type: none"> <li>&gt; Provides for the protection, conservation and sustainable utilisation of wildlife; and</li> <li>&gt; Provides protection of listed threatened species for which proponents must consider direct and indirect impacts on a listed threatened species or place covered under this Act.</li> </ul>	Department of Environment, Parks and Water Security
<i>Territory Parks and Wildlife Regulations 2001</i>	Details regulations under the <i>Territory Parks and Wildlife Conservation Act 1976</i> .	Department of Environment, Parks and Water Security

Document	Purpose / Objectives	Agency
<i>Water Act 1992</i>	<ul style="list-style-type: none"> <li>&gt; Provides for the investigation, allocation, use, control, protection, management and administration of water resources, including extraction of groundwater, waste water management and water pollution; and</li> <li>&gt; Provides for water allocation plans, drilling licences, bore construction permits, water extraction licences, waste discharge licences, fees and charges, and penalties for offences against the Act.</li> </ul>	Department of Environment, Parks and Water Security
<i>Water Regulations 1992</i>	Details regulations under the <i>Water Act 1992</i> .	Department of Environment, Parks and Water Security

Table 1-2 Relevant Commonwealth Legislation

Document	Purpose / Objectives	Agency
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	<ul style="list-style-type: none"> <li>&gt; Provides for the protection of the environment and conservation of biodiversity, particularly species and places of national significance.</li> <li>&gt; Invoked only if a development is likely to have environmental impacts of national significance</li> </ul>	Australian Government Department of Agriculture, Water and the Environment
<i>Environment Protection (Sea Dumping) Act 1981</i>	<ul style="list-style-type: none"> <li>&gt; Regulates the loading and dumping of waste at sea and the placement of artificial reefs within Australian Waters. Australian Waters stretch from the low water mark of the Australian shoreline out to 200 nautical miles, but does not include waters within the limits of a state or territory.</li> <li>&gt; The Act, therefore, does not need to be adhered to when disposing of dredge spoil within Darwin Harbour limits. However, the same assessment process and methods should generally be applied.</li> </ul>	Australian Government Department of Agriculture, Water and the Environment
<i>National Environment Protection Measures (Implementation) Act 1998</i>	<p>The objects of this Act are:</p> <ul style="list-style-type: none"> <li>&gt; To make provision for the implementation of national environment protection measures in respect of certain activities carried on by or on behalf of the Commonwealth and Commonwealth authorities; and</li> <li>&gt; To protect, restore and enhance the quality of the environment in Australia, having regard to the need to maintain ecologically sustainable development; and</li> </ul> <p>To ensure that the community has access to relevant and meaningful information about pollution.</p>	Australian Government Department of Agriculture, Water and the Environment
<i>National Environment Protection Measures (Implementation) Regulations 1999</i>	Details regulations under the <i>National Environment Protection Measures (Implementation) Act 1998</i> .	Australian Government Department of Agriculture, Water and the Environment
<i>National Environment Protection (Assessment of Site Contamination) Measure 1999</i>	<p>The purpose of the Measure is to establish a nationally consistent approach to the assessment of site contamination to ensure sound environmental management practices by the community which includes regulators, site assessors, environmental auditors, land owners, developers and industry.</p> <p>The desired environmental outcome for this Measure is to provide adequate protection of human health and the environment, where site contamination has occurred, through</p>	Australian Government Department of Agriculture, Water and the Environment

	the development of an efficient and effective national approach to the assessment of site contamination.	
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## 1.4 Purpose and Structure of this Document

The purpose of this Marine Environment Report is to describe the marine quality, ecosystems, flora and fauna relevant to the proposed project. The report summarises and assesses existing information relating to the marine environment through desktop review and identifies knowledge gaps where further field investigations were required and undertaken. These field investigations are also documented in this report.

The aim of the report is to identify the existing composition and quality of the marine environment and likely presence of marine flora and fauna within the project area, to allow potential project impacts to be quantified and/or risk assessed.

The document has been structured as follows:

- > This Section (1) introduces the project and context and purpose of this report;
- > **Section 2** details desktop investigations of the marine environment, including database searches and review of existing data;
- > **Section 3** details the identification of relevant data gaps, dictating the need for further field investigations;
- > **Section 4** outlines marine environmental field investigations undertaken for the project, including methodology and results; and
- > **Section 5** outlines the conclusions of the investigations and their implications in terms of the overall project.

## 1.5 Reference Documents

Various investigations and studies have been carried out as part of the overall development and design project to date. This report documents a component of these investigations. The following documents are referenced in, or should be given due consideration when reading, this report:

- > Directly relevant:
  - *Environmental Referral Report* (Cardno, 2022a): This document provides the necessary details to refer the project to the NT EPA. This *Marine Environment Report* is an appendix to the referral document, providing the necessary context for assessing risk to the marine environment from the project;
  - *Sediment Transport Report* (Cardno, 2022g): Details siltation, sedimentation and plume dispersion investigations associated with the project. The results of sedimentation and plume dispersion investigations are used to characterise potential risk and impact to the marine environment;
  - *SAP Implementation Report* (Cardno, 2022h): Details marine sediment quality investigations undertaken to understand any contamination within the dredging and disturbance area and guide proper handling and disposal of dredge material;
  - *Draft Dredging and Spoil Disposal Management Plan (DSDMP)* (Cardno, 2022i): Defines the dredging actions and necessary controls to avoid or minimise risk for, and impact to, the marine environment;
  - *Draft Construction Environmental Management Plan (CEMP)* (Cardno, 2022b): Defines likely construction activities and controls required to avoid or minimise environmental impact. Relevant to the marine environment will be controls related to rock placement, piling actions and control of runoff/discharge; and
- > Relevant to the overall project:
  - *Terrestrial Environment Report* (Cardno, 2022f): Details the terrestrial environment and ecology relevant to the project site, similar to the function of this report for the marine environment.
  - *Design Report* (Cardno, 2022d): Details the design requirements, basis, inputs, calculations and outcomes for the new proposed infrastructure;

- *Geotechnical Report* (Cardno, 2022e): Details the geotechnical information and investigations for the project site that inform design of the new proposed infrastructure; and
- *Metocean Report* (Cardno, 2022f): Details the metocean information and investigations for the project site that inform design of the new proposed infrastructure.

## 2 Desktop Investigations

### 2.1 Benthic Communities and Habitats

#### 2.1.1 Historical Mapping and Monitoring

##### 2.1.1.1 INPEX Ichthys Project

Benthic communities and habitats (BCH) mapping for parts of Darwin Harbour, including adjacent Mandorah, was established during the INPEX Ichthys Environmental Impact Statement (EIS) (INPEX Browse, 2011a). During implementation of the project, baseline, construction and post-construction monitoring and mapping of BCH was also undertaken (Cardno, 2013, 2014 & 2015; INPEX Browse, 2014). The final mapping is presented in **Figure 2-1** and the relevant findings of the investigations are described in the sections below.

##### 2.1.1.2 Predictive Mapping of Benthic Communities

A recent project has been undertaken to produce predictive mapping of the distribution of major benthic habitat classes in the Darwin-Bynoe Harbour region. The large-scale project (total mapped area of approximately 2,000 km<sup>2</sup>) was executed through a collaborative effort by the Northern Territory Department of Environment and Natural Resources (DENR) (now Department of Environment, Parks and Water Security [DEPaWS]), the Australian Institute of Marine Science (AIMS) and Geoscience Australia.

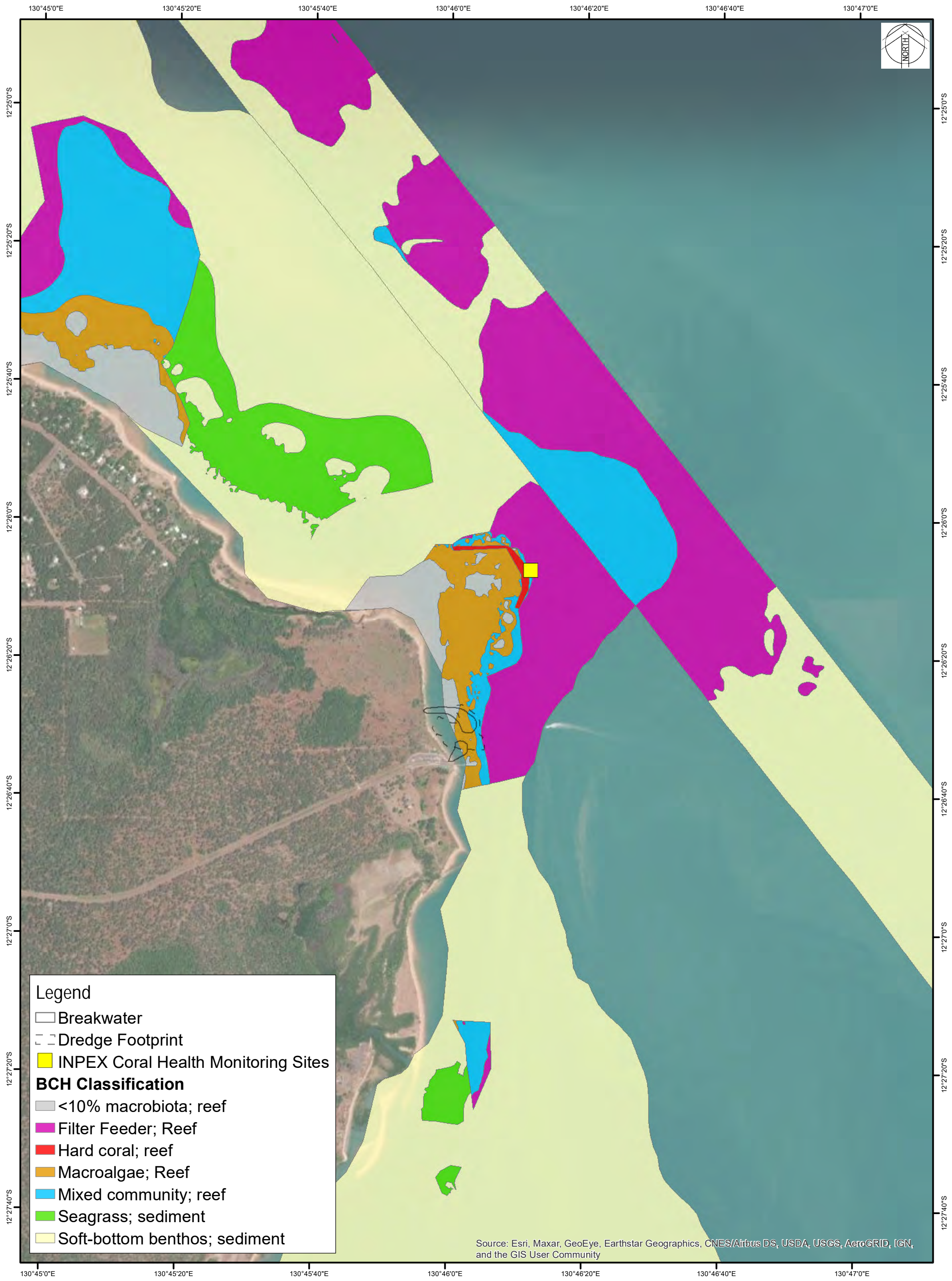
The mapping was derived using bathymetric, physical and biological data collected during the project (between 2015 and 2018), as well as historical field sampling campaigns, to produce spatial predictive habitat models. It used predictive models to build realistic representations of both the topography and composition of the seafloor and major biotic groups, and to produce benthic habitat maps showing where benthic habitat types exist for the entire area of interest (Galaiduk et al., 2019). Several ground-truthing transects from directly offshore Mandorah were incorporated to calibrate and validate the model. However, the work acknowledges that accuracy can be limited in shallow nearshore zones, such as this project's study area. The layers derived from the mapping are presented in **Figure 2-2** and the relevant findings of the investigations are described in the sections below.

#### 2.1.2 Coral

Coral communities in Darwin Harbour are generally located in the lower intertidal (less than 1 m above LAT) to upper subtidal zone, down to approximately 5-10 m below LAT (INPEX Browse, 2011). Coral communities in Darwin Harbour are unique as they are exposed to fluctuations in salinity and higher levels of turbidity and sedimentation that would not normally be associated with coral communities. These can also be combined with other stressors including: high water temperatures at times, exposure to air during spring low tides and changes in salinity during high rainfall. The most common genera and species observed in Darwin Harbour are, therefore, those that are able to tolerate these macrotidal conditions. Growth forms are predominantly encrusting, small massive and sub-massive and low-profile foliose types, with branching corals notably absent (Cardno, 2014).

A contingency reference site was monitored in the vicinity of Mandorah, as part of the INPEX Ichthys project. The site is located approximately 1 km north of the existing jetty and was characterised as having ≈ 20% coral cover (**Figure 2-1**). Data related to various aspects of coral health is available at this location, for nine survey periods between 2012 and 2014 at intervals to document potential impact from dredging during the INPEX project.

Results showed that overall, the composition of coral assemblages at Mandorah was quite different from that of other sites within the inner harbour (including Channel Island, Weed Reef, South Shell Island and Wickham Point). The coral assemblage at Mandorah was characterised by a high proportion of *Dendrophylliidae* (stoney cup corals) and a smaller proportion of *Faviidae* (brain coral), *Poritidae* (small stoney polyp corals) and others, whereas *Pectiniidae* (chalice corals), *Poritidae* and *Faviidae* accounted for the greatest percent cover at the other locations (Cardno, 2015).



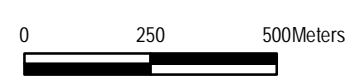
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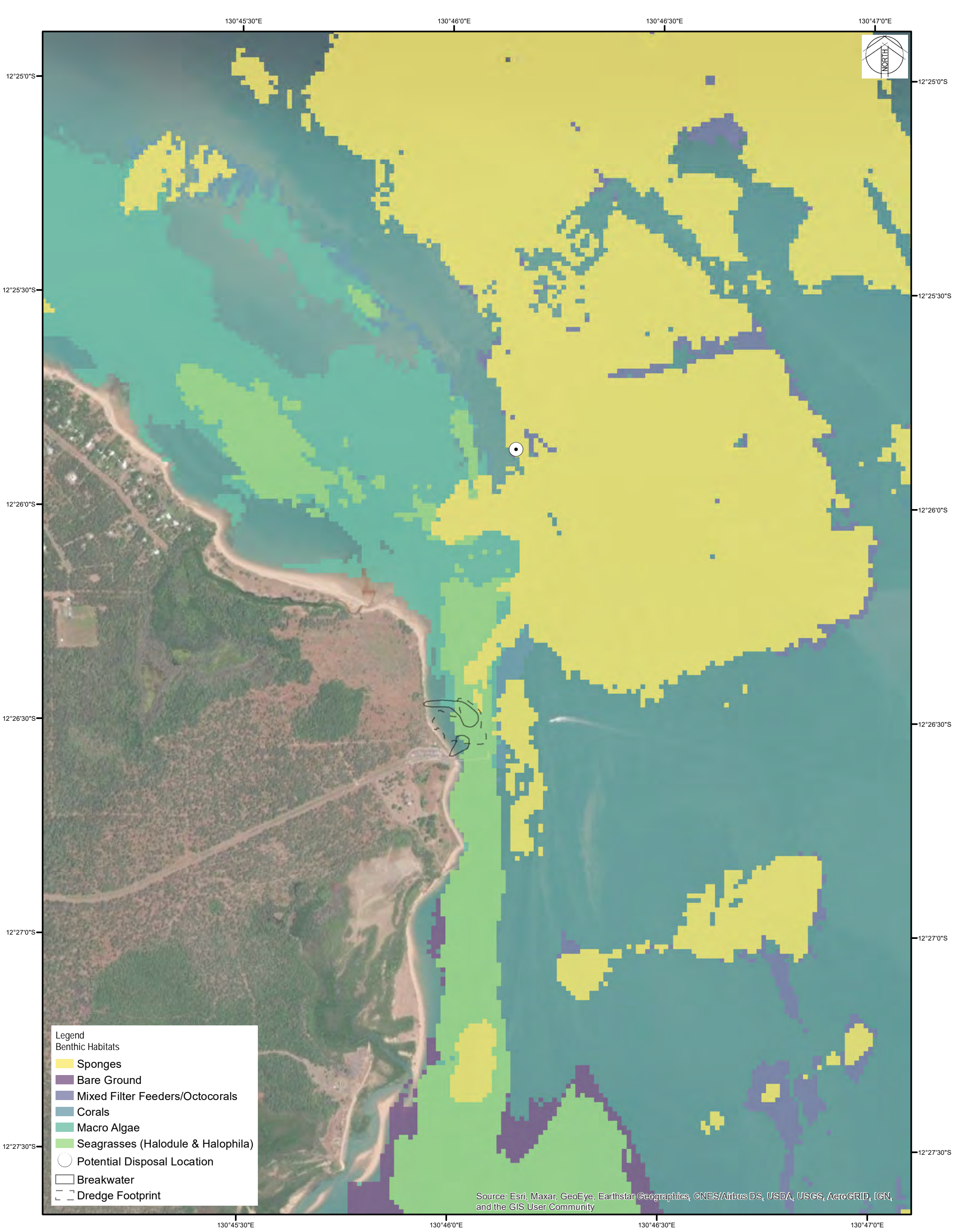
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**BCH MAP (INPEX ICHTHYS PROJECT)**

MANDORAH MARINE FACILITIES  
MARINE ENVIRONMENT REPORT



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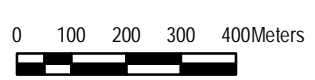
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# PREDICTIVE BENTHIC HABITAT MAPPING

MANDORAH MARINE FACILITIES  
MARINE ENVIRONMENT REPORT

FIGURE 2-2



Predictive mapping (Galaiduk et al., 2019) indicates that substantial coral assemblages are likely to be present in deeper water directly offshore of the project site (below -10m LAT), with potentially substantial coral coverage around 250m to the north east of the project footprint (**Figure 2-2**).

### 2.1.3 Seagrass

Seagrass monitoring as part of the Ichthys Project identified large seagrass beds along the Darwin coastal region between Fannie Bay and Lee Point, and smaller isolated patches at Woods Inlet and off Charles Point along the Cox Peninsula (INPEX Browse, 2014). This included the presence of seagrass in the vicinity of the project site (**Figure 2-1**). These data indicate distinct genus-specific spatial and temporal patterns for the two common genera found in the Darwin region (*Halophila* and *Halodule*).

*Halodule* is typically found in the lower intertidal (+2 m LAT) and subtidal (-1 m LAT) zone. The spatial distribution of *Halodule* typically remains stable through the seasons, although the density/percentage cover varies between 5% and 20% with the lowest values typically recorded during the wet season (November to April).

Conversely, *Halophila* is typically found in the deeper subtidal areas (down to -9.5 m LAT), although distribution can extend into the intertidal zone (up to +2 m LAT). *Halophila* also displays considerable changes in seasonal distribution, with expansion of beds throughout the dry season and extreme reductions in the wet season, to the extent that it may be completely absent at monitoring sites. Subsequently, percentage cover in survey areas can range from complete absence during the wet season to more than 50% cover in the dry season.

Predictive mapping (Galaiduk et al., 2019) indicates that a large assemblage of seagrass (*Halophila* and *Halodule*) are likely to be present in the nearshore area of the project site and extending alongshore to the north and south (**Figure 2-2**).

### 2.1.4 Macroalgae

Macroalgae dominated communities in Darwin Harbour are often located on platform crests and in the intertidal–subtidal interface zone, generally a few metres either side of the low water mark and often in association with coral or sponge dominated communities. Known localities of these communities are East Point Reef and Weed Reef (Smit, 2003). Marine habitat investigations by URS (INPEX Browse, 2011) recorded a sparse though diverse macroalgal community on the rubble covered pavement at Weed Reef, which included browns (*Sargassum* and *Padina* spp.), foliose reds (*Laurencia* spp.), greens (*Caulerpa*, *Ulva* and *Udotea* spp.) and calcareous greens (*Halimeda* spp.). A large patch of macroalgae was also mapped immediately north of the existing jetty at Mandorah (**Figure 2-1**).

Algal composition is highly seasonal and seems to be regulated by the amount of time the community is exposed during spring low tides and other factors such as rise in water temperature. During the build-up season (October to December) when water temperatures rise to over 30 °C and the tidal range is at its largest, exposing the lower intertidal zone, the larger macroalgae die back and turf algae dominates. During the earlier dry season, when the tidal range is not so extreme, the larger macroalgae are more abundant (Cardno, 2014).

Predictive mapping (Galaiduk et al., 2019) indicates that macro algae is likely to be present in the nearshore areas of the project site and directly adjacent the site to its north. Significant coverage of macroalgae in the nearshore area to the north of the project area, from offshore Wagait Beach, has been predicted (**Figure 2-2**).

### 2.1.5 Sponges

Predictive mapping (Galaiduk et al., 2019) indicates that sponges are likely to be the predominant benthic community offshore of the study site (beyond -10m LAT), to its north east (**Figure 2-2**). Sponges are also predicted to occur directly adjacent the project area to its north east and east.

### 2.1.6 Mangroves

Mangrove locations and habitat classes have been documented and mapped across the Northern Territory by DENR (now DEPWS) in 2012. A review of the dataset revealed that the closest mangrove habitat is located approximately 3 km south of the Project site. The mangrove habitat consists of three dominant species:

- > *Avicennia marina*;
- > *Ceriops tagal*;
- > *Rhizophora sp.*

### 2.1.7 Soft Sediments

Soft substrata, which makes up the largest habitat within Darwin Harbour (INPEX Browse, 2014), consists mainly of muds and fine sand that are found seaward of mangroves, and in intertidal and subtidal areas between the hard substrates and the harbour's main drainage channels.

Intertidal and subtidal soft substrata support a range of marine invertebrates that live buried within and on the surface of the sediments, respectively referred to as infauna and epifauna. Infaunal assemblages vary largely depending on the type of sediment they are associated with, but generally contain a variety of burrowing organisms such as polychaete worms, amphipod crustaceans, bivalve and gastropod molluscs, and nemertean and nematodes. These animals are an important source of food for wading birds and fish that live in the Harbour and also help in nutrient cycling. The species richness and abundance of these assemblages is likely to vary both annually and seasonally (Metcalfe & Glasby 2008), likely related to the intensity of the monsoon season and recruitment success (Cardno, 2014).

Extensive surveys of infauna and epifauna associated with soft sediments were carried out throughout Darwin Harbour during the Ichthys Nearshore Environmental Monitoring Program (Cardno, 2013, 2014 & 2015), although sampling did not include the vicinity of the Project site. In general, the area of seabed surveyed at sites in Darwin Harbour Inner consisted of mostly flat, bare, silty sand or coarse sand/shell grit with occasional sponges or hydroids. Epifauna such as sea fans, sea whips, ascidians, bryozoans, ophiuroids and crinoids were also recorded, but were rare.

The greatest taxonomic diversity was associated with subtidal inner habitats, followed by the subtidal outer and intertidal habitat and lowest at the seaward mangrove zone. This is generally consistent with studies reporting macrofaunal abundance and species richness to be relatively low on beaches, higher in intertidal sand/mud flats and increasing in the shallow subtidal habitats of estuaries and towards the shelf (Metcalfe & Glasby, 2008; Connell & Gillanders, 2007; Smit, 2003).

Overall, the findings of the INPEX monitoring and previous investigations show that the composition and distribution of infaunal assemblages associated with the soft sediment habitats of Darwin Harbour and surrounding offshore environment are rich and diverse, but comparable with that of other Australian tropical and temperate estuaries. While this and previous investigations highlight some consistent patterns in relation to the distribution, diversity and abundance of benthic marine fauna, the mechanisms driving these patterns are highly complex and difficult to predict (INPEX Browse, 2014).

### 2.1.8 Database Searches

In the Northern Territory, there are 67 sites of conservation significance (SCS) identified as the most important sites requiring protection to conserve their biodiversity values. The Darwin Harbour SCS (**Figure 2-3**), containing Mandorah, supports a range of estuarine, freshwater and terrestrial environments. Locally significant vegetation includes mangroves, which do not occur in the project study areas.

Department of Water and Environmental Regulation's (DEWA) Protected Matters Search Tool (PMST) was questioned to identify Matters of National Environmental Significance within a 10 km radius of the site, such as threatened ecological communities, listed under the EPBC Act. The PMST report indicated the following, with respect to BCH:

- > No Listed threatened ecological communities occur in the area;
- > No wetlands of international importance occur in the area; and
- > No critical habitats occur in the area.

Northern Territory Department of Environment, Parks and Water Security (DEPWS) natural resources maps were queried to identify known records of vegetation, threatened communities, threatened species and pest

species (accessed on 18 February 2020). No records of these were identified with respect to BCH (e.g. corals) within the broader project area.

Full database search records are included in **Appendix A**.

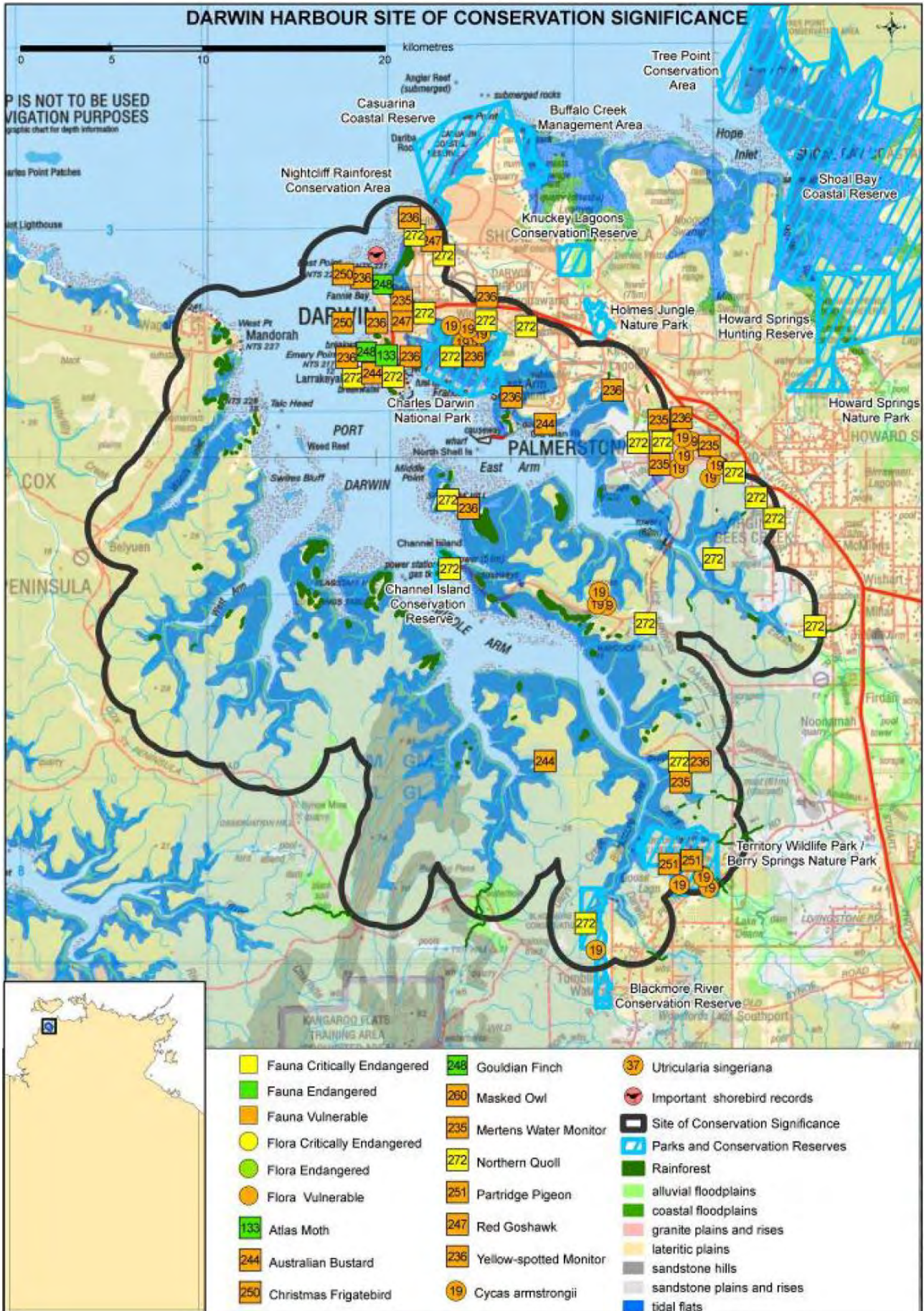


Figure 2-3 Darwin Harbour Sites of Conservation Significance (NRETAS, 2009)

## 2.2 Marine Fauna

### 2.2.1 Inpex Ichthys Project Turtle and Dugong Monitoring

Turtles and Dugongs were identified as the key marine fauna species at risk in the nearshore environment, from the Inpex Ichthys project. As such, they were monitored throughout the nearshore dredging program by aerial and land-based surveys. During the monitoring program, observations of turtles and dugongs from aerial surveys were undertaken three times a year during the dry season, when conditions were most favourable, with approximately 3,500 linear kilometres flown over a 40-hour period during each survey.

The results of the surveys found two individual sighting of Dugong in the nearshore vicinity of the project site. This was likely to be associated with foraging on seagrass in the area. The majority of sightings were on the western and outer edges of the harbour, where significant seagrass assemblages are known to exist. **Figure 2-4** depicts all sightings for the three-year monitoring program (INPEX Browse, 2014).

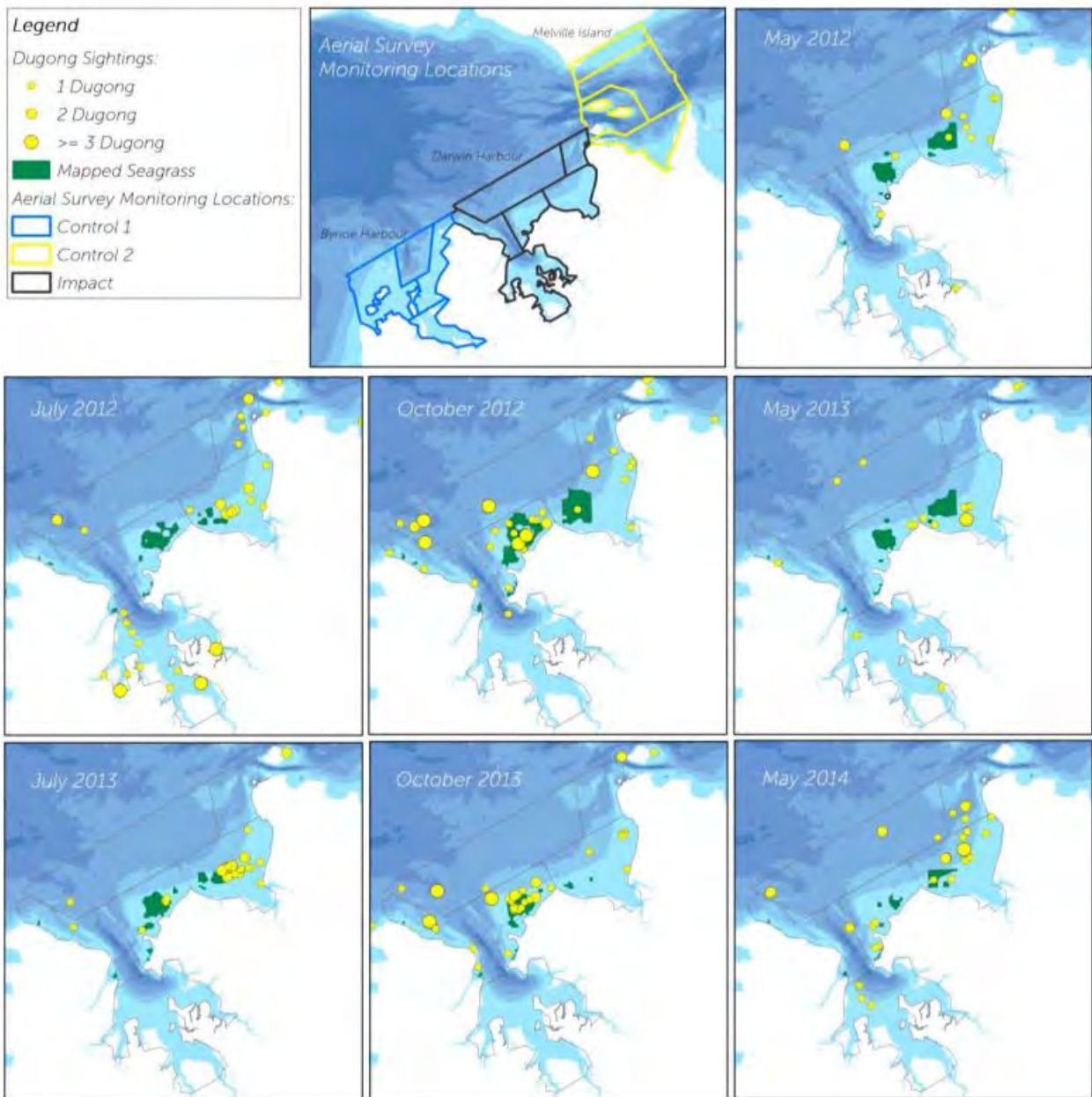


Figure 2-4 Dugong sightings around the Darwin region during aerial surveys from May 2012 to May 2014 (INPEX Browse, 2014)

Turtles were sighted throughout the harbour over the monitoring period, with several observations in the nearshore area at Mandorah. There appeared to be a higher concentration of sightings along the Cox Peninsula during October, with the majority of observations to the north of the project site.

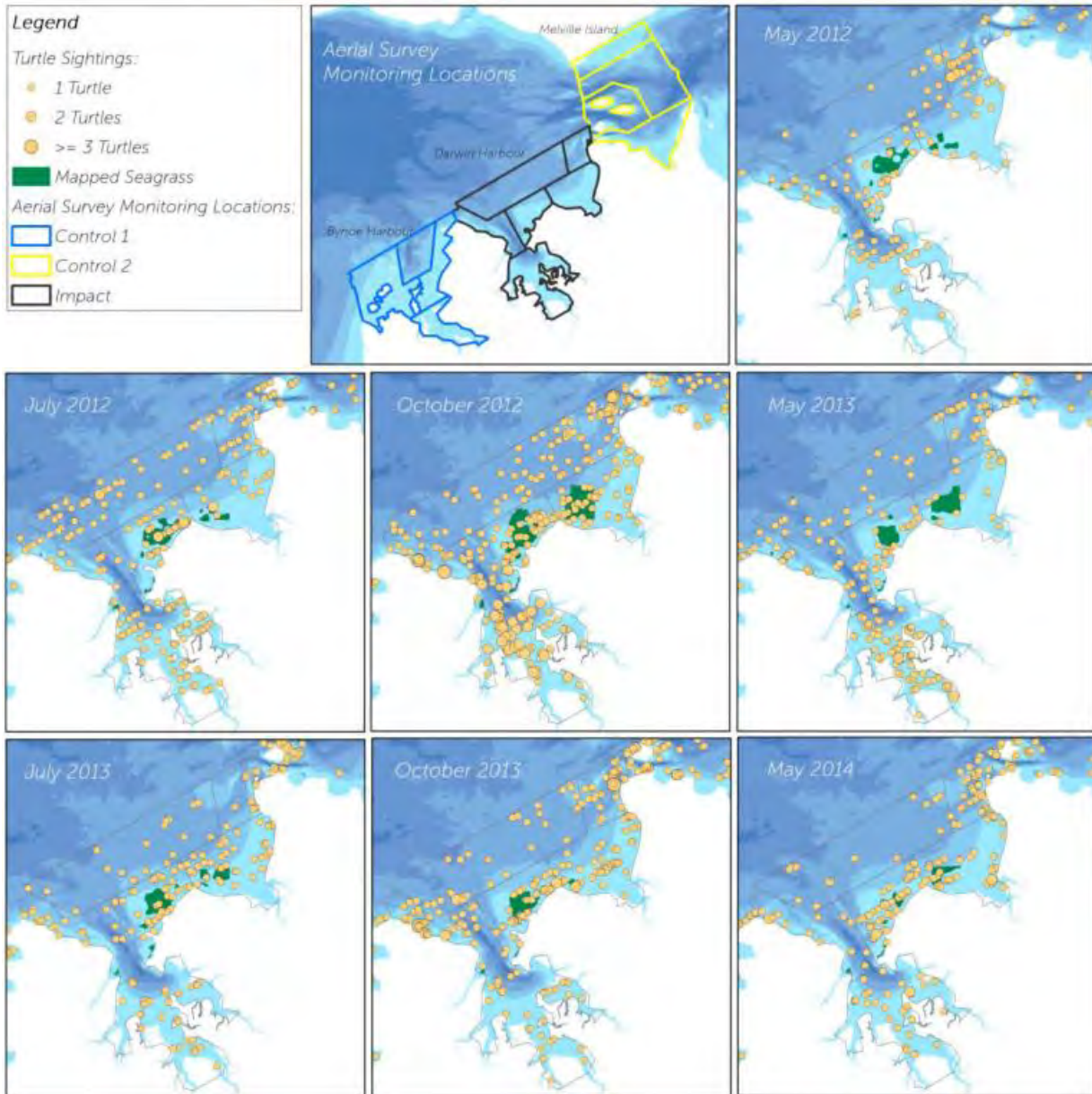


Figure 2-5 Turtle sightings around the Darwin region during aerial surveys from May 2012 to May 2014 (INPEX Browse, 2014)

### 2.2.2 Database Searches

The following database searches were undertaken to identify marine fauna species of concern associated with the project area:

- > Northern Territory Department of Environment and Natural Resources (DENR) natural resources maps to identify known records of vegetation, threatened communities, threatened species and pest species (accessed on 18 February 2020);
- > DEWA's PMST to identify species listed under the *EPBC Act* and Matters of National Environmental Significance (NES) (accessed November 2021);
- > Atlas of Living Australia to identify known records of threatened, least concern and pest species recorded within the vicinity of the project site (accessed February 2020); and

- > The NT Government websites for threatened fauna and flora was also reviewed for any State-listed (*Territory Parks and Wildlife Conservation Act 1976* and *Fisheries Act 1988*) threatened species with potential to occur in close proximity to the Project site.

A 10 km search radius from the Project site was applied for the PMST, identifying:

- > 109 listed marine species;
- > 15 of these species are listed as threatened:
  - 5 Vulnerable;
  - 7 Endangered; and
  - 3 Critically endangered.
- > 1 species of river shark was listed as Endangered (*Glyphis garricki*); and
- > 3 species of sawfish were listed as Vulnerable.

Full database search records are included as **Appendix A**.

**Table 2-1** details EPBC and/or NT listed species, considered 'species of concern' for the project, which includes migratory species and species listed as threatened. A full list of 'species of interest', with potential to occur in the study area is provided in **Appendix D**. Bird species classified as 'marine' under the *EPBC Act* (i.e. seabirds) have been considered in this report, rather than the *Terrestrial Environment Report* (Cardno, 2022c).

Table 2-1 Marine species of concern for the project

Scientific name	Common name	EPBC Act	TPWC Act
<b>Birds</b>			
<i>Calidris canutus</i> (T, M)	Red Knot	E	V
<i>Calidris ferruginea</i> (T, M)	Curlew Sandpiper	C	V
<i>Calidris tenuirostris</i> (T, M)	Great Knot	C	V
<i>Charadrius leschenaultia</i> (T, M)	Greater Sand Plover, Larger Sand Plover	V	V
<i>Charadrius mongolus</i> (T, M)	Lesser Sand Plover, Mongolian Plover	E	V
<i>Limosa lapponica baueri</i> (M)	Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed	-	V
<i>Limosa limosa</i> (M)	Black-tailed Godwit	-	-
<i>Numenius madagascariensis</i> (T, M)	Eastern Curlew, Far Eastern Curlew	C	V
<i>Rostratula benghalensis</i> (sensu lato) (T)	Australian Painted Snipe	E	V
<b>Fish, Sharks &amp; Rays</b>			
<i>Glyphis garricki</i> (T)	Northern River Shark, New Guinea River Shark	E	E
<i>Pristis clavata</i> (T, M)	Dwarf Sawfish, Queensland Sawfish	V	V
<i>Pristis pristis</i> (T, M)	Freshwater Sawfish, Largetooth Sawfish, River Sawfish	V	V
<i>Pristis zijsron</i> (T, M)	Green Sawfish, Dindagubba, Narrowsnout Sawfish	V	V
<b>Mammals and Cetaceans</b>			
<i>Dugong dugon</i> (M)	Dugong	-	-

Scientific name	Common name	EPBC Act	TPWC Act
<i>Orcaella heinsohni / brevirostris (M)</i>	Australian Snubfin Dolphin, Irrawaddy Dolphin	-	-
<i>Sousa chinensis (M)</i>	Indo-Pacific Humpback Dolphin	-	-
<b>Reptiles</b>			
<i>Caretta caretta (T, M)</i>	Loggerhead Turtle	E	V
<i>Chelonia mydas (T, M)</i>	Green Turtle	V	-
<i>Dermochelys coriacea (T, M)</i>	Leatherback Turtle, Leathery Turtle	E	C
<i>Eretmochelys imbricata (T, M)</i>	Hawksbill Turtle	V	V
<i>Lepidochelys olivacea (T, M)</i>	Olive Ridley Turtle, Pacific Ridley Turtle	E	V
<i>Natator depressus (T, M)</i>	Flatback Turtle	V	DD

**Key:**

C = Critically endangered, DD = Data deficient, E = Endangered, LC = Least concern, N = Near Threatened, V = Vulnerable, *EPBC Act*: M = Migratory, T = Threatened

### 2.2.3 Invasive Marine Pests

Marine pests are plants or animals that are not native to a region, usually introduced from overseas, that have a significant impact on our marine industries and environment. Marine pests can grow or reproduce quickly and out-compete other native species by preying directly on them or competing for food. The most common way marine pests are introduced is via boats and other large vessels, either attached to the submerged surfaces of ships ('biofouling') or in the ballast water carried by modern vessels to maintain stability. Marine pests considered a significant threat to Northern Territory (NT) waters include:

- > Asian bag mussel (*Arcuatula senhousia*);
- > Asian green mussel (*Perna veridis*); and
- > Black-striped mussel (*Mytilopsis salleri*).

These species are found overseas in countries frequently visited by boats that travel to the NT (NT Government 2021). The black-striped mussel is of particular concern as it invaded Darwin Harbour marinas in 1999 but was successfully eradicated. The mussel spreads on the hulls and in the internal seawater plumbing of commercial or recreational vessels and multiplies rapidly to form dense groups that can reduce local biodiversity. It can also cause fouling on wharves, marinas and seawater systems, and can damage marine farms.

Marine pests were surveyed extensively as part of the INPEX Nearshore Monitoring Program (2012 – 2014), however, the only pest species detected were a few individuals of the Asian green mussel, reported in 2012.

## 2.3 Marine Environmental Quality

Very limited previous data is understood to have been collected in the project area in terms of sediment quality. A water quality monitoring site was established at Mandorah and Woods Inlet as part of the Ichthys Nearshore Environmental Monitoring Program, providing over 2 years of continuous turbidity and PAR data with sporadic collection of TSS water samples. Known, existing data has been summarised in **Table 2-2**.

Table 2-2 Summary of existing marine environmental quality data

Environmental quality parameter	Data/indicator	Time period	Details	Relevance to Project
<b>Sediment</b>	Physical properties	November 2017	Douglas Partners sampled at two landside test pits and two nearshore boreholes. Characterised geology and surface sediment, including PSD at test pit locations.	Location specific, very small quantity and extent of data. Does not include contamination testing.

Environmental quality parameter	Data/Indicator	Time period	Details	Relevance to Project
	Physical properties	2006 - 2013	Various data collection programs undertaken in Darwin Harbour to characterise sediments in the area. Observations indicate seabed sediments vary from mud, fine- to medium-grained muddy sand, shell grit, medium- to coarse-grained gravel, pebble and cobble, and rocky reef. Intertidal areas adjacent to the coast are mainly characterised by mud and muddy fine- to medium-grained sand. Sediments in channels are mainly comprised of shell grit and coarse-grained sand (Munksgaard et al 2013; URS 2009; Fortune 2006).	Provides general overview of sediment characteristics in the region but not specific to Project site.
	Geochemistry	2009	The sampling undertaken during the EIS phase of the Inpex Project (URS 2009) is the most comprehensive in the area and found that tributyltin (TBT), BTEX, polychlorinated biphenyls (PCBs) and organochlorine pesticides (OCPs) were all below the laboratories LOR. The majority of samples analysed for PAHs and TPHs have also been below LOR.	Provides general overview of sediment geochemistry in the region at that point in time. Data not specific to Project site and likely outdated in terms of contaminant testing.
	Geochemistry	2006	Analysis of potential contaminants in Darwin Harbour such as metals (including metalloids) determined that arsenic concentrations commonly exceed the low (20 mg/kg) and high (70 mg/kg) interim sediment quality guidelines Screening Levels (ANZECC and ARMCANZ 2000a). These high concentrations have been attributed to local geology (weathering of arsenic rich coastal substrata) rather than anthropogenic sources (Fortune 2006). Furthermore, previous bioavailability testing has indicated that only a small proportion is bioavailable indicating that it is unlikely to be toxic in the marine environment.  A range of other metals (e.g. chromium, mercury, nickel and silver) have also been recorded to exceed Screening Levels for individual samples; however mean concentrations have remained below Screening Levels.	Provides general overview of sediment geochemistry in the region. Data not specific to Project site and may be outdated in terms of contaminant testing.
<b>Water Quality</b>	Physical properties	December 2012 – January 2015	Continuous near-bed turbidity (NTU) records collected (15 min interval) at site directly offshore Mandorah, as well as two sites within Woods Inlet. Collection of various TSS and PSD samples for correlation with NTU values.	Good characterization of ambient water quality parameters across wet and dry season at Mandorah and Woods Inlet.

Environmental quality parameter	Data/indicator	Time period	Details	Relevance to Project
			Collected during Inpex Nearshore Environmental Monitoring Program (Cardno, 2012-2015).	
	Physical and chemical properties	2009 - Present	<p>Ongoing water quality monitoring of Darwin Harbour is undertaken by the Department of Environment, Parks and Water Security's (DEPaWS) Aquatic Health Unit. The following parameters are monitored:</p> <ul style="list-style-type: none"> <li>Algae – Chlorophyll-a;</li> <li>Dissolved Oxygen;</li> <li>Water Clarity – Turbidity (NTU); and</li> <li>Nutrients – Filterable Reactive Phosphorus, Ammonia as N and NOx.</li> </ul> <p>Supplementary parameters include:</p> <ul style="list-style-type: none"> <li>Salinity;</li> <li>Temperature; and</li> <li>pH.</li> </ul>	<p>The project site lies within 'Zone 5 – Middle Harbour' defined by the monitoring program. None of the monitoring sites that inform the program are in close proximity to the project site. The monitoring has long temporal coverage but is not site specific.</p>

### 3 Information Gap Analysis

#### 3.1 Benthic Communities and Habitats

Following the desktop review, it was determined that previous mapping of seagrass (and other habitats) within the Project site was at a relatively coarse scale and further site-specific benthic communities and habitats survey was required. Seagrass distribution, particularly for *Halophila*, is relatively ephemeral within Darwin Harbour and it is therefore important to provide recent survey information. Although there is now a lot of information in regard to benthic assemblages associated with soft sediments in Darwin Harbour, sampling has not specifically been carried out within the vicinity of the Project site. Further field survey was therefore undertaken to provide up to date and site-specific habitat information relevant to the direct footprint of the proposed infrastructure and in relation to the potential influence of any dredge plume dispersion. This information would also improve the likelihood of occurrence assessment for marine fauna, by providing an understanding of suitable habitat and foraging for certain species.

#### 3.2 Marine Environmental Quality

Given that dredging is proposed as part of the project, it is necessary to have a comprehensive understanding of sediment quality in the dredging and disturbance footprint. No such data is known to exist for the project site. The project therefore requires a sediment sampling and analysis campaign to be undertaken in accordance with the requirements of the *National Assessment Guidelines for Dredging 2009* (NAGD).

**Table 3-1** summarises the identified data gaps further investigation required.

Table 3-1 Identified data gaps requiring additional investigation

Relevance	Identified data gap	Required further investigation
<b>Marine Environmental Quality</b>	Lack of recent and relevant sediment physical and chemical (contamination) properties data.	Implementation of sediment Sampling and Analysis Plan to properly characterize material (in accordance with NAGD, NEPM etc.).
<b>Benthic Communities and Habitats</b>	Lack of recent and relevant benthic communities and habitats information in the project area.	Map benthic habitat in the Project Site Study Area.
<b>Marine Fauna</b>	Lack of understanding of marine habitat and potential foraging sources in the project area, to inform likelihood assessment for marine fauna	As above.

## 4 Field Investigations

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### 4.1 Benthic Communities and Habitats Mapping

#### 4.1.1 Aims and Objectives

BCH field survey was carried out to:

- > Verify and update existing BCH mapping within the Project site Study Area (**Figure 4-1**);
- > Characterise BCH in the project footprint; and
- > Characterise BCH in the vicinity of the project area that could be exposed to dredge plume dispersion effects.

#### 4.1.2 Methodology

##### 4.1.2.1 Survey Area

Prior to field surveys, a number of GIS data sets were analysed to develop presumptive benthic habitat maps and refine sampling locations. The data inputs guiding the sampling plan included:

- > Presumptive BCH maps that were developed using Cardno's benthic habitat data of Darwin Harbour developed in 2013;
- > Project footprint, defined at the Concept Design Stage; and
- > Preliminary modelled dredge plume extents.

The habitat survey locations were defined to cover the extent of project disturbance and elevated suspended sediment concentrations and deposition, with sufficient spatial resolution to map changes in benthic composition and habitat.

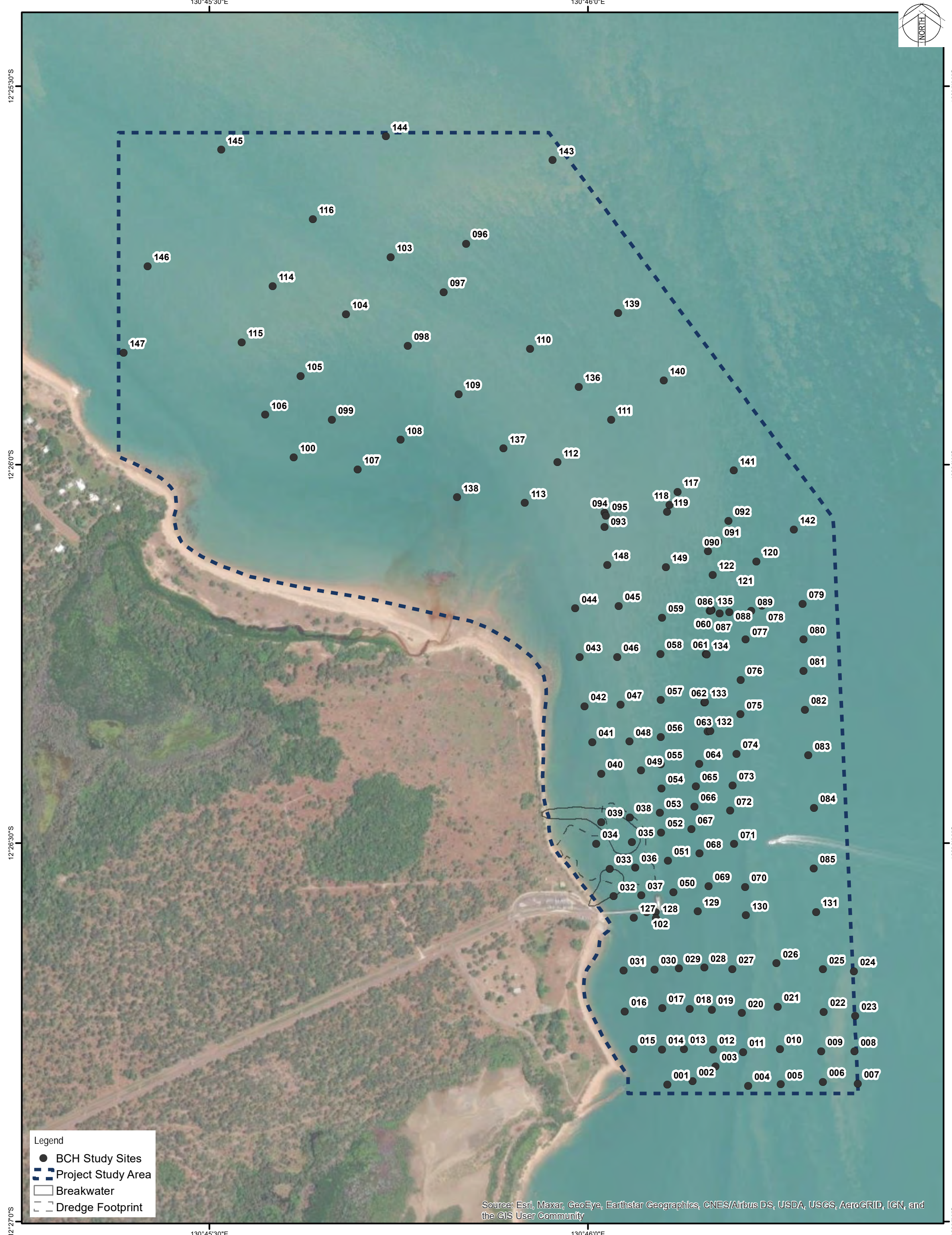
##### 4.1.2.2 Sampling Methodology

Field work was completed from a small vessel capable of operating in water depths less than 2 m during high - mid tide. Proposed sampling locations were overlaid onto the presumptive map based on the latest existing aerial imagery. The survey vessel navigated to each pre-determined sampling point using a GPS accurate to < 5 m. A remotely operated vehicle (ROV) with a live feed and recording device was then used to spot check the habitat at each point noting boundaries of any sensitive seagrass, macroalgae, soft sediment or reef habitat. This is a safe, reliable and efficient method for characterising benthic habitats and can be used across a wide range of soft sediment, algal mat and hard reef substrata to record high-definition video or photographic images.

ROV footage was interpreted to identify:

- > Seagrass, coral, macroalgae and rocky reef;
- > Density of seagrass (categorically low, medium, high based on percentage cover);
- > Percentage cover of coral, macroalgae and rocky reef areas; and
- > Qualitative condition of coral, macroalgae and rocky reef areas.

Any incidental fauna, including epifauna and infauna, was also recorded during the survey. The survey was also used to photograph and assess nearby assemblages of mangroves (Woods Inlet), although preliminary modelling has suggested that the closest assemblages will not be impacted by the project.



**Legend**

- BCH Study Sites
- ▭ Project Study Area
- ▭ Breakwater
- ▭ Dredge Footprint

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Darwin, Northern Territory

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**BCH INVESTIGATIONS MAP**  
 MANDORAH MARINE FACILITIES  
 MARINE ENVIRONMENTS REPORT

FIGURE 4-1

4.1.2.3 Analytical Methods





Video footage collected at each sampling point was examined for habitat type, with each point assigned a category indicating the dominant habitat in that area. Habitat categories were based on the definitions outlined in the Seemap Australia classification scheme (Butler et al. 2017). These included:

- > Soft sediment (bare, unconsolidated sediment);
- > Seagrass (*Halodule* and/or *Halophila*);
- > Filter feeder (Sediment or reef associated with filter feeding organisms (sponges, ascidians, soft corals etc.);
- > Bare reef (bare, consolidated reef substrate);
- > Mixed reef (reef with filter feeding organisms and/or hard corals);
- > Macroalgae reef (Consolidated reef with macroalgae); and
- > Hard coral (Reef dominated by hard coral).

To help characterise each habitat category, a percentage cover was also assigned. This data was then entered into GIS software where each habitat category was mapped by direct interpolation. Examples of extracted still images of benthic habitats identified via footage are presented in **Table 4-1**.

Table 4-1 Still images of identified benthic habitats.

Example BCH Category	Extracted Still Image
Seagrass - Medium Density	
Soft Sediment	

<p>Bare Reef</p>	<p>Depth: 2.05m</p>  <p>FIFISH 2019-12-22 11:09:13</p>
<p>Filter Feeder – Low Density</p>	<p>Depth: 13.09m</p>  <p>FIFISH 2019-12-22 11:24:11</p>
<p>Hard Coral – High Density</p>	<p>Depth: 3.84m</p>  <p>FIFISH 2019-12-22 11:46:38</p>
<p>Mixed Reef – High Density</p>	<p>Depth: 3.81m</p>  <p>FIFISH 2019-12-22 11:52:03</p>

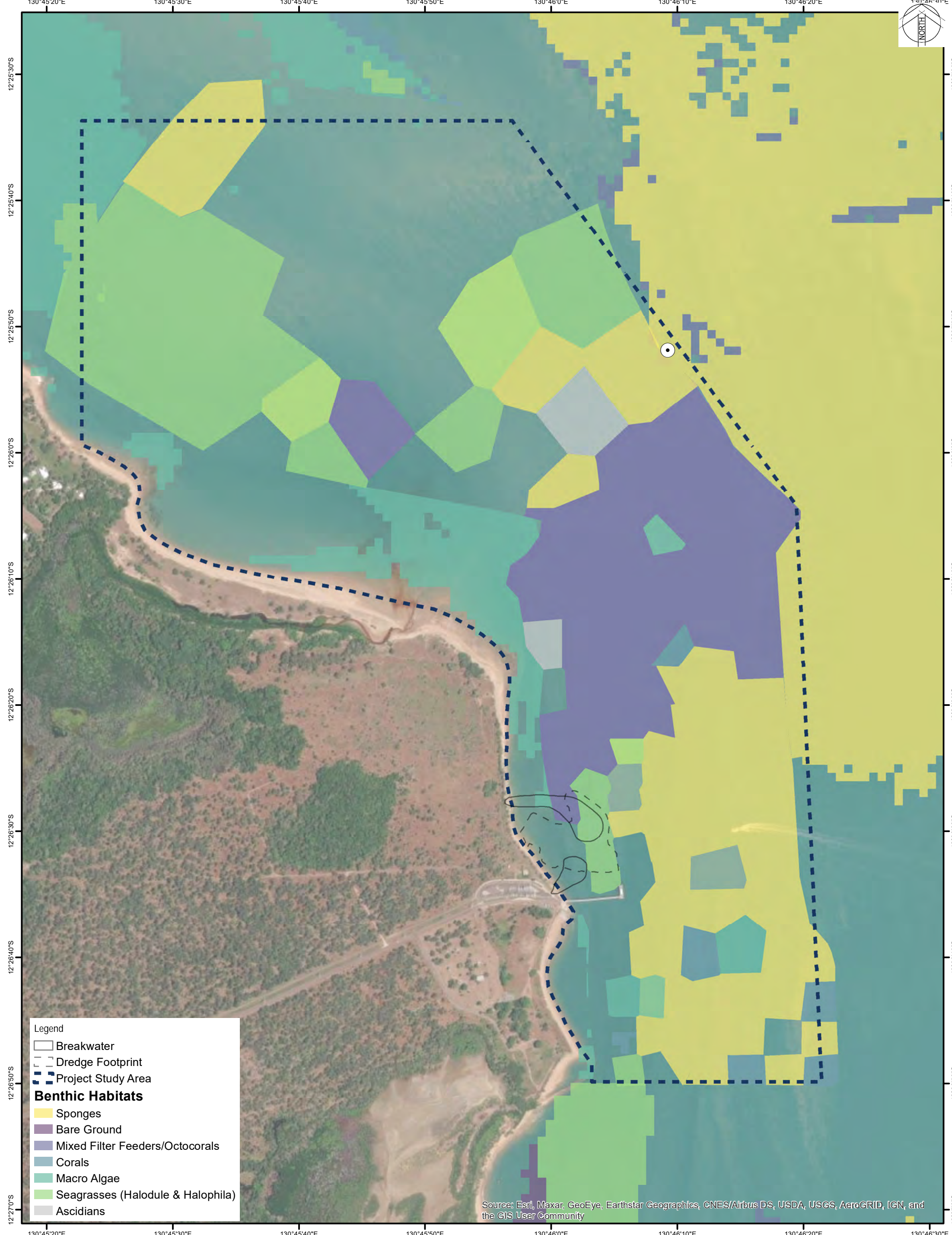
#### 4.1.3 Results

An overall BCH map for the Project Site Study Area is provided in **Figure 4-2**. The Broader Project Study Area is mapped in **Figure 4-3**, with interpreted BCH mapping (Geoscience Australia, AIMS and DEPaws, 2021) used to fill expanded areas where field survey did not take place. **Appendix B** shows all surveyed sites and their respective classifications. **Appendix C** provides mapped, interpreted percentage coverage throughout the Project Site Project Area of the following BCH:

- > Coral;
- > Macroalgae;
- > Mixed filter feeders;
- > Seagrass; and;
- > Sponges.

Important observations include:

- > An assemblage of very low-density seagrass lies within the direct project footprint;
- > An assemblage of low-density seagrass lies in close proximity, directly to the north of the project footprint;
- > Significant coral coverage is present to the north, north east of the project footprint; and
- > Assemblages of sponges and mixed filter feeders are present in the vicinity of the project footprint.



**Legend**

- Breakwater
- Dredge Footprint
- Project Study Area

**Benthic Habitats**

- Sponges
- Bare Ground
- Mixed Filter Feeders/Octocorals
- Corals
- Macro Algae
- Seagrasses (Halodule & Halophila)
- Ascidians

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Darwin, Northern Territory

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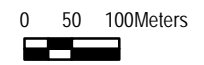
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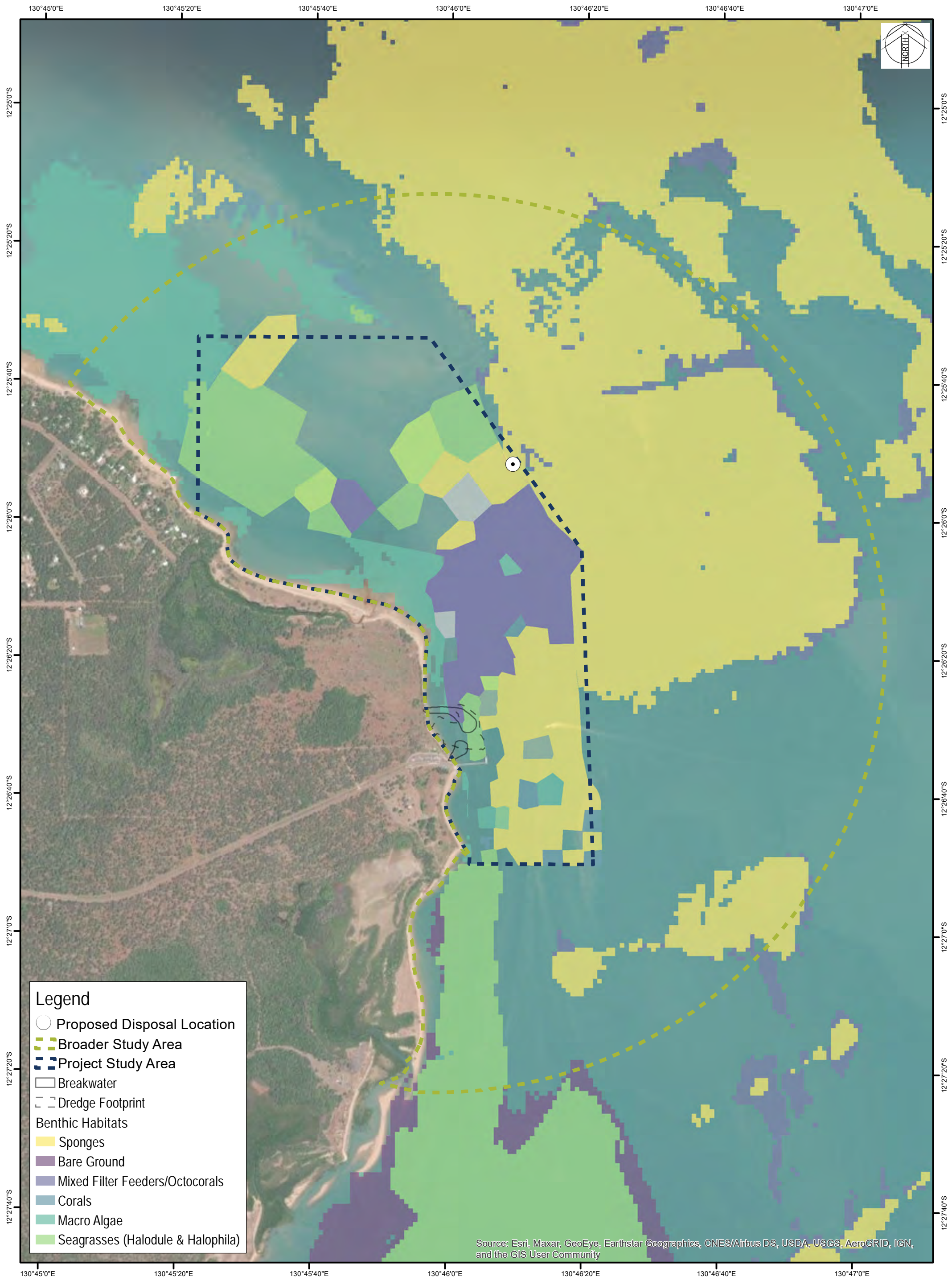
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## BENTHIC HABITAT MAP (PROJECT STUDY SITE)

MANDORAH MARINE FACILITIES  
 ENVIRONMENTAL ENVIRONMENTS REPORT

FIGURE 4-2





Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Perth, Western Australia.  
(08) 9273 3888

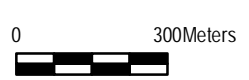
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# BENTHIC HABITAT MAP (BROADER STUDY AREA)

MANDORAH MARINE FACILITIES  
MARINE ENVIRONMENT REPORT

FIGURE 4-3



## 4.2 Sediment Quality Sampling and Analysis

Detailed assessment of the physical and chemical properties of sediments sampled in the project area are found in the *SAP Implementation Report* (Cardno, 2022h).

### 4.2.1.1 Profile Description

- > There is limited marine bed sediment in the area, the deepest refusal depth for push coring was 0.8 metres and for most sample locations the refusal depth was less than 0.5 metres;
- > Field observations did not identify any visual signs of contamination;
- > Field observations noted unconsolidated sediment largely as marine SAND, dark grey; and
- > Field pH testing reported material between 8.7 to 9.1 (alkaline).

A summary of the laboratory results of sediment chemical testing is presented in the following sub-sections.

### 4.2.1.2 Metals and Metalloids

All concentrations of metals and metalloids for the site were below all assessment criteria for offshore and onshore disposal of sediments.

### 4.2.1.3 Organotin

During initial sampling, two sampling locations returned a concentration of Tributyltin (3.8 µg/kg and 9.5 µg/kg) above the limit of reporting (LOR). One of these samples was located within the proposed dredge footprint. The 95% UCL for Tributyltin corrected for 1% TOC (9.5 µg/kg) marginally exceeded the NAGD low screening level of 9 µg/kg. No other samples recorded concentrations of organotin compounds above the LOR.

Further sampling was undertaken at multiple sites in the vicinity of the site with elevated TBT concentration, to identify if a contamination hotspot exists. All results of this sampling returned concentrations below the LOR for TBT.

### 4.2.1.4 Organic Compounds

No organic compounds were detected, with all BTEX, TRH, PAH and organochlorine pesticide concentrations were below their respective LORs in all samples.

### 4.2.1.5 Acid Sulfate Soils

Two samples were found to have Net Acidity values above the DWER ASS's management action criteria for the offshore disposal of sands to loamy clays >1000 tonnes.

Analysis shows that PASS is present at the site and likely to be present in surface-level seabed sediments rather than in those at depth. It should be conservatively assumed that all sediments within the top 0.5m contain PASS and be managed as such. It should be noted that when saturated the opportunity for oxidation of dredged material is negligible as the available supply of oxygen necessary for a significant rate of acid formation is too low.

## 5 Conclusions and Project Implications

### 5.1 Benthic Communities and Habitats

BCH investigations have identified the following sensitive environmental receptors in the Project Site Study Area:

- > Seagrass (*Halodule* and/or *Halophila*); and
- > Corals.

These environmental receptors will be susceptible to the following potential project impacts:

- > Direct impact (removal/destruction) due to dredging and construction of project infrastructure;
- > Impact due to blocking of photosynthetically active radiation (PAR) due to increased suspended sediment concentrations (turbidity) associated with dredge plumes;
- > Smothering due to deposition of sediment from dredge plumes; and
- > Incidental impact (direct or pollution release) by construction vessels and plant.

Assessment of the environmental risk of these activities should be made for corals and seagrasses, based on:

- > Their level of coverage (percentage) within project zones of influence (see **Appendix C**) and with respect to overall coverage and abundance in the region; and
- > Their susceptibility to the relative project impacts.

Appropriate mitigation measures should then be put in place to minimise environmental impacts.

### 5.2 Marine Fauna

For all listed marine fauna identified with potential to occur in the Broader Project Study Area, their likelihood of occurrence has been assessed, based on the criteria in **Table 5-1**. The complete table of assessment is provided as **Appendix D**.

Table 5-1 Species likelihood of occurrence criteria

Likelihood of Occurrence	Criteria
Unlikely	Species that fit into one or more of the following criteria: <ul style="list-style-type: none"> <li>▪ Species highly restricted to certain geographical areas not overlapping the Study Area.</li> <li>▪ Species that have specific habitat requirements that are not present in the Study Area.</li> </ul>
Low	Species that fit into one or more of the following criteria: <ul style="list-style-type: none"> <li>▪ Have not been recorded previously in the Study Area and for which the Study Area is beyond the current distribution range.</li> <li>▪ Use specific habitats or resources not present in the Project Area.</li> </ul>
Moderate	Species that fit one or more of the following criteria: <ul style="list-style-type: none"> <li>▪ Have infrequently been recorded previously in the Study Area.</li> <li>▪ Use specific habitats or resources present in the Project Area, but in a poor or modified condition.</li> <li>▪ Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.</li> </ul>
High	Species that fit one or more of the following criteria: <ul style="list-style-type: none"> <li>▪ Have frequently been recorded previously in the Study Area.</li> <li>▪ Use habitat types or resources that are present in the Project Area, that are abundant and/or in good condition.</li> <li>▪ Are known to, or likely to, maintain resident populations surrounding the Project Area.</li> </ul>

	<ul style="list-style-type: none"> <li>Are known to, or likely to, visit the Project Area during regular seasonal movements or migration.</li> </ul>
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The species that require further environmental risk assessment (and EPBC Act 'self-assessment') for the project are those that are listed as Threatened or Migratory and have moderate to high likelihood of occurring in the study area. **Table 5-2** lists these species and the justification for their likelihood assignment. Specifically, these species include:

- > 21 species of Migratory bird, seven of which are Threatened;
- > The Green Sawfish (*Pristis zijsron*), listed as Threatened and Migratory;
- > The Dugong (*Dugong dugon*), listed as Migratory;
- > Three Migratory species of dolphin:
  - Australia Snubfin Dolphin (*Orcaella heinsohni*);
  - Indo-pacific Humpback Dolphin (*Sousa chinensis*); and
  - Indian Ocean Bottlenose Dolphin (*Tursiops aduncus*);
- > Four species of Threatened and Migratory turtle:
  - Green Turtle (*Chelonia mydas*);
  - Hawksbill Turtle (*Eretmochelys imbricata*);
  - Olive Ridley Turtle (*Lepidochelys olivacea*); and
  - Flatback Turtle (*Natator depressus*); and
- > The Saltwater Crocodile (*Crocodylus porosus*), listed as Migratory.

Table 5-2 Species of concern with moderate to high likelihood of occurrence in the study area

Scientific name	Common name	EPBC Act	TPWC Act	Likelihood of occurrence in Study Area	Justification
<b>Birds</b>					
<i>Actitis hypoleucos</i> (M)	Common Sandpiper	-	-	High	Have frequently been recorded previously in the Study Area. Study site habitat area is suitable for the species, with known breeding grounds around the Darwin area - fly by likely to occur.
<i>Arenaria interpres</i> (M)	Ruddy Turnstone	-	-	High	Have frequently been recorded previously in the Study Area. Potential foraging area. Known breeding site (Bynoe Harbour) located south of Study Area, therefore may also fly through.
<i>Calidris acuminata</i> (M)	Sharp-tailed Sandpiper	-	-	Moderate	Have infrequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Calidris alba</i> (M)	Sanderling	-	-	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Calidris canutus</i> (T, M)	Red Knot	E	V	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the

Scientific name	Common name	EPBC Act	TPWC Act	Likelihood of occurrence in Study Area	Justification
					Project Area, opportunistically or during migration. Migration patterns may see presence of Red Knots, generally during September and October. Numbers reduce in December.
<i>Calidris ferruginea</i> (T, M)	Curlew Sandpiper	C	V	Moderate	Have infrequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Calidris melanotos</i> (M)	Pectoral Sandpiper	-	-	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Calidris tenuirostris</i> (T, M)	Great Knot	C	V	Moderate	Have infrequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Charadrius leschenaultia</i> (T, M)	Greater Sand Plover, Larger Sand Plover	V	V	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Charadrius mongolus</i> (T, M)	Lesser Sand Plover, Mongolian Plover	E	V	High	Have frequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Charadrius veredus</i> (M)	Oriental Plover, Oriental Dotterel	-	-	Moderate	Have infrequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Fregata ariel</i> (M)	Lesser Frigatebird, Least Frigatebird	-	-	Moderate	Have infrequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Hirundo rustica</i> (M)	Barn Swallow	-	-	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.

Scientific name	Common name	EPBC Act	TPWC Act	Likelihood of occurrence in Study Area	Justification
<i>Limosa lapponica baueri</i> (M)	Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed	V	V	Moderate	Have infrequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Limosa limosa</i> (M)	Black-tailed Godwit	-	-	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Numenius madagascariensis</i> (T, M)	Eastern Curlew, Far Eastern Curlew	C	V	High	Have frequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Numenius phaeopus</i> (M)	Whimbrel	-	-	High	Have frequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Pandion haliaetus</i> (M)	Osprey	-	-	Moderate	Species and habitat known Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Pluvialis squatarola</i> (M)	Grey Plover	-	-	Moderate	Have infrequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Sternula albifrons</i> (M)	Little Tern	-	-	Moderate	Have infrequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Tringa nebularia</i> (M)	Common Greenshank, Greenshank	-	-	High	Have frequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<b>Fish, Sharks &amp; Rays</b>					
<i>Pristis zijsron</i> (T, M)	Green Sawfish, Dindagubba,	V	V	Moderate	Are unlikely to maintain sedentary populations, however may

Scientific name	Common name	EPBC Act	TPWC Act	Likelihood of occurrence in Study Area	Justification
	Narrowsnout Sawfish				seasonally use resources within the Project Area, opportunistically or during migration.
<b>Mammals and Cetaceans</b>					
<i>Dugong dugon (M)</i>	Dugong	-	-	Moderate	Have infrequently been recorded previously in the Study Area. Potential for dugongs to be foraging or passing through the study site is likely. Transient, has the potential to swim through the Study Locality, albeit widespread. Known species habitat present in Study area.
<i>Orcaella heinsohni / brevirostris (M)</i>	Australian Snubfin Dolphin, Irrawaddy Dolphin	-	-	Moderate	Have infrequently been recorded previously in the Study Area. Transient, has the potential to swim through the Study Locality, albeit widespread.
<i>Sousa chinensis (M)</i>	Indo-Pacific Humpback Dolphin	-	-	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration. Transient, has the potential to swim through the Study Locality, albeit widespread.
<i>Tursiops aduncus (M, C)</i>	Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin	-	-	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration. Transient, has the potential to swim through the Study Locality, albeit widespread.
<b>Reptiles</b>					
<i>Chelonia mydas (T, M)</i>	Green Turtle	V	-	Moderate	Use specific habitats or resources present in the Study Area. Therefore, potential for foraging.
<i>Crocodylus porosus (M)</i>	Salt-water Crocodile, Estuarine Crocodile	-	LC		Known to inhabit surrounding area of study site. However, capture and removal of any entering Darwin Harbour occurs regularly.
<i>Eretmochelys imbricata (T, M)</i>	Hawksbill Turtle	V	V	Moderate	Have infrequently been recorded previously in the Study Area. Use specific habitats or resources present in the Project Area, but in a poor or modified condition. May seasonally use resources within the Project Area, opportunistically or during migration.
<i>Lepidochelys olivacea (T, M)</i>	Olive Ridley Turtle, Pacific Ridley Turtle	E	V	Moderate	Have infrequently been recorded previously in the Study Area. Use specific habitats or resources present in the Project Area, but in a poor or modified condition.

Scientific name	Common name	EPBC Act	TPWC Act	Likelihood of occurrence in Study Area	Justification
					May seasonally use resources within the Project Area, opportunistically or during migration.
<i>Natator depressus</i> (T, M)	Flatback Turtle	V	DD	Moderate	Have infrequently been recorded previously in the Study Area. Use specific habitats or resources present in the Project Area, but in a poor or modified condition. May seasonally use resources within the Project Area, opportunistically or during migration.

**Key:**

C = Critically endangered, DD = Data deficient, E = Endangered, LC = Least concern, N = Near Threatened, V = Vulnerable, EPBC Act: M = Migratory, T = Threatened

Potential impacts to marine fauna from the project include:

- > Loss of habitat and foraging;
- > Underwater noise impacts;
- > Direct impact/collision from vessel plant and equipment; and
- > Impacts of turbid water (dermal contact and ingestion).

The environmental risk of these impacts should be assessed by combining their consequence with the likelihood of presence and associated behaviour of the respective marine fauna. Appropriate mitigation measures should then be put in place to mitigate and/or minimise environmental impacts.

### 5.3 Marine Environmental Quality

Recommendations regarding marine environmental quality, associated with sediment chemistry, are outlined in the *SAP Implementation Report* (Cardno, 2022h). Impacts to marine environmental quality associated with dredge plume dispersion and sedimentation are outlined in the *Sediment Transport Report* (Cardno, 2022g).

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APPENDIX

A

DATABASE SEARCH RECORDS

## Darwin Harbour

### Location and Description

Darwin Harbour is a large indented embayment with three main arms – East, Middle and West. Two major rivers, the Elizabeth and Darwin Rivers drain into the Harbour and the city of Darwin is located on the north-eastern shore. The shoreline is dominated by mangroves, which largely remain in undisturbed condition and the Site contains more than 5% of the Northern Territory's entire mangrove area. 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 coastal and mangrove environments are backed by savanna woodlands and patches of monsoon rainforest.

### Tenure and Land Use

The Darwin Harbour Site, especially its west and south-west portions, is predominantly vacant Crown land. The remainder is mostly freehold land associated with the cities of Darwin and Palmerston. The land uses within the Site are many and varied - the freehold portions support a mix of commercial, residential and industrial land uses. The Harbour has port facilities and supports tourism, recreation and aquaculture. Approximately 3% of the Site is managed as conservation reserves.

### Significance Rating

International Significance

### Ecological Values

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 Northern Territory. 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). The Harbour itself supports a diverse range of marine species including dugongs, dolphins, marine turtles and a large variety of fish. A total of 15 threatened species are reported from within the Site.

### Management Issues

Future urban and industrial developments around Darwin Harbour represent a major management issue for this Site. The north-eastern part of Darwin Harbour catchment is already highly developed and native vegetation and tidal flats have been cleared and drained. Further major industrial developments around Middle Arm are currently



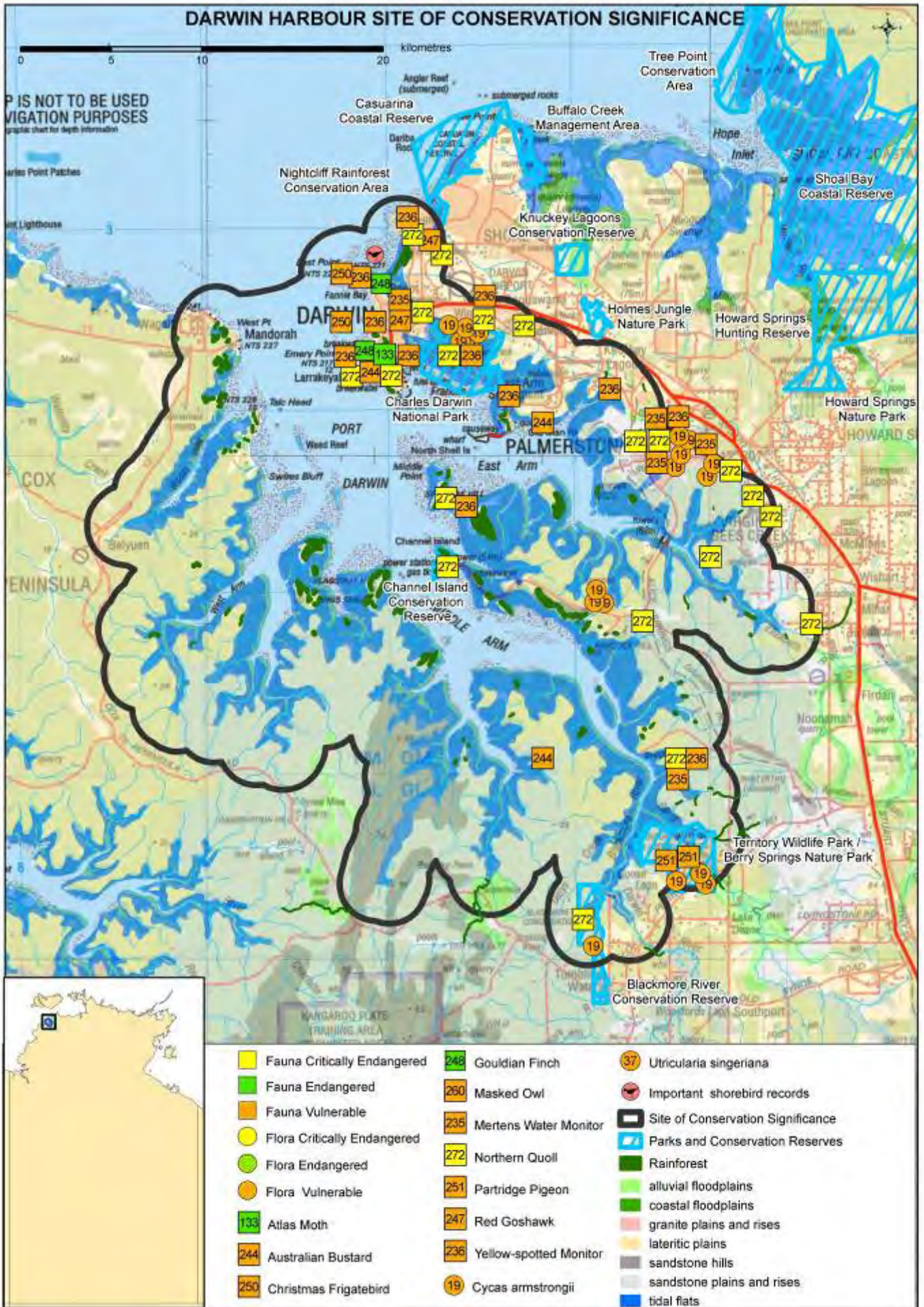
being considered. Water pollution from run-off and industry and sea-level rise will also potentially affect the Harbour environment.

### Condition

In comparison with marine areas near other major cities, Darwin Harbour is in good condition. However, a range of human activities do impact on the marine and coastal environments and these are likely to intensify in future years.

### Current Conservation Initiatives

A regional plan of management has been developed for Darwin Harbour and its catchment area, and priority actions are being implemented. Ecosystem monitoring and research groups have been established to direct strategic research and co-ordinate monitoring activities within the Harbour.



DARWIN HARBOUR - SITE OF CONSERVATION SIGNIFICANCE

LOCATION	<b>SOCS Number</b>	6 (NT Parks and Conservation Masterplan Map Number 12)
	<b>Latitude/Longitude</b>	12° 34' South, 130° 52' East (at centre)
	<b>Bioregion</b>	Darwin Coastal (98%), Pine Creek (2%)
	<b>Description</b>	<p>The site includes the tidal flats (222 km<sup>2</sup>) within the Harbour from East Point around to West Point (including the major sub-embayments of East Arm, Middle Arm, West Arm, Woods Inlet, Frances Bay and Fannie Bay) and a buffering terrestrial area (527 km<sup>2</sup>). Sub-tidal waters of the Harbour are not included in this assessment.</p> <p>The rivers that flow into the Harbour (including the Darwin, Blackmore and Elizabeth Rivers and Berry Creek) have small catchments and lack the large floodplains and freshwater wetlands that characterise many other coastal areas around the Top End. Much of the area behind the extensive tidal flats in this site is high ground forested with woodland rather than wetlands (Darwin Harbour Advisory Committee 2003).</p> <p>The extensive tidal flats associated with nearby Shoal Bay and the sand sheets of the Howard River are also recognised as sites of high conservation significance in the NT.</p>
THREATENED SPECIES	<b>Significance Rating</b>	<b>International Significance</b>
	<b>Threatened plants and animals</b> (Listings at National/NT level <b>CR</b> - Critically Endangered, <b>EN</b> - Endangered, <b>VU</b> - Vulnerable, <b>NT</b> - Near Threatened, <b>LC</b> - Least Concern, <b>DD</b> - Data Deficient)	<p>15 threatened species are reported from this site.</p> <p><b>Plants</b></p> <ul style="list-style-type: none"> <li>▪ <i>Cycas armstrongii</i> (-/VU)</li> <li>▪ <i>Utricularia singeriana</i> (-/VU)</li> </ul> <p><b>Vertebrates</b></p> <ul style="list-style-type: none"> <li>▪ Australian Bustard <i>Ardeotis australis</i> (-/VU)</li> <li>▪ Christmas Frigatebird <i>Fregata andrewsi</i> (VU/-)</li> <li>▪ Gouldian Finch <i>Erythrura gouldiae</i> (EN/EN)</li> <li>▪ Masked Owl <i>Tyto novaehollandiae kimberlii</i> (VU/VU)</li> <li>▪ Partridge Pigeon <i>Geophaps smithii</i> (VU/VU)</li> <li>▪ Red Goshawk <i>Erythrotriorchis radiatus</i> (VU/VU)</li> <li>▪ Northern Quoll <i>Dasyurus hallucatus</i> (EN/CR)</li> <li>▪ Merten's Water Monitor <i>Varanus mertensi</i> (-/VU)</li> <li>▪ Yellow-spotted Monitor <i>Varanus panoptes</i> (-/VU)</li> <li>▪ Flatback Turtle <i>Natator depressus</i> (VU/DD)</li> <li>▪ Green Turtle <i>Chelonia mydas</i> (VU/LC)</li> <li>▪ Hawksbill Turtle <i>Eretmochelys imbricata</i> (VU/-)</li> </ul> <p><b>Invertebrates</b></p> <ul style="list-style-type: none"> <li>▪ Atlas Moth <i>Attacus wardi</i> (-/EN)</li> </ul> <p>There are only historic records of <i>Utricularia singeriana</i> and the Atlas Moth from this site, and suitable habitat may no longer be present.</p>
ENDEMIC SPECIES	<b>Significance Rating</b>	<b>Not Significant</b>
	<b>Notes</b>	<p><b>Endemic to the bioregion:</b> One vertebrate (<i>Ramphotyphlops nema</i>) and two plant species (<i>Spermacoce phalloides</i>, <i>Typhonium praetermissum</i>) recorded in this site are NT endemics and are only known from the Darwin Coastal bioregion.</p> <p><b>Endemic to the NT:</b> 77 plant and 12 vertebrate species recorded in the site are only known from the NT.</p> <p><b>Other:</b> 12 plant and one vertebrate species (Lewin's Rail) are only known from the site or the Darwin Coastal bioregion within the NT, but are also found in other states. There is a collection of records of vagrant bird species from Darwin Harbour/Shoal Bay that have not been recorded elsewhere in the NT.</p>
WILDLIFE AGGREGATIONS	<b>Significance Rating</b>	<b>Not Significant</b>
	<b>Marine turtles</b>	Flatback, Hawksbill, and Green Turtles frequent the waters of Darwin Harbour but the lack of sandy beaches within the Harbour inhibits nesting activity.
	<b>Seabirds</b>	Significant aggregations of seabirds are not known from this site (Chatto 2001).
	<b>Waterbirds</b>	This site lacks a large area of freshwater wetland and supports relatively low numbers of waterbirds (Chatto 2006).
	<b>Shorebirds</b>	Although large areas of mudflats occur around Darwin Harbour during periods of low tide, high numbers of shorebirds have not been recorded. The highest count is 3000 individuals in 1994 (Chatto 2003).
WETLANDS	<b>Other aggregations</b>	None known
	<b>Significance Rating</b>	<b>National Significance</b>
	<b>Ramsar criteria met</b>	Not assessed
	<b>DIWA criteria met</b>	Darwin Harbour is listed as a wetland of national significance in the Directory of Important Wetlands in Australia (DIWA: NT029 Port Darwin). The site meets criteria 1, 2, 3, 4, 5, 6 and includes wetland types: A1, A2, A3, A6, A7, and A9.
<b>Notes</b>	<p>Darwin Harbour is a good example of a shallow branching embayment of the Top End Region, supporting one of the largest discrete areas of mangrove swamp in the NT (DIWA).</p> <p>Within the Darwin Harbour catchment there are series of ponding systems (Dambos) that may play an important role in filtering organic material before it is delivered to the harbour. Many of these are not included within the current boundary of the site (R. Wasson, Charles Darwin University, pers. comm.).</p>	

DARWIN HARBOUR - SITE OF CONSERVATION SIGNIFICANCE

	<b>Rivers</b>	The Darwin, Blackmore and Elizabeth Rivers and Berry Creek flow into Darwin Harbour. All are relatively small Top End rivers.
<b>FLORA</b>	<b>Significance Rating</b>	<b>National Significance</b>
	<b>Notes</b>	<p><b>Rainforest:</b> About 1150 ha of mostly dry rainforest (or 0.4% of the NT rainforest estate) occur as small patches around the margin of the tidal flats in this site. One patch is &gt;100 ha but most patches are small (&lt;10 ha) (Russell-Smith 1991).</p> <p>Large areas of rainforest or vine-thicket habitat occur within the Harbour on peninsulas or 'hinterland islands' such as Blaydin Point, Wickham Point, Flagstaff Hill and Kings Table. Fire-sensitive vine-thicket communities have become particularly well developed in these habitats due to the protection offered by the surrounding mangroves, which unlike savannah woodlands, do not burn.</p> <p><b>Other:</b> Mangroves fringe the whole embayment of Darwin Harbour and comprise one of the largest (~20 400 ha) and most floristically diverse (~41 species) areas of mangroves in the NT (Duke 2006). Mangrove communities within the Harbour have been identified and mapped by Brocklehurst and Edmeades (1996).</p>
<b>OTHER ENVIRONMENTAL VALUES</b>		<p>The mangroves of Darwin Harbour support a highly specialised fauna including over 306 invertebrate species and 112 species of mammals, bats and birds (Metcalf 2007).</p> <p>Mangroves in north-western Australia support distinctive fauna and more mangrove-endemic bird species than any other region in the world (Noske 1996). Some of the highly specialised bird species that occur in Darwin Harbour include the Mangrove Gerygone, Mangrove Robin, Mangrove Golden Whistler and Chestnut Rail.</p> <p>A group of colubrid snakes including the White-bellied Mangrove Snake <i>Fordonia leucobalia</i>, are also part of the distinctive mangrove fauna found in Darwin Harbour, and compliments the wider, but poorly-known, community of sea-snakes in the area (Whiting 2003).</p> <p>In terms of faunal diversity, Darwin Harbour is one of the richest mangrove systems in the Indo-west Pacific region. Each of the eight different floristic assemblages defined in Darwin Harbour mangroves (Brocklehurst and Edmeades 1996) supports a distinctive faunal community. In particular, the most seaward assemblage, with <i>Sonneratia alba</i> dominant, is an exceptionally productive mangrove community with the highest primary productivity (Metcalf 1999) and faunal diversity and abundance of any assemblage in the harbour (Metcalf 2007).</p> <p>Eight sites around Darwin Harbour are listed on the Register of the National Estate for their natural values including: Berry Springs Nature Park, Darwin Foreshores, <i>Pachystoma pubescens</i> Sites 1 and 2, Channel Island Reefs, Imaluk Creek Area, Southport Area, and the Darwin Harbour Wetlands (Australian Heritage Council).</p> <p>80 species recorded from this site are listed under international conventions or bilateral agreements protecting migratory animals.</p> <p>Dugongs are common in the Harbour (Whiting 2004).</p> <p>The marine areas within this site are likely to encompass other significant biodiversity values and these are currently being explored and collated in a project by the Marine Biodiversity Group of NRETAS (K. Edyvane, NRETAS, pers. comm.).</p>
<b>MANAGEMENT ISSUES</b>		<p><b>Fire:</b> The current fire regime in the Darwin region differs from that in other sparsely populated savanna areas of the NT and is ad hoc and closely linked to tenure (Price and Baker 2007). The frequency of late dry season fires is lower in the Darwin region than other areas (Price and Baker 2007), but exotic grasses are increasing fuel loads and the intensity of fires (Kean and Price 2003). In the period 1993-2004, 43% of the site was burnt in fewer than three years, and 24% was burnt in more than six years.</p> <p><b>Feral animals:</b> Feral cat, dog, rat, pig and Cane Toad are present in the site. Marine pest incursions remain a concern given the proximity of Darwin Harbour to Asia (Smit 2003).</p> <p><b>Weeds:</b> Four Weeds of National Significance (<i>Lantana camara</i>, <i>Mimosa pigra</i>, <i>Salvinia molesta</i>, <i>Parkinsonia aculeata</i>), 25 declared Category A and B weeds and 12 other undeclared but problematic environmental weeds (high priority weeds: Smith 2001) are recorded from this site. The aquatic weed <i>Cabomba caroliniana</i> is reported from Darwin River (Smith 2002).</p> <p><b>Other:</b> The north-eastern part of Darwin Harbour catchment is highly developed and native vegetation and tidal flats have been cleared and drained. With the current rapid growth of the city of Darwin, further pressure is likely to come from future recreational, residential and industrial developments within the Harbour (Wightman 2006). Major industrial developments around Middle Arm are currently being considered.</p> <p>Nutrient enrichment from sewerage discharge and storm water run-off may affect mangrove communities in the Harbour (Dames and Moore 1984 in Wightman 2006).</p> <p>Despite having a macrotidal range of 7.8 m, the waters of Darwin Harbour are not particularly well flushed and recent research and modelling indicates that pollution may circulate within the upper reaches of the Harbour for considerable periods (Williams, 2006). Pollution and increased turbidity (e.g. from dredging) associated with future developments within the Harbour, may therefore affect water quality and the biodiversity values.</p> <p>The potential rise in sea level predicted in response to global climate change may affect mangrove communities in Darwin Harbour, especially in areas where coastal developments exclude the landward retreat of coastal ecosystems.</p> <p>Although mangroves are generally well adapted to the dynamic conditions at the land-sea interface, recovery from severe disturbance (e.g. storms, cyclones, clear-felling) may be very slow (Metcalf, 2007). Indeed, severely damaged mangroves may take several decades to recover and such delayed recovery times increase their vulnerability to disturbance (McGuinness 1992).</p>

DARWIN HARBOUR - SITE OF CONSERVATION SIGNIFICANCE

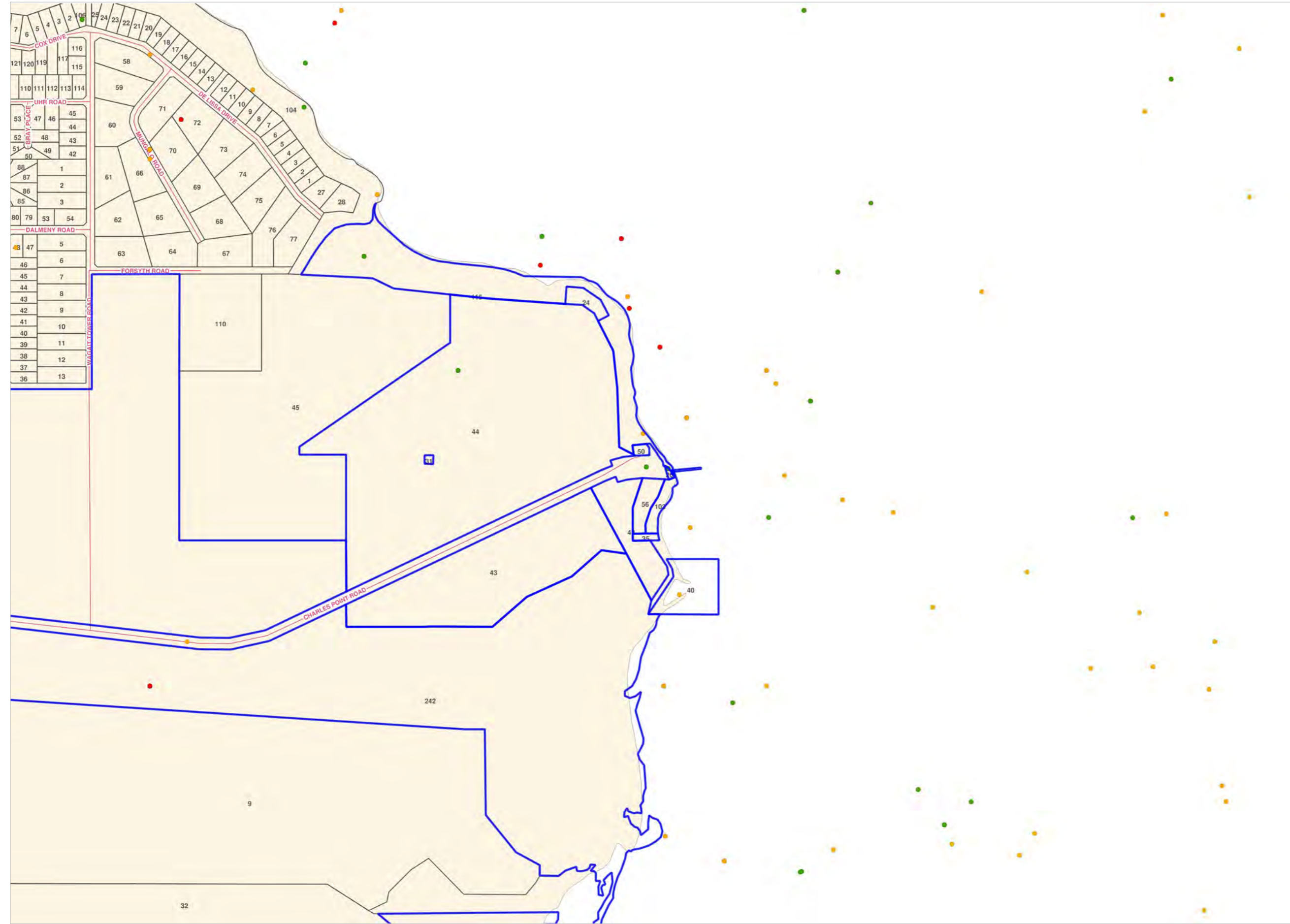
<b>MANAGEMENT INFORMATION</b>	<b>NRM groups</b>	Belyuen Land Management Group (Belyuen), Larrakia Rangers (Darwin) (Northern Land Council 2006).
	<b>Protected areas</b>	Blackmore River Conservation Reserve (4 km <sup>2</sup> / 0.6% of site), Channel Island Conservation Reserve (1 km <sup>2</sup> / 0.1% of site), Charles Darwin National Park (10 km <sup>2</sup> / 1% of site), Territory Wildlife Park/Berry Springs Nature Park (11 km <sup>2</sup> / 1% of site).
	<b>Current management plans</b>	<p><b>Site-specific plans:</b> Charles Darwin National Park Plan of Management (PWCNT undated); Darwin Harbour Regional Plan of Management (Darwin Harbour Advisory Committee 2003).</p> <p><b>National recovery plans for threatened species:</b> marine turtles (Environment Australia 2003); Northern Quoll (Hill and Ward in prep.); Partridge Pigeon and Masked Owl (Woinarski 2004a), Gouldian Finch (O'Malley 2006); Red Goshawk (Baker-Gabb in prep.).</p> <p><b>Other management plans:</b> Australian Weeds Strategy (NRMCC 2007); Threat Abatement Plan for Predation by Feral Cats (Environment Australia, 1999); Threat Abatement Plan for Predation, habitat degradation, competition and disease transmission by feral pigs (DEH 2005); FIREPLAN: Fire management for the savanna community (Russell-Smith <i>et al.</i> in prep.).</p>
<b>KEY REFERENCES</b>	<b>Monitoring programs and research projects</b>	<p>Fire in the tropical savannas is mapped continuously under the North Australia Fire Information Project <a href="http://www.firenorth.org.au/nafi/app/init.jsp">http://www.firenorth.org.au/nafi/app/init.jsp</a></p> <p>Numerous programs and sites exist for monitoring water quality and ecological condition within the Darwin Harbour catchment area and a summary of them is reported by the Darwin Harbour Advisory Committee (2005).</p> <p>Fauna and vegetation are monitored at permanent sites in NT parks within the Darwin region including the Territory Wildlife Park and Charles Darwin National Park (Calnan <i>et al.</i> 2008).</p> <p>Populations of the rare ground orchid <i>Nervilia peltata</i> (D. Liddle, NRETAS unpubl.) and <i>Cycas armstrongii</i> (Liddle 2004) are monitored under different fire regimes at permanent plots in Charles Darwin National Park.</p> <p>There is an ongoing program of monitoring and removal of Saltwater Crocodiles from within Darwin Harbour and Shoal Bay (Nichols and Letnic in press).</p> <p>Dolphins are surveyed monthly along transects within Darwin Harbour and Shoal Bay (C. Palmer, NRETAS unpubl.).</p> <p>Research on the biodiversity of mangrove habitats in Darwin Harbour involving surveys of vertebrate and invertebrate fauna in disturbed and undisturbed mangroves was conducted from 1999-2002 (Metcalf 2007). The methodology developed has since been applied for mangrove monitoring purposes.</p> <p>A two year study of primary productivity within the eight different mangrove assemblages was conducted at eight sites in the three arms of Darwin Harbour from 1997-1999 (Metcalf 1999). Monitoring of mangrove productivity was continued for a 3<sup>rd</sup> year by DIPE.</p> <p>Recommended methodology for monitoring of flora and soils in mangrove habitats of Darwin Harbour was developed by DIPE (Moritz-Zimmeman <i>et al.</i> 2002), developed further in a research framework (Comley 2002) and later applied at the Darwin LNG plant (McHugh 2004).</p> <p>Commercial mangrove monitoring programs for aquaculture developments in Darwin Harbour including Wild River and Tiger International subsequently adopted this monitoring methodology for impact assessment purposes.</p> <p>Research on the distribution and role of Dambo wetland systems in the Darwin Harbour catchment (R. Wasson, Charles Darwin University, pers. comm.).</p> <p>Research on the use of mangrove habitats by fish in Darwin Harbour was conducted from 1998 to 2001 including development of a trophic model for the harbour (Martin 2004).</p> <p>As part of the Environmental Management Plan for the Darwin LNG Plant, Conoco Phillips established in 2002 a mangrove monitoring program at Wickham Point with matched control sites in Darwin Harbour. The monitoring program has provided over 6 years of valuable baseline data on mangrove flora and invertebrate fauna (URS 2003; Metcalfe 2005; 2006).</p>
	<b>Management recommendations</b>	<p>Continue to implement the Darwin Harbour Regional Plan of Management (NRETA 2005).</p> <p>Develop a fire management strategy for the Darwin region that identifies clear objectives, roles and responsibilities (Price and Baker 2007).</p> <p>Prevent the spread of exotic grasses, especially mission grasses and gamba grass, into new areas in the Darwin region and reduce populations in areas with high conservation value or where fires threaten properties (Kean and Price 2003).</p> <p>Assess the data for Darwin Harbour against Ramsar criteria and consider listing as a wetland of international significance (S. Blanch, Environment Centre NT, pers. comm.).</p> <p>Consider expanding the boundary of the site to the catchment boundary to incorporate Dambo wetland systems (R. Wasson, Charles Darwin University, pers. comm.).</p>
<b>KEY REFERENCES</b>	<b>Papers and reports</b>	<p>Darwin Harbour Advisory Committee (2003). <i>Darwin Harbour Regional Plan of Management</i>. Department of Infrastructure, Planning and Environment, Darwin.</p> <p>Darwin Harbour Advisory Committee (2005). <i>A Review of Environmental Monitoring of the Darwin Harbour Region and Recommendations for Integrated Monitoring</i>. Darwin Harbour Advisory Committee, Darwin.</p> <p>DIWA (A Directory of Important Wetlands in Australia). <i>Australian Wetlands Database</i>. Department of Environment, Water, Heritage &amp; the Arts, Canberra ACT (accessed November 2007).</p> <p>Metcalf, K. (2007). <i>The biological diversity, recovery from disturbance and rehabilitation of mangroves in Darwin Harbour</i>. PhD thesis. Charles Darwin University, Darwin.</p>
	<b>Contributors</b>	Kristin Metcalfe, Consultant Environmental Scientist, Darwin



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# NR MAPS

## Mandorah\_Fauna Atlas



### Legend

- Threatened Fauna
- Significant Fauna
- Native Fauna
- Introduced Fauna
- Waterbird Colonies (STATUS)
  - Unknown
  - Low
  - Regionally High
  - National
- Seabird Colonies (STATUS)
  - Unknown
  - Low
  - Regionally High
  - National
  - International



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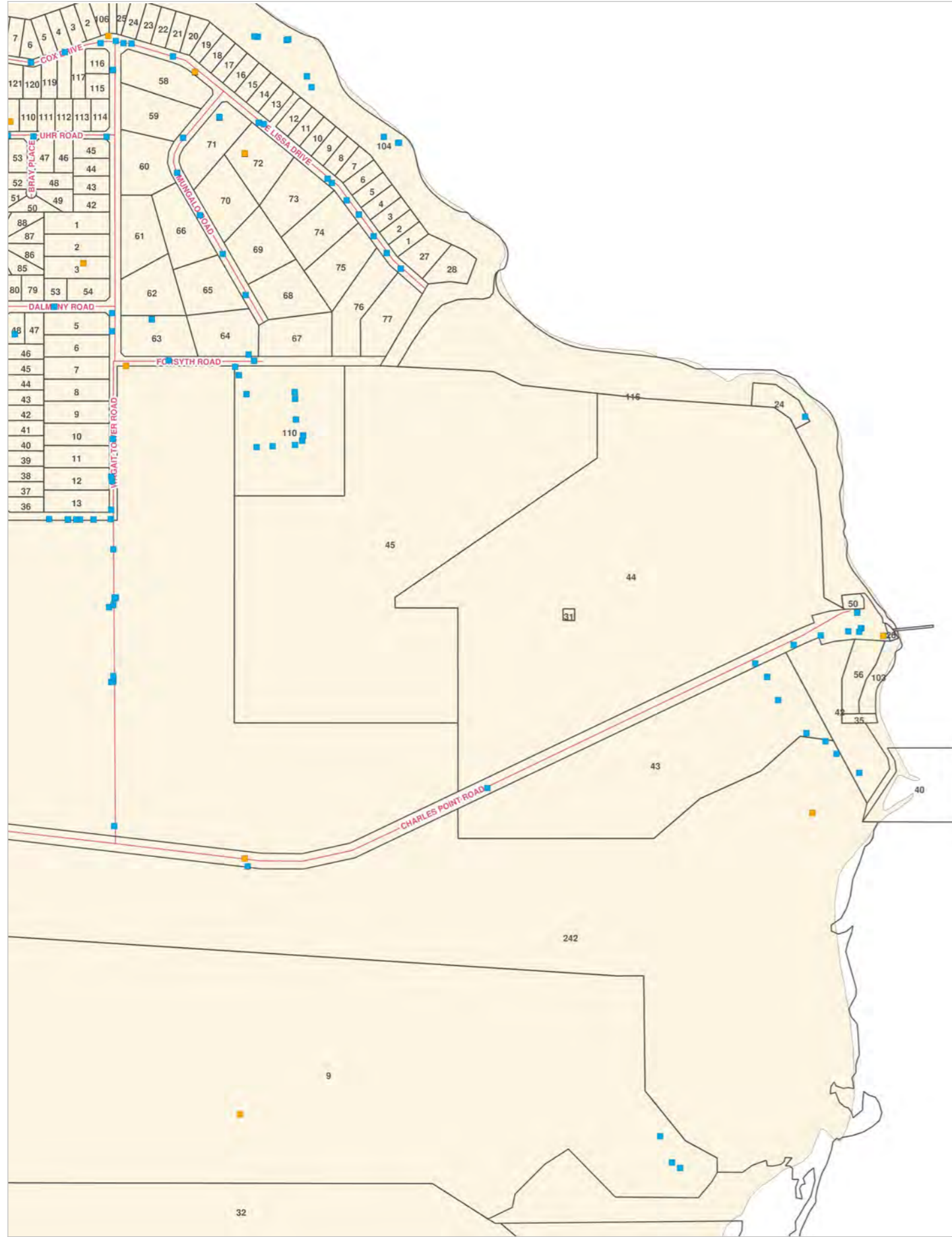
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# NR MAPS

## Mandorah\_Flora Atlas



### Legend

- Threatened Flora ■
- Restricted Range Flora ■
- Significant Flora ■
- Native Flora ■
- Introduced Flora ■

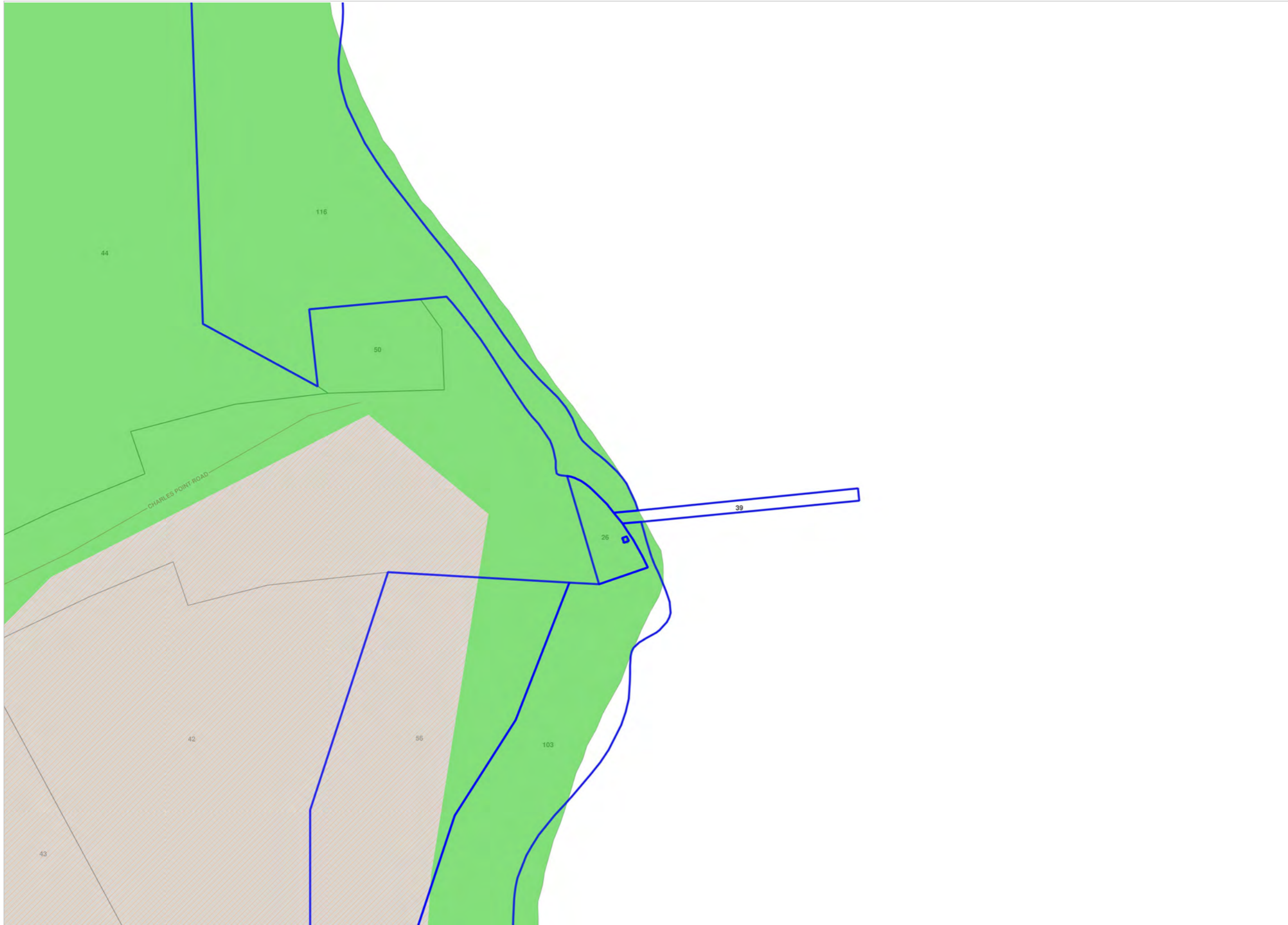


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






















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## Legend

- NVIS 2007 Level 2
-  Closed forest
  -  Mid closed forest
  -  Open forest
  -  Woodland
  -  Open woodland
  -  Open shrubland
  -  Sparse shrubland
  -  Open palmland
  -  Closed tussock grassland
  -  Tussock grassland
  -  Open tussock grassland
  -  Sparse tussock grassland
  -  Hummock grassland
  -  Open hummock grassland
  -  Forbland
  -  Sparse samphire shrubland
  -  Inland salt lake
  -  Pastoral/Horticulture/roads
  -  Plantations/roads
  -  Rural/Residential/roads
  -  Urban/Roads
  -  Unknown



Metres 20 40 60

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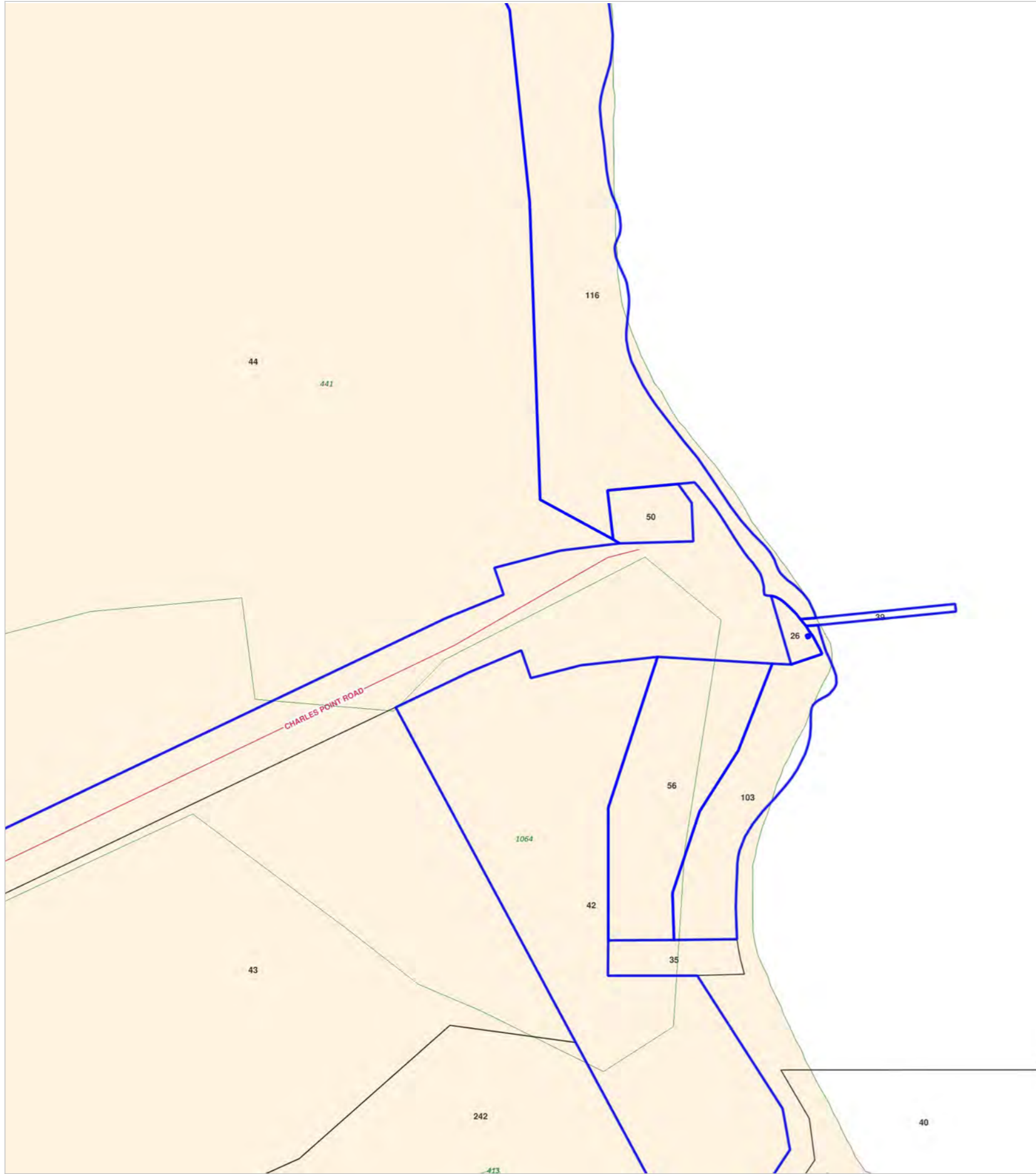
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Legend  
NVIS 2007  




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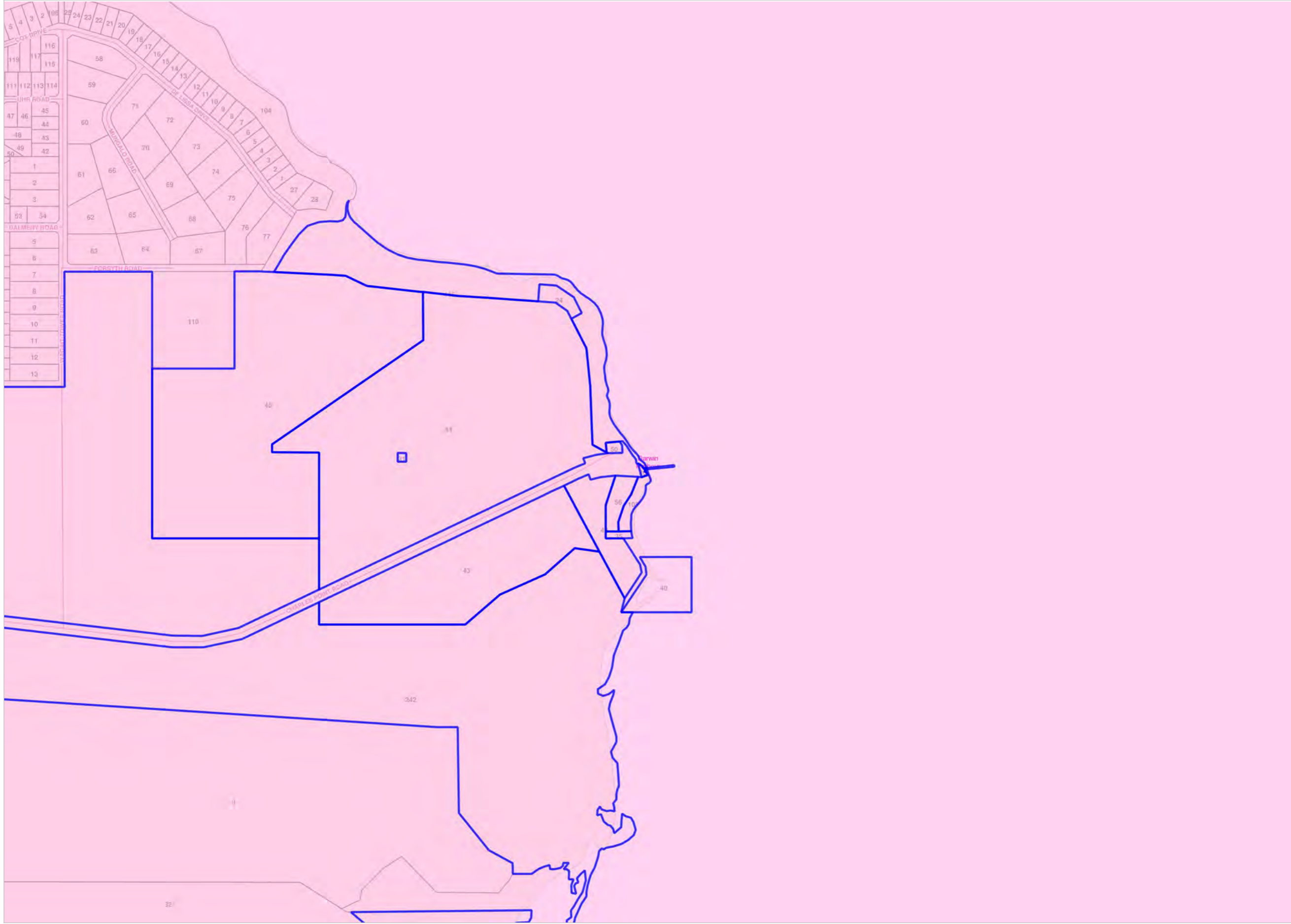
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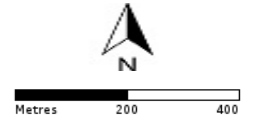
# NR MAPS

## Mandorah\_Significant Biodiversity Areas



### Legend

- Sites of Conservation Significance (Significance)
  - International
  - National
- Sites of Botanical Significance
- Directory of Important Wetlands



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# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 11/11/21 17:56:07

[Summary](#)

[Details](#)

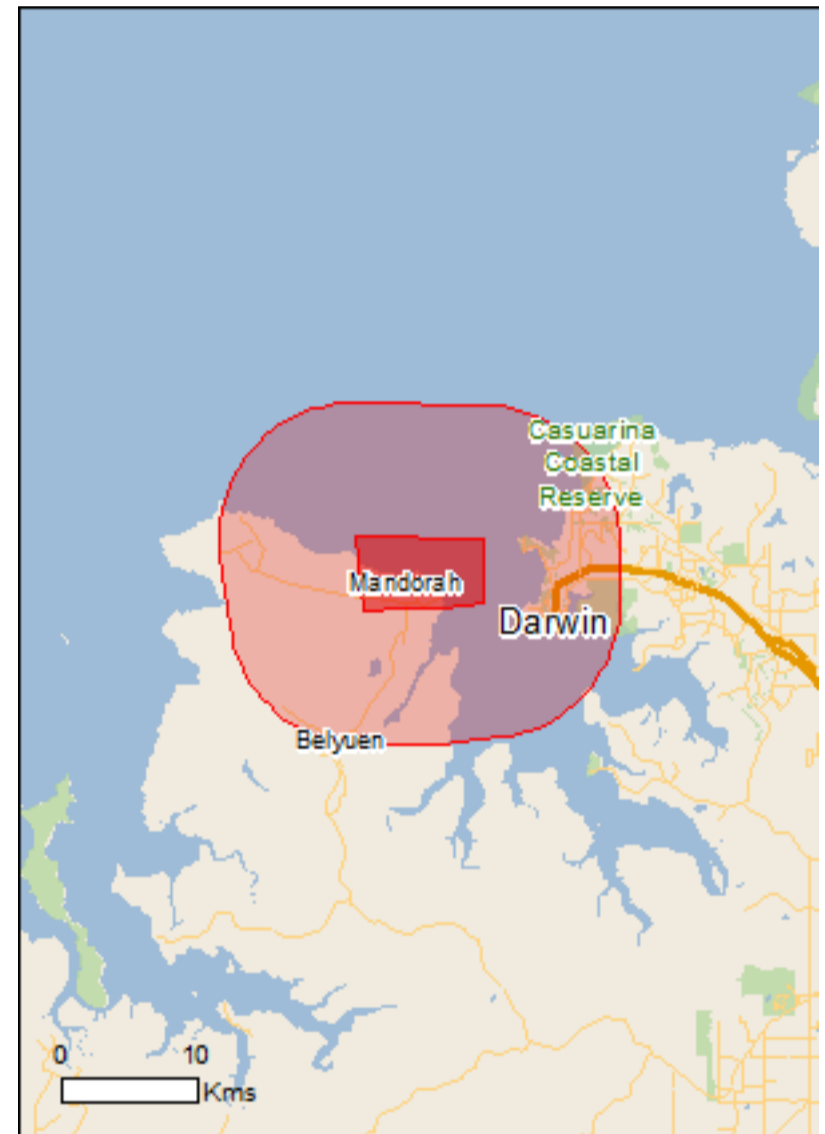
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



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[Coordinates](#)

Buffer: 10.0Km



# Summary

## Matters of National Environmental Significance

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

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	None
<a href="#">Listed Threatened Species:</a>	39
<a href="#">Listed Migratory Species:</a>	70

## Other Matters Protected by the EPBC Act

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

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

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

<a href="#">Commonwealth Land:</a>	16
<a href="#">Commonwealth Heritage Places:</a>	7
<a href="#">Listed Marine Species:</a>	109
<a href="#">Whales and Other Cetaceans:</a>	12
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	3
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	30
<a href="#">Nationally Important Wetlands:</a>	1
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

Listed Threatened Species		[ Resource Information ]
Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calidris tenuirostris</a> Great Knot [862]	Critically Endangered	Roosting known to occur within area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Charadrius mongolus</a> Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
<a href="#">Erythrotriorchis radiatus</a> Red Goshawk [942]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Erythrura gouldiae</a> Gouldian Finch [413]	Endangered	Species or species habitat known to occur within area
<a href="#">Falco hypoleucos</a> Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Geophaps smithii smithii</a> Partridge Pigeon (eastern) [64441]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Limosa lapponica baueri</a> Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
<a href="#">Tyto novaehollandiae kimberli</a> Masked Owl (northern) [26048]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
<b>Mammals</b>		
<a href="#">Antechinus bellus</a> Fawn Antechinus [344]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat may occur within area
<a href="#">Conilurus penicillatus</a> Brush-tailed Rabbit-rat, Brush-tailed Tree-rat, Pakooma [132]	Vulnerable	Species or species habitat may occur within area
<a href="#">Dasyurus hallucatus</a> Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
<a href="#">Macroderma gigas</a> Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat may occur within area
<a href="#">Mesembriomys gouldii gouldii</a> Black-footed Tree-rat (Kimberley and mainland Northern Territory), Djintamoonga, Manbul [87618]	Endangered	Species or species habitat known to occur within area
<a href="#">Petrogale concinna canescens</a> Nabarlek (Top End) [87606]	Endangered	Species or species habitat likely to occur within area
<a href="#">Phascogale pirata</a> Northern Brush-tailed Phascogale [82954]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Saccolaimus saccolaimus nudicluniatus</a> Bare-rumped Sheath-tailed Bat, Bare-rumped Sheath-tail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Trichosurus vulpecula arnhemensis</a> Northern Brushtail Possum [83091]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Xeromys myoides</a> Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat likely to occur within area
<b>Plants</b>		
<a href="#">Stylidium ensatum</a> a triggerplant [86366]	Endangered	Species or species habitat may occur within area
<b>Reptiles</b>		
<a href="#">Acanthophsis hawkei</a> Plains Death Adder [83821]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Breeding known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Name	Status	Type of Presence
<a href="#">Lepidochelys olivacea</a> Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
<b>Sharks</b>		
<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
<a href="#">Glyphis garricki</a> Northern River Shark, New Guinea River Shark [82454]	Endangered	Species or species habitat may occur within area
<a href="#">Pristis clavata</a> Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pristis pristis</a> Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pristis zijsron</a> Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

### Listed Migratory Species [\[ Resource Information \]](#)

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat likely to occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Calonectris leucomelas</a> Streaked Shearwater [1077]		Species or species habitat known to occur within area
<a href="#">Fregata ariel</a> Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
<a href="#">Fregata minor</a> Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat known to occur within area
<a href="#">Sternula albifrons</a> Little Tern [82849]		Species or species habitat may occur within area

### Migratory Marine Species

<a href="#">Anoxypristis cuspidata</a> Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat known to occur within area
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat may occur within

Name	Threatened	Type of Presence area
<a href="#">Carcharhinus longimanus</a> Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Breeding known to occur within area
<a href="#">Crocodylus porosus</a> Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
<a href="#">Dugong dugon</a> Dugong [28]		Species or species habitat known to occur within area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Lepidochelys olivacea</a> Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area
<a href="#">Manta alfredi</a> Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
<a href="#">Manta birostris</a> Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat may occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
<a href="#">Orcaella heinsohni</a> Australian Snubfin Dolphin [81322]		Species or species habitat known to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area
<a href="#">Pristis clavata</a> Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pristis pristis</a> Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pristis zijsron</a> Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Sousa chinensis</a> Indo-Pacific Humpback Dolphin [50]		Breeding known to occur within area
<a href="#">Tursiops aduncus (Arafura/Timor Sea populations)</a> Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Cecropis daurica</a> Red-rumped Swallow [80610]		Species or species habitat known to occur within area
<a href="#">Cuculus optatus</a> Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
<a href="#">Hirundo rustica</a> Barn Swallow [662]		Species or species habitat known to occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat known to occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat known to occur within area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat known to occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Acrocephalus orientalis</a> Oriental Reed-Warbler [59570]		Species or species habitat may occur within area
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Arenaria interpres</a> Ruddy Turnstone [872]		Roosting known to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Roosting known to occur within area
<a href="#">Calidris alba</a> Sanderling [875]		Roosting known to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat known to occur within area
<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Roosting known to occur within area
<a href="#">Calidris subminuta</a> Long-toed Stint [861]		Roosting known to occur within area
<a href="#">Calidris tenuirostris</a> Great Knot [862]	Critically Endangered	Roosting known to occur within area

Name	Threatened	Type of Presence
<a href="#">Charadrius dubius</a> Little Ringed Plover [896]		Roosting known to occur within area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Charadrius mongolus</a> Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
<a href="#">Charadrius veredus</a> Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area
<a href="#">Gallinago megala</a> Swinhoe's Snipe [864]		Roosting known to occur within area
<a href="#">Gallinago stenura</a> Pin-tailed Snipe [841]		Roosting likely to occur within area
<a href="#">Glareola maldivarum</a> Oriental Pratincole [840]		Roosting known to occur within area
<a href="#">Limicola falcinellus</a> Broad-billed Sandpiper [842]		Roosting known to occur within area
<a href="#">Limnodromus semipalmatus</a> Asian Dowitcher [843]		Species or species habitat likely to occur within area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat known to occur within area
<a href="#">Limosa limosa</a> Black-tailed Godwit [845]		Roosting known to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Numenius minutus</a> Little Curlew, Little Whimbrel [848]		Roosting known to occur within area
<a href="#">Numenius phaeopus</a> Whimbrel [849]		Roosting known to occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Breeding known to occur within area
<a href="#">Pluvialis fulva</a> Pacific Golden Plover [25545]		Roosting known to occur within area
<a href="#">Pluvialis squatarola</a> Grey Plover [865]		Roosting known to occur within area
<a href="#">Tringa brevipes</a> Grey-tailed Tattler [851]		Roosting known to occur within area
<a href="#">Tringa glareola</a> Wood Sandpiper [829]		Roosting known to occur within area
<a href="#">Tringa incana</a> Wandering Tattler [831]		Roosting known to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area

Name	Threatened	Type of Presence
<a href="#">Xenus cinereus</a> Terek Sandpiper [59300]		Roosting known to occur within area

## Other Matters Protected by the EPBC Act

### Commonwealth Land [\[ Resource Information \]](#)

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

Name
Commonwealth Land -
Commonwealth Land - Australian Government Solicitor
Commonwealth Land - Department of Administrative Services
Commonwealth Land - Department of Immigration Local Government & Ethnic Affairs
Commonwealth Land - Department of Transport & Regional Development
Commonwealth Land - Deputy Crown Solicitor
Defence - AUSTRALIAN ARMY BAND - DARWIN
Defence - DARWIN RELOCATIONS CENTRE
Defence - DEFENCE FORCE CAREERS REFERENCE CENTRE
Defence - Esanda Builidng
Defence - LARRAKEYAH BARRACKS
Defence - Patrol Boat Base (DARWIN NAVAL BASE)
Defence - RAAF BASE DARWIN
Defence - STOKES HILL OIL FUEL INSTALLATION
Defence - WINNELLIE ONE
Defence - WINNELLIE TWO

### Commonwealth Heritage Places [\[ Resource Information \]](#)

Name	State	Status
<b>Historic</b>		
<a href="#">Larrakeyah Barracks Headquarters Building</a>	NT	Listed place
<a href="#">Larrakeyah Barracks Precinct</a>	NT	Listed place
<a href="#">Larrakeyah Barracks Sergeants Mess</a>	NT	Listed place
<a href="#">RAAF Base Commanding Officers Residence</a>	NT	Listed place
<a href="#">RAAF Base Precinct</a>	NT	Listed place
<a href="#">RAAF Base Tropical Housing Type 2</a>	NT	Listed place
<a href="#">RAAF Base Tropical Housing Type 3</a>	NT	Listed place

### Listed Marine Species [\[ Resource Information \]](#)

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
<b>Birds</b>		
<a href="#">Acrocephalus orientalis</a> Oriental Reed-Warbler [59570]		Species or species habitat may occur within area
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat likely to occur within area
<a href="#">Anseranas semipalmata</a> Magpie Goose [978]		Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Arenaria interpres</a> Ruddy Turnstone [872]		Roosting known to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Roosting known to occur within area
<a href="#">Calidris alba</a> Sanderling [875]		Roosting known to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat known to occur within area
<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Roosting known to occur within area
<a href="#">Calidris subminuta</a> Long-toed Stint [861]		Roosting known to occur within area
<a href="#">Calidris tenuirostris</a> Great Knot [862]	Critically Endangered	Roosting known to occur within area
<a href="#">Calonectris leucomelas</a> Streaked Shearwater [1077]		Species or species habitat known to occur within area
<a href="#">Charadrius dubius</a> Little Ringed Plover [896]		Roosting known to occur within area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Charadrius mongolus</a> Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
<a href="#">Charadrius ruficapillus</a> Red-capped Plover [881]		Roosting known to occur within area
<a href="#">Charadrius veredus</a> Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area
<a href="#">Chrysococcyx osculans</a> Black-eared Cuckoo [705]		Species or species habitat known to occur within area
<a href="#">Fregata ariel</a> Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur

Name	Threatened	Type of Presence
<a href="#">Fregata minor</a> Great Frigatebird, Greater Frigatebird [1013]		within area  Species or species habitat known to occur within area
<a href="#">Gallinago megala</a> Swinhoe's Snipe [864]		Roosting known to occur within area
<a href="#">Gallinago stenura</a> Pin-tailed Snipe [841]		Roosting likely to occur within area
<a href="#">Glareola maldivarum</a> Oriental Pratincole [840]		Roosting known to occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
<a href="#">Heteroscelus brevipes</a> Grey-tailed Tattler [59311]		Roosting known to occur within area
<a href="#">Heteroscelus incanus</a> Wandering Tattler [59547]		Roosting known to occur within area
<a href="#">Himantopus himantopus</a> Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area
<a href="#">Hirundo daurica</a> Red-rumped Swallow [59480]		Species or species habitat known to occur within area
<a href="#">Hirundo rustica</a> Barn Swallow [662]		Species or species habitat known to occur within area
<a href="#">Limicola falcinellus</a> Broad-billed Sandpiper [842]		Roosting known to occur within area
<a href="#">Limnodromus semipalmatus</a> Asian Dowitcher [843]		Species or species habitat likely to occur within area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat known to occur within area
<a href="#">Limosa limosa</a> Black-tailed Godwit [845]		Roosting known to occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat known to occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat known to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Numenius minutus</a> Little Curlew, Little Whimbrel [848]		Roosting known to occur within area
<a href="#">Numenius phaeopus</a> Whimbrel [849]		Roosting known to occur within area

Name	Threatened	Type of Presence
<a href="#">Pandion haliaetus</a> Osprey [952]		Breeding known to occur within area
<a href="#">Pluvialis fulva</a> Pacific Golden Plover [25545]		Roosting known to occur within area
<a href="#">Pluvialis squatarola</a> Grey Plover [865]		Roosting known to occur within area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat known to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
<a href="#">Sterna albifrons</a> Little Tern [813]		Species or species habitat may occur within area
<a href="#">Stiltia isabella</a> Australian Pratincole [818]		Roosting known to occur within area
<a href="#">Tringa glareola</a> Wood Sandpiper [829]		Roosting known to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
<a href="#">Xenus cinereus</a> Terek Sandpiper [59300]		Roosting known to occur within area
<b>Fish</b>		
<a href="#">Campichthys tricarinatus</a> Three-keel Pipefish [66192]		Species or species habitat may occur within area
<a href="#">Choeroichthys brachysoma</a> Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
<a href="#">Choeroichthys suillus</a> Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
<a href="#">Corythoichthys amplexus</a> Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
<a href="#">Corythoichthys flavofasciatus</a> Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
<a href="#">Corythoichthys haematopterus</a> Reef-top Pipefish [66201]		Species or species habitat may occur within area
<a href="#">Doryrhamphus excisus</a> Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
<a href="#">Doryrhamphus janssi</a> Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
<a href="#">Festucalex cinctus</a> Girdled Pipefish [66214]		Species or species habitat may occur within

Name	Threatened	Type of Presence area
<a href="#">Halicampus brocki</a> Brock's Pipefish [66219]		Species or species habitat may occur within area
<a href="#">Halicampus grayi</a> Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
<a href="#">Halicampus spinostris</a> Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
<a href="#">Haliichthys taeniophorus</a> Ribbioned Pipehorse, Ribbioned Seadragon [66226]		Species or species habitat may occur within area
<a href="#">Hippichthys cyanospilos</a> Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
<a href="#">Hippichthys parvicarinatus</a> Short-keel Pipefish, Short-keeled Pipefish [66230]		Species or species habitat may occur within area
<a href="#">Hippichthys penicillus</a> Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
<a href="#">Hippocampus histrix</a> Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
<a href="#">Hippocampus kuda</a> Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
<a href="#">Hippocampus planifrons</a> Flat-face Seahorse [66238]		Species or species habitat may occur within area
<a href="#">Hippocampus spinosissimus</a> Hedgehog Seahorse [66239]		Species or species habitat may occur within area
<a href="#">Micrognathus micronotopterus</a> Tidepool Pipefish [66255]		Species or species habitat may occur within area
<a href="#">Solegnathus hardwickii</a> Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
<a href="#">Solegnathus lettiensis</a> Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
<a href="#">Solenostomus cyanopterus</a> Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
<a href="#">Syngnathoides biaculeatus</a> Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
<a href="#">Trachyrhamphus bicoarctatus</a> Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
<a href="#">Trachyrhamphus longirostris</a> Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<b>Mammals</b>		
<a href="#">Dugong dugon</a> Dugong [28]		Species or species habitat known to occur within area
<b>Reptiles</b>		
<a href="#">Acalyptophis peronii</a> Horned Seasnake [1114]		Species or species habitat may occur within area
<a href="#">Aipysurus duboisii</a> Dubois' Seasnake [1116]		Species or species habitat may occur within area
<a href="#">Aipysurus eydouxii</a> Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
<a href="#">Aipysurus laevis</a> Olive Seasnake [1120]		Species or species habitat may occur within area
<a href="#">Astrotia stokesii</a> Stokes' Seasnake [1122]		Species or species habitat may occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Breeding known to occur within area
<a href="#">Crocodylus johnstoni</a> Freshwater Crocodile, Johnston's Crocodile, Johnstone's Crocodile [1773]		Species or species habitat may occur within area
<a href="#">Crocodylus porosus</a> Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
<a href="#">Disteira kingii</a> Spectacled Seasnake [1123]		Species or species habitat may occur within area
<a href="#">Disteira major</a> Olive-headed Seasnake [1124]		Species or species habitat may occur within area
<a href="#">Enhydrina schistosa</a> Beaked Seasnake [1126]		Species or species habitat may occur within area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Hydrelaps darwiniensis</a> Black-ringed Seasnake [1100]		Species or species habitat may occur within area
<a href="#">Hydrophis atriceps</a> Black-headed Seasnake [1101]		Species or species habitat may occur within area
<a href="#">Hydrophis coggeri</a> Slender-necked Seasnake [25925]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Hydrophis elegans</a> Elegant Seasnake [1104]		Species or species habitat may occur within area
<a href="#">Hydrophis inornatus</a> Plain Seasnake [1107]		Species or species habitat may occur within area
<a href="#">Hydrophis mcdowelli</a> null [25926]		Species or species habitat may occur within area
<a href="#">Hydrophis ornatus</a> Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
<a href="#">Hydrophis pacificus</a> Large-headed Seasnake, Pacific Seasnake [1112]		Species or species habitat may occur within area
<a href="#">Lapemis hardwickii</a> Spine-bellied Seasnake [1113]		Species or species habitat may occur within area
<a href="#">Lepidochelys olivacea</a> Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
<a href="#">Parahydrophis mertoni</a> Northern Mangrove Seasnake [1090]		Species or species habitat may occur within area
<a href="#">Pelamis platurus</a> Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

## Whales and other Cetaceans

[ [Resource Information](#) ]

Name	Status	Type of Presence
<b>Mammals</b>		
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat may occur within area
<a href="#">Delphinus delphis</a> Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
<a href="#">Grampus griseus</a> Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat may occur within area
<a href="#">Orcaella brevirostris</a> Irrawaddy Dolphin [45]		Species or species habitat known to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area
<a href="#">Sousa chinensis</a> Indo-Pacific Humpback Dolphin [50]		Breeding known to occur within area

Name	Status	Type of Presence
<a href="#">Stenella attenuata</a> Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
<a href="#">Tursiops aduncus</a> Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
<a href="#">Tursiops aduncus (Arafura/Timor Sea populations)</a> Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
<a href="#">Tursiops truncatus s. str.</a> Bottlenose Dolphin [68417]		Species or species habitat may occur within area

## Extra Information

State and Territory Reserves	[ Resource Information ]
Name	State
Casuarina	NT
Charles Darwin	NT
George Brown Darwin	NT

Invasive Species	[ Resource Information ]
Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.	

Name	Status	Type of Presence
<b>Birds</b>		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
<b>Frogs</b>		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
<b>Mammals</b>		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Bubalus bubalis Water Buffalo, Swamp Buffalo [1]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
<b>Plants</b>		
Andropogon gayanus Gamba Grass [66895]		Species or species habitat likely to occur within area
Annona glabra Pond Apple, Pond-apple Tree, Alligator Apple, Bullock's Heart, Cherimoya, Monkey Apple, Bobwood, Corkwood [6311]		Species or species habitat may occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Mimosa pigra Mimosa, Giant Mimosa, Giant Sensitive Plant, Thorny Sensitive Plant, Black Mimosa, Catclaw Mimosa, Bashful Plant [11223]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Pennisetum polystachyon Mission Grass, Perennial Mission Grass, Missiongrass, Feathery Pennisetum, Feather Pennisetum, Thin Napier Grass, West Indian Pennisetum, Blue Buffel Grass [21194] Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area  Species or species habitat likely to occur within area

### Reptiles

Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Lepidodactylus lugubris Mourning Gecko [1712]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat known to occur within area

### Nationally Important Wetlands

[ Resource Information ]

Name	State
<a href="#">Port Darwin</a>	NT

# Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

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

# Coordinates

-12.451737 130.713912,-12.40463 130.707389,-12.406475 130.79322,-12.447546 130.793907,-12.450563 130.767299,-12.451737 130.713912

# Acknowledgements

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

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

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

Please feel free to provide feedback via the [Contact Us](#) page.

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APPENDIX

# B

BCH SURVEY RESULTS

Site: 001  
UTM: 692212.921E, 8623379.717N (Zone 52)

Depth: 4.78m

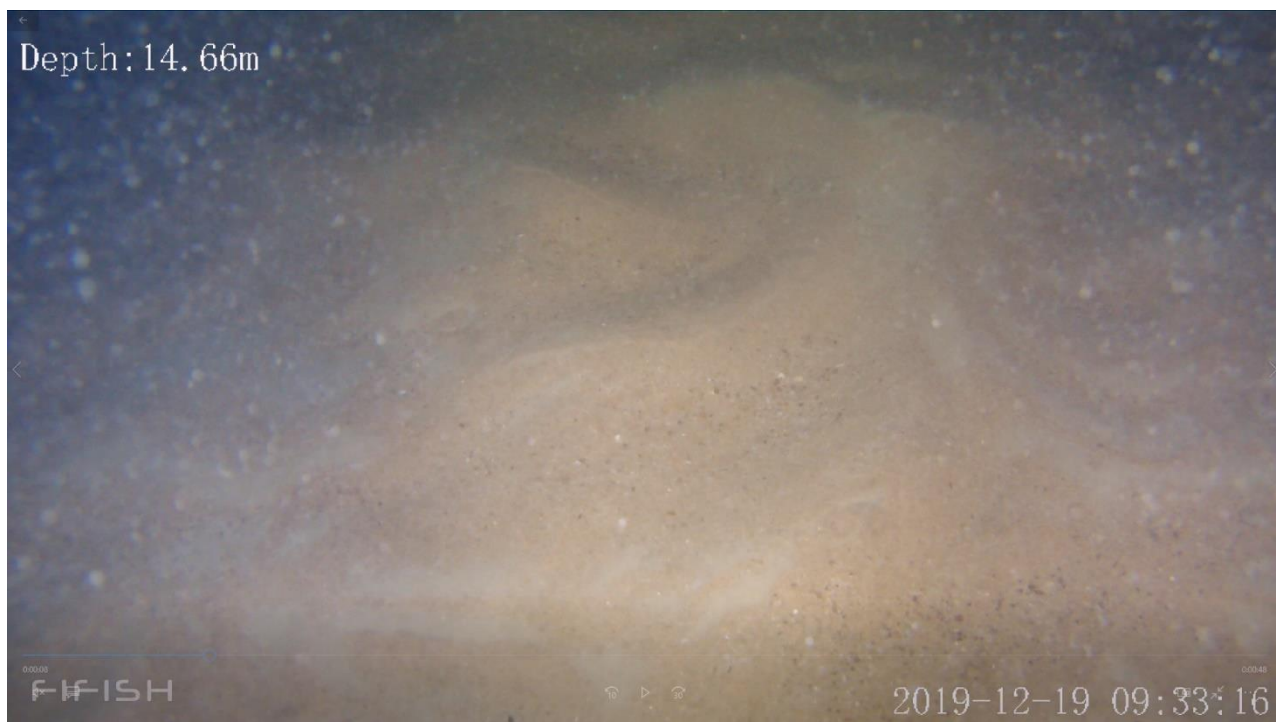


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2019-12-19 09:29:45

Site: 002  
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Depth: 14.66m



FIFISH

2019-12-19 09:33:16

Site: 003  
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Depth: 15.72m

FIFISH

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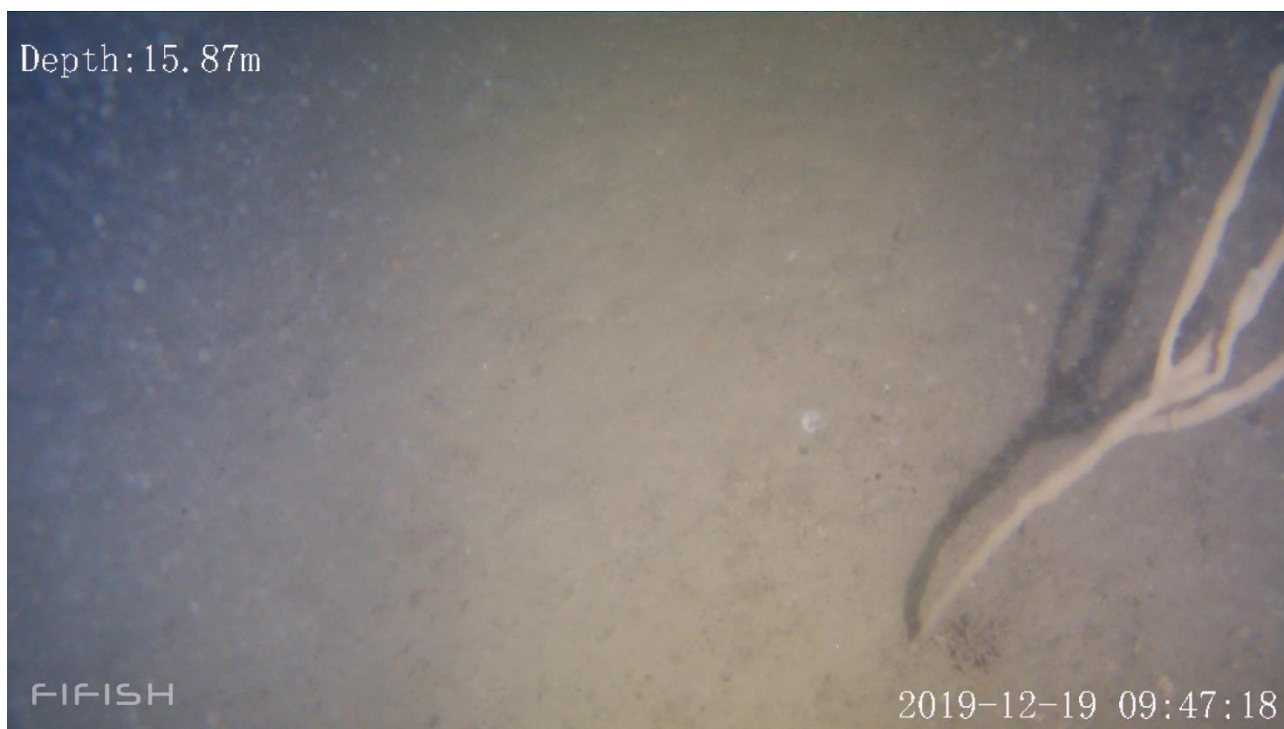
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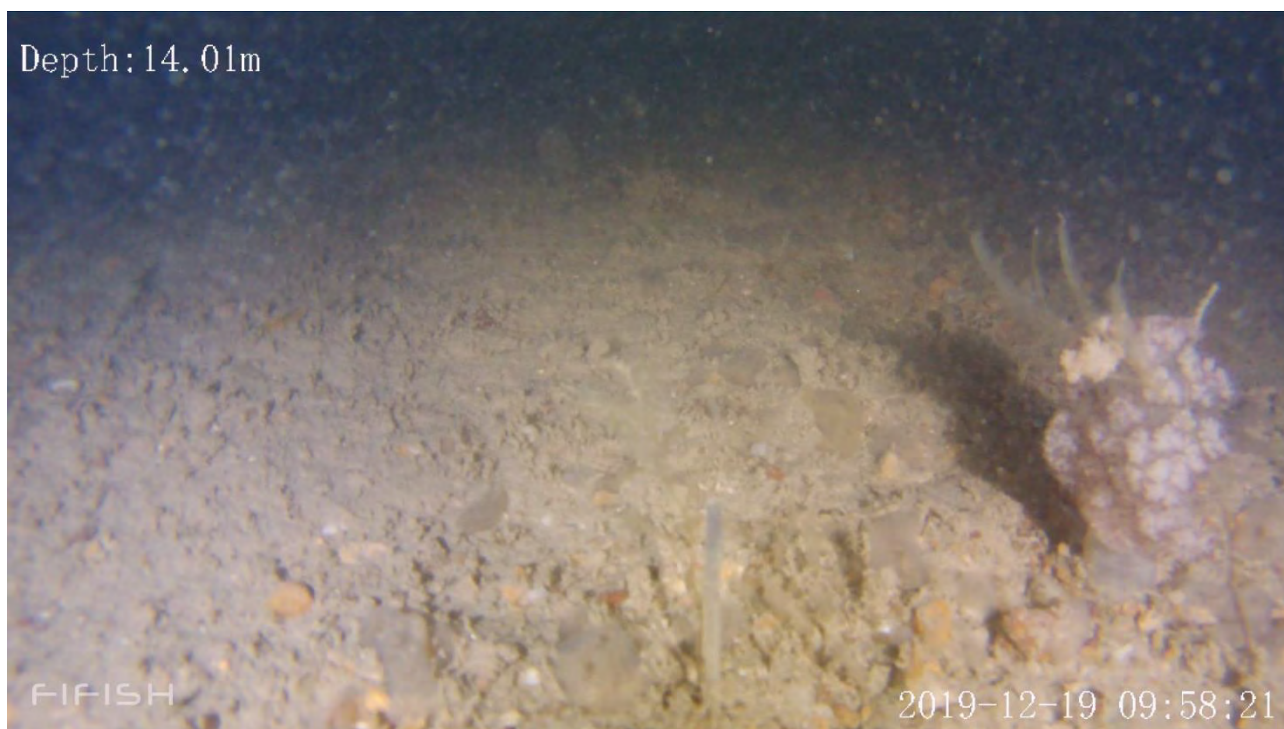
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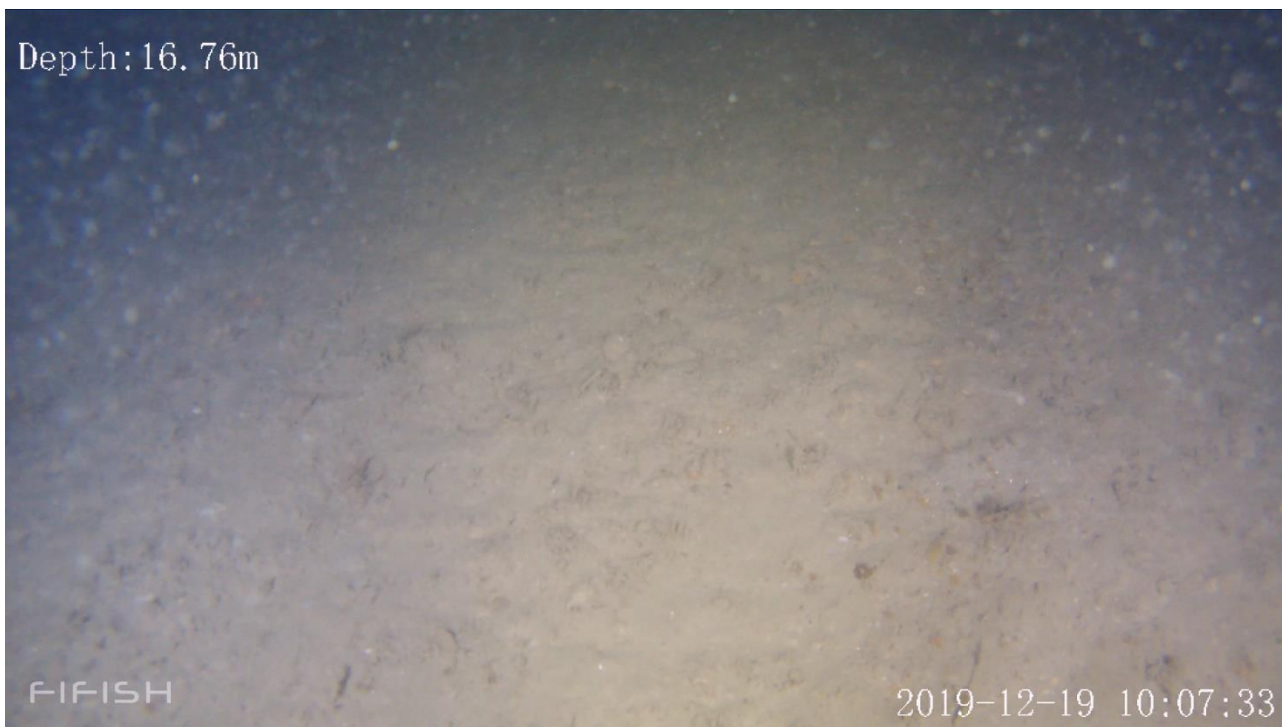


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Site: 009  
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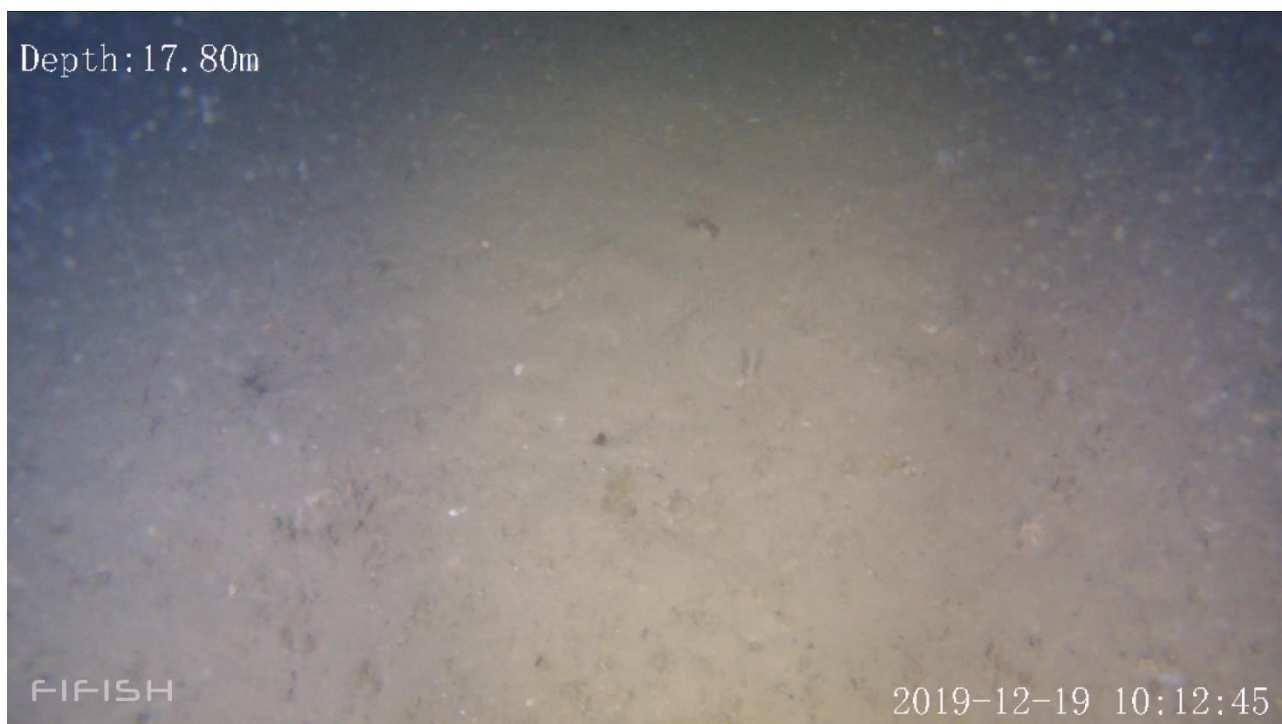


FIFISH

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Depth: 17.80m



FIFISH

2019-12-19 10:12:45

Site: 011  
UTM: 692394.475E, 8623457.981N (Zone 52)

Depth: 16.51m



Site:012  
UTM: 692322.4E, 8623464.73N (Zone 52)

Depth: 15.63m



Site: 013  
UTM: 692253.18E, 8623465.744N (Zone 52)

Depth: 11.71m



Site:014  
UTM: 692200.799E, 8623464.802N (Zone 52)

Depth: 4.79m



Site: 015  
UTM: 692132.493E, 8623466.178N (Zone 52)

Depth: 3.20m

FIFISH

2019-12-19 10:31:47

Site: 016  
UTM: 692112.263E, 8623558.324N (Zone 52)

Depth: 2.94m

FIFISH

2019-12-19 10:35:22

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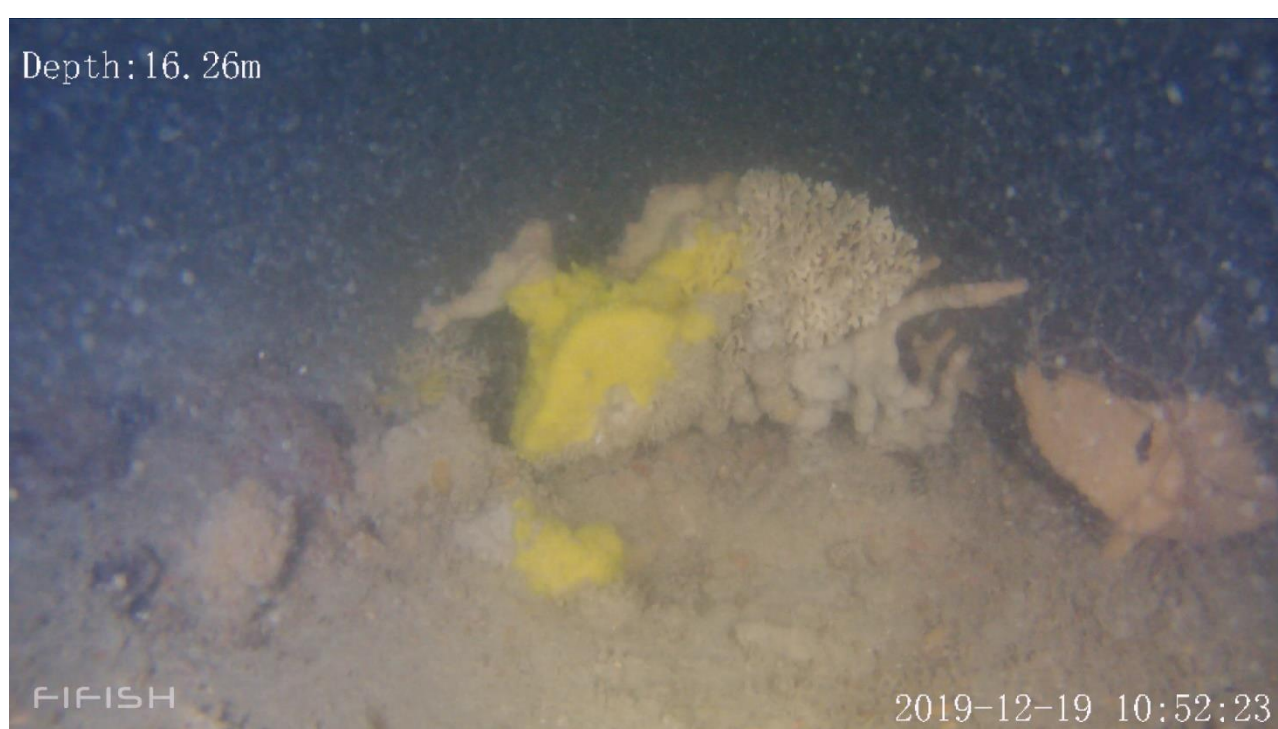
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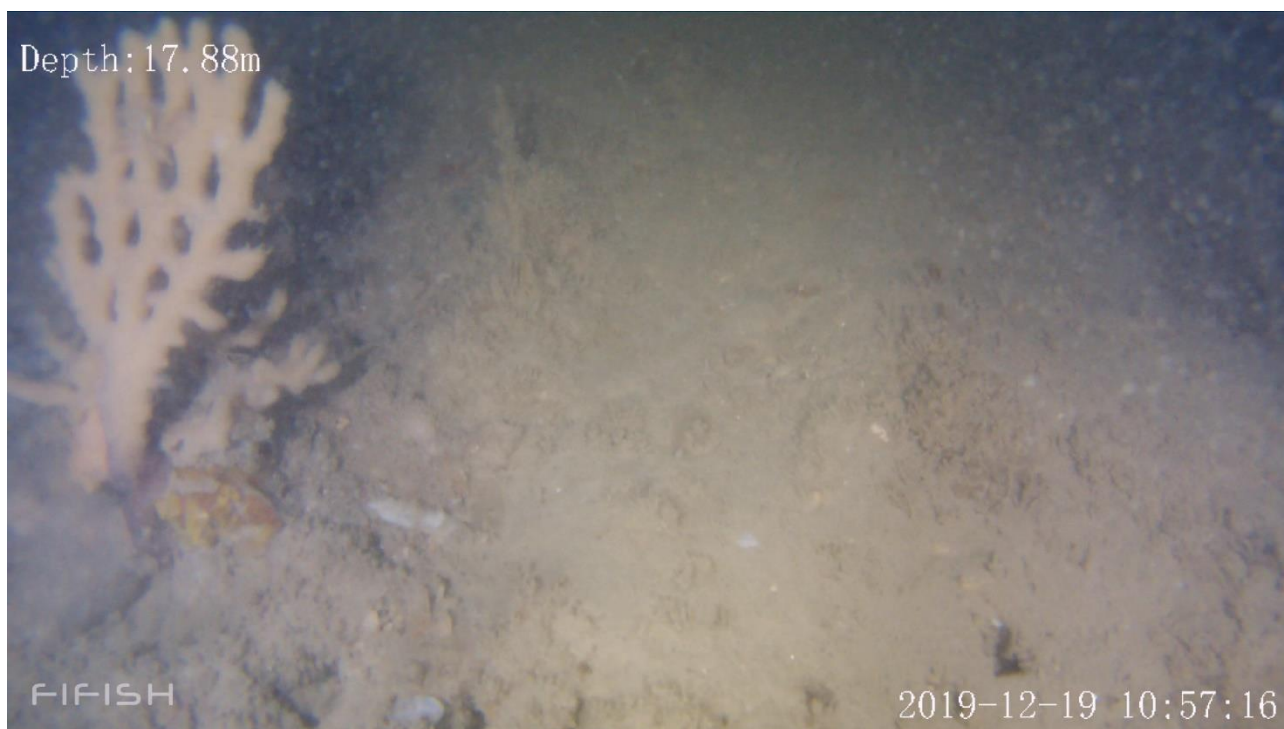
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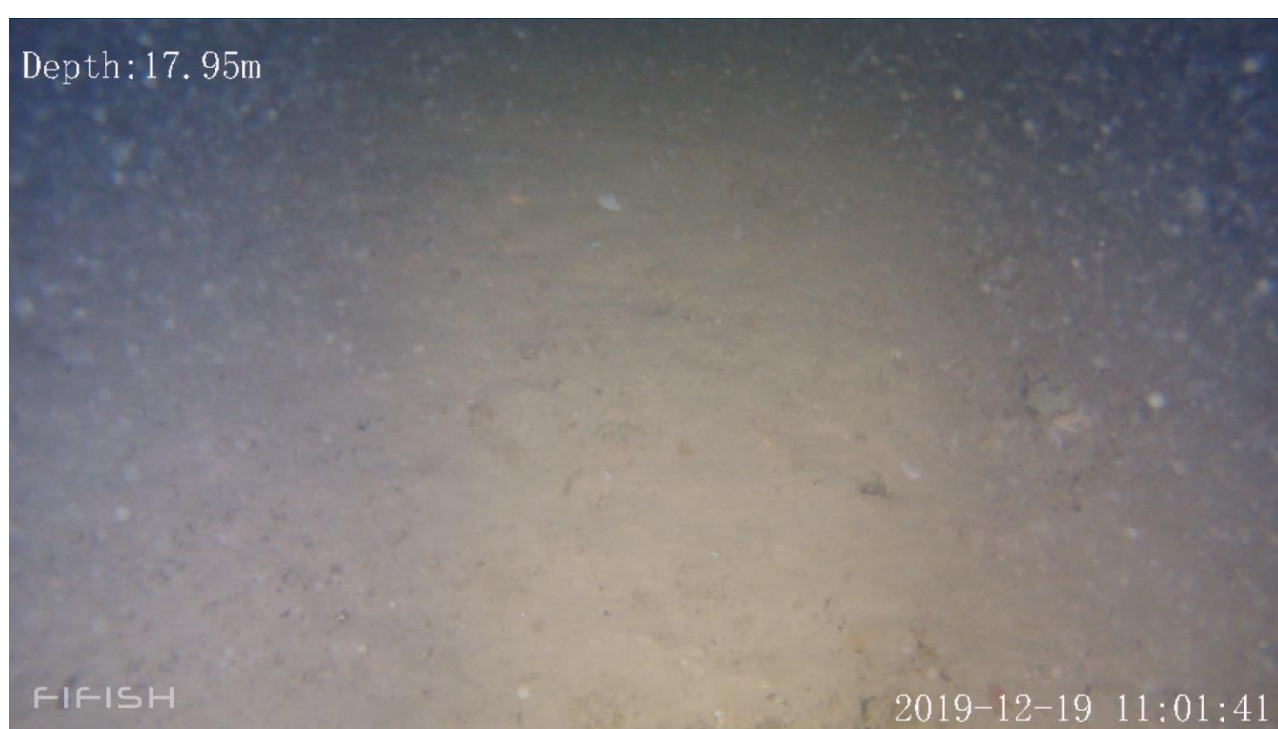
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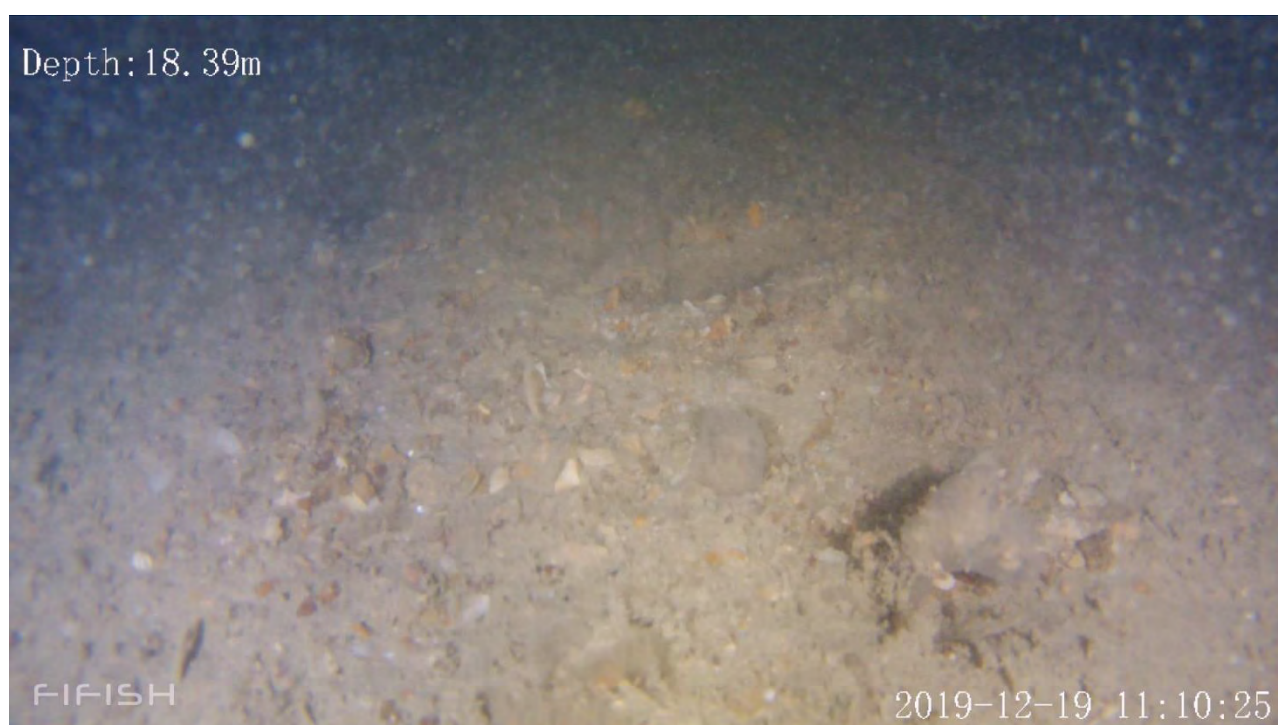
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Site: 023  
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Site:024  
UTM: 692660.711E, 8623652.214N (Zone 52)



Site: 025  
UTM: 692586.986E, 8623657.869N (Zone 52)

Depth: 19.84m



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Depth: 16.09m



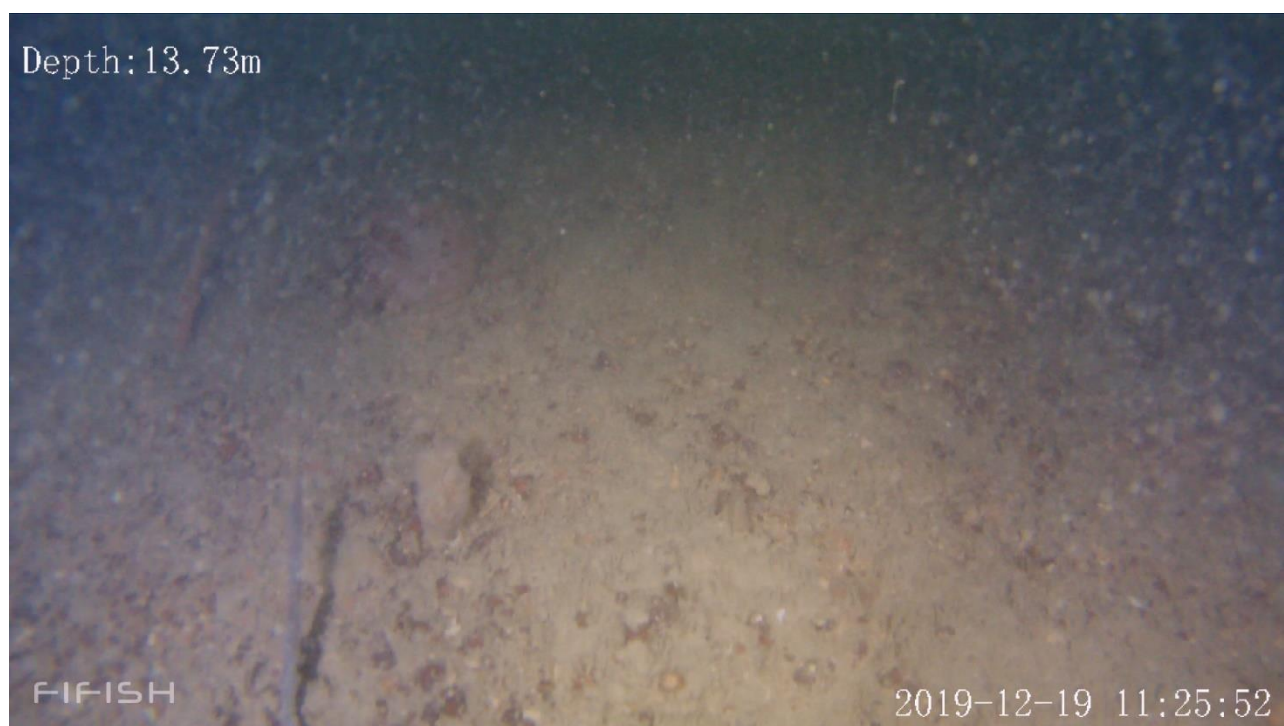
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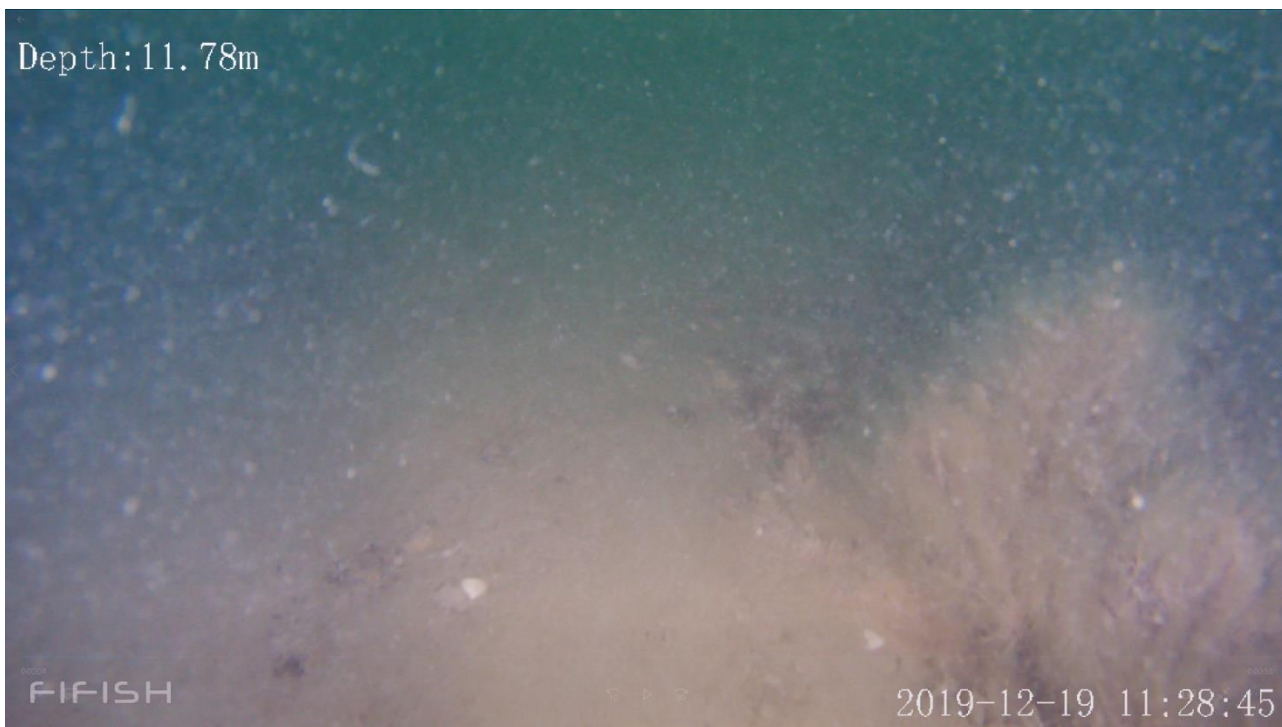
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Depth: 13.73m



Site: 029  
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Depth: 11.78m



FIFISH

2019-12-19 11:28:45

Site: 030  
UTM: 692184.154E, 8623659.63N (Zone 52)

Depth: 4.76m



FIFISH

2019-12-19 11:32:00

Site: 031  
UTM: 692110.033E, 8623657.91N (Zone 52)

Depth: 3.42m



FIFISH

2019-12-19 11:36:34

Site: 032  
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Site: 033

UTM: 692078.693E, 8623905.94N (Zone 52)



Site: 034

UTM: 692046.48E, 8623967.003N (Zone 52)



Site: 035  
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Site: 037

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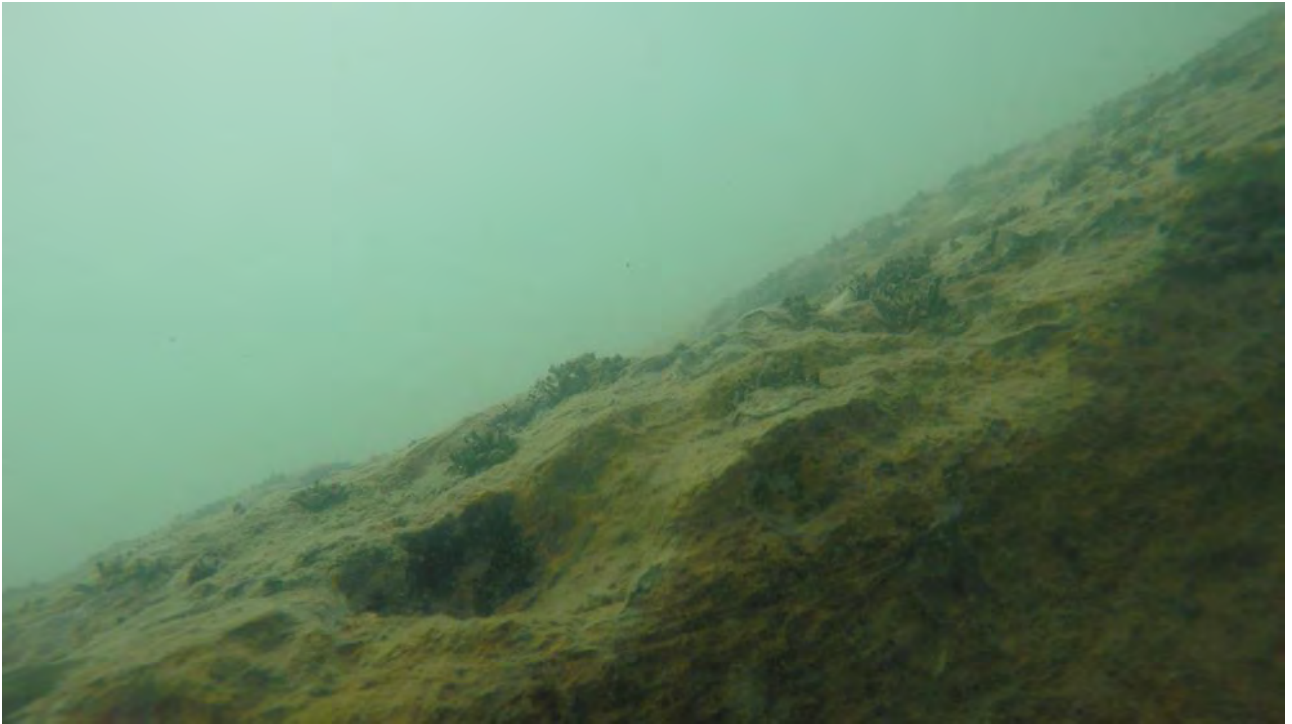
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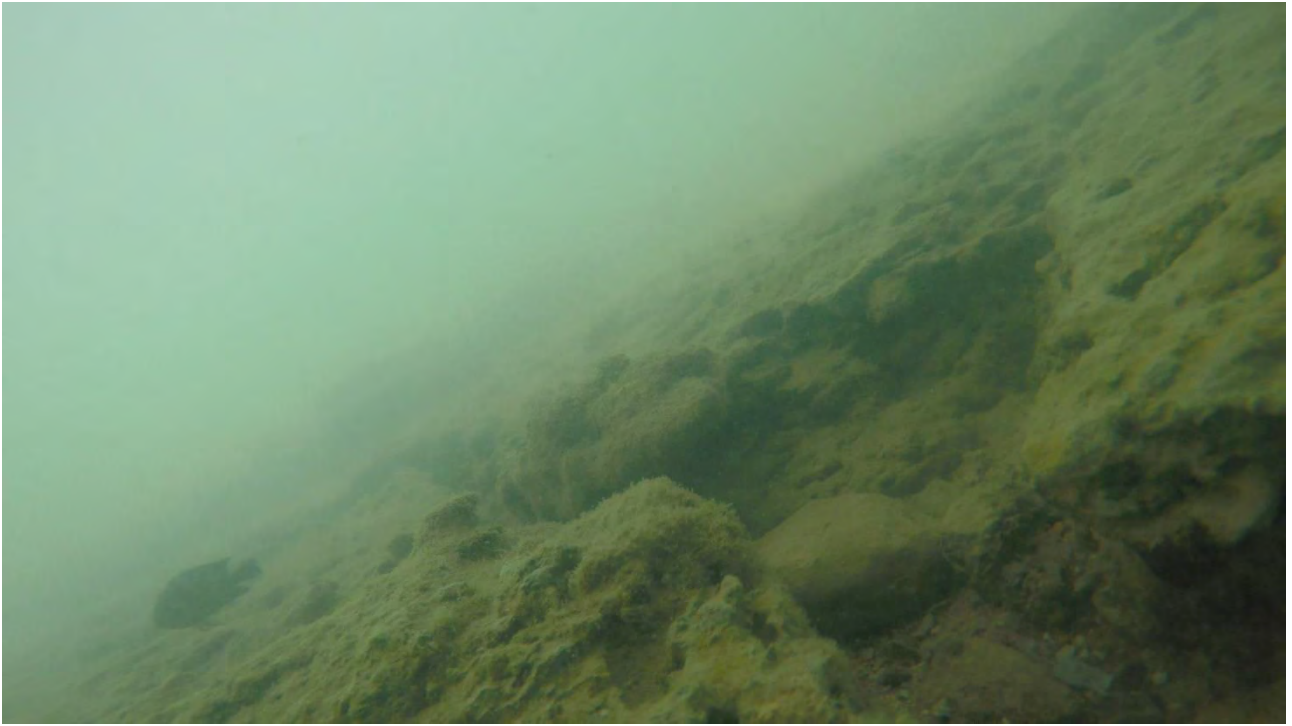
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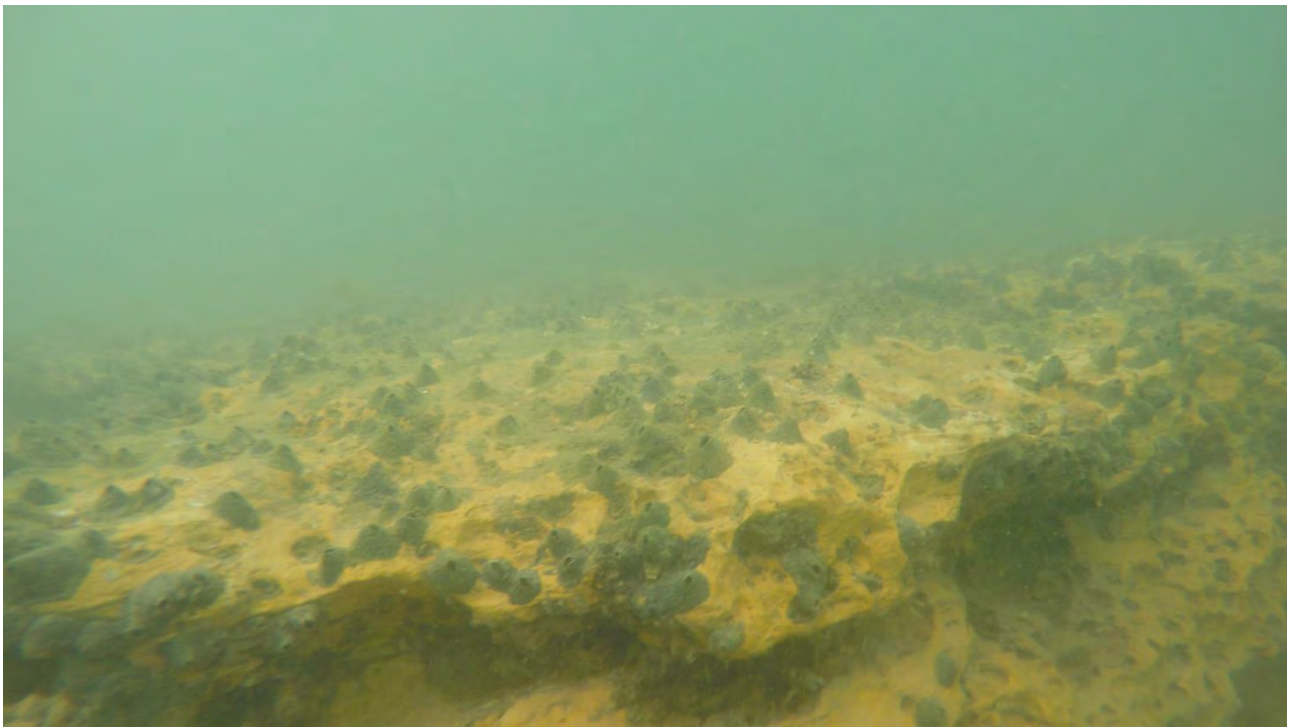
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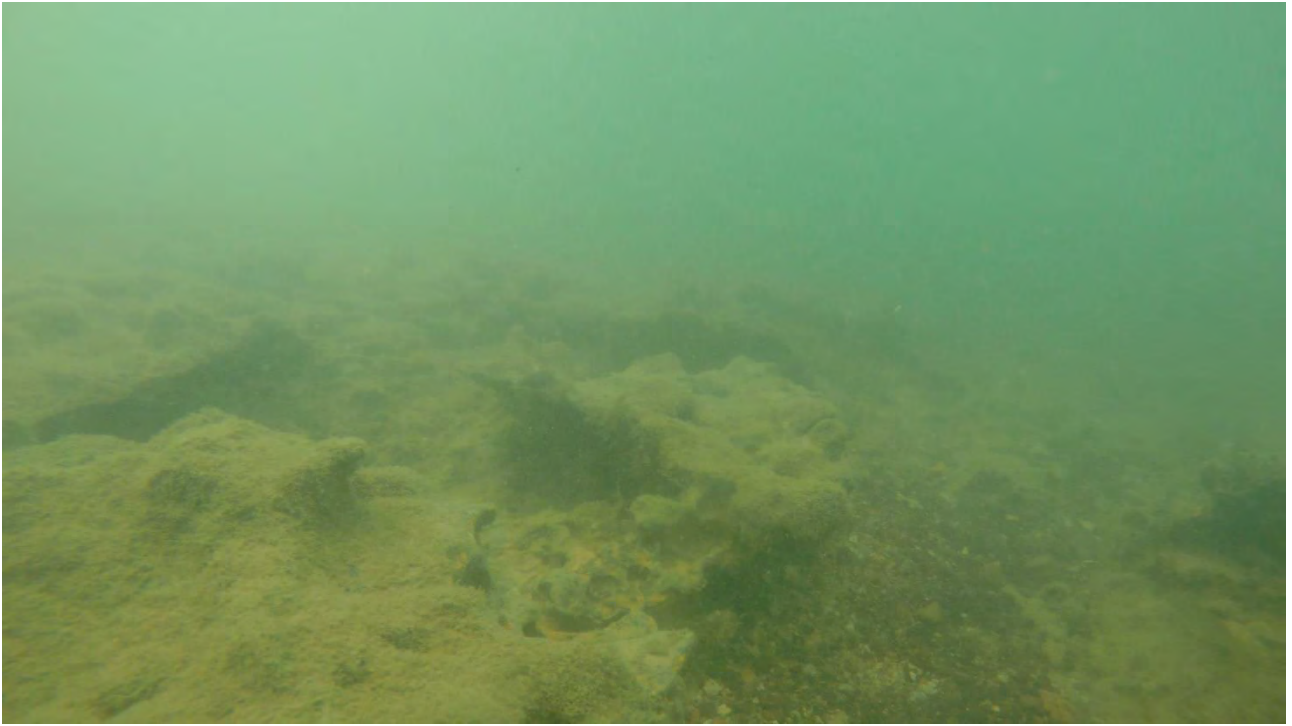
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Site: 047

UTM: 692106.742E, 8624306.123N (Zone 52)



Site: 048

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Site: 049

UTM: 692155.135E, 8624145.324N (Zone 52)



Site: 050

UTM: 692230.717E, 8623848.321N (Zone 52)



Site: 051  
UTM: 692217.635E, 8623924.746N (Zone 52)



Site: 052  
UTM: 692201.968E, 8623993.628N (Zone 52)



Site: 053  
UTM: 692199.2E, 8624041.773N (Zone 52)



Site:054  
UTM: 692203.588E, 8624101.486N (Zone 52)



Site: 055  
UTM: 692202.163E, 8624160.315N (Zone 52)



Site:056  
UTM: 692202.792E, 8624227.062N (Zone 52)



Site: 057  
UTM: 692203.385E, 8624316.302N (Zone 52)



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Site:059

UTM: 692207.625E, 8624517.26N (Zone 52)



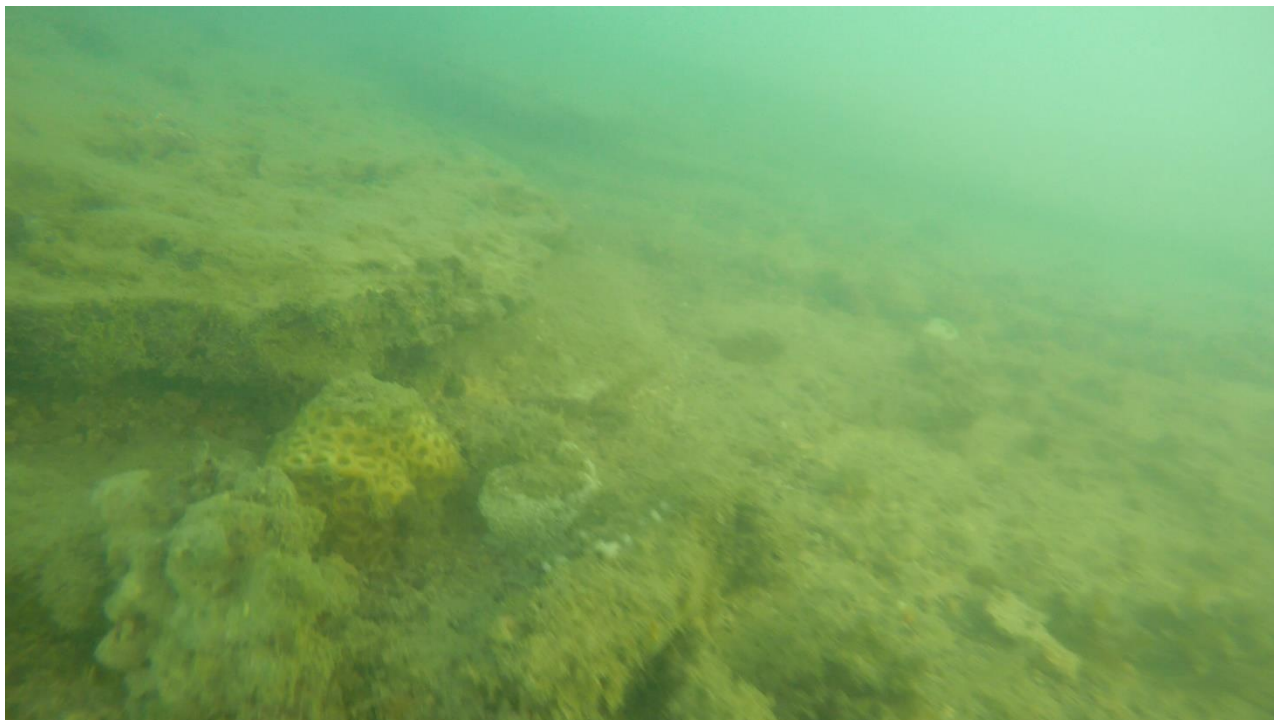
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Site:061

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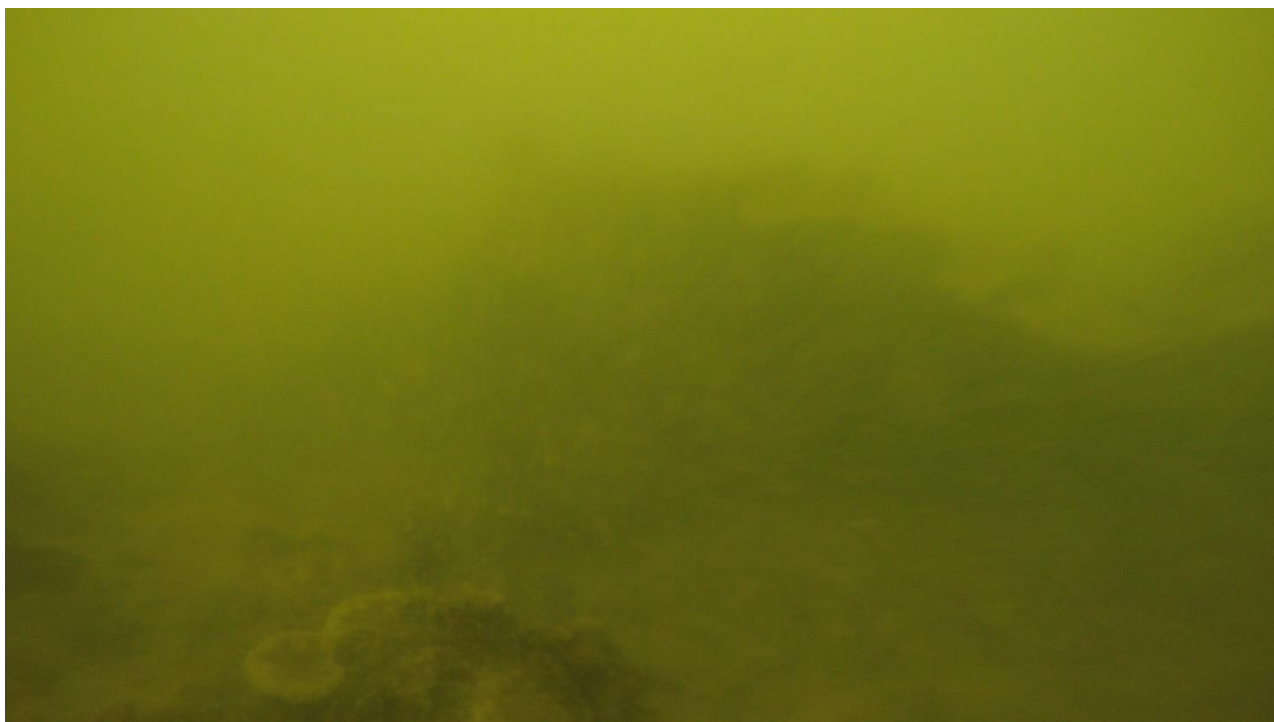
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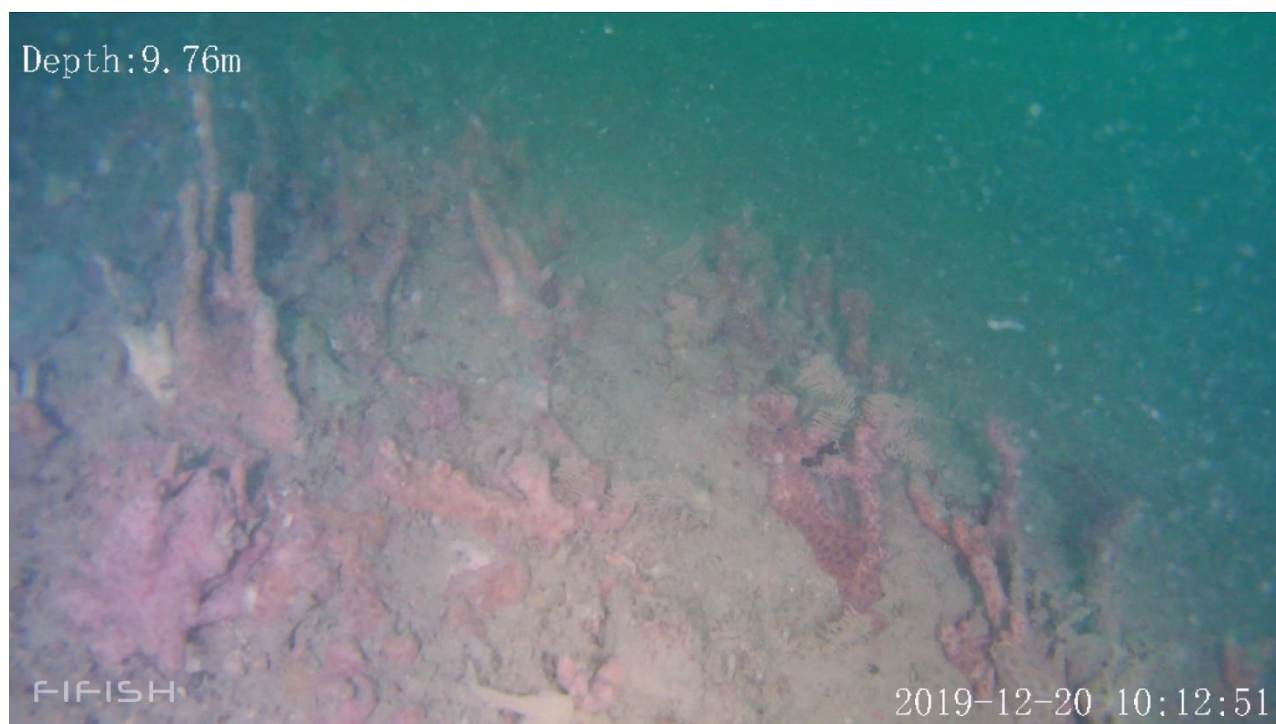


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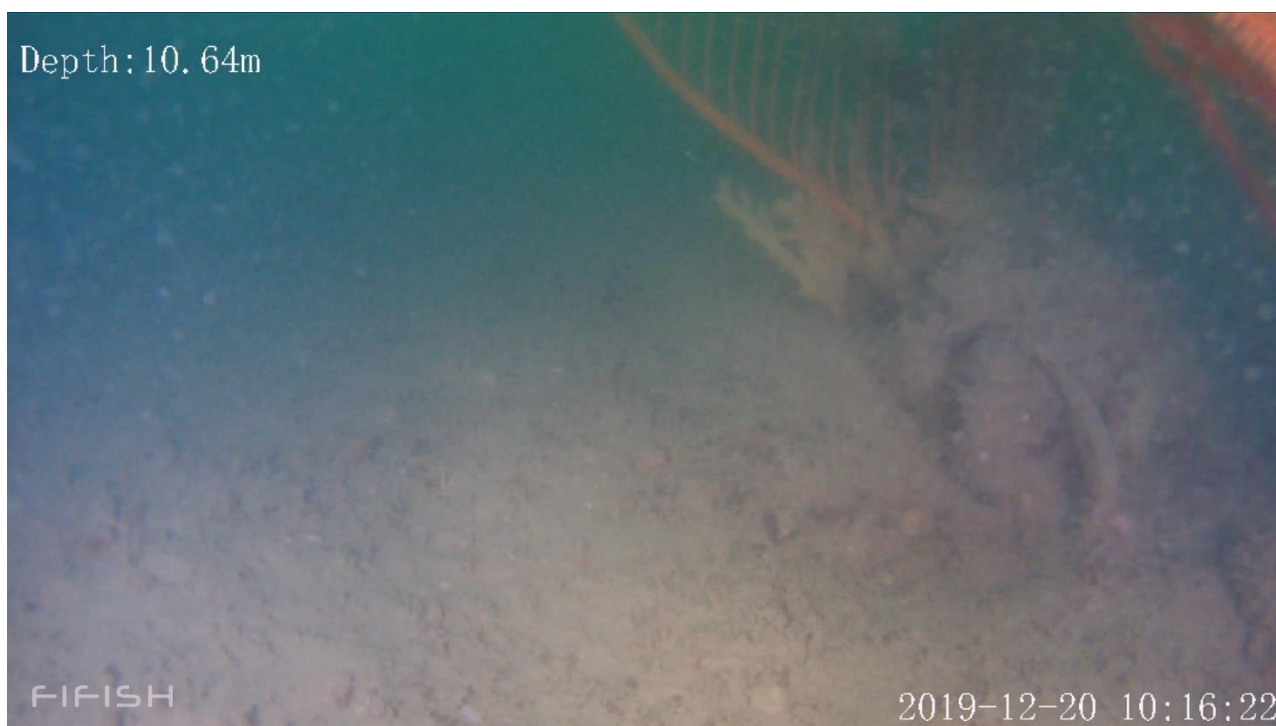
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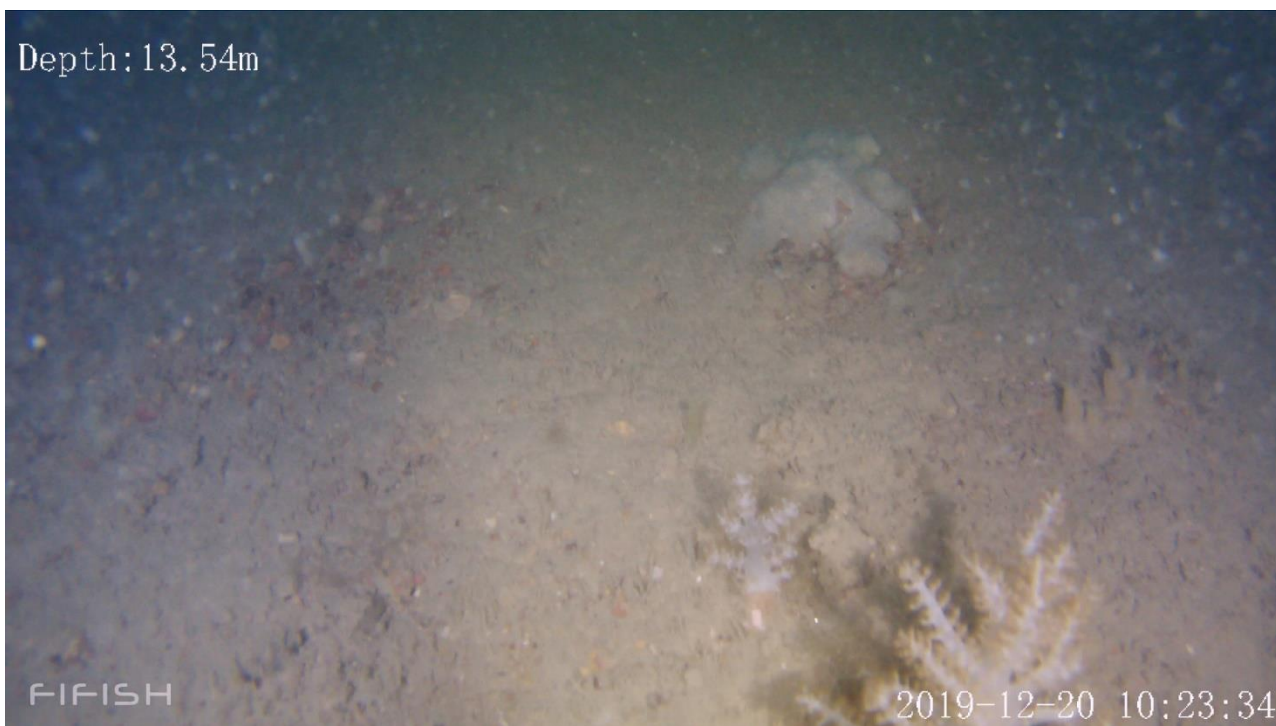
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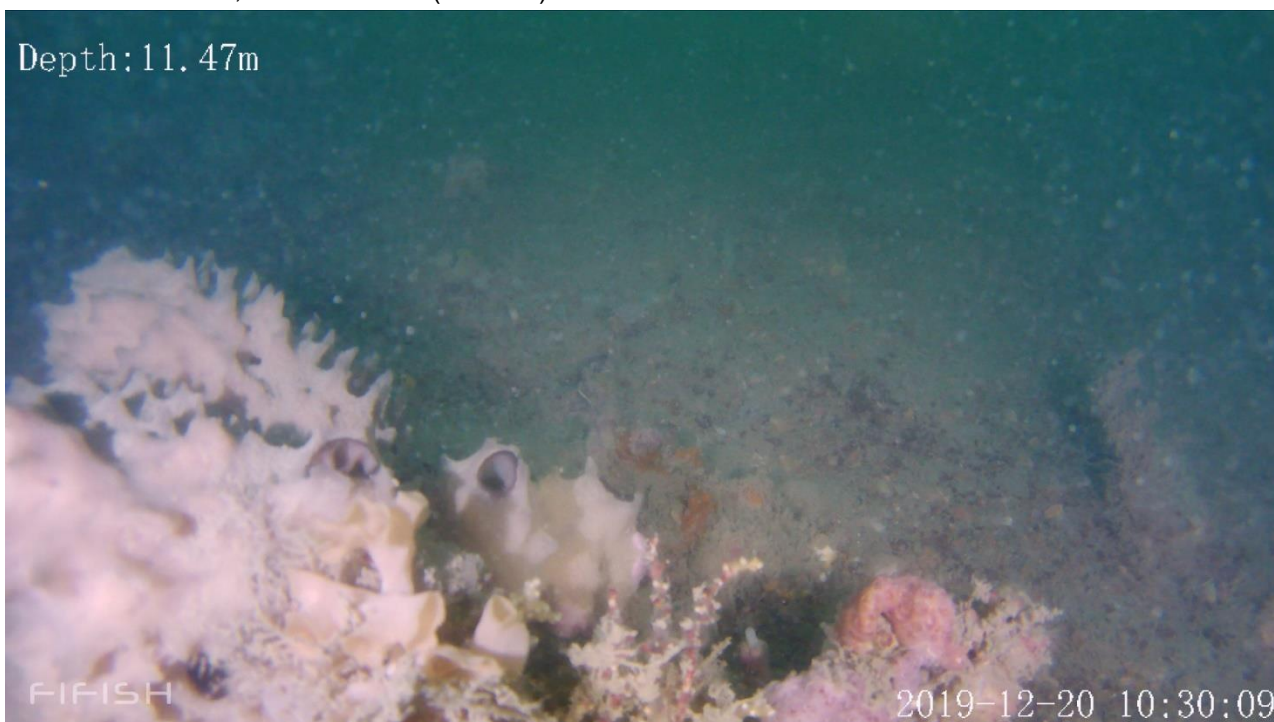
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Site:071  
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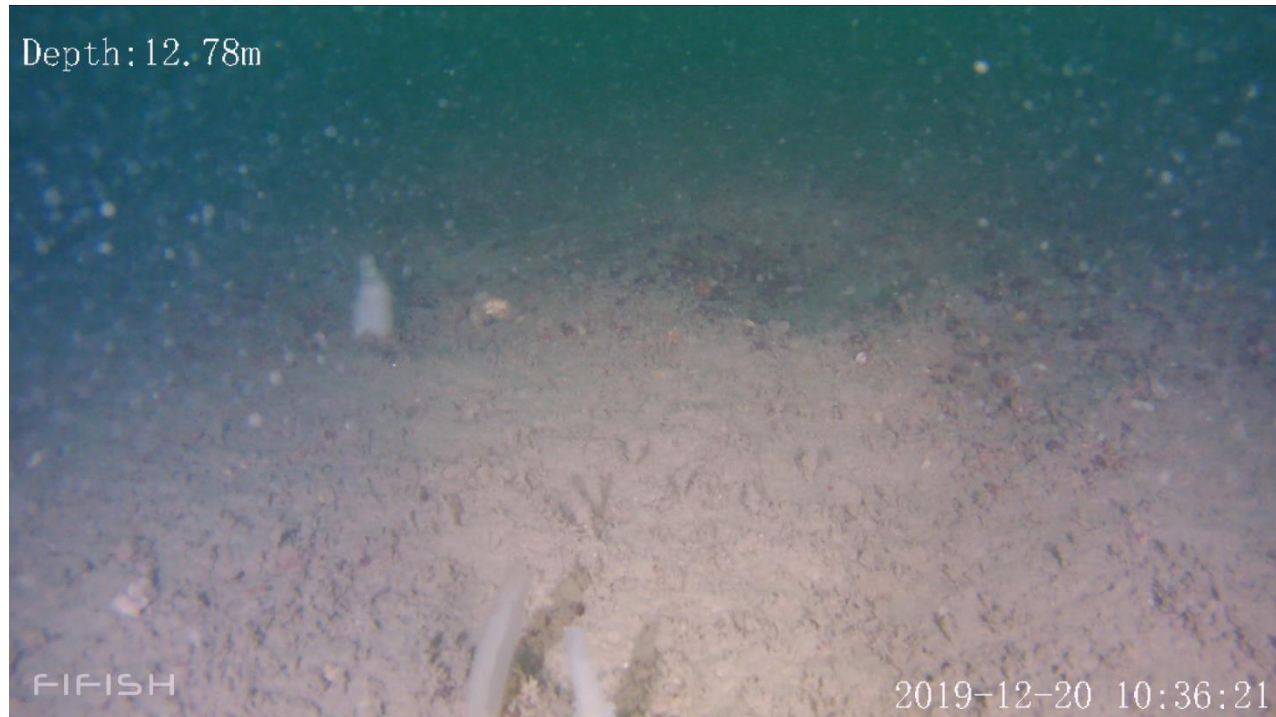


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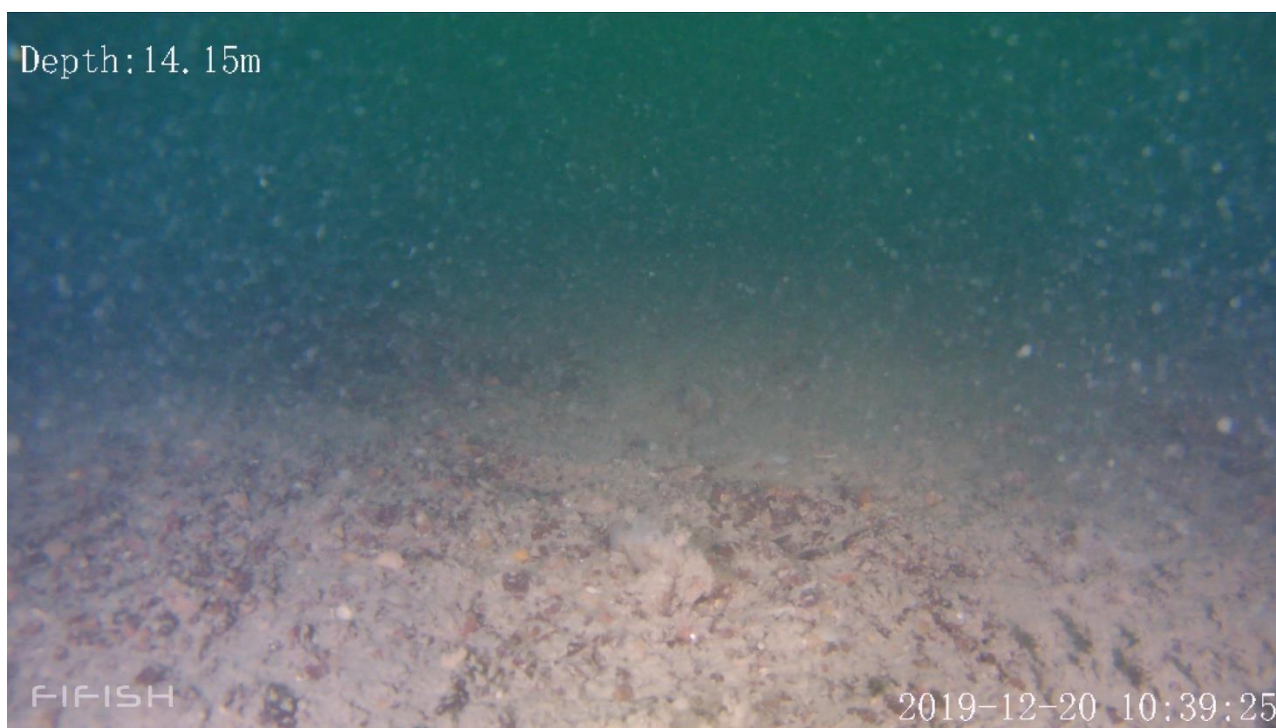
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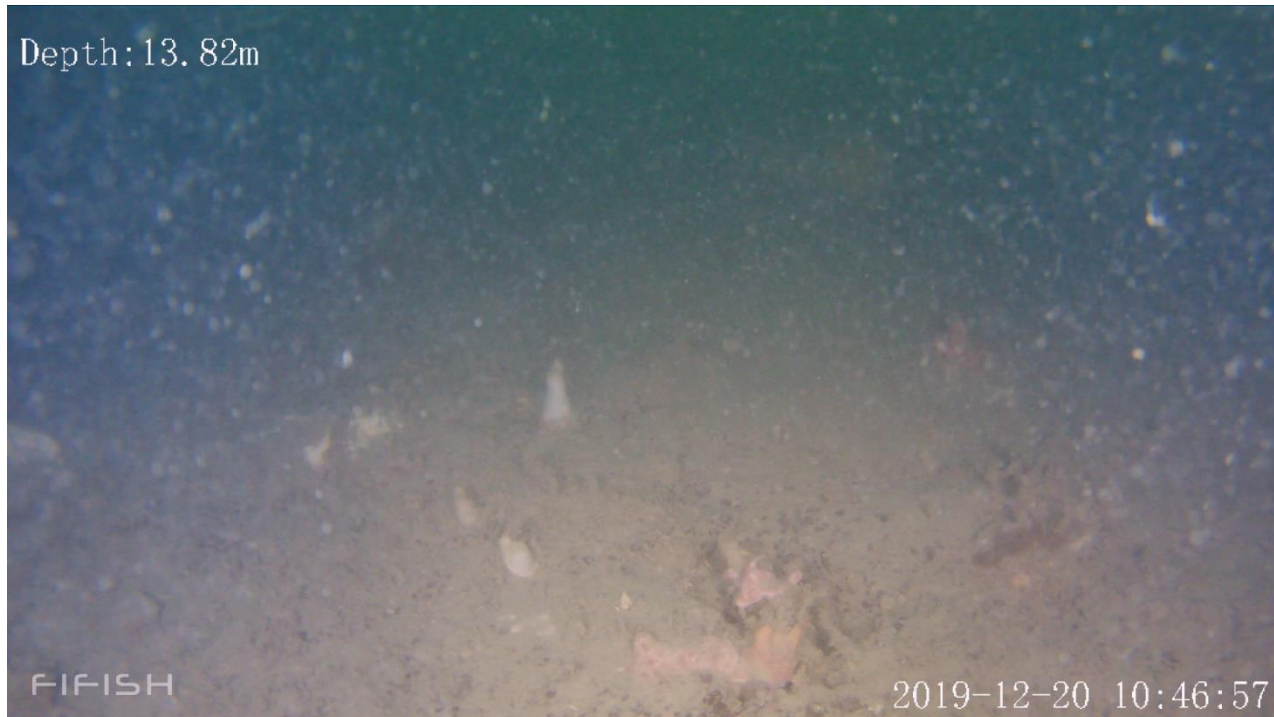
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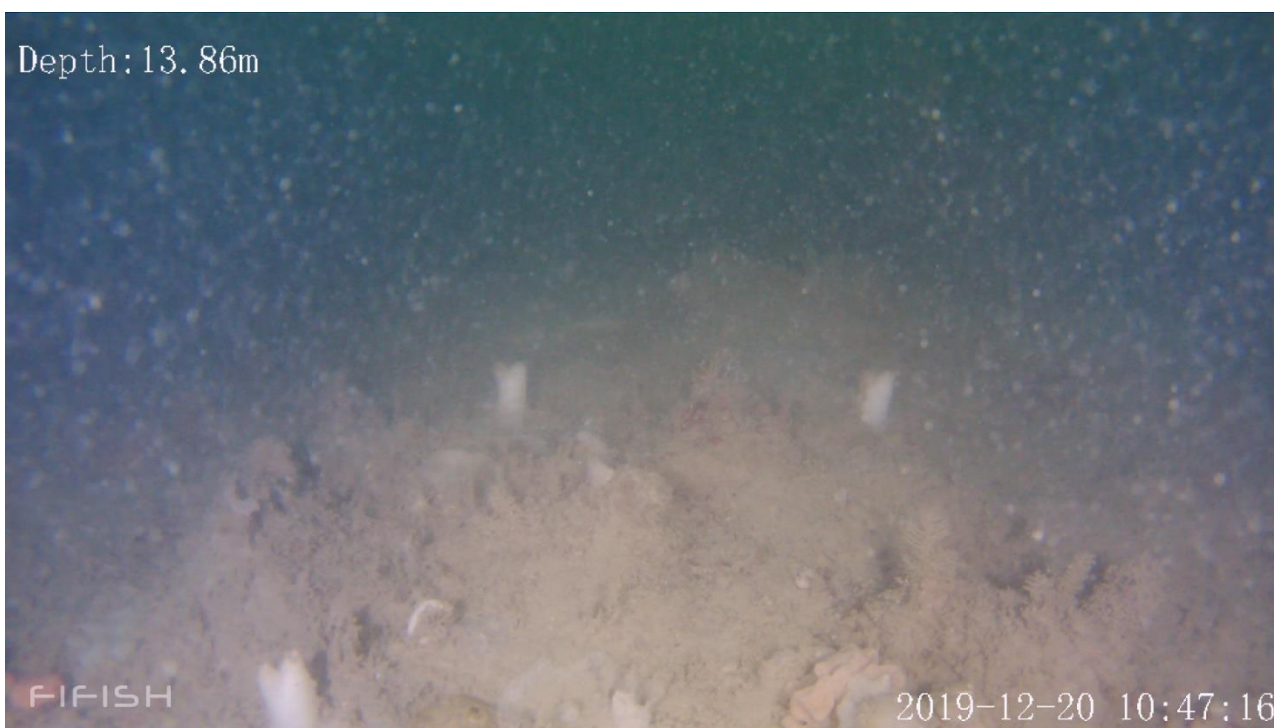
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Site: 076

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Site: 077  
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Site: 078  
UTM: 692446.832E, 8624544.249N (Zone 52)



Site: 079

UTM: 692544.363E, 8624548.763N (Zone 52)

Depth: 14.93m



Site: 080

UTM: 692545.958E, 8624461.719N (Zone 52)

Depth: 14.07m



Site: 081

UTM: 692545.262E, 8624385.018N (Zone 52)

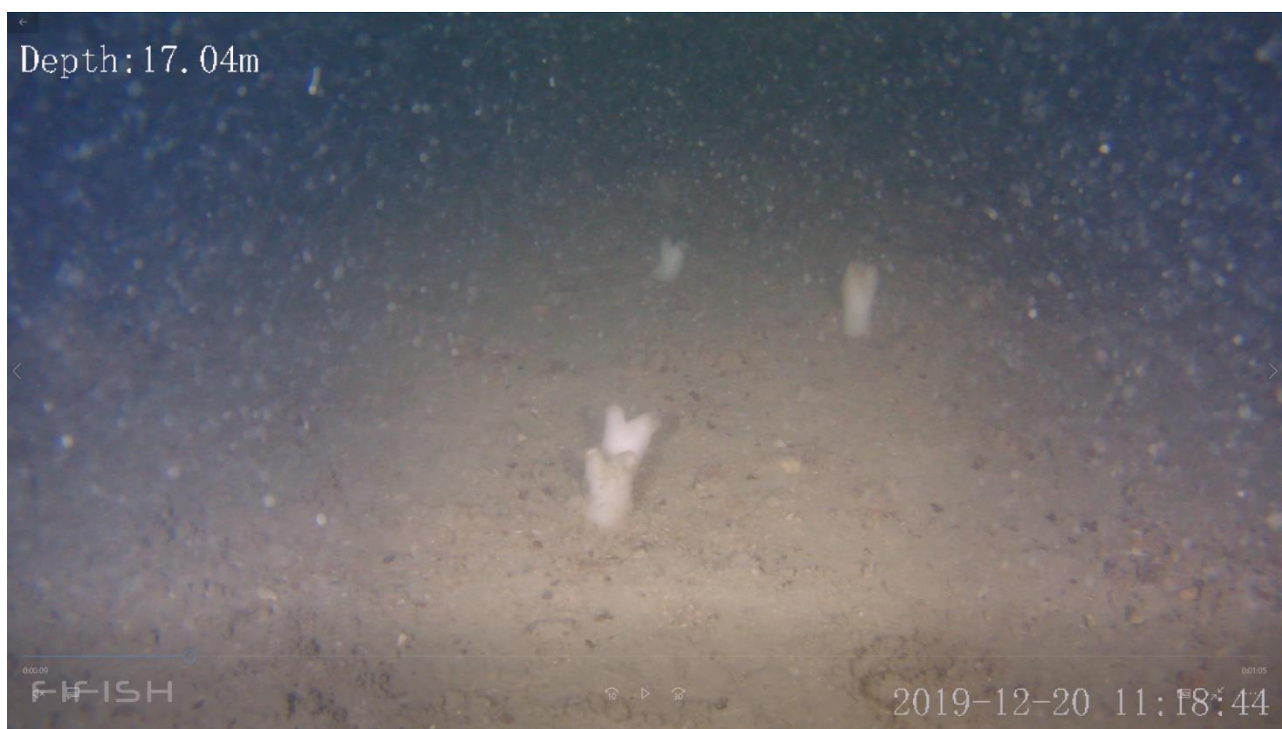
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Site: 083

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Depth: 19.54m



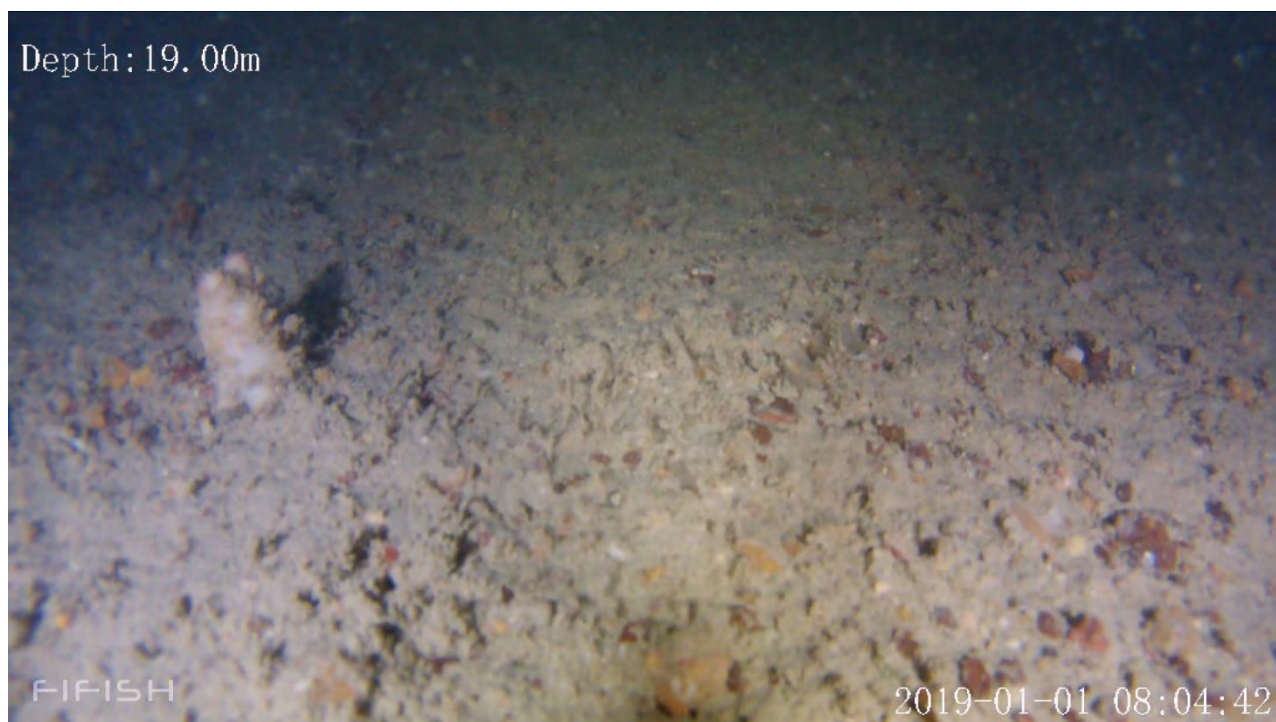
FIFISH

2019-12-20 11:23:46

Site: 084

UTM: 692568.232E, 8624051.301N (Zone 52)

Depth: 19.00m



FIFISH

2019-01-01 08:04:42

Site: 085  
UTM: 692566.705E, 8623903.798N (Zone 52)

Depth: 18.50m



Site: 086  
UTM: 692321.529E, 8624532.913N (Zone 52)

Depth: 4.69m



Site: 087  
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Site:088  
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Site: 089  
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Site: 090  
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Site: 091  
UTM: 692343.138E, 8624701.857N (Zone 52)



Site: 092  
UTM: 692368.111E, 8624752.029N (Zone 52)



Site: 093  
UTM: 692071.55E, 8624738.881N (Zone 52)

Depth: 3.31m



FIFISH

2019-01-01 08:51:58

Site: 094  
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Depth: 6.99m



FIFISH

2019-01-01 08:56:10

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Depth:4.65m

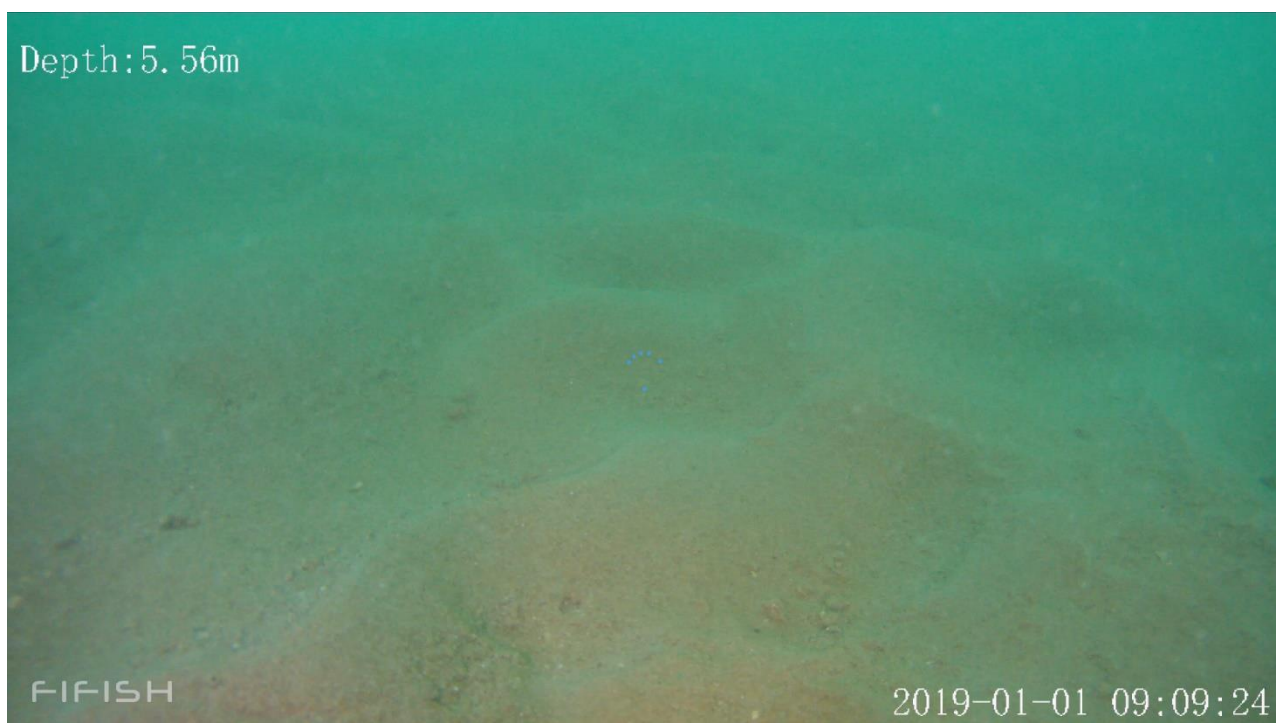


FIFISH

2019-01-01 08:59:13

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Depth:5.56m



FIFISH

2019-01-01 09:09:24

Site: 097  
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Depth: 5.42m

FIFISH

2019-01-01 09:12:56

Site: 098  
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Depth: 4.85m

FIFISH

2019-01-01 09:17:37

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UTM: 691329.144E, 8624913.626N (Zone 52)



Site: 101  
UTM: 692187.636E, 8623800.481N (Zone 52)

Depth: 6.16m



FIFISH

2019-12-21 09:21:06

Site: 102  
UTM: 692165.705E, 8623800.442N (Zone 52)

Depth: 3.71m



FIFISH

2019-12-21 09:24:03

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Depth: 3.35m

FIFISH

2019-12-21 09:39:51

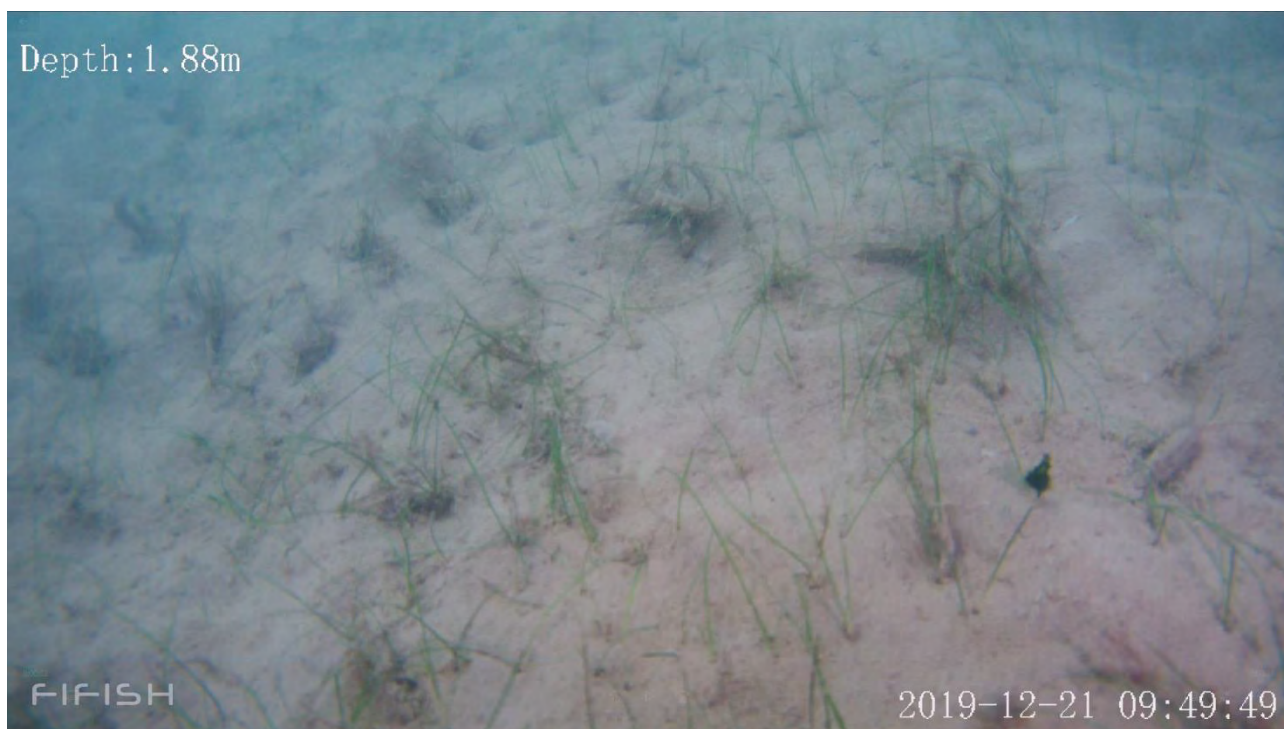
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Depth: 3.28m

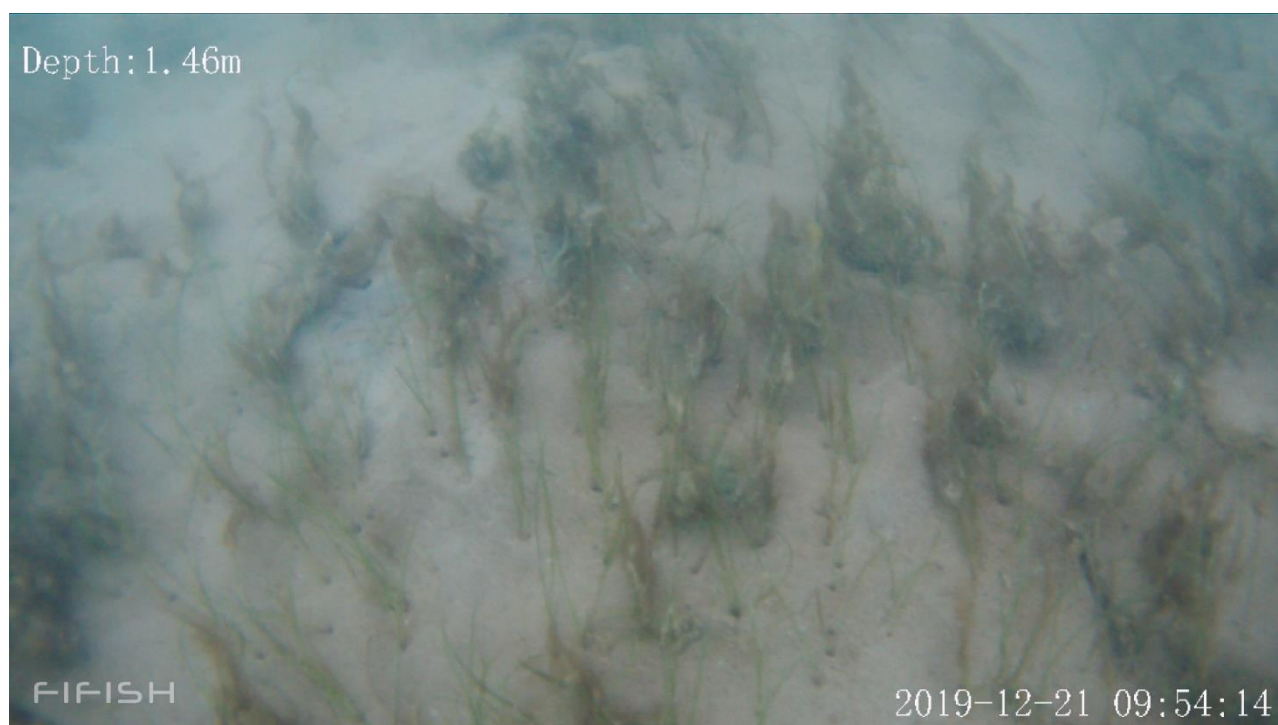
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2019-12-21 09:45:02

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Site: 106  
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Site: 107  
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Site: 108  
UTM: 691584.58E, 8624954.344N (Zone 52)



Site:109  
UTM: 691724.85E, 8625064.787N (Zone 52)



Site: 110  
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Site: 111  
UTM: 692089.225E, 8625000.045N (Zone 52)



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Site: 113  
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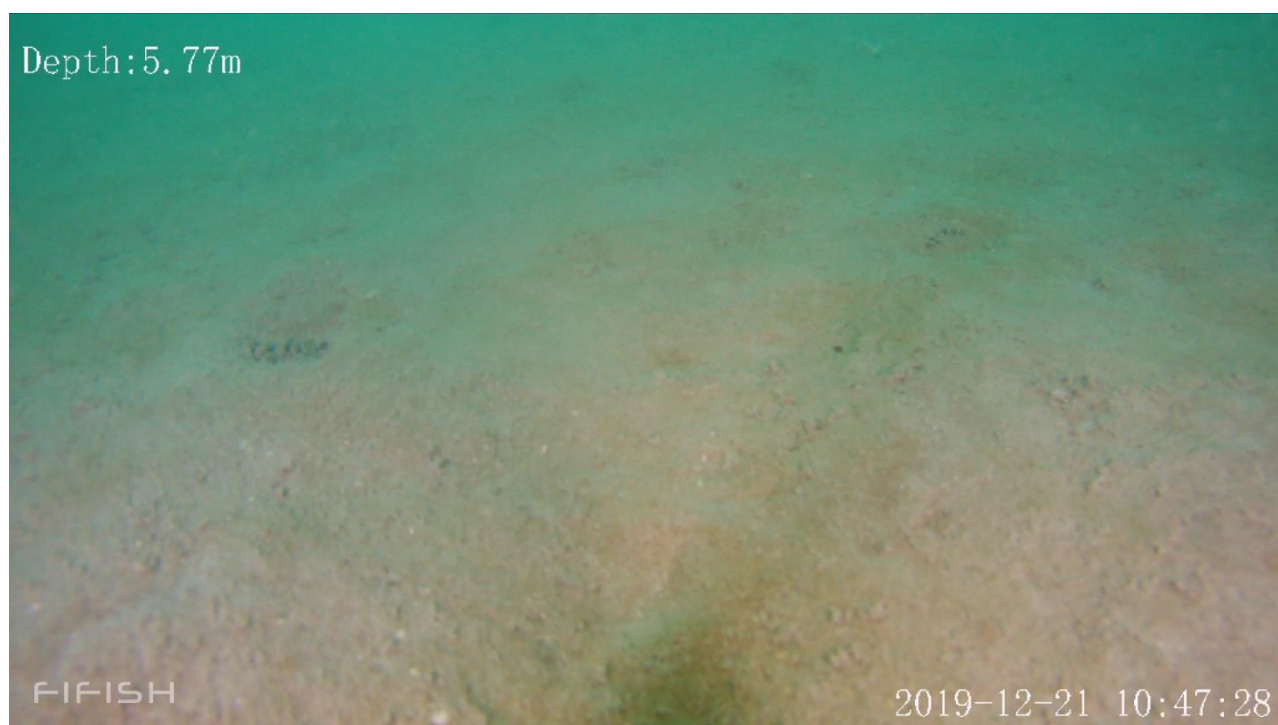
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Site:116  
UTM: 691378.476E, 8625493.575N (Zone 52)



Site: 117  
UTM: 692246.801E, 8624823.089N (Zone 52)

Depth: 5.59m



FIFISH

2019-12-21 11:01:06

Site: 118  
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Depth: 2.50m



FIFISH

2019-12-21 11:04:24

Site:119  
UTM: 692221.661E, 8624775.499N (Zone 52)



Site: 120  
UTM: 692434.687E, 8624652.199N (Zone 52)



Site:121  
UTM: 692374.955E, 8624636.739N (Zone 52)



Site:122  
UTM: 692329.722E, 8624620.445N (Zone 52)



Site: 123

UTM: 692236.017E, 8620563.355N (Zone 52)

Depth: 1.55m



FIFISH

2019-12-22 10:38:59

Site: 124

UTM: 692480.899E, 8620875.187N (Zone 52)

Depth: 2.05m



FIFISH

2019-12-22 10:46:40

Site: 125

UTM: 691993.862E, 8622321.295N (Zone 52)

Depth: 2.01m



FIFISH

2019-12-22 10:56:36

Site: 126

UTM: 692080.141E, 8622379.357N (Zone 52)

Depth: 2.49m



FIFISH

2019-12-22 11:01:36

Site: 127

UTM: 692135.352E, 8623786.447N (Zone 52)

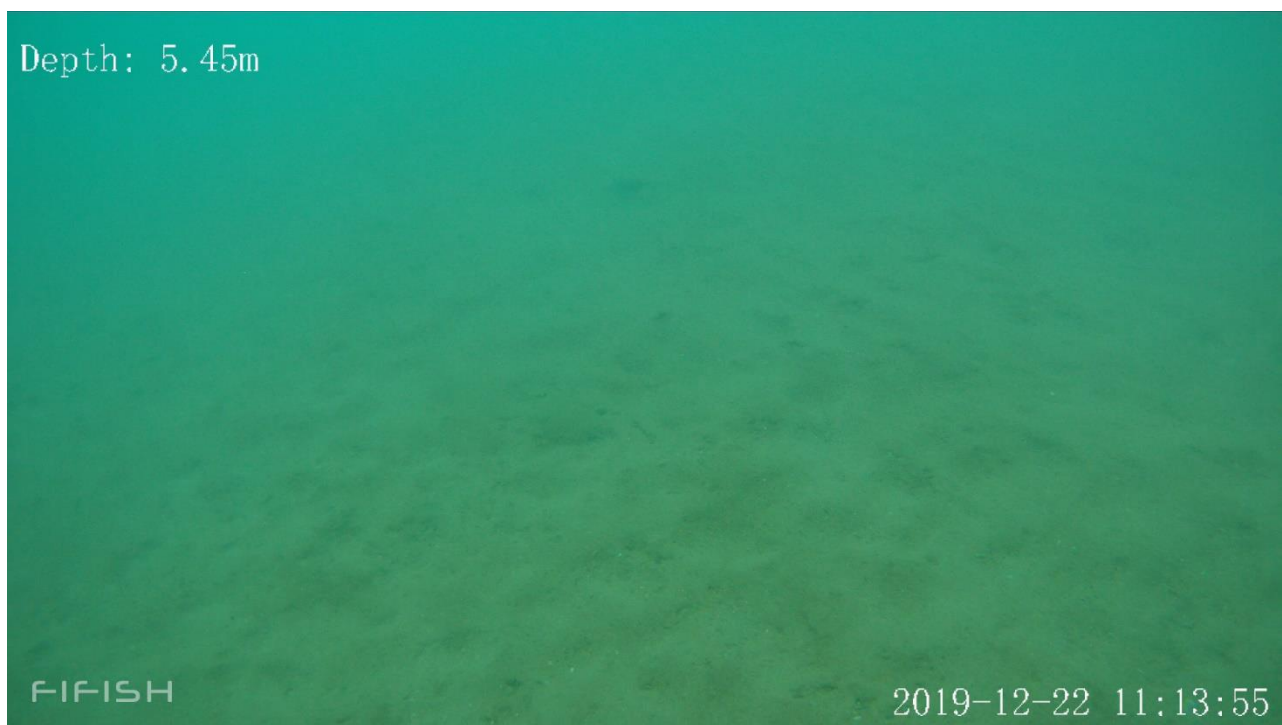
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Depth: 5.45m



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Depth: 10.11m

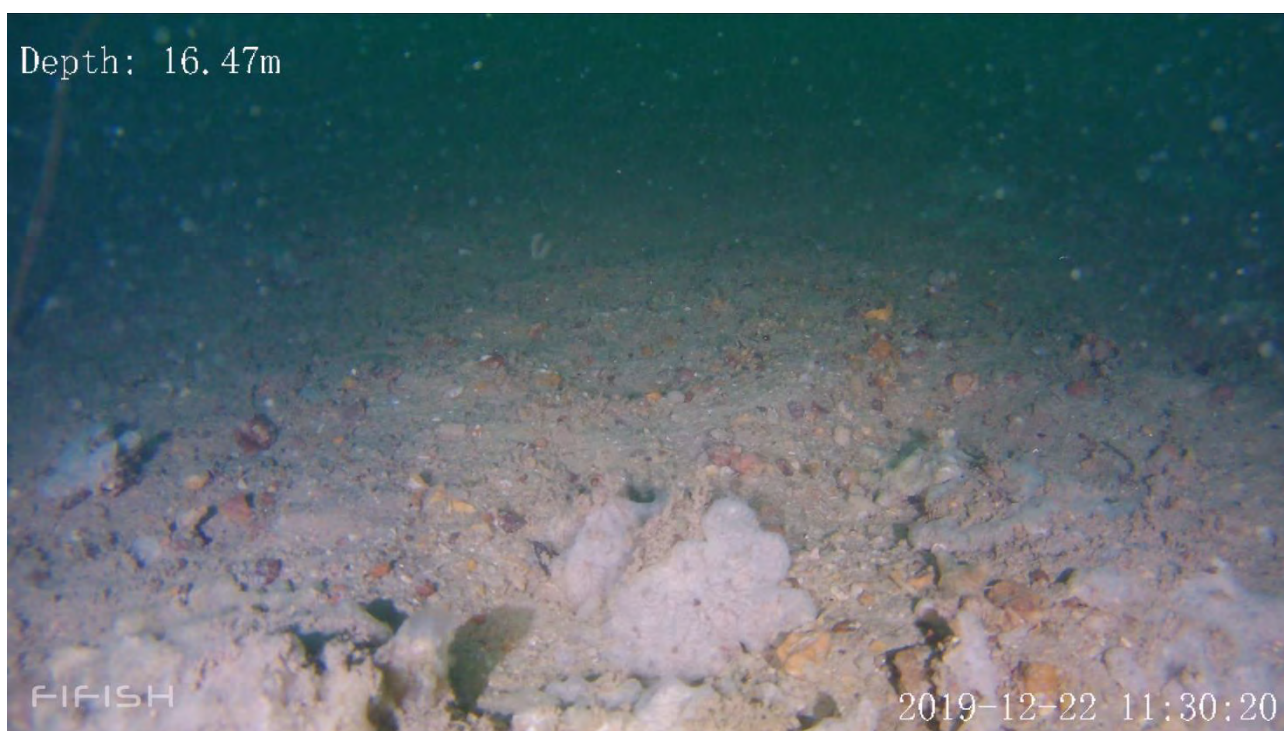


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Depth: 13.04m



Site: 131  
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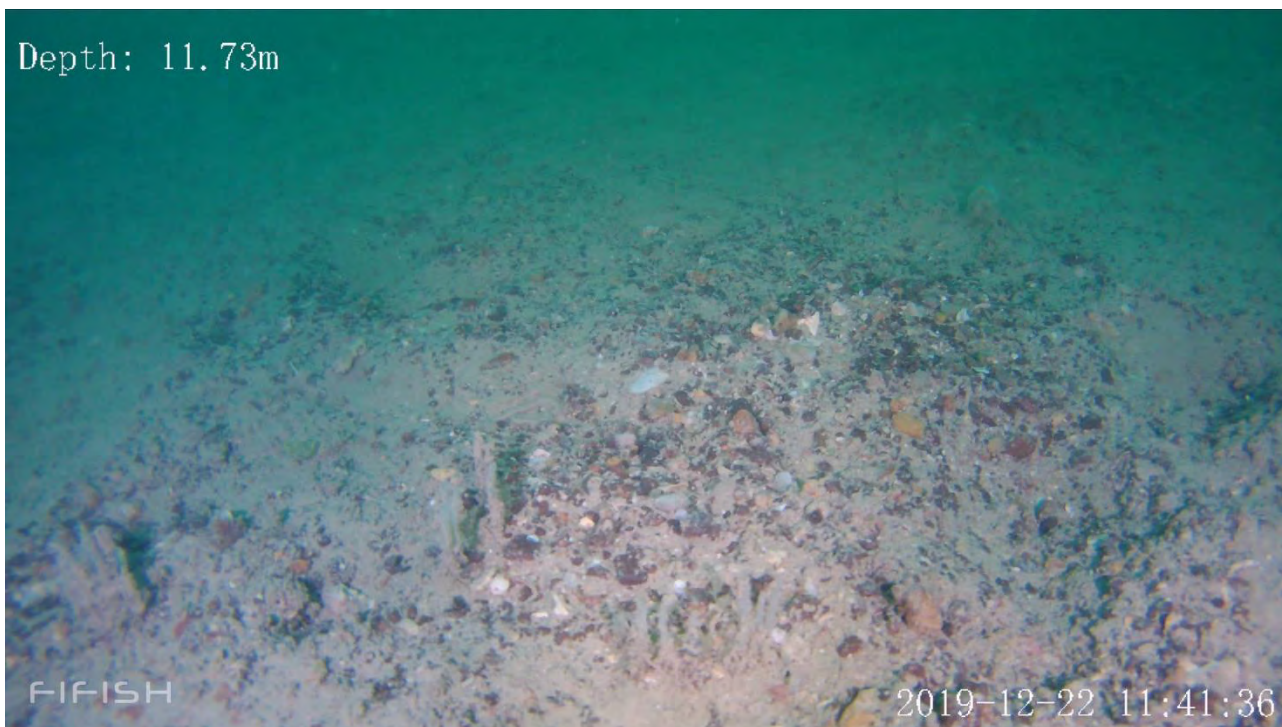


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Site: 133  
UTM: 692309.004E, 8624310.806N (Zone 52)

Depth: 11.73m



Site: 134  
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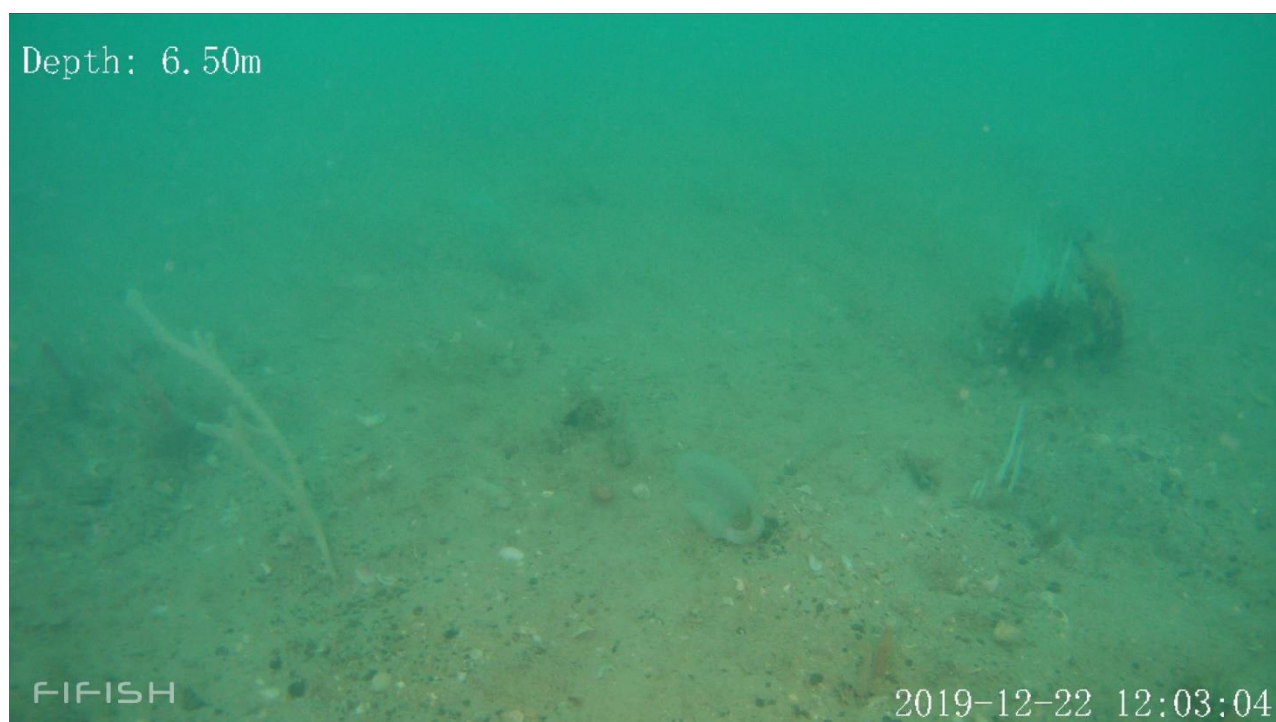
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Site: 136  
UTM: 692012.016E, 8625080.768N (Zone 52)



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Site: 138  
UTM: 691719.019E, 8624813.317N (Zone 52)



Site: 139  
UTM: 692107.45E, 8625260.468N (Zone 52)



Site: 140  
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Site: 141  
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Depth: 8.46m



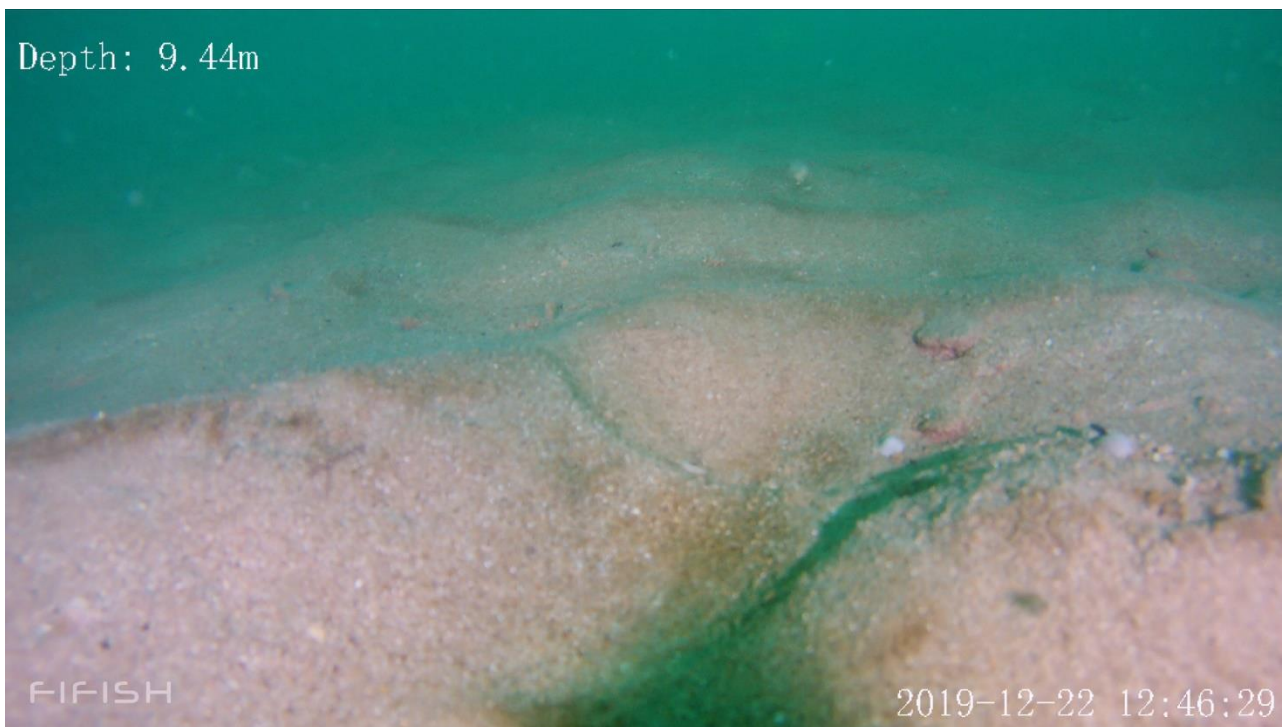
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UTM: 692524.541E, 8624729.968N (Zone 52)

Depth: 9.42m



Site: 143  
UTM: 691952.801E, 8625633.226N (Zone 52)

Depth: 9.44m



FIFISH

2019-12-22 12:46:29

Site: 144  
UTM: 691554.324E, 8625693.95N (Zone 52)

Depth: 4.98m



FIFISH

2019-12-22 12:53:16

Site: 145  
UTM: 691160.131E, 8625664.289N (Zone 52)



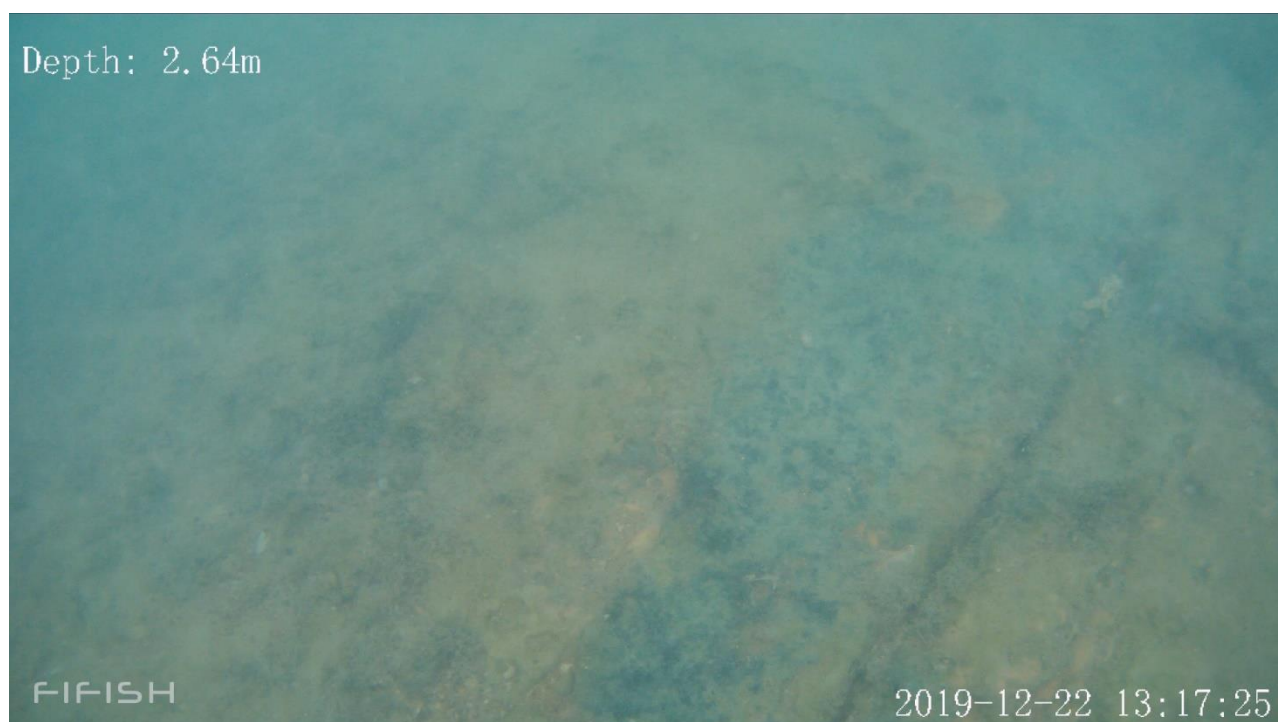
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Depth: 2.42m



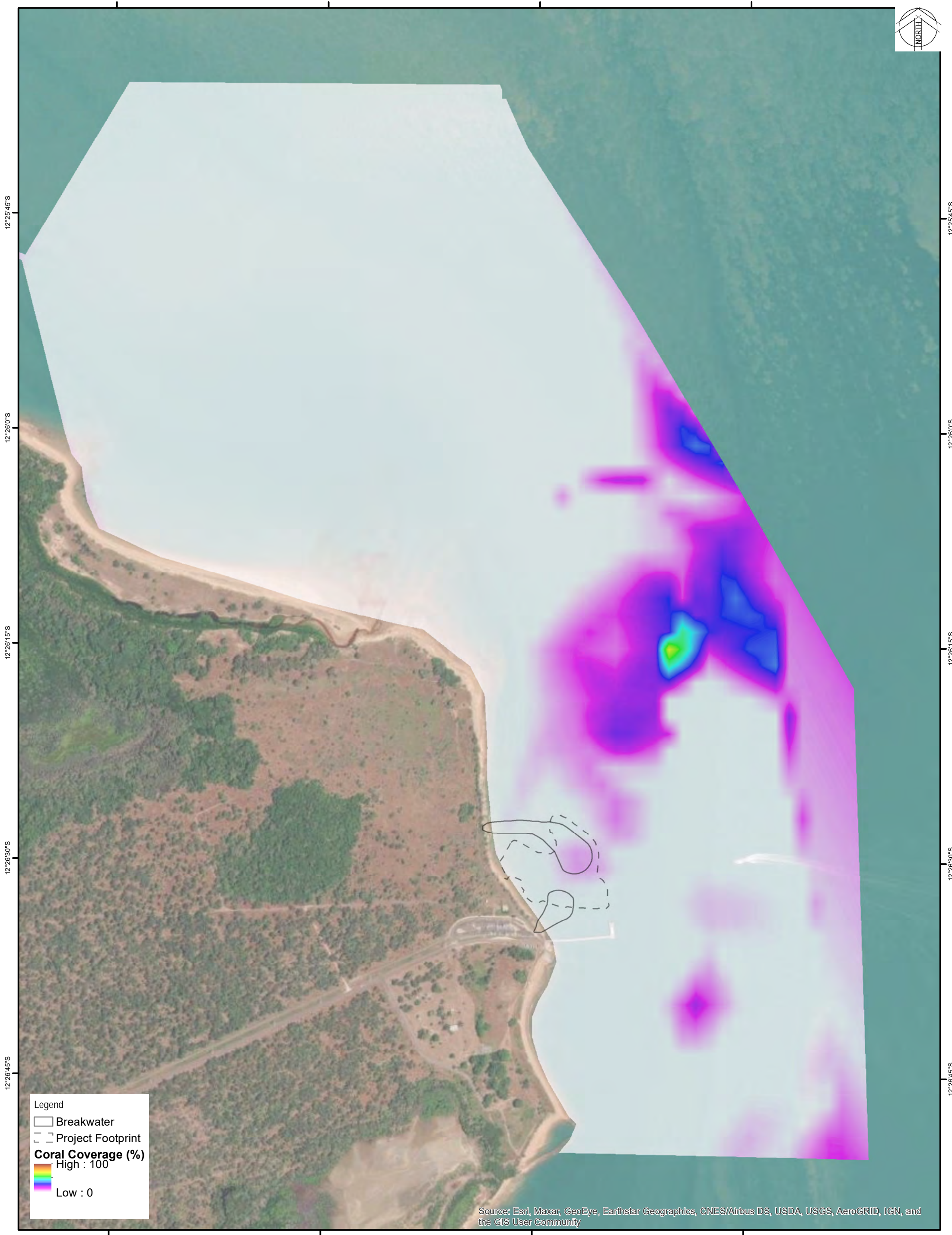
FIFISH

2019-12-22 13:21:10

APPENDIX

C

BCH PERCENTAGE COVER



Legend

- Breakwater
- Project Footprint
- Coral Coverage (%)**
- High : 100
- Low : 0

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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Date  
6/12/2021

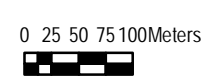
Size  
A3

Scale  
1:7,000

## BENTHIC HABITAT MAP - CORAL COVERAGE (%)

MANDORAH MARINE FACILITIES  
MARINE ECOSYSTEMS REPORT

FIGURE D-1





**Legend**

- Breakwater
- Project Footprint
- Macro Algae (%)**
- High : 100
- Low : 0

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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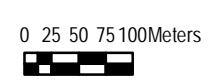
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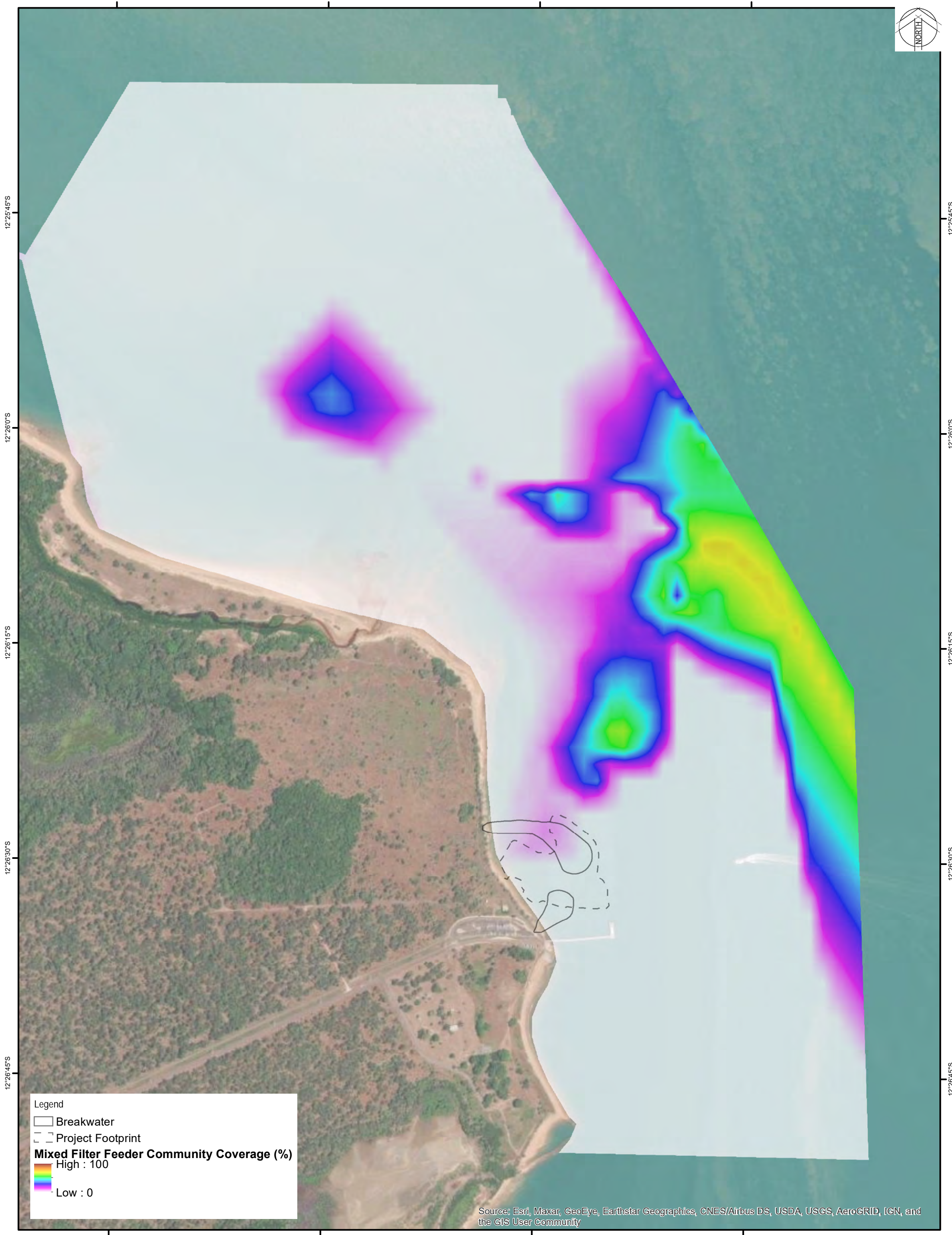
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## BENTHIC HABITAT MAP - MACRO ALGAE (%)



MANDORAH MARINE FACILITIES  
MARINE ECOSYSTEMS REPORT

FIGURE D-2






Legend

-  Breakwater
-  Project Footprint

**Mixed Filter Feeder Community Coverage (%)**

High : 100



Low : 0

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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Date  
6/12/2021

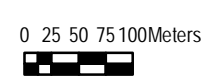
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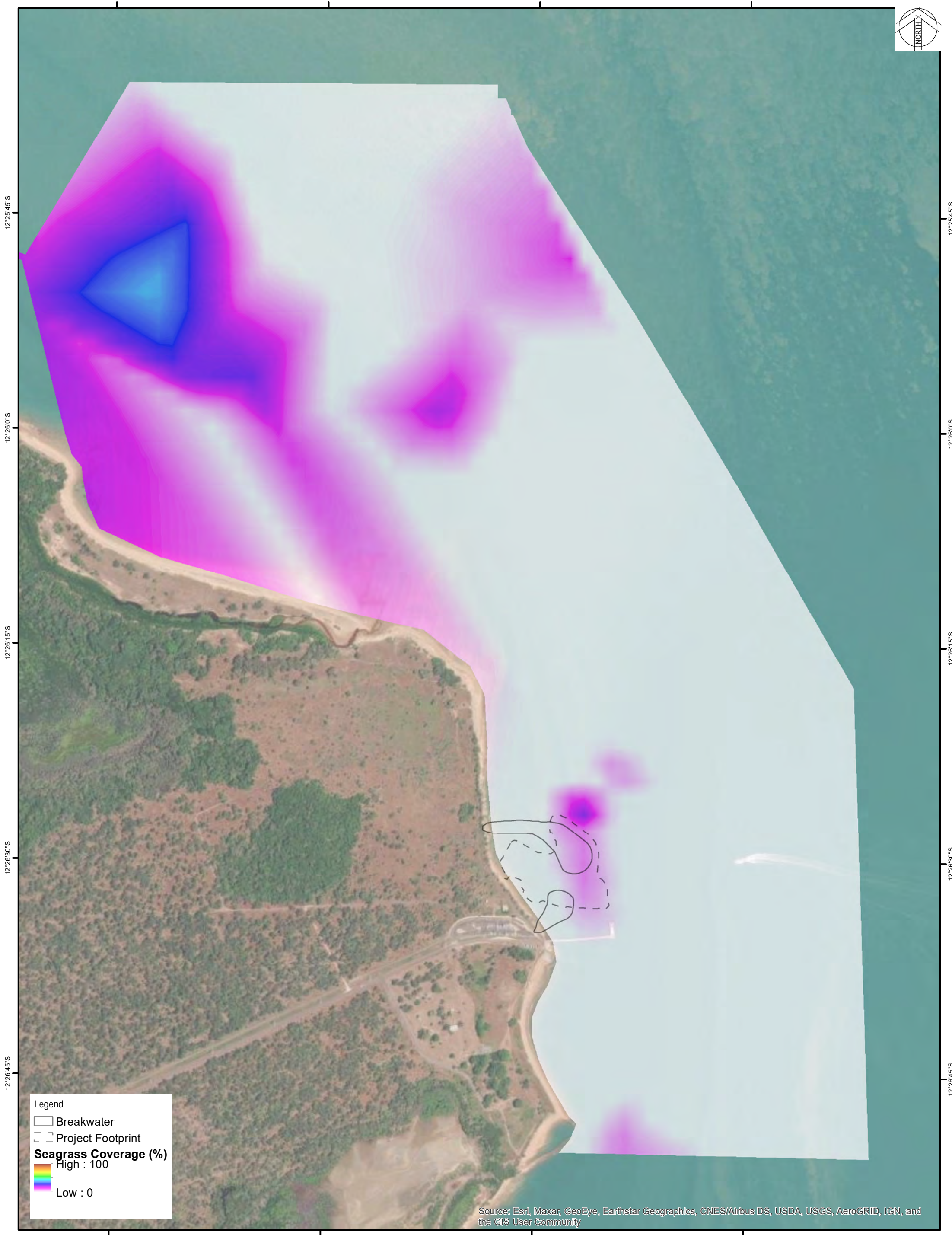
Scale  
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## BENTHIC HABITAT - MIXED FILTER FEEDER (%)

MANDORAH MARINE FACILITIES  
 MARINE ECOSYSTEMS REPORT

FIGURE D-3





Legend

- Breakwater
- Project Footprint

**Seagrass Coverage (%)**

High : 100

Low : 0

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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Date  
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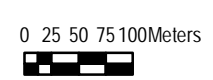
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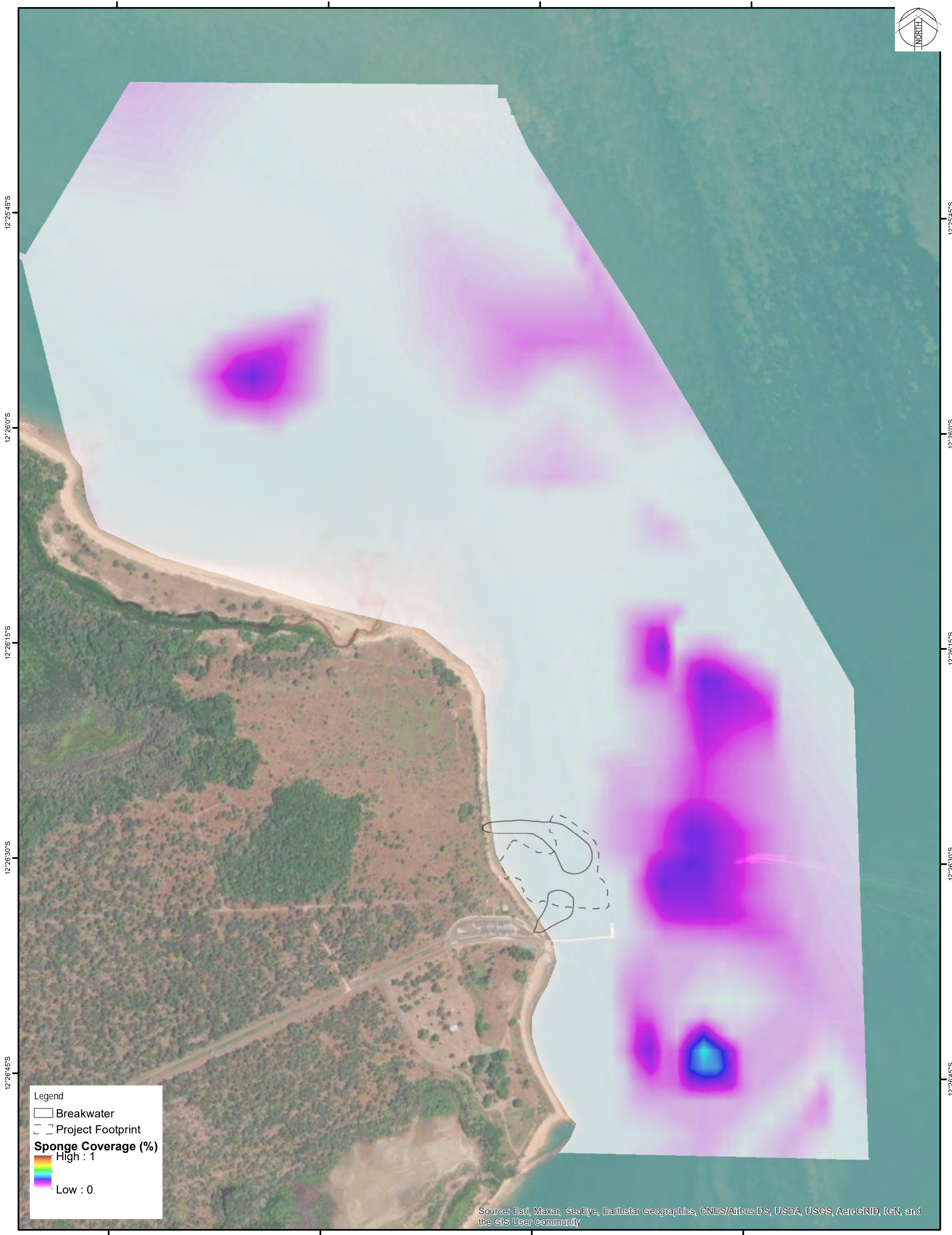
Scale  
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## BENTHIC HABITAT MAP - SEAGRASS (%)


MANDORAH MARINE FACILITIES  
MARINE ECOSYSTEMS REPORT

FIGURE D-4





Legend

-  Breakwater
-  Project Footprint

**Sponge Coverage (%)**  
 High : 1  
  
 Low : 0

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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Date  
6/12/2021

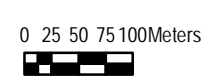
Size  
A3

Scale  
1:7,000

## BENTHIC HABITAT MAP - SPONGE (%)

MANDORAH MARINE FACILITIES  
MARINE ECOSYSTEMS REPORT

FIGURE D-5



APPENDIX

# D

MARINE FAUNA LIKELIHOOD ASSESSMENT

Likelihood of occurrence	Criteria
Unlikely	<p>Species that fit into one or more of the following criteria:</p> <ul style="list-style-type: none"> <li>Species highly restricted to certain geographical areas not overlapping the Study Area.</li> <li>Species that have specific habitat requirements that are not present in the Study Area.</li> </ul>
Low	<p>Species that fit into one or more of the following criteria:</p> <ul style="list-style-type: none"> <li>Have not been recorded previously in the Study Area and for which the Study Area is beyond the current distribution range.</li> <li>Use specific habitats or resources not present in the Project Area.</li> </ul>
Moderate	<p>Species that fit one or more of the following criteria:</p> <ul style="list-style-type: none"> <li>Have infrequently been recorded previously in the Study Area.</li> <li>Use specific habitats or resources present in the Project Area, but in a poor or modified condition.</li> <li>Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.</li> </ul>
High	<p>Species that fit one or more of the following criteria:</p> <ul style="list-style-type: none"> <li>Have frequently been recorded previously in the Study Area.</li> <li>Use habitat types or resources that are present in the Project Area, that are abundant and/or in good condition.</li> <li>Are known to, or likely to, maintain resident populations surrounding the Project Area.</li> <li>Are known to, or likely to, visit the Project Area during regular seasonal movements or migration.</li> </ul>

**Key:**

CR = Critically endangered

EN = Endangered

VU = Vulnerable

LC = Least concern

CD = Conservation dependent

DD = Data deficient

**EPBC Act Protected Matters Categories**

(T) – Threatened

(M) – Migratory

(C) – Whales and other cetaceans

Note: All species in table are listed as 'Marine' under EPBC Act and this may be their reason for inclusion if they are not T, M or C.

**Table D1 Likelihood assessment of listed marine species with potential to occur in the project study area**

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
<b>Birds</b>							
<i>Acrocephalus orientalis</i> (M)	Oriental Reed-Warbler	-	-	Inhabit areas of dense vegetation such as reedbeds, bamboo thickets and lantana alongside water. Distributed Australia-wide, however migratory towards northern Australia in late summer and early autumn.	-	Unlikely	Habitat is not present in the study area, therefore unlikely. Potentially overfly marine areas and study area, especially during migration (late summer, early autumn).
<i>Actitis hypoleucos</i> (M)	Common Sandpiper	-	-	Widespread in small numbers along coastlines and inland areas of northern and western Australia. Known to be observed at Kakadu National Park and the Darwin area. Kakadu National Park is also listed as a site of international importance.	30 - NT Fauna Atlas	High	Have frequently been recorded previously in the Study Area.  Study site habitat area is suitable for the species, with known breeding grounds around the Darwin area - fly by likely to occur.
<i>Anous stolidus</i> (M)	Common Noddy	-	-	Mainly distributed in ocean regions off of the coast of Queensland. The Common Noddy been recorded in the NT in low numbers, but rare (100-150 breeding population). When breeding, birds' nest in pigface ( <i>Carpobrotus</i> spp.), saltbush, bushes and low vegetation. Generally, inhabits offshore tropical islands	-	Low	Habitat within the study area not suitable for species, however, may fly over study site.
<i>Anseranas semipalmata</i>	Magpie Goose	-	-	Magpie Geese are known to be distributed throughout coastal northern Australia. The NT has the world's largest population of Magpie Geese, generally breeding nearby wetland ecosystems.	-	Low	Use specific habitats or resources not present however may fly through. Species or species habitat may occur within area
<i>Apus pacificus</i> (M)	Fork-tailed Swift	-	-	Widespread but scattered distribution throughout the NT. Inhabiting areas of inland plains, coastal areas or above foothills. Tea-tree swamps, saltmarshes, heathland and low scrub are generally habitat suitable for Fork-tailed Swift. However, have been recorded within sandplains and grassland with spinifex present.	-	Unlikely	Species or species habitat may occur within the study area. Behaviour of species is generally aerial therefore unlikely present in study area, however potentially flying through.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
<i>Ardea ibis</i>	Cattle Egret	-	-	One of the major distributions occurs from the Top End of NT to north-west WA. Typically recorded within wooded lands, terrestrial wetlands and grasslands of temperate and tropical regions.	-	Low	Species or species habitat may occur within the study area
<i>Arenaria interpres</i> (M)	Ruddy Turnstone	-	-	Located Australia-wide outside of breeding season, however two populations have been recorded in the NT at Castlereagh Bay and Bynoe Harbour. Habitats include regions with exposed rock, coral reefs, shelves, shallow tidepools and rocky/gravel beaches.	16 – NT Fauna Atlas	High	Have frequently been recorded previously in the Study Area. Potential foraging area. Known breeding site (Bynoe Harbour) located south of Study Area, therefore may also fly through.
<i>Calidris acuminata</i> (M)	Sharp-tailed Sandpiper	-	-	Located in Australia throughout non-breeding seasons, however generally in Groote Eylandt and Gove Peninsula, McArthur River and east Borroloola in the NT. Habitat involves both inland and coastal locations that occupy freshwater and saline habitats. Areas of low vegetation near lagoons, swamps, lakes, waterholes and hypersaline salt lakes. Intertidal mudflats serve as habitat for foraging on low tides, moving to freshwater systems during high tide.	1 – NT Fauna Atlas	Moderate	Have infrequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Calidris alba</i> (M)	Sanderling	-	-	Known to inhabit coastal areas surrounding Darwin, as well as Australia wide. Small groups have also been recorded throughout inland Australia. Sandy beaches, spits and sandbars often provide habitat for Sanderlings. Records within sheltered inlets, estuaries and harbours occur less often. Often found in coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and bare open coastal lagoons; individuals are rarely recorded in near-coastal wetlands. They roost on/behind bare sand, washed up kelp, coastal dunes and rocky reefs.	-	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Calidris canutus</i> (T, M)	Red Knot	EN	VU	Common in all the main suitable habitats around the coast of Australia. Mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs.	-	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area,

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
							opportunistically or during migration. Migration patterns may see presence of Red Knots, generally during September and October. Numbers reduce in December.
<i>Calidris ferruginea</i> (T, M)	Curlew Sandpiper	CE	VU	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. Curlew Sandpipers generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh.	1 – NT Fauna Atlas	Moderate	Have infrequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Calidris melanotos</i> (M)	Pectoral Sandpiper	-	-	Inhabits saline and/or freshwater wetlands along coastal lagoons, bays, estuaries, lakes, floodplains, creeks, saltmarshes and inundated grasslands. Kakadu National Park is listed as one of the 17 East Asian Australasian Flyway site network sites located in Australia. In the Northern Territory (NT), the Pectoral Sandpiper is found at Darwin and Alice Springs.	-	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Calidris tenuirostris</i> (T, M)	Great Knot	CE	VU	In Australasia, the species typically prefers sheltered coastal habitats, with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons. They are occasionally found on exposed reefs or rock platforms, shorelines with mangrove vegetation, ponds in saltworks, at swamps near the coast, saltlakes and non-tidal lagoons. The Great Knot rarely occurs on inland lakes and swamps.	2 – NT Fauna Atlas	Moderate	Have infrequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Calonectris leucomelas</i> (M)	Streaked Shearwater	-	-	Found in the western Pacific, breeding on the coast and on offshore islands of Japan, Russia, and on islands off the coasts of China, North Korea and South Korea. This marine species can be found over both pelagic and inshore waters.	-	Unlikely	Generally found in pelagic zones, however potential to fly over study site.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
							throughout migratory periods.
<i>Charadrius leschenaultia</i> (T, M)	Greater Sand Plover, Larger Sand Plover	VU	VU	In the NT, presence surrounding the Darwin area is evident. In the non-breeding grounds in Australasia, the species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons and inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs. They are occasionally recorded near-coastal saltworks and salt lakes, including marginal saltmarsh, and on brackish swamps. They usually roost on sand-spits and banks on beaches or in tidal lagoons, and occasionally on rocky points above the high-tide mark. Whale shark ( <i>Rhincodon typus</i> )	-	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Charadrius mongolus</i> (T, M)	Lesser Sand Plover, Mongolian Plover	EN	VU	The species is found around the entire coast of Australia, internationally important sites within NT include Darwin. In non-breeding grounds in Australia, this species usually occurs in coastal littoral and estuarine environments. They inhabit large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. It also sometime occurs in short saltmarsh or among mangroves. The species also inhabits saltworks and near-coastal salt pans, brackish swamps and sandy or silt islands in riverbeds. Roosts during high tide on sandy beaches, spits and rocky shores; forage individually or in scattered flocks on wet ground at low tide, usually away from the water's edge.	21 – NT Fauna Atlas	High	Have frequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Charadrius veredus</i> (M)	Oriental Plover, Oriental Dotterel	-	-	The Oriental Plover is a non-breeding visitor to Australia, where the species occurs in both coastal and inland areas, mostly in northern Australia. Most records are along the north-western coast, between Exmouth Gulf and Derby in WA, and there are records at a few scattered sites elsewhere, mainly along the northern coast, such as in the Top End, the Gulf of Carpentaria and on Cape York Peninsula. They forage among short grass or on hard stony bare ground, but also on mudflats or among seaweed on beaches. Sometimes roost on soft wet mud or in shallow	3 – NT Fauna Atlas	Moderate	Have infrequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
				water of beaches and tidal mudflats, and also occasionally in dry, open habitats, such as saltmarsh or paddocks.			
<i>Chrysococcyx osculans</i>	Black-eared Cuckoo	-	-	Widespread geographically within Australia, inhabiting dry regions occupied with open shrubland and woodlands of malle and mulga trees.	-	Low	Species or species habitat may occur within area. Scattered nature of distribution therefore reduces likelihood of presence. May fly past.
<i>Fregata ariel</i> (M)	Lesser Frigatebird, Least Frigatebird	-	-	Breeding populations are found in the tropical waters of Indian and Pacific Oceans, except in the east Pacific, and the South Atlantic on remote tropical and sub-tropical islands. Mainly feeds on fish but can snatch bird eggs and chicks as well as scavenge.	6 – NT Fauna Atlas	Moderate	Have infrequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Fregata minor</i> (M)	Great Frigatebird, Greater Frigatebird	-	-	Large range geographically, generally inhabiting tropical waters of the Indian and Pacific Oceans. Mangroves, bushes and bare ground are usually breeding habitats for the species.	-	Low	Known recording of species in and around study area throughout migration. However not recorded in Darwin area in most recent 30 years.
<i>Glareola maldivarum</i> (M)	Oriental Pratincole	-	-	Within Australia the Oriental Pratincole is widespread in northern areas, especially along the coasts of the Pilbara Region and the Kimberley Division in WA, the Top End of the NT, and parts of the Gulf of Carpentaria. It is also widespread but scattered inland, mostly north of 20° S. There are occasional records in southern Australia, at sparsely scattered sites, with records in all states, including an unconfirmed report in Tasmania. The species has also been recorded on various outlying islands, including Lord Howe Island, and, in the Indian Ocean, Christmas Island and Cocos-Keeling Islands. In non-breeding grounds in Australia, the Oriental Pratincole usually inhabits open plains, floodplains or short grassland (including farmland or airstrips), often with extensive bare areas. They often occur	-	Low	Species or species habitat may occur within area. Scattered nature of dispersal therefore reduces likelihood of presence. May fly past.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
				near terrestrial wetlands, such as billabongs, lakes or creeks, and artificial wetlands such as reservoirs, saltworks and sewage farms, especially around the margins. The species also occurs along the coast, inhabiting beaches, mudflats and islands, or around coastal lagoons. During the heat of the day they usually loaf near water at the edges of terrestrial wetlands, and at one wetland they roosted in the hoofprints of stock. They usually roost in bare areas such as claypans or areas with low vegetation, such as saltmarsh or airfields.			
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	-	-	Distributed along the coastline (including offshore islands) of mainland Australia and Tasmania. Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, and the sea).	14 – NT Fauna Atlas	High	Have frequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Hirundo daurica</i> (M)	Red-rumped Swallow	-	-	Red-rumped Swallow occupies a very large geographical range, being found within areas of sea cliffs, valleys, mountains, river gorges and open hilly regions.	-	Low	Species or species habitat may occur within area. Scattered nature of distribution therefore reduces likelihood of presence. May fly past.
<i>Hirundo rustica</i> (M)	Barn Swallow	-	-	In Australia, the Barn Swallow is recorded in open country in coastal lowlands, often near water, towns and cities. Birds are often sighted perched on overhead wires and also in or over freshwater wetlands, paperbark Melaleuca woodland, mesophyll shrub thickets and tussock grassland.	-	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Limnodromus semipalmatus</i> (M)	Asian Dowitcher	-	VU	Widespread distribution globally. River deltas, lake shores, flooded meadows and riversides are areas of suitable habitat.	-	Low	Suitable species habitat not present within the study area.
<i>Limosa lapponica baueri</i> (T, M)	Nunivak Bar-tailed Godwit,	VU	VU	The bar-tailed godwit has been recorded in the coastal areas of all Australian states But spends its nonbreeding period mostly in the north of WA and south-east Asia. The species	6 – NT Fauna Atlas	Moderate	Have infrequently been recorded previously in the Study Area.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
	Western Alaskan Bar-tailed			occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats.			Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Limosa limosa</i> (M)	Black-tailed Godwit	-	-	The Black-tailed Godwit is found in all states and territories of Australia, however, it prefers coastal regions and the largest populations are found on the north coast between Darwin and Weipa. Occurs in sheltered bays, estuaries and lagoons with large intertidal mudflats and sand flats.	-	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Merops ornatus</i>	Rainbow Bee-eater	-	-	The Rainbow Bee-eater is distributed across much of mainland Australia, and occurs on several near-shore islands. It is not found in Tasmania, and is thinly distributed in the most arid regions of central and Western Australia. The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation (Higgins 1999). It usually occurs in open, cleared or lightly timbered areas that are often, but not always, located in close proximity to permanent water	43 – NT Fauna Atlas	High	Have frequently been recorded previously in the Study Area. Species habitat present within the study area.
<i>Motacilla cinerea</i> (M)	Grey Wagtail	-	-	The Grey Wagtail is an opportunistic migrant to Australia. The species typically migrates to Indonesia occasionally landing in Australia. Most records for the species are from Northern Australia and SA. The non-breeding habitat only of the Grey Wagtail has a strong association with water, particularly rocky substrates along water courses but also lakes and marshes. It can be found mainly in banks and rocks in fast-running freshwater habitats: rivers, creeks, streams, and around waterfalls, both in forest and open country; but occurs almost anywhere during migration.	-	Low	Suitable habitat not present in the study area.
<i>Motacilla flava</i> (M)	Yellow Wagtail	-	-	Breeds in northern latitudes and travels south before the onset of winter. Occurs in a variety of damp or wet habitats with low vegetation. Outside of the breeding season, it is also found in cultivated areas.	-	Low	Suitable habitat not present in the study area.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
<i>Numenius madagascariensis</i> (T, M)	Eastern Curlew, Far Eastern Curlew	CE	VU	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass.	16 – NT Fauna Atlas	High	<p>Have frequently been recorded previously in the Study Area.</p> <p>Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.</p> <p>During the non-breeding season (the austral summer) birds in the NT are often solitary or in small flocks, rarely far from the coast. They are most common in mangrove areas, but will also forage on intertidal flats and saltmarshes.</p>
<i>Numenius phaeopus</i> (M)	Whimbrel	-	-	The Whimbrel nests in the branches of mangroves, around mudflats and in estuaries. They also nest in a depression on the ground filled with fragments of vegetation, usually in an exposed location. The Whimbrel is migratory and moves south from breeding grounds for the Northern Hemisphere winter. The subspecies, <i>Numenius phaeopus variegatus</i> , breeds in east Siberia and migrates to India through to Melanesia, Micronesia, Australia and New Zealand. During migration the Whimbrel occurs widely through inland regions on its route. Chambers Bay has been identified as an area of significance within the NT, with an estimated population of 1500.	36 – NT Fauna Atlas	High	<p>Have frequently been recorded previously in the Study Area.</p> <p>Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.</p> <p>Nearby habitat is likely to be suitable for Whimbrel distribution, therefore potentially flying over site.</p>
<i>Pandion haliaetus</i> (M)	Osprey	-	-	The breeding range of the Eastern Osprey extends around the northern coast of Australia (including many offshore islands) from Albany in Western Australia to Lake Macquarie in NSW; with a second isolated breeding population on the coast of South Australia, extending from Head of Bight east to Cape Spencer and Kangaroo Island. The total range	-	Moderate	<p>Species and habitat known</p> <p>Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area,</p>

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
				(breeding plus non-breeding) around the northern coast is more widespread, extending from Esperance in Western Australia to NSW, where records become scarcer towards the south, and into Victoria and Tasmania, where the species is a rare vagrant. Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes			opportunistically or during migration.
<i>Pluvialis squatarola</i> (M)	Grey Plover	-	-	In non-breeding grounds in Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes. The species is also very occasionally recorded further inland, where they occur around wetlands or salt-lakes	6 – NT Fauna Atlas	Moderate	Have infrequently been recorded previously in the Study Area. Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Rhipidura rufifrons</i> (M)	Rufous Fantail	-	-	The Rufous Fantail forages mainly in the low to middle strata of forests, sometimes in or below the canopy or on the ground; in northern Australia they also forage in mangroves	-	Low	Species and species habitat is unlikely to be observed in the study area.
<i>Rostratula australis</i> (T)	Australian Painted Snipe	EN	VU	Most records are from the southeast, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in WA. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	-	Low	Scattered distribution provides potential for species to fly over site
<i>Rostratula benghalensis</i> ( <i>sensu lato</i> ) (T)	Painted Snipe	EN	VU	The Australian Painted Snipe has been recorded at wetlands in all states of Australia. It is most common in eastern Australia, where it has been recorded at scattered locations throughout much of Queensland, NSW, Victoria and south-eastern South Australia. It has been recorded less frequently	-	Low	Scattered distribution within the Northern Territory and habitat give reasoning for low likelihood.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
				at a smaller number of more scattered locations farther west in South Australia, the Northern Territory and Western Australia. The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum <i>Muehlenbeckia</i> or canegrass or sometimes tea-tree ( <i>Melaleuca</i> ). The Australian Painted Snipe sometimes utilises areas that are lined with trees, or that have some scattered fallen or washed-up timber			
<i>Sternula albifrons</i> (M)	Little Tern	-	-	Migrates from eastern Asia, this species is found along the north, east and south-east Australian coasts. The Australian breeding population can be divided into two major subpopulations: (1) a northern subpopulation that breeds across northern Australia, from about Broome in north-western WA (where first recorded only in December 1995), through coastal NT (mainly from just west of Darwin to the QLD border) to the Gulf of Carpentaria and eastern Cape York Peninsula (with an extended breeding season covering most of the year); and (2) an eastern subpopulation that breeds on the eastern and south-eastern coast of the mainland and northern and eastern Tasmania, occasionally extending as far west as western VIC and south-eastern SA (and breeding in the austral spring-summer). In Australia, Little Terns inhabit sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets, especially those with exposed sandbanks or sand-spits, and also on exposed ocean beaches. In the Northern Territory, Little Terns are commonly seen in sandy coastal habitats and in mangrove-mudflat habitats along the coast or in bays and estuaries, but not recorded on wetlands more than 1 km from the coast	2 – NT Fauna Atlas	Moderate	Have infrequently been recorded previously in the Study Area.  Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Tringa nebularia</i> (M)	Common Greenshank,	-	-	The Common Greenshank does not breed in Australia, however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia. It is found in a wide variety of inland wetlands and sheltered	13 – NT Fauna Atlas	High	Have frequently been recorded previously in the Study Area.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
	Greenshank			coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. The Common Greenshank roosts and loafers round wetlands, in shallow pools and puddles, or slightly elevated on rocks, sandbanks or small muddy islets.			Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<b>Fish, Sharks &amp; Rays</b>							
<i>Anoxypristis cuspidata</i> (M)	Narrow Sawfish, Knifetooth Sawfish.	-	-	Inshore/offshore most widely distributed and abundant sawfish in Gulf of Carpentaria waters.	-	Low	The Study area contains habitat that isn't generally utilised by the species however may pass through when searching for feeding grounds.
<i>Campichthys tricarinatus</i>	Three-keel Pipefish	-	-	Endemic to tropical northern Australia from the Montebello Islands, WA to Thursday Island, Torres Strait, Qld; inhabits inshore coral reef and rubble areas at about 2-11 m.	1 – NT Fauna Atlas	Moderate	Have infrequently been recorded previously in the Study Area. Use specific habitats or resources present in the Project Area, but in a poor or modified condition.
<i>Carcharhinus longimanus</i> (M)	Oceanic Whitetip Shark	-	-	The Oceanic Whitetip Shark is widespread throughout tropical and subtropical pelagic waters of the world (30°N to 35°S). Within Australian waters, it is found in from Cape Leeuwin (WA) through parts of the NT, down the east coast of QLD and NSW to Sydney. It has not been recorded within the Gulf of Carpentaria or the Arafura Sea, preferring pelagic waters. A single specimen has been recorded in SA.	-	Unlikely	Transient and generally only inhabits open ocean habitats, therefore not suitable within study site.
<i>Carcharodon carcharias</i> (T, M)	White Shark, Great White Shark	VU	-	In Australia, white sharks have been recorded from central QLD around the south coast to north-west WA, but may occur further north on both coasts. White sharks are widely, but not evenly, distributed in Australian waters. This species can be found from close inshore around rocky reefs, surf beaches and shallow coastal bays to outer continental shelf and slope areas. The majority of recorded white shark movements occur between the coast and 100 m in depth but have been recorded to dive to depth of over 1,200 m.	-	Unlikely	Habitat and geological range of the study site is not suitable for this species.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
				Individuals may travel long distances in a relatively short time, but can remain in the same areas for weeks to months.			
<i>Choeroichthys brachysoma</i>	Pacific Short-bodied Pipefish, Short-bodied Pipefish	-	-	Although this species has been recorded in depths of up to 27.4 m (Dawson 1976), it most commonly occurs in seagrass, reef and coral habitats in depths of less than 5 m (Dawson 1985). Specimens in Aust. fish collections were collected in association with reefs (fringing, exposed, sheltered and limestone), live corals (including Porites, Acropora, Millepora and Synarea), soft corals, dead corals, algae (including Sargassum and filamentous algae), seagrass, sponges, hydroids, coral and shell rubble, coral rock, beach rock, sandstone terraces, isolated rock pools, caves, lagoons, mud, sand, and silt.	-	Low	Within geographical range. Potential habitat (eg. Coral Reef) is scattered in the Study Area. However, no known records within Darwin area..
<i>Choeroichthys suillus</i>	Pig-snouted Pipefish	-	-	Tropical, subtropical, known from northern Australia and Papua New Guinea; from Jurien Bay (WA) to Moreton Bay (Qld); in rubble habitats of inshore coral reefs to 15 m.	-	Low	Within geographical range. Potential habitat (eg. Coral Reef) is scattered in the Study Area. However, no known records within Darwin area.
<i>Corythoichthys amplexus</i>	Fijian Banded Pipefish, Brown-banded Pipefish	-	-	This species prefers protected coral habitats in depths of 0-31m, but is apparently most commonly found in depths greater than 9m. It occurs in shallow reefs as well as deep walls, with algae and known from clear coastal outer reef crests and along the edges of rubble. It inhabits shallow caves but is bold enough to spend most of the day out searching for food. Specimens in Australia fish collections were collected in association with outer reefs, reef edges, coral gutters, bomboras, caves, isolated coral knolls, reef walls and slopes, against drop-offs, ledges, live corals (including <i>Acropora</i> , alcyonarians and gorgonians), soft corals, sand rubble, lagoons, sand and fine silt. The above specimens were collected in depths of 0-35 m using ichthyocides and dipnets.	-	Low	Species may occur in the area due to suitable habitat present, however not recorded in the study area. Although this species is reported to occur throughout the Indo-West Pacific, it is probably restricted to the Fijian region.
<i>Corythoichthys flavofasciatus</i>	Reticulate Pipefish, Yellow-banded	-	-	This species is observed in still lagoons, sand and coral bomboras. It also occurs in rubble reef and is usually found in pairs. Specimens in Aust. fish collections were collected in	-	Low	Species may occur in the area due to suitable habitat present, however not recorded in the study area

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
	Pipefish, Network Pipefish			association with fringing coral reefs, coral reef crests, reef flats, live corals (including <i>Acropora</i> ), gorgonians, limestone rock platforms, soft corals, dead corals, algae, encrusting organisms, rubble, rocky shores, gutters, drop-offs, bomboras, pools, caves and sand.			
<i>Corythoichthys haematopterus</i>	Reef-top Pipefish	-	-	This species occurs on reef crests and slopes and on rubble patches and large coral heads. It is also known from intertidal and generally shallow sheltered inner reef flats and rubble lagoons, usually in association with partially silty habitats.	-	Low	Species may occur in the area due to suitable habitat present, however not recorded in the study area
<i>Doryrhamphus excisus</i>	Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish	-	-	<i>Doryrhamphus</i> species are free-swimming benthic fishes found in various reef habitats in coastal to outer reefs, and usually stay close to small caves or narrow crevices into which they retreat when threatened. Specimens in Aust. fish collections were collected in association with coral reefs, reef flats, reef crests, limestone platforms, rocks, boulders, sand, rock and coral rubble, seagrasses, shallow channels, outer reef slopes, vertical reef walls, rocky surge channels, coral gutters, sandy gutters, bomboras, live corals (including <i>Acropora</i> ), dead corals, lagoons, rockpools, artificial reefs, sand and fine silt.	-	Unlikely	Species or species habitat may occur in the study site, however study site not within geographical range.
<i>Doryrhamphus janssi</i>	Cleaner Pipefish, Janss' Pipefish	-	-	Free-swimming benthic fishes found in various reef habitats in coastal to outer reefs, and usually stay close to small caves or narrow crevices into which they retreat when threatened. This species occurs under overhangs, in often in association with sponges, in depths of 5-30 m.	-	Low	Within geographical range. Potential habitat (eg. Coral Reef) is scattered in the Study Area. However, no known records in Darwin area.
<i>Festucalex cinctus</i>	Girdled Pipefish	-	-	Species preferred rubble bottoms but is also found in sponge and seagrass habitats (Kuitert 1992) in sheltered coastal bays with sparse low algal growth. Specimens in Aust. fish collections were collected in association with seagrass (including <i>Zostera</i> and <i>Posidonia</i> ), kelp ( <i>Ecklonia</i> ), boulders, rocky reefs, rocks, shell rubble, sand, silt and mud.	-	Low	Within geographical range. Potential habitat (eg. Coral Reef) is scattered in the Study Area. However, no known records in Darwin area.
<i>Halicampus brocki</i>	Brock's Pipefish	-	-	Recorded in Australia from scattered locations in north WA, the NT and QLD. Found elsewhere in the tropical Western Pacific - from the Philippines and north to the Ryukyu Islands, Japan, south to northern Australia, the Coral Sea, eastwards to Micronesia. Usually inhabits patches of coral and macroalgae on coastal reefs at 3-45 m.	-	Low	Within geographical range. Potential habitat (eg. Coral Reef and Macroalgae) is scattered within in the Study Area. However, no known records in Darwin area.

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<i>Halicampus grayi</i>	Mud Pipefish, Gray's Pipefish	-	-	Distributed widely in Indo-west Pacific tropical areas. From Northern Australia to the Gulf of Aden. The Mud Pipefish inhabits areas of muddy and silty bottoms along the continental shelf from onshore bays to deep offshore areas up to 100m.	-	Low	Species or species habitat (e. silty and muddy bottoms) may be present within the study area. However, no known records in Darwin Area.
<i>Halicampus spirostris</i>	Spiny-snout Pipefish	-	-	Known from the tropical Indo-west Pacific - Indonesia, northern Australia, the South China Sea, Vietnam across to American Samoa; inhabits shallow coral rubble areas in lagoons and intertidal zones of inshore coral reefs in 5-10 m.	-	Low	Within geographical range. Potential habitat (eg. Coral Rubble) is scattered within in the Study Area. However, no known records in the Darwin area.
<i>Haliichthys taeniophorus</i>	Ribboned Pipehorse, Ribboned Seadragon	-	-	Shark Bay, WA, to Cape York, QLD. Elsewhere the species occurs in West Papua, Indonesia, and Papua New Guinea. Inhabits a variety of inshore shallow water areas including weedy regions bordering open substrates, coral reefs, rocky, gravel, sandy and muddy substrates; also associated with sponges, macroalgae, hydroids, shells and seagrasses usually from 1-18 m.	-	Low	Within geographical range. Potential habitat is within in the Study Area. However, no known records in the Darwin area.
<i>Hippichthys cyanospilos</i>	Blue-speckled Pipefish, Blue-spotted Pipefish	-	-	The Blue-speckled Pipefish inhabits estuarine and coastal areas that are characterised by brackish shallow water and mangrove environments. Widely distributed across Indo-West Pacific, from the Red Sea and East Africa coast to Fiji, Australia and the Philippines	-	Low	Species or species habitat not present within the study area.
<i>Hippichthys parvicarinatus</i>	Short-keel Pipefish, Short-keeled Pipefish	-	-	The Short-keel Pipefish is known only from estuarine and freshwater habitats in the Northern Territory. Endemic species to the Northern Territory.	-	Low	Species or species habitat not present within the study area.
<i>Hippichthys penicillus</i>	Beady Pipefish, Steep-nosed Pipefish	-	-	Found from Carnarvon, WA, to Woy Woy, NSW. Elsewhere the species occurs in the tropical, Indo-west Pacific, from western Persian Gulf (Kuwait, Saudi Arabia), north central Indian Ocean, and eastward to Japan and Australia.	-	Low	Within geographical range. Potential habitat is within in the Study Area. However, no known records in the Darwin area.
<i>Hippocampus histrix</i>	Spiny Seahorse,	-	-	Recorded in Australia from south of Ashmore Reef, Timor Sea, the Great Barrier Reef, QLD, and in Port Stephens, NSW. Elsewhere the species occurs in the tropical and	-	Low	Potential habitat (e.g. soft corals and sponges) is present in the Study Area.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
	Thorny Seahorse			subtropical Western Pacific, from Bali, Indonesia, Papua New Guinea, New Caledonia and Japan. Inhabits areas with both hard and soft bottoms, often attached to soft corals or sponges at 10-95 m, usually below 15 m. The Thorny Seahorse may also be found on shallower algae-rubble or rocky reef areas in about 10 m.			However no known records in the Darwin area.
<i>Hippocampus kuda</i>	Spotted Seahorse, Yellow Seahorse	-	-	This is a wide-ranging Indo-Pacific seahorse that inhabits waters from Indonesia to the Philippines, Pakistan and India to southern Japan, Hawaii, and the Society Islands, but it might be possible that variations of this species may also reside in other areas outside of the Indo-Pacific region. Inhabit seagrass and marine algae areas of estuaries and seaward reefs; also on steep mud slopes. Found in open water and attached to drifting Sargassum up to 20 km from shore.	-	Low	Species or species habitat not present within the study area.
<i>Hippocampus planifrons</i>	Flat-face Seahorse	-	-	Endemic to WA, from Dirk Hartog Island to Broome. Inhabits tidepools, macroalgal and rubble reefs in shallow bays from the intertidal to a depth of about 20 m. Endemic to tropical areas (north and north east) of Australia.	-	Low	Potential habitat (e.g. soft corals and sponges) is present in the Study Area. However, no known records in the Darwin area.
<i>Hippocampus spinosissimus</i>	Hedgehog Seahorse	-	-	Inhabit coral reefs, muddy or sandy bottoms in the continental shelf. Distributed across the Indo-Pacific region spanning from Taiwan and Australia to Sri Lanka.	-	Low	Potential habitat (e.g. coral reefs) is present in the Study Locality. However, no known records in the Darwin area
<i>Glyphis garricki</i> (T)	Northern River Shark, New Guinea River Shark	EN	EN	In Australia the northern river shark is known from few records, including in the Northern Territory (NT) from the Adelaide and East and South Alligator River systems. It is also known from the Kimberley coast and King Sound in Western Australia. Little is known of the ecology of the northern river shark but it is probably restricted to shallow, brackish reaches of large rivers.	-	Unlikely	Use specific habitats or resources not present within the Study area.
<i>Manta alfredi</i> (M)	Reef Manta Ray, Coastal Manta Ray,	-	-	The Giant Manta Ray occurs in tropical, sub-tropical and temperate waters of the Atlantic, Pacific and Indian Oceans. Commonly sighted along productive coastlines with regular upwelling, oceanic island groups and particularly offshore pinnacles and seamounts. Widespread, although relatively uncommon in Australian waters; also Cocos (Keeling) Islands and Christmas Island in the eastern Indian Ocean.	-	Unlikely	Use specific habitats or resources not present within the Study Locality

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
	Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray			Elsewhere the species is circumglobal, usually offshore, often around oceanic islands, sometimes coastal, and most common in tropical waters. Giant Manta Rays aggregate year round in Coral Bay (Bateman Bay) and Ningaloo Reef during autumn and winter.			
<i>Manta birostris</i> (M)	Giant Manta Ray	-	-	Distributed in the Indo-West Pacific: Red Sea, South Africa, Thailand to WA; north to Japan (Yaeyama Island), to Solitary Island, Australia as far east as French Polynesia and the Hawaiian Islands. Adults are commonly sighted inshore, within a few kilometres of land; found around coral and rocky reefs as well as along productive coastlines with consistent upwelling, tropical island groups, atolls and bays.	-	Unlikely	Use specific habitats or resources not present within the Study Locality
<i>Micrognathus micronotopterus</i>	Tidepool Pipefish	-	-	The Small Tidepool Pipefish is often found in coral reef tidepool on the north coast of the Australia. Tropical East-Indo-west Pacific, known from Singapore, Indonesia, northern Australia and the Philippines; recorded in Australian waters from Exmouth Gulf, WA, to the Gulf of Carpentaria near Yirrkala, Northern Territory. Usually inhabits shallow inshore reefs and tidepools, amongst sparse seagrasses and algae-rubble, in depths from 1-5m, although individuals have been collected from depths to 10m.	-	Low	Study site does not contain suitable habitat for species.
<i>Pristis clavata</i> (T, M)	Dwarf Sawfish, Queensland Sawfish	VU	VU	Since European settlement, the species' Australian distribution has previously been considered to extend north from Cairns around the Cape York Peninsula in QLD, across northern Australian waters to the Pilbara coast in WA. A review of specimen records of Dwarf Sawfish has found no records of the species from the eastern coast of the Cape York Peninsula, although the species has been confirmed from the Pine River on the western coast of Cape York Peninsula. The Dwarf Sawfish usually inhabits shallow (2–3 m) coastal waters and estuarine habitats.	-	Low	Potential habitat is present in the Study Area. However no known records in the Darwin area.
<i>Pristis pristis</i> (T, M)	Freshwater Sawfish, Largetooth	VU	VU	The Freshwater Sawfish may potentially occur in all large rivers of northern Australia from the Fitzroy River, Western Australia, to the western side of Cape York Peninsula, Queensland. It is mainly confined to the main channels of	-	Low	Study site does not contain suitable habitat for species.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
	h Sawfish, River Sawfish			large rivers. In northern Australia, this species appears to be confined to freshwater drainages and the upper reaches of estuaries, occasionally being found as far as 400 km from the sea			
<i>Pristis zijsron</i> (T, M)	Green Sawfish, Dindagub ba, Narrowsw out Sawfish	VU	VU	In Australian waters, Green Sawfish have historically been recorded in the coastal waters off northern Australia and down the east coast as far as Jervis Bay, NSW. Individuals have been recorded in inshore coastal environments and estuaries but the species does not penetrate into freshwater. There are also records of green sawfish hundreds of kilometres offshore in relatively deep water.	-	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration.
<i>Rhincodon typus</i> (T, M)	Whale Shark	VU	-	In Australia, the whale shark is known from NSW, QLD, NT, WA and occasionally VIC and SA, but it is most commonly seen in waters off northern WA, NT and QLD.  The whale shark is an oceanic and coastal, tropical to warm-temperate pelagic shark. It is often seen far offshore, but also comes close inshore and sometimes enters lagoons of coral atolls. The whale shark is generally encountered close to or at the surface, as single individuals or occasionally in schools or aggregations of up to hundreds of sharks.	-	Unlikely	Migratory species who's habitat (open ocean) is not suited to that present in the study area.
<i>Solegnathus hardwickii</i>	Pallid Pipehorse Hardwick's Pipehorse	-	-	Found Northeast of the Monte Bello Islands, WA to north of Cartier Island, Timor Sea, to the Arafura Sea north of Maningrida, NT. Inhabits areas with hard substrates, in association with gorgonian corals, black corals, algae and sponges. Continental slopes	-	Unlikely	Species or species habitat (eg. Continental shelf, hard substrates, algae and spoges) may occur within the study area.
<i>Solegnathus lettiensis</i>	Gunther's Pipehorse	-	-	Recorded in Australia from Rottneest Is, WA (32°00'E) to N of Bathurst Is, NT (130°09'S). Found elsewhere in the Indo-west Pacific	-	Unlikely	Species usually distributed along the continental slope, therefore unlikely to be present in the study area.
<i>Solenostomus cyanopterus</i>	Robust Ghostpipe fish, Blue- finned Ghost Pipefish,	-	-	Occurs within Shark Bay region to NE of the Monte Bello Islands, WA, and the northern Great Barrier Reef, QLD, to Shellharbour, NSW; also Christmas Island in the eastern Indian Ocean. Inhabits shallow protected coral and rocky reefs, along with deep, clear estuaries with seagrass or macro-algae at depths to 28m. Individuals or pairs are often seen head, mimicking algae or seagrass leaves.	-	Low	Species or species habitat (shallow protected coral and rocky reefs) may be present within the study area. Therefore, potential distribution of species in study area. However no

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
							known records in the Darwin area.
<i>Sphyrna lewini</i> (T)	Scalloped Hammerhead	CD	-	The Scalloped Hammerhead is found in warm temperate and tropical coastal seas around the world. In Australia, the species is found in New South Wales (NSW), Queensland, the Northern Territory, and Western Australia. The Australian population is believed to be primarily composed of males and juvenile females, while adult females of the stock are suspected to segregate from the males and may use Indonesian waters more than Australian waters.	-	Low	Scalloped Hammerheads are generally found within semi-ocean pelagic zones, therefore unlikely to be located within the study area, potential to swim through.
<i>Syngnathoides biaculeatus</i>	Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish	-	-	In Australian waters, known from Geraldton to Shark Bay, and north to Ashmore and Cartier Reefs, WA, and from the Timor Sea, the NT, eastwards to QLD and south to Batemans Bay (NSW). Inhabits shallow, protected waters of bays, lagoons and estuaries including mangrove areas, in association with seagrass beds and macroalgae in depths at 0-10 m. Juveniles sometimes found clinging to floating algae and plant debris including Sargassum rafts.	-	Low	Use specific habitats or resources not present in the Project Area.
<i>Trachyrhamphus bicoarctatus</i>	Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish	-	-	Bentstick Pipefish are known in Australian waters from the central coast of WA, northwards throughout the waters of the NT and QLD to central NSW. They live in sheltered coastal lagoon and reef areas on sandy and rubble habitats amongst seagrasses and macroalgae at 1– 30 m.	-	Low	Use specific habitats or resources not present in the Project Area.
<i>Trachyrhamphus longirostris</i>	Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish	-	-	Recorded in Australian waters from North West Cape, WA, northwards around the tropical north to about Magnetic Island, QLD. Most specimens have been trawled or dredged from muddy to sandy-bottom habitats in depths of 16-91m, in association with sand, rubble, seagrasses, algae, sponges, sea pens and hydroids.	-	Low	Use specific habitats or resources not present in the Project Area.
<b>Mammals and Cetaceans</b>							
<i>Balaenoptera edeni</i> (M, C)	Bryde's Whale	-	-	Bryde's Whales occur in temperate to tropical waters, both oceanic and inshore, bounded by latitudes 40° N and 40° S,	-	Unlikely	Use specific habitats or resources not present

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
				or the 20 °C isotherm. Bryde's whales are found year-round primarily in temperatures exceeding 16.3 °C. The coastal front of Bryde's whale appears to be limited to the 200 m depth isobar, moving along the coast in response to availability of suitable prey. The offshore form is found in deeper water (500 m to 1000 m).			within the Study area. Generally observed in the open ocean.
<i>Balaenoptera musculus</i> (T, M, C)	Blue Whale	EN	-	The continental shelf and coastal waters of Australia are generally used for migration and opportunistic feeding by bluewhales, although they are generally associated with open ocean. The only known feeding areas in Australia are located around the southern continental shelf, including Perth Canyon, in WA and the Bonney Upwelling and adjacent upwelling areas of SA and VIC. Satellite tagging has confirmed that the pygmy blue whale feeds off the Perth Canyon and heads north in March/April to potential breeding grounds in Indonesian waters by June.	-	Unlikely	Use specific habitats or resources not present within the Study area. Generally observed in the open ocean.
<i>Delphinus delphis</i> (C)	Common Dolphin, Short-beaked Common Dolphin	-	-	Common Dolphins are found in offshore waters. They have been recorded in waters off all Australian states and territories, but are rarely seen in northern Australian waters. Common Dolphins appear to occur in two main locations around Australia, with one cluster in the southern south-eastern Indian Ocean and another in the Tasman Sea. Common Dolphins are usually found in areas where surface water temperatures are between 10°C and 20°C, and in habitats also inhabited by small epipelagic fishes such as anchovies and sardines.	-	Unlikely	Use specific habitats or resources not present within the Study area.
<i>Dugong dugon</i> (M)	Dugong	-	-	Dugongs occur in coastal and island waters from Shark Bay in WA (25° S) across the northern coastline to Moreton Bay in QLD (27° S). Specific areas supporting dugongs in the Northern Territory include: the northern coast (Daly River to Millingimbi, including Melville Island and Vernon Islands and the Darwin region); and the Gulf of Carpentaria, including the Sir Edward Pellew Group of Islands, the mouth of the Limmen Bight River, and the waters between Blue Mud Bay and Groote Eylandt. Dugongs are seagrass community specialists and the range of the dugong is broadly coincident with the distribution of seagrasses in the tropical and sub-tropical waters in their Australian range.	9 – NT Fauna Atlas	Moderate	Have infrequently been recorded previously in the Study Area. Potential for dugongs to be foraging or passing through the study site is likely. Transient, has the potential to swim through the Study Locality, albeit widespread. Known species habitat present in Study area.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
<i>Grampus griseus</i> (C)	Risso's Dolphin, Grampus	-	-	In Australia, Risso's Dolphins have been recorded from all states except Tasmania and the NT. Stranding records range from about 23° S to 39° S, although there is at least one stranding from further north, on Croker Island in the NT. No estimates of abundance are available but this species is believed to be reasonably abundant throughout the main part of its range, with depths from the limited sighting data ranging from 180 m to 1500 m. Fraser Island has the only suspected 'resident' population in Australia. Risso's Dolphin occur mainly on steep sections of the upper continental slope, usually in waters deeper than 1000 m, in tropical and warm temperate latitudes.	-	Unlikely	No known records of species within Darwin area.
<i>Megaptera novaeangliae</i> (T, M, C)	Humpback Whale	VU	-	Occurs in oceanic and coastal waters worldwide. The west coast humpback whales are often sighted as far north as Ashmore Reef (12° S). Camden sound appears to be the northern most limit for the majority of the west coast whales and is considered to be an important breeding area. The migratory habitat for the humpback whale around mainland Australia is primarily coastal waters less than 200 m in depth and generally within 20 km of the coast. There is also evidence that during the southern migration, some west Australia whales appear to split off from the coastal migratory route and head offshore from the coast between Exmouth and Shark Bay.	-	Unlikely	Transient, has the potential to swim through the Study Locality, albeit widespread. NT coastline within the migration route of Humpback whales, during October. However, the close proximity of the study site to the shore reduces likelihood of occurrence at the site.
<i>Orcaella heinsohni</i> (M, C)	Australian Snubfin Dolphin	-	-	All available data on the distribution and habitat preferences of Australian Snubfin Dolphins indicate that they mainly occur in one location: shallow coastal and estuarine waters of Queensland, Northern Territory and north Western Australia. Within Australia, Australian Snubfin Dolphins have been recorded almost exclusively in coastal and estuarine waters. It is doubtful that they venture very far upstream in river systems, although occasional vagrants may venture upstream	10 – NT Fauna Atlas	Moderate	Have infrequently been recorded previously in the Study Area. Transient, has the potential to swim through the Study Locality, albeit widespread.
<i>Orcinus orca</i> (M, C)	Killer Whale	-	-	In Australia, orcas are recorded from all states, with concentrations reported around Tasmania. Sightings are also frequent in SA and VIC. They may be more common in cold, deep waters, but off Australia, orcas are most often seen along the continental slope and on the shelf, particularly near seal colonies. Orcas have regularly been observed within the Australian territorial waters along the ice edge in summer.	-	Unlikely	Use specific habitats or resources not present within the Study Locality. With no known records in the area.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
<i>Sousa chinensis</i> (M, C)	Indo-Pacific Humpback Dolphin	-	-	In Australia, Indo-Pacific humpback dolphins are known to occur along the northern coastline, extending to Exmouth Gulf on the west coast (25° S), and the QLD/NSW border region on the east coast (34° S). Within their geographical range, Australian humpback dolphins are found primarily in coastal waters however, this species is known to inhabit shallow coastal, estuarine, and occasionally riverine habitats, in tropical and subtropical regions.	-	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration. Transient, has the potential to swim through the Study Locality, albeit widespread.
<i>Stenella attenuate</i> (C)	Spotted Dolphin, Pantropical Spotted Dolphin	-	-	In Australia, Pantropical Spotted Dolphins have been recorded off the NT, WA down south to Augusta, QLD and NSW. The record for VIC is believed to be erroneous. Pantropical Spotted Dolphins inhabit both near-shore and oceanic habitats in tropical and warm temperate seas. They have also been found on the shelf and along the continental slope, indicating that they may use neritic (over the continental slope) habitat as well.	-	Unlikely	Species that have specific habitat requirements that are not present in the Study Area.
<i>Tursiops aduncus</i> (M, C)	Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin	-	-	Bottlenose dolphins are distributed throughout the Australian coastline, but the taxonomic status of many populations is unknown. Indian Ocean Bottlenose Dolphins have been confirmed to occur in estuarine and coastal waters of eastern, western and northern Australia. In Australia, the Indian Ocean Bottlenose Dolphin is restricted to inshore areas such as bays and estuaries, nearshore waters, open coast environments, and shallow offshore waters including coastal areas around oceanic islands. Indian Ocean Bottlenose Dolphins are also known to associate with whales, such as Humpback Whales.	7 – NT Fauna Atlas	Moderate	Are unlikely to maintain sedentary populations, however may seasonally use resources within the Project Area, opportunistically or during migration. Transient, has the potential to swim through the Study Locality, albeit widespread.
<i>Tursiops truncatus s. str.</i> (C)	Bottlenose Dolphin	-	-	The distribution of the Bottlenose Dolphin in Australian waters is not well known, but there are records for QLD, NSW, Tasmania, SA and south-western WA\ Bottlenose Dolphins are found in tropical and temperate waters. They inhabit inshore areas such as bays, lagoons, fjords and estuaries, and nearshore (open coast) and offshore environments, including the coast of oceanic islands. They are associated with many types of substrate and habitats, including mud, sand, seagrasses, mangroves and reefs. Bottlenose Dolphins are known to associate with several	-	Unlikely	Species that have specific habitat requirements that are not present in the Study Area.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
				cetacean species such as Pilot Whales, White-sided, Spotted, Rough-toothed and Risso's Dolphins, and Humpback and Right whales.			
<b>Reptiles</b>							
<i>Acalyptophis peronii</i>	Horned Seasnake	-	-	The horned seasnake occurs in tropical waters from Barrow Island in WA to Moreton Bay in QLD. The Horned Seasnake is typically found on sandy substrates.	-	Low	Use specific habitats or resources not present in the Project Area.
<i>Aipysurus duboisii</i>	Dubois' Seasnake	-	-	The Dubois' Seasnake occurs between Exmouth Gulf in WA and Hervey Bay in QLD; and on Ashmore Reef and the Sahul Shelf. The Dubois' Seasnake is most often observed in shallow water near protected coral reefs at depths of 3–4 m, but it has also been caught in trawling nets at depths of approximately 45 m. During trawling on the northern Australian continental shelf, the species was most frequently caught at depths of 20–50 m.	-	Low	Use specific habitats or resources not present in the Project Area.
<i>Aipysurus eydouxii</i>	Spine-tailed Seasnake	-	-	The Spine-tailed Seasnake occurs in tropical northern Australia from Exmouth Gulf in WA to Fraser Island in QLD. The species is known to inhabit shallow bays and estuaries, where it is commonly associated with soft muddy substrates, rather than rock or coral.	-	Low	Use specific habitats or resources not present in the Project Area.
<i>Aipysurus laevis</i>	Olive Seasnake	-	-	Surveys conducted before 2000 found that the Olive Seasnake occurs in coastal and coral reef waters across northern Australia, including the coast of the NT, the north east coast of WA (north of Exmouth) and the coast of QLD. The Olive Seasnake is found along lower reef edges and upper lagoon slopes of leeward reefs and occurs on larger, sheltered reefs and rarely on highly exposed reefs. Their study also found that the longitude of reef location was a major determinant of the presence or absence of the Olive Seasnake at locations through the Pompey and Swain reef regions of the southern Great Barrier Reef. At Ashmore Reef, the Olive Seasnake occurs on reef flats at both high and low tide, in channels and at the reef crest, in water depths up to 20 m. It is more common on reef flats at high tide. Live coral cover provides crevices suitable for both prey shelter and	-	Low	Use specific habitats or resources not present in the Project Area.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
				prey egg nests. Coral reefs also provide shelter for the Olive Seasnake."			
<i>Astrotia stokesii</i>	Stokes' Seasnake	-	-	The Stokes' Seasnake inhabits the tropical seas of northern Australia, including WA, the NT and QLD. At Ashmore Reef, Stokes' Seasnake is associated with inner reef drop-offs at water depths of 7–10 m. It also occurs on muddy substrates at depths of 10 m. Stokes' Seasnake has been found in coastal tidal pools. At Ashmore Reef, Stokes' Seasnake uses deeper water near the reef crest and channels but avoids the reef flat at low tide. It is most likely to be caught during trawling at depths of 11–20 m.	-	Low	Use specific habitats or resources not present in the Project Area.
<i>Caretta caretta</i> (T, M)	Loggerhead Turtle	EN	VU	The loggerhead turtle has a worldwide distribution in coastal tropical and subtropical waters. In Australia, loggerheads occur in coral reefs, bays and estuaries in tropical and warm temperate waters off the coast of QLD, NT, WA and NSW. Migrations from southern Queensland rookeries to the Northern Territory, Torres Strait, Papua New Guinea, Solomon Islands, New Caledonia and Vanuatu have been recorded. During the nesting months females generally remain within 10 km of the rookery	-	Low	Have not been recorded previously in the Study Area.
<i>Chelonia mydas</i> (T, M)	Green Turtle	VU	NE	Green Turtles occur in tropical and subtropical waters throughout the world. In Australia, the main breeding distribution includes the Great Barrier Reef, the northwest shelf of Western Australia, Wellesley Island group in the southern Gulf of Carpentaria and the Top End coast. Many nesting sites occur in the Northern Territory (NT), mostly from the western end of Melville Island to near the border with Queensland. Nationally significant breeding sites in the NT include Cobourg Peninsula, the mainland from Gove to the northern edge of Blue Mud Bay, the southeast of Groote Eylandt, and the northern beaches of islands in the Sir Edward Pellew group. Adult Green Turtles are primarily herbivorous, feeding mostly on seagrass and algae, while juveniles are carnivorous.	5 – NT Fauna Atlas	Moderate	Have infrequently been recorded previously in the Study Area. Use specific habitats or resources present in the Project Area, but in a poor or modified condition. May seasonally use resources within the Project Area, opportunistically or during migration.
<i>Crocodylus johnstoni</i>	Freshwater Crocodile, Johnston'	-	-	Inhabit both freshwater and saltwater habitats, however generally found within creeks, rivers, swamps, lagoons and upstream from the coastline.	-	Low	Use specific habitats or resources not present in the Project Area.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
	s Crocodile, Johnston e's Crocodile						No previous records in the Study Area.
<i>Crocodylus porosus</i> (M)	Salt-water Crocodile, Estuarine Crocodile	-	LC	May be found in any water body in northern Australia including fresh and salt water. Range from Broome in Western Australia, through the Northern Territory to Rockhampton QLD. Inhabit coastal areas within the Northern Territory, with suitable habitats being coastal creeks, tidal rivers, floodplains, swamps and billabongs. Nesting occurs between November and May, in areas that are not greatly affected by tidal movement (e.g. Swamps).	-	Moderate	Known to inhabit surrounding area of study site. However, capture and removal of any entering Darwin Harbour occurs regularly.
<i>Dermochelys coriacea</i> (T, M)	Leatherback Turtle, Leathery Turtle	EN	CR	<p>The Leatherback Turtle has a near-global distribution, though it nests mostly in tropical areas and feeds mostly in temperate seas and oceans. There are very few records of nesting in Australia.</p> <p>In the Northern Territory (NT), the only places where breeding has been reported are the Sir Edward Pellew Islands, near Maningrida, Danger Point on Cobourg Peninsula and Palm Bay on Croker Island. Tracks of Leatherback Turtles are occasional recorded on the north coast and Gulf of Carpentaria.</p> <p>The Leatherback Turtle is typically an oceanic species. They forage within the water column, preying primarily on jellyfish, but seaweed, fish, crustaceans and other marine invertebrates are also consumed.</p> <p>In Australia, Leatherback Turtles forage mostly in subtropical and temperate waters of Queensland, Western Australia, New South Wales, Victoria and Tasmania. They have also been recorded feeding off the NT coast.</p>	-	Low	Have not been recorded previously in the Study Area.
<i>Disteira kingii</i>	Spectacled Seasnake	-	-	The Spectacled Seasnake has only been known to occur in Australia, between Safety Bay in WA (in 2000) and across the northern coastline of Australia down to Moreton Bay in QLD as recorded in the mid-1970s. The species was found, in 2000, to be confined to coastal waters of northern Australia from WA to the eastern coast of QLD. In the Gulf of Carpentaria, the Spectacled Seasnake is caught most frequently around Weipa and Karumba, and in water deeper than 20 m.	-	Low	Use specific habitats or resources not present in the Project Area.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
<i>Disteira major</i>	Olive-headed Seasnake	-	-	This species is widely distributed in the tropical waters of northern Australia and Southern Papua New Guinea, from Shark Bay in WA to Moreton Bay in QLD and to New Caledonia. Specimens have been observed in and collected from sand or mud habitats in water depths between 3–10 m	-	Low	Use specific habitats or resources not present in the Project Area.
<i>Enhydrina schistose</i>	Beaked Seasnake	-	-	The species is known from widely scattered localities in northern Australia, including the Hey-Embley River, Mission River, and Repulse Bay in North Queensland. The Beaked Seasnake has not been recorded in Western Australia (Cogger 2000; Limpus 1975; Porter et al. 1997). The species inhabits mud and sand environments in estuaries, harbours and shallow bays (Limpus 1975; Porter et al. 1997; Voris et al. 1978). It frequently travels into the fresh water reaches of larger rivers (Cogger 2000) though in Malaysia, is confined to the estuarine environment (Voris 1985). In the Gulf of Carpentaria, the Beaked Seasnake was most likely to be caught in the shallowest water sampled by trawling operations (11–20 m) and most captures were in the eastern Gulf, around Weipa and Karumba (Ward 2000).	-	Low	Use specific habitats or resources not present in the Project Area.
<i>Eretmochelys imbricata</i> (T, M)	Hawksbill Turtle	VU	VU	Hawksbill Turtles occur in tropical, subtropical and temperate waters of all oceans of the world. In Australia, there are two main genetically isolated subpopulations: one on the west coast and the other in the Top End and north-eastern Queensland.  In the Northern Territory (NT), most nesting occurs on islands rather than mainland beaches. Principal nesting sites are concentrated around north-eastern Arnhem Land and Groote Eylandt.  Hawksbill Turtles are omnivorous, eating a wide variety of plants and animals including sponges, gastropods, seagrass and algae.	5 – NT Fauna Atlas	Moderate	Have infrequently been recorded previously in the Study Area.  Use specific habitats or resources present in the Project Area, but in a poor or modified condition.  May seasonally use resources within the Project Area, opportunistically or during migration.
<i>Hydrelaps darwiniensis</i>	Black-ringed Seasnake	-	-	The Black-ringed Seasnake was known (in 2000) to be endemic to the shallow coastal waters of northern Australia and southern Papua New Guinea, west of Torres Strait (Cogger 2000). Black-ringed Seasnakes inhabit the intertidal zone of tidal creeks and flats of relatively compact mud or sandy mud with crab and mud skipper holes (Cogger 2000; Ehmann 1992b).	-	Low	Use specific habitats or resources not present in the Project Area.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
<i>Hydrophis atriceps</i>	Black-headed Seasnake	-	-	The Black-headed Seasnake was known to occur in northern Australia, between Darwin and the coast of Papua New Guinea in 2000 (Cogger 2000). The Black-headed Seasnake has been captured in trawling nets at depths of 20–40 m (Ward 1996b; Ward 2000).	-	Low	Use specific habitats or resources not present in the Project Area.
<i>Hydrophis coggeri</i>	Slender-necked Seasnake	-	-	The Slender-necked Seasnake is found in the waters of the northern Australian coast (Cogger 2000). Slender-necked Seasnakes at Ashmore Reef appear to inhabit the deeper (30–50 m) water beyond the reef edges as well as the reef flat. This is in contrast to the populations in Fiji that are often encountered on reef flats and in lagoons, especially where there are seagrasses (Cogger 2000; Guinea 1982; Guinea & Whiting 2005; McCosker 1975).	-	Low	Use specific habitats or resources not present in the Project Area.
<i>Hydrophis elegans</i>	Elegant Seasnake	-	-	The Elegant Seasnake is widespread in tropical Australia. This includes QLD, WA and the NT. Its distribution extends from Shark Bay in WA to Moreton Bay in QLD. The Elegant Seasnake uses a variety of marine and estuarine habitats, including sandy substrates in less than two metres of water to depths of approximately 80 m. The Elegant Seasnake is sometimes found in freshwater habitats as well as estuaries.	-	Low	Use specific habitats or resources not present in the Project Area.
<i>Hydrophis inornatus</i>	Plain Seasnake	-	-	The Plain Seasnake was thought to be widely distributed in Asia at the turn of the century (Cogger 2000). Only a few specimens had been collected from northern Australian waters by 2000 (Cogger 2000). Specimens have been trawled off Kurumba and dip netted from Mission River in the Gulf of Carpentaria in 1975 (Heatwole 1975). This species comprised less than one percent of the seasnakes captured by dip nets in the Hey-Embley and Mission Rivers of northern Queensland in a 1997 study (Porter et al. 1997). Little is known of the habitat occupied by Plain Seasnakes. Specimens collected by Heatwole (1975) were captured over muddy substrates.	-	Low	Habitat within the study area is potentially suitable for the species, however no sightings present.
<i>Hydrophis mcdowelli</i>	Small-headed sea snake	-	-	The species is restricted to northern Australia (Cogger 2000), including south and south-west Gulf of Carpentaria (Milton et al. 2008) and the coast of the Northern Territory (Milton 2001; Ward 2002 pers. comm.). The Small-headed Seasnake has been caught on the northern Australian continental shelf in water up to 50 m deep, in river estuaries and other turbid (muddy) inshore waters (Cogger 2000).	-	Low	Use specific habitats or resources not present in the Project Area.

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
<i>Hydrophis ornatus</i>	Spotted Seasnake , Ornate Reef Seasnake	-	-	The Ornate Seasnake occurs in tropical northern WA, the NT and northern QLD. The species sometimes occurs further south in summer, extending its range as far as Tasmania. The Ornate Seasnake occurs in a variety of habitats, including clear water near coral reefs and turbid (muddy) water in estuaries. The species has been captured throughout the Gulf of Carpentaria, particularly at depths of 21–50 m.	-	Low	Use specific habitats or resources not present in the Project Area.
<i>Hydrophis pacificus</i>	Large-headed Seasnake , Pacific Seasnake	-	-	The Large-headed Seasnake is restricted to northern Australia (Cogger 1996), including areas of the Gulf of Carpentaria, the coast of the Northern Territory, and the Hey, Embley and Mission Rivers near Weipa on Cape York (Milton 2001; Porter et al. 1997; T. M. Ward 2002 pers. comm.). The Large-headed Seasnake has been caught during trawling in open water up to 50 m deep on the northern Australian Continental Shelf, and in rivers on Cape York (Porter et al. 1997; Ward 2000). This species primarily occurs where the sea bed consists of soft sediments, such as that used for prawn trawling (Milton 2001).	-	Low	Use specific habitats or resources not present in the Project Area.
<i>Lepidochelys olivacea</i> (T, M)	Olive Ridley Turtle, Pacific Ridley Turtle	EN	V	Olive Ridley Turtles occur in tropical and subtropical waters of all oceans of the world. In Australia, the vast majority of the nesting sites occur in the Northern Territory (NT). Nesting sites in the NT have been recorded from Melville Island to Groote Eylandt. The largest nesting colonies occur on Melville Island, islands to the east of Croker Island and some islands off north-east Arnhem Land. Olive Ridley Turtles typically occur in shallow protected waters, though studies outside the NT indicate that individuals may disperse widely from nesting beaches to feeding areas. The species is carnivorous and feeds on benthic molluscs, crabs, echinoderms and gastropods.	2 – NT Fauna Atlas	Moderate	Have infrequently been recorded previously in the Study Area. Use specific habitats or resources present in the Project Area, but in a poor or modified condition. May seasonally use resources within the Project Area, opportunistically or during migration.
<i>Natator depressus</i> (T, M)	Flatback Turtle	VU	DD	Flatback Turtles are restricted to tropical waters of Australia and New Guinea. They have an extensive distribution around the coastline of the Northern Territory (NT), and have been recorded breeding at a large number of mainland and island sites.	15 – NT Fauna Atlas	Moderate	Have infrequently been recorded previously in the Study Area. Use specific habitats or resources present in the

Scientific name	Common name	EPBC Act	TPWC Act	Distribution and habitat*	No. of records and source	Likelihood of occurrence in Study Area	Justification
				Flatback Turtles inhabit shallow, soft-bottomed sea beds and feed on soft corals and soft-bodied animals such as jellyfish and sea cucumbers.			Project Area, but in a poor or modified condition. May seasonally use resources within the Project Area, opportunistically or during migration.
<i>Parahydrophis mertoni</i>	Northern Mangrove Seasnake	-	-	Principally coastal and estuarine and associated mud flats (Cogger 1996).	-	Low	Use specific habitats or resources not present in the Project Area.
<i>Pelamis platurus</i>	Yellow-bellied Sea snake	-	-	The yellow-bellied seasnake is the most widely distributed of all sea snake species. The greatest density of populations was thought to exist south of the tropics where it was most commonly found on beaches after storms. Populations were also found in tropical seas and the Gulf of Carpentaria. The yellow-bellied sea snake is usually found within a few kilometres of the coast and prefers shallow inshore waters found to be between 11.7–36 °C. Nevertheless, the species is the most pelagic of all known sea snakes, occurring in the open waters well away from coasts and reefs.	-	Low	Use specific habitats or resources not present in the Project Area.

\* Information taken directly from the following sources (prioritised depending on availability):

- Threatened species of the Northern Territory Fact Sheets – Department of Environment, Parks and Water Security (NT Government):

<https://nt.gov.au/environment/animals/threatened-animals>

- Species Profile and Threats Database – Department of Agriculture, Water and the Environment (Australian Government): <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

- Fishes of Australia Database: <https://fishesofaustralia.net.au/>