Port of Gladstone
Gatcombe and Golding Cutting Channel Duplication Project

Environmental Impact Statement

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Appendix B1 Supplementary Dredged Material Placement Option Investigation Study

Port of Gladstone Gatcombe and Golding Cutting Channel Duplication – Environmental Impact Statement

Supplementary Dredged Material Placement Options Investigation Study

Gladstone Ports Corporation

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Acronyms and abbreviations

Abbreviation	Explanation
BUF	barge unloading facility
CG	Coordinator-General
CSD	cutter suction dredger
Cth	Commonwealth
CVIP	Clinton Vessel Interaction Project
DMPA	dredged material placement area
DMPOI	Dredged Material Options Investigation Study (completed in 2013-2015)
DoEE	Department of Environment and Energy
DTMR	Department of Transport and Main Roads
EA	Environmental Authority
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
GBR Coast MP	Great Barrier Reef Coast Marine Park (Queensland)
GBRMP	Great Barrier Reef Marine Park (Commonwealth)
GBRMP Reg	*Great Barrier Reef Marine Park Regulations 1983* (Cth)
GBRWHA	Great Barrier Reef World Heritage Area
GPC	Gladstone Ports Corporation Limited
GSDA	Gladstone State Development Area
ha	hectares
km	kilometres
LNG	Liquified natural gas
LTSDP	long term sediment disposal plan
m^3	cubic metres
MCA	multi-criteria analysis
Mm^3	million cubic metres
MNES	matters of national environmental significance
MSES	matters of state environmental significance
Mtpa	million tonnes per annum
NC Act	*Nature Conservation Act 1992* (Qld)
OUV	outstanding universal value
Ports Act	*Sustainable Ports Development Act 2015* (Qld)
Project	Gatcombe and Golding Cutting Channel Duplication Project
Qld	Queensland
Reef 2050	Reef 2050 Long-Term Sustainability Plan
RGTCT	RG Tanna Coal Terminal
SDPWO Act	*State Development and Public Works Act 1971* (Qld)
Supplementary DMPOI	Supplementary DMPOI (completed in 2017-2018)
TECs	threatened ecological communities

Abbreviation	Explanation
ToR	Terms of Reference
TSHD	trailing suction hopper dredger
WBDDP	Western Basin Dredging and Disposal Project
WICT	Wiggins Island Coal Terminal
WICET Pty Ltd	Wiggins Island Coal Export Terminal Pty Ltd

Glossary

Term	Definition
area to be dredged	The defined area where capital dredging operations are proposed to occur as part of the Gatcombe and Golding Cutting Channel Duplication Project
beneficial reuse of dredged material	Means dredged material that has been used for a purpose that provides social, economic or environmental benefits (or a combination of these)
capital dredging	The undertaking of a campaign of dredging works to establish new or larger channels, berths and swing basins or as part of engineering works
constraint aspects	Ecological/environmental, social, cultural heritage, economic and operational constraints associated with identifying potential dredged material placement locations
maintenance dredging	Dredging undertaking to ensure previously dredged channels, berths, swing basins or other areas are maintained at their designated dimensions to safe and continued maritime access

EXPLANATORY NOTE

January 2019

A Dredged Material Placement Options Investigation (DMPOI) was undertaken between 2013 and early 2015 (referred as the original DMPOI) to support the Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project Environmental Impact Statement (EIS). The outcome of this original DMPOI has been retained as a standalone report in its original form (refer Appendix B2).

During 2015 and 2016, significant legislative changes occurred in Commonwealth and Queensland Government policy and environmental regulation which directly impacted the Gatcombe and Golding Cutting Channel Duplication Project. 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**
- **Enactment of the *Sustainable Ports Development Act 2015* (Qld) 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.**

As a result of these policy and legislative changes, the findings of the original DMPOI were reviewed and a Supplementary DMPOI was prepared in 2017 and 2018 and updated in 2019.

This report presents the methodology and findings of the Supplementary DMPOI, including the legislative review undertaken, the short-listing of dredged material placement options, the consideration of the long term dredged material placement needs within the Port of Gladstone and the findings of the Supplementary DMPOI multi-criteria analysis (MCA) process.

At the conclusion of the Supplementary DMPOI MCA process, a preferred dredged material placement option was identified to take forward into the detailed impact assessment phase of the Gatcombe and Golding Cutting Channel Duplication EIS.

In this regard, this report has been provided in the Gatcombe and Golding Cutting Channel Duplication EIS as the relevant assessment of alternative beneficial reuse dredged material placement options required by the Terms of Reference (ToR) and EIS Guidelines for the Gatcombe and Golding Cutting Channel Duplication EIS.

1 Introduction

1.1 Project background

1.1.1 Overview

Gladstone Ports Corporation Limited (GPC) proposes to undertake the Gatcombe and Golding Cutting Channel Duplication Project (the Project), which involves duplicating the existing Gatcombe and Golding Cutting shipping channels, and the construction and operation of associated port infrastructure within the Port of Gladstone. The Project is required to improve Port of Gladstone operation and economical efficiencies, and improve the existing and future safe passage of vessels within the Port as throughput and associated vessel numbers increase, and the portion of predicted Capesize vessels (export and import) also increases.

The key components of the Project between **2013** and **2015** included:

- Dredging of approximately 12.6 million cubic metres (Mm^3) of seabed material (including dredging tolerance) to permanently duplicate the Gatcombe and Golding Cutting shipping channels
- A new onshore and/or offshore (at sea) dredged material placement area (within Port limits) for the placement of approximately 12.6Mm^3 of dredged material
- Removal, relocation and installation of new navigational aids.

1.1.2 Project status

The Project was declared a 'coordinated project' by the Queensland Coordinator-General (CG) under the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act) on 25 September 2012. The Project was also determined to be a 'controlled action' requiring an Environmental Impact Statement (EIS) by the Commonwealth Minister for the Environment under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) on 23 October 2012.

GPC is currently proceeding with the EIS phase of the Project. The EIS will be submitted for parallel assessment to both the CG under the SDPWO Act and the Commonwealth Environment Minister (Department of Environment and Energy (DoEE)) under the EBPC Act.

1.1.3 Project objectives

The high level framework objectives of the Project are:

- To ensure the existing and future commercial vessels utilising the Port of Gladstone's shipping channels, swing basins and berth pockets minimise shipping delays, risk of incidents and other issues associated with the congestion of the shipping channels within the Port
- To identify dredged material placement option(s) for capital dredged material from the Project that meet regulatory requirements as well as maximising beneficial ecological/environmental, social and cultural heritage and economic outcomes
- To implement the following key steps as part of the project development, design, construction and maintenance phases of the Project, including:
    1. Prevention/avoidance of impacts
    2. Mitigation of potential impacts
    3. Offsets to address significant residual adverse impacts

4. Ongoing adaptive management

- To meet the regulatory requirements that apply to the Project.

1.2 Dredged material placement options investigation

As part of the CG's EIS Terms of Reference (ToR) and Commonwealth Environment Minister's EIS Guidelines issued for the Project, there is a requirement to document the alternatives and site selection processes for any offshore (at sea), land based and/or reclamation dredged material placement options identified for the Project.

Section 5.3.3 of the ToR specifies that the EIS must describe placement options for both capital and maintenance dredged materials, including:

- Justification for the choice of the preferred dredged material placement site(s) based on:
  - Relevant agreements, guidelines and policies
  - Potential ecological impacts
  - Characteristics of the spoil, including contaminants/metals
  - Dredging technology constraints
  - Cost of alternatives.

Section 5.7 of the EIS Guidelines specifies that the EIS must describe, to the extent reasonably practicable, any prudent and feasible alternatives to the proposal. For each alternative listed the proponent should provide the project details, impacts (positive and negative), location, scale, configuration and staging options. Sufficient detail must be provided to make clear why an alternative is preferred to another.

In response to the ToR and EIS Guidelines requirements, a Dredged Material Placement Options Investigation (DMPOI) was undertaken between 2013 and 2015 to support the Project's objectives associated with the identification of potential dredged material placement site option(s) for the 12.6Mm^3 of dredged material from the Project that:

- Complied with regulatory requirements and supported current policy objectives
- Maximised the beneficial ecological environmental, social, cultural heritage and economic outcomes
- Could be considered feasible option(s) to be taken forward into the detailed assessment phase of the EIS to undergo further analysis and impact assessment.

However, in seeking to achieve this primary objective, the following secondary objectives were also sought:

- Support a strategic approach to planning for the long term dredging needs of the Port of Gladstone by considering whether any of the identified placement sites would be more appropriately/efficiently used if prioritised for other future Port dredging requirements (capital and/or maintenance dredging)
- Develop a transparent, robust and repeatable process for how dredged material placement alternatives are considered and preferred options identified for future capital and/or maintenance dredged material for the Port of Gladstone, with a strong emphasis on early and ongoing stakeholder and regulatory agency engagement.

At the commencement of the DMPOI, a total of 16 potential dredged material placement sites were identified for investigation. At the completion of the DMPOI, three potential dredged material placement sites (being two onshore and one offshore (at sea) dredged material placement areas) remained to undergo detailed impact assessment as part of the Project EIS. In 2014, EIS baseline data collection commenced for the Project study area that incorporated the wider Port Curtis area and the three potential dredged material placement sites.

The methodology and findings of the DMPOI were presented in a DMPOI report, which was finalised in February 2015 and issued to the stakeholders and regulatory agencies involved in the DMPOI process. Further detail regarding the methodology and findings of the DMPOI are summarised in Section 2. A copy of the full DMPOI report is contained in Appendix B2 to the Project EIS.

1.3 Supplementary dredged material options investigation

1.3.1 Purpose and need

During 2015 and 2016, after the DMPOI had been completed, significant legislative changes occurred in Commonwealth and State Government policy and environmental regulation which directly impacted the Project. These were:

- Release of the Reef 2050 Long-Term Sustainability Plan (Reef 2050) which presented a plan to action protecting the Outstanding Universal Value (OUV) 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 mandating of master planning for the priority ports of Gladstone, Abbot Point, Townsville, Hay Point and Mackay to 2050
- Amendments to the *Great Barrier Reef Marine Park Regulations 1983* (Cth) (GBRMP Regs) which introduced prohibitions and limitations on the sea-based placement of capital dredged material within the Great Barrier Reef Marine Park (GBRMP).

A detailed summary of these legislative changes and their implications to the Project is provided in Section 3. These policy and legislative changes triggered a review of the findings of the DMPOI and required the completion of a Supplementary DMPOI in 2017 and 2018.

1.3.2 Objectives

Whilst the primary objectives of the Supplementary DMPOI reflect those of the DMPOI, the legislative changes that occurred in 2015 and 2016 (and more specifically, the mandating of the beneficial reuse of port-related capital dredged material) prompted the broadening of the original secondary objective (refer Section 1.2) associated with considering the longer term dredging needs of the Port of Gladstone to include:

- The dredged material placement needs of other future capital dredging projects within the Port of Gladstone
- Potential opportunities for a dredged material placement area to not only provide capacity for the Project, but also have sufficient additional capacity to accommodate dredged material from other future Port of Gladstone dredging projects to 2050 (to align with the priority port master planning timeframe).

1.4 Report purpose

This report has been prepared to present the methodology and findings of the Supplementary DMPOI completed in 2017 and 2018 (Supplementary DMPOI) for the purposes of identifying a preferred dredged material placement area that can be taken forward into the detailed impact assessment phase of the Project EIS.

Whilst it is intended that the Supplementary DMPOI be referred to as the relevant assessment of alternative beneficial reuse dredged material placement options for the Project EIS, this report should be read in conjunction with the original DMPOI (Appendix B2 of the Project EIS) given that both reports operate together to capture the full history of the DMPOI process and address the requirements of the EIS ToR and EIS Guidelines in relation to the assessment of alternative placement options for both capital and maintenance dredged materials.

For clarity, references made throughout this report to the DMPOI refer to the original investigations undertaken in 2013 and 2014, while references to the Supplementary DMPOI refer to the later investigations undertaken in 2017 and 2018.

2 Methodology and findings

2.1 Overview

This section summarises the methodology and findings of the DMPOI, together with the methodology of the Supplementary DMPOI.

2.2 Dredged material placement options investigation

2.2.1 Methodology

In undertaking the DMPOI, a six phase process was adopted which included the following key tasks:

- Phase 1 – Completion of a literature review to gather existing information pertaining to dredging methods, dredged material placement management and potential beneficial reuse options within the local context of the Port of Gladstone
- Phases 2 and 3 – Definition of constraints, opportunities and considerations through the mapping of spatial aspects (including ecological/environmental, social and cultural heritage, economic and operational) within the Gladstone region to assist in defining potential dredged material placement locations
- Phase 4 – Undertaking preliminary site investigations to assess site availability and feasibility for dredged material placement
- Phase 5 – Undertaking of a multi-criteria analysis (MCA) of the potential dredged material placement locations to score and rank each site to support identification of potential/preferred locations
- Phase 6 – Completion of additional investigation to support the further short-listing of potential dredged material placement locations to be taken through to the detailed impact assessment phase of the Project EIS.

Stakeholder and regulatory agency engagement and involvement occurred throughout the DMPOI through a series of workshops (including participation in the MCA process) and the review and comment of findings and reporting.

2.2.2 Findings

At the commencement of the DMPOI, 16 indicative dredged material placement sites were identified for investigation. Each of these original sites is illustrated in Figure 2.1. Following the completion of preliminary investigations, five of the 16 sites were identified as potentially unfeasible due to site operational requirements, inadequate capacity, incompatibility with Project timings and site availability and dredging operational constraints, resulting in 11 sites being progressed to the MCA process. The five sites that were excluded were:

- Targinnie Valley Investigation Area
- Landing Road Investigation Area
- QAL Red Mud Dams
- Tannum Sands North
- Tannum Sands South.

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Kangaroo Island
Western Basin Expansion
Landing Road Investigation Area
Fisherman's Landing Expansion (South)
Targinie Valley
Boat Creek South
Gladstone-Mt Larcom Road South
Port Central Expansion
Facing Island (North)
Facing Island (South)
East Banks DMPA Expansion
West Banks Island Reclamation
East Banks Island Reclamation
QAL Red Mud Dams
Tannum Sands North
Tannum Sands South

Legend

- Dredged Material Placement Options (Indicative Location)
- Great Barrier Reef Marine Park Boundary (Commonwealth)
- Shipping Channels
- Port of Gladstone Port Limits
- Existing GPC Approved East Banks DMPA
- Western Basin Reclamation Area
- Santos GLNG Gas Pipeline
- QGC Gas Pipeline (Indicative Location)

Source:
Aerial: Bing Maps, 2013.
Shipping Channels: GPC, 2013.

Map by: RB \\aurecon.info\shares\AUBNE\Projects\GIS\Projects\237374_GPC_Channel_Duplication_EIS\237374_Placement_Options_v7_Land_Rec_ALL_in_One_001.mxd 02/09/2015 12:42

A1 scale: 1:75,000
0 2 4 6km

Date: 11/02/2015 Version: 4 Job No: 237374
Coordinate system: GDA_1994_MGA_Zone_56

Gatcombe and Golding Cutting Channel Duplication Project

Figure 2.1: Indicative dredged material placement options from the DMPOI

Through the completion of the MCA scoring process, rankings for each of the 11 sites were as follows (in order of most preferred '1' to least preferred '11'):

1. Gladstone Mount Larcom Road (South)
2. East Banks Dredged Material Placement Area (DMPA) Expansion (at sea)
3. Port Central Expansion
4. Boat Creek South
5. East Banks Island Reclamation
6. West Banks Island Reclamation
7. Fisherman's Landing Expansion (South)
8. Western Basin Expansion
9. Kangaroo Island
10. Facing Island (North)
11. Facing Island (South).

At the conclusion of the MCA process, participants agreed to exclude the three lowest ranking sites (Kangaroo Island, Facing Island (North) and Facing Island (South)) as they were considered to be too highly constrained by cultural heritage and ecological aspects, and likely to result in unacceptable potential impacts on the OUV of the GBRWHA. As a result, the following eight sites remained (in order of ranking):

1. Gladstone Mount Larcom Road (South)
2. East Banks DMPA Expansion
3. Port Central Expansion
4. Boat Creek South
5. East Banks Island Reclamation
6. West Banks Island Reclamation
7. Fisherman's Landing Expansion (South)
8. Western Basin Expansion.

As agreed by the MCA participants, additional investigations of the remaining eight options were undertaken. This included completion of:

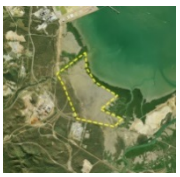
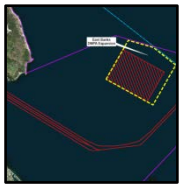
- State government stakeholder discussions (regarding site feasibility/availability)
- Additional hydrodynamic modelling
- Preliminary ecological assessment.

Through a final stakeholder and regulatory agency workshop, the findings of the additional investigations were discussed with respect to the remaining eight sites, with the following three sites being chosen to be taken forward for further assessment as part of the Project EIS:

- Port Central Expansion
- West Banks Island Reclamation
- East Banks DMPA Expansion (at sea).

Table 2.1 provides an excerpt of Table 9.2 of the DMPOI detailing the preferred short-listing of options for further assessment in the Project EIS.

Table 2.1 Excerpt from Table 9.2 of the DMPOI – Preferred short-listing of options

Site option		Short-listing of options for further study in the Project EIS	
		Option not feasible and/or preferred for the Project at the time of this investigation	**Option to proceed to Project EIS**
	Gladstone-Mt Larcom Road (South)	✘ Not considered feasible owing to high level of commitment of the site by the Wiggins Island Coal Terminal (WICT) Project	
	Boat Creek South	✘ Not considered feasible owing to high level of commitment of the site by the Tenement to Terminal Ltd and Arrow Liquefied Natural Gas (LNG) projects	
	East Banks Island Reclamation	✘ Not considered as economically feasible as the West Banks Island Reclamation site due to the cost in establishing access (bridge or tunnel)	
	Western Basin Expansion	✘ Not preferred due to the site being deemed more appropriate to meet long term strategic needs of the Port for use by other dredging projects in the inner harbour (e.g. Western Basin Project Stages 2 to 4)	
	Fisherman's Landing Expansion (South)	✘ Not preferred due to the site being deemed more appropriate to meet long term strategic needs of the Port for use by other dredging projects in the inner harbour (e.g. Western Basin Project Stages 2 to 4)	
	West Banks Island Reclamation		✓ Considered feasible to proceed, however potential impacts to seagrass meadows, hydrodynamic and coastal processes highlighted
	Port Central Expansion		✓ Considered feasible to proceed, however noted that further consideration and assessment be given to design and staging
	East Banks DMPA Expansion (at sea)		✓ Considered feasible to proceed, however concerns with proximity to GBRMP boundary (i.e. setback from boundary needed)

2.3 Supplementary dredged material options investigation

2.3.1 Methodology

The methodology for the Supplementary DMPOI has involved the following key tasks, which have been drawn (where applicable) from aspects of the DMPOI methodology.

- Undertake a review of the 2015 and 2016 legislative changes and identify the relevant implications for the Project
- Undertake additional investigations of the eight short-listed site options that were identified at the end of phase five (DMPOI MCA process) to identify a short-list of placement sites having regard to:
  - Site feasibility considerations, including changes that have occurred in the time since the DMPOI originally identified potential site options
  - The legislative changes, predominantly in relation to the prohibition of at sea placement of capital dredged material and the requirement for beneficial reuse, and a subsequent need to consider future dredged material placement requirements of other dredging projects in the Port of Gladstone
- Complete a Supplementary DMPOI MCA process for the short-listed sites to identify a preferred option to proceed to the detailed impact assessment stage of the Project EIS.

The decision to reconsider the assessment of potential dredged material placement options at the point where the MCA process was completed (phase five) was one that was driven by:

- Recognition of the work that had already been completed up until the end of phase five, including stakeholder and regulatory agency input, together with a decision to not re-open the DMPOI in its entirety (i.e. restart the DMPOI process from the beginning)
- Recognition that the additional investigations undertaken as part of phase six of the DMPOI would be subject to change, having regard to the time that had passed since the DMPOI was completed
- Recognition that the short-listed sites at the end of the MCA process reflected those sites that were identified and agreed to by the MCA process participants (stakeholders and regulatory agency representatives) as being feasible for further assessment
- The need to ensure that an appropriate number and type of potential dredged material placement site options were considered in the Supplementary DMPOI MCA process.

2.3.2 Recap of short listed sites

To reconfirm, the Supplementary DMPOI has considered the following eight potential dredged material placement site options which were identified at the conclusion of phase five of the DMPOI:

- West Banks Island Reclamation
- Port Central Expansion
- East Banks DMPA Expansion (at sea)
- Gladstone Mount Larcom Road (South)
- Boat Creek South
- East Banks Island Reclamation
- Western Basin Expansion
- Fisherman's Landing Expansion (South)

3 Legislative changes

3.1 Overview

This section provides a summary of the significant legislative changes in government policy and environmental regulation that occurred in 2015 and 2016, and the associated implications to the Project.

3.2 Reef 2050 Long-Term Sustainability Plan (Reef 2050)

Released by the Australian and Queensland Governments in March 2015, Reef 2050 presented a plan to action protecting the OUV of the GBRWHA, whilst supporting ecologically sustainable development. The Reef 2050 included the following dredging, dredged material placement and port-related development actions:

- Undertake port master planning for the priority ports of Gladstone, Abbot Point, Townsville and Hay Point/Mackay
- A commitment to limiting port-related capital dredging in the GBRWHA to the four priority ports
- Support for the prohibition of sea-based placement of capital dredged material in the restricted area
- A commitment to establishing a maintenance dredging framework which identifies future dredging and examines opportunities for the beneficial reuse of dredged material or on-land disposal where it is environmentally safe to do so.

In December 2016, the Australian and Queensland Governments released an update to the Reef 2050 Plan, capturing progress made within the first 18 months of the Reef 2050 Plan's 35 year horizon.

Whilst Reef 2050 does not have any direct legislative implications for the Project, any recommendations from Reef 2050 that are implemented through legislative or policy mechanisms relevant to dredging (capital and maintenance), dredged material placement and/or port development have the potential to be relevant to the Project. Key legislative changes that have occurred to date that are relevant to the Project are detailed in the sections below.

3.3 Great Barrier Reef Marine Park Regulations 1983

The GBRMP Reg prescribes limitations on the granting of permission for 'prohibited dumping', prohibiting the sea-based placement of an amount of capital dredged material that prior to its excavation was, in situ, greater than 15,000 cubic metres (m^3) in volume anywhere within the GBRMP.

3.4 Sustainable Ports Development Act 2015

The Ports Act introduced a legislative framework for the protection of the GBRWHA through managing port-related development in and adjacent to the area. The Ports Act gives legislative effect to the Queensland Government's key port-related commitments in Reef 2050. As a result of its enactment, the Ports Act:

- Prohibits capital dredging for the development of new, or the expansion of, existing port facilities within the GBRWHA outside the four identified priority ports of Gladstone, Abbot Point, Townsville and Hay Point/Mackay. The Ports Act defines a 'master planned area' as being an area 'identified in a master plan for the port as the master planned area and approved by regulation'

- Restricts new port development in and adjoining the GBRWHA to within current port limits and outside both the Commonwealth GBRMP and Queensland Great Barrier Reef Coast Marine Park (GBR Coast MP)
- Prohibits the sea-based placement of port-related capital dredged material within the 'restricted area' (which includes any area within the GBRWHA, including within port limits but outside the GBRMP) unless the material is beneficially reused
- Mandates the requirement to prepare master plans and port overlays for the four identified priority ports of Gladstone, Abbot Point, Townsville and Hay Point/Mackay.

3.5 Relevance to the Project and DMPOI

The legislative changes under the GBRMP Regs and Ports Act have the following implications for the Project and the Supplementary DMPOI:

- Capital dredging must not be undertaken within the priority Port of Gladstone unless it is carried out for the purposes of establishing, constructing or improving a port facility within the priority Port of Gladstone master planned area
- Capital dredging for the purpose of establishing, constructing or improving a port facility within the priority Port of Gladstone master planned area cannot occur until the master planned area is identified in a master plan and is approved by regulation (and subject to undertaking the necessary environmental assessments and securing the required approvals other Commonwealth and State legislation)
- Material generated from capital dredging cannot be placed within the GBRMP
- Material generated from capital dredging cannot be placed within the restricted area unless the material is beneficially reused
- The Project is subject to the requirements of the Master plan for the priority Port of Gladstone 2018
- The Project will be subject to the requirements of the port overlay. Whilst a preliminary draft port overlay was released in 2017, a formal draft port overlay is yet to be released for public consultation in accordance with the Ports Act. Whilst timing of the formal draft port overlay and approved port overlay are yet to be confirmed, it is currently anticipated that the Project EIS will be released for public consultation prior to the port overlay being finalised, with the final port overlay in effect prior to dredging commencing (subject to securing of the necessary Project approvals).

As a result of these legislative changes, the East Banks DMPA Expansion (at sea) site was identified as no longer being able to meet Commonwealth and State regulatory requirements or support policy objectives and as such could not be considered further in the Supplementary DMPOI. By contrast, the seven remaining site options were identified as comprising beneficial reuse within the Port of Gladstone (restricted area), which is supported under the legislative changes.

4 Short-listing of placement sites

4.1 Overview

Following completion of the legislative review and the identification that the East Banks DMPA Expansion (at sea) site could not be progressed, a re-assessment of the feasibility of the remaining seven sites was undertaken to identify a short-list to take forward into a Supplementary DMPOI MCA process. The re-assessment considered:

- Site availability
- Site economic feasibility
- The long term dredged material placement needs with the Port of Gladstone, having regard to other capital dredging projects and maintenance dredging within the Port of Gladstone
- Consideration of a likely dredging methodology to transfer dredged material from the area to be dredged to each of the potential placement areas, and placement within a potential area (reclamation)
- The remaining capacity of existing reclamation areas to accommodate dredged material from the Project
- The capacity of dredged material placement options to accommodate future dredged material.

4.2 Site availability

During phase five of the DMPOI (DMPOI MCA process), constraints to site availability were identified as a potential issue for both the Gladstone Mount Larcom Road (South) and Boat Creek South options. To reassess the current status of availability of both these sites, a review of available approvals information together with project status was undertaken, given both sites had been subject to proposed/approved projects under the SDPWO Act. A summary of this review is provided below.

4.2.1 Gladstone Mount Larcom Road (South)

The Gladstone Mount Larcom Road (South) site is situated within the GSDA and includes the majority of an area which is subject to an approval held by GPC to undertake reclamation works. The area is referred to as 'Reclamation Area C' and covers approximately 140 hectares (ha), with a portion of the area used for reclamation and construction works to support Stage 1 of the Wiggins Island Coal Terminal (WICT) Project.

The WICT Project is the Port's second coal terminal to supplement the existing RGTCT export capacity. Situated at Golding Point, west of the RGTCT, the WICT Project has an ultimate export capacity of 84 Mtpa, with the completed Stage 1 comprising 27Mtpa.

The Gladstone Mount Larcom Road (South) site was originally identified during Workshop 2 as a potential placement location for dredged material, whereby material could be used to continue future reclamation works.

To enable maritime access, the ultimate WICT Project approval included dredging works to establish six berth pockets, a departure channel and swing basin. Dredging for Stage 1 of the WICT Project was undertaken from May 2012 to February 2013 and included dredging of 2.9Mm^3 of material using a CSD to establish one berth pocket, departure channel and swing basin.

All material dredged as part of Stage 1 of the WICT Project was placed within a 140ha intertidal reclamation and land based containment area as fill for the establishment of the WICT Project and other future port and industrial related industries.

Existing approvals obtained for the coal terminal support development beyond Stage 1, including authorising dredging works beyond Stage 1 and a continued level of commitment to utilise the area for future onshore dredged material placement. These existing approvals include:

- CG's Report on the WICT Project EIS (no currency end date)
- Commonwealth EPBC Act controlled action approval (valid to February 2021)
- Environmental Authority (EA) for Environmentally Relevant Activity 16 - Extractive Activities authorising dredging of up to 4Mm^3 with placement of dredged material within Reclamation Area B and C or at sea (EPPR00825113). It is noted however that in 2016, the EA was suspended by the Wiggins Island Coal Export Terminal Pty Ltd (WICET Pty Ltd) for the period between 5 December 2016 and 5 December 2019, unless the suspension is terminated earlier by WICET Pty Ltd.

Future WICT Project stages will involve the dredging of approximately 3.4Mm^3 of material to establish the remaining berth pockets and swing basin. These stages will be developed in response to market demand and there is currently no timeframe proposed.

Based on this information, it has been determined that the site would unlikely be available for dredged material placement for the Project.

4.2.2 Boat Creek South

The Boat Creek South site is located in the intertidal area between Fisherman's Landing and the current WICT project site. The area is situated with the Gladstone State Development Area (GSDA) and is owned by the State. During phase four of the DMPOI, the site was identified as being subject to a proposal by Tenement to Terminal Ltd to develop the Yarwun Coal Terminal, a greenfield coal export terminal together with associated rail infrastructure with a nominal Stage 1 output of 25 Million tonnes per annum (Mtpa). Despite the Project being declared a 'controlled action' under the EPBC Act, a 'coordinated project' under the SDPWO Act in 2012, the Project's 'coordinated project' status lapsed in 2014, and was withdrawn as a proposal under the EPBC Act in late 2014.

It is also noted that a portion of the Boat Creek South site was also originally subject to a proposed feed gas pipeline as part of the Arrow LNG Plant Project. The Arrow LNG Plant Project was approved (subject to conditions) as a 'controlled action' under the EPBC Act and as a 'coordinated project' under the SDPWO Act in late 2013. Despite this, the proponent announced in 2015 that the Arrow LNG Plant Project would not proceed.

Based on both these projects no longer having a commitment to proceed, the Boat Creek South site is considered likely to be feasible for further consideration on the basis of site availability.

4.3 Site economic feasibility

Upon reviewing the economic feasibility of a number of the sites, it has been identified that a long lead time would likely be required in order to realise the true economic potential of reclaimed land (i.e. as future developable port land) where the site relies on utilising the entire capacity for dredged material placement in order for port land to be created and become suitable to accommodate future development. The East Banks Island Reclamation site, which scored higher in the MCA process than the West Banks Island Reclamation, was no longer considered practically feasible by GPC without the heavy investment to deliver the required infrastructure (5 kilometre (km) bridge or tunnel) to facilitate access.

As a result, the East Banks Island Reclamation site was not considered a feasible option to progress.

Although the West Banks Island Reclamation site also requires the establishment of infrastructure (i.e. mainland access road and bridge to the island) to support establishment and future use, it was considered that this site remain a feasible option to consider owing to:

- The site having a smaller reclamation area size, and capacity for dredged material than East Banks Island Reclamation site, resulting in the ability for future developable port land to be realised sooner
- The site being located in closer proximity to the mainland than the East Banks Island Reclamation site, resulting in a shorter distance being required to be covered by connecting infrastructure (i.e. bridge).

4.4 Long term dredged material placement needs within the Port of Gladstone

4.4.1 Overview

As identified in Section 1.2, one of the secondary objectives of the DMPOI is to support a strategic approach to planning for the long term dredging needs of the Port of Gladstone by considering whether any of the potential dredged material placement areas would be more appropriately/efficiently used if prioritised for other future Port dredging requirements (capital and/or maintenance).

In response to the Ports Act prohibiting the offshore placement of capital dredged material within the GBRWHA and mandating the beneficial reuse of port-related capital dredged material (where it is environmentally safe to do so), all priority ports, including the Port of Gladstone, now have a legislative imperative adding further weight to the need to consider the future beneficial reuse of dredged material.

Whilst the DMPOI originally sought to address the long term dredging needs of the Port in terms of the appropriate and efficient use of dredged material placement areas, the new legislative mandate has required that greater consideration be given to these long term needs by giving increased weighting to:

- The dredged material placement needs of other capital dredging projects within the Port of Gladstone
- Potential opportunities to utilise a single dredged material placement area for the Project that also has sufficient additional capacity to accommodate dredged material from other future dredging projects/campaigns (i.e. up to 2050 to be consistent with the priority Port of Gladstone master planning timeframe).

4.4.2 Other capital dredging projects and maintenance dredging within the Port of Gladstone

Section 2 of the DMPOI covered in detail the history of past dredging in the Port of Gladstone, together with details of future planned maintenance and capital dredging works that were known in 2013-2015.

In the time since these original future planned maintenance and capital dredging works were identified in the DMPOI, and as part of GPC's ongoing strategic planning for the Port of Gladstone, other future dredging requirements beyond the current Project have now been reviewed, and identified to comprise:

- Capital dredging associated with the Western Basin Dredging and Disposal Project (WBDDP) Stages 1B, 2, 3 and 4 (21Mm^3)
- Clinton Vessel Interaction Project (CVIP) (0.8Mm^3)
- WICT Project (future dredging stages) (3.4Mm^3)
- Additional future Port capital dredging projects (22.5Mm^3)

- Annual port maintenance dredging (approximately 260,000m^3 annually).

Western Basin Dredging and Disposal Project

The WBDDP has been approved to undertake capital dredging of 46Mm^3 of material. The WBDDP's EPBC Act 'controlled action' approval authorises the dredging of 25Mm^3 for Stages 1A and 1B with a further 21Mm^3 for Stages 2 ,3 and 4. Dredging for the WBDDP Stage 1A commenced on 20 May 2011 and concluded on 18 September 2013, involving the dredging of approximately 22.56Mm^3 of material with placement within the:

- Western Basin reclamation area constructed as part of the WBDDP (approximately 17.45Mm^3)
- East Banks DMPA (at sea) (approximately 5.11 Mm^3).

The indicative timing of proposed future dredging campaigns associated with Stages 1B, 2, 3 and 4 of the WBDDP is proposed to occur between 2020 (or later) and 2037, subject to future proponent requirements. However, Condition 4 of the WBDDP EPBC Act 'controlled action' approval requires the development, submission and approval of a Long Term Sediment Disposal Plan (LTSDP) prior to the commencement of dredging for Stages 2, 3 or 4.

Current GPC surveys and engineering capacity estimates for the existing Western Basin reclamation area have identified that due to the bulking factor of dredged material and water within the Western Basin reclamation area, the volume of material currently within the reclamation area equates to approximately 23.7Mm^3 of material (i.e. a bulking factor of approximately 1.36).

Table 4.1 provides the existing dredged material volumes, estimated remaining capacity and key assumptions to achieve the maximum dredged material capacity within the Western Basin reclamation area (as approved under the EPBC Act controlled action). Figure 4.1 illustrates the current material levels within the Western Basin reclamation area.

Table 4.1 Estimated remaining dredged material capacity within the Western Basin reclamation area

Western Basin reclamation area location	Dredged material volume within the Western Basin reclamation area (Mm^3)	Estimated remaining capacity volume (Mm^3)[2] (in situ at the area to be dredged)
Northern pond	6	1.5[1] (1.2 in situ)
Southern pond, including the mound[3]	16.5	5.5 (4.4 in situ)
Polishing pond	1.2	0.8 (0.65 in situ)
Total	**23.7**	**7.8 (6.25 in situ)**

Table notes:

1 Estimated capacity assumes material is filled to an average of 4.75m Australian Height Datum (AHD)
2 Estimated capacity assumes port land area in the eastern portion of the southern pond is filled to an average of 4.75m AHD and the mound in the western portion of the southern pond is filled to a maximum height of 24.6 m AHD (or 27m LAT)
3 Long term total capacity for the southern pond area, including the mound approved under the WBDDP EPBC Act controlled action, is approximately 22Mm^3

The WBDDP LTSDP is currently being prepared by GPC and provides for 6.01 Mm^3 of future dredged material associated with Stage 1B to be accommodated within the existing Western Basin reclamation area (to occur in 2020 or later).

Clinton Vessel Interaction Project

GPC is currently proposing to undertake the CVIP which involves capital dredging of approximately 0.8Mm^3 (insitu) and 1.0Mm^3 (with bulking factor) of material to facilitate the widening of the existing Clinton Channel by 100m. Due to the current configuration of the Clinton Channel, Capesize vessels are required to pass within 80m of vessels berthed at the RG Tanna Coal Terminal (RGTCT). When this occurs, displaced water from the passing vessel has the potential to result in significant forces on

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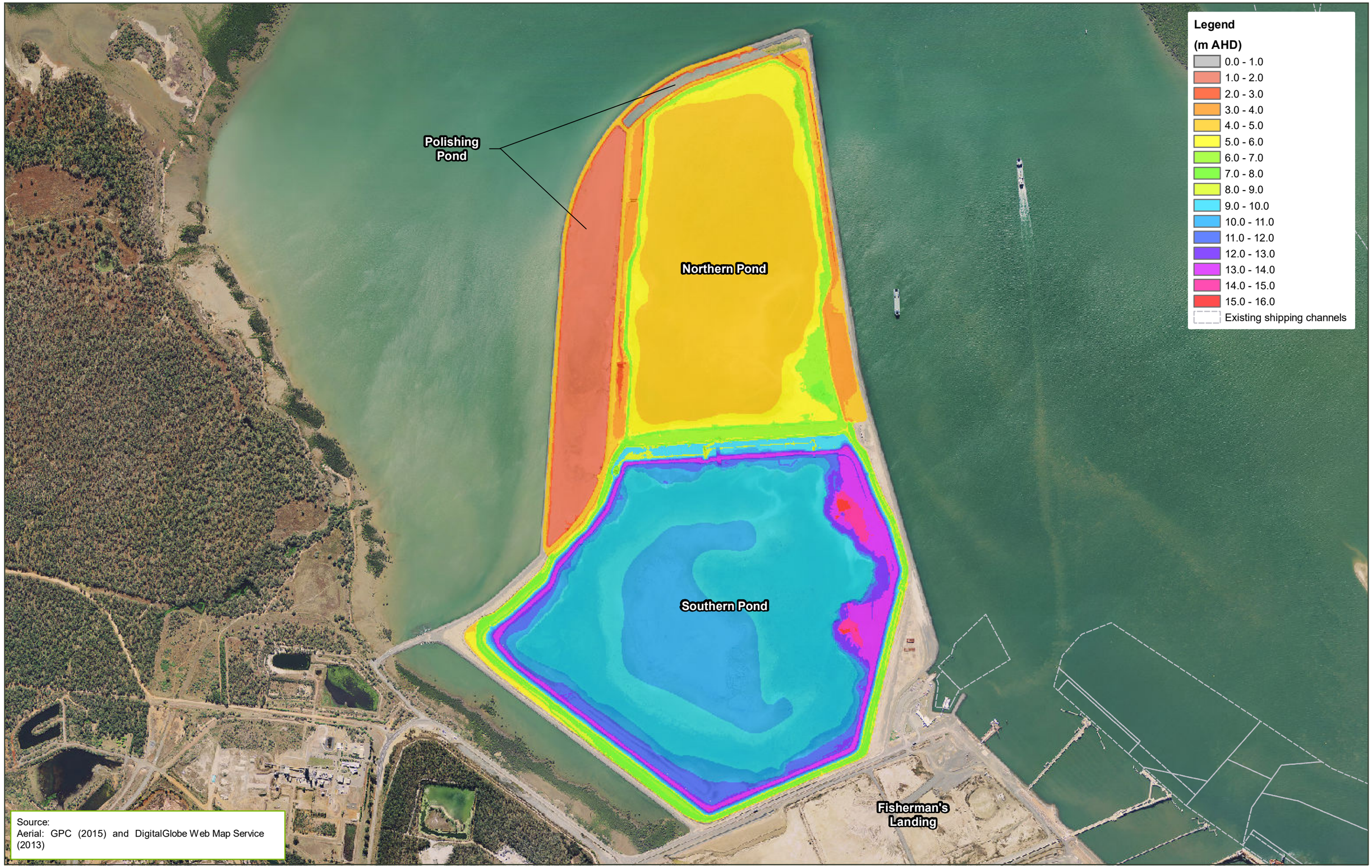

Source:
Aerial: GPC (2015) and DigitalGlobe Web Map Service (2013)

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Gatcombe and Golding Cutting Channel Duplication Project

Figure 4.1: Current material levels within the Western Basin reclamation area

the berthed vessels, resulting in the risk that these vessels break mooring lines and move off the RGTCT wharf.

Material to be dredged as part of CVIP is proposed to be placed within the existing Western Basin reclamation area. An EPBC Act referral was lodged in July 2017 and was determined by the Commonwealth Environment Minister to be a 'controlled action' for which assessment by preliminary documentation would be required. The final preliminary documentation was lodged by GPC in January 2019. Subject to obtaining the required State approvals (for which applications have been lodged) dredging for CVIP is planned to be undertaken in 2019.

Wiggins Island Coal Terminal Project

As identified in Section 4.2.1, future WICT Project stages will involve the dredging of approximately 3.4Mm^3 of material to establish the remaining berth pockets and swing basin. These stages will be developed in response to market demand and there is currently no timeframe proposed. The remaining dredged material is proposed to be placed in the Gladstone-Mt Larcom Road (South) site which only has capacity to receive the future WICT Project dredging requirements.

Additional future Port capital dredging projects

GPC does not hold any existing approvals or permits associated with other future capital dredging. In addition, no background studies or assessments have been commenced at this time.

In 2016, the priority Port of Gladstone evidence based master planning process was commenced which involved the preparation of an infrastructure and supply chain requirements assessment. The assessment determined that if the ultimate development of the Port is undertaken as per the master planning high growth scenario (i.e. total maximum Port throughput of 294 Mtpa), then other additional future Port capital dredging, up to the 2050 master planning timeframe, could be in the order of 22.5Mm^3 (in situ) (PSA 2016; TMR 2018). It is important to note that this dredging volume excludes the capital dredging associated with the Project, WBDDP, CVIP and the WICT Project.

Three additional future capital dredging projects for the Port that have been identified include:

- Port Central berths
- Auckland Channel deepening
- Boyne Cutting and Wild Cattle Cutting channel duplications.

The location, associated volumes and timeframes of these additional future capital dredging projects within the Port will be subject to the nature, scope and location of port and industrial development in the future.

Annual port maintenance dredging

As part of maintaining the Port and its associated maritime access and safety, GPC has an ongoing requirement to undertake maintenance dredging within the Port of Gladstone to provide safe passage and navigable channels for vessels under the *Transport Infrastructure Act 1995* (Qld). In 2016, the Queensland Government developed the 'Maintenance Dredging Strategy for Great Barrier Reef World Heritage Area Ports' (TMR 2016) to provide a framework for the sustainable, leading practice management of maintenance dredging at ports in the GBRWHA. Included within the framework is the requirement for all GBRWHA ports to develop, publish and implement Long-term Maintenance Dredging Management Plans that:

- Contribute to maintaining and enhancing the OUV of the GBRWHA
- Are based on the best available science
- Utilise the principles of ecologically sustainable development

- Ensure continued efficient operation of the port
- Are developed in consultation with key stakeholders.

GPC's 'Long-term Maintenance Dredging Management Plan for the Port of Gladstone' was finalised in December 2018.

Normally, GPC has an annual maintenance dredging campaign for its main Port channels and associated infrastructure. Any additional campaigns are carried out only if required. GPC's future maintenance dredging campaigns in the main channels will be on average approximately 0.26Mm^3 per annum (equalling an estimated 2.6Mm^3 over the next ten years).

4.5 Dredging concept design, methodology and volume of material to be dredged

This section discusses further considerations with respect to the likely dredging concept design and methodology, along with the volume of material to be dredged and the dredged material bulking factor.

4.5.1 Dredging concept design and methodology for the transfer and placement of dredged material

Section 4 of the DMPOI provided the findings of a detailed review regarding dredging and material placement methods, which included consideration of, for example, the distance and accessibility of a dredged material placement location in relation to the area to be dredged.

Having regard to the location of each of the short-listed options in relation to the area to be dredged and the legislative changes that have occurred under the Ports Act, it has been identified in all instances (except for the West Banks Island Reclamation Area option), that the following would be required to be established:

- A dredger or barge access channel – involving the initial dredging of a specific access channel to enable the dredger or a barge carrying dredged material, to manoeuvre closer to a dredged material placement area, where it is located in shallower water
- A barge unloading facility (BUF) – which would support the unloading of dredged material, involving barges accessing a dock to allow excavators to unload the barges and place the material into trucks to transport dredged material from the barges into the reclamation areas.

Key drivers for both the dredger/barge access channel and BUF being required are:

- Regardless of the dredger type chosen (i.e. CSD or TSHD), there is the requirement to pump (via pipeline) the dredged material into the material placement area, and that the effectiveness and efficiency of pumping reduces as distance increase
- Both the CSD and TSHD types have restricted access in areas of shallower water, typically associated with intertidal areas where reclamation could occur
- The legislative changes, specifically the Ports Act, prohibit both the temporary and permanent sea-based placement of port-related capital dredged material, therefore requiring the infrastructure to support a dredging methodology using barges to transport dredged material from a dredger to a material placement area, where pumping is not feasible due to the distance between the area to be dredged and the placement area, and the nature of the material to be dredged is not suitable to be pumped that distance.

Establishing a dredger/barge access channel and BUF would therefore allow:

- Dredgers (TSHD or CSD) to position closer to the dredged material placement area in order to reduce the pumping distance, thereby increasing effectiveness and efficiency in the dredging methodology.

- The transfer of dredged material from a TSHD, CSD or backhoe to a material placement area using barges, where pumping distances are high and the nature of the material to be dredged is not suitable to be pumped over that distance.

4.5.2 Volume of material to be dredged and consideration of the dredged material bulking factor

It is important to note that the ability for the Project to achieve the design capacity estimates within any given reclamation area is highly dependent upon:

- The final bulking factor of the material to be dredged (given that the undertaking of dredged material dewatering and consolidation occupies a greater reclamation area size and capacity than what the same volume of dredged material occupies once dewatering and consolidation has finished over a number of years). As part of reclamation area design within the Port, an average bulking factor (ratio of dredged volume after placement within the reclamation area, to the in situ volume of sediment to be dredged) of 1.25 is generally adopted for the material to be dredged.
- The timeframe of the dredging works, including timing between Project stages or multiple projects (campaigns) which ultimately influences the length of time available for the dredged material within the placement area to undergo dewatering and consolidation before new dredged material is introduced
- The carrying out of bulk earthworks to move and shape the dredged material (once dewatering and consolidation has occurred) so as to facilitate:
  - The creation of the final landform with the dredged material that has been dewatered and consolidated
  - Where required, create additional working capacity (area and volume) so as to enable the reclamation area to receive more dredged material and successfully undergo dewatering and consolidation once more.

As detailed in Section 1.1.1, the Project (between 2013 and 2015) involved the dredging of 12.6Mm^3 of seabed material to deepen and duplicate the Gatcombe and Golding Cutting shipping channels. In the time since 2015, amendments to the dredging methodology have occurred, with preliminary estimates identifying that additional dredging in the order of 0.25Mm^3 (including dredging tolerance) will be required to establish the barge access channel to a BUF dock for each of the short-listed sites (with the exception of the West Banks Island Reclamation area given its deep water location).

As such the total Project dredging volume will be 12.85 Mm^3 (insitu) and 16.06 Mm^3 with the 1.25 bulking factor applied.

4.6 Dredged material placement volume requirements

As identified in Section 4.4.2, the estimated remaining capacity of the Western Basin reclamation area is 7.8Mm^3 (6.25Mm^3 insitu). To date, dredged material (with bulking factor) associated with the following other Port capital dredging projects is proposed to be placed within the Western Basin reclamation area prior to or within a similar timeframe as the Project:

- CVIP (1Mm^3) (with dredging to be undertaken in 2019)
- Stage 1B of the WBDDP (6.09Mm^3) (with dredging planned for 2020 or later).

As a result, 0.71Mm^3 of capacity within the Western Basin reclamation area is available for use by the Project, resulting in there being a requirement to accommodate 15.35Mm^3 within a new dredged material placement area.

4.7 Capacity of dredged material placement options

A review of the estimated design capacities for each of the remaining six dredged material placement options has been undertaken in order to determine whether the potential opportunity exists to utilise a single dredged material placement area for the Project that also has sufficient additional capacity to accommodate dredged material from other future dredging projects/campaigns (up to 2050).

A summary of the findings of this review, which has considered original capacity estimates (identified in phases four and five of the original DMPOI) and revised estimates (where relevant) is presented in Table 4.2.

Table 4.2 Review of the capacity of dredged material placement options

Site option	Original design capacity estimate (Mm^3)	Revised design capacity estimate (Mm^3)	Comments
Gladstone Mount Larcom Road (South)	7 to 9	4.25	The site only has capacity to receive the future WICT Project dredging requirements (3.4Mm^3) and therefore does not provide any opportunity to take the dredged material from the Project or any future long term capital or maintenance dredging requirements for the Port beyond the WICT Project requirements.
Boat Creek South	10 to 12	No change	The site does not have the capacity to take all of the dredged material from the Project, and if progressed would need to be utilised in combination with a second site The site does not provide any opportunity to accommodate future long term capital or maintenance dredging requirements for the Port
Western Basin Expansion	29 to 32	45 to 50 across two areas (northern and southern) with mounding	Preliminary concept designs developed as part of initial Project EIS background studies have identified that the Western Basin Expansion site has a larger capacity than originally estimated. As a result, the site has the capacity to take all of the dredged material for the Project The site provides the opportunity for additional capacity of up to 34.65Mm^3. The ability to achieve the design capacity estimate for the site would however be subject to the final bulking factor of the material to be dredged, the timing of dredging works and the final earthworks design for the reclamation area.
Fisherman's Landing Expansion (South)	12 to 14	Further design investigations required to confirm	Site may have the capacity to take all of the dredged material from the Project, subject to preliminary concept designs The site may have the potential opportunity to accommodate future long term capital or maintenance dredging requirements for the Port, subject to further design investigations
West Banks Island Reclamation	27 to 30	No change	Site has the capacity to take all of the dredged material for the Project The site provides the opportunity for additional capacity of up to 14.65Mm^3, which could accommodate a portion of the WBDDP Stages 2, 3 and 4, or other future capital dredging and/or maintenance requirements

Site option	Original design capacity estimate (Mm^3)	Revised design capacity estimate (Mm^3)	Comments
Port Central Expansion	25 to 30	18 across two areas being: ■ Eastern area (13) ■ Western area (5)	Preliminary concept designs developed as part of initial Project EIS background studies have identified that the Port Central Expansion site has a smaller capacity than originally estimated, however the site does have the capacity to take all of the dredged material for the Project The site may have the potential to accommodate future long term capital or maintenance dredging requirements for the Port, subject to further design investigations The ability to achieve the design capacity estimate for the site would however be subject to the final bulking factor of the material to be dredged, the timing of dredging works and the final earthworks design for the reclamation area.

In undertaking the capacity review of each of the six remaining dredged material placement options, a decision was made to only progress those sites which have sufficient capacity to accommodate all of the dredged material for the Project (removing the requirement to consider the need for multiple sites) and also provide the opportunity for additional capacity that can accommodate future Port long term capital dredging and/or maintenance requirements.

As a result, the Gladstone Mount Larcom Road (South) and Boat Creek South sites were not considered feasible to progress to the Supplementary DMPOI MCA process. Fisherman's Landing Expansion (South) was however retained as a potential option, recognising that original capacity estimates are close to the Project capacity requirements and that some additional volume may be achieved through future development of a preliminary engineering concept design.

4.8 Summary of short-listed sites

At the conclusion of the additional investigations (refer Sections 4.2 to 4.7) the following three sites were identified as no longer being feasible to progress in the Supplementary DMPOI:

- Gladstone Mount Larcom Road (South) (due to site availability and capacity constraints)
- East Banks Island Reclamation (due to site economic feasibility constraints)
- Boat Creek South (due to site capacity constraints).

As a result, the following four sites remained to progress to the Supplementary DMPOI MCA process:

- Western Basin Expansion
- Fisherman's Landing (South)
- Port Central Expansion
- West Banks Island Reclamation.

Figure 4.2 illustrates the locations of each of these potential dredged material placement options.

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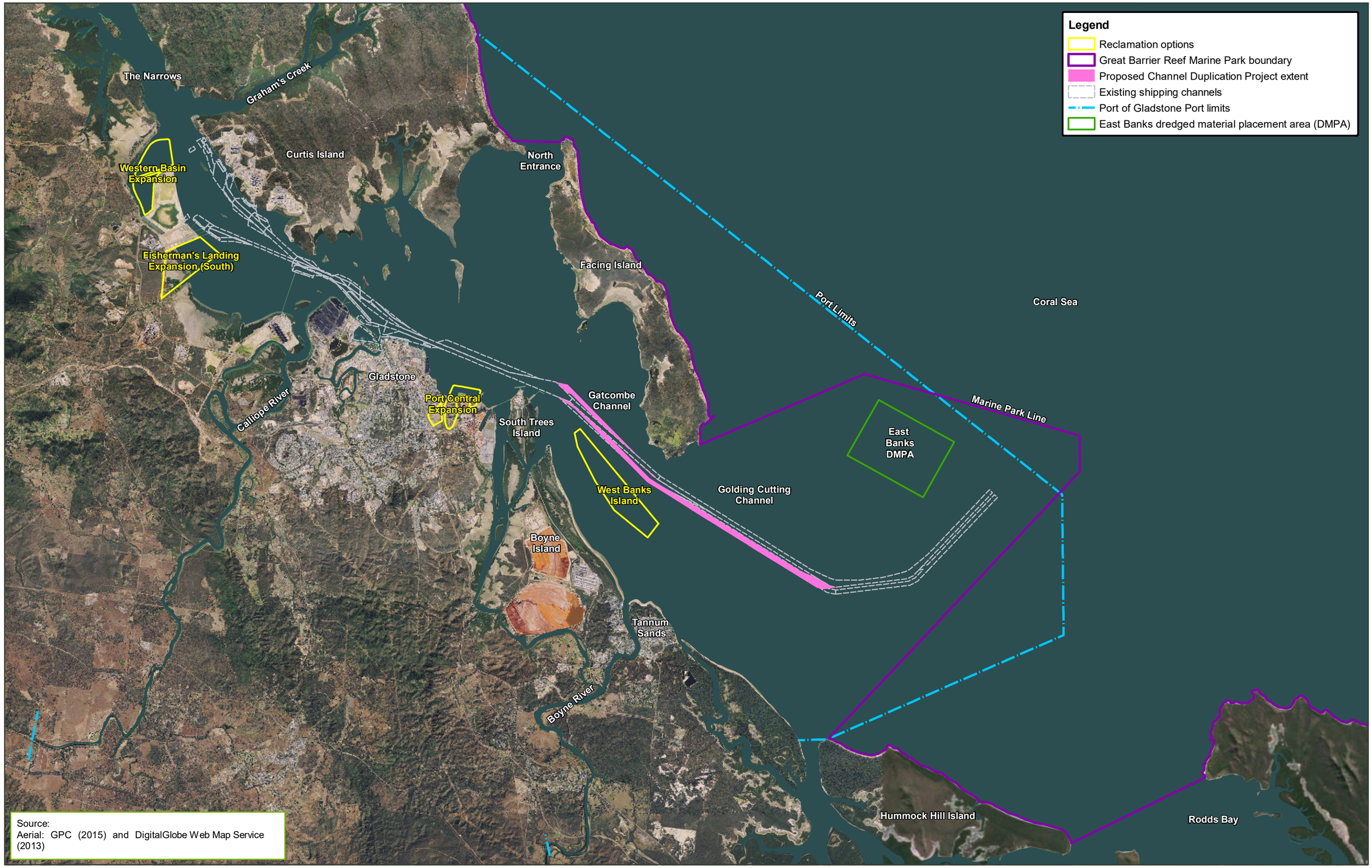

Source:
Aerial: GPC (2015) and DigitalGlobe Web Map Service (2013)

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Gatcombe and Golding Cutting Channel Duplication Project

Figure 4.2: Short-listed potential dredged material placement options

5 Supplementary DMPOI MCA process

5.1 Methodology

Consistent with the approach taken for the DMPOI, a Supplementary DMPOI MCA process utilising the 'weighted summation' method was completed to rank the remaining four short-listed sites and support the identification of a preferred site to be taken forward into the detailed impact assessment stage as part of the Project EIS.

Whilst the Supplementary DMPOI MCA process generally followed the same methodology as the original DMPOI MCA process, a number of variations were made. For ease of reference, Table 5.1 presents the original DMPOI MCA process summary (as detailed in the original DMPOI report), together with the revised process for the Supplementary DMPOI MCA.

Table 5.1 Key variations made to the DMPOI multi-criteria analysis process for the Supplementary DMPOI MCA process

DMPOI MCA process			Supplementary DMPOI MCA process
Timing	**Step**	**Process**	**Process**
Pre-workshop 3	1	■ Development of objectives for aquatic ecology, terrestrial ecology, social and cultural heritage, and economic aspects that reflect the values associated with the consequences of each option	■ Review of the stakeholder and regulatory agency agreed original objectives ■ Update the economic objectives regarding beneficial reuse to reflect legislative changes ■ Develop new objectives in relation to long term dredged material placement needs within the Port of Gladstone ■ Development of a suite of issues and aspects for each objective to support further transparency in the MCA process in lieu of stakeholder and agency involvement (refer step 4)
	2	■ Assigning of weightings for each of the objectives to reflect their relative importance to the decision	■ Review of the weightings assigned to each of the original objectives ■ Assign new weightings to the revised and new objectives, and adjusting the weighting of the original objectives proportionately adjusted
	3	■ Definition of scoring approach and scoring considerations for each objective to assist in determining how to allocate a score for each option being assessed	■ Adopt the same scoring approach for the original objectives and applying these to the additional new objectives ■ Adoption the same scoring considerations for the original aquatic environment, terrestrial environment, social and cultural heritage objectives, and develop revised and new scoring considerations for the revised economic objectives and new long term dredged material placement need objectives
Workshop 3	4	■ Assessment and scoring of the performance of each option against the objectives	■ Assessment and scoring of the performance of each option against the objectives having regard to identified key issues and aspects in lieu of separate assessments being carried out by stakeholders and regulatory agencies in a workshop format
	5	■ Collation of each options score and weighting to derive an overall value for each option, enabling the ranking of all options together	■ Collation of each options score and weighting to derive an overall value for each option, enabling the ranking of all options together
	6	■ Review and examination of the MCA results	■ Review and examination of the MCA results

DMPOI MCA process			Supplementary DMPOI MCA process
Timing	**Step**	**Process**	**Process**
	7	■ Conducting of a sensitivity analysis of the MCA results of the scores and weightings	■ Conducting of a sensitivity analysis of the MCA results (scores and weightings)

5.1.1 Steps one and two – review objectives, identify issues/aspects and revise weightings

In preparation for the Supplementary DMPOI MCA process, the original objectives and weightings agreed with the stakeholders and regulatory agencies during phase five of the DMPOI were reviewed. As part of this review, the economic objectives were amended to ensure they appropriately reflected the legislative requirements regarding the mandatory beneficial reuse of dredged material (where environmentally safe to do so), and a new objective was developed to ensure consideration of long term dredged material placement needs within the Port of Gladstone.

Furthermore, a suite of issues and aspects for each sub-objective were identified to support more detailed ranking and greater transparency in the MCA process in lieu of stakeholder and agency involvement.

In addition, the weightings assigned to each of the original objectives were reviewed, new weighting were assigned to the amended/new objectives, and the original weightings proportionately adjusted to account for the additional new criteria. Table 5.2 presents the revised MCA objectives, issues/aspects and weightings.

Table 5.2 Supplementary DMPOI MCA process objectives, issues/aspects and weightings

Objectives and issues/aspects	Weightings (%)
1. Aquatic environmental objectives	**27**
1.1 Avoid or minimise irrevocable adverse impact on aquatic and/or coastal ecosystem sensitive receptors (i.e. permanent loss of the OUV of the GBRWHA, including but not limited to seagrass meadows, mangroves, saltmarsh intertidal area)	
Intertidal vegetation	12
Seagrass (direct impacts)	16
1.2 Avoid or minimise short term water quality and adverse ecological impacts (e.g. occurrence of sediment plume) on aquatic and/or coastal ecosystem sensitive receptors (i.e. minimise short term impact on the OUV of the GBRWHA, including but not limited to seagrass meadows, coral/rocky reef, declared Fish Habitat Areas, turtle nesting beaches, GBRMP)	
Seagrass (indirect impacts)	12
Macroinvertebrate habitat	12
Acid sulfate soils	12
1.3 Avoid or minimise adverse impact on listed threatened, migratory and other protected marine fauna species (including the OUV of the GBRWHA biodiversity conservation attributes, and species listed under the EPBC Act, GBRMP Act and Nature Conservation Act 1992 (NC Act)) and their habitat	
Marine fauna	12
Migratory birds	12
OUV of the GBRWHA (biodiversity conservation values)	12
Total	**100**
2. Terrestrial environmental objectives	**20**
2.1 Avoid or minimise impacts on significant terrestrial vegetation communities (i.e. Matters of National Environmental Significance (MNES) (threatened ecological communities (TECs) and threatened species) and Matters of State Environmental Significance (MSES) (endangered or of concern regional ecosystems, habitat for threatened species))	
Terrestrial vegetation	33

Objectives and issues/aspects	Weightings (%)
Terrestrial fauna	33
2.2 Avoid or minimise adverse impacts on natural aesthetic values and geological processes/heritage attributes as defined under the OUV of the GBRWHA (e.g. Port Curtis islands, beaches, dune systems, fringing reefs)	
Amenity (World Heritage Values – aesthetics)	34
Total	**100**
3. Social and cultural heritage objectives	**18**
3.1 Maximise level of compatibility of the final placement location with existing and approved land uses and future land use planning documents	
Strategic land use intent	12
3.2 Avoid or minimise adverse impacts on Gladstone community and recreational activities associated with dredging, construction of containment bunds and placement impacts, and future operational land use of placement area)	
Community and recreational activities	12
Amenity (air, noise, vibration)	12
Amenity (visual)	12
Traffic	12
3.3 *Avoid or minimise adverse impacts on opportunities for reasonable use, appreciation, enjoyment and understanding of the Great Barrier Reef region and adjacent coastline*	
Amenity (World Heritage Values – human appreciation/enjoyment of the Great Barrier Reef)	12
3.4 *Avoid or minimise adverse impacts on cultural heritage values, including Traditional Owner/use values and heritage values*	
Indigenous cultural heritage	16
Non-indigenous cultural heritage	12
Total	**100**
4. Economic objectives	**20**
4.1 Avoid or minimise adverse impacts on ecosystem reliant commercial activities	
Commercial and recreational fishing	40
4.2 Maximise cost efficiency of dredging method and dredged material placement	
Dredging method costs	30
Reclamation area establishment and dredged material placement costs	30
Total	**100**
5. Long term dredged material placement (beneficial reuse) objective	**15**
5.1 Maximise the potential capacity of the placement area to accommodate the beneficial reuse of long term dredged material volumes within the Port of Gladstone (up to 2050)	
Capacity of placement area	**100**
Total	**100**
Total (Objectives 1 to 5)	**100**

5.1.2 Scoring values and considerations

For consistency, the Supplementary DMPOI MCA process adopted the same set of scoring values as the original MCA process and applied these to the new set of 12 objectives and associated issues/aspects to be considered in the options scoring process. These are summarised in Table 5.3.

Table 5.3 Supplementary DMPOI MCA process scoring values

Score	Criteria
1	Prevents objective
2	Against objective
3	Partially fails objective
4	Partially satisfies objective
5	Meets objective
6	Exceeds objective

Scoring considerations developed for the DMPOI MCA process in relation to aquatic environment, terrestrial environment, and social and cultural heritage were again applied, with amended/new scoring considerations developed to reflect the potential outcome/scale of potential impact associated with the economic and long term dredged material placement objectives.

The scoring considerations adopted from the Supplementary DMPOI MCA process are provided in Table 5.4.

Table 5.4 Supplementary DMPOI MCA process scoring objectives

Objective	Scoring		Scoring considerations
1. Aquatic environment objectives			
1.1	***Avoid or minimise irrevocable adverse impact on aquatic and/or coastal ecosystem sensitive receptors (i.e. permanent loss of the OUV of the GBRWHA, including but not limited to seagrass meadows, mangroves, saltmarsh intertidal area)***		
	1	Prevents objective	Unacceptable impact on the OUV of the GBRWHA aquatic and coastal ecosystem sensitive receptors (e.g. seagrass meadows identified as having a comparatively high or medium potential value to the ecology of Port Curtis)
	2	Against objective	Impact on OUV of the GBRWHA aquatic and/or coastal ecosystem sensitive receptors (e.g. seagrass meadows identified as having a comparatively high or medium potential value to the ecology of Port Curtis)
	3	Partially fails objective	Impact on OUV of the GBRWHA aquatic and/or coastal ecosystem sensitive receptors (e.g. seagrass meadows identified as having a comparatively low potential value to the ecology of Port Curtis)
	4	Partially satisfies objective	Manageable impact on OUV of the GBRWHA aquatic and coastal ecosystem sensitive receptors (e.g. seagrass meadows)
	5	Meets objective	No impact on OUV of the GBRWHA aquatic and coastal ecosystem sensitive receptors (e.g. seagrass meadows, mangroves, intertidal areas)
	6	Exceeds objective	Creates additional potential OUV of the GBRWHA aquatic and coastal ecosystem habitat
1.2	***Avoid or minimise short term water quality and adverse ecological impacts (e.g. occurrence of sediment plume) on aquatic and/or coastal ecosystem sensitive receptors (i.e. minimise short term impact on the OUV of the GBRWHA, including but not limited to seagrass meadows, coral/rocky reef, declared Fish Habitat Areas, turtle nesting beaches, GBRMP)***		
	1	Prevents objective	Unacceptable impacts on aquatic ecosystem sensitive receptors on a regional or local scale
	2	Against objective	Impacts on aquatic ecosystem sensitive receptors on a regional scale
	3	Partially fails objective	Impacts on aquatic ecosystem sensitive receptors on a local scale
	4	Partially satisfies objective	Manageable impacts on aquatic ecosystem sensitive receptors on a local scale
	5	Meets objective	Does not impact on aquatic ecosystem sensitive receptors
	6	Exceeds objective	Creates additional potential aquatic ecosystem sensitive habitat

Objective	Scoring		Scoring considerations
1.3	***Avoid or minimise adverse impact on listed threatened, migratory and other protected marine fauna species (including the OUV of the GBRWHA biodiversity conservation attributes, and species listed under the EPBC Act, GBRMP Act and NC Act) and their habitat***		
	1	Prevents objective	Unacceptable impacts on listed threatened, migratory and other protected marine fauna species on a regional or local scale
	2	Against objective	Impacts on listed threatened, migratory and other protected marine fauna species on a regional scale
	3	Partially fails objective	Impacts on listed threatened, migratory and other protected marine fauna species on a local scale
	4	Partially satisfies objective	Manageable impacts on listed threatened, migratory and other protected marine fauna species on a local scale
	5	Meets objective	Does not impact listed threatened, migratory and other protected marine fauna species
	6	Exceeds objective	Creates additional potential listed threatened, migratory and other protected marine fauna species habitat
2.	**Terrestrial environmental objectives**		
2.1	***Avoid or minimise impacts on significant terrestrial vegetation communities (i.e. MNES (TECs and threatened species) and Matters of State Environmental Significance (MSES) (endangered or of concern regional ecosystems, habitat for threatened species))***		
	1	Prevents objective	Unacceptable impacts on terrestrial vegetation communities on a regional or local scale
	2	Against objective	Impacts on terrestrial vegetation communities on a regional scale
	3	Partially fails objective	Impacts on terrestrial vegetation communities on a local scale
	4	Partially satisfies objective	Manageable impacts on terrestrial vegetation communities on a local scale
	5	Meets objective	Does not impact on terrestrial vegetation communities
	6	Exceeds objective	Creates additional potential areas for terrestrial vegetation communities
2.2	***Avoid or minimise adverse impacts on natural aesthetic values and geological processes/heritage attributes as defined under the OUV of the GBRWHA (e.g. Port Curtis islands, beaches, dune systems, fringing reefs)***		
	1	Prevents objective	Unacceptable impacts on local and regional natural aesthetic values and/or geological processes/heritage attributes
	2	Against objective	Detracts from local and regional natural aesthetic values and/or geological processes/heritage attributes
	3	Partially fails objective	Detracts from local natural aesthetic values and/or geological processes/heritage attributes
	4	Partially satisfies objective	Partially detracts from local natural aesthetic values and/or geological processes/heritage attributes
	5	Meets objective	Does not detract from natural aesthetic values and/or geological processes/heritage attributes
	6	Exceeds objective	Increases natural aesthetic values and/or geological processes/heritage attributes

Objective	Scoring		Scoring considerations
3.	**Social and cultural heritage objectives**		
3.1	***Maximise level of compatibility of the final placement location with existing and approved land uses and future land use planning documents***		
	1	Prevents objective	Unacceptable impacts on adjoining land uses; Conflicts with long term planning intent for the area
	2	Against objective	Detracts from/conflicts with adjoining land uses
	3	Partially fails objective	Is not compatible with adjoining land uses, but does not detract from/conflicts with adjoining land uses
	4	Partially satisfies objective	Is compatible with some adjoining land uses
	5	Meets objective	Is compatible with all adjoining land uses
	6	Exceeds objective	Is compatible and complements all adjoining land uses
3.2	***Avoid or minimise adverse impacts on Gladstone community and recreational activities associated with dredging, construction of containment bunds and placement impacts, and future operational land use of placement area)***		
	1	Prevents objective	Unacceptable and long term impacts on the Gladstone community and/or recreational activities
	2	Against objective	Long term adverse impact on the Gladstone community and/or recreational activities
	3	Partially fails objective	Short term adverse impact on the Gladstone community and/or recreational activities
	4	Partially satisfies objective	Manageable impact on the Gladstone community and/or recreational activities
	5	Meets objective	Minor to no impact on the Gladstone community and/or recreational activities
	6	Exceeds objective	Provides benefit to the Gladstone community and/or recreational activities
3.3	***Avoid or minimise adverse impacts on opportunities for reasonable use, appreciation, enjoyment and understanding of the Great Barrier Reef region and adjacent coastline***		
	1	Prevents objective	Unacceptable and long term loss of opportunities for reasonable use, appreciation, enjoyment and understanding of the GBR region and adjacent coastline
	2	Against objective	Long term loss of opportunities for reasonable use, appreciation, enjoyment and understanding of the GBR region and adjacent coastline
	3	Partially fails objective	Short term loss of opportunities for reasonable use, appreciation, enjoyment and understanding of the GBR region and adjacent coastline
	4	Partially satisfies objective	Manageable impact on opportunities for reasonable use, appreciation, enjoyment and understanding of the GBR region and adjacent coastline
	5	Meets objective	Minor to no impact on opportunities for reasonable use, appreciation, enjoyment and understanding of the GBR region and adjacent coastline
	6	Exceeds objective	Provides additional opportunities for reasonable use, appreciation, enjoyment and understanding of the GBR region and adjacent coastline

Objective	Scoring		Scoring considerations
3.4	***Avoid or minimise adverse impacts on cultural heritage values, including Traditional Owner/use values and heritage values***		
	1	Prevents objective	Unacceptable impacts on cultural heritage values and Traditional Owner/use values on a regional scale
	2	Against objective	Impacts cultural heritage values and Traditional Owner/use values on a regional scale
	3	Partially fails objective	Impacts cultural heritage values and Traditional Owner/use values on a local scale
	4	Partially satisfies objective	Manageable impact on cultural heritage values and Traditional Owner/use values
	5	Meets objective	No impact to cultural heritage values and Traditional Owner/use values
	6	Exceeds objective	Provides benefit to cultural heritage values and Traditional Owner/use values
4.	**Economic objectives**		
4.1	***Avoid or minimise adverse impacts on ecosystem reliant commercial activities***		
	1	Prevents objective	Unacceptable and long term loss in ecosystem reliant commercial activities
	2	Against objective	Long term loss in ecosystem reliant commercial activities
	3	Partially fails objective	Temporary loss in ecosystem reliant commercial activities
	4	Partially satisfies objective	Manageable loss in ecosystem reliant commercial activities
	5	Meets objective	Minor to no impact to ecosystem reliant commercial activities
	6	Exceeds objective	Improves ecosystem reliant commercial activities
4.2	***Maximise cost efficiency of dredging method and dredged material placement***		
	1	Prevents objective	Unacceptable costs for dredging and/or dredged material management and placement
	2	Against objective	Double (or more) handling of dredged material required, and placement area location requires high containment bund costs, and achieves low dredging pumping efficiency Duplication of handling/management area
	3	Partially fails objective	Placement area location requires high containment bund costs and achieves low dredging pumping efficiency
	4	Partially satisfies objective	Placement area location requires high containment bund costs or achieves low dredging pumping efficiency
	5	Meets objective	Placement area location minimises containment bund costs and/or maximises dredging pumping efficiency
	6	Exceeds objective	Lowest costs per m^3 for dredging and placement area location

Objective	Scoring		Scoring considerations
5.	**Long term dredged material placement (beneficial reuse) objectives**		
5.1	***Maximise the potential capacity of the placement area to accommodate the beneficial reuse of long term dredged material volumes within the Port of Gladstone (up to 2050)***		
	1	Prevents objective	Placement area cannot accommodate all of the dredged material volume for the Project and requires two or more additional sites
	2	Against objective	Placement area cannot accommodate all of the dredged material volume for the Project and relies on the use of a second placement site in parallel
	3	Partially fails objective	Placement area accommodates all of the dredged material volume for the Project
	4	Partially satisfies objective	Placement area: ■ Accommodates all of the dredged material volume for the Project ■ Provides additional capacity of up to 10Mm^3 which could be utilised by future capital and/or maintenance dredging projects within the Port of Gladstone
	5	Meets objective	Placement area: ■ Accommodates all of the dredged material volume for the Project ■ Provides additional capacity of more than 10Mm^3 but less than 20Mm^3 which could be utilised by future capital and/or maintenance dredging projects within the Port of Gladstone
	6	Exceeds objective	Placement area: ■ Accommodates all of the dredged material volume for the Project ■ Provides additional capacity of more than 20Mm^3 which could be utilised by future capital and/or maintenance dredging projects within the Port of Gladstone (up to 2050)

5.1.3 Ranking of options

Consistent with the approach taken for the DMPOI MCA process, each objective and associated issues/aspects were assessed for each option to allow comparison between each of the options and the application of comparative scores.

Allocated scores were recorded in a Microsoft Excel spreadsheet to facilitate calculation of the final scores with consideration to the weightings applied. The final overall rankings are presented in Table 5.5, with a ranking of '1' representing the most preferred and '4' presenting the least preferred. A copy of the final spreadsheet output from the Supplementary DMPOI MCA process is provided in Appendix A.

Table 5.5 Supplementary DMPOI MCA process rankings for preferred dredged material placement site

Objective	Western Basin Expansion	Fisherman's Landing Expansion South	Port Central Expansion	West Banks Island Reclamation
1. Aquatic environmental objectives	3	4	2	1
2. Terrestrial environmental objectives	2	1	3	4
3. Social and cultural heritage objectives	1	1	3	4
4. Economic objectives	3	3	1	1
5. Long term dredged material placement (beneficial reuse) objectives	1	4	3	2
TOTAL	**1**	**2**	**4**	**3**

Table note:

The 'total rank' is calculated using the total scores of each weighted aspect and applying the overall weightings to each objective

5.1.4 Sensitivity analysis

Sensitivity analysis was undertaken at the end of the Supplementary DMPOI MCA process to determine whether changes to the weightings of each of the five objectives categories would impact the final scores and rankings for the options assessed. This analysis found no significant changes to the outcomes of the MCA process.

5.1.5 Preferred dredged material placement option

At the conclusion of the Supplementary DMPOI MCA process, the Western Basin Expansion reclamation area was identified as the preferred dredged material placement area to take forward into the detailed impact assessment stage of the Project EIS.

6 Conclusion

A DMPOI was undertaken between 2013 and early 2015 to support the Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project EIS. The methodology and findings of the DMPOI were originally published in a standalone DMPOI report. During 2015 and 2016, significant legislative changes occurred in Commonwealth and Queensland Government policy and environmental regulation which directly impacted the Gatcombe and Golding Cutting Channel Duplication Project, triggering the need to undertake a review of the findings of the DMPOI, and detail the review findings in a Supplementary DMPOI.

This report presents the methodology and findings of the Supplementary DMPOI completed in 2017 and 2018. For context to the Supplementary DMPOI, this report has also provided a brief summary of the key findings of the DMPOI completed in 2013 and 2015.

Both the original DMPOI and Supplementary DMPOI have been prepared in response to the EIS ToR and EIS Guidelines requirements to assess placement options for both capital and maintenance dredged material and provide justification for the final dredged material placement option site.

Whilst the primary objectives of the Supplementary DMPOI reflect those of the DMPOI, the legislative changes that occurred in 2015 and 2016 (and more specifically, the mandating of the beneficial reuse of port-related capital dredged material) has required that greater consideration be given to the long term dredging needs of the Port of Gladstone to include:

- The dredged material placement needs of other capital dredging projects within the Port of Gladstone, including remaining capacities of existing dredged material placement areas (i.e. Western Basin reclamation area)
- Potential opportunities to utilise a single dredged material placement area for the Project that also has sufficient additional capacity to accommodate dredged material from other future dredging projects/campaigns (i.e. up to 2050 to be consistent with the priority Port of Gladstone master planning timeframe).

The methodology for the Supplementary DMPOI has sought to reconsider the findings of the DMPOI from the conclusion of the DMPOI phase five (MCA process), and in doing so has firstly included a review of the 2015 and 2016 legislative changes to identify the relevant implications for the DMPOI and the Project, secondly, included undertaking of additional investigations for the eight short-listed sites in the DMPOI having regard to these legislative implications as well as current site feasibility considerations to arrive at an updated short-list of potential sites and lastly, completing a Supplementary DMPOI MCA process to identify a preferred option to proceed to the detailed impact assessment stage of the Project EIS in conjunction with the use of the existing Western Basin reclamation area.

As a result of the legislative review, the East Banks DMPA expansion (at sea) could not be progressed, resulting in the short-listed options reducing from eight to seven. Through undertaking the additional site investigations for the seven remaining sites, three sites were identified as no longer being feasible (Gladstone Mount Larcom Road (South), East Banks Island Reclamation and Boat Creek South) to progress owing to a combination of site availability, economic feasibility and capacity constraints), with four being identified as still being feasible to progress into the Supplementary DMPOI MCA process.

The Supplementary DMPOI MCA process assessed the four remaining short-listed sites, adopting the same objectives as the DMPOI MCA process albeit with some variations to reflect the legislative changes. Furthermore, a suite of issues and aspects for each objective were identified to support more detailed ranking and greater transparency in the MCA process in lieu of stakeholder and agency involvement.

At the conclusion of the Supplementary DMPOI, the Western Basin Expansion site was identified as the preferred dredged material placement option to take forward into the detailed impact assessment stage of the Project EIS in conjunction with the use of the existing Western Basin reclamation area. The key reasons for the WBE reclamation area scoring higher that the other placement options in the Supplementary DMPOI MCA process were that the site has:

- The highest potential to accommodate the long term dredged material placement (beneficial reuse) objectives for the Port when compared to all other options
- The lowest potential impact to intertidal vegetation (i.e. mangroves) when compared to all other options
- Potential impacts to terrestrial vegetation and fauna that are lower than Port Central Expansion and West Banks Island Reclamation options, and comparable to those of Fisherman's Landing Expansion (South)
- Potential impacts to social and cultural heritage values (land use intent, community and recreational activities, amenity and traffic) are lower than the Port Central Expansion and West Banks Island Reclamation options, and comparable to those of Fisherman's Landing Expansion (South)
- Potential impacts to aquatic environmental values are lower than that of Fisherman's Landing Expansion (South)
- Potential impacts to economic values and objectives are lower than that of the Port Central Expansion and West Banks Island Reclamation options, and comparable to that of Fisherman's Landing Expansion (South).

A

Supplementary DMPOI MCA outcomes

Appendix A - Supplementary DMPOI MCA outcomes

Objectives, issues and aspects		Weighting (%)	Western Basin Expansion		Fisherman's Landing Expansion (South)		Port Central Expansion		West Banks Island Reclamation	
Objective	Issue/aspect		Score	W Score	Score	W Score	Score	W Score	Score	W Score
SCORING OF OPTIONS BY WEIGHTED ASPECT										
1. Aquatic environmental objectives										
1.1	Intertidal vegetation	12	5	60	4	48	4	48	3	36
1.1	Seagrass (direct impacts)	16	3	48	2	32	3	48	5	80
1.2	Seagrass (indirect impacts)	12	3	36	2	24	3	36	5	60
1.2	Macroinvertebrate habitat	12	2	24	3	36	2	24	2	24
1.2	Acid sulfate soils	12	4	48	4	48	4	48	5	60
1.3	Marine fauna	12	3	36	3	36	4	48	2	24
1.3	Migratory birds	12	2	24	3	36	4	48	3	36
1.3	OUV of GBRWHA (biodiversity conservation values)	12	3	36	3	36	4	48	2	24
Total		100	312		296		348		344	
Rank			3		4		1		2	
2. Terrestrial environmental objectives										
2.1	Terrestrial vegetation	33	5	165	5	165	3	99	3	99
2.1	Terrestrial fauna	33	5	165	5	165	3	99	3	99
2.2	Amenity (World Heritage Values - aesthetics)	34	2	68	3	102	3	102	2	68
Total		100	398		432		300		266	
Rank			2		1		3		4	
3. Social and cultural heritage objectives										
3.1	Strategic land use intent	12	5	60	5	60	4	48	2	24
3.2	Community and recreational activities	12	5	60	5	60	2	24	4	48
3.2	Amenity (air, noise, vibration)	12	5	60	5	60	3	36	3	36
3.2	Amenity (visual)	12	5	60	5	60	3	36	2	24
3.2	Traffic	12	5	60	5	60	3	36	3	36
3.3	Amenity (World Heritage Values - human appreciation/enjoyment)	12	3	36	3	36	3	36	2	24
3.4	Indigenous cultural heritage	16	4	64	4	64	4	64	4	64
3.4	Non-indigenous cultural heritage	12	4	48	4	48	4	48	4	48
Total		100	448		448		328		304	
Rank			1		1		3		4	
4. Economic objectives										
4.1	Commercial and recreational fishing	40	2	80	2	80	3	120	3	120
4.2	Dredging costs	30	2	60	2	60	3	90	4	120
4.2	Reclamation area establishment and dredged material placement costs	30	2	60	2	60	2	60	1	30
Total		100	200		200		270		270	
Rank			3		3		1		1	
5. Long term dredged material placement (beneficial reuse) objectives										
5.1	Capacity of placement area	15	6	90	3	45	4	60	5	75
Total			90		45		60		75	
Rank			1		4		3		2	
SCORING OF OPTIONS BY WEIGHTED OBJECTIVE CATEGORY										
1. Aquatic environmental objectives		27	312	8424	296	7992	344	9288	344	9288
2. Terrestrial environmental objectives		20	398	7960	432	8640	300	6000	266	5320
3. Social and cultural heritage objectives		18	448	8064	448	8064	266	4788	304	5472
4. Economic objectives		20	200	4000	200	4000	270	5400	270	5400
5. Long term dredged material placement (beneficial reuse) objectives		15	90	1350	45	675	60	900	75	1125
Total		100		29,798		29,371		26,376		26,605
Rank			**1**		**2**		**4**		**3**	

Table note: W Score - Weighted score (objective weighting x score)

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