

**Port of Gladstone  
Gatcombe and Golding Cutting  
Channel Duplication Project**

Environmental Impact Statement



# Executive summary

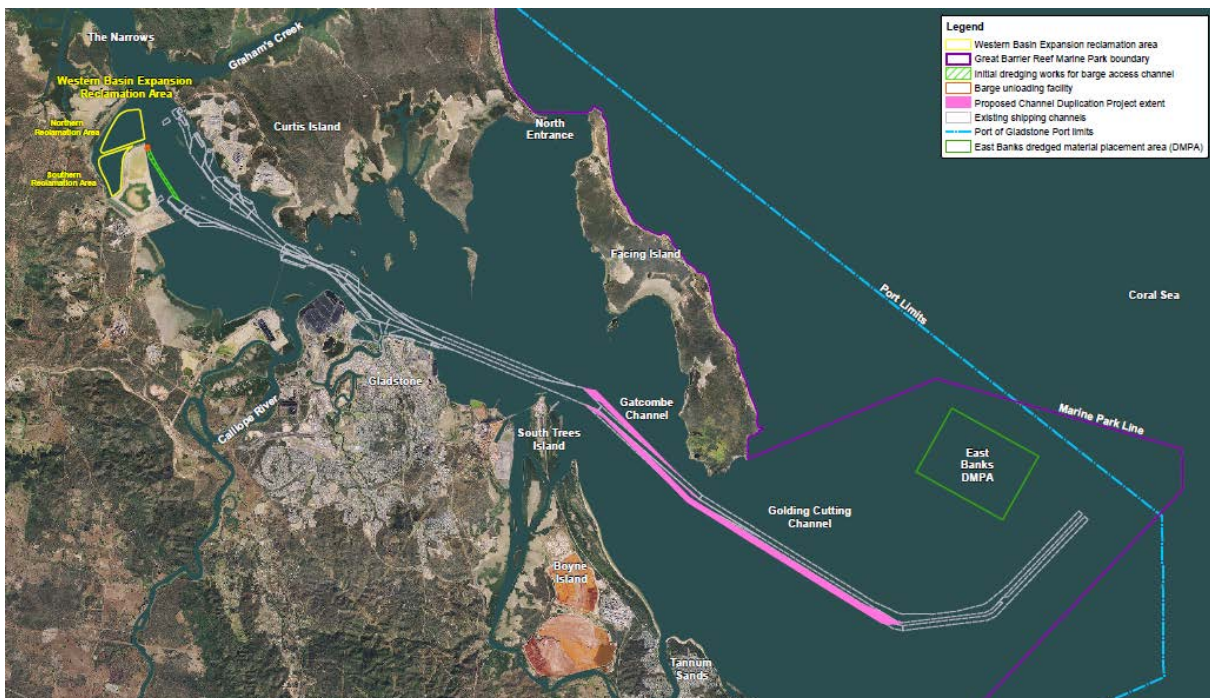
# Executive summary

## Introduction

### Overview

This Environmental Impact Statement (EIS) has been prepared to assess the environmental, social, cultural heritage and economic impacts associated with the Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project (the Project).

The Project involves the duplication of the existing Gatcombe and Golding Cutting shipping channels to provide a duplicated channel parallel to the main shipping channels with sufficient depth and width to allow improved two-way passage into the Port under all weather and tidal conditions. The duplication involves the deepening and widening of the existing Gatcombe and Golding Cutting bypass shipping channels, resulting in two shipping channels of the same depth to allow vessel passing. The Project involves the dredging of seabed material within the Port of Gladstone and the placement of dredged material for beneficial reuse purposes within the Port.



The Project is required to improve the operational and economic efficiency of the Port of Gladstone by reducing vessel incident risk as Port throughput and associated vessel numbers increase, and in particular as the portion of Capesize vessels (large bulk carriers used for both import and export) increases into the future. Improving the tidal constraints for bulk carrier vessel movements allows improved flexibility for vessel passing within the Port.

The improved Port operational efficiencies will enable substantial economic benefits for the region to be realised by enabling future resource and industry growth within the catchment of the Port of Gladstone.

It is important to note that while the Project will facilitate an improvement in the existing and future vessel movement efficiency, and a reduction in the likelihood of vessel incident risk, the duplication of the Gatcombe and Golding Cutting Channels will not have any direct influence on increasing commercial vessel movement numbers within the Port.

## Project proponent

Gladstone Ports Corporation Limited (GPC) is the Project proponent. GPC is a Company Government Owned Corporation under the *Government Owned Corporation Act 1993* (Queensland (Qld)). GPC manages and operates the Ports of Gladstone, Rockhampton and Bundaberg.

The GPC designated proponent contact is:

Mr Craig Walker  
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GPC's core business functions are to manage port infrastructure and cargo handling operations for coal and other products at the three ports, provide and maintain vital shipping channels, and to develop, manage and lease Strategic Port Land. GPC is also directly responsible for road infrastructure, community parklands, pilotage, towage, property, quarantine and waste disposal services for the ports.

GPC directly supports the resources sector by operating the facilities required to export significant quantities of Queensland's resources (e.g. coal, alumina, liquefied natural gas (LNG), etc.) to international markets and by planning and delivering infrastructure to grow the region and the Queensland economy.

Table 1 summarises the relevant recent projects undertaken by GPC within the Gladstone region. GPC is also involved in the development of the East Shores precinct which provides a community parkland/recreation hub. Stage 1A of the project was completed in 2014, and it is anticipated that Stage 1B will be completed in late 2019/early 2020 which will include the delivery of an amphitheatre, waterfront café and a cruise passenger interface for the growing cruise tourism industry.

**Table 1 Relevant Gladstone Ports Corporation projects within the Gladstone region**

Project	Description
Clinton Vessel Interaction Project	The proposed project involves dredging approximately 800,000 cubic metres (m <sup>3</sup> ) to widen the Clinton Channel by approximately 100 metres (m). This will increase the separation distance between passing vessels and vessels berthed at RG Tanna Coal Terminal, reducing the risk of mooring lines being broken and vessels moving off the wharf.  GPC propose to undertake the dredging in 2019.
Western Basin Dredging and Disposal Project	Stage 1A of the project was completed in September 2013 and involved the dredging of 22 million cubic metres (Mm <sup>3</sup> ) of material.  The project has improved Port access by deepening, widening and creating new shipping channels with depths of up to 13m to allow vessels to enter and exit the Western Basin area. The project also included the construction of a reclamation area adjacent to Fisherman's Landing.
Wiggins Island Coal Terminal (WICT)	Stage 1 of the WICT project was completed in 2015. The ultimate approved capacity is 84 million tonnes (Mt) per annum. The project also included dredging of an access channel and swing basin for the coal terminal.



GPC has a good environmental record and a strong commitment to manage, develop and operate the business in a manner which minimises the occurrence of environmental harm or incident and ensures continual improvement in environmental performance. GPC operations are guided by an Environmental Management System (EMS) accredited under AS/NZS ISO 14001:2004 which guides environmental management of day to day operations. The EMS is regularly audited by an independent third party and is certified on a triennial basis to ISO AS/NZS 14001:2004.

## Environmental Impact Statement Process

On 25 September 2012, the Project was declared a 'coordinated project' under the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act) for which an EIS is required to assess the impacts of the Project. Terms of Reference (ToR) for the EIS were released by the Queensland Coordinator-General in November 2012. The Coordinator-General has extended the Project declaration lapse date to 30 September 2019.

On 23 October 2012, the Project was declared a 'controlled action' for which an EIS is required under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act). The Commonwealth EIS Guidelines were released in March 2013 and on 13 December 2016, the Department of the Environment and Energy confirmed that the EIS Guidelines remain applicable to the Project.

The Project EIS has been prepared to address the statutory requirements of both EIS processes. Following submission, the EIS will be considered separately under the two assessment frameworks as follows:

1. Under the Queensland (SDPWO Act) process, the EIS and any additional information requested will be evaluated by the Coordinator-General. The Coordinator-General will then prepare a report evaluating the EIS. Based on the report's conclusion, the Coordinator-General will recommend that the Project either:
  - Proceed, subject to conditions and recommendations designed to ensure the Project's environmental impacts are properly managed; or
  - Be refused, on the grounds that its environmental impacts cannot be adequately addressed.
2. Under the Commonwealth (EPBC Act) process, the information presented in the EIS must be sufficient to allow the Minister to make an informed decision on whether to approve, approve with conditions or not approve the proposed action under Part 9 of the EPBC Act.

Both processes provide for public, stakeholder and Government comment on the EIS, with the finalised EIS taking into account the comments received during the EIS display period.

As part of the Queensland Government assessment of the EIS under the SDPWO Act, GPC is also seeking assessment and draft conditions for the following approvals that will be sought by GPC post-EIS approval:

- Development Permit for a material change of use involving environmentally relevant activity (ERA) 16 (Extractive and Screening Activities) for dredging more than 1,000,000 tonnes (t) of material in one year
- Development Permit for operational works involving the removal, destruction or damage of marine plants (temporary and permanent disturbance)
- Environmental Authority for a prescribed Environmentally Relevant Activity (ERA) (ERA 16)
- Preliminary approval for operational works that are tidal works (undertaken by a port authority) and works within a Coastal Management District (constructing bund walls and placement of dredged material in tidal water)
- Allocation of Quarry Material (Allocation Notice) under the *Coastal Protection and Management Act 1995* (Qld).

# The Project

## Background and need for the Project

The Port of Gladstone is Queensland's largest multi-commodity port, with RG Tanna Coal Terminal being the world's fourth largest coal export terminal (by throughput) in the 2017/18 reporting period. The Port handles the export of mineral resources from Central Queensland, products from local industries, and the import of raw materials from national and international sources.

Since 2010/11, there has been an increase in throughput and vessel numbers utilising the Port of Gladstone with a corresponding increase in the number of Capesize vessels (large bulk carriers).

The predicted growth in tonnage throughput is estimated to be 16Mt in 2030/31, with a rise in total Port throughput from 128Mt in 2018/19 to 136Mt in 2030/31. With industrial expansion and new industries occurring in the Gladstone region, there is the potential for much higher growth in throughput of up to 172Mt by 2030/31.

With respect to vessel numbers, continued strong growth in trade export bulk carrier vessel movements is predicted. Given the high portion of coal and LNG throughput, there is likely to be a corresponding increase in the number of Capesize vessels and LNG tankers utilising the Port. Increasing bulk carrier size was a clear trend at the Port between 2011 and 2018, and a continuation of this trend is predicted.

Increased demand for maritime transport around the world has given rise to a need for better economies of scale using larger vessel sizes. With increasing trading volumes, bulk vessels are also increasing in size. Therefore, for a port to be competitive in the international market it must be able to provide deeper access channels for these larger vessels and ensure vessel safety so that improved economic efficiencies can be realised.

Vessel capacity at the Port of Gladstone, however, is constrained by the existing depth of the Gatcombe and Golding Cutting bypass channels; the under-keel clearance requirements for deep draft vessels; and vessel follow-on times required to ensure safe operation within the harbour. Consequently, the number of Capesize vessels it can accommodate is limited.

The Project is needed to improve Port of Gladstone operational and economical efficiencies, and reduce existing and increasing vessel incident risk as the Port throughput and associated vessel numbers increase, and the portion of predicted Capesize vessels (import and export) also increases.

Improving the tidal constraints for bulk carrier vessel movements will also allow improved flexibility for vessel passing within the Port. The improved Port operational efficiencies will enable substantial economic benefits for the region to be realised by enabling future resource and industry growth within the catchment of the Port of Gladstone.

The Project is consistent with the National Ports Strategy and the Master Plan for the priority Port of Gladstone 2018 as it addresses the primary objective of improving the efficiency and safety of port vessel movements.

The consequence of not proceeding with the Project (i.e. without the duplication of the Gatcombe and Golding Cutting Channels) is that there will continue to be existing vessel incident risk which has a direct impact on the safety of commercial vessel movements within the Port of Gladstone. The future growth in Port vessel movements, including Capesize (import and export) vessels, will further increase this vessel incident risk, and increase Port traffic congestion and delays, and significantly limit the Port's shipping capacity.

It is important to note that while the Project will facilitate an improvement in the existing and future vessel movement efficiency, and a reduction in the likelihood of vessel incident risk, the duplication of the Gatcombe and Golding Cutting Channels will not have any direct influence on increasing vessel movement numbers within the Port.

## Alternative options

The alternative options assessment for the Project has focussed on options for beneficial reuse of dredged material. A Dredged Material Placement Options Investigation (DMPOI) was undertaken between 2013 and early 2015 for the Project. During 2015 and 2016, significant legislative changes occurred in Commonwealth and Queensland Government policy and environmental regulation which directly impacted on the availability of feasible Project options. These were:

- Release of the Reef 2050 Long-Term Sustainability Plan (Reef 2050) which presented a plan to action protecting the Outstanding Universal Value of the Great Barrier Reef World Heritage Area (GBRWHA)
- Enactment of the *Sustainable Ports Development Act 2015* (Qld) (Ports Act) which introduced prohibitions on capital dredging and capital dredged material placement, restrictions on port development and the requirement for priority port master planning
- Amendments to the *Great Barrier Reef Marine Park Regulations 1983* (Cth) which introduced prohibitions and limitations on the sea-based placement of capital dredged material within the Great Barrier Reef Marine Park (GBRMP).

As a result of these policy and legislative changes, the findings of the DMPOI were reviewed and a Supplementary DMPOI was prepared in 2017, 2018, and was updated in 2019. The review resulted in four dredged material placement options progressing into the Supplementary DMPOI multicriteria analysis. The Supplementary DMPOI concluded that the preferred dredged material placement option to take forward into detailed impact assessment stage of the Project EIS was the Western Basin Extension (WBE) reclamation area. The WBE reclamation area was selected on the basis that this site had:

- The lowest potential impacts on environmental values when compared to all other options
- Lower potential impacts to social and cultural heritage values (land use intent, community and recreational activities, amenity and traffic) than most other options
- Lower potential impacts to economic values than most other options.

The Supplementary DMPOI also concluded that a small quantity of Project dredged material could be placed within the existing Western Basin (WB) reclamation area.

## Project components

The Project involves a range of activities, including:

- Construction of the WBE reclamation area bund walls and a barge unloading facility (BUF) adjacent to the existing WB reclamation area prior to dredging commencing
- Initial dredging works of approximately 0.25Mm<sup>3</sup> of seabed material (including dredging tolerance) to establish a 2.3 kilometre (km) long barge access channel to a depth of -7m lowest astronomical tide to allow barges to transport dredged material from the Gatcombe and Golding Cutting bypass shipping channels to the BUF adjacent to the existing WB reclamation area
- Dredging approximately 12.6Mm<sup>3</sup> of seabed material (including dredging tolerance) to deepen the existing Gatcombe and Golding Cutting bypass shipping channels. The preferred dredging methodology involves utilising a trailing suction hopper dredger (TSHD) which loads the dredged material from the Gatcombe and Golding Cutting shipping channels into barges (four barges will be working in cycles for the entire dredging operation) which will transport the material to the BUF adjacent to the existing WB reclamation area to be unloaded using large excavators into trucks for beneficial reuse within the existing WB and WBE reclamation areas. The proposed duplicate channels will be approximately 15km long and dredging is proposed to be undertaken to an ultimate depth of -16.1m lowest astronomical tide, with a channel width (toe to toe) of 200m.
- Dredged material placement for beneficial reuse within the WB and WBE reclamation areas

- Provision of supporting services to the Project activities
- Removal, relocation and installation of new navigational aids
- Demobilisation of dredging operation
- Project maintenance phase activities, including:
  - Reclaimed land surface stabilisation and maintenance activities on the reclamation areas
  - Final land uses on reclaimed land (i.e. stormwater ponds, port and port-related industry with three to four wharves attached to the northern reclamation area)
  - Maritime operation within duplicated channels
  - Maintenance dredging within the duplicated channels.

It is important to note that the WBE reclamation area has the potential to be utilised as the preferred dredged material placement location for other Port capital dredging projects subject to obtaining the relevant Commonwealth and State Government approvals.

Two dredging campaign options are proposed however, should the growth in Port trade justify the need for the ultimate design channel depth earlier, the two stages will be combined into a singular campaign. As the dredging methodology is the same for both options, the initial dredging works will be required prior to either Stage 1 dredging or prior to the singular campaign. The likely volumes and timing of each dredging stage are shown in Table 2.

**Table 2 Dredging campaign and staging options, location and volumes**

Stage	Location	Timeframe – likely start date or later (duration)	Design depth (m LAT)	Volume (Mm <sup>3</sup> ) <sup>1</sup>
Initial dredging works	Barge access channel	2023 (6.5 weeks)	-7.0	0.25
1	Gatcombe and Golding Cutting Channels	2023 or later (33 weeks)	-13.5	7.25
2	Gatcombe and Golding Cutting Channels	2026 or later (25 weeks)	-16.1	5.35 <sup>2</sup>
Singular campaign	Initial dredging works and Gatcombe and Golding Cutting Channels	2023 or later (64.5 weeks)	As above	12.85

**Table notes:**

- 1 Includes 0.3m (depth) allowance for average dredging tolerance
- 2 The Stage 2 dredged material volume assumes that the barge access channel is maintained at their Project design depths as part of the Port-wide maintenance dredging

The WBE reclamation area will consist of two areas (northern and southern) connected by a bridge or series of culverts. The rock material for the construction of the reclamation area bund walls and BUF is likely to be sourced from existing local quarries in the Targinnie/Yarwun area and will be transported to the WBE reclamation area and BUF by truck via the public road network. The construction of the reclamation area bund walls and BUF will commence three years prior to the commencement of dredging.

The workforce required for the establishment and delivery of the Project will involve 382 people with 20 involved in reclamation bund wall and BUF construction, 356 (over two shifts) involved in dredging and dredged material placement, and 10 involved in navigational aid works. The post dredging workforce for stabilisation and maintenance activities on the WB and WBE reclamation areas will involve 23 people, including 15 involved in annual maintenance dredging.

The hours of operation of the main Project activities will be 6.30am to 6.30pm Monday to Saturday for reclamation bund wall and BUF construction, navigational aid works and maintenance works on the WB and WBE reclamation areas. All dredging operations will be undertaken on a 24 hours per day, 7 days per week basis during the period of dredging works.

The capital cost of the dredging works (Stages 1 and 2), establishment of the WBE reclamation area and installation of the navigational aids has been estimated at \$760 million.

## Stakeholder and community engagement

GPC has engaged with a wide range of stakeholders and community members during the preparation of the EIS. Considering the key Project components, engagement has focused on people and groups who have the greatest potential to be impacted by the dredging activities. The views of the broader community have also been taken into consideration during the preparation of the EIS through wider community engagement activities and the monitoring of public opinion.

## Existing environment

The Port is located on the Capricorn Coast of Central Queensland, approximately 525km north of Brisbane. The outer Port limits extend east of Port Curtis, past the adjoining Curtis and Facing Islands. The southern Port limits extend to the northern tip of Hummock Hill Island, near Tannum Sands, and the northern Port limit is located within the upper sections of an estuarine passage known as The Narrows.

Key infrastructure within the Port includes Port Central wharves, RG Tanna Coal Terminal, WICT, Fisherman's Landing wharves, the Curtis Island LNG Precinct, and reclamation areas that support industrial development.

The Port is located within the GBRWHA, with the outer limits within the GBRMP. The southern limits of the Port extend to the Rodds Bay Dugong Protection Area and Fish Habitat Areas (FHAs) are located at Rodds Bay, Colosseum Inlet and De-ral-li (Calliope River). There are also wetlands listed in the Directory of Important Wetlands in Australia and Queensland high ecological significance wetlands within the Port.

The existing environment of the Port and surrounds includes a variety of marine, coastal and terrestrial habitats, with marine and island habitats located within the GBRWHA. The main coastal area of the Port is described as a shallow, semi-enclosed estuarine system, with the Calliope River entering Port Curtis at Gladstone.

The WBE reclamation area is located to the north of Fisherman's Landing and adjacent to the Gladstone State Development Area with the nearest residential community some 4km away. Gatcombe Head is a small settlement located on the southern tip of Facing Island near Facing Island Reef, located approximately 1km east of the Gatcombe Channel. This is the closest residential community to the Project activities (i.e. dredging and the installation of navigational aids). Boyne Island and Tannum Sands are two large waterfront residential communities on the mainland, located approximately 4.8km to the west of the Golding Cutting Channel.

A detailed description of each aspect of the existing environment is provided in the EIS chapters.

## Environmental Impact Statement Project assessment and findings

The EIS assessment for each environmental aspect has been undertaken in accordance with the requirements outlined in the EIS ToR and the EIS Guidelines. The EIS has applied an impact assessment methodology that is appropriate for each environmental, social, cultural heritage and economic aspect, including an appropriate compliance, risk or significance assessment. Impact assessment has been undertaken for the Project activities over both direct and indirect impact areas where relevant. A summary of the findings of each environmental aspect assessment undertaken for the EIS is provided below.



## Land use and tenure

The Project impact areas are located predominantly on Unallocated State Land (USL), however, the existing WB reclamation area, along with a portion of the BUF and WBE reclamation area associated with the southern reclamation area is located on State leasehold land.

Land tenure approval processes to establish tenure over those portions of USL that will be raised above the high-water mark resulting from the reclamation works and BUF construction will be required. GPC will also apply for a lease over the reclaimed land and BUF in advance of applying for ownership in freehold. Consideration of Native Title matters under the existing Indigenous Land Use Agreement will be undertaken as part of seeking tenure over the WBE reclamation area and BUF.

The Project impact areas are subject to a range of relevant land use planning instruments, including the State Planning Policy, Central Queensland Regional Plan, Master Plan for the priority Port of Gladstone 2018 and the GPC Land Use Plan 2012. The Project will be consistent with the interests of the State, as well as the land use intent of the region, locality and impact sites under each of these relevant planning instruments.

## Visual amenity

Industrial and port-related development is a major feature of the visual landscape of Gladstone. Recent industrial development, including the Fisherman's Landing and WB reclamation areas, Curtis Island LNG plants and WICT have significantly influenced the industrial character of the landscape. Dredging vessels and ships of larger size are a common visual aspect of the Port landscape.

An assessment of the Project's potential impacts on the GBRWHA visual aesthetic values concluded that the establishment of the WBE reclamation area and BUF would impact on the visual aesthetic values of a small portion of the GBRWHA within the Port of Gladstone. This needs to be considered in the context of the existing industrial character of the Port, which consequently lowers the magnitude of the change when compared to the introduction of the Project into a pristine landscape setting. The broader visual aesthetic values of the GBRWHA will be maintained beyond the Port limits.

The potential for adverse visual amenity impacts are primarily associated with the creation of the WBE reclamation area and BUF, where a permanent change to the visual landscape and amenity will occur, over short distance views from Yarwun, Friend Point, The Narrows and the Port near the existing WB reclamation area.

The WBE reclamation area will create new Port land generating a permanent visual change for which there are limited mitigation opportunities. The use of locally endemic and native grass species to stabilise the final Project landform will assist with the WBE reclamation area's integration into the existing landscape as much as possible, particularly when seen from a distance.

The changes to the landscape from the Project are consistent with the character of the existing industrial dominant landscape of the Port of Gladstone and the visual amenity impacts of the Project are assessed as being of moderate significance and acceptable.

## Topography, geology and soils

The geology of the areas to be dredged is mapped as the Curtis Island Group (the Wandilla Formation and the Shoalwater Formation). The Project geotechnical investigation determined that the dredged material in the Gatcombe Channel is medium dense sand and gravel; in the Golding Cutting Channel is medium to high plasticity, stiff to very stiff cohesive material with pockets of low strength cohesive material and a layer of medium dense sand; while in the barge access channel the material to be dredged is very soft to soft silty clays.

The acid sulfate soils (ASS) investigations identified potential acid sulfate soils (PASS) within the material to be dredged and at the WBE reclamation area. However, the acid neutralising capacity of the material to be dredged was substantially higher than the net acidity of the sediments and as such, self-neutralisation is likely to occur. The sediments at the WBE reclamation area also contain a high level of acid neutralising capacity.

There is potential for impacts related to oxidation of PASS material and subsequent increase in acidity and migration of metals/metalloids into the marine water. An ASS Management Plan (incorporated into the Project Environmental Management Plan (EMP), Dredging EMP and to be further developed in the contractors' EMPs) will be implemented during all phases of the Project to manage PASS impacts and risks. With these measures effectively implemented, the residual PASS impacts and risks to human health and environmental values from Project activities are assessed as being low to medium and acceptable.

During the WB and WBE reclamation area activities land contamination has the potential to occur from the storage and use of oils, fuels, chemicals and hazardous materials for the operation of machinery, vehicles and other equipment. Mitigation of the potential effects from any spills or leaks will include plant maintenance, availability of spill kits and appropriate training in the use of spill kits. The residual impacts from land contamination and risks to human health and environmental values from Project activities are assessed as being low and acceptable.

## **Sediment quality**

The Project geochemical investigations demonstrated that the dredged material within the Gatcombe and Golding Cutting bypass shipping channels and barge access channel are clean in accordance with National Assessment Guidelines for Dredging (NAGD) and chemically suitable for placement within a reclamation area. In addition, sediment results from the WBE reclamation area also show clean material in accordance with NAGD and the area is chemically suitable to receive the dredged material. The dredged material is suitable for a future port-related industrial land use.

There is potential for minor impacts related to the resuspension of sediment and mobilisation of contaminants during reclamation area bund wall and BUF construction, dredging activities, unloading and placement of dredged material. A range of mitigation measures will be implemented to manage potential impacts from sediment quality and are incorporated into the Project EMP and Dredging EMP. With these measures effectively implemented, the residual sediment quality risks to human health and environmental values from Project activities are assessed as being low and acceptable.

## **Coastal processes and hydrodynamics**

The permanent changes to coastal processes and hydrodynamics associated with the Project will be small in magnitude and the associated risks have been determined to be in the low to medium hazard risk categories. Due to the certain and unavoidable nature of the changes to bathymetry and geometry, specific mitigation measures to deal with coastal processes and hydrodynamic impacts are not proposed. As the potential impacts identified are negligible to low in consequence, the impacts are acceptable.

The most significant changes will occur in the immediate vicinity of the WBE reclamation area. Further coastal processes and hydrodynamic modelling of the WBE reclamation area bund wall and construction sequences will be undertaken during the detailed design phase of the Project, and a monitoring program will be implemented to manage any observed impacts in the channels and along the shoreline adjacent to the new reclamation area.

## Water quality

Water quality conditions within Port Curtis are strongly correlated with the tidal state and associated bedload resuspension. The Port has naturally high turbidity during large spring tides, which generate strong tidal currents eroding and resuspending fine sediments. Water quality is also heavily influenced by weather extremes, particularly turbidity and conductivity when turbid freshwater from the Calliope and Boyne Rivers enters Port Curtis.

The main impacts from the Project are increased turbidity and sedimentation from dredging, and the potential release of contaminants. These changes to water quality conditions have the potential to result in impacts to sensitive ecological receptors such as seagrass meadows, coral reef communities, marine flora and fauna as well as other environmental and recreational values.

The Project coastal processes and hydrodynamic modelling results indicate that water level impacts will be negligible. Velocity impacts will be significant in channels adjacent to the WBE reclamation area, but small in the vicinity of the deepened shipping channels. Wave climate impacts will be limited to the immediate vicinity of the WBE reclamation area. Sedimentation impacts will be most significant adjacent to the WBE reclamation area, but there will also be a slight increase in overall annual maintenance dredging requirements. The deepening of the shipping channels is not likely to cause any change to the projected impacts of climate change and sea level rise in the Project impact areas.

The modelling was used to simulate the full dredging program and the expected impacts to the turbidity percentiles and deposition rates due to dredging were assessed. The model indicates that increases to the turbidity and deposition rate statistics are expected near the WBE reclamation area and in the vicinity of the TSHD operating in the Gatcombe and Golding Cutting Channels.

The low levels of potential contaminants within the dredged material is unlikely to pose any significant risk to water quality and the receiving environment. Other potential impacts include localised turbidity associated with reclamation area bund wall and BUF construction, and the installation and removal of navigational aids.

To mitigate potential water quality impacts, a range of mitigation measures in conjunction with the Project EMP, the Dredging EMP and the ASS Management Plan will be implemented to minimise sediment loads from the Project dredging activities and the establishment of the WBE reclamation area.

Implementation of the mitigation measures will result in the water quality risks to human health and environmental values being assessed as low to medium and acceptable.

## Nature conservation

### Terrestrial and intertidal flora

The establishment of the WBE reclamation area and BUF will not result in the direct and permanent loss of Coastal Saltmarsh Threatened Ecological Community, mangrove communities and terrestrial vegetation communities. Proposed works associated with the dredging activities, the removal and installation of navigational aids, and stabilisation and maintenance works on the final Project landform will not result in the direct or permanent loss of these flora values.

## **Wetland values**

The construction of the WBE reclamation area and BUF will result in the permanent loss of 278.2ha, or 0.89% of the mapped Port Curtis Directory of Important Wetlands in Australia wetland area and the permanent loss of 48.62ha, or 0.16% of the mapped Queensland high ecological significance wetlands within Port Curtis. Potential indirect impacts from Project activities may occur adjacent to the WBE reclamation area and BUF during construction, including short term declines in water quality, and the potential for accidental release of contaminants and waste/debris into the marine environment. However, these impacts are expected to be contained in extent and are not expected to result in significant impacts on wetland values within Port Curtis.

## **Seagrass**

The most notable potential impact to seagrass meadows from the Project is the direct and permanent loss of seagrass meadows as a result of the WBE reclamation area (i.e. 156.41ha of coastal seagrass habitat as per the 2017 surveys). This loss of seagrass represents approximately 4.85% of the total area of coastal seagrass recorded in Port Curtis in the 2017 survey.

During dredging activities, a short term decline in water quality is expected to occur in the form of increased turbidity caused by sediment resuspension predominantly concentrated in and around the areas to be dredged and the WBE reclamation area. Increased turbidity has the potential to impact seagrass meadows through temporarily decreasing benthic light conditions and smothering through sediment deposition. Hydrodynamic modelling and the implementation of adaptive management measures within the Dredging EMP predicts dredging activities will not result in a wide-reaching zone of high impact. It is therefore unlikely that dredging activities will have long term impacts on seagrass meadows as a result of turbidity and sedimentation impacts.

## **Reef communities**

The establishment of the WBE reclamation area and BUF will not result in the loss of known reef communities. There are no reef communities known from the WB zone, and therefore there are no expected impacts on reef communities as a result of the establishment of the WBE reclamation area and BUF. There is the potential for short term declines in water quality to impact on reef communities during Project activities, however these impacts are not expected to be significant.

## **Fish and other marine reptiles**

Port Curtis is important in terms of its commercial and recreational fisheries, and contains ecologically important fisheries habitats, including the declared FHAs located at Colosseum Inlet, Rodds Harbour, and the upper reaches of the Calliope Creek. In addition, areas of significant inshore fish and other marine reptile habitat in the form of seagrass meadows, mangrove communities, estuaries and coral reef communities are present within the Port.

The FHAs are not located in the Project direct impact areas, and are not expected to be significantly impacted as a result of the Project activities. The nearest FHA to the Project impact areas is the Dē-rāl-lī (Calliope River) FHA which is situated approximately 15km to the east of the area to be dredged for the barge access channel.

Whilst the direct loss of inshore habitat from the establishment of the WBE reclamation area and BUF has the potential to impact on fisheries and other marine reptile values, due to the extent of other Port Curtis seagrass meadows, mangrove communities and other inshore areas identified as having fisheries importance, this Project direct loss of inshore habitat will not result in any significant impacts on Port Curtis fish, other marine reptiles and fisheries values.



## **Soft sediment habitats and benthic macroinvertebrates**

The soft sediment habitats and benthic macroinvertebrate communities of Port Curtis are not considered to be unique or rare to the region, and are considered representative of those present in similar environments across Queensland.

Project direct disturbance areas will result in the permanent loss of soft sediment habitat and benthic macroinvertebrate assemblages. Dredging activities will result in a temporary loss and mobilisation of benthic macroinvertebrates from within the dredging footprint, with benthic macroinvertebrates anticipated to recolonise the deepened channel footprint.

## **Migratory shorebirds**

The WBE reclamation area will result in permanent loss of approximately 275.37ha of migratory potential shorebird foraging habitat (99.74% of the direct disturbance area). The habitat within the WBE reclamation area is foraging habitat in close proximity to a number of important roosting habitats for migratory shorebird species, and is therefore likely important foraging habitat for birds utilising these roosts.

Loss of foraging habitat due to establishment of the WBE reclamation area has the potential to impact on migratory shorebirds via the potential to cause disruption to roosting and foraging behaviour. As a result, adverse impacts on the survival of migratory shorebirds and their breeding success may potentially occur if shorebirds are unable to find suitable alternative foraging sites within close proximity to current suitable roosting sites.

During the establishment of the WBE reclamation area bund wall and BUF, and dredged material unloading and placement, migratory shorebirds have the potential to be disturbed (e.g. noise, dust and vehicle movements). Potential noise impacts have the potential to cause alert responses and sometimes an alarm or flight reaction in shorebirds. It is likely that shorebirds will avoid areas of vehicle movements.

## **Intertidal and terrestrial fauna**

The establishment of the WBE reclamation area and BUF will not involve the direct and permanent loss of intertidal or terrestrial vegetation. The establishment of the WBE reclamation area, including the placement of dredged material, will result in the permanent loss of exposed mudflats and benthic habitats which provide foraging habitat for resident shorebird species and intertidal fauna species.

The new navigational aids and the areas to be dredged are located offshore and these activities will not result in the direct and permanent loss of intertidal or terrestrial habitats.

## **Marine turtles**

The most notable potential impact to marine turtles from the Project is the direct and permanent loss of coastal seagrass habitat as a result of the WBE reclamation area.

Short term declines in water quality generated by dredging activities and increased turbidity have the potential to impact on important Green turtle habitat at seagrass meadows through temporarily decreasing benthic light conditions and smothering through sediment deposition. These potential impacts to water quality are short term and will not significantly impact the availability of seagrass habitat for marine turtles.

Underwater noise impacts from navigational aid impact piling activity is expected to have the largest impact on marine turtles with a single strike having potential to cause mortal injury within 35m from piling location, avoidance of source at up to 600m and behavioural changes exhibited within 2km from piling location. Measures incorporated into Project EMP to reduce these impacts include avoidance during sensitive breeding/nesting periods and establishing an exclusion/safety zone around the perimeter of the navigational aids impact piling with visual monitoring, soft start, stand-by and shut-down procedures in the event of turtles being within the impact zone.

The Project will not result in direct impacts on marine turtle nesting beaches within the Port Curtis. The disruption of nesting and hatchling activity through increases in artificial lighting are unlikely given the location of Project activities and the low levels of light to be produced, particularly when compared to the artificial light generated by the surrounding industries of Port Curtis.

## **Marine mammals**

The most notable potential impact to marine mammals from the Project is the direct and permanent loss of coastal seagrass habitat as a result of the establishment of the WBE reclamation area.

Short term declines in water quality generated by dredging activities and increased turbidity have the potential to impact on dugong and inshore dolphin habitat at seagrass meadows through temporarily decreasing benthic light conditions and smothering through sediment deposition. Hydrodynamic modelling predicts that dredging activities and associated dredged material transfer and the licenced dewatering discharge from the WB and WBE reclamation area will not result in a wide-reaching zone of high impact.

The establishment of the WBE reclamation area, BUF (including vibratory sheet piling) and dredging activities associated with the Project are not expected to result in any significant adverse noise impacts on marine mammal species due to the low levels of noise emissions being emitted. Behavioural changes may occur in marine mammal species in response to underwater noise generated by the Project, however it is unlikely that temporary or permanent hearing trauma to marine mammals will result from these activities.

The installation of navigational aids has the potential to result in mortal injuries to dugong within a 160m radius of impact piling activities and potential behavioural displacement responses by dugong have the potential to occur within a 2km radius of the activity. The zone of impact for potential behavioural changes are predicted to be up to 3.4km from piling locations. Measures incorporated into Project EMP to reduce these impacts include avoidance during sensitive breeding/nesting periods and establishing an exclusion/safety zone around the perimeter of the navigational aids impact piling with visual monitoring, soft start, stand-by and shut-down procedures in the event of marine mammals being within the impact zone.

## **World Heritage values**

The outstanding universal value (OUV) of the GBRWHA that have the potential to be impacted by the Project at the local level (i.e. local expression of OUV) include marine water quality, dugong, seagrass meadows, shorebirds and migratory birds. Of these locally expressed values, only the local expression of shorebirds and migratory birds contributes significantly to the overall OUV of the GBRWHA.

The Project has the potential to impact on the local expression of the OUV attributes within the Port of Gladstone, however it is not likely that these impacts will result in the loss of the local expression of the value, or the value overall.

The Project will not result in the loss of one or more World Heritage and National Heritage values, and these values will not be notably altered, modified, obscured or diminished by Project activities.

## Significant residual adverse impact assessments

The EIS significant residual adverse impact assessments have concluded that the establishment of the WBE reclamation area is the only Project activity that will result in a significant residual adverse impact on:

- Migratory shorebird foraging habitat, including for threatened migratory shorebirds (direct loss of 275.37ha) (matters of national environmental significance (MNES) and matters of state environmental significance (MSES))
- Seagrass (direct loss of 156.41ha) and associated dugong habitat (MSES)
- HES wetlands (direct loss of 48.62ha) (MSES)
- Beach stone curlew (resident shorebird) foraging habitat (direct loss of 275.37ha) (MSES).

A Project offset framework has been developed for the EIS, and a more detailed Project offset strategy and delivery plan will be developed and implemented by GPC to mitigate the above significant residual adverse impacts on ecological values.

## Water resources

The Project activities will occur in tidal waters and therefore the likelihood of impacts on fresh water resources from these activities is predicted to be remote.

Assessment of potential impact from the Project activities associated with the WB and WBE reclamation areas and BUF have concluded that there will be no direct impact on fresh water resources upstream of the WB and WBE reclamation areas.

Groundwater resources may be impacted by Project activities associated with the WB and WBE reclamation areas and BUF. The quality of the groundwater along the existing shoreline is brackish to saline and unsuitable for drinking, stock watering and irrigation. The potential impacts related to the groundwater resources during the construction and maintenance phases include potential spillage associated with the storage and use of oils, fuels, chemicals and hazardous materials for the operation of machinery, vehicles and other equipment as well as potential contamination from ASS disturbance.

Due to the location of the Project activities within the marine coastal area as well as the effective implementation of a suite mitigation measures through the Project EMP, the Dredging EMP and the ASS Management Plan, the impact on groundwater resources is assessed as low.

## Climate change

The climate change assessment has quantified future climate conditions with respect to established baseline conditions. Climate change was determined by comparing outputs from global and regional models, as well as projections with established baselines for the period relevant to the Project. A more localised assessment for Gladstone was conducted using the Commonwealth Scientific and Industrial Research Organisation online tool Climate Change in Australia. Sea level rise, rainfall and temperature were identified as the critical variables likely to be affected by climate change and, hence, these parameters formed the basis of the assessment.

The assessment's model predictions concluded that average as well as seasonal rainfall is likely to decrease throughout the year with a minor decrease in the frequency of extreme rainfall events, however, the intensity of extreme rainfall events is projected to increase. Temperature is likely to increase throughout the year and based on the most representative model, seasonal temperature is likely to increase by approximately 1°C by 2030 and 3.7°C by 2090. Current sea level projections show an increase of 0.14m by 2030 and 0.78m by 2090. Sea water is also predicted to be slightly more acidic in the future. The rise in sea level is also expected to exacerbate storm tides and wave height.

The short term potential impacts of climate change on the Project, therefore, relate to higher intensity tropical storms or cyclones causing delays to activities or in the worst instance injury or death.

Longer term potential impacts relate to the structural integrity of the WBE reclamation area due to higher temperatures and evaporation rates, lower average rainfall, sea level rise and more intense storm/cyclone systems. More frequent maintenance dredging may be required as a consequence of more intense storm/cyclone systems causing increased sediment loading.

The bund wall preliminary design has allowed for a storm tide and sea level change of +1.88m above the existing highest astronomical tide level at Fisherman's Landing. The potential impacts of climate change, including predicted sea level change and storm tide have been incorporated into the concept design for the Project and further analysis will be undertaken at the detailed design phase, particularly for the WBE reclamation area bund wall and BUF.

## Air quality and greenhouse gas emissions

An assessment of air quality impacts was undertaken to describe the air quality conditions that apply to the Project, as well as to identify emission sources from Project activities and quantify any impacts.

It was predicted that dust emissions associated with the Project will be highest during dredging due to the transport of dredged material from the BUF to the reclamation areas in haul trucks. The assessment concluded that compliance with the relevant air quality objectives can be achieved as follows:

- Predicted ground-level concentrations of particulates, and dust deposition rates are predicted to comply with the relevant air quality objectives at the location of sensitive receptors, provided a 75% control due to watering is achieved to reduce dust emissions due to haulage along the bund walls and other unsealed roads
- Predicted ground-level concentrations of exhaust emissions from the diesel generator are predicted to comply with the relevant air quality objectives at the location of sensitive receptors, provided the exhaust emissions are not wake affected
- Exhaust emissions from the dredging vessels during various modes of operation are also predicted to comply with the relevant air quality objectives at the location of sensitive receptors, provided emissions of nitrogen oxides are in accordance with Tier III limits, and a fuel sulphur content of 0.5% can be achieved
- During dredging, predicted ground-level concentrations of PM<sub>10</sub> are predicted to exceed at some residential locations in Targinnie. Additional management measures such as the use of chemical suppressants on haulage routes could assist in preventing elevated dust concentrations during this stage of the Project.

The greenhouse gas (GHG) emissions from the Project components have also been assessed. It is predicted that GHG emissions under GPC's control would temporarily increase GPC's annual GHG emissions but this overall emissions total would be under the Safeguard Mechanism trigger.

The total GHG emissions associated with the Project are calculated as 262,059t of carbon dioxide equivalent, with all significant GHG emissions assumed to be associated with the Project's construction of which the dredging activities accounted for the majority of emissions (67%). The most practical opportunities for the mitigation of GHG emissions are predominantly fuel efficiency initiatives such as equipment selection and maximising payload weight in dredging operations.

A more accurate estimate of annual GHG will be made during the detailed design phase of the Project, as GHG emissions profiling is dependent on the actual timing of the Project components, including start dates and the actual duration required to complete each component. The impact of the Project on air quality and GHG emissions is predicted to be low and acceptable.



## Noise and vibration

Noise impact assessment for the Project activities has been carried out in respect of terrestrial noise and vibration, and underwater noise impacts on nearby sensitive receptors (e.g. residents, terrestrial fauna and marine species). Baseline noise monitoring has been conducted at locations representative of Project activities for a range of sensitive receptors. The assessment modelled a number of construction and maintenance activity scenarios to determine the potential Project activity noise impacts on the sensitive receptors.

The terrestrial noise and vibration assessment concluded that predicted noise levels for sensitive receptors from the majority of Project activities will be well below the current ambient noise levels due to separation distances. Similarly, with separation distances at least 3.6km from sources of ground vibration and sensitive receptors, vibration impacts are not expected to occur during the Project activities. However, specific noise management measures for the TSHD operations (including the use of pushbusters) and for the piling activities associated with the installation of new navigational aids are required to control potential audible noise levels at the closest sensitive receptors at Facing Island and Boyne Island.

The underwater noise assessment has shown that the short term piling events associated with the installation of the navigational aids are predicted to result in the highest noise impacts on assessed marine fauna species, due to the high piling source noise emissions and the impulsive characteristics of piling noise. Piling noise is predicted to potentially cause injury to marine fauna species if they remain in close proximity to the piling location for sustained periods.

Other activities such as the WBE reclamation area and BUF rock placement, vibratory sheet piling for the BUF construction, dredging and barge noise are unlikely to result in significant adverse underwater noise impacts to assessed marine fauna species, due to their relatively low noise emissions, the non-impulsive characteristics, and relatively higher baseline underwater noise environment within the inner harbour area.

The acoustic monitoring and relevant mitigation measures will be implemented to minimise the installation of navigational aids piling noise impact on assessed marine fauna species.

All construction activities and maintenance activities will be undertaken in accordance with the management measures set out in the Noise and Vibration Management Plan which forms part of the Project EMP and Dredging EMP.

With the effective implementation of the mitigation measures, the impacts of noise and vibration are predicted to be low and acceptable.

## Waste

Project activities will generate a range of waste types, including hydrocarbons, potentially hazardous wastes, sewage/grey water, municipal and office wastes, general building materials, dunnage and quarantine waste and green waste. The generation of waste from Project activities is expected to be minimal due to the dredged material being beneficially reused within the WB and WBE reclamation areas, the construction materials for the bund walls and BUF being sourced from existing local quarries and sheet pile or similar earth retaining structure supplier, and the construction workforce numbers being relatively low.

Potential impacts from uncontrolled waste may include contamination of soil and sediment through leaching, contamination of water, toxicity or injury to marine/intertidal flora and fauna, and degradation of visual amenity. A range of mitigation measures are proposed to manage potential waste impacts from hazardous, regulated and general wastes which have been incorporated into the Project EMP and Dredging EMP. With these measures effectively implemented, the waste risks to human health and environmental values are assessed as being low to medium and acceptable.

## Transport

The dredging activities, changes to navigational aids and the traffic generated from the Project workforce at all locations will generate low levels of additional shipping and traffic movements in the Gladstone region.

The relatively small number of additional vessel movements associated with the Project will have an insignificant impact on existing and likely future vessel movements in the Port, including on both commercial and recreational vessel movements. With all vessels operated in accordance with Port Procedures and under the direction of the Regional Harbour Master, and by appropriately licenced operators, maritime safety in the Port will not be compromised by Project activities.

A slight reduction in navigable waterway within the Port will occur during dredging operations and also following completion of the WBE reclamation area and BUF, however this reduction is insignificant and will not compromise maritime safety or the safe navigation of vessels within the Port.

The most significant transport impacts will occur during the transport of rock material for the construction of the WBE reclamation area bund wall and BUF. These impacts will be of short term duration and would be confined to Guerassimoff Road and Landing Road. The main intersection on the route has adequate capacity to accommodate the heavy vehicle traffic associated with the Project with no road-based infrastructure mitigation required. Temporary speed reduction and variable message signage are proposed to improve road safety along the haulage route during the three-year bund wall construction period.

The transport impacts from the majority of Project activities are predicted to be low with moderate and acceptable impacts predicted for the short term haulage of rock material for bund wall construction associated with the WBE reclamation area and BUF.

## Aboriginal cultural heritage

An assessment of potential direct and indirect impacts on Aboriginal cultural heritage was conducted on behalf of the Port Curtis Coral Coast (PCCC) Native Title claimant group. The assessment involved archaeological and anthropological surveys, and included PCCC and GPC participants.

The PCCC participants expressed that the Project will have direct and indirect impacts on recorded and potential cultural heritage sites, and the natural environment generally as well as potential impacts on cultural activities such as fishing and knowledge transfer within the Port Curtis area. Potential loss of access to Port Curtis for cultural activities such as obtaining food was also raised.

The PCCC participants acknowledged that the WBE reclamation area should not impinge on the coastal fringe and that the existing buffer between the shoreline and proposed development area be maintained.

Due to the majority of Project activities being within tidal waters, the potential for impact on known sites of cultural heritage significance is predicted to be low.

A range of mitigation measures are proposed to manage potential Aboriginal cultural heritage impacts, including monitoring, discovery and consultation measures under the existing Cultural Heritage Protocol established under the Indigenous Land Use Agreement, to which GPC is a signatory.

## Non-Aboriginal cultural heritage

The Project activities have the potential to directly and indirectly impact on items of non-Aboriginal cultural heritage within the vicinity of the Project area. As the majority of the Project activities will be undertaken in tidal waters, both direct and indirect impacts on the nearest listed places/sites of Settlement Point, Targinnie Cemetery and William Wyndhams gravesites and remnant orchard trees is highly unlikely.

The Great Barrier Reef is a listed cultural heritage item that potentially may be impacted by the Project activities. The area's United Nations Educational, Scientific and Cultural Organization and National listings relate to the size and diversity of ecosystems, therefore, the heritage values of the Great Barrier Reef will be protected through Project mitigation measures which aim to protect ecological values within the Project impact areas.

A number of recorded shipwreck sites are located within 5km of the Project activities and have the potential to be indirectly impacted due to potential indirect sediment deposition and/or physical damage from Project activities. All Project activities will adopt the mitigation measures outlined in the Project EMP and Dredging EMP, and with their implementation, these indirect impacts are predicted to be negligible to low.

## Social

Consideration of the Project's potential social impacts was undertaken by way of profiling the existing social environment and the community character and values, as well as reviewing outcomes from the Project engagement process and other technical discipline assessments.

The social impacts are predicted to vary for different groups, mainly correlating to their proximity to the Project impact areas (for landscape character, visual amenity and noise and vibration), and their use of the marine environment (commercial, recreational fishing and tourism). The majority of social impacts (from visual amenity, noise and vibration, and road safety) would be during construction and therefore temporary and short term.

The nearest settlements to the Project are those with the most potential for their way of life and amenity to be adversely affected during construction. Ongoing consultation and communication about Project timeframes, duration and likely impacts of construction works will be important in managing potential social impacts related to negative public perceptions, anxiety, change of outlook and disruption. Workforce requirements for the Project are low and will be mainly sourced from the local area. Consequently, adverse social effects associated with workforce influx such as pressure on services and facilities or community severance will be low to negligible for the Project.

Commercial and recreational fishers, tourism operations and other maritime uses have the potential be impacted by the Project construction activities, particularly if there is a decline in water quality causing a change in the location of fish stocks. All Project activities will adhere to the mitigation measures outlined in the Dredging EMP and Project EMP, and with these in place, the consequences for fishing and the marine environment are expected to be low and therefore, the associated social impacts and risks will also be low and acceptable.

Project dredging of seabed material and permanent beneficial reuse of dredged material within the WB and WBE reclamation areas have the potential to impact Traditional Owner values. Ongoing consultation with Traditional Owners about their values, traditional fishing grounds and potential Project impacts will be integral to further understanding and managing these impacts, in accordance with the Indigenous Land Use Agreement.

Social and community impacts from the Project will be minimised through the implementation of the Social Impact Management Plan.

## Economic

The Project is required to accommodate medium and longer-term future growth in industry and trade in the Gladstone region to ensure that the Port remains competitive in a global market with increasing vessel size. Channel dredging improves accessibility for vessels and increased shipping movements, and reduces the existing and potentially increasing vessel incident risk as Port throughput increases. The Project also increases the prospect of additional berths at the Port to accommodate the predicted estimated future growth in export and import, particularly the highly demanded commodities of coal and Liquefied Natural Gas.

Whilst the existing Port shipping channels have capacity available to meet the current throughput and vessel numbers, the Project is needed to ensure that ongoing sustainable development of the Port and Gladstone region are achieved. This desired outcome is not only the intent of the Project, but numerous national, State and regional government policies, strategies and action plans.

Deciding not to proceed with the Project will restrict future trades and the economic growth contingencies of these Government strategies, and the economic growth of the Gladstone region and State which rely on the Port.

The potential economic impact on the Queensland economy is also substantial, where \$250 million investment will lead to generation of employment of 2,906, income generation of \$287 million and economic growth of more than \$502 million, a contribution of 0.15% to the Gross State Product of Queensland and 10.5% to the Gross Regional Product of Gladstone.

## Hazard and risk

There are three main areas of risk associated with the Project, namely:

- Natural hazards that exist in the Gladstone region and for which established management and response systems or design standards are in place
- Project-specific elements and activities that have required detailed assessment and will require targeted management
- Construction and maintenance risks that would apply to any similar project in the Gladstone area and that are routinely dealt with by GPC and its contractors.

The design, construction and maintenance of the Project are covered by an extensive regulatory and hazard management framework, including health and safety requirements. The management of health and safety risks is an integral part of GPC's core functions which the Project will comply with.

Both the construction and maintenance hazards and risks identified for the Project have a low to medium residual risk rating due to these hazards and risks being well known and already addressed by GPC systems and procedures.

## Cumulative impacts

Cumulative impacts were assessed through the consideration of environmental risk of multiple projects over varying spatial and temporal scales. Using a scoring methodology, the environmental risks from the Project alone and the additive effects of the 'other projects' were analysed. The 'other projects' did not act cumulatively to increase the environmental risk for any potential mode of impact for any of the environmental values, when assessed against the criteria established. Impacts on seagrass and soft bottom benthic habitats through a deterioration in water quality come closest to increasing cumulative risks above those determined from the Project alone.



When the cumulative risk scores from 'other projects' were considered, the distribution of risk across environmental values remained broadly similar to risks for the Project alone. The highest cumulative risk scores from 'other projects' were largely associated with environmental values subject to moderate levels of risk from the Project alone. Shorebirds, which incurred the highest Project risk score, were assessed to be subject to little additional cumulative risk from 'other projects', but were equal to marine turtles as the environmental values with the highest risk score when risks from all projects were considered. Dugongs, dolphins and seagrass had cumulative risk scores that were similar to, but below, those of shorebirds.

Most of the additional risk from 'other projects' arose from the Clinton Vessel Interaction Project and maintenance dredging for the Port of Gladstone. These are the only 'other projects' with activities located within the marine environment, and have the greatest potential for spatial overlap in the areas to be impacted by the Project. However, the Clinton Vessel Interaction Project is likely to be completed several years before the commencement of the Project. Annual maintenance dredging is likely to occur over a similar period as the Project, although the maintenance dredging is episodic, occurring for only four to six weeks of the year.

Results of the cumulative impact assessment indicate that significant cumulative impacts from the Project combined with reasonably foreseeable 'other projects' are unlikely. However, the assessment identified that some environmental values are sensitive to the cumulative impacts of the Project combined with exogenous factors such as episodic climatic events, particularly floods and/or coral bleaching events. These cumulative risks primarily relate to seagrass, benthic habitats, marine turtles and dugongs. The 'other projects' considered in the cumulative impact assessment are unlikely to have significant impacts on non-biological values (i.e. socio-economic values), that will act cumulatively with those of the Project.

Mitigation measures are proposed, to manage the potential for cumulative impacts, should such events occur at the same time as the Project.

## **Environmental protection measures**

The identified impacts and mitigation measures outlined in the EIS inform the environmental protection and management actions contained in the Project EMP and the Dredging EMP. These documents contain the mechanisms for implementation of the Project EIS commitments which aim to ensure the potential environmental impacts of the Project are avoided, mitigated and/or offset.

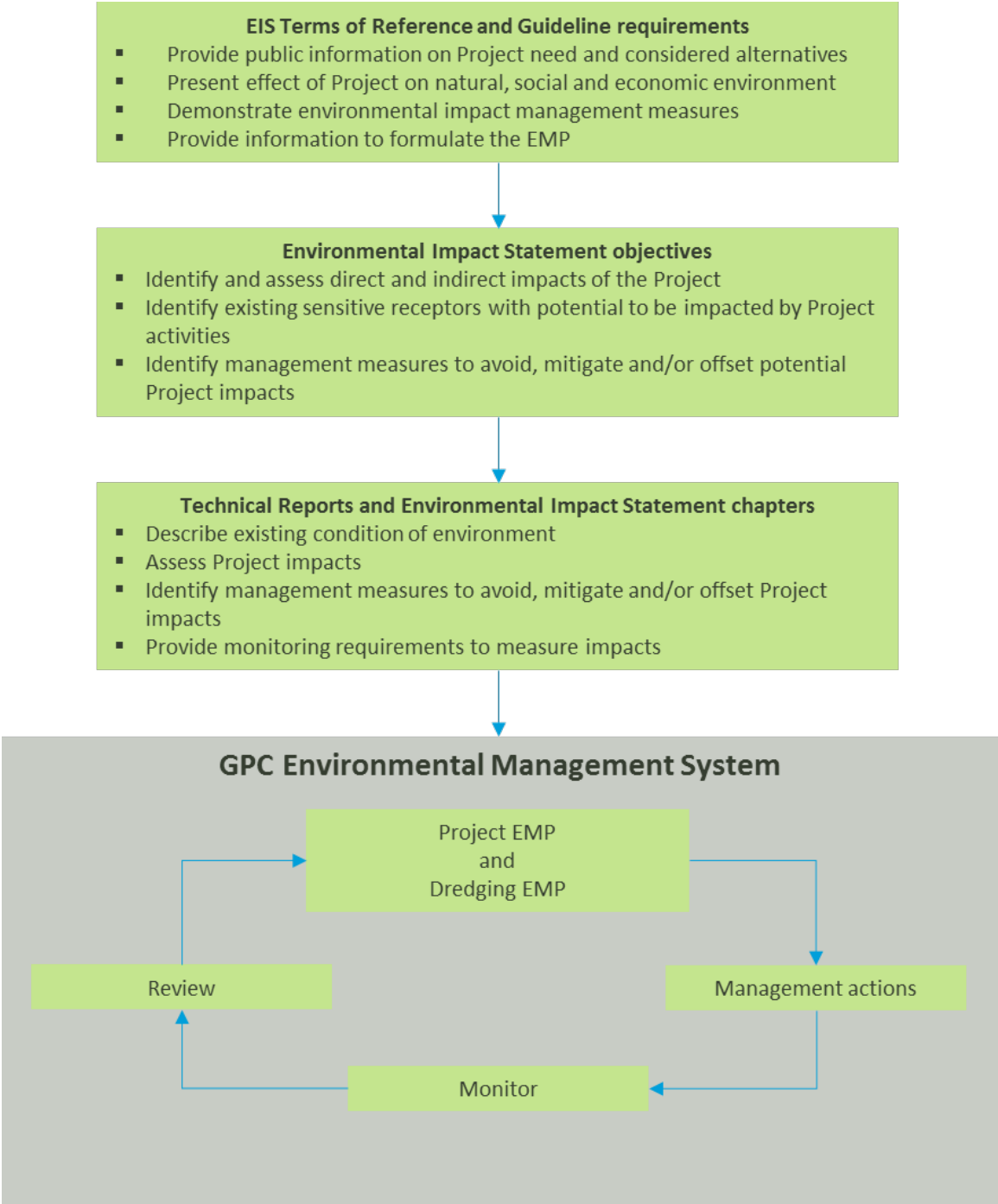
In order to facilitate the effective implementation of these management measures, the Project's activity components have been divided into two categories and two subsequent EMPs. Non-dredging components of the Project have been included under the scope of the Project EMP and components relating to capital dredging activities have been included within the scope of the Dredging EMP.

The environmental management of the quarry operation for the supply of rock material for the construction of the WBE reclamation area and BUF bund walls is not included in the scope of the Project EMP and potential environmental impacts will be managed by the quarry operator.

The Project EMP and Dredging EMP are designed to be working management documents to be implemented during the Project delivery. They provide a structured program for the management of the works for GPC and relevant contractors to follow to best achieve desired environmental outcomes. They aim to ensure that all reasonable and practicable measures will be implemented within an adaptive management framework to prevent and/or minimise the likelihood of environmental harm being caused during the Project activities.

The Project EMP and Dredging EMP will operate within the framework provided by the existing GPC EMS, which is an overarching framework for managing environmental risk at all GPC managed sites. The intent of the EMS is to provide a user-friendly directory which quickly directs the user to the desired area of the EMS for guidance and actions to undertake.

The Project EMP and Dredging EMP sit within the GPC EMS framework. GPC staff and relevant contractors will be directed to follow reporting, incident and record keeping procedures outlined in the EMS, while also following the site specific management actions and monitoring outlined in the Project EMP and Dredging EMP.



### Conclusion

With the effective implementation of the Project EMP and the Dredging EMP within the framework of the GPC EMS, the EIS for the Project has concluded that the majority of environmental impacts from Project activities fall within the significance range of low to moderate and are acceptable in the context of a Port infrastructure project to be carried out within Port limits with the objective of improving the operational and economic efficiency of the Port and reducing vessel incident risk.

The Project is consistent with the objectives of the EPBC Act, including maintaining the protection of MNES. The Project aligns with the core objectives and the guiding principles of Ecologically Sustainable Development and aligns with national, State and regional policies regarding sustainable growth of priority ports, including the National Ports Strategy, Ports Act and priority port planning in response to Reef 2050, and the Port Strategic Plan.

The Project is also consistent with the objectives of the GBRMP Act with no Project activities proposed within the GBRMP and the indirect impacts of the Project having a low residual impact risk within the GBRMP.

The EIS significant residual adverse impact assessments have concluded that the establishment of the WBE reclamation area is the only Project activity that will result in a significant residual adverse impact on:

- Migratory shorebird foraging habitat, including for threatened migratory shorebirds (direct loss of 275.37ha) (MNES and MSES)
- Seagrass (direct loss of 156.41ha) (MSES) and associated dugong habitat (MSES)
- HES wetlands (direct loss of 48.62ha) (MSES)
- Beach stone curlew (resident shorebird) foraging habitat (direct loss of 275.37ha) (MSES).

A Project offset framework has been developed for the EIS, and a more detailed Project offset strategy and delivery plan will be developed and implemented by GPC to mitigate the above significant residual adverse impacts on ecological values.