



# **Half Tide Tug Harbour, Hay Point Marine Plant Assessment September 2021**

**Paul York & Skye McKenna**  
Report No. 21/54

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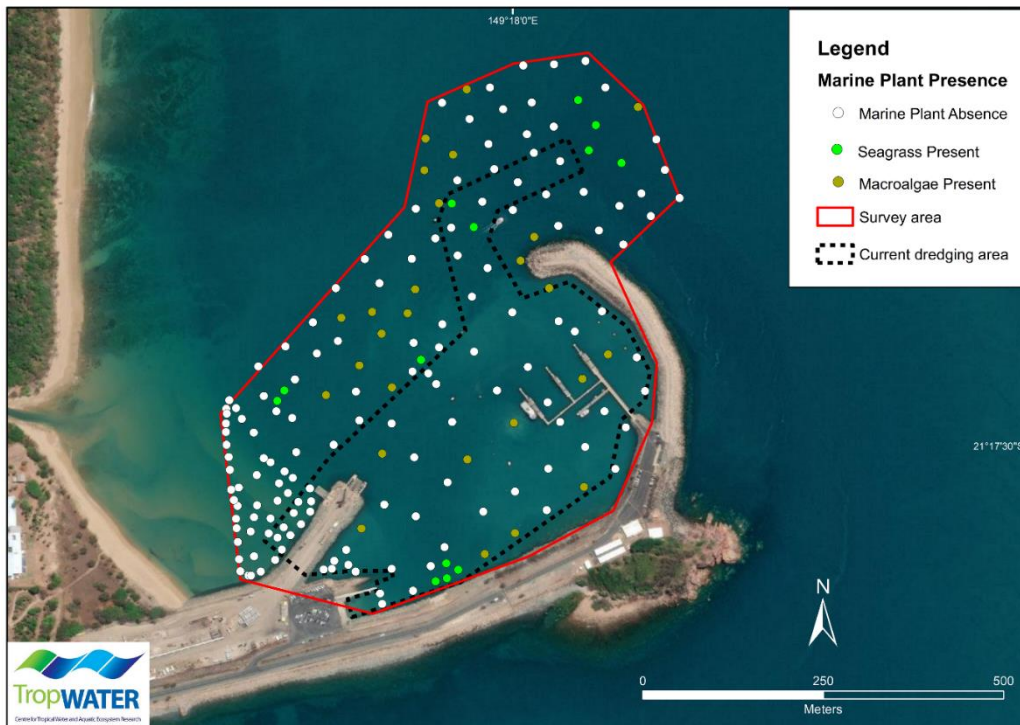
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## Executive Summary

North Queensland Bulk Ports (NQBPs) engaged TropWATER at James Cook University to undertake a survey of the presence of marine plants (seagrass and algae) within the Half Tide Tug Harbour at the Port of Hay Point, and a survey area of 31.6 Ha. The survey required assessment of marine plant distribution in the area proposed for expanded maintenance dredging, as well as a contemporary survey of marine plants in the area currently approved for dredging (14.8 Ha - Figure 1).



**Figure 1.** Presence of marine plants at Half Tide Tug Harbour in September 2021. (Image credit: ESRI).

A total of 184 sites were surveyed across the entire area, with seagrass observed at 13 of those sites and estimated to occupy approximately 1.25 ha at very low biomass of 0.1 g DW m<sup>2</sup>. Overall, two species of seagrass were observed with *Halophila decipiens* dominant and occurring at 12 sites and *Halophila ovalis* observed at one site. Macroalgae was also observed at 27 sites out of the 184 sampled and estimated to cover an area of approximately 4.4 Ha of sparse habitat (Figure 1).

Within the expanded maintenance dredging area one seagrass species, *H. decipiens*, was observed at 7 sites covering an area estimated at 0.9 Ha. Seagrass was sparse and patchy with a mean biomass of 0.11 ± 0.03 g DW m<sup>2</sup>. Macroalgae in this area was present at 18 sites and covered an area of approximately 2.5 Ha with sparse ground cover averaging around 5.3% of the seabed.

Seagrass and algal habitat in the Hay Point and Mackay region has been monitored regularly since 2004 as part of a series of annual and broad-scale monitoring programs undertaken by TropWATER on behalf of NQBPs. Seagrass in the Hay Point area is dominated by *Halophila* species, particularly in deeper or more turbid waters. These species are colonisers characterised by high turnover of leaves and shoots, low resistance to disturbance and short lifecycles. Monitoring has found a regular annual occurrence of *H. decipiens* between July and December. For the remainder of the year these populations remain dormant in the form of a seed bank. The high variability of these annual meadows means their distribution is likely to change over coming seasons and years.

Macroalgal distributions are also highly variable in presence and distribution throughout the Hay Point region. The area outside of the Half Tide Tug Harbour has had both macroalgae and filamentous algae present in some years and an absence of all algae in others and assemblages in the survey area are also likely to be highly variable and intermittent in presence and distribution.

## 1. Background & Scope

North Queensland Bulk Ports (NQBP) have engaged the Centre for Tropical Water and Aquatic Ecosystem Research at James Cook University (TropWATER) to undertake a survey to determine the presence/absence of marine plants within the Half Tide Tug Harbour, located at the Port of Hay Point (Figure 2). The TropWATER team is currently responsible for the annual seagrass long-term monitoring program in the Hay Point/Mackay area, and has previously conducted extensive benthic habitat assessments in the Hay Point area (2004, 2014, 2010, 2016-2021) as well as the benthic surveys for the HPCT Berth 2 Ship Loader Upgrades in 2019 and 2020.

Specifically, the survey requires assessment of marine plant distribution in the area proposed for expanded maintenance dredging, as well as a contemporary survey of marine plants in the area currently approved for dredging (Figure 2).

Objectives of this scope of works were to:

- Determine the presence and distribution of marine plants (seagrass and marine algae) that may occur within the survey area;
- Provide a written report and GIS layers of the presence and distribution of marine plants within the survey area.



**Figure 2.** Marine plant survey area (inside the red line) showing survey boundaries for the current approved maintenance dredging area (inside black dotted line) and the newly proposed area of maintenance dredging requiring an higher intensity of sites (outside the black dotted line).

## 2. Sampling approach and methods

The sampling methods followed those used in the established annual seagrass monitoring program and previous whole of port surveys in the Mackay/Hay Point/Keswick Island areas (see York and Rasheed 2020 for latest monitoring report). These standard methods are based on the TropWATER seagrass program for baseline assessment and monitoring in the Mackay/Hay Point areas and for other areas of Queensland including the ports of Cairns, Townsville, Weipa, Gladstone, Abbot Point, Karumba and Thursday Island. The survey was conducted in September 2021 when marine plants, such as seagrass are at their peak density and distribution.

The following technique was used to survey marine plants in the survey area:

- The Half Tide Tug Harbour area was monitored from a small vessel using a digital camera mounted on a drop frame that provided a live feed to a monitor on the surface. The transmitted image incorporated a 0.25m<sup>2</sup> view of a quadrat on the seafloor from which a researcher could estimate habitat cover, biomass and species or functional groups present (Figure 3). At each site key seagrass, macroalgae and sediment information from three random placements of the quadrat were collected.



**Figure 3.** Monitoring set ups for marine plant habitat assessments using live digital cameras (a & b) and on-vessel assessment, spatial referencing and recording of images (c).

Data recorded at each site included:

- **Seagrass species composition** - Seagrass identifications in the field and from video. Species composition was measured from the video screen when species are distinct.
- **Seagrass biomass** - Estimates of seagrass biomass from video images and live feed were made using a calibrated visual estimates technique adapted from Mellors (1991). All observers are calibrated to a standard set of video images that have been harvested and measured.
- **Algae** - Presence/absence, algae type and per cent cover. Per cent cover was estimated from the video or live feed on the monitor. For each site an algal community density category were determined. Six community density categories will be used:
  - Open substrate** - dominant feature was bare substrate;
  - Very low** - algae covered less than 1% of the substrate;
  - Low** - algae covered between 1% and 5% of the substrate;
  - Low/moderate** - algae covered between 5% and 20% of the substrate;
  - Moderate** - algae covered 20-80% of the substrate;
  - High** - algae covered more than 80% of the substrate.

Algae were identified into the following five functional groups:

<b><i>Erect macrophytes</i></b> -	Macrophytic algae with an erect growth form and high level of cellular differentiation e.g. <i>Sargassum</i> , <i>Caulerpa</i> and <i>Galaxaura</i> species.
<b><i>Erect calcareous</i></b> -	Algae with erect growth form and high level of cellular differentiation containing calcified segments e.g. <i>Halimeda</i> species.
<b><i>Filamentous</i></b> -	Thin thread-like algae with little cellular differentiation.
<b><i>Encrusting</i></b> -	Algae growing in sheet like form attached to substrate or benthos e.g. coralline algae.
<b><i>Turf Mat</i></b> -	Algae that forms a dense mat or “turf” on the substrate.

### 3. GIS layers

All survey data were entered into a Geographic Information System (GIS) using ArcGIS 10.8®. GIS layers were created to describe the survey and each of the habitat components (seagrass, macro-algae) within the survey area. For each habitat component the following GIS layer was created:

- **Seagrass:**
  - Presence/absence of seagrass at survey sites;
  - Area data for seagrass meadows and information on community characteristics and biomass
- **Macro-algae:**
  - Presence/absence of algae at survey sites;
  - Area data for algae and information on community characteristics and percent cover

### 3. Results & Discussion

Marine plant surveys in the survey area at the Half Tide Tug Harbour were conducted between 23<sup>rd</sup>-25<sup>th</sup> September 2021. Favourable weather and sea state conditions provided good in-water visibility for the assessment of benthic habitats using a live-feed, remote camera. One hundred and eighty four (184) sites were assessed during the survey of the current and proposed maintenance dredge area with three separate camera drops at each site (Figures 4 and 5). Seagrass was observed at 7% of sites sampled (13 sites – Figure 4) and macroalgae was observed at 15% of sites sampled (27 sites – Figure 5). Overall, two species of seagrass were observed in the Half Tide Tug Harbour, with *Halophila decipiens* dominant and occurring at 12 sites and *Halophila ovalis* observed at one site. Seagrass habitat was estimated to cover an area of 1.25 Ha at very low biomass of 0.1 g DW m<sup>2</sup> (Figure 6). A further 4.4 ha of the Half tide Tug Harbour was estimated to be covered with sparse (approx 6 % cover) macroalgal habitat (Figure 7).

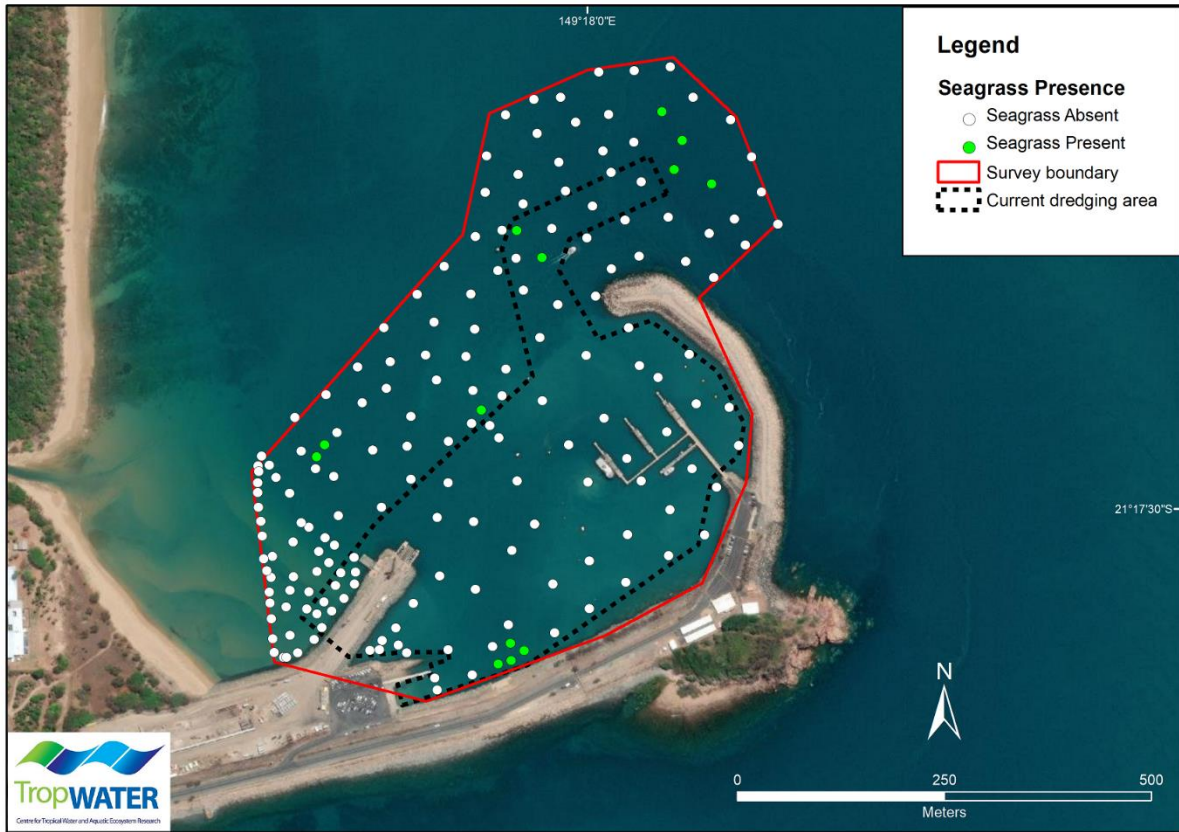


Figure 4. Presence of seagrass at Half Tide Tug Harbour in September 2021. (Image credit: ESRI).

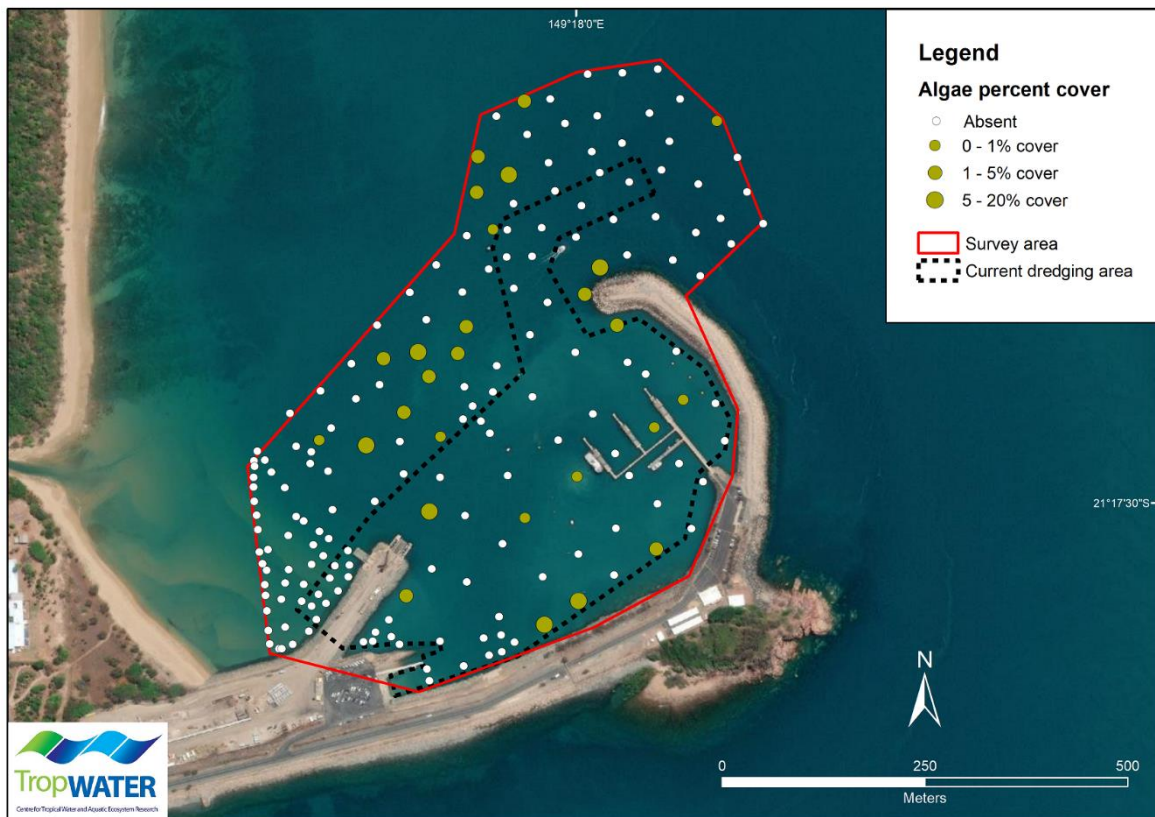


Figure 5. Presence of macroalgae at Half Tide Tug Harbour in September 2021. (Image credit: ESRI).



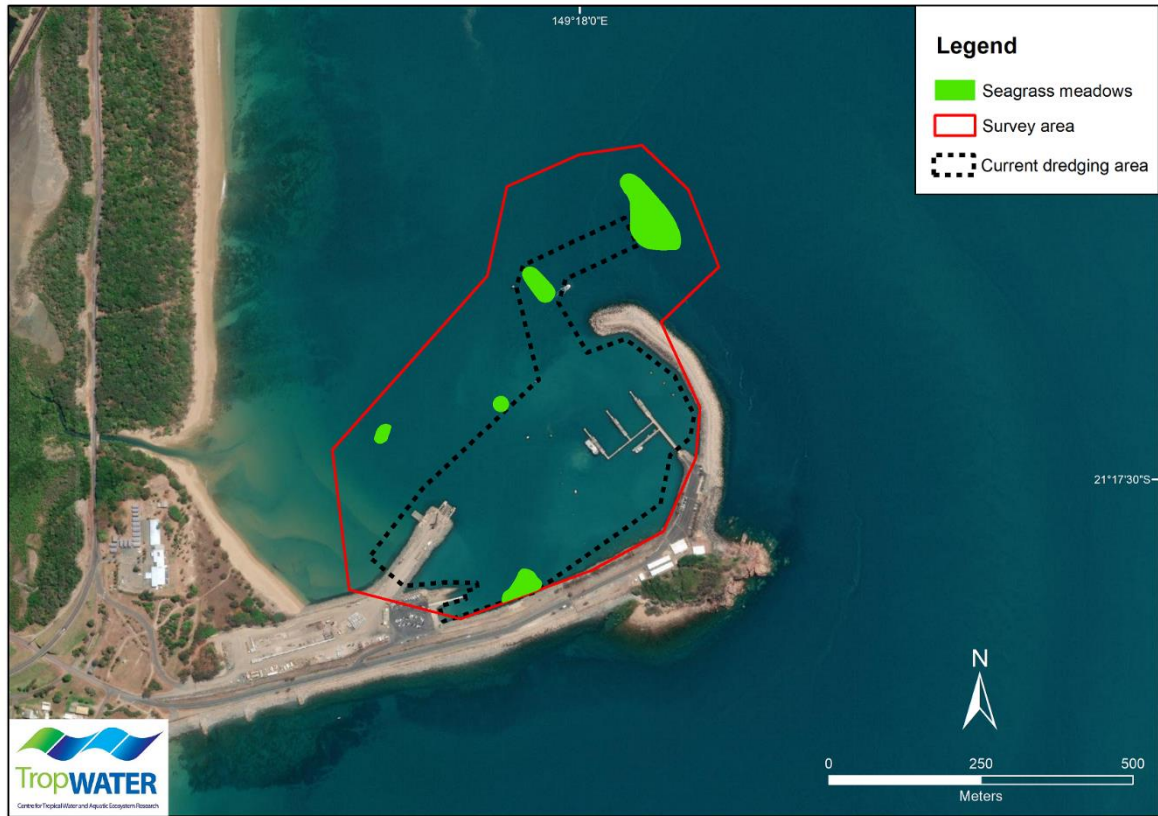


Figure 6. Distribution of seagrass at Half Tide Tug Harbour in September 2021. (Image credit: ESRI).

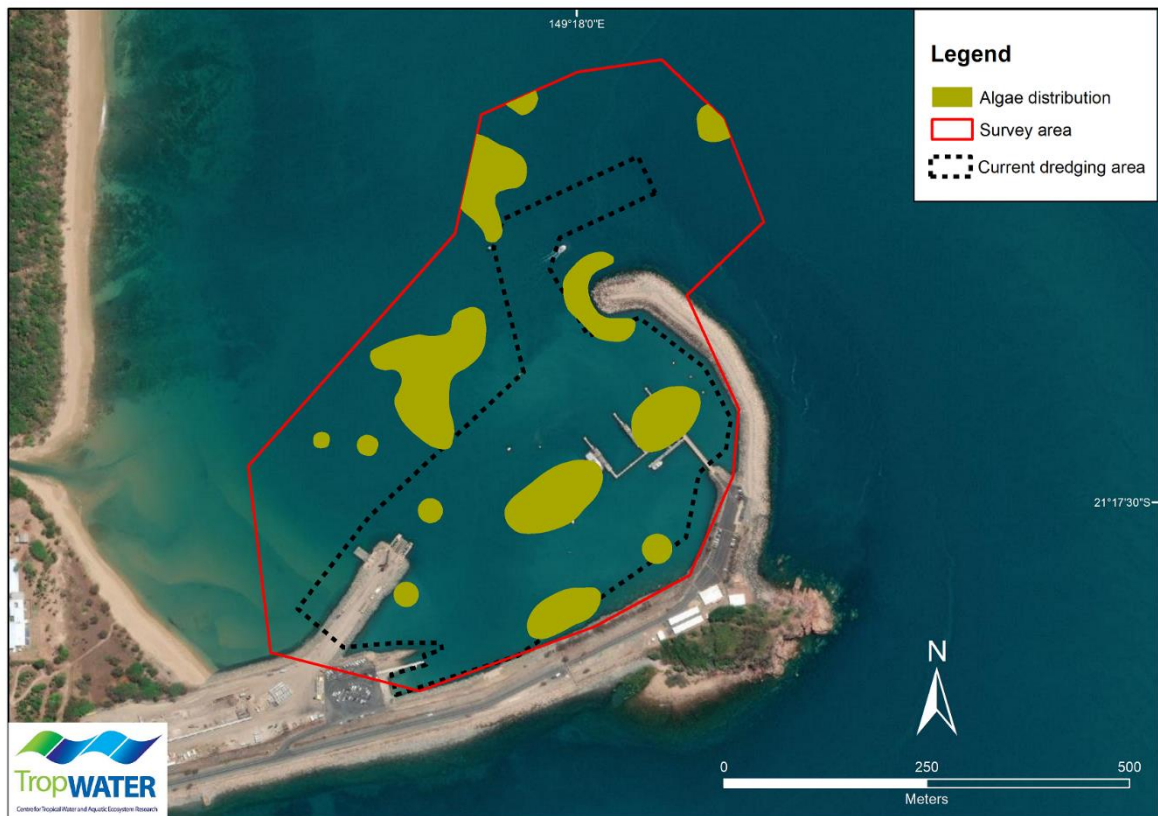


Figure 7. Distribution of macroalgae at Half Tide Tug Harbour in September 2021. (Image credit: ESRI).

### **Marine Plants in Area Currently Approved for Maintenance Dredging**

The benthic habitat in the area currently approved for maintenance dredging consisted of open substrate of sandy and muddy sediments with both seagrass and macroalgae present at some of the assessment sites (Figures 4, 5 & 8). Seagrass from colonising species *H. decipiens* and *H. ovalis* occurred at six sites and covered an estimated area of 0.4 ha in a sparse and patchy distribution. The mean biomass throughout this area was  $0.09 \pm 0.02$  g DW m<sup>2</sup> (Figure 6). Macroalgae in this area was present at 9 sites and covered an area of approximately 1.9 Ha with sparse ground cover averaging around 6.6% (Figure 7).

### **Marine Plants in Proposed Extended Area for Maintenance Dredging**

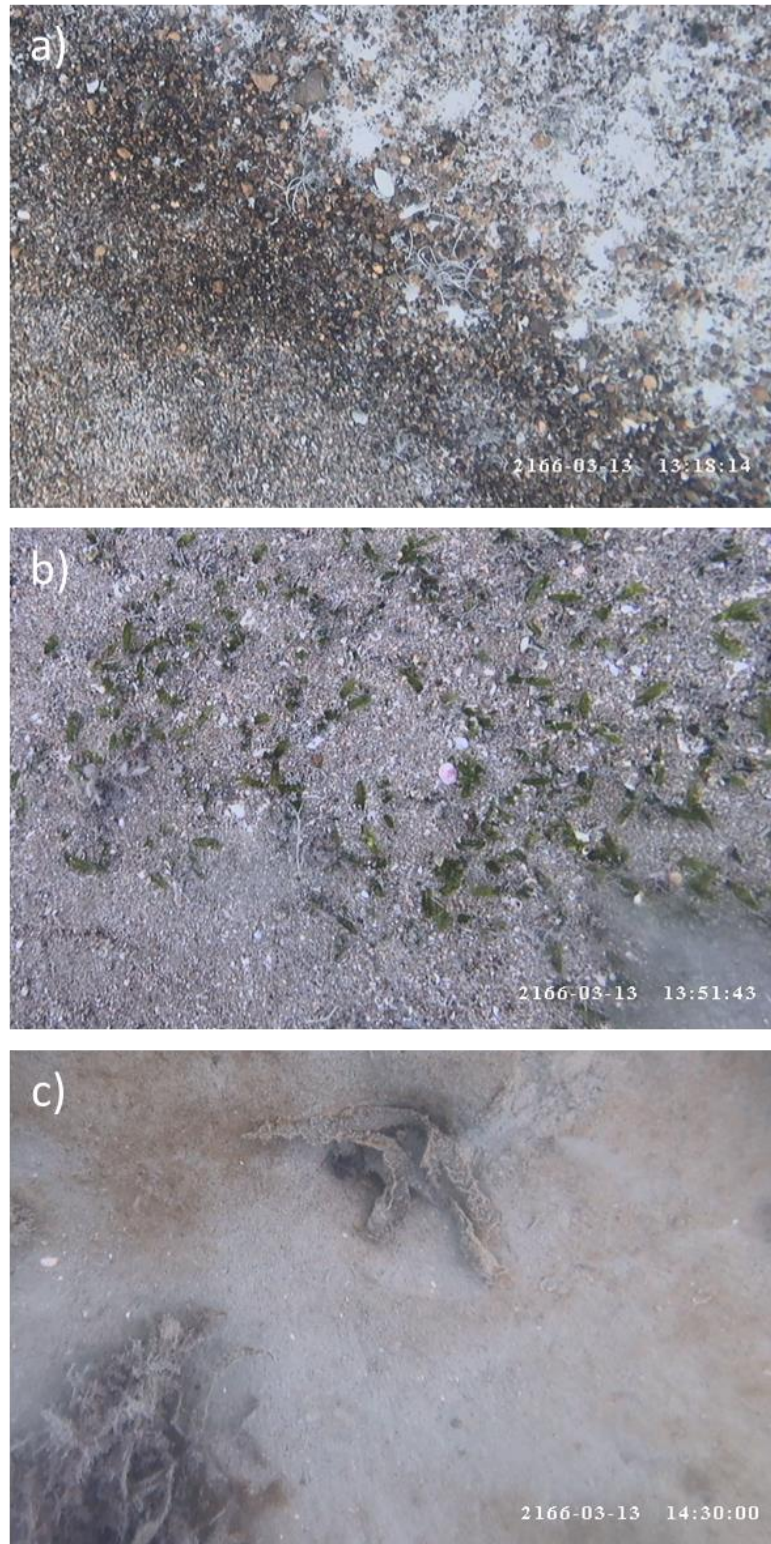
The benthic habitat for the extended area proposed for maintenance dredging also consisted of open substrate of sandy and muddy sediments with both seagrass and macroalgae present (Figures 4 & 5). In this area one seagrass species, *H. decipiens*, was observed at 7 sites covering an area estimated at 0.9 Ha (Figure 6). Seagrass was sparse and patchy with a mean biomass of  $0.11 \pm 0.03$  g DW m<sup>2</sup>. Macroalgae in this area was present at 18 sites and covered an area of approximately 2.5 Ha with sparse ground cover averaging around 5.3% (Figure 7).

### **Spatial and temporal distribution of marine plants within the Hay Point Region**

Seagrass habitat in the Hay Point and Mackay region has been monitored regularly since 2004 as part of a series of annual and broad-scale monitoring programs undertaken by TropWATER on behalf of North Queensland Bulk Ports (York and Rasheed 2020). The annual monitoring survey boundaries of these programs include a large part of the area outside of the Half Tide Tug Harbour but not the areas within the harbour. Seagrass in the Hay Point area is dominated by *Halophila* species, particularly in deeper or more turbid waters. These species are colonisers characterised by high turnover of leaves and shoots, low resistance to disturbance and short lifecycles (Kilminster et al. 2015).

The monitoring programs have been valuable in providing baseline information on seagrass communities in the region. A long-term (8-year) analysis of the presence of offshore seagrass at Hay Point has found a regular annual occurrence of *H. decipiens* between July and December (York et al. 2015). For the remainder of the year these populations remain dormant in the form of a seed bank (York et al. 2015, Chartrand et al. 2018). The two species found in the area are adapted for low light environments (Chartrand et al. 2018). The high variability of these annual meadows means their distribution is likely to change over coming seasons and years and a similar but smaller-scale survey of the Half Tide Tug Harbour in the previous year found no seagrass present (York et al. 2020).

Macroalgae has also been monitored by TropWATER in the Hay Point region in 2004, 2010, 2014 and 2016. These surveys have shown that algal distributions are also highly variable in presence and distribution throughout the region. The area outside of the Half Tide Tug Harbour has had both macroalgae and filamentous algae present during the 2004 and 2016 monitoring surveys (Rasheed et al. 2004, McKenna and Rasheed 2017), but the same area consisted of bare, open substrate during surveys in 2010 and 2014 (Thomas and Rasheed 2011; McKenna and Rasheed 2015). The absence of macroalgae within the Tug Harbour in a 2020 survey (York et al. 2020) indicates that these assemblages are also likely to be highly variable and intermittent in presence and distribution in the area.



**Figure 8:** Screenshots of different marine benthic habitat seen during the survey including; a) open sandy substrate b) sandy substrate with patches of seagrass and c) muddy substrate with macroalgae

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