Dredge Management Plan

Half Tide Tug Harbour Maintenance Dredging Program 2024

July 2024

Version control

Revision No.	Date	Revision details
1	07/03/24	Draft for NQBP review
2	10/04/24	Revision to incorporate NQBP review
3	24/07/2024	Final for DESI review

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1. Introduction

1.1 Objective

The objective of this Dredge Management Plan (DMP) is to guide activities during the 2024 maintenance dredging program at Half Tide Tug Harbour (HTTH). It details the environmental management measures, objectives and actions that will be implemented by NQBP staff and contractors during the program.

This DMP includes:

- program timing and estimated volume of dredge material to be removed
- a description of the dredging equipment and methodology
- environmental values, sensitive receptors and key environmental risks
- Sediment Plume Associated Monitoring (SPAM) program
- environmental management measures and control strategies
- roles and responsibilities for implementing this DMP.

This DMP has been developed as a stand-alone operational document that ties together all aspects of maintenance dredging at HTTH.

As maintenance dredging will also be occurring across the broader Port of Hay Point maintenance areas at the same time, this DMP should be read in conjunction with:

1. *Port of Hay Point Long-term Maintenance Dredging Management Plan* 2018-2043 (LMDMP), dated May 2024. The LMDMP sets out the overall dredge management framework to inform long term planning and management of all dredging activities at the Port over a 25-year period.
2. *Port of Hay Point Marine Environmental Monitoring Plan*, dated May 2024 (MEMP). The monitoring plan outlines the monitoring arrangements that will apply in relation to maintenance dredging operations across the whole Port (including ambient impact and adaptive monitoring programs).

The management and monitoring commitments set out in these documents will also apply to maintenance dredging activities within HTTH (and have been replicated in this DMP where relevant).

The current approved versions of these plans will be maintained on the North Queensland Bulk Ports (NQBP) website – www.nqbp.com.au.

1.2 Changes to this DMP

This DMP will be reviewed prior to each maintenance dredging program within HTTH.

Any amendments will be submitted to the administering authority prior to the commencement of maintenance dredging activities.

1.3 Port context

North Queensland Bulk Ports Corporation (NQBP) is the Port Authority for the Port of Hay Point and is responsible for maintaining seafloor navigational infrastructure to ensure the efficient and safe movement of vessels accessing the Port. NQBP regularly undertakes maintenance dredging at the Port of Hay Point to maintain this seafloor infrastructure.

The Port of Hay Point is located approximately 40km south of the city of Mackay and is shown in Figure 1. The Port comprises two operating coal terminals, Dalrymple Bay Coal Terminal (DBCT) and Hay Point Coal Terminal (HPCT), as well as a tug harbour (Half Tide Tug Harbour – HTTH) and a public boat ramp located just to the south of the terminal facilities.

HTTH is located just south of the terminal infrastructure and was originally developed in the late 1970's with the construction of the breakwater and is shown in Figure 2.

HTTH provides six dedicated berth facilities for the tugboats and operators that service Dalrymple Bay and Hay Point Coal Terminal vessels. Other facilities include a Material Offloading Facility (MOF), laydown areas, lines boat jetty, public boat ramp and carpark.

Left unmanaged, natural sediment fills up navigational infrastructure, impacting the depth necessary for safe loading, manoeuvring and transit of ships. A reduced ability to effectively load ships can have a substantial economic impact on the region that the port supports.

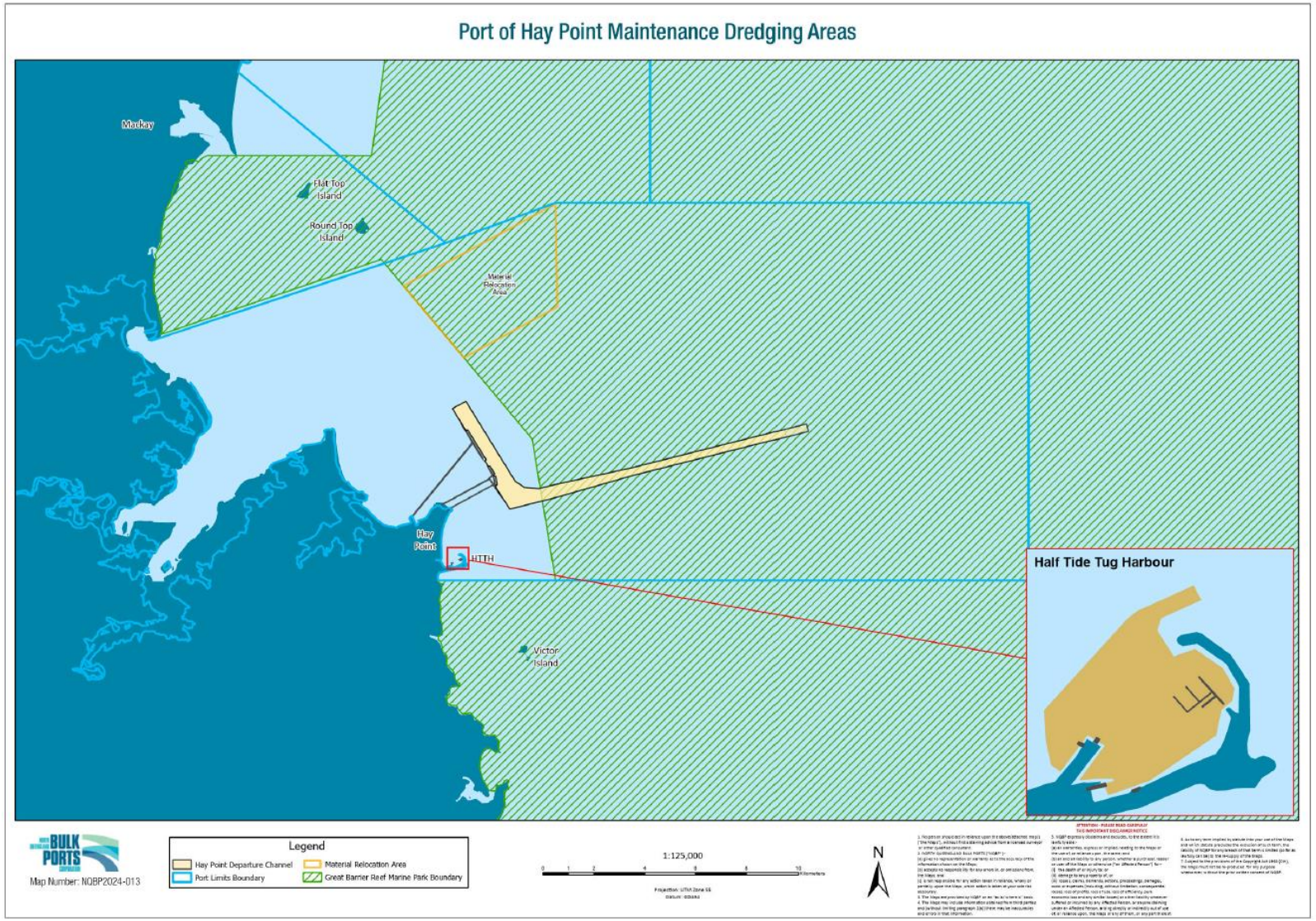

Figure 1: Port of Hay Point Approved Maintenance Dredging Areas

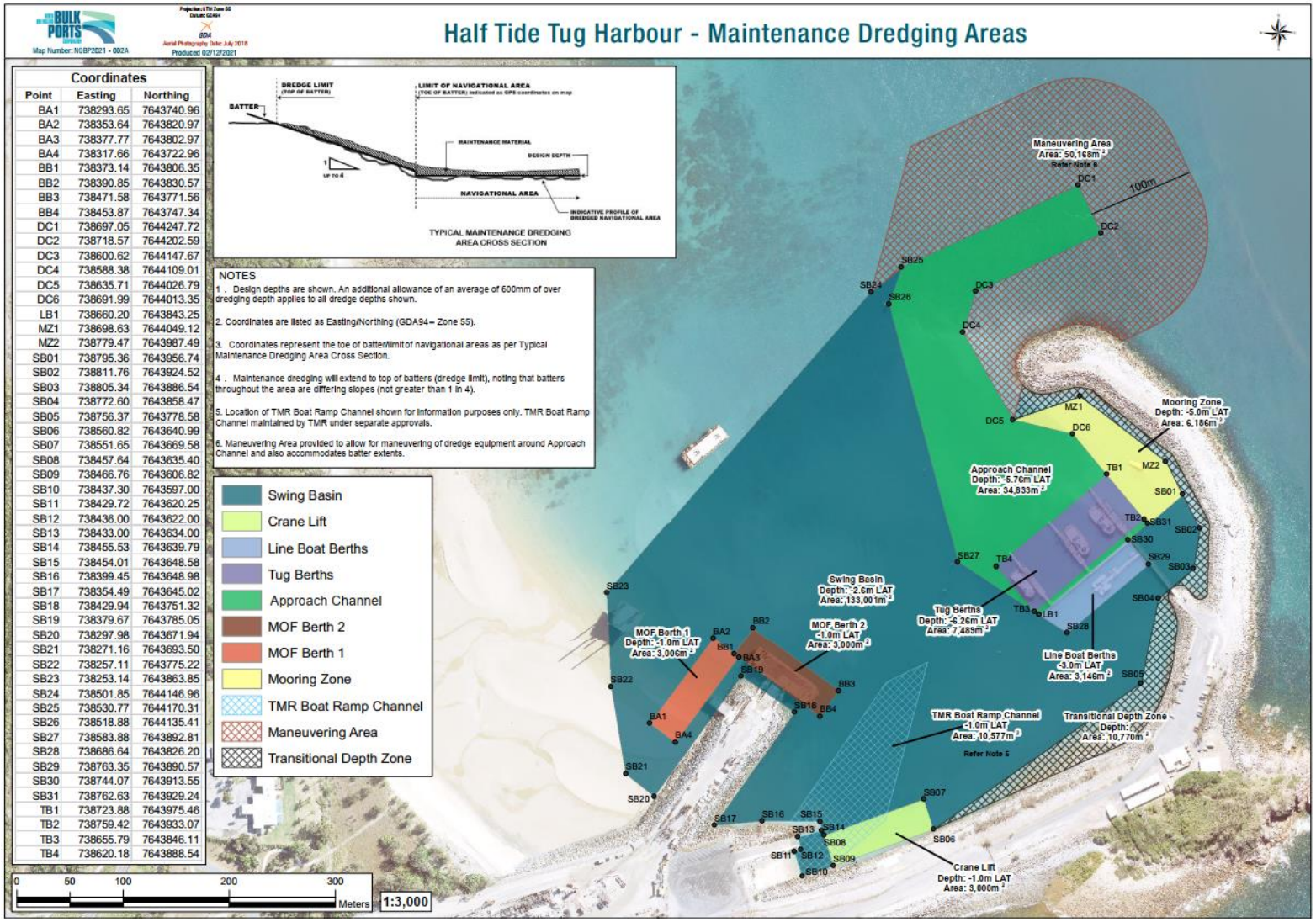

Figure 2: Half Tide Tug Harbour Approved Maintenance Dredging Areas

2. Approvals

In July 2022, NQBP amended the Environmental Authority (EA), issued by the Queensland Government, that permits NQBP to undertake maintenance dredging at the Port of Hay Point and HTTH. The approved dredge area for HTTH was expanded to allow for improved operations and to amalgamate smaller areas of dredging which were formerly approved under a range of other approvals.

The HTTH approved maintenance dredging areas are shown in Figure 2. Section 2, Condition G16 of the amended EA (P-EA-100222169) requires the development of a Dredge Management Plan (DMP) prior to the commencement of maintenance dredging in HTTH.

This DMP has been developed to meet the requirements of the EA and will be implemented by NQBP to ensure compliance with their environmental obligations during maintenance dredging at HTTH.

There are several other State and Commonwealth approvals necessary to conduct maintenance dredging at HTTH. Table 1 provides a list of current approvals that are relevant to this DMP.

Table 1. Approvals relevant to maintenance dredging at HTTH.

Permit	Permit No.	Activity
Environmental Authority (18 July 2022 – Environmentally Relevant Activity*	P-EA-100222169	Undertake maintenance dredging of navigational infrastructure
Development Approval (1 February 2019) - Operational Works (Tidal Works)	1805-5537 SPD	Placement of dredged material below high-water mark
Development Approval (22 July 2022) – Operational Works (Tidal Works and Marine Plant disturbance)	2112-26590 SRA	Dredging and disturbance of marine plants at HTTH
Development Approval (16 March 2022) – Operational Works (Tidal Works)	2112-26520 SDA	Placement of dredged material from HTTH below high-water mark
Marine Park Permit*	G19/40185.1	Dredging and placement inside Marine Park
Sea Dumping Permit*	SD19/01	Loading and placement of material at sea.

**Note that some of these approvals also relate to maintenance dredging (and offshore placement) across the broader Port of Hay Point.*

3. Program Description

3.1 Dredging need

NQBP, as the Port Authority, is responsible for maintaining seafloor navigational infrastructure within the Port of Hay Point including HTTH.

Maintenance dredging has not been carried out within HTTH since the early 2010s. Excess siltation has traditionally been managed via regular bed levelling activities. However, recent hydrographic surveys have identified significant siltation within HTTH that can no longer be effectively managed via bed levelling. Maintenance dredging is now required to ensure that HTTH remains navigable to all vessels that use the tug harbour.

3.2 Estimated volumes

Based on recent hydrographic surveys, the anticipated dredge volume for the HTTH 2024 maintenance dredging program is a maximum of 60,000 m^3.

The estimated volumes of material to be dredged from each area within HTTH are presented in Table 2.

*Table 2. Estimated dredge volumes for 2024 maintenance dredging**

Dredge Area	Design Depth (mLAT)	Estimated dredge volume (m^3)
HTTH Tug Channel	-5.76	**15,000**
HTTH Tug Zone		**26,750**
Berths	-6.26	4,750
Line Boat	-3.0	3,000
Mooring Zone	-5.0	18,000
HTTH MOF		**11,250**
Berth 1	-1.0	6,000
Berth 2	-1.0	1,250
Berth 3	-1.0	4,000
HTTH Swing Basin	-2.6	**8,000**
Total		**60,000**

**Note final volumes to be determined via pre-dredge survey.*

At 1.6 t/m^3 this equates to 96,000 tonnes, less than 100,000 tonnes per year limit stipulated in Part 2 condition G1 of EA P-EA-100222169.

3.3 Estimated timing

Dredging activities will occur within HTTH as part of the broader Port of Hay Point program planned currently scheduled over 28 days from 22 August to 19 September 2024; approx. 1 or 2 dredge loads per day will occur within HTTH across the planned program. This is subject to tide, weather conditions and operational requirements.

3.4 Dredging plant and equipment

As maintenance dredging will occur within HTTH as part of the broader Port of Hay Point program in 2024, dredging activities will be completed using the Trailer Suction Hopper Dredge (TSHD) *Brisbane.*

Dredging support vessels that will also be utilised include bed levellers and survey vessels.

3.4.1 Trailing Suction Hopper Dredge

The TSHD *Brisbane* (Figure 3) has an overall length of 84.1m, hopper capacity of 2900m^3 and maximum dredging depth of 25m.

The TSHD *Brisbane* is a specially designed dredge vessel that is fitted with the following environmental design features:

- Central weir discharge system
- Below keel discharge point
- Low wash hull design
- Electronic positioning system (GPS)
- Turtle exclusion devices on intake heads.

Figure 3: TSHD Brisbane

The method for maintenance dredging and offshore placement by this TSHD is described below.

Material to be dredged is removed through two suction heads which are lowered into position on either side of the vessel. As the vessel steams slowly (1-3 knots), large pumps on-board then draw water through the heads entraining sediments from the seafloor, depositing a mixture of water and sediments into the vessel's central hopper.

The maintenance dredged material is then transported to the dredge material placement area where the material will be bottom dumped by opening large valves in the floor of the hopper to allow the material to fall out through the hull. See Figure 4 below.

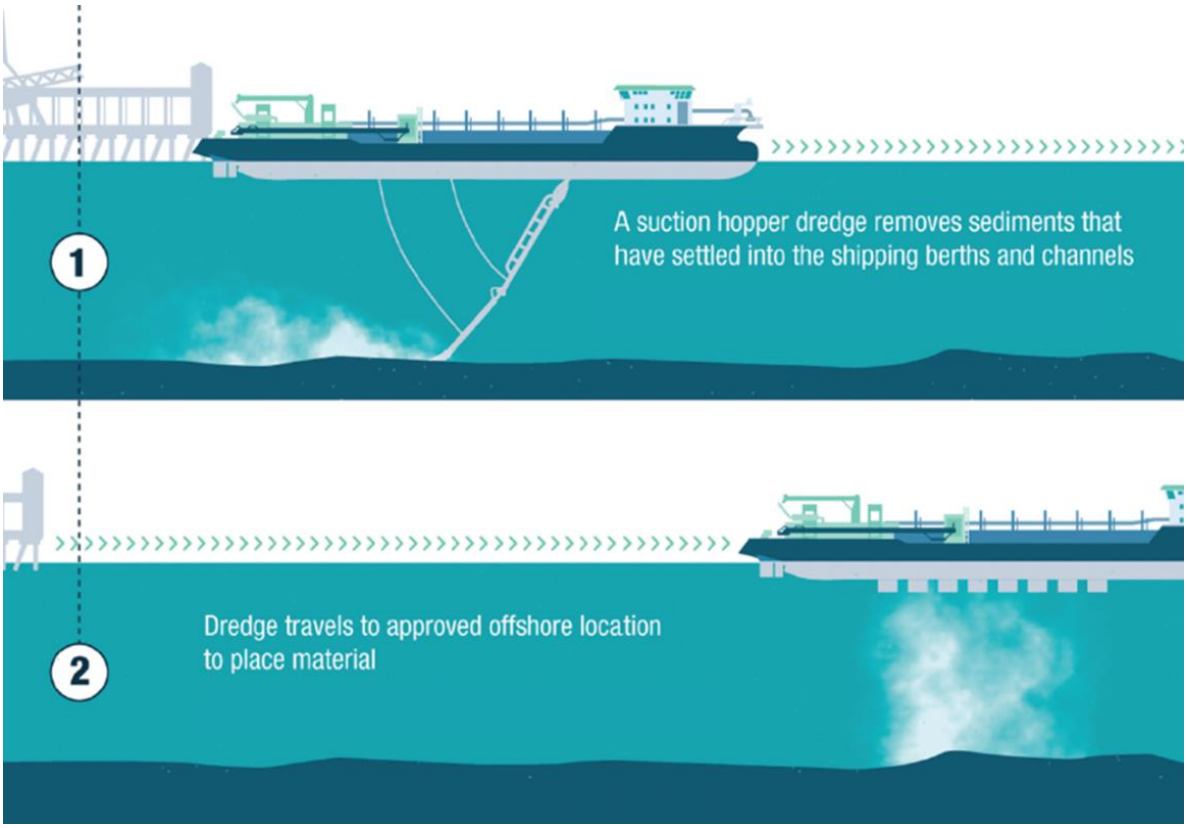

Figure 4. TSHD dredging and placement method

Due to the relatively small area and shallow depths within HTTH, access by the TSHD *Brisbane* is limited due to the required under keel clearance and manoeuvrability issues around existing structures. A bed leveller will be used to relocate maintenance dredge material to areas within the approved area that the TSHD can access (i.e. approach channel).

3.4.2 Bed leveller

Bed levelling is the process of using a 'drag bar' or 'sweep bar' attached to a vessel to conduct levelling of the sea floor. Bed levelling redistributes the sediment on the sea floor to create a more uniform depth.

The *Pacific Titan* and *Pacific Tiger* (Figure 5) will be utilised during the 2024 maintenance dredging program. Activities in HTTH will involve relocating sediment from operational areas that are above design depths to areas accessible by the TSHD *Brisbane*.

Figure 5. Pacific Tiger bed leveller

3.4.3 Survey vessels

Survey vessels are used pre, during and post dredging activities to obtain accurate data on the depths and volumes of sediments within navigational areas. This data informs the dredging program.

3.5 Dredge material placement area

The approved Dredge Material Placement Area (DMPA) is located approx. 8km from the approved HTTH maintenance dredging areas (Figure 1) within the following coordinates (GDA94):

Longitude	Latitude
149.3019269	-21.2198327
149.3348576	-21.20192259
149.3342955	-21.1655219
149.2806085	-21.19450986

The DMPA is 1840 ha (or 18.4km^2) in size and generally ranges in depth from 11m below LAT to 16m below LAT, west to east. The seabed of the DMPA is relatively flat. Sediments across the DMPA are largely dominated by sand and gravel, with clay and silt making up minor components (Advisian, 2018).

The DMPA has been used for dredge material placement (capital and maintenance material) since 2006. Previous bathymetric analysis conducted (RHDHV, 2016) indicates that the DMPA is partially retentive.

All maintenance dredge material from HTTH will be placed at the DMPA.

4. Environmental values

4.1 Port of Hay Point region

The environmental values at the Port of Hay Point and surrounding region are reasonably typical of an inshore location along the central Queensland coast. The inshore marine environments are naturally turbid, with prevailing wind being a key driver of conditions.

There are a number of protected fauna species that are known to occur at the Port at times, including marine turtles, whales, dolphins, dugong, migratory shorebirds and the Water Mouse, but the area does not provide critical habitat resources for any protected marine species (Eco Logical Australia, 2018).

The region continues to support areas of international, national and state environmental significance. The marine environment adjacent to the Port and coastline contributes to the diversity of values in the region and forms part of the larger Great Barrier Reef World Heritage Area (NQBP, 2018).

The key environmental values of the Port and surrounds include:

- Great Barrier Reef World Heritage Area and Great Barrier Reef Marine Park
- Deepwater and coastal seagrass meadows, which are seasonally variable
- Reefs dominated by sediment-tolerant hard coral species fringing Victor Island, Round Top Island, Flat Top Island, Taroba Rocks, Dudgeon Point, Keswick Island and St Bees Island
- Intertidal mangrove and saltmarsh areas that are important as feeding habitats and fish nursery areas
- Locally important populations of a number of threatened and migratory marine species, including marine turtles (green, flatback, leatherback and hawksbill), dugong, whales and dolphins
- Internationally important migratory shorebird roosting sites.

Further detail on the environmental values of the Port and surrounds are summarised in the LMDMP (Figure 6 below) and are further described in detail in Jacobs (2016).

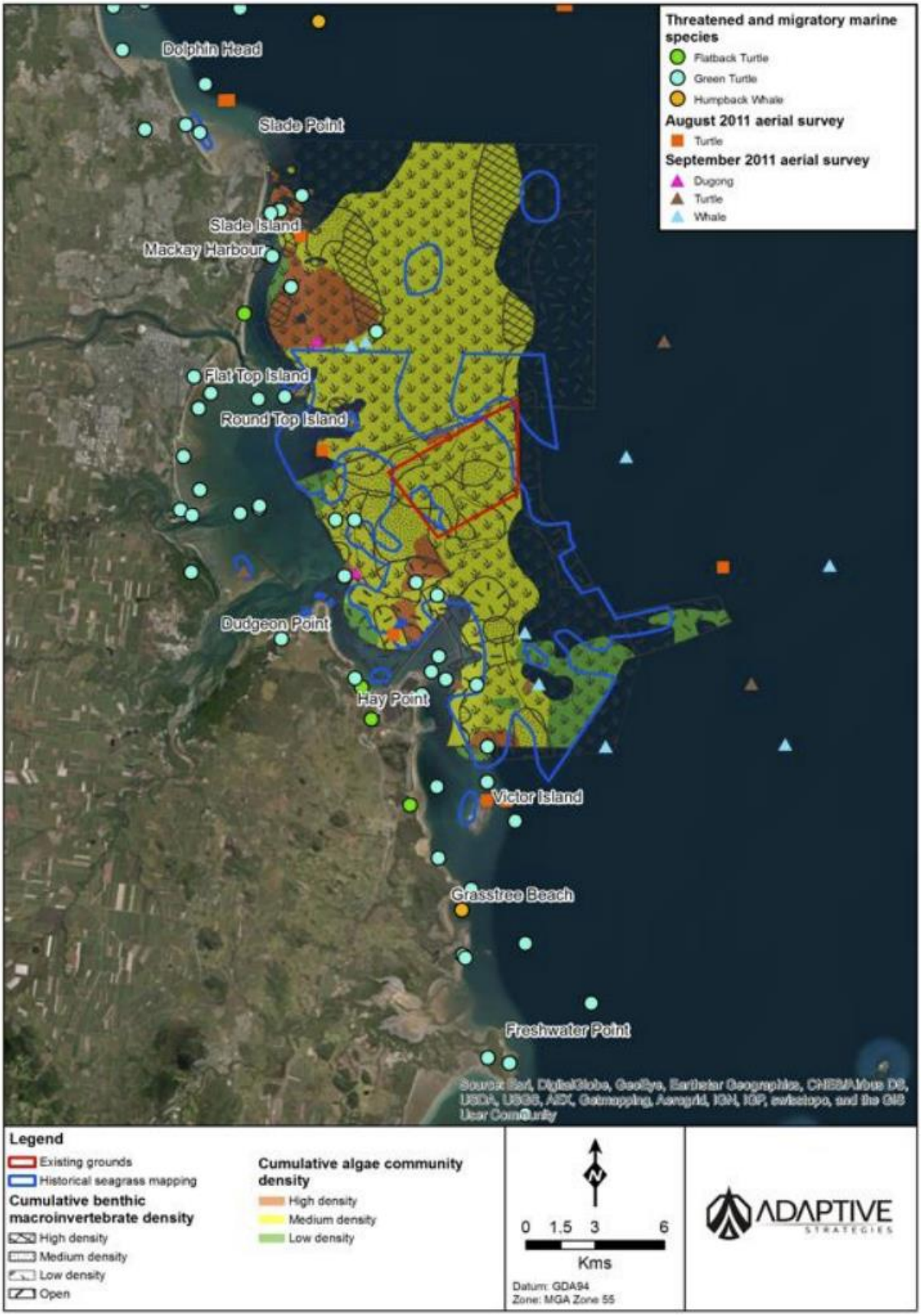

Figure 6. Marine Values Port of Hay Point Region (LMDMP 2018-2043).

4.2 HTTH Sensitive receptors

HTTH is a man-made structure that was established in the late 1970's to provide tug berth facilities to support operation of the Port of Hay Point coal terminals. HTTH is subject to vessel movements (tugs and public boat ramp) 24-hours a day, 7 days a week. Sandfly creek collects runoff from the terminal facilities and surrounding areas and drains directly into HTTH.

HTTH is surrounded by various sensitive receptors (as described in section 4.1), although there are limited sensitive receptors within 300m. Sensitive receptors within and immediately surrounding HTTH relevant to maintenance dredging activities include:

- Seagrass meadows
    - Presence of very low-density seagrass have been observed within HTTH
    - Located generally offshore (deeper water). Annual monitoring has shown these to be highly variable and ephemeral (short growing season)
    - Seagrasses in region are known to recover quickly following disturbance, e.g. from storms and floods as well as dredging activities.
- Benthic habitat
    - Benthic habitat within and surrounding HTTH is dominated by 'open substrate'
    - Small areas of macroalgae are present within and surrounding HTTH
- Benthic infauna
    - The Hay Point area is generally sparsely populated by macroinvertebrate communities

The most recent annual seagrass monitoring around the Port of Hay Point including HTTH was completed at the end of 2023 as part of NQBP's ambient monitoring program. A benthic habitat assessment was also completed within HTTH in December 2023. See Figures 7 to 9 below.

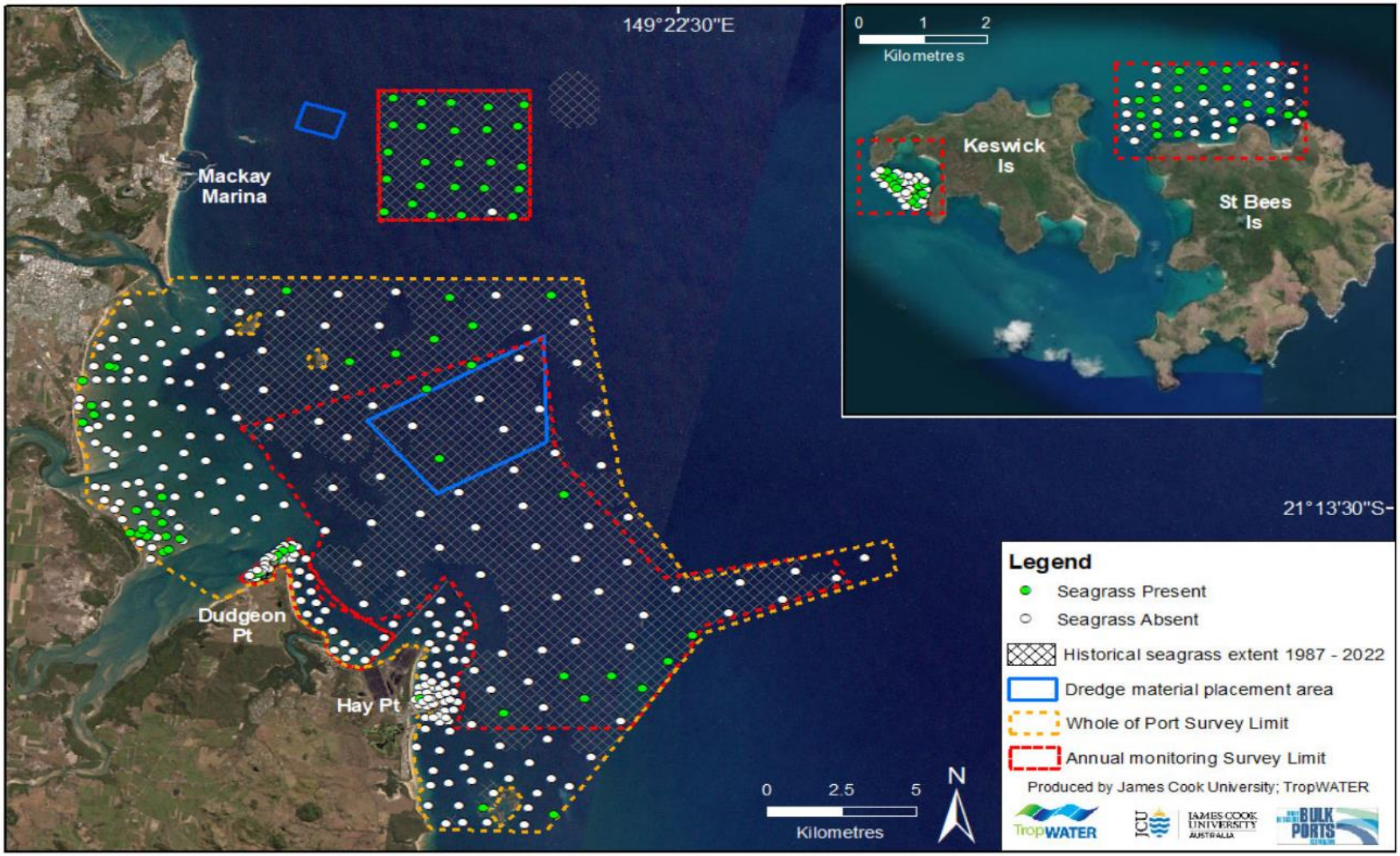

Figure 7. Location of 2023 annual and extended seagrass monitoring survey sites in the Hay Point-Mackay region (JCU TropWater, 2023)

Figure 8. Location and seagrass monitoring survey sites in the 2023 HTTH (JCU TropWater, 2023)

Figure 9. Algae presence/absence, distribution, and cover in HTTH (JCU TropWater, 2023)

Apart from very low presence of seagrass and macroalgae, the closest sensitive receptors to HTTH are the offshore islands of Victor Island (to the south) and Round Top Island (to the north) for their associated coral and rocky reef habitats. These islands are located approximately 4.5km and 13km distance respectfully from HTTH (refer Figure 6).

Modelling indicates that sediment plumes from maintenance dredging of 60,000m^3 at HTTH is not predicted to extend to these closest sensitive receptors.

4.3 HTTH Sediment Plume Modelling

For NQBP to understand the likely plume behaviour and sediment concentration, detailed plume modelling (PCS, 2023) was completed for a range of scenarios (40 in total), accounting for:

- Different dredge volumes (30,000 m^3 and 60,000 m^3)
- Different dredging methodologies, including differing combinations of dredging plant:
    - Trailer Suction Hopper Dredge (TSHD) only
    - Cutter Suction Dredge (CSD) only
    - Backhoe Dredge (BHD) only
    - CSD and TSHD
    - BHD and TSHD
- A range of metocean conditions (wet and dry seasons).

The modelling approach adopted was consistent with the Great Barrier Reef Marine Park Authority (GBRMPA) Hydrodynamic Modelling Guidelines (GBRMPA, 2012).

A summary of the key findings of the dredge sediment plume modelling (PCS, 2023) are:

a) The plume resulting from maintenance dredging in HTTH would predominantly remain within the harbour (illustrated in Figure 10).
b) The breakwater assists to retain suspended sediment within the harbour.
c) The plumes from the different dredging approaches were relatively similar.
d) Natural suspended sediment concentration (SSC) was predicted to be generally much higher than the SSC from maintenance dredging, except within the dredging and placement locations (HTTH and the Hay Point DMPA) (illustrated in Figure 10).
e) The elevated SSC from HTTH dredging and placement is typically very localised and of a relatively low SSC compared to the natural conditions
f) HTTH generally retains most of the SSC from dredging and therefore there is limited potential for impact to sensitive receptors.

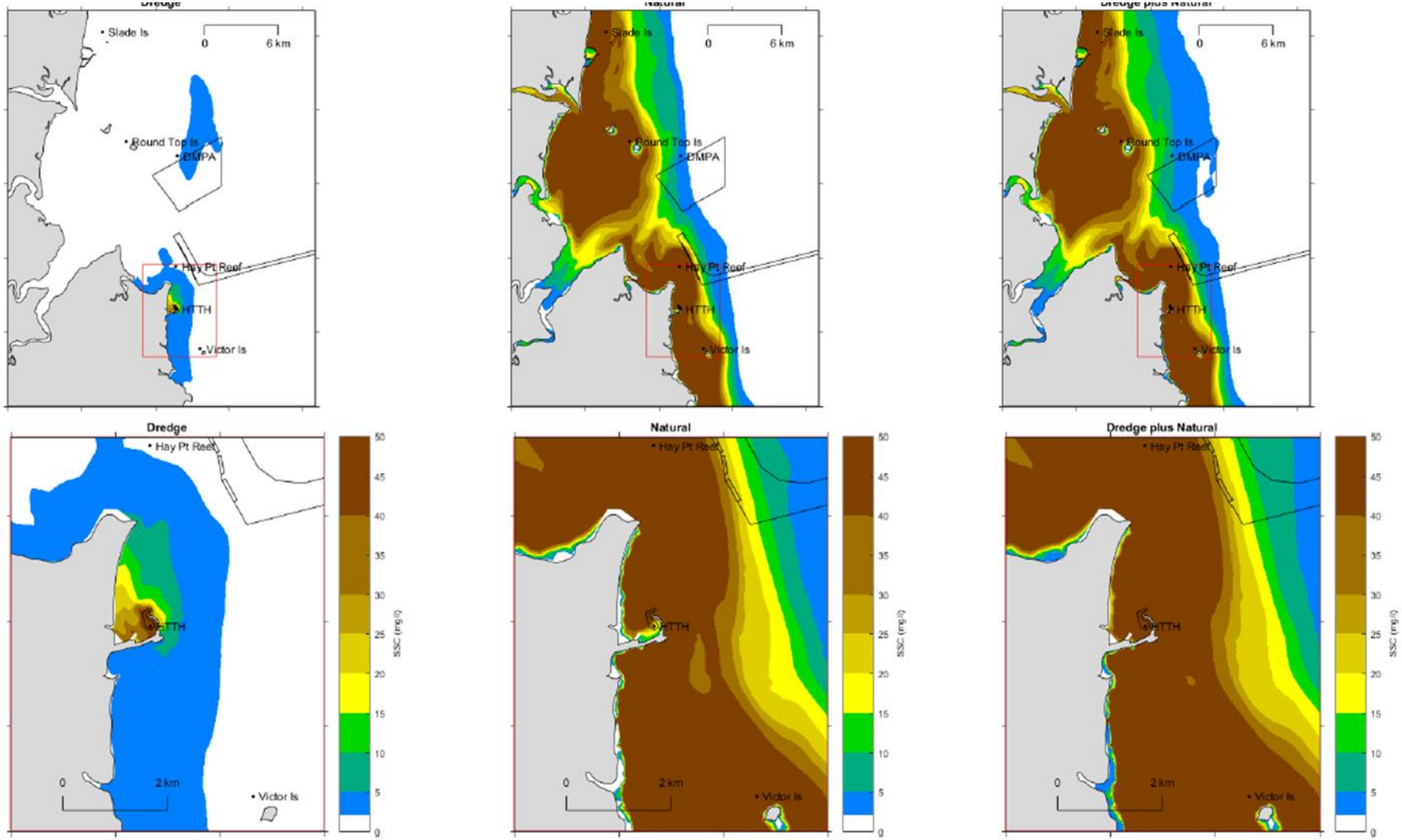

Figure 10: Modelled 95th percentile dredge, natural and natural plus dredge SSC when dredging 60,000 m³ from HTTH using a TSHD during energetic wet season (Figure 38, PCS, 2023

4.4 HTTH Zone of Influence

The zone of influence for maintenance dredging campaigns within HTTH was determined through modelling completed for HTTH. As illustrated below in Figure 11, the zone of influence for dredging up to 60,000m^3 within HTTH using the TSHD was determined. This was based on the 95th percentile SSC being increased by more than 10mg/l as a result of the dredging.

The zone of influence was determined in accordance with the definition in the EA. All metocean conditions were considered when determining the zone of influence. The potential sediment plume from dredging 60,000 m^3 at HTTH is not predicted to extend to the closest sensitive receptors of Victor Island or Round Top Island.

Figure 11: Zone of influence for dredging 60,000 m^3 from HTTH using a TSHD, based on 95th percentile SSC being increased by more than 10mg/l as a result of dredging

5. Environmental risks

5.1 Environmental Risk Assessment

A comprehensive Environmental Risk Assessment was completed for maintenance dredging activities across the whole of Port of Hay Point, including HTTH in 2018.

A summary of the Port of Hay Point maintenance dredging Environmental Risk Assessment (Eco Logical, 2018) key findings were:

- Resuspension of sediments from maintenance dredging is comparable to natural suspended sediment concentrations (SSC) during calm conditions
- Numerical modelling of sediment transport demonstrates that natural SSC levels are much higher than those generated by maintenance dredging
- Analysis against intensity and duration thresholds indicated that dredging would not drive conditions outside those experienced naturally at dredge volumes up to 800,000 m^3
- Impacts to sensitive habitats such as seagrass and coral communities are likely to be negligible to low. Seagrass communities are naturally low density and ephemeral and have been shown to recover post dredging. Coral communities lie outside of area predicted to be impacted by turbidity and sedimentation, and ecologically relevant turbidity thresholds will be used during dredging to further prevent impacts
- Protected species are also unlikely to be significantly impacted by maintenance dredging. The Port of Hay Point does not provide critical habitat resources for any marine species and disturbance to habitats will be low. Indirect disturbances can be effectively managed via best practise dredging operations. The short timeframe of each program will also reduce impact
- Impacts to protected areas including the GBRWHA and GBRMP will also be low to negligible.

The 2018 detailed Environmental Risk Assessment and supporting documents can be accessed on NQBP's website here.

A summary of the environmental risks is provided in Table 3 (below). The 2018 risk assessment has been reviewed and considered still relevant and applicable to dredging at HTTH, noting that the volume of maintenance dredging at HTTH is significantly lower than considered as part of this assessment.

Table 3. Summary of environmental risks

Risk activity (cause)	Consequence	Likelihood	Potential environment receptors
Dredge material placement	Temporary loss of benthic habitat	Low	Transient seagrass beds and seagrass habitat Benthic macroinvertebrate communities
Dredge material placement and associated sediment plume	Changes to water quality	Low for volumes below 800,000m^3	Coral and rocky reef habitats at Round and Flat Top islands, and Slade Islet
Dredge material placement and associated sediment plume	Sediment deposition	Low for volumes below 800,000m^3	Coral and rocky reef habitats at Round and Flat Top islands, and Slade Islet

Movement of dredge vessel from the HTTH to the dredge material placement area	Potential for marine fauna vessel strike	Low	Transitory threatened and migratory marine animals
Dredging suction	Potential for marine fauna to be caught	Low	Foraging marine turtles

The outcomes of the Environmental Risk Assessment informed the monitoring commitments and programs that are implemented for each maintenance dredging campaign at the Port of Hay Point.

These existing monitoring commitments and programs will also apply for maintenance dredging activities within HTTH with the inclusion of a Sediment Plume Associated Monitoring (SPAM) program based on recent plume modelling completed (section 4.3 and 4.4) and to fulfill EA conditions for HTTH.

These monitoring commitments and programs are detailed in section 6.

6. Environmental monitoring program

6.1 Port of Hay Point Marine Environmental Monitoring Plan (MEMP)

As maintenance dredging will be undertaken within HTTH as part of the broader Port of Hay Point program in 2024, monitoring commitments set out in the *Port of Hay Point Marine Environmental Monitoring Plan* (MEMP) will be implemented.

The MEMP captures monitoring of key parameters and sensitive receptors that are relevant to maintenance dredging activities within HTTH.

The MEMP takes a tiered approach to monitoring comprising of:

- **Ambient monitoring** – ongoing long-term continuous monitoring to assess natural environmental condition
- **Impact monitoring** – undertaken before, during and after maintenance dredging to detect unpredicted impacts; and
- **Adaptive monitoring** – real time monitoring during each maintenance dredging program to respond to unpredicted changes in water quality

A summary of the key parameters under this approach is provided in **Error! Reference source not found.**.

Table 4. Key parameters to be monitored through the MEMP

Parameter	Ambient	Impact	Adaptive
Marine water quality	✓	✓	✓
Island fringing corals	✓	✓	
Seagrass and benthic habitats	✓		
Invasive marine pests	✓		
Sediment quality	✓	✓	
Marine megafauna			✓

A copy of the MEMP can be accessed on NQBPs website here.

Adaptive (real time) water quality monitoring that will be undertaken as per the MEMP is summarised below.

6.1.1 Port of Hay Point - Adaptive water quality monitoring

Adaptive (real time) water quality monitoring sites will be established (Figure 12) at sensitive receptors and water quality data tracked against site specific turbidity thresholds developed for each location using the Intensity, Duration and Frequency (IDF) approach (Table 5).

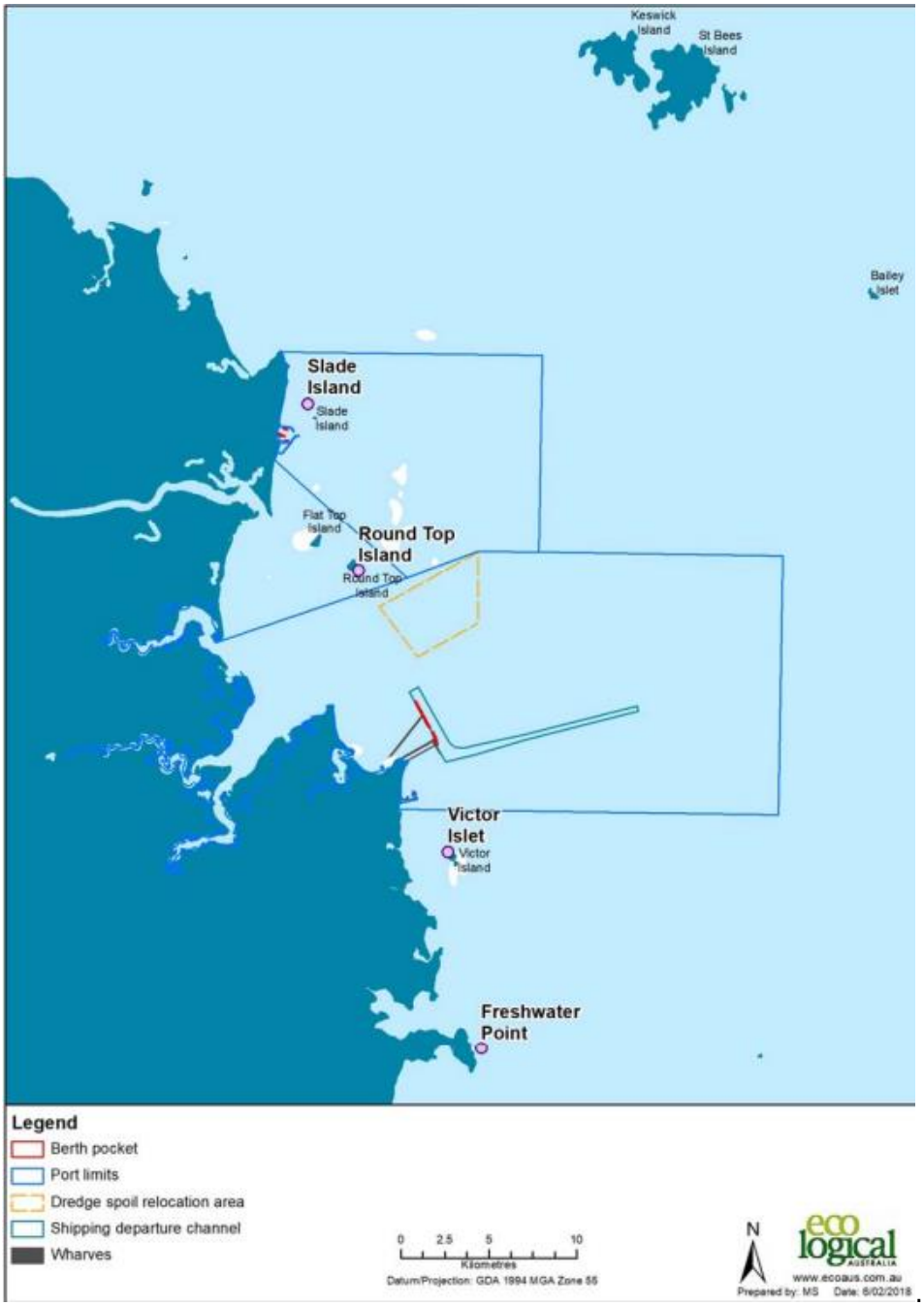

Figure 12. Adaptive water quality monitoring sites

Table 5. Trigger site turbidity thresholds

		Duration (hours)		
Site	NTUe	Average	90th	Max
Round Top Island	12	14	55	114
Victor Island	25	14	45	128

Monitoring protocol

Adaptive monitoring of water quality during the maintenance dredging program will be undertaken in according to the protocol provided in Table .

Table 6. Adaptive water quality monitoring protocol

Protocol	Details
Parameters	Turbidity (NTU) Total Suspended Solids (derived from NTU results) Pressure (to provide data on water depth) Water temperature Photosynthetically Active Radiation (PAR) Current speed and direction
Method	Data recorded on in situ multi-parameter data loggers and Marotte current meter Loggers to be telemetered to provide real time data feeds
Timing and frequency	Continuous data collection and analysis during dredging (10 min frequency) Deploy 4 weeks prior to dredging commencing Retrieve 4 weeks post conclusion of dredging
Sites	Trigger sites at Round Top Island and Victor Island Control sites at Freshwater Point and Slade Point
Data analysis	Data telemetered and delivered as recorded (every 10 minutes) Data QA/QC undertaken to review and remove (if appropriate) unexplained spikes (e.g. algae covering sensor) Calculation of average hourly value At trigger sites, if above hourly IDF 92nd/95th % threshold, add 1 hour to cumulative duration total – refer to Table 7 below
Satellite imagery analysis	
MODIS image analysis	Daily visual analysis of images to compare actual plume location (from MODIS) and with predicted plume location (from hydrodynamic model)

Management actions

Based on the Management Zones the following response actions in Table 5 will apply.

Table 5. Management zone responses and actions

Status	Action
NO ACTION	No response actions required Apply standard measures to ongoing dredging campaign

INVESTIGATE	This zone indicates that the cumulative duration has increased beyond the average. The Environmental Manager should investigate to determine if the exceedance is potentially dredging related. Examine:
	• the monitoring equipment for any faults/defects that may have influenced data collection at both monitoring and control sites.
	• the dredge and disposal activity and locations in the 24 hours preceding exceedance.
	• the results against:
	  ○ turbidity levels at control site
	  ○ recent meteorological and current/wave/tide conditions (particularly due to any
	  ○ events or wind direction that may not also be affecting control site)
	  ○ sediment transport patterns using MODIS or other aerials/satellite imagery.
	• where possible, examine the monitoring site to ensure no natural processes or other human activity (e.g. vessel movements, fishing activity) are contributing to the elevated turbidity level.
	• whether any significant rainfall events resulting in increased surface runoff or river sedimentation outfall from Pioneer River or Bakers Creek are affecting the trigger site.
	If it is determined that dredging activities have contributed to the exceedance, the dredging operations should be placed on a warning status.

RESPOND	If the trigger site cumulative duration and instantaneous control site reading indicate that dredging is causing an exceedance above the 90th percentile duration the following management measures should be progressively applied. • Change the disposal location and vessel route within spoil grounds • Slow vessel speed during disposal • Alteration of overflow regime • Change the dredging location (e.g. move to Half Tide Tug Harbour) • Modification of disposal phase with respect to the tide (e.g. dispose on ebb tide only) • Reduce the dredge load.

	The measures should be applied sequentially. One measure should be applied to each sequential disposal run and NTU monitored at the trigger site to determine if levels stabilise or fall. If they continue to increase or remain above the threshold then the next measure should be applied and so forth. Normal operations can resume once NTU falls below threshold or matches equivalent percentile reading at control site. Additionally, climate conditions should be used to inform expected turbidity responses.
STOP DREDGING	Instigate stop dredging and disposal measures until either: • NTU falls below threshold or trigger site matches equivalent percentile reading at control site • Weather conditions have stabilised to a point where continued raised NTU is unlikely

Adaptive monitoring relevant to dredging at HTTH **in addition** to the commitments set out in the MEMP are detailed in Section 6.3 below.

6.2 HTTH - Adaptive water quality monitoring

The following section describes the **additional** adaptive monitoring that will be implemented during the 2024 maintenance dredging program.

6.2.1 HTTH Sediment plume associated monitoring (SPAM)

As required in condition WT12 of the EA, a sediment-plume associated monitoring (SPAM) must be developed and implemented for maintenance dredging campaigns in HTTH.

Part 'a' of this condition requires monitoring within 300 metres of HTTH. However, given the outcomes of the plume modelling and ambient SSC concentrations inshore, establishing a logger for water quality monitoring within 300 metres of HTTH is unlikely to distinguish between natural and dredging-related SSC (insufficient depth, impact from wave and tidal action, etc) and is therefore not proposed.

The SPAM and management plan to be applied for the 2024 maintenance dredging program is set out in Table 8 below.

Table 8. Sediment-plume associated monitoring and management plan

Element	Sediment-plume
Objectives	Monitor plume behaviour and extent within HTTH and DMPA. Protection of adjacent sensitive receptors (Round Top and Victor Island) from dredge related plumes.
Performance Indicators	Established turbidity thresholds at trigger sites do not exceed IDF trigger values due to maintenance dredging activities resulting in need to cease dredging activities. Total Suspended Solids (TSS) does not exceed 100mg/L calculated on a six-hourly rolling mean at any of the water logger locations. Coral mortality does not exceed 5% at Round Top Island and 5% at Victor Island in any one dredge campaign.
Implementation Strategies	Use of TSM derived satellite imagery to monitor plume extents and behaviour within HTTH and at DMPA. Implement MEMP impact and adaptive water quality monitoring
Monitoring and Reporting	Extent of the modelled 'zone of influence' to be provided to the Dredge Manager (TSHD *Brisbane*) to be uploaded to their navigational system. Visual monitoring of plume extents during dredging:

	• Real time monitoring by the crew on board the dredge • Daily review of satellite imagery to observe plume behaviour against modelled 'zone of influence' extent and satellite derived TSM concentrations (at local and regional scale). • Satellite imagery monitoring will be undertaken prior to dredging, during dredging and post dredging. Water quality monitoring in accordance with MEMP (see extract section 6.1.1).
Corrective Actions	Management and corrective actions set out in the MEMP (Adaptive water quality monitoring) and may include: • Relocating the vessel to an alternative location • Ceasing overflow dredging.

7. Environmental strategies and management plans

The following section outlines additional mitigation strategies and management plans for the protection of specific environmental values that may be affected by maintenance dredging and placement of dredged material at the DMPA.

These strategies and management plans may be revised and updated based on changes in dredge campaign methodology. The following management measures will be implemented to minimise potential impacts as a result of maintenance dredging and placement at the DMPA.

7.1 Dredge material placement

Table 9 below details the dredge material placement management plan which outlines the objectives, performance indicators, implementation strategies, monitoring and reporting and corrective actions to ensure there are no significant impacts to the DMPA or adjacent areas.

Table 9. Dredge material placement management plan

Element	Dredge material placement
Objectives	To minimise impacts to the DMPA and adjacent areas
Performance Indicators	All dredged material is placed within the DMPA Dredge material is uniformly spread throughout DMPA The level of dredge material within the DMPA must not exceed a maximum height of 10 metres below Lowest Astronomical Tide (LAT).
Implementation Strategies	Altering deposition patterns that vary with prevailing conditions. When currents are minimal, deposition will occur relatively uniformly over the DMPA in arc patterns. When currents are present, deposition will occur in tighter arcs in the up-current portion of the dredge material relocation ground to take into account drift of sediment as it settles. Dredge material will be spread in a manner that sediment mobilisation and turbidity plume generation is minimised (e.g. bottom / keel discharge) A DGPS will be used to ensure the material placement is within the designated area Each load of the TSHD will be placed in a manner that distributes the dredged sediments evenly across the designated area.

Monitoring and Reporting	Post-dredge hydrographic survey shows uniform distribution of dredge material in DMPA and a maximum height of 10 metres below LAT. Vessel positioning plots demonstrate all material has been placed within the DMPA.
Corrective Actions	Where the performance indicators cannot be met alternate dredge material placement methodology must be utilised

7.2 Marine fauna

Table 10 below details the marine fauna management plan which outlines the objectives, performance indicators, implementation strategies, monitoring and reporting and corrective actions to ensure there are no impacts to marine fauna.

Table 10. Marine fauna management plan

Element	Marine fauna
Objectives	To reduce the risk of disturbance or injury to marine mammals and sea-turtles resulting from the dredging and placement activities. Establish and maintain awareness of the importance of protecting marine mammals and sea turtles.
Performance Indicators	No incidents of vessel related disturbance to marine mammals and turtles. All members of the dredging team to complete an induction, which will include information on marine mammal and turtle management requirements. Vessel masters and spotters trained in marine mammal and turtle interaction procedures.
Implementation Strategies	Bridge personnel to maintain watch for marine fauna during dredging, transit and dredge material placement If megafauna are present outside 300m radius monitoring zone: • Continue to monitor presence • Prepare for response if animals move within 150m of the dredge If megafauna present within monitoring zone: • Stop dredging Dredging to commence only when megafauna have exited monitoring zone or not observed for 20 mins or the dredge vessel moves to another area of the DMPA to maintain a distance of 300m Stationary dredging operations and spoil disposal activities must cease, or relocate to another site, if marine fauna are likely to be struck or captured, or are observed within 75 metres of the activity/ies being undertaken Record observations and actions in Vessel Masters log Drag head to be fitted with turtle exclusion device Stop suction of dredge as dredge head is lowered/tilted
Monitoring and Reporting	Marine mammal and turtle activity will be performed by a person at a suitable location on each vessel. A record of sighted animals will be maintained, indicating the sighting of each individual animal and actions taken. Immediate reporting of any incident involving injured or killed animals to NQBP and administering authority. Any injury to marine megafauna shall be recorded and reported to DES immediately (1300 130 372). A record of the injury/death to be taken, including species impacted, location of the event, works that caused the injury and corrective actions. Details of the incident are to be compiled into an incident report.
Corrective Actions	In the event of an environmental incident, appropriate emergency response measures shall be implemented to ensure environmental harm from the event is reduced.

	If injury to marine megafauna occurs, liaise with NQBP and DES immediately to identify rescue options and develop future corrective strategy. Assist in capture of injured animals per advice from regulatory agencies. Other strategies will implemented, as advised by regulatory agencies or NQBP, to reduce likelihood of incident recurring.

7.3 Ballast water and washdown

Table 11 below details the ballast water and washdown management plan which outlines the objectives, performance indicators, implementation strategies, monitoring and reporting and corrective actions to ensure there are no significant impacts as a result of ballast water or washdown procedures.

Table 11. Ballast water and washdown management plan

Element	Ballast water and washdown
Objectives	Maintain ballast water in accordance with the *Biosecurity Act 2015*
Performance Indicators	To minimise the impacts of ballast water and washdown procedures on surrounding environment
Implementation Strategies	Release of ballast waters will be minimised at all times Sweep deck in preference to washing where possible Washdown of the deck and or dredge head shall only occur within the designated disposal areas Only dredged material to be release as a result of vessel washing activities (i.e. no release of oil or other contaminants)
Monitoring and Reporting	A record will be kept of volumes, location and times of ballasting and de-ballasting operations Reporting by crew to Vessel Master of any observations of contamination to the waterway whilst washing the deck/equipment Reporting in accordance with hazardous waste measures
Corrective Actions	If practicable, take measures to rectify. Review procedures and take immediate action to rectify.

7.4 Air and noise quality

Table 12 below details the air and noise management plan which outlines the objectives, performance indicators, implementation strategies, monitoring and reporting and corrective actions to ensure there are no impacts to air and noise quality.

Table 12.6 Air and noise management plan

Element	Air and noise
Objectives	To minimise the impacts (including odours and airborne contaminants) of maintenance dredging on air quality To minimise the impacts of maintenance dredging on noise-sensitive receptors To protect the air quality of surrounding sensitive receivers. To respond effectively to any air quality issues that arise during maintenance dredging.
Performance Indicators	All noise from activities must not exceed the acoustic quality objectives specified in the *Environmental Protection Noise Policy 2019* Response to all complaints about noise or air quality issues initiated within 24 hours of receipt. Machinery is operating in a fit-for-purpose manner.

	There are no complaints received regarding air or noise quality associated with dredge operations.
Implementation Strategies	All noise reduction equipment to be maintained as per manufactures' specifications. Ensure that engines and equipment on board the dredge are properly maintained in good working order. Maintain and operate all equipment on board the dredge in a safe and efficient manner. Carry out non-essential maintenance during day-light hours. Appropriate adjustment of trim and ballast to ensure effective operation. Exhaust stack to be visually monitored to ensure no visual dark emissions. The contractor staff are aware of noise and air quality requirements in relevant permits and/or approvals. Operate a complaints management system.
Monitoring and Reporting	Any complaints to be reported to NQBP, Vessel Master, PBPL Environment Manager and PBPL Manager Dredging Operations. All complaints will be recorded on the applicable complaints form and referred to NQBP. Investigation of complaints and review of equipment versus relevant standards / requirements. The results of any air and noise quality monitoring are to be provided to NQBP within two weeks following completion of any monitoring / investigation.
Corrective Actions	Vessel Master to investigate source of emissions or basis of complaint. If this relates to inappropriate work practices, inform crew of necessary changes and ensure these are undertaken. If complaints relate to plant, investigate effectiveness of emissions reduction equipment and review/replace as required. All complaints received will be investigated immediately, taking note of prevailing wind conditions and noting any evidence that relates to the complaint. Defective vessels are to be repaired prior to continuing work. Changes to hours of work or dredging procedures should be considered if practical and potentially beneficial.

7.5 Waste management

Table 13 below details the waste management plan which outlines the objectives, performance indicators, implementation strategies, monitoring and reporting and corrective actions to ensure there are no impacts as a result of waste disposal.

Table 13 Waste management Plan

Element	Vessel waste
Objectives	To ensure that general refuse produced on-board the dredge vessel is collected, retained, and transferred to an appropriate facility without unintentional material loss.
Performance Indicators	No loss of solid wastes material overboard during collection or transfer. No discharge of solid wastes other than at berth.
Implementation Strategies	Supply of appropriate collection bins in areas such as galley, crew quarters and mess. Transfer of bins as required to large bins on-deck. Material placed in bin to be as compacted as possible to reduce space requirements All on-deck bins secured in position to prevent movement whilst at sea.

	Where facilities exist to recycle material, appropriate separation of refuse. Bin lids to be chained down to prevent wind-blown material loss at all times. All collection points to be emptied to on-deck bin when 75% capacity. Visual check to ensure that on-deck bins have sufficient capacity to retain general waste until next scheduled on-shore transfer. All sewage effluent (including greywaters and blackwater) generated onboard shall be directed to the onboard treatment system. Treated effluent shall be diverted to onboard holding tanks Effluent from the treatment system and holding tank is to be discharged in appropriate locations to ensure compliance with relevant legislation Pump-out of sludge tank to be managed as for untreated sewage discharges and, by way of appropriately licensed contractors where required. All hazardous waste to be stored in appropriate manner (contained and bunded) and clearly marked in accordance with legislative requirements. All appropriate spill kit equipment will be on site and all personnel will be trained in the use of spill kits. Hazardous waste to be collected by licensed contractor, for disposal at approved facility Bunkering of fuel to be undertaken by licensed contractor and levels shall be monitored at all times Spill response equipment shall be easily identifiable and conveniently located
Monitoring and Reporting	Dredge crew to carry out regular visual inspections of collection points and visual inspection of on-deck bins. Reporting of material loss over-board to Vessel Master and NQBP in accordance with incident Review procedure resulting in sewerage discharge in prohibited location and rectify immediately Reporting of sewerage discharge location in Sewage Log Book. Any exceptions reported to Vessel Master and NQBP All sewage spills to be reported to Maritime Safety Queensland. In the event of hazardous material spill, Vessel Master must report any spills to the marine environment to NQBP's Principal Advisor - Environment on 0409 282 110 (24 hours); and notify Maritime Safety Queensland on 07 4052 7470 or 1300 551 899
Corrective Actions	If practicable, take measures to retrieve material that is lost. Review procedures causing material loss and take immediate action to rectify. In the event of spill, Vessel Master to assist with clean-up of spill, review procedure breakdown and correct if required. This may include staff training

7.6 Cultural heritage

Table 14 below details the cultural heritage management plan which outlines the objectives, performance indicators, implementation strategies, monitoring and reporting and corrective actions to ensure there are no significant impacts to cultural heritage. Cultural heritage includes both European and Indigenous heritage.

Table 14 Cultural heritage management plan

Element	Cultural heritage

Objectives	No impacts to European or Indigenous heritage
Performance Indicators	Ensure dredging and material relocation is undertaken within the approved areas only
Implementation Strategies	Dredge personnel to be aware of their obligations relating to European and Indigenous heritage
Monitoring and Reporting	Undertake opportunistic visual inspection of dredge load and dredge heads, reporting any items of suspected cultural significance. Observe all site-specific requirements which may influence dredge operations.
Corrective Actions	If items of cultural significance are found, retain and report to relevant authorities through Vessel Master and NQBP

7.7 Incident management

All NQBP Hay Point staff, and any contractors involved, have the responsibility to report any significant incidents and emergencies. This requirement will be included in inductions and reinforced at operational meetings.

Environmental incidents and hazards, including pollution incidents will be managed in accordance with either the *TSHD Brisbane* on-board emergency procedures or the Port of Hay Point emergency response procedure (for in water incidents).

All incidents will be reported and recorded in accordance with NQBP's policies, procedures and permit conditions.

In the first instance, reporting should be to the operational works supervisor, but generally, the Environment Manager will have the responsibility to initiate corrective action for environmental incidents.

In the case of an environmental emergency, after first notifying the Environment Manager, the operational works supervisor may make contact with NQBP's nominated consultants, who would help co-ordinate and manage a response. Depending on the nature and magnitude of the incident, the Environment Manager may be required to notify government regulators.

8. Roles and responsibilities

NQBP as the Port Authority for the Port of Hay Point is responsible for the maintenance of seafloor navigation at HTTH. NQBP are therefore the holder of all permits related to maintenance dredging at HTTH.

The following personnel have responsibilities under this DMP.

Table 7. Roles and responsibilities, 2024 maintenance dredging campaign

Position	Person	Contact details	Responsibility
NQBP Environment Manager	[redacted]	[redacted]	Compliance with all Permits and DMP requirements Adaptive management decisions
NQBP Principal Advisor -Environment	[redacted]	[redacted]	Implementation of Monitoring Program Notification of trigger level exceedances to Environment Manager and Vessel Master
NQBP Project Manager	[redacted]	[redacted]	Operational and contractual matters relating to the operation of the dredge
NQBP Dredge Supervisor	[redacted]	[redacted]	NQBP contact for operational issues
Vessel Master		[redacted]	All matters related to the safety of vessel and crew. Compliance with maritime laws Implementation of management measures as detailed in this DMP
TSHD Brisbane Senior Manager Marine Operations	[redacted]	[redacted]	Management of overall operations of dredger
Regional Harbour Master		[redacted]	Contact for hazardous spills and shipping safety issues

9. Reporting

9.1 Record keeping and auditing requirements

During dredging activities, NQBP (or their contractors) will keep records which detail:

- the times and dates of when each material placement run is commenced and finished.
- the position (by GPS) of the vessel at the beginning and end of each placement run with the inclusion of the path of each dredge material relocation run.
- the volume of dredge material (in cubic metres) dumped for the specific operational period. These records will be retained for audit purposes.
- detail of any spill of oil, fuel or other potential contaminant, details of remedial action and monitoring instigated as result.
- details of any marine mega fauna observations during dredging activities
- time and duration of any alterations to the program, including stop work actions, as a result of any environmental mitigation measure.
- NQBP will undertake internal audits during each dredging program.

9.2 Incidents and contingency arrangements

Significant environmental incidents should be logged in writing, with all relevant details recorded, after corrective action has been completed.

Should an environmental incident occur during the course of dredging or placement, NQBP will take measures to mitigate the risk or impact. NQBP would report the following information to DESI/GBRMPA, within 24 hours:

- nature of incident and type of risk associated with the incident, including (where possible) volume, nature and chemical composition of substances released
- measures taken to mitigate the risk
- the success of the measures undertaken
- proposed future measures (if required) and monitoring.

10 Communication

10.1 Internal communication

Internal communication methods include telephone, ship to shore radio, meeting and notices distributed by email.

Daily meetings will be scheduled between NQBP and the TSHD contractor. Environmental matters will be included as a standing agenda item at all meetings.

The TSHD contractor is responsible for ensuring that the location of and access to this DMP is communicated at induction and that any changes made to the DMP are communicated to project personnel.

10.2 External communication

A variety of methods will be used to enable information to be distributed to interested members of the community and stakeholders. These may include the following:

- NQBP website (www.nqbp.com.au)
- Email
- Media releases
- Notices to Mariners.

Key communication activities and content include the following:

- Scheduled activities to be included on the NQBP website covering planned operational activities.
- All complaints will receive an initial response within one (1) business day. Complaints will be managed following NQBP's standard complaints procedure.
- Communication and advice to the TACC during and post the dredging operations

10.3 Environmental site inductions / training

Prior to commencing work, where required, dredge campaign specific inductions shall be undertaken by all employees, sub-contractors and visitors. Records of inductions shall be maintained on site throughout the life of the project. The environmental site induction process shall consist of the following:

- Relevant legislation identified.

- General environmental duty and duty to notify.
- Conditions of environmental permits and authorities.
- Environmental management strategies contained in the DMP.
- Identified dredge campaign specific areas such as: sensitive receptors, marine fauna, cultural heritage requirements.
- Definition of and management of environmental incidents.
- Reporting requirements for environmental incidents.
- Emergency response procedures.
- Refuelling, waste disposal, litter collection, location of spill kits.

All staff involved on the works site will be made aware of the environmental responsibilities and requirements of the project, including the requirements of the DMP.

11. References

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