FLANAGAN CONSULTING GROUP
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Ports North

CAIRNS SHIPPING DEVELOPMENT PROJECT

Revised Draft Environmental Impact Statement

Chapter B18: Cumulative Impacts Assessment

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B18.1 Introduction

B18.1.1 Overview

This chapter considers potential cumulative environmental and social impacts and ecosystem resilience in the assessment of the Cairns Shipping Development Project (the CSD Project), particularly in the context of the Great Barrier Reef World Heritage Area (GBRWHA). In common with the Strategic Assessment of the GBR (GBRMPA 2014a), the Great Barrier Reef World Heritage Area (GBRWHA), Great Barrier Reef Marine Park (GBRMP), and the GBR Region are jointly referred to as the 'GBR' for convenience. These terms and the areas covered are defined in **Chapter B2** (Nature Conservation Areas) and **Chapter 19** (EPBC Act Issues).

Section B18.1.2 and **Section B18.1.3** of this chapter outline the key requirements of the Commonwealth EIS Guidelines and Queensland Government's Terms of Reference (ToR) for the project in regard to cumulative impacts and ecosystem resilience. These requirements form the basis for the discussion of cumulative impacts and resilience within this chapter. However, in broad terms, the cumulative impacts assessment (CIA) task can be summarised as follows:

- take into account interactive and cumulative effects from other existing and potential projects and activities including by Ports North and/or other proponents and developers, that combined with the CSD Project, may cause an impact on the environment
- appreciate consequential impacts that may arise from the project
- consider ecosystem resilience at regional and local scales and how the project may potentially affect these ecosystems
- assess impacts on the controlling provisions of the EPBC Act at the local, regional, state, national, and international scale.

Ecosystem resilience has been considered as part of the impact assessment in each of the relevant Revised Draft EIS chapters in Part B and cross references, where necessary, are made to the specific chapters in relation to the potential cumulative impacts on a specific aspect of the environment. The focus of this chapter is on the interactive effects on resilience, i.e. how separate impacts may interact and affect resilience.

A separate and distinct cumulative impact risk assessment has not been reproduced in this chapter as the impact assessment methodology used throughout the EIS (as described in **Chapter A1** (Introduction)) already employs a risk-based approach to assessment. The assessment summary tables from each chapter provide a summary of residual risk levels for each impacting process or value. The findings from the assessment summary tables have been used in the preparation of the CIA presented in this chapter. However, some explanation of the risk assessment framework is necessary to explain the concepts and terminology used. An overview is provided in **Section B18.2.6**.

B18.1.2 Terms of Reference (Queensland Government)

The principal Queensland Government ToR that apply to the CIA are as follows:

- Section 5 states that the EIS must describe any cumulative impacts on environmental values caused by the project, either in isolation or in combination with other known existing or planned projects.
- Section 5.4.2 states that the EIS must consider potential impacts on terrestrial fauna, relevant wildlife habitat and other fauna conservation values, including cumulative effects of direct and indirect impacts.
- Section 9 states that the EIS must summarise the project's cumulative impacts and describe these impacts in combination with those of existing or proposed projects publicly known or advised by the Office of the Coordinator-General to be in the region, to the greatest extent practicable. Assess cumulative impacts with respect to both geographic location and environmental values. In particular, address cumulative impacts in sensitive environmental areas.
- Section 9 also requires explanation of the methodology used to determine the cumulative impacts of the project, detailing the range of variables considered (including relevant baseline or other criteria upon which the cumulative aspects of the project have been assessed, where applicable).

- Section 10 requires consideration of the cumulative impacts (both beneficial and adverse) of the project from a life-of-project perspective, taking into consideration the scale, intensity, duration and frequency of the impacts to demonstrate a balance between environmental integrity, social development and economic development.

Other ToR are also relevant and these are discussed where appropriate below.

B18.1.3 EIS Guidelines (Commonwealth Government)

The principal Commonwealth Government EIS guidelines that apply to the CIA are as follows:

- Section 5.10 states that, when discussing potential impacts, consideration be given as to how the interaction of extreme environmental events (e.g cyclones, coral bleaching, flood events) and any related cumulative impacts may impact on the proposal and the environment (both independently and cumulatively).
- Section 5.10.7 states that the EIS must identify and address cumulative impacts, where potential project impacts are in addition to existing impacts of other activities (including known current and future expansions or developments by the proponent and other proponents in the region and vicinity).
- Section 5.10.7 also states the EIS must address the potential cumulative impact of the proposal on ecosystem resilience. The cumulative effects of climate change impacts on the environment must also be considered in the assessment of ecosystem resilience. Where relevant to the potential impact, a risk assessment must be conducted and documented. The risk assessment must include known future expansions or developments by the proponent and other proponents and known impacts on ecosystem resilience, Matters of National Environmental Significance (MNES) and Commonwealth land.
- Section 5.10.7 requires cumulative impacts should be considered in terms of the following activities:
  - Existing, planned or potential developments of a similar type and scale to the proposed development that have been approved within the last five years or are still under assessment, with emphasis on those in the region that have, will have or are likely to have impacts on the same MNES and Commonwealth land.
  - Any current or likely development precincts or zones in the region.
  - Impacts of other tourism, residential, industrial and infrastructure projects both directly and indirectly related to the proposal in a regional context.
  - Existing and known and/or predicted increases in shipping in the region.
  - Discussion and analysis of the cumulative impacts of this proposal on the integrity and Outstanding Universal Value (OUV) of the GBRWHA.
  - Discussion of any potential future changes to the development which are likely to change the nature or scale of environmental impacts.
  - If existing impacts on the environment in general and MNES and Commonwealth land will be amplified by the action in combination with impacts of other projects.
  - Discussion of the developments and activities which are likely to be facilitated by the proposal.
  - Identify if the resulting impacts on the general environment, ecosystems and MNES and Commonwealth land could be unacceptable.
  - Identify if these impacts on the general environment, ecosystems, MNES and Commonwealth land could be permanent. If the impacts on MNES and Commonwealth land are not permanent, describe how long it will take before recovery from the effect.
  - Describe how the cumulative impact of the project will impact on the reproductive capacity and/or survival of listed threatened and migratory species.
  - Explain how much recovery of MNES and Commonwealth land population, habitat, ecosystems, and the environment in general could occur, with and without mitigation (e.g complete, partial, none).
  - Describe how soon restoration of habitat could be achieved to reinstate ecosystem function for MNES.
  - Where possible, identify how much likely change to MNES and Commonwealth land exceeds natural variability in the region.

- Describe how this project will contribute to the desired conservation objectives for MNES.
- Describe how housing, workforce and local and regional community changes as a result of the development.
- In conducting the risk assessment, key information sources and indicators for assessing change and impact must be described.

- Section 5.10.8 requires assessment of impacts on the controlling provisions of the EPBC Act at the local, regional, state, national, and international scale. These are described in **Chapter B19** (EPBC Act Issues).
- In regard to dredging and dredge material disposal related impacts, Section 5.10.9 of the EIS Guidelines states that cumulative impacts of the entire dredge operation and likely maintenance dredging requirements must be described.
- Section 5.11 of the EIS Guidelines states that the EIS must provide information on proposed avoidance, safeguards and mitigation measures to deal with the impacts of the action. Particular focus must be given to how any avoidance, safeguards, management and mitigation measures will increase resilience of the environment, ecosystems and MNES and Commonwealth land within the region.

B18.1.4 The Study Area and Project Areas

The 'study area' for the EIS varies depending on the issue at hand while the 'project area' is the immediate footprint of the proposed works. For the consideration of cumulative impacts, the following definitions apply.

The Study Area is shown variously on **Figure B18-1** and encompasses:

- The whole of WHA scale (not mapped) – this scale can be defined as the Great Barrier Reef World Heritage Area (GBRWHA) including both nearshore and offshore areas as well as the Wet Tropics (of Queensland) World Heritage Area (WTWHA). This scale of assessment is relevant in the context of the project affecting, for example, a key aspect of the Outstanding Universal Value (OUV) of a world heritage property as a whole or otherwise causing impacts that could result in the property no longer meeting its nomination criteria. The concept of OUV is described in **Chapter 19** (EPBC Act Issues).
- The regional scale (**Figure B18-1**):
  - In terms of marine issues, this is defined as being a subset of the Wet Tropics region of the GBRWHA, extending north of Cairns to the Bloomfield River and south to Mission Beach (Dunk Island). This regional classification has been chosen on the basis that the condition of water quality, seagrass, and coral within this region is reported as part of the Great Barrier Reef Report Card 2012/2013 within the 'Reef Water Quality Protection Plan – Marine Results' published by the Australian and Queensland Governments. [GBR Outlook Report 2014 (GBRMPA 2014b)]
  - For terrestrial issues, the regional scale includes areas between the WTWHA and the ocean.

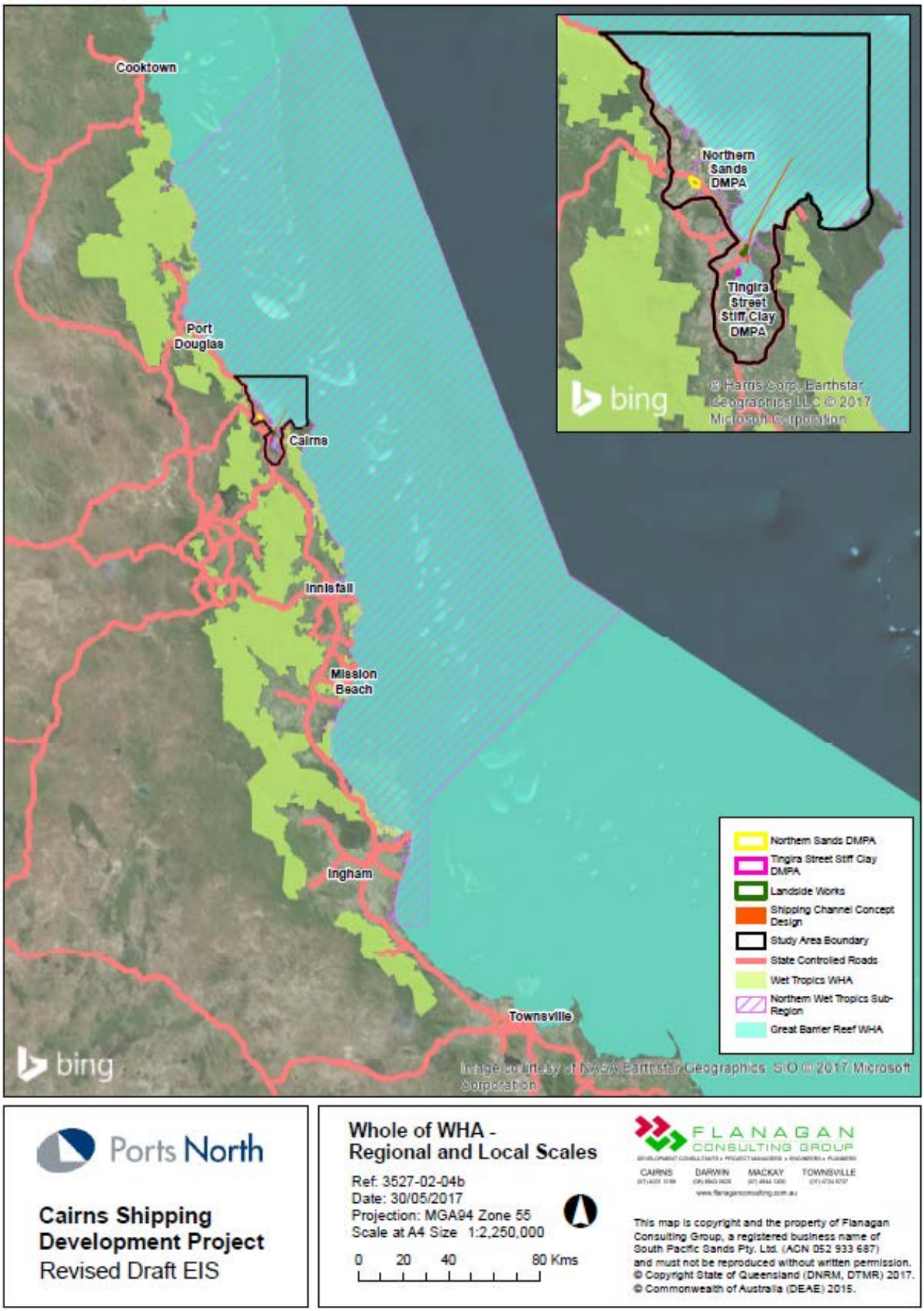

Figure B18-1 Whole of WHA, Regional and Local Scales.

- The local scale (**Figure B18-2**)
  - The township of Cairns.
  - The marine environment including the Trinity Inlet, Trinity Bay and surrounding waters including:
    - all waters of Trinity Bay
    - the tidal waters of Trinity Inlet, including landward areas to the boundary of the Fish Habitat Area
    - Double Island
    - the coastline and nearshore waters of Cairns' Northern Beaches
    - Mission Bay
    - the coastline extending to Cape Grafton.

Project areas are also shown on **Figure B18-2** and encompass:

- Channel Project Area including the shipping channel and the route to the pump out point at the seaward end of the pipeline to the Northern Sands DMPA.
- Landside Works Project Area for wharf upgrades and berthing of cruise ships.
- Northern Sands Project Area (includes the DMPA, delivery pipeline corridor, tailwater ponds, and tailwater outlet works).
- Tingira Street Project Area (essentially the Tingira Street DMPA).

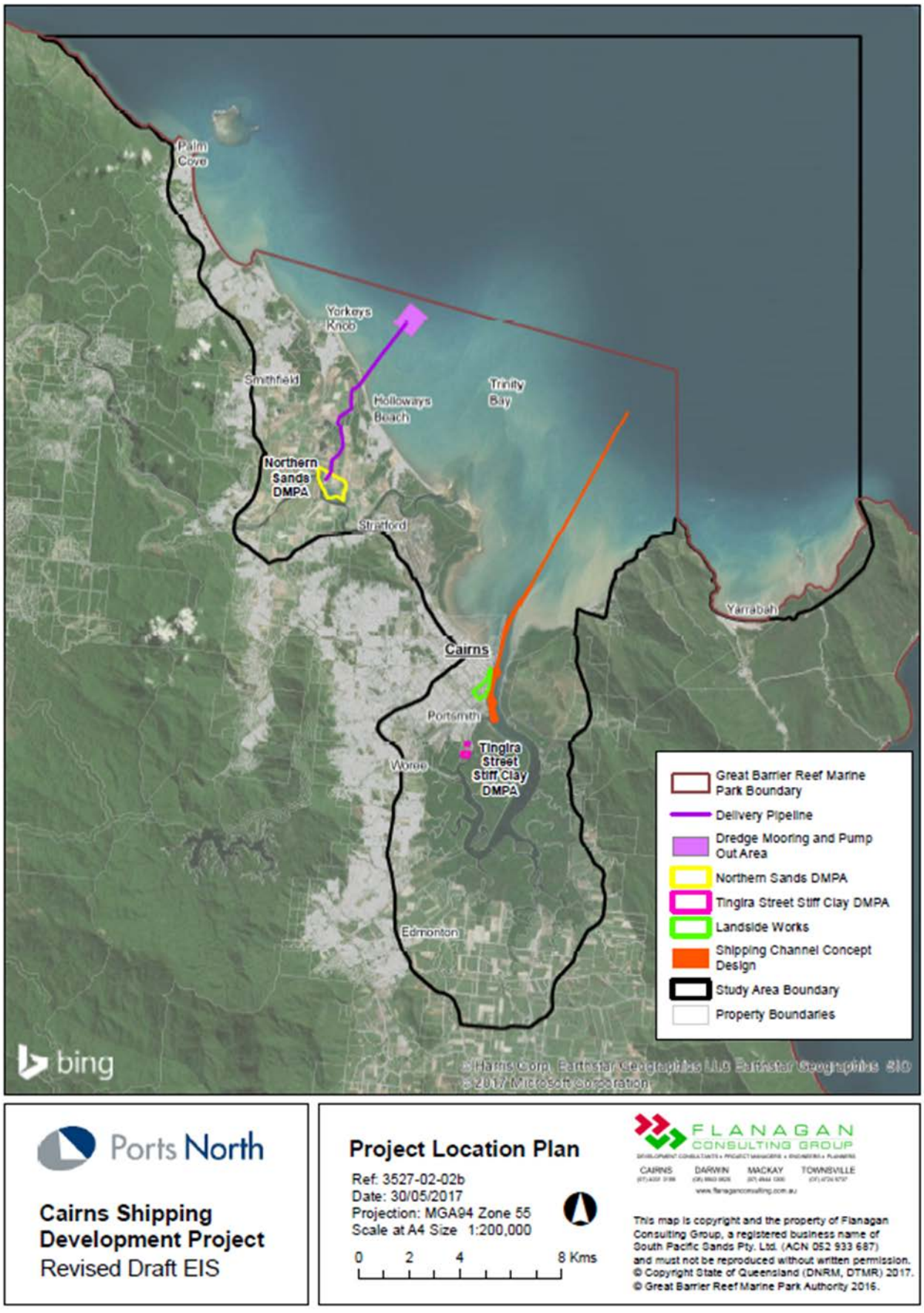

Figure B18-2 Study Area and Project Areas.

B18.1.5 End Use of DMPAs

End uses of the DMPAs are briefly described below because an appreciation of these is critical to the assessment of impacts. As these are also relevant to consequential impacts, more detail is provided later in this chapter (**Section B18.5.6**).

B18.1.5.a Northern Sands DMPA

The soft clay placement campaign will fill all or most of the void over a period of some three months and then settle over a further year or so. Once this filling is complete, the DMPA will revert to the control of the owner who will then determine subsequent uses. No assumptions can be made about this use although current approvals imply that at some time the void is to be completely filled.

B18.1.5.b Delivery Pipeline

Soft clay will be delivered to the DMPA via the dredge material delivery pipeline which commences at the offshore dredge mooring and pump out facility located approximately 2.8 km offshore from Yorkeys Knob. The marine section of the pipeline will be submerged, while the landward section will be constructed above ground and suspended on low (<0.5 m) earthen plinths. Up to three booster stations may be necessary because of the pipeline length. Booster stations will be placed in cleared grassland areas or cane headlands in consultation with landowners, to minimise interference with farming operations.

After the completion of the soft clay placement campaign, the inlet pipeline (landward and marine sections) and booster stations will be disassembled and removed. The disturbed area will be restored and the small amount of natural vegetation cleared for its construction will be rehabilitated using appropriate native species as described in **Chapter C1** (Construction Environmental Management Plan). A specific Restoration Plan will be prepared during the approvals phase and implemented for this purpose.

B18.1.5.c Tailwater Discharge Pipeline(s)

Similarly, the tailwater discharge pipelines will be disassembled and removed and the disturbed area restored and rehabilitated as described in **Chapter C1** (Construction Environmental Management Plan).

B18.1.5.d Tailwater Ponds

When no longer required, the tailwater ponds will be filled and the disturbed area restored such that the area can be re-used for its existing use. No rehabilitation will be necessary.

B18.1.5.e Tingira Street Project Area

The Tingira Street DMPA is currently cleared (although some marine plants have recolonised much of the area not covered by anthropogenic grasslands) and in its past has been filled to above Highest Astronomical Tide. The placed stiff clay will be used to fill and preload the site to accelerate settlement. As a separate project, Ports North intends to import additional fill and construct industrial hardstands and other infrastructure. This project has been under consideration for many years and most of the necessary approvals have already been obtained.

B18.2 Methodology

B18.2.1 Overview

The methodology used in this chapter involves:

- consideration of types of impacts (including cumulative and consequential)
- definition of assessment scales for considering various types of impacts
- overview of the existing situation of the CSD Project Study Area and the broader GBR in terms of the various actions that could be relevant to this CIA (in addition to completed or proposed projects this includes activities that currently put the values of the GBR at risk and could therefore interact with the CSD Project).

Regarding this last point, considerable use is made of the findings of the Strategic Assessment of the GBR (GBRMPA 2014a) regarding the impacts of past and current activities on the values of the GBR (this provides a context for considering the impacts of the CSD Project and other projects). In summary, the assessment investigates the interaction of the CSD Project and other potential projects / activities in terms of the impacts of concern determined by GBRMPA (2014a).

While cumulative and consequential impacts of the CSD Project and these other projects are addressed in **Section B18.4 and Section B18.5**, the methodology assumes that actual or likely impacts of other projects and activities are or will be part of the 'existing situation' with respect to the CSD Project.

This assessment highlights the prospective cumulative impacts or cumulative risks on MNES (to address the EIS Guidelines) and Matters of State Environmental Significance (MSES) (to address the Queensland Government ToR), both as listed previously.

B18.2.2 Types of Impacts

At the broad level, impacts can fall into one or more of the following categories:

- adverse and beneficial
- consequential / facilitated and cumulative
- short term and long term
- reversible and irreversible
- predictable and unpredictable.

For this CIA, it is relevant to refer to the Department of Sustainability, Environment, Water, Population and Communities' (SEWPaC) Interim Guidelines on the Outstanding Universal Value of the Great Barrier Reef World Heritage Area – for proponents of Actions (SEWPaC n.d.) where various types of impacts on the GBR are described:

- Direct impacts may include for example direct clearing of vegetation and habitat, construction of buildings and impacts to water quality through runoff.
- Indirect and/or consequential impacts may include, but are not limited to, the risk of weed invasion, pollution, noise, increased boat strike on marine fauna and increased impacts from recreational activities, such as fishing. The department may also consider road upgrades and supporting water and power infrastructure and the possibility that urban development and population growth may be encouraged in the surrounding region as a result of the proposed development. Consideration may also be given to changes to the shoreline as a result of land reclamation.
- Cumulative impacts which may be considered include coastal development (including habitat loss and degradation, and underwater noise) and changing landscape character, catchment runoff (creating greater accumulation of toxins and bacteria), climate change impacts such as extreme weather events and the combined effects of the proposed development in light of these.

In the strategic assessment of the GBR (GBRMPA 2014a) defined the following types of impacts:

- Direct impacts — where the loss or modification of values is a direct result of an action within the strategic assessment area (for example, dredging and disturbing wildlife). Indirect impacts — can be either:
  - from actions outside the strategic assessment area with 'downstream' effects in the area (for example, modifying supporting terrestrial habitats, urban and industrial discharge)
  - as a result of another direct impact (for example, an oil spill resulting from the grounding of a ship).
- Consequential impacts — where the impact arises from an action made possible by an initial direct impact (for example, anchor damage from ships now able to visit an area after dredging).
- Cumulative impacts — the successive and combined effects of impacts on the environment, taking into account direct, indirect and consequential impacts and the incremental and compounding effects of these impacts over time. (p6-4)

Direct, indirect and consequential impacts are diagrammatically represented in Figure 6.1 from GBRMPA (2014a) reproduced below as **Figure B18-3**.

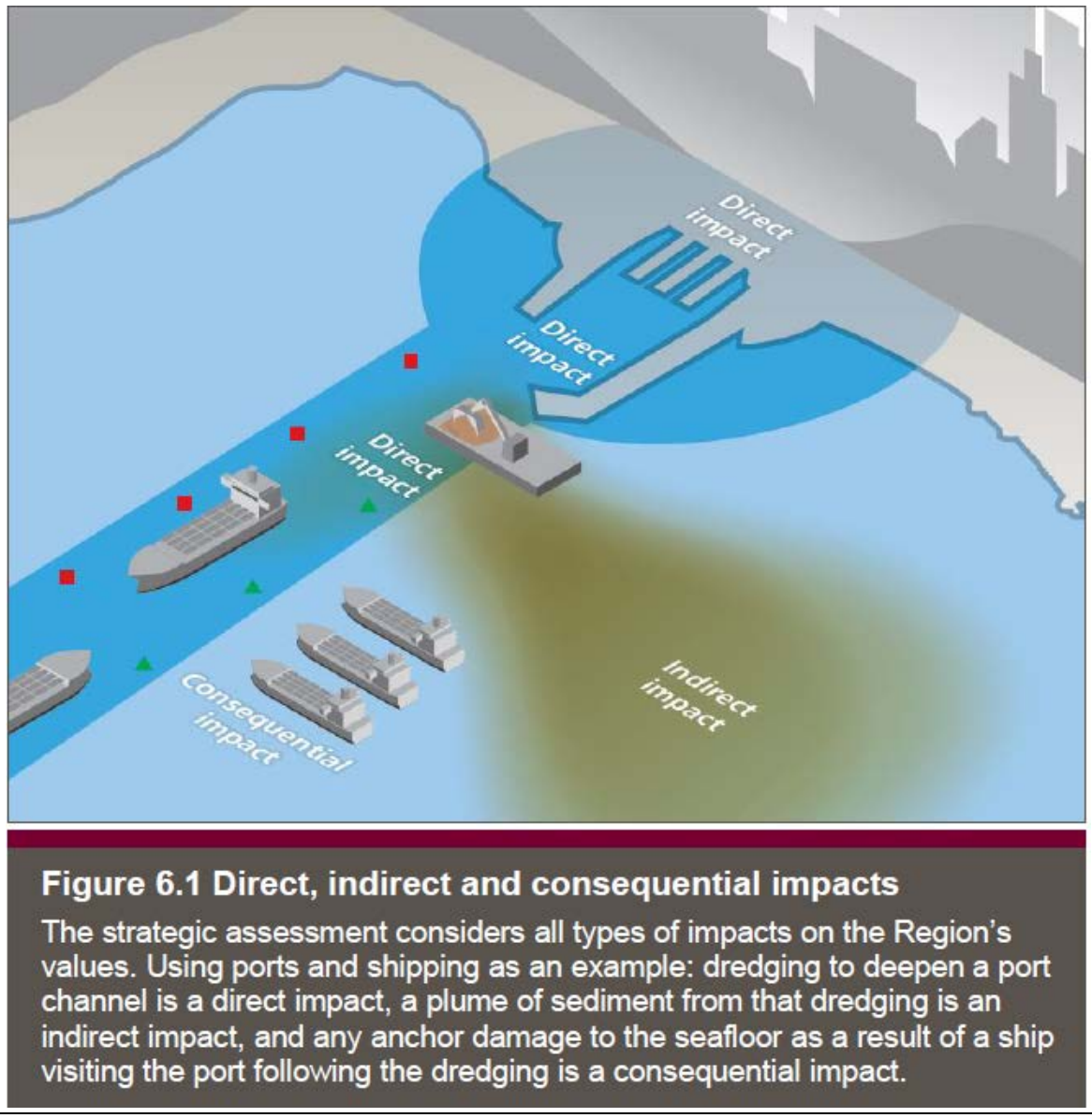

Figure B18-3 Types of impacts.

Source: GBRMPA (2014a) Figure 6.1.

B18.2.3 Cumulative Impacts

The GBR Strategic Assessment (GBRMPA 2014a) provides the following definitions that have been adopted for the purposes of this chapter:

- Cumulative impact: The impact on the environment resulting from the effects of one or more impacts, and the interactions between those impacts, added to other past, present, and reasonably foreseeable future pressures.
- Cumulative risk: The combined risks to the environment by multiple impacts.

B18.2.4 Consequential Impacts

The GBR Strategic Assessment (GBRMPA 2014a) does not specifically define consequential impacts, but cites some examples documented above, namely:

- being where the impact arises from an action made possible by an initial direct impact (for example, anchor damage from ships now able to visit an area after dredging)

The Interim Guidelines (SEWPaC no date) note that consequential impacts:

- include weed invasion, pollution, noise, increased boat strike on marine fauna and increased impacts from recreational activities, such as fishing.

According to the Matters of National Environmental Significance: Significant Impact Guidelines 1.1 produced by the Department of the Environment (DoTE 2013c) in considering consequential impacts:

> It may be helpful to consider the following:
> - 'But for' the proposed action would the indirect impacts occur?
> - Is the proposed action a 'material and substantial' cause of the indirect impacts?
> - Are the potential impacts of any subsequent or third party actions known, or would they be expected to be known, by the person proposing to take the action (particularly where the subsequent or third party actions are an intended outcome of the proposed action)?
>
> If the answer to these questions is 'yes', then it is necessary to consider whether these impacts are likely to occur, and whether they are likely to have a significant impact on a matter of national environmental significance. (p6)

For the purposes of this chapter, consequential impacts are those that arise as a result of the project, particularly in the long term. The EIS Guidelines and Queensland ToR require consideration of any likely impacts development may facilitate on the relevant MNES and MSES at relevant local, regional, state, national and international scales.

B18.2.5 Assessment Scales

As required by the ToR, the assessment of cumulative impacts considers three scales:

- whole of GBR
- northern Wet Tropics Sub-region (Lucinda to Bloomfield – see **Figure B18-1**)
- local area (CSD Project Study Area – see **Figure B18-2**)

This is a consistent approach taken in the strategic Assessment of the GBR which considers:

- reef-wide
- regional
- local.

B18.2.6 Impact Assessment Methodology

B18.2.6.a Risk-based Assessment

Impact assessment based on the following methodology has been undertaken for each of the matters described in the technical chapters of this Revised Draft EIS. This is the risk-based process adopted for the Revised Draft EIS as outlined in **Chapter A1** (Introduction) and includes an assessment of the following:

- the magnitude of impacts (consequence) as discussed below
- the duration of impact (from **Chapter A1** (Introduction)
- the likelihood of impact (from **Chapter A1** (Introduction)
- risk level (from **Chapter A1** (Introduction).

These are considered together to determine the final level of impact risk, which is described in **Table B18-5**. The details of **Table B18-1** and **Table B18-5** vary with the topic under consideration.

B18.2.6.b Impact Significance / Consequence Criteria

Table B18-1 describes consequences (sometimes referred to as significance criteria). These vary depending on the topic under consideration. The following table is for MNES (see **Chapter 19** (EPBC Act Issues)).

TABLE B18-1 CONSEQUENCE CRITERIA

IMPACT CONSEQUENCE	DESCRIPTION OF CONSEQUENCE
Very High	The impact is considered critical to the decision-making process. Value/s of a World Heritage property suffer/s permanently damaged serious or irreversible environmental damage to the extent that the area requires reclassification, or where value/s is/are permanently lost (e.g. if the OUV of the GBRWHA suffered serious or irreversible environmental damage or a key attribute underpinning listing of the site is lost or permanently modified). Irreversible or long-term (i.e. greater than decades) loss or diminishment of important habitats or communities that lead to major flow on effects to biodiversity values and ecosystem functioning at a regional (Cairns wide) scale. Severe impacts to populations of listed threatened species, such that their capacity to reproduce and recover is significantly affected.
High	The impact is considered likely to be important to decision-making. Impacts tend to be permanent or irreversible or otherwise long to medium term. Impacts can occur over large or medium scale areas. High to moderate sensitivity of environmental receptors to impact (e.g. fragmentation or partial loss of populations of EPBC listed threatened flora or substantial loss of OUV). Mortality of a several individuals of internationally/nationally threatened species, but no detectable change to population status or the capacity of populations to recover.
Moderate	The effects of the impact are relevant to decision-making including the development of environmental mitigation measures. Impacts can range from long term to short term in duration. Impacts can occur over medium scale areas or otherwise represents a significant impact at the local scale. Moderate sensitivity of environmental receptors to impact (e.g. removal or significant reduction in the extent of suitable habitat assessed as 'high suitability' for EPBC listed threatened flora across the site). Loss of several individuals, or temporary loss of life history function for threatened species, or species of high fisheries or otherwise ecological value, but no detectable change in their population status at local (study area and surrounds) spatial scales (e.g. once off interruption of breeding or spawning, not necessarily affecting all of local population).

IMPACT CONSEQUENCE	DESCRIPTION OF CONSEQUENCE
Minor	Impacts are recognisable / detectable but acceptable. These impacts are unlikely to be of importance in the decision making process. Nevertheless, they are relevant in the consideration of standard mitigation measures. Impacts tend to be short term or temporary and /or occur at local scale (e.g. reduction in the extent of suitable habitat assessed as 'high suitability' for EPBC listed threatened flora across the site, however replacement habitat will be provided). Short term (i.e. duration of dredge campaign, less than one year) changes to the distribution of threatened species or species of high fisheries significance (i.e. avoidance of areas), but no long-term effects to local population status.
Negligible	Minimal change to the existing situation. This could include, for example, impacts which are beneath levels of detection, impacts that are within the normal bounds of variation, or impacts that are within the margin of forecasting error.
Beneficial	Impacts have a positive outcome on the existing situation. This could include, for example, an improvement in ecosystem values, integrity, or resilience.

Source: Chapter 19 (EPBC Act Issues) (Table B19-9)

B18.2.6.c Duration of Impacts

Table B18-2 shows the general approach to classifying the duration of identified impacts. This applies to all topics and is identical to that contained in **Chapter A1** (Project Introduction).

TABLE B18-2 CLASSIFICATIONS OF THE DURATION OF IDENTIFIED IMPACTS

RELATIVE DURATION OF IMPACTS	
Temporary	Days to months
Short Term	Up to one year
Medium Term	From one to five years
Long Term	From five to 50 years
Permanent / Irreversible	In excess of 50 years

B18.2.6.d Likelihood

Likelihood of risk is described in **Table B18-3** below. This applies to all topics and is identical to that contained in **Chapter A1** (Project Introduction).

TABLE B18-3 LIKELIHOOD OF IMPACT

CATEGORY	DEFINITION
Almost Certain	Very likely to occur during construction or the operational phases.
Likely	Likely to occur during construction or operational phases.
Possible	Less than likely to occur but still appreciable with the probability of occurrence rated above 50 percent.
Unlikely	May occur during construction or during the life of the project with the probability of occurrence being below 50 percent, but not negligible.
Highly Unlikely/Rare	Highly unlikely to occur but theoretically possible.

B18.2.6.e Risk Matrix

Risk is described as the product of likelihood and consequence as shown in **Table B18-4** below. This applies to all topics and is identical to that contained in **Chapter A1** (Project Introduction).

TABLE B18-4 RISK MATRIX

LIKELIHOOD	CONSEQUENCE				
	Negligible	Minor	Moderate	High	Very high
Highly Unlikely/ Rare	Negligible	Negligible	Low	Medium	High
Unlikely	Negligible	Low	Low	Medium	High
Possible	Negligible	Low	Medium	Medium	High
Likely	Negligible	Medium	Medium	High	Extreme
Almost Certain	Low	Medium	High	Extreme	Extreme

B18.2.6.f Risk Rating

The rating of risk as assessed above is as shown in **Table B18-5** below. These vary depending on the topic under consideration. The following table is for MNES (see **Chapter 19** (EPBC Act Issues)).

TABLE B18-5 RISK RATING LEGEND

Extreme Risk	An issue requiring change in project scope; almost certain to result in a 'significant' impact on a Matter of National or State Environmental Significance (including OUV and integrity)
High Risk	An issue requiring further detailed investigation and planning to manage and reduce risk; likely to result in a 'significant' impact on a Matter of National Significance (including OUV and integrity)
Medium Risk	An issue requiring project specific controls and procedures to manage
Low Risk	Manageable by standard mitigation and similar operating procedures
Negligible Risk	No additional management required

Source: Source: Chapter 19 (EPBC Act Issues) (Table B19-13).

B18.3 Existing Situation

B18.3.1 Introduction

As described in the discussion on the methodology for this chapter, the 'existing situation' with respect to cumulative impacts of the CSD Project and other projects or activities is the existing environment (which, prior to construction of the works, will already include the impacts of existing projects and activities in the Study Area). Attributes and values of the existing environment for the purposes of this chapter have been described in other chapters of Part B of this Revised Draft EIS and are referred to where appropriate. In the balance of this section, a description is provided of:

- current and proposed major projects segregated into:
  - port expansion projects in the GBR
  - other projects in the Northern Wet Tropics Area but outside the Study Area
  - other projects in within or near the Study Area
- current and proposed activities (i.e. actions already underway that could affect the GBR environment, and including agriculture, tourism, and other actions in the GBR catchment)
- the findings of the Strategic Assessment of the GBR (GBRMPA 2014a) and 2014 Outlook Report (GBRMPA 2014b) with respect to existing actions and threats on the GBR.

B18.3.1.a Projects and Activities

Projects

In terms of (future) projects, this CIA uses information available in the public domain including government websites (Queensland Department of State Development, GBRMPA, etc.), media sources, and specific project websites where relevant, to both identify current or prospective projects/developments and characterise impacts associated with third party developments. Information sources include draft and final EIS documents, approvals and associated conditions, and similar documentation.

These projects have been identified at GBR, regional, and local scales (see **Section B18.2.5**) and their potential for cumulative impacts with the proposed project has been determined by the following:

- proposed development type, magnitude and timing
- geographic location and potential receiving environment for any impacts (considering the scale of impacts as determined by **Table 18-7**)
- potential processes which may impact the same receiving environments as the project, most notably the marine environments of the GBR.

A search of available public information has identified a number of planned, proposed, or recently approved developments that should be considered in the context of this CIA. Their potential relevance at a GBR, regional, and local level (as described in **Section B18.2.5**), is discussed below.

Activities

Existing impacts on the values of the GBR are not restricted to current or proposed projects – there are existing threats that arise from diffuse sources (i.e. activities that take place in the GBR catchment). These are addressed in the Reef 2050 Long-Term Sustainability Plan (Reef 2050) prepared by the Commonwealth Government (Commonwealth of Australia 2015) as an overarching framework for protecting and managing the Great Barrier Reef from 2015 to 2050. Reef 2050 refers to GBRMPA's Outlook Report 2014 (GBRMPA 2014b), stating that:

> The Outlook Report 2014 found the direct and flow-on effects of port activities, including dredging and the disposal of dredge material, generally occur in areas that are already under pressure from an accumulation of impacts. While port activities have a significant localised effect, these activities pose a relatively lower threat to the health of the broader World Heritage Area compared to, for example, the broadscale impacts from land-based run-off. (p3)

Further details of this and other relevant 'activity' issues are provided in **Section B18.3.3**.

B18.3.2 Other Projects

B18.3.2.a Proposed Port Expansion Projects in the GBR

Other ports are relevant in that they have impacts that could affect the values of the GBR. This applies to existing as well as proposed projects. There are 12 ports located within the Great Barrier Reef area including those at Quintell Beach, Cape Flattery, Cooktown, Cairns, Mourilyan, Lucinda, Townsville, Abbot Point, Mackay, Hay Point, Port Alma and Gladstone.

Three of these, Port of Townsville, Port of Abbot Point, and Port of Gladstone are currently undertaking major port expansion projects that involve capital dredge programs in or in close proximity to the GBRWHA. An overview of these projects is provided below.

Details

Port of Townsville (located ~ 280 km from Cairns)

The Port of Townsville Limited proposes the expansion of the Port of Townsville facilities including:

- New deepwater outer harbour.
- 6 x additional berths in new harbour.
- Deepening and widening of existing approach channels.
- Reclamation of 152 hectares of existing harbour for new berths, bulk cargo storage and a rail loop.
- The EIS was on public display until 13 May 2013. Following receipt of additional information in November 2016, the evaluation report on the EIS is being prepared (as of 18 June 2017).

Port of Abbot Point (located ~ 415 km from Cairns)

North Queensland Bulk Ports Corporation has a development approval for the expansion of the Port of Abbot Point facilities including:

- Expansion of the shipping channel requiring the capital dredging of approximately 3 M m^3.
- Expansion of terminals including Terminal O (TO), Terminal 2 (T2) and Terminal 3 (T3).
- Marine disposal of the dredge material, approximately 24 km from the dredge area. However, it is noted there is currently investigation of land-based placement options between the proponents and the relevant Government parties.

Following a review of expansion demand and alternatives for terminal expansions beyond the currently planned T0- T3 terminals, the Queensland Government undertook a Registration of Interest process for the allocation of further terminal capacity at the Port of Abbot Point, known as the AP-X Project.

2017 update:

- Stage 3. Duplication of the existing terminal infrastructure, which will double the Port of Abbot Point's capacity from 25 million tonnes per annum to 50 mtpa.
- CoG Recommended project proceed subject to conditions and recommendations.
- EPBC Act Recommended project proceed subject to conditions and recommendations.

Port of Gladstone (located ~ 960 km from Cairns)

Gladstone Ports Corporation proposes duplication of the existing Gatcombe and Golding Cutting shipping channels at the Port of Gladstone.

Expansion of the Port of Gladstone facilities includes:

- Duplication and expansion of the original shipping channel and swing basins requiring an estimated capital dredging of approximately 12 M m^3.
- The long-term disposal of dredged material associated with capital and maintenance dredging of all channels and berth pockets, land disposal and reclamation close to the foreshore are to be investigated under the EIS process.

2017 update:

- New channel with a length of 9.12 km, depth of RL -16.1m and width of 200 m (duplicating the existing Gatcombe and Golding Cutting Channel).
- Investigation of onshore and offshore locations for disposal of approximately 12 M m^3 of dredged spoil material.
- Relocation of existing, and placement of new, navigational aids for the channel duplication.
- EIS active.
- 23/5/16 change to project lapsing date 30 September 2017.

Comparison with Port of Cairns (CSD Project)

Overview

The following provides a summary of the CSD Project and comparison with other port expansion projects proposed within the vicinity of the GBR, in order to provide an appreciation of the commonality and differentiators of the CSD Project and their potential for cumulative benefit and impact.

The detailed assessments undertaken in the technical chapters of Part B of this Revised Draft EIS conclude that there are no aspects of the CSD Project predicted to have more than a negligible risk of impact at the whole of GBR (Reef-Wide) scale. Accordingly, although each port development project can be expected to have local to regional scale impacts, it is most unlikely that these will interact. There may, however, be cumulative impacts that do not involve interaction (i.e. those that GBRMPA has designated as being applicable at the Regional or Reef-wide level). See **Table 18-7**.

While the project involves dredging and placement of dredge material activities similar to these other port expansion projects, it is differentiated in a number of ways as described below.

Land Placement

The capital dredging project does not involve sea dumping, with all dredge material being proposed to be placed on land. All projects are subject to the prohibition on the placement of capital dredge material within the Great Barrier Reef Marine Park.

Absence of Reclamation

The project does not involve reclamation. The existing Cairns Cruise Liner Terminal (CCLT) facilities at the Trinity Wharves have been upgraded and are already suitable for accommodating the Mega class ships that could enter the Port after the project construction. No additional land reclamation works are identified as needed as part of the CSD Project or other Port projects (e.g. Cityport).

Creation of large areas of land through reclamation of tidal land and/or land filling processes are options that have been constructed as part of the Port of Gladstone Western Basin project and are proposed for the Port of Townsville Expansion Project. The Queensland Government and North Queensland Bulk Ports are also considering land disposal of some nature for the already approved Port of Abbot Point. In South-east Queensland, dredge material is being used to fill the port expansion reclamation area at the Port of Brisbane and extracted sand (not dredge material) from Moreton Bay is currently being used to fill intertidal and sub-tidal wetland areas of the Brisbane Airport for a New Parallel Runway.

As outlined in **Chapter A2** (Project Background), consideration was given to reclamation during the Options Report (**Appendix I**). This noted that under the *Sustainable Ports Development Act 2015* (Qld) section 36(2), any subtidal placement options or reclamation of land options within the GBRWHA needs to meet the 'beneficial reuse' test. It was concluded that beneficial reuse in reclamation situations for the CSD Project was restricted to either creating new habitat or new land for development of some type. The multi-criteria analysis documented in the Options Report concluded that, while coastal reclamation options scored well on tailwater and ground-related issues and, due to close proximity to the channel, have minimal pumping head, they scored poorly on several environmental attributes and coastal hazards. They were ruled out by the Options Report and have not been considered further.

The Draft EIS also considered this issue and noted that reclamation comes with its own range of environmental impacts including the permanent loss of habitat from converting the sea bed into land, the removal of areas from conservation estate (e.g. marine park, fish habitat area, and WHA), and the management of water quality from dredge tailwater / potential to spill placed fine material from semi-permeable bund walls.

Dredge Material Characteristics – Trinity Bay

The dredge material characteristics within and adjacent to the existing Cairns shipping channel in Trinity Bay are also different from other port projects. The bulk of sediments to be dredged by the project – while uncontaminated – are characterised by very fine clays, muds, and silts (90 – 95 percent fines content). This material has very different characteristics from the predominantly sandy material present at the Port of Abbot Point, the stiffer clays present at the Port of Townsville's Platypus Channel, and in Port Curtis adjacent to the Port of Gladstone.

However, the stiff clay component of the Cairns Harbour dredging is suitable for beneficial use on land as described in **Section B18.5.6**.

Chapter A3 (Dredge Material Placement Options) describes a number of studies into potential for beneficial use as landfill and these have consistently been noted to have significant constraints and beneficial use is not viable. The land-based disposal of the CSD Project soft clays does not provide any beneficial use. However, the stiff clays destined for the Tingira Street DMPA are considered suitable for supporting future infrastructure.

Shipping Movements

Unlike expanding bulk and break bulk cargo and LNG ports at Gladstone, Abbot Point, and Townsville, which involve a high volume of new cargo and LNG ships entering the GBRWHA, the CSD Project does not involve or foreshadow a significant increase in the number of large cargo ships coming to port.

The main increase in shipping will involve cruise ships as described in detail in **Chapter A2** (Project Background). According to the 2016 shipping demand update (**Appendix H**), the total number of cruise ships visiting Cairns and Yorkeys Knob was reported to be 65 in 2016. Focusing on Trinity Wharf where the majority of growth in cruise shipping is expected to take place, the Business as Usual (BaU) situation is that by 2026 it

is expected that 81 cruise ships will visit Trinity Wharf annually. With the implementation of the CSD Project and based on the assumptions stated in **Chapter A3** (Project Description), the number will be 148. This represents a compound growth rate of approximately 6% annually.

The majority of these additional ships are expected to be relatively new vessels, crewed by competent international crews, and subject to international maritime and environmental requirements including the Australian Marine Safety Authorities' (AMSA) North East Shipping Management Plan (discussed in more detail later in **Section B18.5.2**). The safe management of the additional number of cruise ship transits through the GBR is well within the existing capabilities of Marine Safety Queensland's Vessel Traffic Safety systems (including ReefVTS).

Re-suspension of Fine Sediments

The environmental impacts from the project, such as the generation and dispersion of fine sediment from dredging and placement, have demonstrated in **Chapter B5** (Marine Water Quality) and **Chapter B3** (Coastal Processes) to be highly localised in nature. This is in large part due to strategies to:

- Undertake the capital dredging with a TSHD that operates under constrained overflow conditions (operating the dredge in this manner will limit the amount of fine material available for resuspension with the principal sources of plume generation during dredging coming from the operation of the drag head and propeller action of the vessel).
- Adopt land-based disposal of soft clays, avoiding any risk of resuspension.

The land-based placement strategy responds specifically to science-based statements made in the Outlook Report (GBRMPA 2014b) and Strategic Assessment (GBRMPA 2014a) that there is uncertainty about the extent of resuspension of dredged sediment from at-sea placement and the projected distances such sediment can mobilise (refer GBRMPA 2014b, p258).

Past Performance of Port Dredging Projects

Ports Australia released a report in April 2014 to examine approval processes associated with dredging and at-sea placement in subtropical and tropical ports (Ports Australia 2014b). The report specifically examined the nature of environmental monitoring programs associated with recent port-related dredging projects in Queensland, the Northern Territory, and Western Australia, and the performance of these projects against monitored environmental impacts from EIS and other approval documents.

A key finding of the study was that monitoring programs associated with recent dredging showed 'recorded impacts consistent with (generally no impact to a sensitive receptor), or less than, those approved or predicted'. Even in the two case studies where turbidity exceedances were observed (one being the case of recent dredging and reclamation at the Port of Gladstone), ecological monitoring did not indicate impacts to sensitive receptors such as seagrass (Ports Australia 2014b).

This study reinforces the finding that existing assessment, management and environmental monitoring processes associated with port dredging projects in Queensland have not resulted in unapproved impacts to environmental resources of high conservation value and that generally, the impacts that have eventuated have been consistent with those predicted by EIS documentation and approved by regulatory agencies.

B18.3.2.b Northern Wet Tropics Sub-Region

There are several major developments in planning or under construction along or near the coastline and within the catchments of the Northern Wet Tropics Sub-Region (see **Figure B18-1**).

Coordinated Projects

Coordinated projects are declared under the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act). Coordinated projects both 'current' and 'completed' (i.e. in terms of assessment, not necessarily constructed) within the Northern Wet Tropics Sub-Region are shown on **Figure B18-4** and described below. All of these are also addressed by the EPBC Act approvals process.

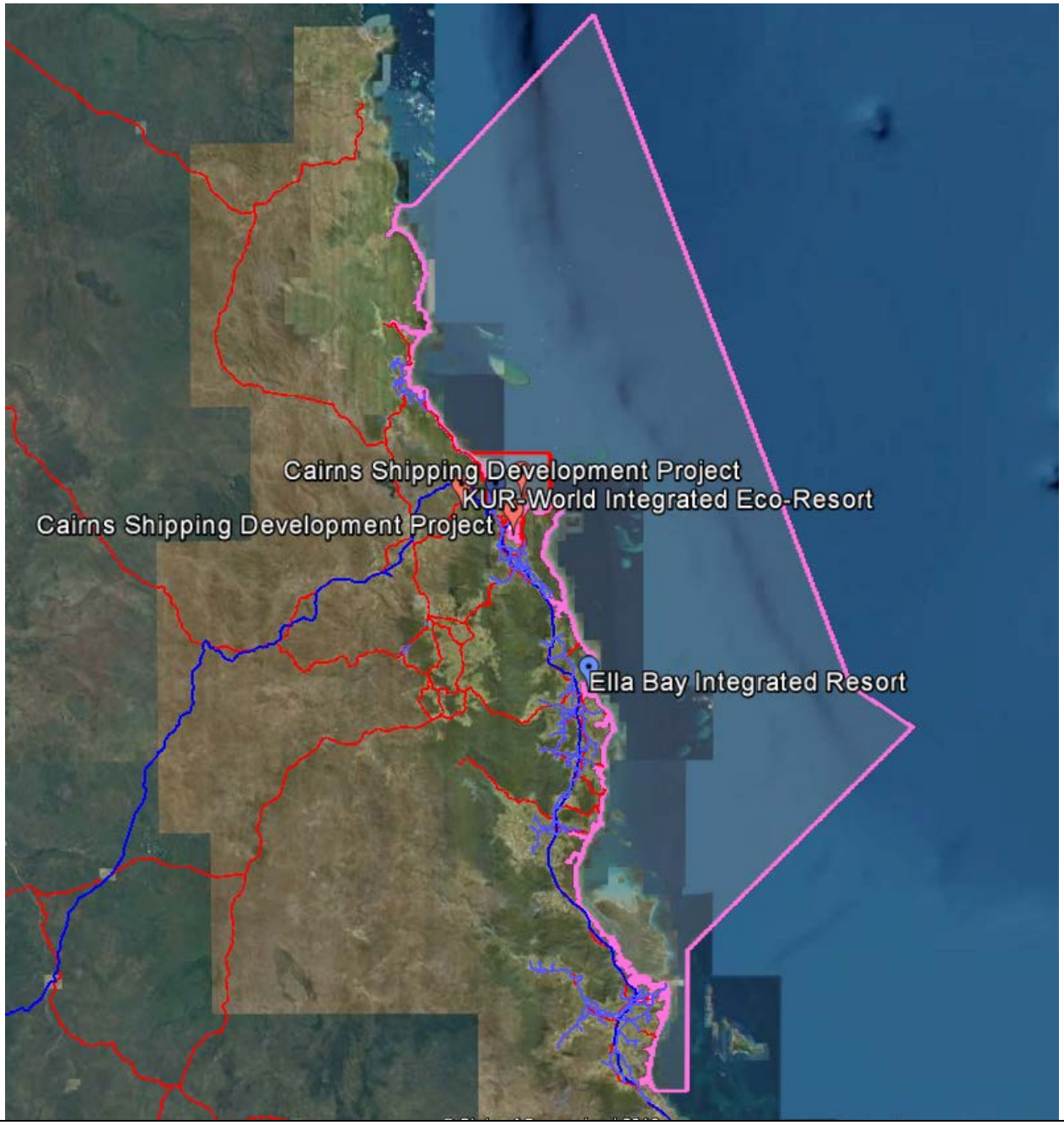

Figure B18-4 Coordinated projects in the Northern Wet Tropics Sub-Region.

Source: Qld Globe accessed 18 June 2017. Duplicate labels cannot be removed.

Aquis Resort

- Name: Aquis Resort at The Great Barrier Reef
- Location: 13 km north of Cairns and 3 km south of Yorkeys Knob
- Key details: Stage 1 – integrated resort including an artificial lake and island within the development site, a casino, 5 hotels including 4000 rooms, additional facilities including: retail shopping; an aquarium; a theatre; a reef lagoon; an outdoor sport and recreation facility including an 18-hole golf course; a convention and exhibition centre; and a cultural heritage centre. Stage 2 – 3 additional hotels including 3500 rooms, a second casino, additional facilities including: an additional theatre; retail shopping; and a rainforest.

- SDPWO Act status: 'completed' (development approval with conditions)
- EPBC Act status: approved with conditions
- Construction status: Nil. See further discussion below.

Ella Bay

- Name: Ella Bay Integrated Master Planned Community.
- Location: 88 km south of Cairns near Innisfail.
- Key details: a 450 ha master planned resort and residential eco-community including five resorts, 540 residences, golf course and swimming lagoon, over a 15-year period
- SDPWO Act status: 'completed' (development approval with conditions)
- EPBC Act status: approved with conditions
- Construction status: Nil.

KUR World

- Name: KUR-World Integrated Eco-Resort.
- Location: 20 kilometres north-west of Cairns and 4km west of Kuranda.
- Key details: luxury hotel and residential accommodation; education and business facilities; rejuvenation, health and wellbeing services; and adventure and recreation amenities
- Construction status: Nil.
- SDPWO Act status: current (Draft EIS being prepared by proponent)
- EPBC Act status: declared a controlled action
- Construction status: Nil.

Other Major Projects

Other major projects in the region are as follows:

- Mt Emerald Wind Farm (located 49 km south-west of Cairns): wind farm including 53 wind turbines with a target generation of 180 MW, substations, and associated infrastructure. Status: early works commenced November 2018, civil works commenced March 2017, plant to go live in September 2018).
- Sheraton Mirage Port Douglas Redevelopment (located 56 km north of Cairns): Redevelopment of existing resort lands. Status: the $40 m first stage completed August 2016.
- Port Douglas Waterfront (located 60 km north of Cairns). Douglas Shire Council has approved the $85 million Reef Marina redevelopment of the Port Douglas waterfront. The Reef Marina proposal includes a rainforest walk connecting Macrossan Street to the Marina, waterfront residences including 80 new apartments and townhouses, new restaurants and bars, and a live entertainment venue.

The above are all land-based development projects, with no identified development areas within the GBRWHA itself. It is recognised that there is the potential for any development within the catchment of the GBRWHA to collectively detract from the water quality of the receiving waters should appropriate development operation and construction controls not be implemented. It has been assumed that any development approvals of projects within these catchments would include conditions for appropriate consideration of standard erosion and sediment control measures and project- specific design elements to ensure that this does not occur.

B18.3.2.c Local Scale

Within the local study area there are numerous developments proposed on land in the vicinity of the City of Cairns. The most significant of these by far is the proposed Aquis Great Barrier Reef Resort, located approximately 13 km from Cairns. Further details on Aquis and other potential local developments are provided in the sections below.

Aquis Resort

Revised Draft EIS Update

At the time of completing the Draft EIS (November 2014), the Aquis Resort at The Great Barrier Reef (Aquis) had yet to receive a report from the Coordinator-General and had yet to submit an EPBC Act referral. The Draft EIS noted that, 'as a single project, only Aquis resort is considered to be of sufficient scale and with marine development aspects to have the potential to impact marine Nature Conservation Areas such as the GBRWHA, GBRMPA and GBRCMP.' Accordingly, the Draft EIS devoted considerable attention to the project in the context of cumulative impacts.

Since that time:

- the Coordinator-General issued his report and conditions on 17 December 2014 (while not being an approval as such, the Coordinator-General set conditions that must be included in any approval by any state agency or Cairns Regional Council)
- EPBC Act approval (with conditions) was received 30 April 2015
- the casino element was officially withdrawn in August 2016 and the proponent is reviewing the project as a tourism / residential development.

In the absence of any advice to the contrary, Aquis is discussed in this chapter as described in the public display version of the EIS (Aquis Resort at The Great Barrier Reef 2014), while noting that the casino element has been withdrawn and it is likely that the development, if it proceeds, will be smaller than that assessed in its Draft EIS.

Background

The draft Environmental Impact Statement for the Aquis development was prepared under the *State Development and Public Works Organisation Act 1971* (Qld) and released for public comment from 21 June 2014 to 5 August 2014. The project was approved with conditions on 17 December 2014. The project was declared a 'controlled action' under the EPBC Act by the Commonwealth Government, requiring assessment under the accredited assessment process. Approval with conditions under this act was issued on 30 appropriate 2015.

Situated 13 km north of Cairns and 3 km south of Yorkeys Knob, the Aquis project will involve the redevelopment of 343 ha of rural land into a large-scale integrated tourism resort.

Figure B18-5 Image of the proposed Aquis Great Barrier Reef Resort.
Source: Aquis Resort at The Great Barrier Reef (2014).

The construction of Aquis Resort is reported to take place over two stages:

- Stage 1 (nominally 2014-2018), with a workforce of 3750, and capital expenditure of $5.05b
- Stage 2 (nominally 2020-2024), with a workforce of 3500, and capital expenditure of $3.10b.

Stage 1 of the Aquis project proposes:

- an artificial lake and island within the development site
- a casino
- five hotels including 4000 rooms
- additional facilities including: retail shopping, an aquarium, a theatre, a reef lagoon, an outdoor sport and recreation facility including an 18-hole golf course, a convention and exhibition centre and a cultural heritage centre.

Stage 2 of the Aquis project proposes:

- three additional hotels including 3500 rooms
- a second casino
- additional facilities including another theatre, retail shopping and a rainforest.

As noted above, the casino element was officially withdrawn in August 2016 and the proponent is reviewing the project as a tourism / residential development.

The program is identified to include three distinct construction elements:

- external Works: upgrades to the external roads and connections to water and the sewerage treatment plant, all of which will be required before the bulk of the building works starting
- site works: bulk earthworks, site shaping, roads, landscaping, and the golf course. The lake functions as a flood channel and is required to be at least as deep as the ground water level prior to the building of the resort complex rising above the natural ground level
- building works: the building of the island from basements up to podium level, prior to construction of the buildings above the podium.

Impact Findings

Chapter 22 of the Draft EIS examines impacts from the Aquis project on MNES. The Executive Summary from the Draft EIS indicates the following with respect to MNES in this chapter:

'…the Aquis Resort site:

- is not within any area that is a matter of NES (although maps show that a small creek running into Richters Creek from the Aquis Resort site may actually include the 'low water' line)
- is adjacent to the GBRWHA (at its nearest point – Richters Creek – the site is basically adjacent to the boundary)
- is 3.5 km from the Great Barrier Reef Marine Park
- is 6.3 km from the Commonwealth marine area
- is 2.5 km (line-of-sight) from the Wet Tropics WHA (approximately 8.4km via the Richters Creek/Thomatis Creek and Barron River corridor) is 1.1km from the nearest listed ecological community.

In addition, the lake inlet pipeline:

- lies almost entirely within the GBRWHA
- at its nearest is 1.9 km from the GBRMP
- at its nearest is 4.1 km from the Commonwealth marine area.'

In terms of predicted impacts to GBRWHA values and other values relevant to MNES and MSES, the following impact assessment findings are provided in the Draft EIS, Executive Summary for the Aquis project:

'In terms of impacts on the values:

- The construction process (including acid sulfate soil, agricultural contamination, and general soil and water issues) can be adequately managed by normal construction management techniques as committed.
- The protection of 99 percent of the 53 ha of natural vegetation on site and its enhancement by a further 56ha, together with the removal of five waterway barriers, will enhance on-site habitat and the connectivity provided by the site to the GBR and its catchment.
- The use of treated sewage effluent as a potable water substitute and the adoption of water sensitive urban design techniques will remove 133 t/a of sediment and nutrients when compared with the existing cane farm.
- Water quality modelling of the lake and the receiving waters shows that water quality of the discharge is expected to be superior to that of Richters Creek into which it will be discharged.
- There are unlikely to be any visual impacts on the GBRWHA, its OUV and associated aesthetic attributes, or on intangible perceptions or responses, as the built form will be no more visible from offshore than Cairns CBD buildings.'

Based on these assessment outcomes, and when considering the impact conclusion of the CSD Project, the cumulative impacts from the two projects on the GBRWHA and other MNES are not considered to be unacceptable or will additively result in any unexpected cumulative impacts.

While not able to be quantified at this stage, it is more likely that the Aquis and the CSD Project will likely be mutually beneficial to each other in terms of tourism growth, differentiation, and overall economic development of the Cairns and North Queensland region.

The Aquis Resort at The Great Barrier Reef and the CSD Project have no overtly stated degree of interdependence with each other. The cruise ship demand study that underpins the CSD Project has not considered or otherwise accounted for any increased cruise passenger demand that may be generated by the influx of international and domestic tourists associated with an operating Aquis resort.

The extent that future guests of Aquis will or may use the Port of Cairns as an embarkation or disembarkation point for cruise shipping cannot be quantified at the present time but provides a further possible positive economic flow-on both for the existing Adventure class cruise ship market (which home ports in Cairns) and the possibility of additional home ported cruise ships for parts of the year to address local demand.

Other Local Projects

The Draft EIS noted other potential development within the catchment of Trinity Inlet and Trinity Bay that were thought to have the potential to impact the receiving marine environment in the vicinity of the Port of Cairns. These are discussed below, along with 2017 updates as appropriate.

- Potential upgrades to ports, marinas and ferry terminals, for example:
  - Yorkeys Knob: (Located ~ 15 km north of Cairns). Ports North is currently undertaking an upgrade to Boat Club facilities including the pontoon, walkways and land-side transport amenities and landscaping. **2017 update:** Completed Late 2014.
  - Yarrabah: (Located ~10 km east of Cairns). A potential ferry terminal proposal under feasibility planning. **2017 update:** Funding provided for study, no progress. However, Queensland Government funding has been issued for construction of a small jetty at the northern end of Mission Bay. This will be a minor structure that will extend to only to -0.5m LAT depth. A 'design and construct' contract is expected to be let in 2017 and it is likely that the works will be completed before the CSD Project.
  - Port of Cairns Cityport development. Ports North has an approved master plan for the Cityport area extending from the Esplanade to the Trinity Wharves. The marina and waterfront works stages are completed with further landside development proposed. **2017 update:** There is no further waterfront or marine works planned. The next developments will be fit-out of Shed 2 (to be completed by December 2017) and after that only the land-side property developments. There are no active property development processes occurring at present and Ports North is currently reviewing its Land Use Plan and Cityport Master Plan before any further works are considered. It is feasible that future building construction could overlap with the CSD Project.
  - Palm Cove: (located ~ 30 km north of Cairns). A preliminary proposal exists for a small marina adjacent to the existing jetty at Pam Cove. This project has no formal status.
- Cairns CBD and waterfront redevelopment including Cairns Airport, Cairns Aquarium, Spence Street Redevelopment, Central Queensland University (Cairns) upgrade, Caravonica high density residential precinct and Edmonton Business and Industry Park, amongst others.
- Mount Peter Residential Master Plan: (Located ~10 km south of Cairns). Approved 1500 ha residential master planned area to be developed over 25 years. **2017 update:** Several developers have already released about 130 lots and a further 260 lots and associated infrastructure are in advanced planning or construction. A 100 place child care facility is to be commenced soon. The rate of development of this area is currently quite low considering the capacity and ultimate plans, with a modest target of approximately 100 lots per year.

- Cairns Bruce Highway Upgrade. The CBHU Masterplan (basically six lanes from Gordonvale to the CBD plus intersection improvements) is being implemented in stages as follows. This plan is designed to relieve urban congestion on the south side of Cairns and will be necessary to accommodate demand from the Mt Peter development in particular. The plan assumes a high degree of self-containment (to reduce commuter needs) and a high public transport and cycling utilisation.
  - Stage 1 (Sheehy Road to Kate Street). Complete.
  - Stage 2 (Robert Road to Foster Road). Under in construction.
  - Stage 3 (Edmonton to Gordonvale Duplication). Detailed planning (Business Case in preparation).
  - Stage 4 (Kate Street to Aumuller Street). Detailed planning (Business Case in preparation).
  - Stage 5 (Foster Road Intersection). Detailed planning (Business Case in preparation).

B18.3.2.d Other Relevant Projects

The final class of 'other' projects involves those that, while being remote from the GBR and the region, involve activities that could potentially impact on the values of the Study Area. At the time of writing (June 2017) the only identified major project is the South of the Embley (Amrun) bauxite project (located ~40 km south-west of Weipa, 40 km north of Aurukun, 630 km north-west of Cairns). This is most unlikely to involve cumulative impacts in association with the CSD Project.

This new bauxite mining operation was approved with conditions on 23 May 2012 and will initially produce 22.8 million dry product tonnes per annum (mdpt/a) with the potential to increase to 50 mdpt/a. It consists of an open-cut bauxite mine, processing plant, bauxite stockpiles, ancillary infrastructure, and port development. According to the project's EIS (Rio Tinto Alcan 2010), the majority of equipment and materials would continue to be transported by sea from Cairns to Weipa. The volume of cargo and fuel deliveries to the Port of Weipa is expected to increase 20% during the construction phase and more than double at 50 mdpt/a, compared to the current volume of deliveries for the existing Weipa operations. This increased freight demand will increase shipping movements (see **Section B18.3.3**) and cargo handling via land-side activities (see **Section B18.5.6**).

B18.3.2.e Conclusions

Other than proposed port expansion projects elsewhere in the GBR region, none of the potential or proposed projects described above include any significant dredging as part of their implementation. However, the proximity of the local developments to the waterfront and/or catchment of Trinity Bay has the potential to impact upon the water quality of the receiving waters of Trinity Bay, albeit in a minor way given the nature of their construction and operation. Nonetheless, these developments collectively have the potential for cumulative impact upon these receiving waters should the timing of any such impacts (e.g extreme weather event producing turbid runoff from the construction areas in the catchment into Trinity Inlet/Bay) coincide with dredging operations for the CSD Project.

However, any impacts on receiving water quality of the individual projects will need to be mitigated to acceptable levels and would likely be subject to individual monitoring programs. In addition, if broader scale impacts to water quality are occurring this will likely be detected by the proposed reactive monitoring program for the CSD Project and then could be considered in the context of the dredging program associated with the project.

At the GBR and northern WHA Wet Tropics regional scale, there are a number of other port expansion projects that are relevant to the CIA. At a local scale, the Aquis project north of Cairns is the most significant and able to be included in the assessment (through review of the findings of its EIS), although there are several smaller projects that are at a planning or preparation stage in the Cairns region.

B18.3.3 Impacts of Other Projects and Activities

B18.3.3.a Potential Impacts on the GBR

In assessing potential impacts arising from the CSD Project and other projects / activities in the context of a landscape-scale property like the GBR (taken to include the World Heritage Area, National Heritage Place, and GBRMP), consideration needs to be given to the nature of the related activities, the likely impacts flowing from these activities, and the of the scale over which impacts should be considered. Guidance on these issues has been obtained from GBRMPA (2014a). Referring to that report, the following information is provided:

- Table 6.1 lists all likely impacts on the GBR and assigns a scale of applicability (Local, Regional, and Reef-wide).
- Table 6.2 assigns this list of likely impacts to a range of activities.
- Table 6.11 determines the GBR value that could be affected and assigns a level of impact.

The above information is used in this CIA as follows:

- In **Table B18-6**, the Table 6.1 impacts are listed in the first column, while the second and third columns are the study team's assessment of likely CSD Project impacts and those attributable to other projects and activities respectively, based on the previous discussion. Only impacts that could involve be medium or greater levels of risk (as defined in **Table B18-5**) are noted. While this table focuses on the marine aspects of the CSD Project, where relevant impacts associated with other project elements are included.
- In **Table 18-7**, the relevant impacts are listed (filtered based on relevant activities from Table 6.2) and the Table 6.11 information (level of impact by GBR value) is provided for relevant activities (only *Low*, *High*, and *Very High* levels selected) on the following values listed in Table 6.11, namely:
  - Biodiversity
  - Geomorphology
  - Indigenous Heritage
  - Historic Heritage.

This approach provides an assessment of the likely impacts of concern to the CIA at the local, regional, and GBR scales. While most activities listed in the first column take place in the Study area, the ones selected are considered to be those with the greatest potential to involve cumulative impacts. The reference to climate change does not imply that the CSD Project will have an impact on climate, rather that climate change could have an impact on the CSD Project as discussed in detail in **Chapter B16** (Climate Change and Greenhouse). See also notes below the table.

TABLE B18-6 LIKELY IMPACTS OF THE CSD PROJECT AND OTHER PROJECTS AND ACTIVITIES

IMPACT / ACTIVITY	CSD PROJECT	OTHER PROJECTS AND ACTIVITIES
Climate change	✓	✓
Agriculture		✓
Aquaculture		
Urban development		✓
Industrial development		
Port activities	✓	
Traditional use		
Tourism		✓
Fishing — commercial		
Fishing — recreational		
Recreation		
Shipping	✓	✓
Defence activities		
Research		

Source: Column 1: GBRMPA (2014a); Columns 2 and 3: study team compilation.

The following descriptions of the relevant activities described above are extracted from GBRMPA (2014a) (p5-49 – 5-50).

- **Climate change.** Reef-dependent values and activities are vulnerable to the negative effects on Reef condition of ocean acidification, sea level rise, more frequent extreme weather and warming sea temperatures. The frequency and severity of associated impacts such as coral bleaching are predicted to increase, with serious consequences for the Reef likely before mid-century.
- **Agriculture** within the catchment is an important producer of food and, to a lesser extent, fibre. Over the 160 years of European settlement in the catchment, agricultural use has become more widespread and more intensive. Land clearing and altering water courses have affected many ecological processes that support the Reef. There have been significant improvements in agricultural land use practices in recent years, such as those supported by the implementation of the Reef Water Quality Protection Plan.
- **Urban development.** The six major population centres within the Great Barrier Reef catchment — Cairns, Townsville, Mackay, Rockhampton, Gladstone and Bundaberg — account for about 42 per cent of the population. While urban areas occupy only a small proportion of the catchment, development of housing and associated utilities increases land clearing, modifies water flows and affects connectivity between coastal and marine habitats.
- There are 12 **trading ports** in or adjacent to the Region. Many are of economic importance, especially to export industries such as mining and agriculture. Over the past two decades, total export tonnage has grown by about 300 per cent. Five ports currently have active proposals for port expansions, and there are proposals for two new ports. Port operations and infrastructure can lead to impacts such as clearing, modifying and fragmenting of coastal habitats, reclamation of marine areas, alteration of natural coastal processes, as well as requiring capital and maintenance dredging. [Note – since the completion of GBRMPA (2014a), dumping in the GBRMPA is no longer permitted by Regulation 88RA of the Great Barrier Reef Marine Park Regulations, enacted on 2 June 2015.]

- **Tourism** is the most economically significant direct use of the Region, with about 2 million tourists visiting the Region each year. It offers a wide range of tourism experiences, focused on a small portion of the Region, and plays an important role in presenting the Region's world heritage values. Many tourism operators are active stewards of the Reef and more than 60 per cent of visitors travel to the Reef with a certified high standard tourism operator. The impacts associated with tourism activities, such as localised anchor damage and wildlife disturbance, are generally regarded as low risk, concentrated in a few intensively managed areas.
- **Ships** transiting the Reef carry export goods, service coastal and inland communities and transport passengers. The Region is one of the world's most regulated shipping areas. While the number of ship voyages increased substantially over the past 10 years — driven mainly by industrial activity — improvements in management arrangements have meant there have been relatively few shipping incidents.

The associated classes of impacts are also shown on Table 6.2 of GBRMPA (2014a) and these are:

- Climate change
- Catchment runoff
- Degradation of coastal ecosystems
- Direct use.

Each of these classes of impacts has a number of sub-impacts and these are described below. Specifically, **Table 18-7** below is an amalgamation of the following tables from GBRMPA (2014a):

- Table 6.1 (impacts and their scale) – filtered based on relevant activities from Table 6.2
- Table 6.2 (impacts by activity)
- Table 6.11 (level of impact by GBR value) – for relevant activities (only *Low*, *High*, and *Very High* levels selected) on the following values:
  - Biodiversity
  - Geomorphology
  - Indigenous Heritage
  - Historic Heritage.

This table provides a suitable screening of likely impacts of the likely activities that could take place in the same receiving environment as the CSD Project (stratified by scale and level) and hence provides a useful context for assessment of cumulative impacts.

In this table:

- an 'x' in the 'Activities in the Region' columns signifies that the impact (rows) is relevant to the particular activity
- the legend for the 'Effect of Impacts on Region's Attributes' is derived from Table 6.11, namely:
  - VH = *Very High*
  - H = *High*
  - L = *Low*.

TABLE 18-7 POTENTIAL IMPACTS BY SCALE AND ACTIVITY

ABBREVIATED TITLE (TABLE 6.1)	IMPACT (TABLE 6.1)	SCALE (TABLE 6.1)	ACTIVITIES IN THE REGION (TABLE 6.2)						EFFECT OF IMPACTS ON REGION'S ATTRIBUTES (TABLE 6.11)			
			CLIMATE CHANGE	AGRICULTURE	URBAN DEVELOPMENT	PORT ACTIVITIES	TOURISM	SHIPPING	BIODIVERSITY	GEOMORPHOLOGY	INDIGENOUS HERITAGE	HISTORIC HERITAGE
Acid sulphate soils	Exposure and subsequent oxidation of potential acid sulphate soils	Local		x	x	x			L		L	
Altered ocean currents	Altered ocean currents due to climate change or anomalies related to the El Niño-Southern Oscillation, and altered coastal water movement at a local scale	Reef-wide	x		x	x					L	
Artificial barriers to flow	Artificial barriers to riverine and estuarine flow including breakwalls, weirs, dams, gates, ponded pastures, and weeds causing changes to hydrology, groundwater and ecological connectivity	Regional		x	x	x			H	L	L	
Atmospheric pollution	Atmospheric pollution, including coal dust	Local			x	x		x				
Coastal reclamation	Coastal land reclamation, including for ports and groynes	Local			x	x	x		L		H	
Cyclone activity	Cyclone activity	Regional	x						VH	L	H	L
Dredging	Dredging of the seafloor	Local			x	x		x	L	L	VH	
Exotic species and diseases	Introduction of exotic species and diseases from aquaculture operations, hull fouling, ballast release, imported bait and release of aquarium specimens to the Region, plus the introduction of weeds and feral animals to islands	Regional					x	x	H			L
Increased freshwater inflow	Increased freshwater inflow from prolonged or heavy rainfall including flood events, and from changes to catchment ecosystems; resulting in reduced salinity	Regional		x	x				H	L	L	L

ABBREVIATED TITLE (TABLE 6.1)	IMPACT (TABLE 6.1)	SCALE (TABLE 6.1)	ACTIVITIES IN THE REGION (TABLE 6.2)						EFFECT OF IMPACTS ON REGION'S ATTRIBUTES (TABLE 6.11)			
			CLIMATE CHANGE	AGRICULTURE	URBAN DEVELOPMENT	PORT ACTIVITIES	TOURISM	SHIPPING	BIODIVERSITY	GEOMORPHOLOGY	INDIGENOUS HERITAGE	HISTORIC HERITAGE
Increased sea temperature	Increased sea temperature due to climate change	Reef-wide	x						H	L		
Light impacts (artificial)	An increased amount of artificial light	Local			x	x		x				
Marine debris	Manufactured material discarded, disposed of or abandoned in the marine and coastal environment (including discarded fishing gear and plastics)	Reef-wide		x	x	x	x	x	H		L	L
Modifying supporting terrestrial habitats	Clearing or modifying supporting terrestrial habitats such as wetlands, saltmarshes, mangroves and sand dunes — this also includes trampling and damage from recreational vehicle use	Regional		x	x	x	x		H	L	H	
Noise pollution	Noise from human activities, both below and above water	Local				x		x	L		L	L
Nutrients from catchment run-off	Nutrients entering the Region in run-off from the catchment Reef-wide	Reef-wide		x	x				VH	L	L	L
Ocean acidification	Increasing acidity of the Region's waters	Reef-wide	x									
Outbreak of crown-of-thorns starfish	Outbreak of crown-of-thorns starfish (i.e. when the density exceeds about 30 starfish per hectare)	Regional		x	x				VH	L	L	L
Outbreak of disease	Outbreak of naturally occurring diseases	Local		x		x			L			
Outbreak or bloom of other species	Outbreak of naturally occurring or native species, excluding crown-of-thorns starfish	Local		x				x				
Pesticides from catchment run-off	Pesticides (including herbicides, insecticides, fungicides) entering the Region in run-off from the catchment	Regional		x	x				H		L	L

(Continued over)

ABBREVIATED TITLE (TABLE 6.1)	IMPACT (TABLE 6.1)	SCALE (TABLE 6.1)	ACTIVITIES IN THE REGION (TABLE 6.2)						EFFECT OF IMPACTS ON REGION'S ATTRIBUTES (TABLE 6.11)			
			CLIMATE CHANGE	AGRICULTURE	URBAN DEVELOPMENT	PORT ACTIVITIES	TOURISM	SHIPPING	BIODIVERSITY	GEOMORPHOLOGY	INDIGENOUS HERITAGE	HISTORIC HERITAGE
Physical damage — other	Physical damage to coral reefs and seafloor habitats including from anchoring of vessels of any size, grounding of small vessels, diving and snorkelling. Does not include physical damage for fishing or ship grounding	Local					x	x	L		H	L
Physical damage — ship grounding	Grounding of ships including physical damage and the dislodging of antifoulants	Local					x	x			VH	
Rising sea level	Rising sea level	Reef-wide	x					x			H	
Sediments from catchment run-off	Sediments entering the Region in run-off from the catchment	Reef-wide		x	x	x		x	VH	L	L	L
Spill — large chemical	Chemical spills that trigger a national or regional response or are more than 10 tonnes	Regional			x	x		x				
Spill — large oil	Oil spills that trigger a national or regional response or are more than 10 tonnes	Regional				x		x	L			L
Spill — small chemical and oil	Chemical and oil spills that do not trigger a national or regional response and are less than 10 tonnes	Local			x	x	x	x				L
Urban and industrial discharge	Point and diffuse-source land-based discharge of pollutants from urban and industrial land use and mining, including polluted water, sewage, wastewater and stormwater	Local			x	x		x	L		L	L
Vessel strike on wildlife	Death or injury to wildlife as a result of being struck by a vessel of any type or size	Local				x	x	x			H	
Waste discharge from vessels	Waste discharged from a vessel into the marine environment	Local					x	x				

ABBREVIATED TITLE (TABLE 6.1)	IMPACT (TABLE 6.1)	SCALE (TABLE 6.1)	ACTIVITIES IN THE REGION (TABLE 6.2)						EFFECT OF IMPACTS ON REGION'S ATTRIBUTES (TABLE 6.11)			
			CLIMATE CHANGE	AGRICULTURE	URBAN DEVELOPMENT	PORT ACTIVITIES	TOURISM	SHIPPING	BIODIVERSITY	GEOMORPHOLOGY	INDIGENOUS HERITAGE	HISTORIC HERITAGE
Wildlife disturbance	Disturbance to wildlife including from snorkelling, diving, fish feeding, walking on islands and beaches, and the presence of boats	Local				x	x	x	L		L	L

Source: GBRMPA (2014a) Table 6.1, 6.2 and 6.11. Legend (effect of impact on attributes): VH = *Very High*, H = *High*, L = *Low*.

B18.3.3.b Discussion

Table 18-7 above uses GBRMPA's strategic assessment as a framework to identify the likely impacts that could occur in the CSD Project Study Area (at the Local, Regional, and Reef-wide scales as appropriate) due to the cumulative impacts of the project itself and other relevant projects / activities that are known to involve current threats.

Examination of this table shows that the selected activities result in *Very High* impacts on at least one of the four values (scale in brackets):

- Cyclone activity (Regional)
- Dredging (Local)
- Nutrients from catchment run-off (Reef-wide)
- Outbreak of crown-of-thorns starfish (Regional)
- Physical damage — ship grounding (Local)
- Sediments from catchment run-off (Reef-wide).

For *High* impacts the results are:

- Artificial barriers to flow (Regional)
- Coastal reclamation (Local)
- Exotic species and diseases (Regional)
- Increased freshwater inflow (Regional)
- Increased sea temperature (Reef-wide)
- Marine debris (Reef-wide)
- Modifying supporting terrestrial habitats (Regional)
- Pesticides from catchment run-off (Regional)
- Physical damage — other (Local)
- Rising sea level (Reef-wide)
- Vessel strike on wildlife (Local).

Clearly, not all of these will be potential impacts of the CSD Project and are therefore not addressed further. In addition, some may not be relevant due to scale as discussed later in this chapter.

The following extracts from GBRMPA (2014a) are relevant (by way of confirmation of the *Very High* impacts derived above):

> Over the past 10 years, coral reefs between Cairns and Townsville have experienced the highest cumulative impacts from cyclones, thermal stress, crown-of-thorns starfish outbreaks and increased freshwater inflow. The spatial assessment also shows almost all coral reefs in the Region have been exposed to one or more of these threats over the last decade (p6-66).

With respect to cumulative impact assessment methods:

> It demonstrates the importance of understanding the zones of influence of different activities (the sources of impact) and the need to be particularly vigilant in areas where zones of influence overlap and cumulative impact intensity is highest. Determination of zones of influence requires the use of geographic information systems to spatially identify, map and model activities and impacts and their likelihood of occurring. It also requires 'breaking up' of impacts from point and non-point sources into intensity categories. For example, in Figure 6.33 impact gradients from a point-source discharge from an urban development, and more diffuse impacts such as water quality changes associated with agricultural run-off from catchments, have been divided into high, moderate and low intensities. Their overlapping zones of influence create a mosaic of impact intensities that, combined, have an effect on the values of the area.

> Importantly impacts vary in both time and space and with differing levels of severity. For example, major storm and flood events may only occur once every two decades, yet their impact in a flooding year can be severe with a legacy that persists for decades. Hence, the determination of the zone of influence of individual and cumulative impacts requires an understanding of both the spatial and temporal dimensions of the activity or event and its associated effects. (p6-66)

In terms of the methodology for this CIA, impact assessment and mitigation should focus on likely impacts listed as *Very High* and *High* and that could be the result of the CSD Project. This is not to imply that the CSD Project will involve high levels of risk in these areas – just that the existing environment is already considered to be stressed by these, at least at the whole of GBR scale. Scale is very relevant and activity and scale filters are used to assess the potential cumulative impacts of the projects discussed in **Section B18.3.2**. That is, the assessment investigates the interaction of the CSD Project and other potential projects in terms of the impacts of concern determined by GBRMPA (2014a) and at the designated scales.

B18.4 Assessment of Potential Impacts (Cumulative)

B18.4.1 Methodology

This section addresses cumulative impacts from two perspectives:

- Using the strategic assessment (GBRMPA 2014a) framework to identify impacts of concern that are relevant to the GBR at the Local, Regional, and Reef-wide scales and identifying the residual risk derived in the various technical chapters of this Revised Draft EIS. See **Section B18.4.2**.
- Using the findings of residual risk derived in each of the technical chapters of this Revised Draft EIS and commenting on their relevance to the strategic assessment findings. See **Section B18.4.3**.

The first approach puts the impact of the CSD Project into the GBR framework, while the second is a cross-check to review the likely consequence of project impacts to the GBR at the various scales.

B18.4.2 Strategic Assessment

B18.4.2.a Relevant Impacts

The use of the strategic assessment findings and methodology described in **Section B18.3.3.b** has produced a list of impacts of concern for the GBR, customised for local conditions and activities. For the assessment of cumulative impacts, only those impacts that also involve the CSD Project are addressed below (other impacts from all sources are considered in the context of ecosystem resilience in **Section B18.6**). These CSD Project-specific impacts have been further classified into key project elements, namely:

- dredging of the channel and swing basin (future maintenance dredging is addressed in **Section B18.5.3**)
- placement on land at the two DMPAs
- shipping (i.e. relevant to the operation of the (increased numbers of) cruise vessels).

In this table:

- the first three columns are as per those of **Table 18-7** (i.e. from the strategic assessment)
- 'Maximum value' is the highest value shown in **Table 18-7** for 'Effect of Impacts on Region's Attributes' (i.e. from the strategic assessment)
- entries (if any) in the relevant 'CSD Project Element' columns are the residual risk assessment derived from the technical chapters of this Revised Draft EIS as follows (note that the Revised Draft EIS assessment shows that no residual risks are more severe than medium):
  - N = Negligible
  - L = Low
  - M = Medium.

TABLE B18-8 CUMULATIVE IMPACTS FOR ASSESSMENT

STRATEGIC ASSESSMENT				CSD PROJECT ELEMENT		
ABBREVIATED TITLE	**IMPACT**	**SCALE**	**MAXIMUM VALUE**	**DREDGING**	**DMPA**	**SHIPPING**
Coastal reclamation	Coastal land reclamation, including for ports and groynes	Local	H		Note 1	
Dredging	Dredging of the seafloor	Local	V	N		
Exotic species and diseases	Introduction of exotic species and diseases from aquaculture operations, hull fouling, ballast release, imported bait and release of aquarium specimens to the Region, plus the introduction of weeds and feral animals to islands	Regional	H			L
Marine debris	Manufactured material discarded, disposed of or abandoned in the marine and coastal environment (including discarded fishing gear and plastics)	Reef-wide	H			L
Modifying supporting terrestrial habitats	Clearing or modifying supporting terrestrial habitats such as wetlands, saltmarshes, mangroves and sand dunes — this also includes trampling and damage from recreational vehicle use	Regional	H		L	
Physical damage — ship grounding	Grounding of ships including physical damage and the dislodging of antifoulants	Local	V			N
Sediments from catchment run-off	Sediments entering the Region in run-off from the catchment	Reef-wide	V		N	
Vessel strike on wildlife	Death or injury to wildlife as a result of being struck by a vessel of any type or size	Local	H	L		L

Source: Study team compilation based on **Table 18-7** and **Chapter B7** (Marine Ecology).

Note 1: As discussed below, the filling works at the Tingira Street DMPA are better described under 'Modifying supporting terrestrial habitats'.

These impacts of concern are discussed below in the context of the other projects and activities described in **Section B18.3.2** to examine cumulative impacts. The strategic assessment details are extracts from GBRMPA (2014a), with page references as noted (e.g. p6-27).

As a check that all relevant project impacts have been captured, the findings of the risk assessment from each issue considered in this Revised Draft EIS (i.e. each of the Part B technical chapters) are summarised and correlated to likely impacts from other sources. See Section **B18.4.3**.

B18.4.2.b Coastal Reclamation

Strategic Assessment Details

- Full description: Coastal land reclamation, including for ports and groynes.
- Scale: Local.
- (p6-27) Coastal reclamation refers to the process of creating new land where there was ocean, wetlands, or other water bodies by filling the area with 'land fill' or infrastructure such as groynes and jetties. Reclamation projects can be for public open space, housing or commercial and industrial developments.
- The total area reclaimed within the Region is approximately eight square kilometres, the majority of which is in the Gladstone area (approximately 5.5 square kilometres). The largest coastal reclamation projects have been for the development of ports, for example in Gladstone and Townsville.
- For some of the major ports in the last few years, the dredge material has been largely used for reclamation works in ports areas. For example, 14 million cubic metres of dredge material has been disposed to the Fisherman's Landing reclamation area in Gladstone Harbour as part of the development of Gladstone's port facilities. Land disposal of dredge material including reclamation can have localised effects on habitats critical to the Great Barrier Reef's health.
- Sand replenishment is a form of reclamation used to address beach erosion in order to protect coastal properties and preserve areas for recreational use.
- Coastal reclamation can have local effects on the Region's environment, for example removing coastal habitats, covering marine habitats (such as seagrass meadows), altering small-scale local currents, impeding natural drainage from the catchments, altering groundwater levels, and diminishing local aesthetic values. If not properly managed, reclamation works can affect water quality in the adjacent waters and potentially expose acid sulphate soils. Coastal reclamation may also alter the mainland boundary of the World Heritage Area — defined by mean low water.

Impact Assessment

The strategic assessment notes that this impact is relevant at the Local scale.

As noted previously, the CSD Project will involve filling of the two Tingira Street lots with stiff clay (see **Section B18.5.6** for more details of the future use of this site). The DMPA site has previously been cleared and filled to between 2.0 m to 4.0 m AHD (i.e. is already above generally above HAT). Technically, the placement of the stiff clay could be considered as reclamation.

However, the site has been identified in Ports North planning as a future development area, the use of the area as the stiff clay DMPA provides a future beneficial use of the material and enhances the financial viability of the proposed facility.

For these reasons it is considered that the placement activity relates better to modifying terrestrial habitats than reclamation. Refer to **Section B18.4.2.f**.

B18.4.2.c Dredging

Strategic Assessment Details

- Full description: Dredging of the seafloor.
- Scale: Local.
- (P6-29). Dredging involves the extraction of parts of the seafloor (predominantly sand and fine silt, but also harder substrate such as rock [and in the case of the CSD Project, stiff clay]) to deepen an area and allow increased access for navigation. It is usually associated with ports, shipping channels, marinas and boat ramps. The term 'capital' dredging is used to refer to dredging that is undertaken to create, lengthen, widen or deepen channels, berth areas, swing basins, marinas and harbour areas. 'Maintenance' dredging refers to dredging which is undertaken to ensure that previously dredged depths are maintained (that is, removing accumulated silt from the channel). The disposal or 'dumping' of dredge material from the dredge site to a disposal site is dealt with separately in the section below.
- Both capital and maintenance dredging is undertaken at the majority of trading ports and at a number of marinas within and adjacent to the Region.
- Proposals currently under assessment (as at May 2013) would involve an estimated maximum of approximately 54 million cubic metres of dredging in the World Heritage Area. Decisions are yet to be made in relation to these applications and it is important to note that a change in economic circumstances may result in applications being withdrawn or modified. While it is difficult to predict whether all pending applications will proceed through the full assessment process, projected increases in economic and population growth over the next 25 years clearly demonstrate that there will be a need for Great Barrier Reef ports to handle increasing volumes of exports and imports and therefore a future need for both capital and maintenance dredging.
- Consideration of dredging impacts requires an understanding of:
  - values or attributes likely to be affected by dredging activities, including their current condition
  - the scale (zone of influence), duration and frequency of dredging activities
  - non-dredging impacts affecting values or attributes within the dredge zone of influence and the likely combined (or cumulative) effects of dredging and non-dredging impacts on values and attributes
  - ecosystem thresholds for health.
- The effects of dredging activities are well documented and include:
  - seabed disturbance
  - removal or modification of habitats
  - loss of species, including benthic organisms and injury or mortality to species of conservation concern, changes in species behaviour
  - degradation of water quality including increased turbidity levels; changes to hydrodynamics and coastal hydrology
  - increased underwater noise
  - increased risk of oil spills.
- However, there is an acute lack of region-specific knowledge and more research and monitoring is required to establish adequate baselines and region-specific impacts.

Impact Assessment

The strategic assessment notes that this impact is relevant at the Local scale.

The assessment documented in **Chapter B2** (Nature Conservation Areas) concludes that the overall residual risk to the GBRWHA / GBRMP associated with dredging is as follows:

- Whole of GBR (Reef-Wide) scale: Negligible
- Regional scale: Negligible to Low
- Local scale: Low.

Mitigation is feasible and is documented in **Chapter C2** (Dredge Management Plan). In **Table B18-8**, the impact at the Whole of GBR / Reef-Wide scale is entered as this is relevant to an assessment of cumulative impacts at other ports.

The CSD Project element relevant to dredging is the dredging of the main channel and swing basin. The likely extent of interaction with similar impacts from other projects and activities as noted in the following table. While the scale of the impact is determined by GBRMPA to be 'local', GBRMPA is also concerned about the lack of knowledge regarding region-specific impacts and therefore possible cumulative impact of these local effects at large scales. Accordingly, other proposed port projects involving dredging are considered below.

TABLE B18-9 DREDGING

DETAILS	PROJECT ELEMENTS	POTENTIAL IMPACT	MITIGATION / NOTES
CSD Project	Main channel and swing basin	Negligible risk on Nature Conservation Areas (Reef-Wide scale) Low to medium risk on coastal processes	**Chapter C2** (Dredge Management Plan) SAP
Port of Townsville	Whole project	All effects considered to be local to its environment and therefore will not interact with the CSD Project.	280 km from Cairns
Port of Abbot Point	Whole project	As above, any effect diminished by increasing distance.	415 km from Cairns
Port of Gladstone	Whole project	As above.	960 km from Cairns

Chapter B2 (Nature Conservation Areas) concludes that while the CSD Project could involve Low risk at the local scale, it is likely to involve only a Negligible risk at the Whole of GBR / Reef-Wide scale (**Table B2-13**). Impact is short term.

In assessing cumulative impacts, it is noted that GBRMPA (2014a) sees dredging as a local scale impact. This is confirmed by recent EISs prepared for Gladstone, Abbot Point, Townsville (and now Cairns) that have concluded that, while there are localised impacts (up to an 'embayment' scale), none involve a cumulative impact at a regional or WHA scale.

B18.4.2.d Exotic Species and Diseases

Strategic Assessment Details

- Full description: Introduction of exotic species and diseases from aquaculture operations, hull fouling, ballast release, imported bait and release of aquarium specimens to the Region, plus the introduction of weeds and feral animals to islands.
- Scale: Regional.
- (P 6-34). Exotic species and diseases can be introduced through vessel ballast discharge, hull fouling, imported bait and aquaculture operations; in cargo; and by intentional releases (for example, unwanted aquarium fish, dogs and cats). They can travel on all types and sizes of vessels from yachts to cargo ships. Species may be transferred on external and internal surfaces of vessel hulls and on equipment which makes contact with the water (for example, propellers, ropes, chains and intake grates). It is estimated that about 7000 different marine species, including viruses, bacteria and small marine invertebrates, are transported around the world in ballast water every day and more than 150 million tonnes of ballast water is discharged into Australia's major ports each year. More than 250 introduced marine species have been documented in Australia. While most have been relatively harmless, some, such as the Northern Pacific seastar, have become aggressive pests in temperate waters.
- Introduced marine species have been found in ports along the Great Barrier Reef coastline (for example, the Asian green mussel and Caribbean tubeworm in the Cairns port), although none have been recorded beyond these ports. Any introductions in the future are likely to have regional effects on the ecosystem — the nature of those effects would depend on the species introduced.

Impact Assessment

The strategic assessment notes that this impact is relevant at the Regional scale.

Chapter B7 (Marine Ecology) considers marine pests and concludes that international and domestic vessels involved in either the construction or operational phases of the project will be required to comply with national and state biofouling and ballast water management guidelines, and other requirements to minimise the risk of introductions of marine pest species. While unlikely, their introduction and subsequent establishment would present a moderate consequence from a marine ecology perspective. This corresponds to a Low impact (long term to permanent).

Marine pest risks will be managed in accordance with standard mitigation procedures included in **Chapter C2** (Dredge Management Plan).

None of the other local or regional projects are likely to contribute to adverse impacts on this criterion.

B18.4.2.e Marine Debris

Strategic Assessment Details

- Full description: Manufactured material discarded, disposed of or abandoned in the marine and coastal environment (including discarded fishing gear and plastics).
- Scale: Reef-wide.
- (p6-39) There is a massive amount of anthropogenic material accidentally or deliberately released into the marine environment. Common items found within the Region are plastic bags, discarded fishing gear, plastic and glass bottles, rubber thongs, aerosols and drink cans. The annual global demand for plastics has continually grown over recent years. In 2011, it was estimated to be 245 million tonnes.
- Plastic is the most prevalent type of debris found on beaches worldwide, comprising between 50 to 90 per cent by number of all debris items recorded. Plastic debris poses a significant threat to wildlife which can choke on the material and starve, absorb chemicals, or ingest items that have degraded into microplastics. In Australia, plastic waste, including discarded fishing gear (nets, lines and ropes), is potentially one of the most harmful types of debris to marine wildlife because of ingestion and entanglement.

- Marine debris is identified as a key threatening process under the EPBC Act and can affect species and habitats throughout the Region. Marine debris from the catchment appears to accumulate and remain confined within the lagoon system of the Reef but with a northward movement. At the southern end of the Reef, debris appears to be more ocean-sourced.

Impact Assessment

The strategic assessment notes that this impact is relevant at the Reef-wide scale.

Chapter B7 (Marine Ecology) considers marine debris and notes that throughout both the construction and operational phases of the project, ships, dredgers and other vessels associated with the project will need to ensure waste materials are properly managed in accordance with standard protocols and waste management strategies in the respective Management Plans. The Port of Cairns will provide appropriate waste reception facilities for accommodating this, in line with best practice (e.g. Best Practice Guidelines for waste Reception Facilities at Ports, Marinas and Boat Harbours in Australia and New Zealand, IMO Guide to Best Practice for Port Reception Facility Providers and Users). The residual risk rating following mitigation is Low (long term).

Reef-wide shipping other than that associated with the CSD Project could contribute to adverse impacts on this criterion but will be subject to the same management framework.

B18.4.2.f Modifying Supporting Terrestrial Habitats

Strategic Assessment Details

- Full description: Clearing or modifying supporting terrestrial habitats such as wetlands, saltmarshes, mangroves and sand dunes — this also includes trampling and damage from recreational vehicle use.
- Scale: Regional.
- (p6-27) Since European settlement, there have been significant losses of and modifications to terrestrial habitats that support the Great Barrier Reef ecosystem (Figure 6.16 and Figure 6.17). For the purposes of this report, modifying supporting terrestrial habitats refer to changes that have direct effects on reef species, and environmental processes. It does not include changes to the hydrology or degradation of water quality as those impacts are covered under catchment run-off (Section 6.4.2) or artificial barriers to flow (in this section).
- Overall, approximately 60 per cent of pre-clear vegetation — classified as remnant vegetation — remains intact in the Great Barrier Reef catchment. However, the status of coastal ecosystems varies greatly across regions and basins. Generally, human development and the modification of supporting terrestrial habitats intensifies from north to south in the catchment and closer to the coast. For example, much of Cape York's catchment ecosystems remain intact and these make up around one-third of the total area of currently intact ecosystems within the Great Barrier Reef catchment. By contrast, in the Wet Tropics natural resource management region there has been substantial loss of native grasslands and freshwater wetlands across the entire region (greater than 55 per cent) and a high loss of forests and woodlands in several basins, especially on the coastal floodplain.
- The loss of functional ecosystems (such as forested floodplains and estuarine habitats) close to the Reef is having significant effects on the feeding and reproduction of many marine species, as well as diminishing dry season refuges. For example, where forested floodplains have been lost through changes in land use, the areas no longer provide nesting habitat or roosts for waterbirds and shady migratory pathways for aquatic species with connections to the Great Barrier Reef. Another example is the replacement of coastal grasslands with intensive agriculture or urban settlements, reducing breeding habitat for many bird and reptile species, including saltwater crocodiles.
- Some coastal habitats such as sand dunes are highly sensitive to trampling associated with recreational activities and damage from recreational vehicle use. Damaged coastal vegetation and compacted dune sands influence soil moisture, run-off, erosion, vegetation and micro-organisms. Some animals may also be affected by these activities. For example, shorebirds are highly sensitive to intensive use of beaches, and frequent disturbance results in reduced feeding times, lower survival of chicks, and ultimately population declines.

Impact Assessment

The strategic assessment notes that this impact is relevant at the Regional scale.

Chapter B8 (Terrestrial Ecology) assesses impacts on terrestrial habitats, noting that these are restricted to minor clearing for the Northern Sands DMPA delivery pipeline (Negligible, short term, reversible) and the permanent clearing of disturbed land at the Tingira Street DMPA (Low, long term to permanent).

As noted previously, the CSD Project will involve filling of the two Tingira Street lots with stiff clay (see **Section B18.5.6** for more details of the future use of this site). The DMPA site has previously been cleared and filled to between 2.0 m to 4.0 m AHD (i.e. is already above generally above HAT). As the site has been identified in Ports North planning as a future development area, the use of the area as the stiff clay DMPA provides a future beneficial use of the material and enhances the financial viability of the proposed facility. For these reasons it is considered that the placement activity relates better to modifying terrestrial habitats than reclamation.

Chapter B8 (Terrestrial Ecology) concludes that the permanent loss of habitat of the migratory bird *Gallinago hardwickii* (Latham's snipe) at the Tingira Street DMPA Site 2 (1.3 ha) and to a lesser extent, Site 1 (4.3 ha) has a Medium level of risk. Specifically, the detailed assessment documented in the technical study supporting **Chapter B8** (Terrestrial Ecology) (**Appendix AM**) concludes the following:

- The Tingira Street DMPA site does not have any qualities that are not found in greater extent and better quality at East Trinity site on the eastern side of Trinity Inlet. Any birds displaced by the project are likely to use the adjacent East Trinity habitats.
- Although there were several individuals recorded during each survey, 18 individuals (the critical threshold number) were not recorded using the site at one time (the maximum number of reliably distinct individuals recorded on the site by the surveyor was 13). This site is therefore not of international significance for *G. hardwickii*. However, for a species that does not congregate, the number of individuals of this species recorded on the site was of close to being of national importance. Unofficial counts completed in the area by bird watchers, and verbally discussed with Biotropica survey staff onsite, report numbers of national importance recorded on site (i.e. greater than 18). These figures cannot be verified.
- Overall, due to the relatively large number of individuals using the site, and the permanent nature of the impact, the CSD Project is likely to have a medium risk impact on this species. The transient nature of the resources for this species reduces what may otherwise have been a relatively significant impact to a minor (Medium) impact. Mitigation is not feasible at the Tingira Street DMPA due to the intended end use of the site as an industrial hardstand.
- Using the EPBC Significant Impact Guidelines (DoE 2013) definition, the Tingira Street study area does not support areas of important habitat for migratory species nor does it support an ecologically significant proportion of the population of any migratory species. Therefore the impact on the species is not significant as defined by these criteria. It has therefore been reassessed as Low for the purposes of this CIA.

None of the other local projects are likely to contribute to adverse impacts on this criterion. However, it is possible that future projects could involve significant impacts on supporting terrestrial habitats.

Conservatively, the highest overall impact on terrestrial habitats is assigned (i.e. Low, long term to permanent).

B18.4.2.g Physical Damage — Ship Grounding

Strategic Assessment Details

- Full description: Grounding of ships including physical damage and the dislodging of antifoulants.
- Scale: Local.
- (p6-42) The nature of the Region's environment, with its thousands of coral reefs and islands, increases the navigational hazards for all ships including cargo, large tourist and recreational vessels. The grounding of a ship can have significant and long-lasting environmental effects on a local area. The grounding of smaller vessels (less than 50 metres in overall length) generally has less effect and is considered in the section on physical damage — other (see above).
- Potential impacts from the grounding of a ship include direct physical damage to coral reef or other habitats at the grounding site, leaving visible scars; scraping off and releasing into the local environment toxic substances including anti-fouling paint, copper, zinc, and tributyltin (also known as TBT, an anti-fouling chemical that targets marine organisms); and cargo and oil spills which can have damaging or lethal effects on marine life.
- Despite more than 4000 ship calls to ports adjacent to the Great Barrier Reef each year, there have only been a small number of collisions and groundings. Since 1996, 22 ship groundings and collisions have been recorded in the World Heritage Area.
- In April 2010, a Chinese registered coal carrier *Shen Neng I* ran aground on Douglas shoal in the Great Barrier Reef. The vessel was grounded for nine days, severely damaging an estimated 80 000 to 400 000 square metres of reef. It is the largest ship grounding scar on the Great Barrier Reef. At best, it is expected the site of impact will take decades to recover. Anti-fouling chemicals from this and other ship groundings, particularly the *Bunga Terati Satu*, *Doric Chariot* and *Peacock*, will have affected marine life. These chemicals combine with pulverised reef to damage corals at the grounding sites and surrounding areas where currents transport the paint flakes and pulverised particles.

Impact Assessment

The strategic assessment notes that this impact is relevant at the Local scale.

The risk of grounding has not assessed in this Revised Draft EIS. Based on the discussion the North-East Shipping Management Plan (AMSA 2014) in **Section B18.5.2**, it is known that there has been a gradual increase (about one per cent per annum) in the number of ship voyages undertaken through the GBR region. This increase has been driven mainly by industry and mining demands, with cruise shipping only contributing <2 percent of all shipping calling at Queensland Ports (GBRMPA 2014a). Despite this increase in shipping traffic, improvements in shipping safety management as outlined below have resulted in fewer major shipping incidents in the past 10 years, with almost all ships travelling safely along the designated shipping routes of the GBR.

The Great Barrier Reef and Torres Strait Vessel Traffic Service (REEFVTS) currently monitors about 11 000 ship voyages annually (i.e. vessels >50 m) in the Great Barrier Reef and Torres Strait, and has recorded four 'grounding' incidents since its inception in 2004 (AMSA 2014).

On this basis the risk is assessed as Negligible.

Local shipping other than that associated with the CSD Project could contribute to adverse impacts on this criterion but will be subject to the same management framework.

B18.4.2.h Sediments from Catchment Run-off

Strategic Assessment Details

- Full description: Sediments entering the Region in run-off from the catchment.
- Scale: Reef-wide.
- (p6-22) Sediments from the catchment are transported to the Region via coastal rivers and floodplains during the wet season.

- It is estimated that since European settlement of the catchment in the 1850s, the average annual suspended sediment load entering the Great Barrier Reef has increased by 5.5 times from 3100 to 17,000 kilotonnes per year, with some catchments as high as 14 times more. This is mainly due to increased soil erosion where areas have been cleared of native vegetation to establish pasture grasses for grazing. It has been exacerbated by poor land management practices. In addition, hardened surfaces and straightened channels, as a result of urban and industrial development and agriculture, mean run-off has more erosive power, exacerbating stream bank erosion.
- Much of the inshore southern area of the Region is now frequently affected by increased suspended solids that often exceed water quality guidelines (Figure 6.14). Most sediment is confined to the inner shelf and settles out of the water column within five to 15 kilometres of the coastline where it may be later resuspended by wind-generated waves and currents. However, during flood events, suspended sediment may be carried further offshore. For example, during the 2010–11 wet season, when the Burdekin River had highly elevated discharge over 200 days, most sediment initially settled within approximately 10 kilometres of the river mouth, but some fine silt and clay was carried as far as 100 kilometres northward. These fine colloidal sediments also carry nutrients and other contaminants further into the Region.
- Increasing sediment loads have far-reaching effects on the Great Barrier Reef values. For example:
  - The heavier erosion sediments, which flow more slowly through the system, are filling freshwater stream beds and deep waterholes. This degrades these habitats, affecting the distribution, abundance and recruitment of many freshwater species and some marine-related species such as sawfish.
  - Increases in suspended sediment significantly alter light regimes — lower light levels reduce primary production, both pelagic and benthic (including in the coral-algae symbiosis).
  - As the increased sediment load settles, it can smother benthic organisms such as seagrass and corals, making it harder or impossible for them to grow, survive and reproduce. This has significant flow-on effects to organisms and animals dependent on these habitats.
  - The resuspension of sediments increases the turbidity of open waters and releases additional nutrients previously bound up or buried in sediments.
- Tourism operators voluntarily monitor the health of their tourism sites as part of the Eye on the Reef program. Six years of data collected from tourism sites (Figure 6.15) has found water clarity at some sites is diminishing, particularly in the southern Great Barrier Reef, which is consistent with results presented in Figure 6.14.

Impact Assessment

The strategic assessment notes that this impact is relevant at the Reef-wide scale.

Only minor earthworks are proposed for the CSD Project (i.e. at the Northern Sands DMPA, the Tingira Street DMPA, and along the Northern Sands DMPA delivery pipeline corridor). These works will be protected by erosion and sedimentation control plan as detailed in **Chapter C1** (Construction Environmental Management Plan). It is concluded that the risk of any sediment runoff is Negligible. Ports North is a contributor to the Wet Tropics Region Healthy Waterways Partnership and through this forum is actively involved in initiatives that help improve GBR water quality.

The only other relevant risk is from the remobilisation od dredge material at the Northern Sands DMPA as documented in **Chapter B17** (Hazard and Risk). This was assessed as Negligible.

None of the other local projects are likely to contribute to adverse impacts on this criterion. However, it is likely that current land uses (e.g. agriculture) and future projects could involve significant sedimentation.

B18.4.2.i Vessel Strike on Wildlife

Strategic Assessment Details

- Full description: Death or injury to wildlife as a result of being struck by a vessel of any type or size.
- Scale: Local.
- (p6-45) Vessel strikes typically affect surface-breathing marine animals such as marine turtles, dugongs, dolphins and whales, often resulting in injury or death. Wildlife may be struck by any moving vessel (for example, jet skis, yachts, dinghies and cargo ships), but the chances and consequences are far greater for high-speed vessels. The likelihood of a strike increases where high-speed vessels overlap with key shallow water habitats (for example seagrass meadows) or movement corridors for vulnerable animals. It also increases in areas adjacent to large regional communities where visits to the Region are more frequent and there are larger volumes of commercial traffic. Dugongs do not appear to swim away from passing vessels, making them at high risk of vessel strike, especially from high speed vessels.
- Current published information on vessel strikes on dugongs, whales and dolphins suggests its impact on these species has not increased substantially within the Region and is a relatively infrequent occurrence on these species.
- Recently, the waters offshore from Gladstone have had an elevated number of marine turtle strandings. In 2011, there were eight times more interactions between marine turtles and vessels compared to 1996 when strandings data began to be recorded.
- Voluntary go slow areas and transit lanes have been declared in some areas where there is high vessel traffic and large populations of marine turtles or dugongs, such as near Hinchinbrook Island. However, compliance to these voluntary measures remains low, especially among frequent users of the Hinchinbrook area. The increase in boat traffic and the consequent risks to dugongs was of great concern to Traditional Owners prior to adoption of the management arrangements.

Impact Assessment

The strategic assessment notes that this impact is relevant at the Local Reef-wide scale.

Chapter B7 (Marine Ecology) assesses the risk of vessel fauna strike, or entrainment (at the dredge head), concluding that it may occur, but with a very low probability. This is dependent on highly variable factors such as the species present, the number of individuals present and their condition, at the time of such works/operations. The overall assessed residual risk is Low with mitigation as described in **Chapter C2** (Dredge Management Plan).

Vessel strike from cruise ships is discussed in **Section B18.5.2** where it is concluded that this is an industry-wide issue that is beyond the scope of the CSD Project. For the purposes of this assessment, the residual risk is assessed as Low on the basis that management is already being applied to the issue and that this can be expected to help reduce the risk of impacts.

Reef-wide shipping other than that associated with the CSD Project could contribute to adverse impacts on this criterion but will be subject to the same management framework.

Given that there have been no recorded incidents of vessel strike in Cairns Harbour, it is considered appropriate to classify the residual risk to megafauna as Low in the short term (i.e. as per **Chapter B7** (Marine Ecology)) and Negligible in the long term (i.e. as per **Chapter B16** (Climate Change and Greenhouse) in the context of resilience).

B18.4.2.j Summary

In summary, of the High or Very High 'Effect of Impacts on Region's Attributes' classifications from the strategic assessment (note that the risk of dredging is listed at all three scales):

- At the Whole of GBR / Reef-wide scale:
  - Dredging – the CSD Project risk is Negligible
  - Marine debris – the CSD Project risk is Low
  - Sediments from catchment run-off – the CSD Project risk is Negligible.
- At the Regional scale:
  - Dredging – the CSD Project risk is Negligible to Low
  - Exotic species and diseases – the CSD Project risk is Low
  - Modifying supporting terrestrial habitats – the CSD Project risk is Low.
- At the Local scale:
  - Coastal reclamation – the CSD Project risk is N/A (i.e. the stiff clay placement at the Tingira Street DMPA is reassessed as being better described under 'Modifying supporting terrestrial habitats'
  - Dredging – the CSD Project risk is Low
  - Physical damage — ship grounding – the CSD Project risk is Negligible.
  - Vessel strike on wildlife – the CSD Project risk is Low.

As a check that all relevant project impacts have been captured, the findings of the risk assessment from each issue considered in this Revised Draft EIS (i.e. each of the Part B technical chapters) are summarised and correlated to likely impacts from other sources. See Section **B18.4.3**.

B18.4.3 Issue-based Assessment

B18.4.3.a Risk Assessment

The potential for cumulative impacts to arise from interaction of the project with third party developments was assessed during the preparation of the Revised Draft EIS technical studies (e.g. air quality, water quality, traffic, coastal processes). In some cases, technical studies assessed impacts by including the effects of other development (e.g. CityPort) or in the case of the natural environment, known and demonstrated in condition and resilience levels.

Table 18-10 contains a summary of the key findings related to the project, predicted impacts from other projects at the regional scale (focusing on the other port expansion projects) and impacts from other projects at the local scale (focusing on the proposed Aquis project as the most significant in terms of scale and location to affect the similar areas to this project).

Overall the predicted cumulative risks from all issues are assessed as having a low or negligible risk of impact in relation to potential impacts from the CSD project. This is due, in part, to each project (as required by legislation and conditions of any development approval) ensuring its own impacts are avoided, minimised, or mitigated to acceptable levels, as well as ensuring key cumulative impact issues such as the reduced resilience of natural values have been conservatively considered in the assessments and impact predictions.

The assessment described above uses the strategic assessment of the GBR to determine which cumulative impacts are of greatest concern. In the following table, a check is made of likely impacts arising from other projects and activities for each of the topics described in the Part B technical chapters. This involves an alternative CIA and is presented as a check on the previous work.

Reference is made to the scale of the cumulative impact, based on **Table B18-8**. Codes are used as follows:

- L = Local
- R = Regional
- RW = Reef-wide.

TABLE 18-10 ISSUE-BASED ASSESSMENT

EIS CHAPTER / ISSUE	CSD PROJECT RESIDUAL RISK ASSESSMENT SUMMARY	SCALE	IMPACTS FROM OTHER PROJECTS AT A GBRWHA REGIONAL SCALE (E.G. OTHER GBR PORT PROJECTS)	IMPACTS FROM OTHER PROJECTS AT A LOCAL SCALE (AQUIS AND OTHER PROJECTS)	PREDICTED CUMULATIVE RISK FOR THE ISSUE
Chapter B1 Land	<u>Soils</u> While the volume of soft clay to be deposited on land is substantial (of the order of 1 million m^3), it is to be deposited into an existing void with appropriate management in place. The residual risk of impacts on soils are assessed as being Negligible to Low.	L	The other port projects in the GBR will not affect sols in the Cairns region due to their distance from the project.	Proposed impacts on soils at the Aquis site (~13 km from the CSD) are outlined in the Aquis draft EIS. These are predicted to be negligible at the local scale. CityPort is a complementary development master plan for the Port of Cairns SPL. It is assumed that CityPort and all approved development in the CBD and vicinity is in accordance with the Cairns Regional Plan and will be complementary to the project.	Negligible risk of cumulative impact
	<u>Land Use</u> While there will be a loss of amenity due to the intrusion of the delivery pipeline and associated infrastructure at the mouth of Richters Creek, this is a short term impact.	L	The other port projects in the GBR will not affect land use in the Cairns region due to their distance from the project.	Proposed changes to local land use at the Aquis site are outlined in the Aquis draft EIS. While these will be extensive, there will be little interaction with the CSD Project. CityPort is a complementary development master plan for the Port of Cairns SPL. It is assumed that CityPort and all approved development in the CBD and vicinity is in accordance with the Cairns Regional Plan and will be complementary to the project.	Negligible risk of cumulative impact
Chapter B2 Nature Conservation Areas	The project has predicted a Low (temporary) risk of local impacts to the GBRWHA, GBRMP and Queensland Great Barrier Reef Coast Marine Park (GBRCMP) at the local scale, primarily related to impacts to unvegetated benthic habitat in the dredge footprint and DMPA.	L R RW	If other port projects in the region predict significant impacts on the GBRWHA or GBRMP they will not be approved or otherwise require appropriate offsets. Modelled impacts from dredging and dredge material placement for other port projects have not shown re-suspension impacts that affect the	The draft EIS for Aquis does not predict impacts on downstream Nature Conservation Areas (MNES and/or MSES). Refer to Water Quality and Marine Ecology sections below for discussion of other local project potential impacts on non area-based MNES/SES.	Low risk of cumulative impact

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	Residual impacts to the Trinity Inlet Fish Habitat area are Low as they are being offset by a proposed adjustment to the boundaries to achieve no net loss. There is a Negligible to Low risk of impacts at the regional scale and negligible impacts at the whole of the GBRWHA and GBRMP scale as the impacts from the project are generally confined to the local scale.		local study area for the project to date. Shipping from other port expansions will increase the number of ships that traverse the GBRWHA/GBRMP and the implementation of the strategies outlined in the North-East Shipping Management Plan (AMSA 2014) to proactively manage these risks.		
Chapter B3 Coastal processes	Overall, Negligible to Low risk of impacts on coastal processes from the project are predicted with the exception of increased annual maintenance dredging (2-6%) that has been assessed as medium. No mitigation is possible, although the proposed DMPA location has been shown to be a highly retentive site under both prevailing and 'worst case' conditions. Long-term impacts are considered unlikely.	L	Impacts from dredging and dredge material placement for other port projects in the GBRWHA are unlikely to indicate changes to hydrodynamics, shoreline morphology or sediment transport processes that could affect the project area.	The draft EIS for Aquis identified that the project will not impact coastal processes or have adverse effects on adjacent lands. There are no other local projects known to propose dredging or other significant marine works that would be predicted to significantly impact on coastal processes.	Negligible risk of cumulative impact
Chapter B4 Marine sediment quality	All capital dredge material will be placed on land. Future maintenance material must be tested in accordance with this NAGD assessment process; noting maintenance dredging material at the Port of Cairns has always been deemed suitable for marine placement in terms of contaminant levels. All residual risks have been assessed as Negligible.	L	All port projects must demonstrate dredged material is suitable for at- sea placement through the NAGD assessment process and sea dumping permit process (administered by the GBRMPA and/or Department of Environment (DoE)). These statutory processes protect the GBRWHA and associated values from the impacts of contaminated sediments.	The draft EIS for Aquis indicates there is a negligible risk of sediment contamination from the project. There are no other local projects known to likely pose a significantly impact to sediment quality in Trinity Bay.	Negligible risk of cumulative impact

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Chapter B5 Marine water quality	The project predicts a Low risk of residual impact on water quality based on the implementation of a strategy to avoid or reduce dredge overflow by the trailing suction hopper dredge. Further, the use of a backhoe dredge for stiff clay will further reduce the impacts of overflow during capital dredging. Impacts from the dredging will be Low (temporary) and will not preclude the achievement of water quality objectives (noting that for some parameters these objectives are already exceeded in ambient conditions). Tailwater discharges from the Northern Sands DMPA do not exceed specified water quality criteria and the residual risk is Negligible. Operational risks (i.e. on-going maintenance dredging and marine placement) are Negligible to Low.	L R RW	Studies of water quality impacts from dredging and dredge material placement for other port projects show that turbidity or other water quality impacts will not affect the local study area for the project. Increase in shipping: Cruise ships comprise only a very minor component of the total number of commercial vessels transiting the GBRWHA region. In 2011-2012, cruise ships represented <2 percent of the commercial vessel calls to GBR ports. (GBRMPA website, 2014)	The draft Aquis EIS commits to implement water quality management plans that apply to both construction (EMP, ASS management plan, etc.) and operational phases (stormwater and lake water quality management) of the project. These commitments are reflected in the CoG's conditions and will follow through to development approvals. At a local and regional scale there is the potential for water quality impacts from any of the development areas that are in the catchment of the local study area. Should the timing of construction works occur with severe/ extreme weather events there is the potential for turbid runoff from sites in the catchment of Trinity Bay.	Low risk of cumulative impact. (see Note 1)
Chapter B6 Water Resources	<u>Surface Water</u> There is little use of surface water in the Study Area and all risks are Negligible.	L	There are no known regional projects that are predicted to impact upon surface water resources in the vicinity of the CSD Project	The draft EIS for Aquis indicates that there will be negligible risk of impacting on surface water. Handling of any chemicals or fuels in the catchment of waterways has the potential for impact. However there is a low risk based on implementation of standard management practices as would be conditioned by any development approval.	Negligible risk of cumulative impact

(Continued over)

EIS CHAPTER / ISSUE	CSD PROJECT RESIDUAL RISK ASSESSMENT SUMMARY	SCALE	IMPACTS FROM OTHER PROJECTS AT A GBRWHA REGIONAL SCALE (E.G. OTHER GBR PORT PROJECTS)	IMPACTS FROM OTHER PROJECTS AT A LOCAL SCALE (AQUIS AND OTHER PROJECTS)	PREDICTED CUMULATIVE RISK FOR THE ISSUE
	<u>Groundwater</u> The only risk of any consequence is lateral migration of saline water away from the Northern Sands DMPA causing impacts on water quality in the upper unconfined aquifer (Medium). All other risks associated with the soft clay placement are Low.	L	There are no known regional projects that are predicted to impact upon groundwater resources in the vicinity of the CSD Project	The draft EIS for Aquis indicate that, with the recommended mitigation, there will be negligible risk of impacting on groundwater. There are no other local projects known to likely pose a significantly impact to groundwater in the Study Area.	Negligible risk of cumulative impact
Chapter B7 Marine Ecology	The project predicts Negligible to Low level temporary impacts on the important habitats and species of Trinity Bay and Trinity Inlet that could be affected by dredging. All impacts during the operational phase have Low residual risk.	L	The resilience of marine ecological resources in the GBR region is well documented in both the Outlook Report (2014) and Strategic Assessment (Australian and Queensland Governments 2014). Local impacts from other port projects on these values are subject to rigorous EIS process and conditions of approval. As outlined above, regional impacts from port projects on marine ecological resources are not predicted for issues such as dredge material placement and shipping.	The draft Aquis EIS indicates that management solutions will result in a net beneficial impact on flora and fauna values both within the site and in external areas downstream to the GBR lagoon via the two Fish Habitat Areas and the Estuarine Conservation Zone of the GBRMP. Refer to water quality aspects as no known local project with direct marine ecology impacts	Low risk of cumulative impact.
Chapter B8 Terrestrial Ecology	The project predicts Negligible to Low residual risk to terrestrial ecology due to the fact that there is little need for clearing other than in small areas along the delivery pipeline corridor (and this will be rehabilitated following demobilisation). There is expected to be a Low to Medium risk of impact on the migratory bird *Gallinago hardwickii* (Latham's snipe) at the Tingira Street DMPA although any birds displaced by the clearing are likely to use the adjacent East Trinity habitats	L	There are no known regional projects that are predicted to impact upon local terrestrial ecology.	The Aquis project is not predicted to have an impact on the local ecological study area of the CSD project. Potential construction works for adjacent developments (e.g CityPort and other waterfront development) are not expected to have impact on the local terrestrial or intertidal ecological study area of the project.	Negligible risk of cumulative impact.

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Chapter B9 Socio Economic	<u>Social</u> The project predicts a low to negligible residual risk from a social perspective. This is as a result of public support for the project and mitigation measures in the form of continued consultation with key parties.	L	There are no known regional projects that are predicted to impact upon local social values.	Potential cumulative disbenefit should co-incidental timing of project constructions cause amenity impacts (traffic, noise, air quality, visual, etc.) and potential strain on local worker accommodation and other services.	Low risk of cumulative impact.
	<u>Economic</u> The project predicts a beneficial outcome from when it is operational in terms of local economy, local employment, improved efficiency for existing cargo shipping and improved cruise ship passenger experience. However, it identifies a high risk in terms of lost economic opportunity (of which the project is the only mitigation) if the project does not go ahead.	L R RW	Other port projects primarily cater for bulk cargo exports, while the CSD project which will improve the regional cruise liner shipping revenue. All promote overall regional and wider economic benefits.	Potential cumulative economic benefit due to local and regional job creation and associated economic benefit.	Beneficial cumulative benefit.
Chapter B10 Noise and Vibration	The project predicts a Low to Medium level of residual risk. The impacts from noise are primarily seen in construction noise from land-based infrastructure and dredging. However, there are air quality concerns at the neighbourhood level. All other noise and vibration impacts are considered Low residual risk.	L	The other port projects in the GBR will not affect noise emissions in the Cairns region due to their distance from the CSD Project. There are no known regional projects that are predicted to impact upon local acoustic environment. In any case, noise is not cumulative unless the emissions occur simultaneously at the same place or in the same vicinity.	Potential cumulative impacts are possible should timing and location of construction of multiple projects coincide. This is most unlikely.	Negligible risk of cumulative impact.

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Chapter B11 Air Quality	The air quality impact as a result of the project construction and operations is likely to be Low due to good existing air quality in the Cairns region and air quality management and mitigation measures proposed for the project. However, there are air quality concerns at the neighbourhood level. The likelihood of significant air emissions affecting nearby sensitive receivers from the disturbance of dredged material is considered to be negligible. Dust generation and vehicle exhaust emissions are expected to be minor and short term in their nature.	L	The other port projects in the GBR will not affect air quality (in terms of concentration) in the Cairns region due to their distance from the CSD Project. Air emissions are cumulative (in terms of flux).	Other local projects will not affect air quality (in terms of concentration) in the local area unless they are in the same vicinity as the CSD Project. Air emissions are cumulative (in terms of flux).	Negligible risk of cumulative impact.
Chapter B12 Landscape and Visual	The project predicts Negligible residual risk from the viewpoints assessed. The incremental increase in the size and frequency of cruise ships at the CCLT will be perceptible in a number of views, but unlikely to be appreciably different from the existing situation. There will be visual intrusion of the delivery pipeline and associated infrastructure at the mouth of Richters Creek but this is a short term impact.	L	The other port projects in the GBR will not affect visual amenity in the Cairns region due to their distance from the project.	Potential cumulative impacts are possible should timing and location of construction of multiple projects coincide. This is most unlikely.	Negligible risk of cumulative impact.

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EIS CHAPTER / ISSUE	CSD PROJECT RESIDUAL RISK ASSESSMENT SUMMARY	SCALE	IMPACTS FROM OTHER PROJECTS AT A GBRWHA REGIONAL SCALE (E.G. OTHER GBR PORT PROJECTS)	IMPACTS FROM OTHER PROJECTS AT A LOCAL SCALE (AQUIS AND OTHER PROJECTS)	PREDICTED CUMULATIVE RISK FOR THE ISSUE
Chapter B13 Cultural Heritage	<u>Indigenous cultural heritage</u> The project predicts Negligible to Low residual risk to Indigenous cultural heritage. Known places of significance (sites and story places) have been identified and are considered unlikely to experience impacts.	L	There are no known regional projects that are predicted to impact upon local indigenous cultural heritage aspects.	There are no known other local projects that are predicted to impact upon identified indigenous cultural heritage aspects within the CSD Project study area.	Negligible risk of cumulative impact.
	<u>Non-indigenous cultural heritage</u> The project predicts Low residual risk to non-indigenous cultural heritage. Known places of significance (Shipwrecks, Trinity Wharf Complex (Wharves 1-6), remnant Malay Town) have been identified and are considered unlikely to experience impacts.	L	There are no known regional projects that are predicted to impact upon local non-indigenous cultural heritage aspects.	There are no known other local projects that are predicted to impact upon identified non-indigenous cultural heritage aspects within the CSD Project study area.	Negligible risk of cumulative impact.
Chapter B14 Land Transport	The project predicts a Negligible residual risk to transport infrastructure. No mitigation measures are required.	L	There are no known regional port projects that are predicted to impact upon the local Cairns transportation network.	Development conditions of all approved projects will include predicted traffic management measures. CityPort will be developed to facilitate all port transport requirements in accordance with the approved master plan.	Negligible risk of cumulative impact.
Chapter B15 Waste Management	There will be Negligible residual risk to human health, ecological values, and amenity from waste. Existing waste infrastructure and procedures are adequate to handle the incremental increase expected.	L	Potential cumulative impact from increased shipping (ballast water, sewage, etc.) has the potential to impact at a regional scale, however, the cruise liner industry contribution is <2 percent total shipping. Additionally, most modern cruise ships have on board incinerators reducing the generation of solid wastes.	No additional shipping wastes predicted from any local development.	Negligible risk of cumulative impact.

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EIS CHAPTER / ISSUE	CSD PROJECT RESIDUAL RISK ASSESSMENT SUMMARY	SCALE	IMPACTS FROM OTHER PROJECTS AT A GBRWHA REGIONAL SCALE (E.G. OTHER GBR PORT PROJECTS)	IMPACTS FROM OTHER PROJECTS AT A LOCAL SCALE (AQUIS AND OTHER PROJECTS)	PREDICTED CUMULATIVE RISK FOR THE ISSUE
Chapter B16 Climate Change and GHGs	Climate Change Climate change will involve a Medium residual risk for the Landside Works in terms of projected sea level rise and increased severity of cyclones. This may lead to more frequent maintenance or temporary delays or obstruction of cruise ship berthing. No other project elements are at risk.	N/A	Climate change is an impact on a project not an impact of it. Hence there is no prospect for cumulative impacts.	As for previous column.	Negligible (No) risk of cumulative impact.
	GHG Emissions Moderate levels of carbon emissions are predicted as a result of the construction and operation of the CSD Project. The amounts produced are well below the National Reporting Thresholds (which are an indication of high carbon emitters), and are only an extremely small percentage (>1 percent) of Queensland's annual total carbon emissions. The residual risk is assessed as Low.	RW	All developments contribute GHGs. However, none are considered to have significant impacts. Aquis is predicted to produce 17.4 kt of CO_2e during its construction and 189 kt of CO_2e annually once it is operational. Similarly to the CSD Project, these are relatively small amounts when compared to Queensland's annual total carbon emissions.	As for previous column.	Negligible risk of cumulative impact.
Chapter B17 Hazard and Risk	Natural Hazards There are a number of natural hazards that various projects elements will be exposed to. The most severe of these are earthquake tsunami, cyclonic winds, and cyclone-induced water levels (Landside Works only). There are established design standards and disaster management plans for these and other natural hazards. Other project areas have limited exposure as the works will be short term and underway outside the cyclone season.	L	Not applicable	Natural hazards do not involve cumulative risks, although demands on emergency services are additive.	Negligible risk of cumulative impact.

EIS CHAPTER / ISSUE	CSD PROJECT RESIDUAL RISK ASSESSMENT SUMMARY	SCALE	IMPACTS FROM OTHER PROJECTS AT A GBRWHA REGIONAL SCALE (E.G. OTHER GBR PORT PROJECTS)	IMPACTS FROM OTHER PROJECTS AT A LOCAL SCALE (AQUIS AND OTHER PROJECTS)	PREDICTED CUMULATIVE RISK FOR THE ISSUE
	<u>Project-specific Risks</u> The placement of sift clays at the Northern Sands DMPA involves a Negligible risk of afflux for surrounding lands and a negligible risk of remobilisation of placed material. The DMPA has limited exposure as the works will be short term and will generally be underway outside the cyclone season when Barron River flooding risk is greatest. Although the facility will operated over one wet season (post-placement), the proposed bunds will ensure that it is resilient to flooding.	L	Not applicable	Aquis has minor afflux impacts but these are independent of those at the Northern Sands DMPA (i.e. the floodwaters will not interact).	Negligible risk of cumulative impact.
	<u>Operational Risks</u> Construction Hazards and Risks identified have a Low to Medium residual risk rating whilst the Operational Hazards and Risks that are identified as being High are existing risks and not additional risks introduced by the delivery of the CSD Project. Those existing High risk activities are well established and actively managed by Ports North as part of existing management and operational practices, protocols and plans.	L	Not applicable	Construction and operational risks and hazards do not involve cumulative risks, although demands on emergency services are additive.	

(Continued over)

EIS CHAPTER / ISSUE	CSD PROJECT RESIDUAL RISK ASSESSMENT SUMMARY	SCALE	IMPACTS FROM OTHER PROJECTS AT A GBRWHA REGIONAL SCALE (E.G. OTHER GBR PORT PROJECTS)	IMPACTS FROM OTHER PROJECTS AT A LOCAL SCALE (AQUIS AND OTHER PROJECTS)	PREDICTED CUMULATIVE RISK FOR THE ISSUE
Chapter B19 EPBC Act Issues	<u>WHAs and NHPs and GBRMP</u> As for Chapter B2 (i.e. Low risk at local scale, Negligible to Low at regional scale, Negligible at Whole of GBR scale)	L R RW	Other ports have similar risk profiles. The local scale and regional scale risks will not be cumulative whereas the (Negligible) Whole of GBR scale risks will be.	The draft EIS for Aquis does not predict more than Negligible impacts on these areas.	Low risk of cumulative impact
	<u>Listed threatened species and migratory species</u> As per **Chapter B8** (Terrestrial Ecology) and **Chapter B7** (Marine Ecology). With the exception of *G. hardwickii* at the Tingira Street DMPA, all EPBC Act species impacts have Negligible to Low risk of impacts. *G. hardwickii* risks are probably overstated.	L	Other ports are expected to have similar risk profiles regarding marine species and migratory birds (Low) (i.e. the same species are likely to be present). No comment can be made regarding terrestrial species. The local scale and regional scale risks will not be cumulative whereas the (Low) Whole of GBR scale risks will be.	The draft EIS for Aquis does not predict more than Negligible impacts on species. Most Aquis impacts will be terrestrial rather than marine, suggesting that impacts will not be cumulative. The exception is water quality which involves Negligible risk for both projects. It is most unlikely that these risks would coincide due to timing considerations.	Negligible risk of cumulative impact

Source: Study team compilation based on designated Part B chapters. Scale code from **Table B18-8**.

Note 1: Both projects will likely be subject to extensive monitoring programs to validate EIS findings and to reactively respond to any triggers to water quality performance requirements. It can be assumed that the conditions of any development approval will include provisions to employ minimum standard erosion and sediment control techniques to prevent turbid runoff from leaving the development site. Additionally all coastal developments are required to meet design criteria for storm surge impacts in extreme weather events. The proposed Reactive Monitoring Program will respond to any triggers to water quality performance requirements and will therefore mitigate the potential for cumulative water quality impacts during capital dredging.

B18.4.3.b Summary

The issues-based assessment reveals that there may be Low cumulative risk levels for the following issues:

- (Local scale) to Nature Conservation Areas (including EPBC Act protected areas) during dredging (temporary).
- (Local scale) to marine water quality during dredging (temporary)
- (Local scale) to marine ecology during dredging (temporary) and during operation (permanent)
- (Local scale) to social values during construction (temporary)

There will be beneficial (Local to Whole of GBR) beneficial impacts to the economy (permanent). All other risks are Negligible. Operational risks (i.e. on-going maintenance dredging and marine placement) are Negligible to Low (permanent).

No additional cumulative risks were identified.

B18.5 Assessment of Potential Impacts (Consequential)

B18.5.1 Introduction

As previously discussed, consequential impacts are those that arise as a result of / are facilitated by the CSD Project, particularly in the long term. These are considered to be as follows:

- increased cruise shipping
- increased maintenance dredging
- increased visitation
- increased demand on infrastructure and services
- end-uses of the two DMPAs.

These are described below.

B18.5.2 Increased Cruise Shipping

B18.5.2.a Likely Changes in Shipping Movements

As outlined previously, the net increase in cruise ship visits from the improved infrastructure provided by the project will be incremental, with many of the larger class cruise vessels that currently anchor at Yorkeys Knob able to 'moor alongside' at Trinity wharves following completion of the project.

Under the adopted growth scenario (with Brisbane Cruise Terminal & Home Porting, Medium Projection), the CSD Project will facilitate an increase in the number of ships at Cairns of 67 by 2026, compared with business as usual. The 2031 estimate is 70. This is a far smaller number than the increase in bulk and break bulk cargo and fuel ship movements projected at other expanding GBR ports.

In addition to the small volume of ships involved, other aspects of the project which reduce the risk of impacts from cruise shipping include:

- The wider and deeper channel and swing basins improve navigational safety in terms of all tide access to the port. The 100 m channel and wider bend have been designed to fully meet regional harbour master and marine pilot safety requirements. While existing cruise ship operations at the Port of Cairns are very safe, the expanded channel will further improve factors of safety, noting the overall manoeuvrability and navigability of modern cruise ships also continues to improve through technological advances and the continued higher use of larger cruise ships in the region.
- The project will enable the Port of Cairns to cater for the majority of cruise vessels visiting the area, minimising the use of anchorages at Yorkeys Knob. Management of shipping within the port limits is considered a favourable and safer alternative for the overall management of shipping risks.
- Large cruise ships and the cruise ship companies who operate them, have accredited good practice Environmental Management Systems (EMS) to manage incidents as well as ship sourced waste and pollution. This includes waste incineration at sea and the ability to hold large volumes of wastewater. Alongside operations at Trinity wharves (particularly during overnight visits) provides cruise ships with the additional opportunity to dispose of liquid and solid waste materials to appropriate on-shore facilities, as well as take on new supplies and crew exchange.

Based on the above, the forecast increase in cruise shipping visits presents a very minimal change to the substantive risk levels of shipping in the GBRWHA and in the port limits of Port of Cairns if managed accordingly. Further consideration of consequential impacts is provided below.

B18.5.2.b Impacts

Thousands of domestic and international ships transit the GBRWHA each year with very few, if any, incidents. The Great Barrier Reef and Torres Strait Vessel Traffic Service (REEFVTS) currently monitors about 11 000 ship voyages annually (i.e. vessels >50 m) in the Great Barrier Reef and Torres Strait, and has recorded four 'grounding' incidents since its inception in 2004 (AMSA 2014).

During this period, the service has recorded a gradual increase (about one per cent per annum) in the number of ship voyages undertaken through the GBR region. This increase has been driven mainly by industry and mining demands, with cruise shipping only contributing <2 percent of all shipping calling at Queensland Ports (GBRMPA 2014a). Despite this increase in shipping traffic, improvements in shipping safety management as outlined below have resulted in fewer major shipping incidents in the past 10 years, with almost all ships travelling safely along the designated shipping routes of the GBR.

AMSA (2014) includes an assessment of the impacts of shipping and refers extensively to the strategic assessment. It also provides a more detailed assessment of known and potential shipping impacts on MNES and OUV and concludes that:

> Even when operated safely, and in accordance with all legal requirements, shipping may still have an impact on the environment from operational and other routine impacts such as exhaust gas emissions and anchoring. The cumulative effect of these impacts may accumulate in time or interact with other impacts to place additional pressures on an already stressed environment. (p ix)

Shipping activity in the GBRWHA has the potential to impact the OUV of the WHA and other MNES through the following (PGM Environment 2012):

- collisions, groundings and other maritime navigational incidents
- oil spills
- anchorages (in relation to potential damage and contamination of the seabed and associated habitats)
- ship sourced atmospheric emissions
- the incision and possible establishment of marine pests in relation to ballast water and biofouling
- ship sourced oily wastes, sewage and garbage
- marine fauna strike
- underwater noise.

Several of these have already been discussed in the context of cumulative impacts.

B18.5.2.c Management

Given these risks, the GBRWHA is one of the world's most regulated shipping areas (GBRMPA 2014a). The GBRMPA together with the AMSA and MSQ work closely to protect the marine environment from the potential adverse consequences of shipping operations. The Reef was designated as a "Particularly Sensitive Sea Area' by the International Maritime Organization (IMO) in 1990 and shipping traffic is confined to a Designed Shipping Area unless otherwise permitted by GBRMPA.

Measures to increase navigational safety and reduce the risk of ship groundings and collisions include:

- compulsory and recommended pilotage areas (noting specified areas of the GBR requires accredited reef pilots as well as port specific pilots within port limits)
- an automatic ship identification and vessel tracking system (REEFVTS system)
- traffic separation controls
- ship vetting procedures
- mandatory vessel reporting and monitoring.

Standing arrangements are in place for dealing in an effective and expeditious manner to any oil or chemical spill in the GBRWHA under the Australian National Plan to Combat Pollution of the Sea by Oil and Other Noxious and Hazardous Substances. The National Plan links with Queensland State-wide and regional measures that address the waters of the GBRWHA and include 1st Strike Response plans for each port (including the Port of Cairns) as well as an Oiled Wildlife Response Plan.

The Port of Cairns already regularly handles a range of petroleum cargos at its fuel wharf and provides smaller quantities of marine diesel fuel at the CCLT via road tankers. Oil and chemical spill response assets are pre-

positioned at the Port of Cairns including AMSA's national stockpiles of spill response equipment for use by other ports and marine users.

The overall approach to the environmental management of shipping in the GBRWHA has also recently been reviewed and updated as part of the North-East Shipping Management Plan (AMSA 2014). The plan examines shipping-related risks in the GBRWHA, the Torres Strait and the Coral Sea and identifies protective measures and is identified in the State Party Report as a key supporting measure for protecting the OUV of the World Heritage Area.

With shipping numbers predicted to significantly increase in the next 10 to 15 years as a result of mining and LNG industry growth, port expansions and increases in trade, AMSA (2014) has made recommendations to further reduce the risks from shipping and to consolidate and improve upon the existing shipping record in the GBR.

Specific environmental management measures for shipping that operate in the GBR region include:

- areas where anchoring is prohibited
- special requirements for tankers and hazardous cargos
- oily waste discharge restrictions
- sewage discharge restrictions
- garbage discharge restrictions
- ballast water discharge restrictions consistent with IMO Protocols.

While the additional ship movements could increase the likelihood of vessel-related impacts (due to the fact that there are more vessels), it is concluded that these are all industry-wide issues that is beyond the scope of the CSD Project. All vessels will be subject to the existing and proposed management framework.

B18.5.3 Increased Maintenance Dredging

As discussed in **Chapter B3** (Coastal Processes), the CSD Project is likely to result in an increase in annual maintenance dredging volume on the order of 10 000 to 20 000 m^3 per year. This corresponds to an increase of 2% to 6%. Placement will continue to occur at the existing sea disposal site.

Annual dredging at the Port of Cairns is likely to continue to be undertaken by the TSHD Brisbane, a similar but slightly smaller dredge vessel to that modelled for the Project capital dredging. Current channel maintenance dredging campaigns typically occur during the months of July and August and generally take about 3 to 4 weeks to complete. **Chapter B5** (Marine Water Quality) discusses the water quality impacts from future maintenance dredging likely to be undertaken by the TSHD Brisbane.

In the context of coastal processes, maintenance dredging clears the channel of sediment trapped within the dredge footprint. Current management practice is for the dredged material to be placed at the approved offshore DMPA. As shown in the bathymetry, marine placement sites in Trinity Bay have demonstrated a high degree of retentiveness of the dredge material placed within them over time, despite the occurrence of extreme weather events.

A numerical modelling assessment has been undertaken of placed maintenance material resuspension from both the existing approved DMPA and a deeper alternative site (Option 1A) that was investigated as part of the previous draft EIS.

The two re-suspension simulations adopted the period from August 2011 to August 2012 for environmental forcing. This period was selected since it had been previously simulated as part of the Draft EIS and was shown to be reasonably representative of the long term average wind and wave climate. As expected the quantity of material dispersed to areas outside of the DMPA perimeter during the 12 month period is relatively low for each location. While there is ample capacity at the existing approved DMPA for the maintenance dredging requirements associated with the project, Option 1A DMPA has also been investigated and proved acceptable. This alternative site could be used once the existing site has expired and a new site is required, noting even greater retentiveness and associated water quality benefits.

In the longer term, the port will continue to be required to prepare and implement a sediment sampling and analysis plans (SAP) to determine the suitability of future maintenance dredge material for marine placement. These will be need to be undertaken at regular intervals noting current investigations are permitted to remain current for a period of six years under the NAGD. Despite any approval issued pursuant to the project, any contaminated dredge material detected in future testing will not be permitted to be placed at sea under the NAGD and sea dumping permit process. Also in the longer term, GBRWHA ports are required under the Maintenance Dredging Strategy for Great Barrier Reef World Heritage Area Ports (TMR 2016) to prepare a Long term Maintenance Dredging Management Plan in the near future (approximately one year). Guidelines and approval processes (through the Queensland Government) are being developed and these will provide a long term basis to manage risks of maintenance dredging. This strategy is a key action under the Reef 2050 Long-Term Sustainability Plan.

The residual risk (**Table 18-10**) has been assessed as Negligible to Low (permanent). This is considered applicable also to consequential impacts.

B18.5.4 Increased Visitation

B18.5.4.a Overview

The CSD Project is expected to lead to an increase in visitation by virtue of the additional capacity. Some obvious flow-on effects of this additional visitation will be increases in:

- demand for on-ship services while the vessels are in port (electricity, water, sewerage, food, waste collection)
- demand for the above and other services when passengers and crew make use of on-shore facilities
- increased visitation to attractions (day trips etc.) and the suite of allied impacts (see **Section B18.5.4.b**)
- consequential demands for infrastructure and services arising from new jobs created by new passengers (e.g. housing, education, medical).

With the exception of the on-ship services category, the remaining demands are those of any visitor to the region and it could be argued that on-ship demands are equivalent to similar services provided by hotels and other forms of accommodation. On this basis, cruise ship passengers are similar to other classes of tourists whose numbers are included in local and regional forecasting.

B18.5.4.b Impacts on Nature Conservation Areas

The following points are relevant to the consideration of possible impacts on Nature Conservation Areas (especially the GBRWHA and the WTWHA).

- FNQ Regional Plan 2009-2031
  - The role of tourism in the regional economy is well-recognised in the FNQ Regional Plan 2009-2031 (Regional Plan). This notes that '… over the past decade, the FNQ region has experienced continuous growth in resident population, visitation, economic activity, and urban development. The region's tourism industry expansion and the national trend of population movement north along the Australian east coast have driven this growth. The government expects this growth to continue over the next 20 years and beyond. The regional plan will help manage this growth in the most sustainable way to protect and enhance the quality of life in the region'. (p 6)
  - The Regional Plan recognises the need for management and states:
    - The cumulative number, location and type of visitor sites is managed so that they do not adversely affect World Heritage values while maximising options for presenting the area. (p 101)
    - This objective is given effect through local government planning schemes and government agencies planning and management arrangements. However, the major management of tourist use of the WTWHA is via the *Wet Tropics Management Plan 1998* (WTMP) prepared under the *Wet Tropics World Heritage Protection and Management Act 1993* (Qld).

- GBRWHA Management
  - Zoning Plan. The *Great Barrier Reef Marine Park Zoning Plan 2003* is designed to protect the Region's biodiversity while allowing ecologically sustainable use and the continuation of traditional activities. It achieves biodiversity protection by providing spatial control of use (predominantly extractive activities) and, to a lesser extent, access within the GBRMP. It establishes the need for permits for some uses in the Marine Park, such as tourism, infrastructure and research and also provides for emergency responses in relation to incidents such as risks to human life, pollution threats or vessel groundings. There are complementary zoning arrangements in adjacent areas under Queensland jurisdiction within the Great Barrier Reef Coast Marine Park.
  - Plans of management. There are four plans of management for areas in the Marine Park, covering about eight per cent of the Marine Park. They set out specific management arrangements for areas, species, ecological communities or activities and are important in protecting biodiversity and heritage values while ensuring sustainable use (especially tourism and recreation activities). They complement zoning and permitting arrangements. The plans for the Cairns Area, the Whitsundays and Hinchinbrook set out detailed management arrangements applying to all users of these areas, with a focus on protecting key natural values and allowing a range of uses. Some provisions of each plan are legally binding.
  - Permits. Permits regulate use of the Marine Park and are a tool to reduce impacts, separate potentially conflicting activities, collect data for planning, and monitor potentially damaging activities. They are issued mainly for marine tourism, research, dredging and infrastructure (for example jetties and marinas). As part of the permitting process, there is a formal environmental impact assessment under the Act for evaluating the likely possible risks or impacts to the environment from a proposed activity or development. Joint Queensland Government / GBRMPA permits may be issued for activities which operate across jurisdictions.
- WTWHA Management
  - According to the strategic review of the GBR coastal zone (DSDIP 2013), visitor use is not listed as one of the major threats to the values of the WTWHA.
  - Management of the WHA is via a zoning system (that establishes which activities in the Area are prohibited, allowed under permit, or allowed without a permit) and via the associated permit system as appropriate. In general, tourism infrastructure is located within Zone D of the WHA and this zone is managed to minimise any adverse impacts of activities and facilities, and to protect and rehabilitate the land. Between them, the zoning and permit system ensure the likely impact of the proposed activity on the WTWHA's World Heritage values is minimised. Decision-making principles and criteria also include the precautionary principle and consideration of prudent and feasible alternatives, carrying capacity, and community aspects (DSDIP 2013).
  - The strategic assessment also notes that promoting presentation of the Wet Tropics WHA to visitors is a key function of the WTMA under the World Heritage Convention and the Wet Tropics Act. The WTMA works with QPWS, community conservation groups, and the tourism industry, to inform and educate residents and visitors about the wonders of the WTWHA, its unique plants and animals, and its scenic beauty. Specifically, the WTMA recognises that properly managed, nature based tourism provides a valuable opportunity to present the Wet Tropics WHA and promote regional, national, and international recognition, understanding, and appreciation of the OUV of the WHA. Such recognition and appreciation has resulted in enhanced support for the protection of the WHA and its OUV (DSDIP 2013).

It is concluded that there are sufficient controls to ensure that visitor use is managed sustainably. The residual risk has been assessed as Negligible.

B18.5.5 Increased Demand on Infrastructure and Services

It has been demonstrated that the infrastructure improvements associated with the project (channel expansion, provision of bunker fuel, and construction of a holding tank to deal with the minor capacity limitation of the existing sewerage system) can respond to and increase demand for cruise shipping by improving access and facilities at the port and generating tangible benefits for the broader North Queensland economy. It will also be beneficial to expansion of HMAS Cairns Naval facility and have efficiency benefits for existing cargo operations, proposed or currently being assessed in the GBRWHA region.

The residual risk has been assessed as Negligible.

B18.5.6 End-uses of the Two DMPAs

The filling of the Northern Sands and Tingira Street DMPAs will create new environments that to some extent are a consequence of the CSD Project. Issues are discussed below.

B18.5.6.a Northern Sands DMPA

The Northern Sands DMPA is currently used as an approved sand quarry and the existing void is approved for the disposal of inert construction and demolition waste, and up to 5000 m^3 / annum of potential acid sulfate soil. The void (known locally as Lake Narelle) contains water from groundwater seepage and rainfall and is mapped under the Queensland wetland mapping program as a 'Lacustrine wetland' as described in **Chapter B8** (Terrestrial Ecology). This mapping classifies all waterbodies and does not distinguish between natural and artificial waterbodies, nor classify for ecological importance of the 'wetland'. The wetland values are currently reduced by constant disturbance resulting from the active use of the void and surrounds. Overall, the Northern Sands site displays low ecological values and is within an area of widespread anthropogenic disturbance.

Once the soft clay placement campaign is over, the clays are expected to gradually consolidate and the saline water that accompanied the pumping inflow will gradually be replaced by fresh groundwater. This process is described in detail in **Chapter B6** (Water Resources) and **Chapter B17** (Hazard and Risk). Over a period of several months, the placed material will develop a crust at or about the current ground level.

In terms of consequential impacts, the use of the void as a DMPA will fill the current lake to about the current ground level. At this time, the DMPA will revert to the control of the owner who will then determine subsequent uses. No assumptions can be made about this use although current approvals imply that at some time the void is to be completely filled (if this is not the outcome of the placement).

Overall, the CSD Project will result in a slight reduction in biodiversity values at Northern Sands as Lake Narelle currently supports some flora and fauna. The use as a DMPA will fill the void, meaning that it can no longer be used for placing inert waste and PASS. It will have very poor load-bearing capacity and so will have limited use for industrial purposes.

Filling the void will also reduce the current risk of birdstrike (see **Chapter B17** (Hazard and Risk)) by sterilising current waterbird habitat.

The residual risk has been assessed as Negligible.

B18.5.6.b Tingira Street DMPA

The area to be used as the Tingira Street DMPA was identified in Ports North planning (FCG 2011, 2016) with three identified land use precincts being:

- Marina/Commercial precinct adjacent to the marina basin and east of Tingira Street
- Seaport Business Park on land west of Tingira Street
- Smiths Creek Industrial Park located south of the existing Tingira Street.

Refer **Figure B18-6**. The undeveloped portion of the site was cleared of mangroves and initially filled in the 1980s using materials dredged from Smiths Creek and the Commercial Fishing Base 2 harbour (FCG 2011). During these dredging operations, bunds were located around the boundary of the site to confine the dredge materials. During the 1990s additional filling (including demolition waste materials) was placed on the DMPA.

The existing status of the site and its values is described in **Chapter B8** (Terrestrial Ecology). The associated impact assessment reveals that although the site is degraded with few remnant biodiversity values, it is occasional habitat for the migratory bird *Gallinago hardwickii* (Latham's snipe).

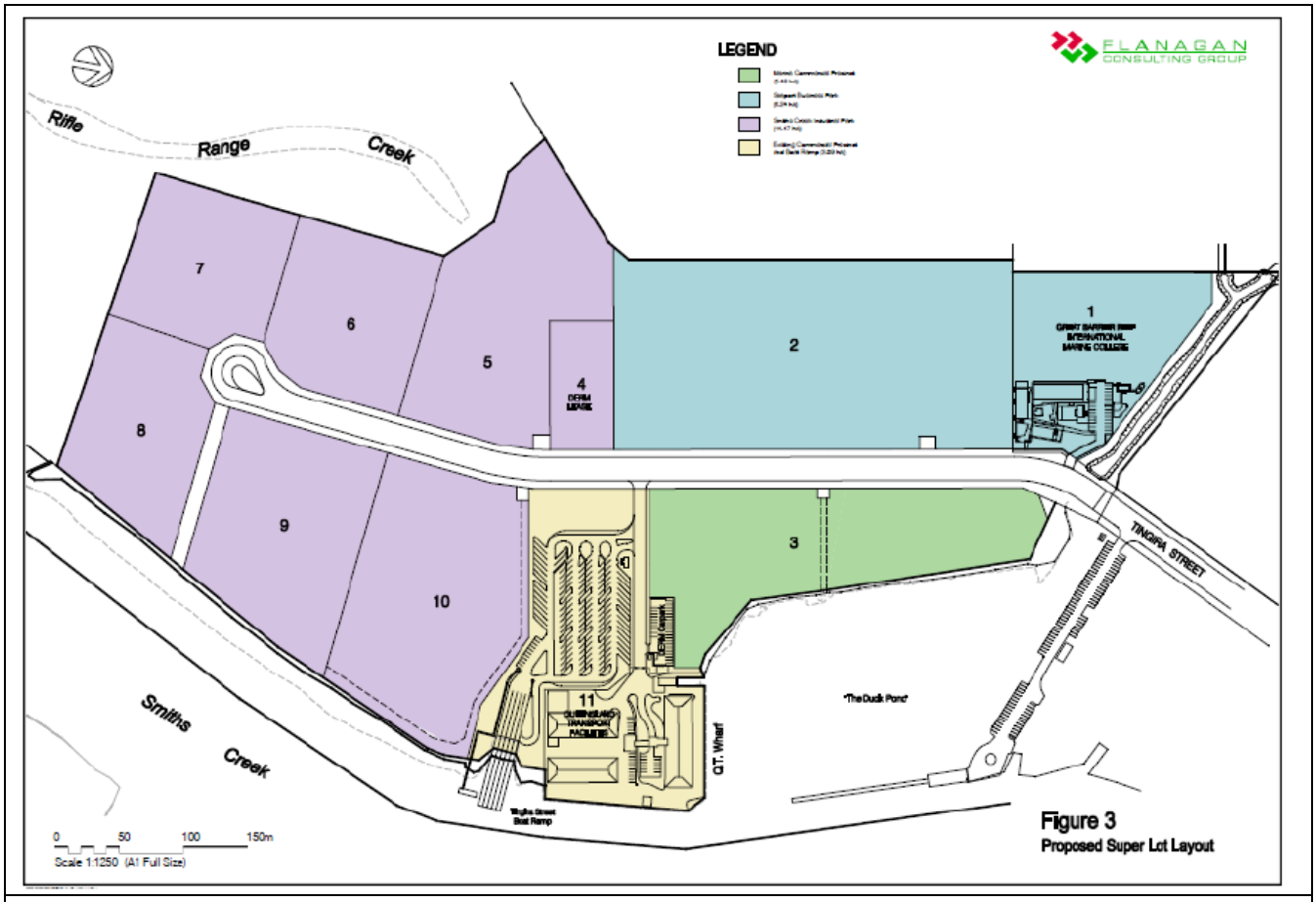

Figure B18-6 End use of the Tingira Street DMPA.

Source: FCG (2016).

On this plan, the two Tingira Street DMPA lots are 6 (part), 7, 8 (part), 9 (part), and 3 (part).

- Site 1 (southern site) 4.3 ha (approx.)
- Site 2 (northern site) 1.3 ha (approx.)

The land development proposal originally involved developing the site incrementally over a period of 10-15 years. It was hoped that development would coincide with firming market demand in relation to storage and assemble areas for major components associated with the Mt Emerald Wind Farm on the Atherton Tableland and the Amrun Bauxite mining project on Cape York (FCG 2016). Both of these are listed as major projects in the region (see Section **B18.3.2.b** and **Section B18.3.2.d**). However, it is now likely that the placement will be completed after the land is needed for these projects. In this case, part of the proposed industrial park will be filled from other sources and the stiff clay used to surcharge the balance (i.e. in the designated Tingira Street DMPA lots). Once the design settlement has taken place, the stiff clay (or a portion of it, the balance being 'consumed' in the settlement) will be moved elsewhere on the industrial park to accelerate settlement there and, where suitable, used as permanent fill. It is expected that in time all of the stiff clay will be 'consumed'.

In terms of consequential impacts:

- there will be a reduction in wading bird habitat at the currently disturbed Tingira Street DMPA (although there is suitable alterative habitat nearby)
- the use as a DMPA will mean that the placed stiff clay will provide a surcharge to accelerate the settlement of the subject lots and thereby bring forward the site development.
- use of the developed site was envisaged in planning for the Smiths Creek Industrial Park (FCG 2011) and opportunities for acceleration to take advantage of major projects have recently been identified (FCG 2016)

- no additional impacts will take place as a result of the CSD Project (i.e. further clearing and filling and the placement of stiff clay will mean that this volume of material no longer needs to be imported to the site, avoiding minor adverse environmental impacts and cost savings).

Overall, the CSD Project will result in a minor economic benefit and involve a slight reduction in adverse environmental impacts at the Tingira Street DMPA. The residual risk has been assessed as Beneficial.

B18.6 Ecosystem Resilience

B18.6.1 Definitions and Concepts Used

The 2014 Outlook Report (GBRMPA 2014b) defines 'resilience' as 'the capacity of a system to resist disturbance and undergo change while still retaining essentially the same function, structure, intensity and feedbacks'. It further states that 'resilience is a way of describing the properties of a system and how it responds to exposure to disturbance. Together with exposure, resilience helps determine a system's overall vulnerability.'

In their work on a conceptual framework for understanding cumulative impacts for managing the GBRWHA, Anthony *et al.* (2013) reproduced a figure from Füssel and Klein (2006) which shows the relationship between the concepts of sensitivity, adaptive capacity, resilience and vulnerability. This figure is reproduced on **Figure B18-7**.

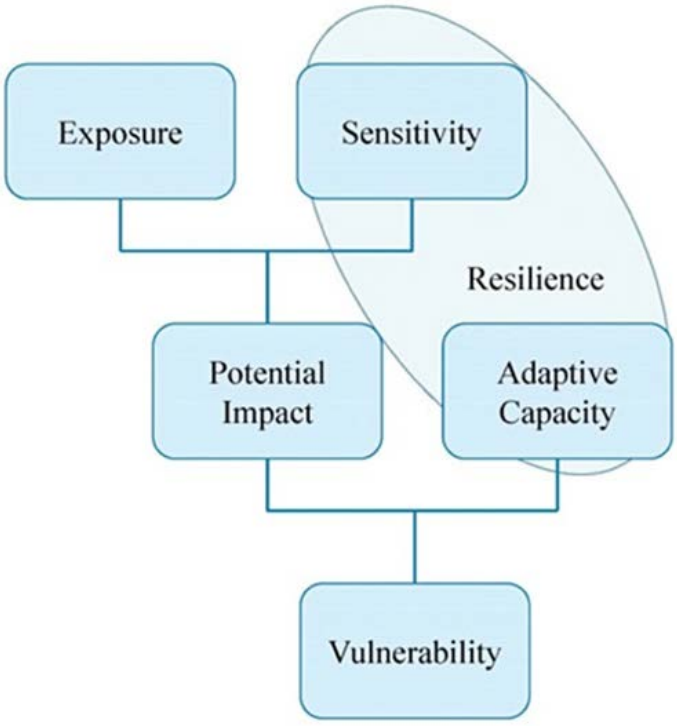

Figure B18-7 Concepts of Resilience in the context of a Vulnerability Assessment.

Source: Füssel and Klein (2006).

In general terms, a resilient system is one that can resist pressures and return to its existing state within a very short timeframe. However, it is recognised that tropical marine systems such as the GBR and its underlying coastal ecosystems are subject to a wide range of natural and human-related threats that can make resilience and recovery complex and difficult to measure.

This section examines these concepts of resilience at three scales: Reef-wide (i.e. whole of GBR), Regional, and Local as defined in **Section B18.2.5**.

B18.6.2 Resilience of the GBR WHA and other MNES

B18.6.2.a Whole of GBR Scale

As outlined in the State Party Report (Australian Government 2014), the drivers for the current condition of the GBRWHA are well understood. The most fundamental impacts have been from the 150 years history of land use change that continues to contribute sediment, nutrients and pesticides to the GBRWHA.

Overall, the health and resilience of the reef is affected by a range of short-term acute and longer-term chronic disturbances, including:

- catchment runoff and diffuse land-based pollution including sediment and nutrient enrichment
- floods
- cyclones
- crown of Thorns Starfish (COTS) outbreaks
- elevated sea surface temperatures.

While the Strategic Assessments by the Australian and Queensland governments (GBRMPA 2014a, DSDIP 2013) found that the GBR World Heritage property continues to retain its OUV and integrity, a number of attributes are in decline, particularly in areas south of Cooktown.

Over recent years, a 'confluence' of severe weather events has occurred resulting in cyclones and flooding that have significantly affected near-shore water quality and associated habitats, increased the mortality of dugong and green turtle, due to the loss of seagrass as a result of these events, and created conditions suitable for outbreaks of COTS.

In particular, multiple acute disturbances in short succession as has been experienced in the region since 2010 can have a combined negative effect on reef condition and resilience that is greater than the effect of each disturbance in isolation (Report Card 2013).

The 2016 and 2017 coral bleaching events have occurred since the completion of the Draft EIS. Recent research suggests that while these are most likely to be caused by high sea temperature, there may be other causal factors.

There is no comprehensive information on the ecosystem resilience of the GBRWHA due to the vast extent and complexity of the ecosystem and because resilience is a complex and dynamic property that is difficult to quantify and measure. However, indicators of resilience (in the form of case studies) are listed in the Outlook Report (2014) (section 8) and shown in **Table B18-11**.

Not all of these indicators are relevant to Trinity Bay and Trinity Inlet where the project is proposed, but this list forms a useful set of indicators that will be used and discussed later in this chapter.

TABLE B18-11 INDICATORS OF RESILIENCE FROM GBR 2014 OUTLOOK REPORT

INDICATOR	SUMMARY	ASSESSMENT GRADE	TREND
Coral reef habitat	Increases in the frequency and severity of disturbances, such as cyclones, flooding, and crown of thorns starfish outbreaks have reduced the capacity for coral reefs to recover since 2009. There is evidence of recovery at the local scale.	Poor	Deteriorated
Lagoon floor habitat	On-going management arrangements mean that some lagoon floor habitats previously at risk are continuing to recover from disturbances. There is little monitoring of lagoon flood condition or recovery.	Good	Stable
Black teatfish	Based on recent modelling, populations of black teatfish in the region are likely to be slowly recovering.	Very Poor	Improved
Coral trout	Coral trout populations demonstrate a strong ability to recover and increased reproduction on zones closed to fishing disperses beyond those zones. However, there are emerging concerns about the overall condition of populations.	Good	No consistent trend
Loggerhead Turtles	Loggerhead populations are recovering. There are comprehensive management arrangements in the region but some threats remain. Pressures from outside Australian waters are likely to influence their full recovery.	Poor	Improved
Urban coast dugongs	The urban coast dugong population has declined further since 2009 affected by the loss of seagrass from cyclones and flooding. Continued effective implementation of all management arrangements is required to reduce direct threats.	Very Poor	Deteriorated
Humpback whales	Humpback whales continue to recover at their maximum population growth rate 50 years following the cessation of whaling.	Very Good	Improved

Source: GBRMPA (2014b).

B18.6.2.b Regional Scale

The GBR Report Card (2015) – Marine Results published by the Australian and Queensland Governments (2015), is the most recent and comprehensive assessment of regional habitat condition for the Wet Tropics region of the GBRWHA, which includes the coastal areas north of Cairns to Ingham in the south. **Figure B18-8** provides a snapshot summary of the status of key ecosystem components and processes in this region.

- Water quality in the region is assessed as being 'Poor' although the trend is slightly positive
- Corals are assessed as being 'Moderate'
- Seagrass is assessed as 'Poor'.

Both corals and seagrass results show a slight improvement since the last report card (2012-13) described in the Draft EIS.

Figure B18-9 (Water Quality), **Figure B18-10** (Seagrass) and **Figure B18-11** (Corals) from the Report Card show trend information within each grading category for these components.

Coral reefs in the region have declined from a previous 'Moderate' rating in 2011 (although there has been a slight improvement since 2012-13), noting that disturbances, especially from tropical storms, are a major driver of coral cover and more acute disturbances have been demonstrated to affect reefs. Continuing and increasing catchment runoff (nutrients, sediment, pesticides) post the repeal of the specific legislation in relation to this aspect are also affecting reefs in the region with likely increased COTS outbreak frequencies. During the 27 year decline in coral cover on the Great Barrier Reef, in the absence of cyclones, COTS and bleaching, the estimated rate of increase in coral cover would be 2.85 percent per year and that in the absence of COTS coral cover could increase by 0.89 percent per year despite ongoing losses due to cyclones and bleaching.

Seagrass has also shown a slight improvement since 2012-13 but is still assessed as 'Poor'.

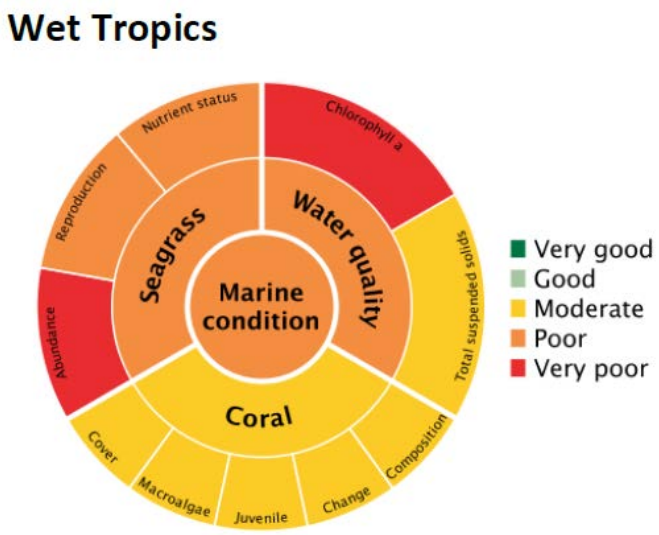

Figure B18-8 Marine Condition in Wet Tropics

Source: GBR Report Card 2015 (Figure 19).

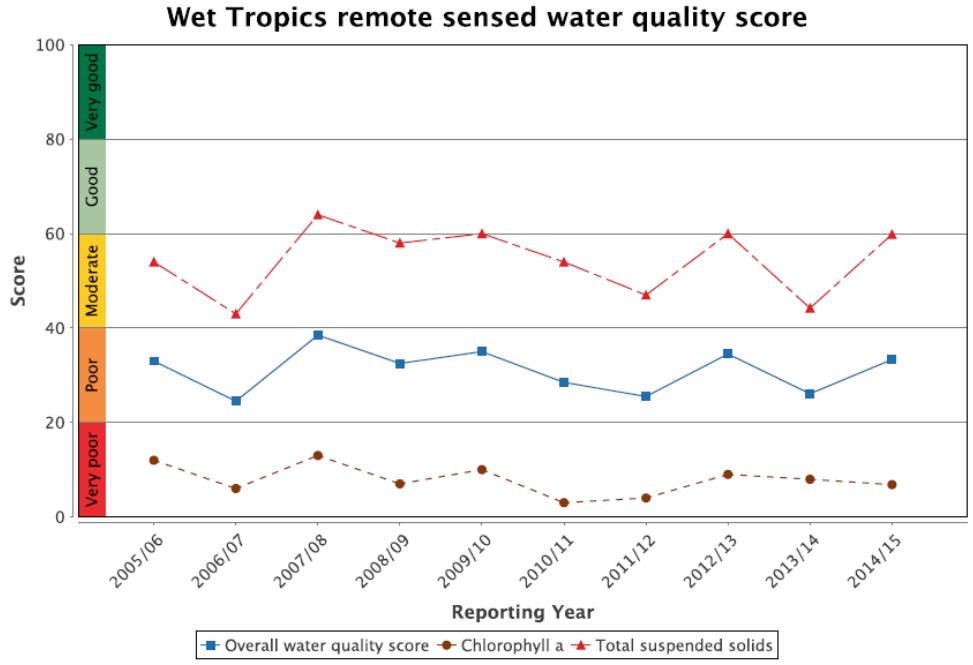

Figure 20: Trend in the water quality scores for the inshore Wet Tropics from 2005-06 to 2014-15
The overall water quality score is the average of the component scores for chlorophyll *a* and total suspended solids. Values are indexed scores scaled from 0-100; ■ = very good (81-100), ■ = good (61 - 80), ■ = moderate (41 - 60), ■ = poor (21 - 40), ■ = very poor (0 - 20). NB: Scores are unitless. Data source: (Bureau of Meteorology 2016b; Tracey *et al.* 2016).

Figure B18-9 Water Quality in Wet Tropics.

Source: GBR Report Card 2015 (Figure 19).

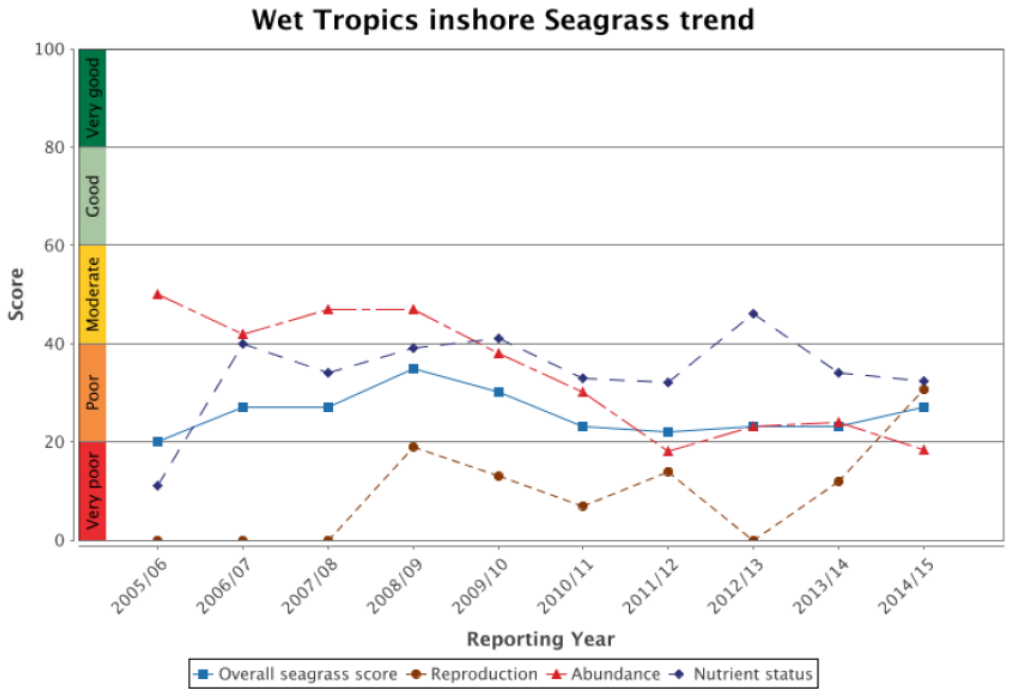

Figure 21: Trend in seagrass condition for the inshore Wet Tropics region from 2005-06 to 2014-15
The overall seagrass score is the average of the component scores for reproduction, abundance and nutrient status. Values are indexed scores scaled from 0-100; ■ = very good (81-100), ■ = good (61 - 80), ■ = moderate (41 - 60), ■ = poor (21 - 40), ■ = very poor (0 - 20). NB: Scores are unitless. Data source: (McKenzie *et al.* 2016).

Figure B18-10 Inshore Seagrass in Wet Tropics.

Source: GBR Report Card 2015 (Figure 19).

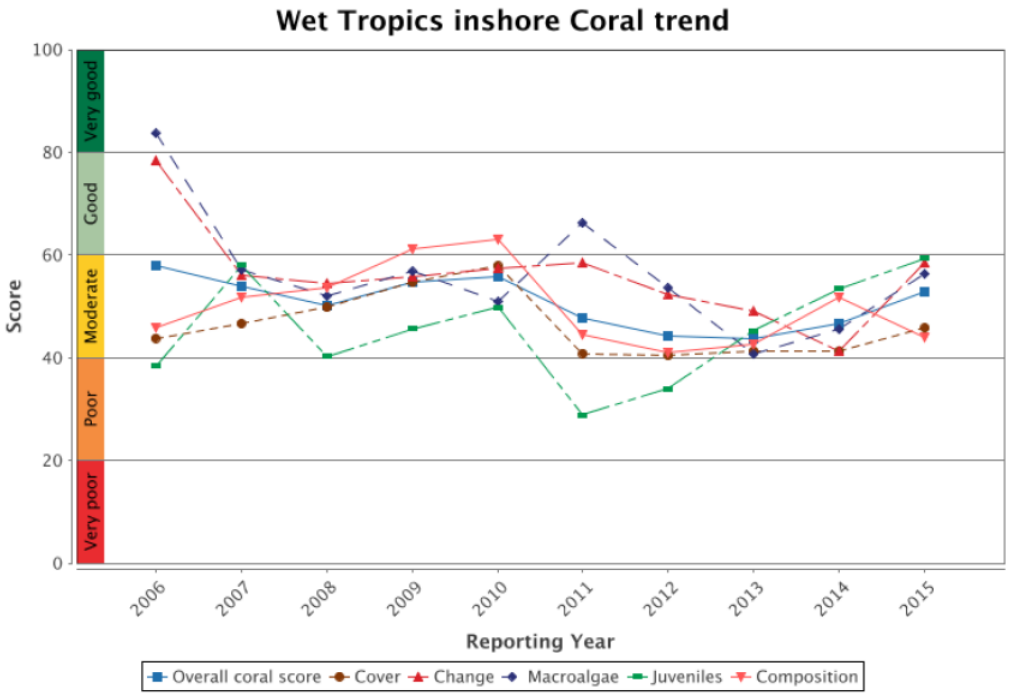

Figure 23: Trends in coral condition for the inshore Wet Tropics region from 2006 to 2015
The overall coral score is the average of the component scores for combined hard and soft coral cover, coral change, proportional macroalgal cover, juvenile density and coral community composition. Data includes monitoring in the Marine Monitoring Program and the AIMS Long Term Monitoring Program. The coral change indicator is calculated as the average rate of increase in coral cover compared to modelled predictions over the preceding four years. Note that the time series for coral has been recalculated and trend graphs in previous reports are not comparable. Values are indexed scores scaled from 0-100; ■ = very good (81-100), ■ = good (61 - 80), ■ = moderate (41 - 60), ■ = poor (21 - 40), ■ = very poor (0 - 20). NB: Scores are unitless. Data source: (Thompson *et al.* 2016).

Figure B18-11 Inshore Corals in Wet Tropics.

Source: From GBR Report Card 2015 (Figure 19).

B18.6.2.c Local Scale

The existing baseline environmental conditions within the local study area (e.g Trinity Bay and Trinity Inlet) are described elsewhere in Part B of this Revised Draft EIS and are summarised below.

Water Quality

Local water quality resource condition and trends are outlined in **Chapter B5** (Marine Water Quality). Trinity Bay and Trinity Inlet are naturally turbid environments especially following periods of high rainfall and sustained winds and currents which resuspend seabed sediments. As a result, naturally occurring turbid plumes are a regular feature of the marine environment.

Turbidity is a critical water quality parameter as it contributes to the available light within the marine environment for key habitats such as seagrass and coral. During the wet season, sediments from the Barron River are deposited at various locations within the bay depending on the sediment particle size. In particular, coarse sediment grain sizes tend to settle out near the Barron River entrance, shoreline channels or along the beaches. Finer sediment particles settle out within mangroves or within the centre of Trinity Bay. Total Suspended Solids (TSS) appears to be strongly correlated to currents along with wind speed and direction.

During periods of stronger south-east winds, there is generally an associated spike in turbidity at Palm Cove Beach. In areas more sheltered from these winds, such as Trinity Inlet, turbidity is less susceptible to wind direction and more influenced by stronger currents during spring tides.

The local water quality data capture program undertaken for the Revised Draft EIS with respect to turbidity found that:

- During the wet and dry seasons, turbidity levels generally increased from the Trinity Inlet out to near shore areas (False Cape, Cape Grafton and Northern Beaches). Turbidity was relatively low (<10 NTU) at offshore areas (region 4) during both seasons. The highest median turbidity was at False Cape during the wet season.
- All monitoring locations demonstrated median turbidity levels in excess of the WQO for both seasons, with the exception of Trinity Inlet (Region 1b) during the dry season

The Ports North turbidity data show similar turbidity levels to those observed in the Coastal Data Collection and Water Quality Monitoring programs.

These results and trends are generally consistent with long-term trends in water quality observed as part of previous monitoring by Ports North as well as by other studies in Trinity Bay both with and without dredging and at-sea placement.

Corals

Coral reefs in the region have been monitored since 1992 by a number of researchers. The monitoring programs have recorded five major disturbances that have resulted in substantial reductions in coral cover on reefs within the study area including bleaching events in 1998 and 2002, COTS outbreaks in 1999-2000 and cyclone impacts in 2006 (from Cyclone Larry) and in 2010/11 (from Cyclone Yasi).

While hard coral cover has fluctuated considerably in response to these pressures, cover for offshore reef areas at Fitzroy Island and Green Island has increased from 1993 to 2011. Soft coral cover has fluctuated over the same period but has generally recovered to similar levels as those recorded in 1993.

According to **Chapter B7** (Marine Ecology), overall, the reef community at Double Island was in excellent condition, particularly on the reef slope and areas mapped as 'extensive hard and soft coral, sparse sargassum' and 'digitate *Porites* and *Acropora* with macroalgae'. Across these areas, corals were diverse in terms of species richness and in excellent condition, particularly for an inshore reef so close to the mainland. Being located inshore, most well-established species present at Double Island would have some resilience to windows of increased turbidity, to the extent that turbidity is increased during natural disturbance events in the northern beaches area.

Seagrass

As described in detail in **Chapter B7** (Marine Ecology), the past 15 years of monitoring has shown great variation in the distribution, extent, biomass and density of seagrass assemblages. The most recent (2016) survey showed a general improvement in seagrass cover and biomass compared to 2014; however, cover and biomass were still very low compared to pre-2009 conditions. The reduction in cover and biomass between 2009 and 2010 sampling episodes coincided with above average rainfall associated with 2010/11 La Niña events and Tropical Cyclone Yasi. It is likely that these conditions reduced the light available for seagrasses causing dieback, as broad-scale reductions in seagrass cover were observed throughout Queensland.

Between 2014 and 2015 there has been a substantial increase in meadow extent in front of the Cairns Esplanade and much more moderate increase in cover near False Cape. Seagrass species differ in their sensitivity to disturbance (i.e. resistance) and capacity to recover following disturbance (i.e. resilience). The degree of resistance and resilience of seagrass depends on a number of often interactive factors including:

- carbohydrate (energy) reserves to draw on during low light periods (resistance)
- ability for photosystems to recover (resilience)
- capacity for vegetative propagation (resilience)
- seed bank occurrence (resilience)
- historical and future disturbance regimes, including frequency, timing, duration and magnitude of disturbance (resistance and resilience).

The capacity to recover following disturbance also depends on seagrass condition, which is a function of the previous disturbance history (magnitude, and spatial and temporal scale of disturbance). Successive periods of disturbance (i.e. multiple wet years) can deplete seagrass energy stores, seed banks and standing crop (i.e. seagrass condition), which greatly decreases the capacity for seagrasses to recover following disturbance.

In summary, seagrasses in the Cairns harbour are currently in a poor state, but showing signs of recovery. The next few growing seasons will be critical for the recovery trajectory of seagrasses in Cairns since propagule sources for recolonisation are limited and seed banks are ageing with reduced seed viability. This means that it will be critical to maintain conditions suitable for seagrass growth over the coming years.

Benthos

Extensive infauna studies have been conducted throughout the Cairns region since 2003 including as part of the current Revised Draft EIS. These studies have found that the infauna composition within the area do not show high levels of spatial variability and are dominated by fine silts and muds. High natural levels of turbidity and low light levels preclude the establishment of significant macroalgae communities.

Benthic fauna communities within the proposed dredge footprint are largely simplified, with a lower fauna abundance and diversity compared to soft sediment habitats elsewhere in the study area. This relates to both epifauna and infauna communities, and is largely associated with much of the dredge footprint having been exposed to past dredging effects, either directly, or by being located immediately adjacent to previously dredged areas. No reef communities or other features of high fauna biodiversity value occur in the proposed newly dredged areas.

Megafauna

As outlined in **Chapter B7** (Marine Ecology), marine megafauna that potentially exist in the study area include whales (noting key whale species such as Minke and Humpback whales are most likely to occur offshore in waters between 30 and 60 m), coastal dolphins species (noting the area is not known to be an important habitat for the Snubfin Dolphin), several species of marine turtle, and dugongs. There are no dugong protected areas within the study area. Of the very few species of megafauna recorded from the study area, dolphins are the most commonly occurring cetacean species and are capable of successfully foraging in turbid waters.

With the exception of whales, local population information on megafauna species is generally poor, however, it is likely that dugong and turtles in Trinity Bay are probably at very low numbers at the present time due to the sustained reduction in key food resources in terms of seagrass. Populations of Humpback and Minke whales continue to remain at a stable or ever increasing seasonal abundance based on published anecdotal observations from tourism operators in the local area.

B18.6.3 Cumulative Impacts from the Project that could affect Resilience

The technical chapters of this Revised Draft EIS B have found that the residual impacts on local environmental values (including World Heritage values) from dredging are acceptable in that they are:

- not assessed to result in any ‘Extreme’ or ‘High’ risks of impact following the application of mitigation measures. All residual impacts have been assessed as having a Low or Negligible risk
- not assessed as resulting in a ‘significant impact’ to a MNES or a MSES
- generally temporary in nature and are within the range of natural variability for key parameters such as water quality.

Notwithstanding, it is recognised that the overall resilience of the GBRWHA (including at the local scale) is currently low. In particular, the low biomass and vulnerability of seagrass in the region is likely having an impact on other important MNES values in the region, for example, the abundance and health of marine megafauna such as marine turtles and dugong that use seagrass as feeding habitat. However, this trend appears to have been reversed since the completion of the Draft EIS, both locally and in the Wet Tropics region.

To address the current low resilience of the marine environment, the CSD Project has sought to achieve a high level of environmental performance through the following measures:

- reduction in dredging overall through reducing channel widths from 140 m to 100 m which reduces the duration of capital dredging and the volume of future maintenance dredging
- sediment quality of capital dredge sediments has been rigorously tested to ensure no contaminated sediment (as defined by the NAGD 2009) is mobilised during the dredging process
- placement of the dredge material on land in areas that are already degraded
- expansion of the channel is in an area that does not have seagrass
- dredging areas seek to maximise buffers to coral communities and other hard substrate
- mitigation by dredging with no/limited overflow by the TSHD will significantly reduce the amount of fines generated by dredging that are available for re-suspension and reduces temporary stress on Trinity Bay seagrass
- timing of dredging will seek to minimise (but cannot completely avoid) impacts on marine receptors in terms of prioritising the scheduling of the dredge campaign for when the system is predicted to be the most resilient through:
  - avoiding dredging during the peak growing period for key seagrass species (*Zostera* sp.)
  - avoiding key coral spawning and heat stress periods
- dredge triggers and the proposed reactive monitoring program have considered the low resilience of seagrass including historical extents (a key feature of the reactive monitoring program will be to target and protect existing remnant patches of seagrass, noting these areas may be critical to broader scale recovery and seed banks).

While the impacts from the project are not significant, it will seek to invest in a range of programs and initiatives that offset or otherwise build resilience of the natural environment to the temporary impacts of the project (discussed in Section B18.4.4 below).

Section B18.4.2 provides a cumulative impact assessment using the relevant threats and stressors from the strategic assessment of the GBR (GBRMPA 2014a) while **Section B18.4.3** undertakes a similar assessment based on each issue raised in the technical chapters of the Revised Draft EIS. These are directly applicable to resilience. The residual risk assumes the full implementation of the mitigation, monitoring and compensatory measures identified through the Revised Draft EIS and as described in the Management Plans contained in Part C of the EIS.

B18.6.4 Climate Change and Future Resilience

According to the Outlook Report 2014 (GBRMPA 2014b), degradation of key GBR values, especially coral reefs, is forecast to occur from climate change in the middle of the 21st century unless there are marked reductions in global CO_2. The most significant threatening processes include:

- increased sea surface temperature (increasing the frequency and severity of coral bleaching)
- increased ocean acidity (affecting the ability of corals to grow and colonise areas)
- increased severe storms and cyclones (leading to physical damage to corals, seagrass and other marine habitats), as well as associated increased flood flows from catchments (leading to water quality declines, increased nutrients and COTS outbreaks).

As these effects worsen, it is likely that interactions between climate-related threats and other threats will have increasingly serious consequences (GBRMPA 2014b).

Ecosystem resilience in the context of climate change is described in **Chapter B16** (Climate Change and Greenhouse). This concludes that project activities that may cause an impact on the resilience of terrestrial, freshwater and estuarine, and marine ecosystems to climate change are:

- maintenance dredging
- placement of additional maintenance dredged material at the Offshore DMPA
- increased shipping movements.

Table B18-12 is an extract from **Chapter B16** (Climate Change and Greenhouse). It presents the assessment of the significant of this resilience loss, based on the 'adaptive capacity' thresholds defined in that chapter and with the recommended mitigation measures (set out in the various Part C chapters).

TABLE B18-12 PROJECT IMPACTS ON ECOSYSTEM RESILIENCE TO CLIMATE CHANGE

VALUE	PROJECT IMPACT	RISK ASSESSMENT OF IMPACT TO RESILIENCE		
		Consequence	Likelihood	Overall
Seagrass meadows	Smothering and growth impacts caused by turbid plumes during maintenance dredging, and resuspension from Offshore DMPA.	Minor	Highly Unlikely / Rare	Negligible
Marine megafauna	Vessel strike associated with maintenance dredging and increased cruise ship traffic.	Minor	Highly Unlikely / Rare	Negligible
	Impacts to feeding habitat (i.e. seagrass meadows) from turbid plumes during maintenance dredging and resuspension from Offshore DMPA.	Minor	Highly Unlikely / Rare	Negligible

Source: Chapter B16 (Climate Change and Greenhouse) Table B16-20.

B18.7 Recommended Mitigation Measures

B18.7.1 Issue-based mitigation

Each Part B technical chapter includes recommended mitigation measures applicable to the issue covered by that chapter. By mitigating each aspect of impact, overall cumulative and consequential impacts will be mitigated and this has been assumed in the previous assessment (i.e. mitigated (residual) risk has been assumed). In addition to mitigation-by-design undertaken during the concept design of the CSD Project, the main mitigation measures are the various management plans. **Table B18-13** below shows these plans and the key environmental matters that they protect (there values are also protected but in the context of this discussion of cumulative impacts, those listed are considered to be the most important).

This is an amalgam of similar tables in **Chapter 2** (Nature Conservation Areas) and **Chapter B19** (EPBC Act Issues).

TABLE B18-13 DOCUMENTS DESCRIBING PROJECT MANAGEMENT MEASURES AND MITIGATION

RELEVANT DOCUMENT IN PART C OF THE EIS	APPLICABLE MNES & MSES
Chapter C1 (Construction Environmental Management Plan)	Great Barrier Reef World Heritage Area Nationally Important Wetland – Trinity Inlet Listed threatened species (terrestrial) Listed migratory species (terrestrial) Integrity (especially stormwater quality runoff) Fish Habitat Area – Trinity Inlet Fish Habitat Area – Yorkeys Creek
Chapter C2 (Dredge Management Plan)	Great Barrier Reef World Heritage Area Great Barrier Reef Marine Park Nationally Important Wetland – Trinity Inlet Integrity (especially water quality during dredging and placement) State Marine Park Fish Habitat Area – Trinity Inlet Fish Habitat Area – Yorkeys Creek
Chapter C3 (Vessel Traffic Management Plan)	Great Barrier Reef World Heritage Area Great Barrier Reef Marine Park Nationally Important Wetland – Trinity Inlet State Marine Park Fish Habitat Area – Trinity Inlet
Chapter C4 (Maritime Operations Management Plan)	Great Barrier Reef World Heritage Area Great Barrier Reef Marine Park Nationally Important Wetland – Trinity Inlet State Marine Park Fish Habitat Area – Trinity Inlet

B18.7.2 Additional Mitigation

The assessment of cumulative and consequential impacts has not revealed any issues that require additional mitigation in the context of the CSD Project. In the areas where the CSD Project could contribute to adverse impacts at Regional and Reef-wide scales in particular, on-going management is committed by others, and especially:

- the Great Barrier Reef Marine Park Authority and the Queensland Government – controls over coastal and port development, with specific targets regarding land use and hence marine water quality
- the Australian Maritime Safety Authority – controls over coastal shipping.

B18.8 Residual Impacts and Assessment Summary

B18.8.1 Assessment

Table 18-14 below provides a summary of the residual risks associated with cumulative and consequential impacts.

TABLE 18-14 SUMMARY OF RESIDUAL IMPACT (FOR KEY IMPACTS)

ABBREVIATED TITLE	IMPACT	SCALE	RESIDUAL RISK
Cumulative Impacts			
Coastal reclamation	Coastal land reclamation, including for ports and groynes.	Local	N/A
Dredging	Dredging of the seafloor.	Local	Low
		Regional	Negligible to Low
		Reef-wide	Negligible
Exotic species and diseases	Introduction of exotic species and diseases from aquaculture operations, hull fouling, ballast release, imported bait and release of aquarium specimens to the Region, plus the introduction of weeds and feral animals to islands.	Regional	Low
Marine debris	Manufactured material discarded, disposed of or abandoned in the marine and coastal environment (including discarded fishing gear and plastics).	Reef-wide	Low
Modifying supporting terrestrial habitats	Clearing or modifying supporting terrestrial habitats such as wetlands, saltmarshes, mangroves and sand dunes — this also includes trampling and damage from recreational vehicle use.	Regional	Low
Physical damage — ship grounding	Grounding of ships including physical damage and the dislodging of antifoulants.	Local	Negligible
Sediments from catchment run-off	Sediments entering the Region in run-off from the catchment.	Reef-wide	Negligible
Vessel strike on wildlife	Death or injury to wildlife as a result of being struck by a vessel of any type or size (short term).	Local	Low
Consequential Impacts			
Increased cruise shipping	Impacts arising from increased vessel movements (other than grounding and vessels strike as above).	Reef-wide	Negligible
Increased maintenance dredging	A small (2-6%) increase in maintenance dredging (and marine placement) is predicted.	Local	Negligible to Low
Increased visitation	Increased use of (and impacts on) the GBRWHA and WTWHA	Regional Reef-wide	Negligible
Increased demand on infrastructure and services	No consequential impacts are predicted	Local	Negligible
End-use of the Northern Sands DMPA	Control will revert to the owner and end use cannot be predicted. The use as a DMPA will fill the void, meaning that it can no longer be used for placing inert waste and PASS. It will have very poor load-bearing capacity and so will have limited use for industrial purposes.	Local	Negligible
End-use of the Tingira Street DMPA	Consequential impacts arising from end uses of the Tingira Street DMPA.	Local	Beneficial

ABBREVIATED TITLE	IMPACT	SCALE	RESIDUAL RISK
Resilience indicators			
Seagrass meadows	Turbidity impacts from maintenance dredging and resuspension at Offshore DMPA	Local	Negligible
Marine megafauna	Vessel strike (long term)	Local	Negligible
Marine megafauna	Turbidity impacts to seagrass meadows	Local	Negligible

B18.8.2 Conclusions

Based on the above assessment, all cumulative and consequential risks can be reduced to a Low or Negligible residual risk through the application of controls and commitments included in the various management plans contained in Part C of the Revised Draft EIS.

In the case of consequential impacts:

- The majority of the additional cruise ships attracted to Cairns are expected to be relatively new vessels, crewed by competent international crews, and subject to international maritime and environmental requirements including the North East Shipping Management Plan. The safe management of the additional number of cruise ship transits through the GBR is well within the existing capabilities of Marine Safety Queensland's Vessel Traffic Safety systems (including ReefVTS).
- The small amount of increased maintenance dredging (2 to 6%) will be subject to a new Long term Maintenance Dredging Management Plan prepared under the Maintenance Dredging Strategy for Great Barrier Reef World Heritage Area Ports (TMR 2016). This strategy is a key action under the Reef 2050 Long-Term Sustainability Plan.
- Management of visitation to the GBRMP and Wet Tropics World Heritage Area by GBRMPA and the Wet Tropics Management Authority / Queensland Parks and Wildlife Service respectively.
- In terms of end-use of the tailwater DMPAs, the CSD Project will have the following effects:
    - There will be a slight reduction in biodiversity values at Northern Sands as Lake Narelle currently supports some flora and fauna. The use as a DMPA will fill the void, meaning that it can no longer be used for placing inert waste and PASS. It will have very poor load-bearing capacity and so will have limited use for industrial purposes. Filling the lake will also reduce the current risk of birdstrike by sterilising current waterbird habitat. The residual risk has been assessed as Negligible.
    - There will be a reduction in wading bird habitat at the currently disturbed Tingira Street DMPA (although there is suitable alterative habitat nearby). However, current planning for the site (in the absence of the CSD Project) involves further clearing and filling and the placement of stiff clay will mean that this volume of material no longer needs to be imported to the site. Overall, the CSD Project will result in a minor economic benefit and involve a slight reduction in adverse environmental impacts associated with transporting fill at the Tingira Street DMPA. The residual risk has been assessed as Beneficial.

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