

Risk assessment for scheduling annual maintenance dredging at the Port of Gladstone

08 January 2020

To ensure the safe passage of vessels through Port of Gladstone (PoG), Gladstone Ports Corporation (GPC) conducts annual maintenance dredging using the Trailing Suction Hopper Dredger (*TSHD Brisbane*).

This risk assessment is to inform the scheduling process for the *TSHD Brisbane* and provides information to;

- determine if there are any Gladstone specific risks associated with the scheduling of maintenance dredging by the *TSHD Brisbane* with a focus on environmental windows impacting on key environmental values;
- identify if any changes in current control measures are required; and
- demonstrate GPC's dredging activities are managed in accordance with the principles of the Maintenance Dredging Strategy (MDS) (TMR, 2016).

In November 2016, the Queensland Department of Transport and Main Roads (TMR) released the MDS for Great Barrier Reef World Heritage Area Ports: Technical Supporting Document; which identified the Port of Gladstone's (PoG) environmental values, their distribution and environmental windows, which include seagrasses, corals and megafauna (and their recruitment / breeding). It also documented an Environmental Review and Risk Assessment which provided a summary of risks from maintenance dredging and dredge material placement activities to the environmental values that have the greatest potential to be influenced by these activities. Through this process, the PoG was identified as Low Risk with a High Confidence level.

Under GPC's Environmental Management System, all environmental risks are assessed and recorded on the GPC Aspects and Impacts Register in accordance with GPC's Risk Management Policy and Standard.

The risk assessment in Table 1 is an extract from GPC's Aspects and Impacts Register which was subsequently modified to ensure it aligned with the Environmental Review and Risk Assessment in the MDS Technical Supporting Document. It uses the definitions of risk consequences, likelihood and hazard grades adopted for the *Great Barrier Reef Region Strategic Assessment: Strategic assessment report, GBRMPA, Gladstone* (GBRMPA, 2014) which is provided in Appendix A. This process ensures that there is an annual review of the information used to inform the development of the *TSHD Brisbane*'s state wide annual maintenance dredging schedule.

Overview

The risk assessment indicates that all risks associated with maintenance dredging at the PoG in 2020 are **Low** as a result of implementing the identified management controls.

While no new management controls are required, to assist in turtle protection GPC have added two (2) additional controls in 2018 line with the *Recovery Plan for Marine Turtles in Australia 2017-2027, Commonwealth of Australia 2017* (the Recovery Plan), and gain a better understanding of turtle fatalities in the PoG. These include:

1. Development of protocols for multiple marine megafauna fatalities to temporarily halt dredging until investigation is complete and corrective actions (where identified) have been applied.
2. Notification of opportunistic marine megafauna finds, where the remains (carcass or parts thereof) will be retrieved and stored appropriately for analyses.

These controls have been developed in accordance with specialist advice received from the Department of Environment and Science.

All existing controls for the protection of seagrass, coral, marine megafauna and for the mitigation of risks associated with weather events, have been in place for many years and their application and effectiveness is well understood.

As a result, it is proposed that no environmental windows are required for maintenance undertaken by the *TSHD Brisbane* at the PoG. The ecological and environmental timings relevant to the PoG that were considered in this assessment are included in Appendix B. All management controls identified through this process have been documented in GPC's PoG Environmental Management Plan for Maintenance Dredging.

Table 1. Scheduling risk assessment for *TSHD Brisbane* maintenance dredging: Port of Gladstone – 2020

		Inherent risk		Residual risk		
Threat	Description and risk commentary	Likelihood and consequence	Risk	Management controls	Likelihood and consequence	Risk
Seagrass and seagrass recruitment Potentially impacted due to elevated turbidity, reduction in benthic light and/or sedimentation as a result of dredge plumes or dredge material placement.	<p>Seagrass communities occur throughout Port Curtis with intertidal, subtidal and deep water seagrass meadows present. The intertidal and subtidal seagrasses have been monitored, at least once a year, since 2002.</p> <p>Seagrass in Port Curtis is diverse, reproductive, variable between years and highly seasonal.</p> <p>In November 2018, substantial improvement in seagrass condition was observed. Significant increases in meadow condition in The Narrows, Western Basin and Rodds Bay was observed. Highest recovery of seagrass since 2009 was observed at Rodds Bay. Pelican Banks showed improvement in meadow area compared to previous years. Movement of sediments and herbivory may have led to deterioration of seagrass condition at Pelican Banks. Extensive dugong feeding trails were observed in Port Curtis and Rodds Bay demonstrating that the area is widely being used by mega herbivores. Environmental factors including light and climate drivers demonstrated a generally</p>	Unlikely/ Insignificant	Low	<p>Seagrass communities, management tools and thresholds are very well understood in Gladstone. Comprehensive seagrass, water quality and light monitoring programs have been in place for many years. No adverse impacts from maintenance dredging have been detected. Existing management controls for maintenance dredging are demonstrably effective. e.g.</p> <p>GPC Controls Management and Monitoring Plans and Procedures which include: *Hydrodynamic modelling of estimated volumes * Assessment of modelled impacts against known sensitive receptor thresholds, * Monitoring in alignment with modelling, * Monitoring and triggers for sensitive receptor * Passage Island (<6 mol/m2/day on a 14 day rolling average of BPAR applied conservatively in both the growing and senescent season), and * Adaptive management processes. * Long term monitoring of seagrass communities</p> <p>Contractor controls - detailed in TSHD Brisbane EMP * Engineering controls on THSD Brisbane e.g. Green valves (anti-turbidity), below keel discharge;</p>	Unlikely/ Insignificant	Low

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	<p>favourable environment for seagrass growth in 2018.</p> <p>Mapping of deepwater seagrass at East banks Spoil Disposal Site was conducted in November 2019 along with port wide assessment of seagrass condition. Report is expected in March 2020.</p> <p>GPC has been monitoring Benthic Photosynthetic Active Radiation (BPAR) during maintenance dredging. BPAR levels were below threshold for more than 14 consecutive days during the maintenance dredging campaign in 2018. Upon investigation that cause of the low BPAR are attributed to environmental conditions and not dredging.</p> <p>Based on validated modelling results updated in 2018, most sensitive receptors (including seagrasses) are unlikely to be affected by maintenance dredging plumes. However, the zone of potential plume influence does coincide with the Passage Island seagrasses. Potential impacts may occur in the absence of any adaptive management.</p>			<p>* Notification requirements, * Dredging and disposal locations and volumes as per the defined requirements of GPC's approvals.</p>		
Corals Potentially impacted due	Coral reef habitats include shallow fringing and subtidal reefs within Port Curtis, near North and South	Possible/ Insignificant	Low	Existing management controls for maintenance dredging are demonstrably effective. For example.	Unlikely/ Insignificant	Low

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to elevated turbidity, reduction in benthic light and sedimentation as a result of dredge plumes or dredge material placement.	Entrances and along Facing Island. Surveys showed loss of coral cover from 2009 to 2014, with reduced salinities and high turbidity, associated with climate events, likely to be major drivers of this change. Further assessments of a small selection of sites in 2015, noted further coral loss. Annual surveys undertaken of permanent coral monitoring locations within Port Curtis for the Gladstone Healthy Harbour Partnership (GHHP) have shown an improvement in coral condition from 2015 to 2017 despite coral cover still remaining very poor. GHHP surveys undertaken in 2018 showed a decline in coral condition which was attributed to the extremely low coral cover on most reefs. In 2018, GPC also undertook surveys of coral communities on the eastern side of Facing Island to assess any changes since previous surveys were undertaken at these locations in 2013. Hard coral cover was greatest at sites along the eastern side of Facing Island (closest to EBSDS) and the control sites at Rundle Island. The lowest coral cover was recorded at sites in the harbour entrance. These sites had greatly reduced in coral cover between 2013 and 2014, and do not appear to have recovered			<p>GPC Controls Management and Monitoring Plans and Procedures which include:</p> <ul style="list-style-type: none"> *hydrodynamic modelling, * assessment of modelled impacts against known sensitive receptor thresholds, * monitoring in alignment with modelling, * monitoring and water quality triggers for turbidity and adaptive management processes *Long term monitoring of reef communities <p>Contractor controls - detailed in TSHD Brisbane EMP</p> <ul style="list-style-type: none"> * Engineering controls on THSD Brisbane e.g. Green valves (anti-turbidity), below keel discharge; * Notification requirements, * Dredging and disposal locations and volumes as per the defined requirements of GPC;s approvals. 		

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	<p>substantially between 2014 and 2018. Macroalgae cover displayed an inverse relationship with to coral cover – highest macroalgae cover was observed at sites with low coral cover</p> <p>While the spatial patterns in hard coral and macroalgal cover are consistent with catchment disturbances, the relative influence of dredged material placement impacts cannot be completely partitioned. However, based on dredge plume monitoring, modelling studies, and the 2018 cover data, it is considered extremely unlikely that sediment plumes created by maintenance dredging are driving these spatial patterns. Both monitoring and modelling indicate that sediment plumes created by material placement are short- term features (measurable for < 1 hour) that do not have significantly large enough concentrations to impact reef communities.</p>					
Coral spawning Potentially impacted by dredging related high suspended sediment and	<p>Coral spawning occurs on the full moon for up to six (6) days usually in October or November, but potentially December depending on presence of suitable conditions.</p> <p>See coral description provided above.</p>	Unlikely/ Insignificant	Low	<p>Existing management controls for maintenance dredging are demonstrably effective. e.g.</p> <p>GPC Controls Management and Monitoring Plans and Procedures which include: * hydrodynamic modelling,</p>	Unlikely/ Insignificant	Low

		Inherent risk			Residual risk	
Threat	Description and risk commentary	Likelihood and consequence	Risk	Management controls	Likelihood and consequence	Risk
settlement levels as a result of dredge plumes or dredge material placement.				<ul style="list-style-type: none"> * assessment of modelled impacts against known sensitive receptor thresholds, * monitoring in alignment with modelling, * monitoring and water quality triggers for turbidity and adaptive management processes * Long term monitoring of reef communities <p>Contractor controls - detailed in TSHD Brisbane EMP</p> <ul style="list-style-type: none"> * Engineering controls on THSD Brisbane e.g. Green valves (anti-turbidity), below keel discharge; * Notification requirements, * Dredging and disposal locations and volumes as per the defined requirements of GPC's approvals 		
<p>Marine megafauna breeding Potentially impacted as a result of dredge strike or entrainment.</p>	<p>Six of the seven recognised species of marine turtle are known to occur in Port Curtis and nearby coastal areas.</p> <p>The ocean side of Curtis Island is an index beach for a medium density population of nesting Flatback turtles as recognised by the Recovery Plan. Green and loggerhead turtles are also known to nest along this beach.</p> <p>All three species have also been recorded nesting on other beaches within the region such as those on the ocean side of Facing Island, Tannum Sands Beach and Lilleys</p>	Unlikely/ Minor	Low	<p>Existing management controls for maintenance dredging have been effective with no megafauna strikes. e.g.</p> <p>GPC Controls Management and Monitoring Plans and Procedures which include: Long term monitoring of marine megafauna</p> <p>Contractor controls - detailed in TSHD Brisbane EMP</p> <ul style="list-style-type: none"> * ensuring turtle deflectors are fitted to drag heads, * visual monitoring prior to dumping activities, * opportunistic monitoring in vessel hopper, <p>Protocols on retrieved megafauna to allow for DES to retrieve and analyse</p>	Unlikely/ Minor	Low

		Inherent risk			Residual risk	
Threat	Description and risk commentary	Likelihood and consequence	Risk	Management controls	Likelihood and consequence	Risk
	<p>Beach.</p> <p>Satellite tagged flatback turtles have been tracked utilising the waters of the Port of Gladstone including within or in close proximity to shipping channels and vessel transit lanes.</p> <p>While not formally recognised by the Recovery Plan, Port Curtis does represent a foraging area for green turtles with regular capture and assessment of green turtles within Port Curtis since 2011.</p> <p>Satellite tagging of green turtles within Port Curtis showed that a small number of turtles moved close to, or across shipping channels.</p> <p>Australian humpback dolphins occur throughout Port Curtis and bottlenose dolphins have been observed on the ocean sides of Facing and Curtis Islands.</p> <p>Dugongs occur throughout Port Curtis and this region is recognised as a Dugong Protection Area under State legislation. Dugong feeding trails have been observed on seagrass meadows throughout Port Curtis. Three dugongs satellite</p>			<p>* Protocols for megafauna multiple strike, which may include halting dredging</p> <p>* Notification requirements for strikes & finds of megafauna</p>		

		Inherent risk			Residual risk	
Threat	Description and risk commentary	Likelihood and consequence	Risk	Management controls	Likelihood and consequence	Risk
	<p>tagged in Port Curtis have shown a range of movements including within the inner harbour.</p> <p>Humpback whales make their annual migration through the Great Barrier Reef region from June to August. Individual whales have been sighted within the Port of Gladstone.</p> <p>Turtle strike data provided by PBPL indicates that five (5) turtles have been captured during maintenance dredging in the PoG since 2000, which all occurred prior to 2011.</p> <p>Based on validated modelling results, most sensitive receptors (including seagrasses and corals) are unlikely to be affected by maintenance dredging plumes. Therefore no flow on effects to marine megafauna are expected.</p>					
<p>Extreme Weather</p> <p>Potential impacts to environmental resources and water quality may occur as a result of dredging immediately</p>	<p>Severe weather events have the potential to increase the volume of dredge material in the Port of Gladstone, which can present additional operational and environmental hazards.</p> <p>Severe weather in Gladstone usually occurs between December and March (BOM data 1993-2018) and therefore dredging immediately</p>	Rare/ Insignificant	Low	<p>GPC has experienced evaluated turbidity before, during and after dredging. This data has been evaluated against weather (wind, rain and tide) and found that Port of Gladstone is influenced by weather events and that no discernible impact has been found on sensitive receptors from the maintenance dredging activity.</p> <p>GPC Controls</p>	Rare/ Insignificant	Low

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Threat	Description and risk commentary	Likelihood and consequence	Risk	Management controls	Likelihood and consequence	Risk
following an extreme weather event.	following an event at this time of the year would have negligible to no impact on spawning, breeding or recruitment.			Management and Monitoring Plans and Procedures which include: * Emergency management section gives guidance for extreme events that allows for risk assessment jointly between PBPL and GPC to determine what additional controls to employ. The actions could also include halting dredging, and are dependent on the risk to the environment and the vessel.		

Appendix A

Risk ratings as per: *Great Barrier Reef Region Strategic Assessment: Strategic assessment report, GBRMPA, Gladstone (GBRMPA, 2014)*

Consequence description and definition

Consequence	Extent of the impact based on current management	
	Broad scale	Local scale
Catastrophic	Impact is clearly affecting, or would clearly affect, the nature of the value over a wide area. Recovery periods greater than 20 years likely.	
Major	Impact is, or would be, significant at a wider level. Recovery periods of 10 to 20 years likely.	Impact is, or would be, extremely serious and possibly irreversible to the condition of a value. Condition of the affected value possibly irretrievably compromised.
Moderate	Impact is, or would be, present at a wider level. Recovery periods of 5 to 10 years likely.	Impact is, or would be, extremely serious to the condition of a value and possibly irreversible over a small area. Recovery periods of 10 to 20 years likely.
Minor	Impact is, or would be, not discernible at a wider level. Impact would not impair the overall condition of the value, including sensitive populations or communities, over a wider level.	Impact is, or would be, significant to the condition of value at a local level. Recovery periods of 5 to 10 years likely.
Insignificant	No impact or if impact is, or would be, present then only to the extent that it has no discernible effect on the overall condition of the value.	No impact or if impact is, or would be, present then only to the extent that it has no discernible effect on the overall condition of the value.

Note: Recovery periods relate to major capital dredging programs and not maintenance dredging.

Likelihood description and frequency

Likelihood	Expected frequency of a given threat
Almost certain	Expected to occur more or less continuously throughout a year
Likely	Not expected to be continuous but expected to occur one or more times in a year
Possible	Not expected to occur annually but expected to occur within a 10-year period
Unlikely	Not expected to occur in a 10-year period but expected to occur in a 100-year period
Rare	Not expected to occur within the next 100 years

Hazard Risk Grades

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Low	Medium	High	Very high	Very high
Likely	Low	Medium	High	High	Very high
Possible	Low	Low	Medium	High	Very high
Unlikely	Low	Low	Low	Medium	High
Rare	Low	Low	Low	Medium	High

Appendix B

Port of Gladstone Ecological / Environmental Timings

Subject Matter	Event and Time period/s
Seagrass	Growing Season: July to December.
Corals	Spawning: Inshore reefs – up to 6 days after the first full moon in October. GBR region – up to 6 days after the first full moon in November. Can vary according to suitable conditions.
Flatback turtles	Mating: Unknown. Nesting: October to January (peak: late November to early December). Hatching: December to March (peak: February).
Green turtles	Foraging: all year round in PoG (not documented in the Recovery Plan for this area but known from other studies).
Loggerhead turtles	While known to be present, limited understanding of use of PoG.
Dolphins	No known significant events or time periods.
Dugongs	No known significant events or time periods.
Whales	Migration through GBR region: June to August.
Wet / Cyclone Season	Generally December to March.

