Ports North

VOLUME 1

Draft : Environmental Impact Statement

Executive Summary

Ports North

Far North Queensland Ports Corporation Limited (trading as Ports North) proposed to undertake the Cairns Shipping Development Project (the project) on behalf of the Queensland Government. Ports North is responsible for the development and management of Queensland ports including Cairns, Cape Flattery, Karumba, Mourilyan, Skardon River, Quintell Beach, Thursday Island, Burketown and Cooktown.

Ports North's operations and facilities are vital economic generators for the regions they service, as well as Queensland's broader tourism and export industry. In providing and maintaining facilities at Trinity wharves, Cairns, for cruise ships as well as the Marlin Marina, Reef Fleet berths and the Reef Fleet Terminal, Ports North is heavily invested in the ongoing success of the marine tourism industry in North Queensland and it's major drawcard, the Great Barrier Reef.

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Ports North is committed to understanding and minimising any potential environmental impacts of its operations and encourages good environmental practice by its port users, tenants and other stakeholders. The organisation has a successful history of compliance with its environmental obligations and developing and maintaining port facilities against a backdrop of the region's high-value environmental resources. Its approach to environmental management focuses on regulatory requirements and improving performance through the implementation of best practice environmental management measures and effective community and stakeholder consultation.

Ports North has extensive experience in delivering major projects and managing port infrastructure while maintaining a high level of environmental management. The project development will complement previous Ports North sponsored projects - the Cairns Cruise Liner Terminal, Foreshore Development, Reef Fleet Terminal and Marlin Marina works completed as part of the Cityport Masterplan. The City Port Masterplan aims to consolidate port operations and provide for the integration of the CBD with the Cairns waterfront to create an urban waterfront area with a focus on uses that maximise the community and tourism values of the area.

Port of Cairns

The Port of Cairns is located in Far North Queensland, within the city of Cairns. The port extends along Trinity Inlet which opens into Trinity Bay. The naturally protected waters of Trinity Bay provide a safe harbour for shipping. As with similar tropical estuaries that provide such protection from energetic coastal processes, these dynamics similarly contribute to the deposition and retention of natural sediments deposited into the bay via the local river systems and longshore coastal processes. For more than 100 years the Port of Cairns shipping channel has been dredged annually to maintain its defined dimensions to ensure safe passage for ships entering the port. Every 20-30 years a capital dredging program has been undertaken to increase the size of the shipping channel in line with growth in vessel size. The most recent capital dredging program took place in 1990. At present, the outer channel is approximately 9.8 kilometres (km) in length, 90 metres (m) wide with a declared depth of -8.3m below Lowest Astronomical Tide (LAT). The inner channel extends for 2.5km in length, with variable widths adjacent to the swing basins.

Although approximately 15km distant from the inner reefs of the Great Barrier Reef, the existing dredge material placement area (DMPA) is located within the waters of the Great Barrier Reef Marine Park (GBRMP). Ports North therefore holds a permit issued by the Great Barrier Reef Marine Park Authority (GBRMPA) for placement of maintenance dredge material at sea to 2020, or when the dredging volume allowance has been exhausted, at which time the permit requires renewal. This was the first 10-year Sea Dumping Permit and Long-Term Management Plan approved by GBRMPA for maintenance dredging activities, acknowledging Ports North's strong record of effective environmental management within Trinity Inlet, and continuing commitment into the future.

The ongoing monitoring and assessment of the dredging and dredge material placement activities has been overseen by the Technical Advisory Consultative Committee (TACC) consisting of representatives from relevant Queensland government departments (Department of Environment and Heritage Protection, Department of Agriculture, Fisheries and Forestry, Department of National Parks, Recreation, Sport and Racing and Maritime Safety Queensland), Commonwealth Government Departments (Department of the Environment and the Great Barrier Reef Marine Park Authority) as well as community and industry stakeholders. Surveys of the existing DMPA have been undertaken to investigate potential impacts and indicate that placing dredged material over the years has not had any significant long-term environmental effects (Carter et al 2001, Neil et al 2003 and Worley Parsons 2009). Hydrographic surveys undertaken by Ports North as part of their monitoring program similarly indicates that the topographic profiles of the DMPA areas have increased over time, demonstrating retention of the deposited material.

The Project

Ports North is the proponent for the project on behalf of the Queensland Government which seeks to improve shipping access to the Port of Cairns. The project will promote expansion of the cruise shipping industry in Cairns and the wider North Queensland region, and support and improve the cruise offering along the east coast of Australia. In addition, the Navy and cargo ships using the Port of Cairns will benefit from improved access and efficiencies.

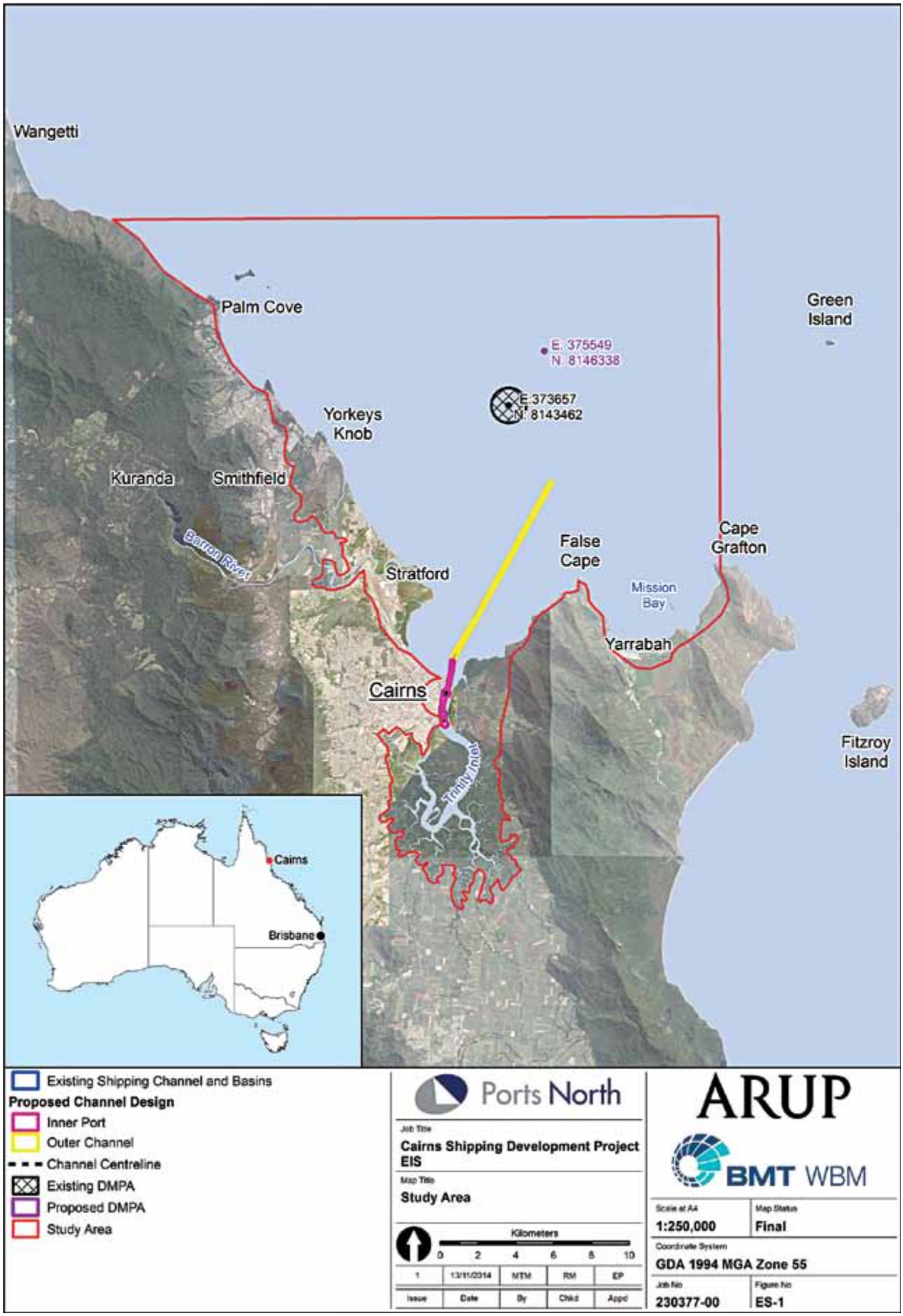
The major components of the project include:

Dredging and Wharf Construction

- Widening, deepening and lengthening the existing outer shipping channel; the current 90m channel will be widened to 130m and the declared depth will be increased from 8.3m to 9.4m
- Widening and deepening the existing inner harbour channel
- Widening the existing Crystal Swing Basin
- Establishing a new shipping swing basin (Smith's Creek Swing Basin) to enable future expansion of the HMAS Cairns Navy base
- Approximately 4.4 million in-situ cubic metres (m^3) of capital dredging during the construction phase of the project
- An estimated additional 100,000 in-situ m^3 of annual channel maintenance dredging throughout the operation of the project
- Upgrading the fender system for the existing cruise shipping wharves (Trinity wharves 1 - 5)
- Installing and relocating new and existing navigational aids, fuel supply, potable water, fire fighting services and other service utilities infrastructure
- Establishing a new DMPA area to accommodate capital dredge material and for placement of future maintenance material. The EIS examined both land and sea disposal and shortlisted two options being a land site at East Trinity and a marine site, Option 1A, in the Great Barrier Reef Marine Park. This Executive Summary deals with both of these options.

The contextual setting of the project and its key elements are shown in **Figure ES-1**.

Figure ES-1 Study Area and Key Elements of the CSD Project



Program

The project could be constructed and operational by 2017. Land-side construction would take approximately one year and dredging and marine placement would take a minimum of 23 weeks subject to the final option, dredge windows and methodology and Government legislative changes. The proposed DMPA has been designed to have a life of 20-25 years. Remaining capacity of the DMPA will be assessed as part of Ports North's normal operations and permit requirements. Once at capacity the DMPA will be decommissioned. It is assumed the channel will be used indefinitely into the future. As such, active decommissioning of the channel is not expected to occur in the timeframe of the project.

The Program Gant Chart is shown in **Figure ES-2**.

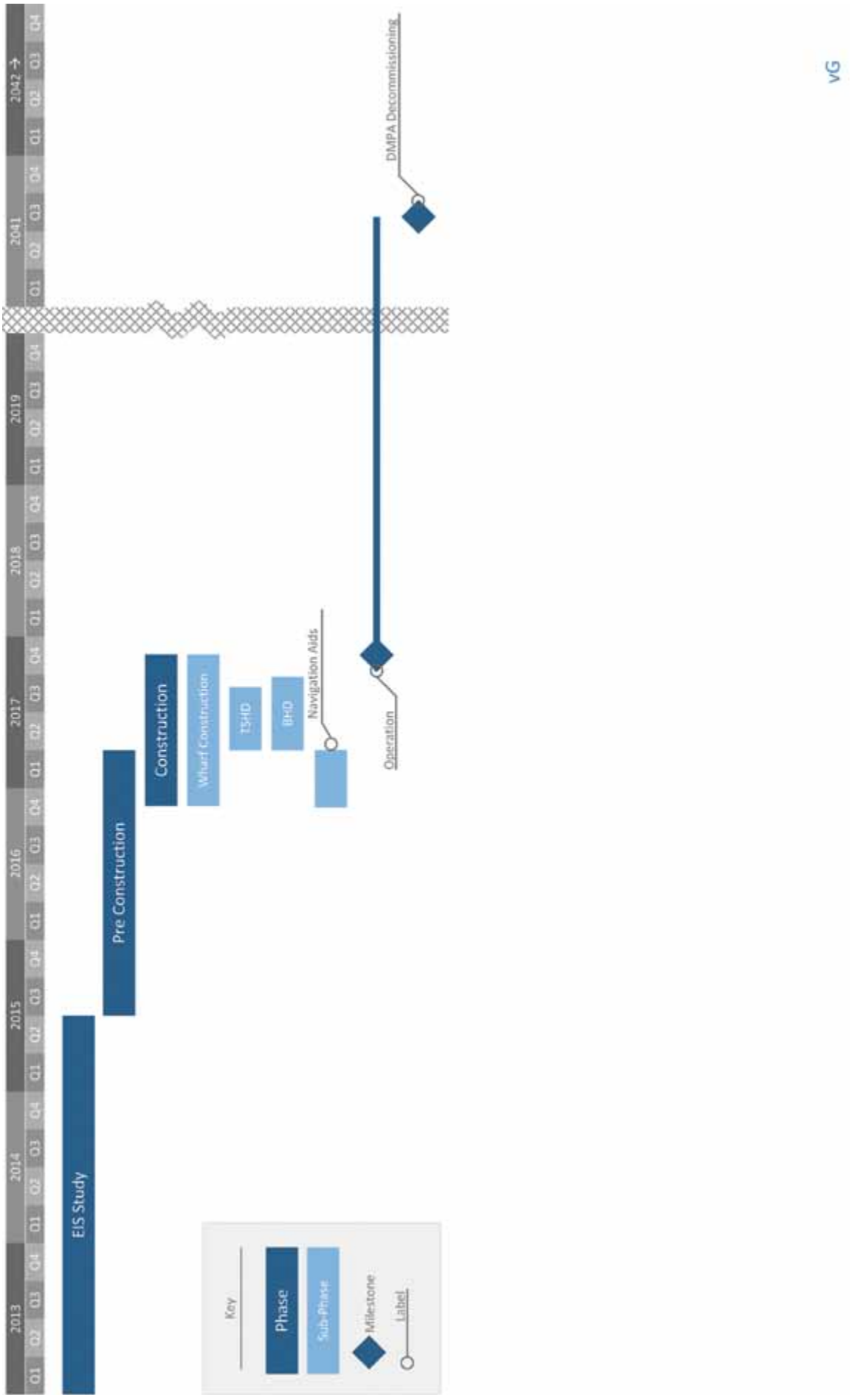


Figure ES-2 Gant Chart

Project Objectives

The aims and objectives of the project are to:

- Strengthen the regional economy of Far North Queensland
- Promote tourism and growth for the Far North Queensland and wider Queensland cruise tourism industry, which will bring additional stability and diversity to the Cairns tourism sector
- Create additional employment during both construction and operational phases of the project
- Provide a more efficient shipping channel which will increase port efficiencies for cargo shipping
- Provide opportunities for future expansion of the HMAS Cairns Navy Base.

Unlike other port expansion projects in the Great Barrier Reef region, this project is proposed largely for the benefit of the local Cairns community and businesses and more broadly to enable increased cruise shipping within Queensland. The investigations associated with the EIS have been funded by the Queensland Government.

Project Approval Process

On 24 September 2012, the Coordinator-General declared the project to be a 'coordinated project' under section 26(1)(a) of the ***State Development and Public Works Organisation Act 1971*** (Qld) (SDPWO Act). This declaration initiated the statutory environmental impact assessment procedure of Part 4 of the SDPWO Act, which requires the proponent to prepare an EIS for the project. Terms of Reference (TOR) for the environmental impact statement were finalised in November 2012.

The project was referred to the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities to determine whether it was a 'controlled action' under the ***Environment Protection and Biodiversity Conservation Act 1999*** (EPBC Act) (Cwlth). On 4 October 2012, it was decided the project was a controlled action and would require assessment and approval under the EPBC Act. The assessment was to be undertaken in accordance with Guidelines for an Environmental Impact Statement which were finalised in March 2013.

The relevant controlling provisions under the EPBC Act are:

- World Heritage properties
- National Heritage places
- Listed threatened species and communities
- Listed migratory species
- Commonwealth marine areas
- Great Barrier Reef Marine Park
- Commonwealth land.

The EIS must follow the format and content outlined in the TOR and the EIS Guidelines and this single EIS document has been prepared to address the requirements of both documents. **Appendix A** of the EIS contains cross-reference tables showing how each requirement of the TOR and EIS Guidelines have been addressed.

Once submitted, the EIS will be considered separately under the two legal frameworks as follows:

1. Under the State (SDPWO Act) process, the EIS and any additional information will be evaluated by the Coordinator-General. The Coordinator-General will then prepare a report that includes the evaluations of, and conclusions regarding, the project's environmental impacts and proposed mitigation measures. After considering all of this information, the Coordinator-General will recommend the project either:
    - Proceed subject to conditions and recommendations designed to ensure the project's environmental impacts are properly managed
    - Be refused on the grounds its environmental impacts cannot be adequately addressed.

    The Coordinator-General's report on the EIS is not an approval in itself. Subsequent approvals and permissions will also be required for the project under other relevant Queensland Government legislation.
2. Under the Commonwealth (EPBC Act) process, the information presented in the EIS must be sufficient to allow the Minister to make an informed decision on whether or not to approve, under Part 9 of the EPBC Act, the taking of the action for the purposes of each controlling provision. Following consideration by the Minister, subsequent approvals and permissions will also be required under other Commonwealth legislation including the ***Great Barrier Reef Marine Park Act 1975*** and the ***Environmental Protection (Sea Dumping) Act 1981***.

Stakeholder Consultation

Ports North has been meeting with stakeholders for the past two years to discuss the project and better understand potential impacts to stakeholder's interests so the project design and methodologies can be refined.

The EIS identifies and lists all meetings with stakeholders including an extensive program of workshops and meetings with regulatory agencies held before submission of the EIS for consideration. Most key stakeholder groups have been consulted multiple times leading up to the release of the EIS, including through existing forums such as the TACC, Local Marine Advisory Group (LMAC) and state agency working groups.

A range of publicly available information has been available from the Ports North website since the advertisement of the TOR for the EIS including project information sheets and PowerPoint presentations. Ports North also staffed an information booth over three days at the Cairns Show in July 2014. During the show, 241 contacts were logged on to the project database. Ports North representatives also met with members of the general public and distributed a large volume of information sheets about the project.

Consultation with stakeholders will continue in the coming months while the Draft EIS is open for public comment.

Changing Circumstances

Following the Queensland Government's announcement to improve cruise shipping access to Trinity Inlet, Ports North sought Terms of References from the State and Federal Governments and commenced studies associated with the EIS in accordance with those Terms of Reference in April 2013. Since that time Ports North has worked closely with Government agencies and stakeholders to develop a rigorous EIS that comprehensively addressed the Terms of Reference.

There are a number of emerging issues related to port development and dredging that could lead to a change in the assessment processes for capital dredging. A number of key environmental reports, port project announcements, and environmental and cost considerations could change the options available for assessment for capital dredging disposal. Following completion and submission of the draft EIS and prior to its public release, the Federal Minister for the Environment announced in November 2014 that legislation would be put in place using the Great Barrier Reef Marine Park Act to ban all capital dredging disposal into GBRMP and, subsequently, in March 2015, GBRMPA commenced consultation on this new regulation.

The Queensland Government and Federal Government also released the Reef 2050 Long Term Sustainability Plan in March 2015. Based on the potential new regulation and in anticipation of the potential change in legislation on this matter, the EIS Executive Summary has been updated to reflect this latest position with balance of the EIS unchanged.

Structure of the EIS

The objectives of the EIS are to provide:

- An understanding of the project and existing environmental, social and economic values and potential impacts that may occur and measures to be adopted to mitigate potential adverse impacts
- A framework for assessing impacts of the project in view of legislative and policy provisions
- A mechanism for sustainable environmental outcomes, including control measures and strategies to be implemented during the construction and operational phases through environmental management plans (EMPs).

The project EIS consists of four parts, with each part further divided into chapters. Each part of the EIS provides the following information:

- **Part A**: Contains background information about the project and the proponent to assist in setting spatial, environmental, economic, social and legislative contexts. **Part A** includes the justification and need for the project, the consideration of alternatives to the project, an assessment of development options including a detailed assessment of land and marine dredge material placement sites and the project description. The detailed assessment of potential land and marine dredge material placement sites determined the shortlisted land option and marine option. Included within **Part A** is a consultation summary and overview of the methodology used in the assessment
- **Part B**: Contains the baseline and impact assessments on a range of potential environmental, economic and social effects including residual and cumulative effects, as well as recommended measures for mitigating potential impacts. The assessments are based on the original Project Description set out in **Part A4**, which includes capital dredging, wharfside improvements and placement of dredge material at the preferred marine-based dredge material placement area (DMPA) in the GBRMP. As detailed in this Executive Summary, the changing circumstances associated with the recent Federal Minister for the Environment's announcements on dredge material placement in the GBRMP are likely to result in this option no longer being available

- **Part C**: Contains descriptions of recommended environmental management requirements, based on the impact assessment presented in **Part B**, through specific management plans to be implemented at different stages using prescribed standards or recommended practices
- **Part D**: Contains a review of environmental factors and key information gaps associated with the placement of dredge material on land at the East Trinity site. This Part of the EIS has been added to respond to the changing circumstances of the Project and the proposed regulations on capital dredge material placement in the Marine Park.

Appendices present more detailed technical investigations (studies, analyses and assessments) that support the baseline and impact assessments made in preceding EIS parts.

Background and Need for the Project

Demand

The global cruise industry is a $60+ billion industry that employs over 100,000 seagoing staff and 20,000 on-shore staff, and carries 21.7 million passengers annually ¬ an increase of four million since 2011 (CLIA, 2014). The industry is primarily based in the Northern Hemisphere market where the bulk of the world's cruising populations reside.

In terms of market penetration three percent of Australians have cruised and while this is significant in world percentage terms, being the highest of any other nation outside the United States, it relates to a very small number of passengers globally. Some 694,062 people worldwide cruised in 2012, an increase of 11 percent from 2011, which followed an increase of 34 percent in 2011 (International Cruise Council of Australia, Cruise Industry Report 2012). The cruise tourism industry was worth $11.6m to the North Queensland region in 2012-13. (AEC Group, 2010).

The Great Barrier Reef (GBR) is an Australian icon for the cruise tourism industry. Cairns is strategically situated to provide access to the GBR, particularly as Cairns has a range of varied natural attractions and tourism products that are supported by high quality, well-managed and reliable operators.

For almost two decades Cairns enjoyed more cruise ship visits than any other port in Australasia. In recent years that share, along with other Queensland ports, has fallen considerably. Current use of the Port of Cairns by cruise ships is split between those vessels that can access the entrance channel and moor at Trinity wharves and the larger ships that must anchor at Yorkeys Knob.

Ships that cannot access the port will typically anchor approximately four kilometres offshore from Yorkeys Knob and ferry their passengers ashore either by the ships tenders or by catamarans from the Cairns reef fleet before travelling by bus 15kms to the Cairns CBD.

Being unable to reach Trinity wharves because of the existing channel dimensions restricts both the number of ships visiting the region as well as the number of passengers (and crew) disembarking to visit the city and to undertake associated tourism activities. It also adversely affects the visitor experience. Transporting passengers from Yorkeys Knob is inefficient and costly and results in fewer passengers and crew disembarking ships and spending money in the local economy. (Cummings Economics, 2014).

More than 80 percent of cruise ships built since 2008 are too large to access the Port of Cairns. With the size of new cruise ships ever increasing, it is essential that the Port of Cairns is positioned to respond, particularly if it is to fully realise the economic benefits that flow to tourism operators, retailers and other business owners from the disembarking passengers and crew of these large vessels.

The passenger carrying capacity of these ships is also relevant to cruise shipping in Cairns. In time, as ship sizes increase, it will become more difficult to effectively transfer passengers ashore at Yorkeys Knob due to the number of passengers involved and the restricted time available for transfers, leading to the prospect of future "mega class" ships bypassing Cairns unless the channel access is improved.

The key infrastructure improvements able to deliver the greatest opportunities for increased ship visits by large vessels and prospective home porting at the Port of Cairns are as follows:

- Capital and maintenance dredging of the entrance channel and swing basin to accommodate larger ships
- Fender system upgrade
- Provision of bunker fuel.

Accordingly, the demand analysis within this EIS has examined: (a) demand based on the existing (e.g. unimproved) scenario; and (b) demand with an improved infrastructure scenario.

The demand study has found that compared to a do-nothing option, the improved channel infrastructure, wharfside improvements and provision of fuel services will significantly increase estimated ship visits and passenger numbers to Cairns.

Figure ES-3 shows that the number of mega class cruise ship visits in Cairns could rise from 32 visits to 63 visits by 2026 if channel improvements are made, with these ships able to directly access Trinity wharves.

Figure ES-4 shows that the existing number of passengers forecast for Cairns (Trinity wharves and Yorkeys Knob) in 2016 will almost triple by 2026 through implementation of improved infrastructure.

Figure ES-3 Cruise Demand Predictions (With and Without Infrastructure Improvement) – Ship Visits

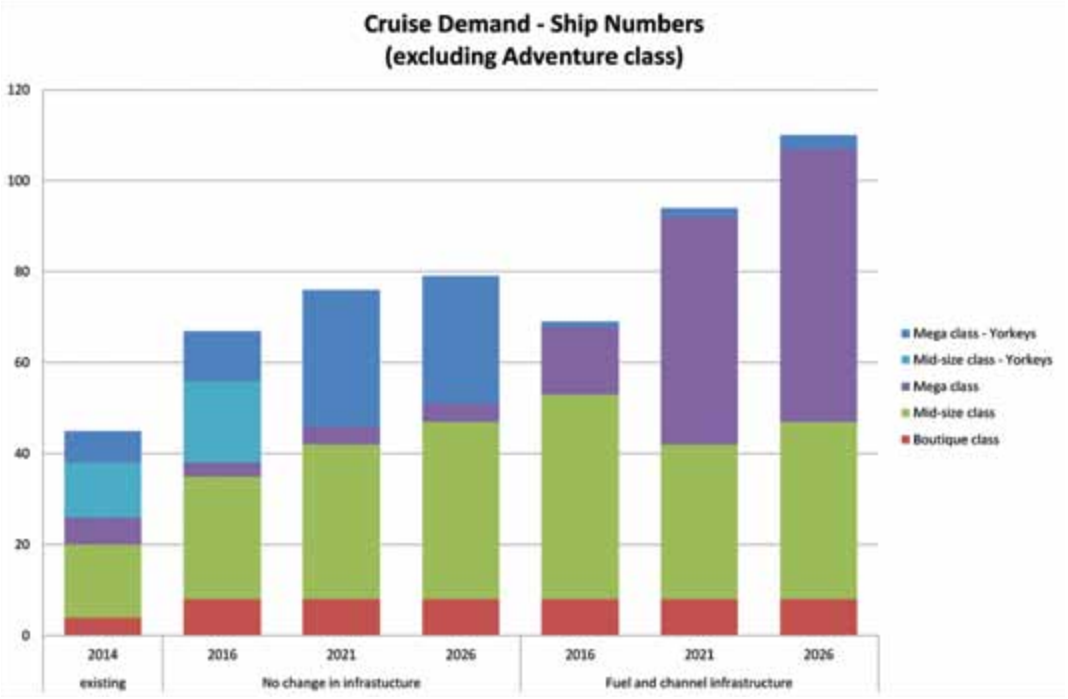
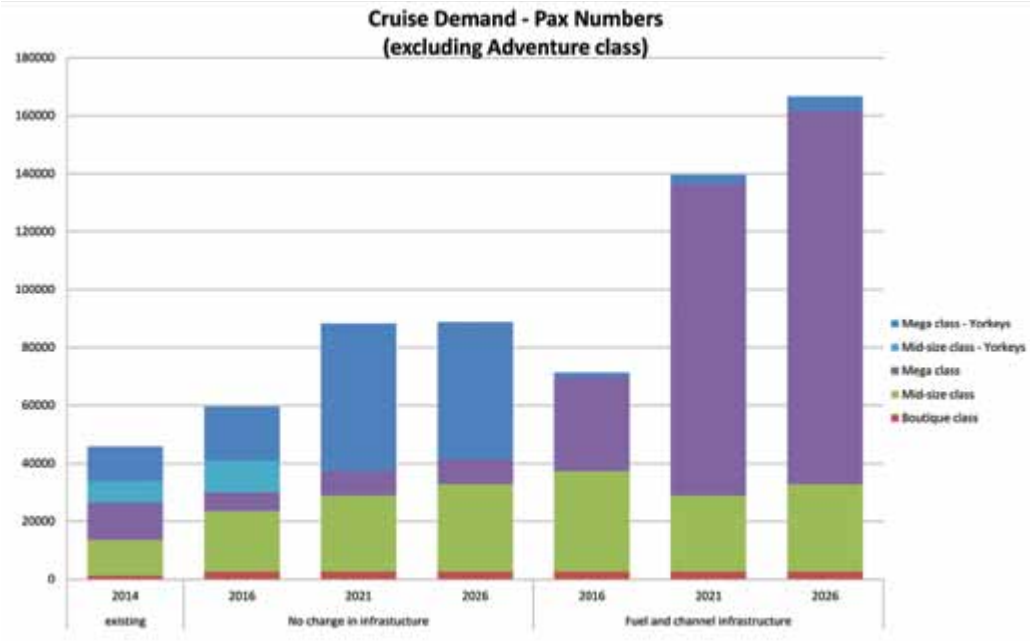


Figure ES-4 Cruise Demand Predictions (With and Without Infrastructure Improvement) – Passenger Numbers



The significant economic benefits from the predicted increase in passenger numbers is that the bulk of these passengers (as well as crew which are not included in **Figure ES-4**) will be able to efficiently disembark at Trinity wharves and walk into Cairns city centre during both day and overnight visits as opposed to the day-time only tendering operations at Yorkeys Knob, where cruise ships do not stay overnight.

To validate the cruise shipping demand findings, extensive consultation has been undertaken with key stakeholders in both 2011 and 2014 including cruise ship companies, in-bound tourism operators, port service providers and Government and tourism stakeholders. The prospect of improved infrastructure to attract cruise vessels to the Port of Cairns was reinforced strongly during this consultation, particularly with key cruise industry representatives. In particular, their comments supported the findings that growth will be marginal without infrastructure investment and that the channel dredging and provision of bunker fuel would make the port much more attractive to future operations.

Economic Benefits

The project will generate economic benefit for Cairns and will provide wider benefits to the Queensland cruising industry through the provision of home porting and improved infrastructure facilities. Cairns is considered by cruise companies as an 'iconic'/'marque' port of call included in almost all cruise ship itineraries along the Queensland coast. The ability of ships to come into the port has an effect of enhancing the Queensland cruise ship experience for passengers, has substantial operational benefits for cruise companies including availability of fuel, and enhances opportunities for expanding tours to the north. Upgrading the Port of Cairns will upgrade Queensland's attraction as a cruise destination and thus has the potential to benefit other Queensland ports, because of increased cruise ship visits to the region.

Some key economic forecasts are:

- As outlined above, the demand study has estimated that improved access to Cairns will see mega cruise ship numbers almost double from the existing 32 visits (moored at Yorkeys Knob) in 2016 to 63 annual visits (berthed at Trinity Wharves) by 2025, delivering regional economic benefits of $634m during the next 25 years
- The increase in cruise shipping activity is predicted to generate an additional 467 jobs in the regional by 2026 and 680 jobs by 2041
- Home porting could result in an additional $309m over the next 25 years based on expenditure of $2m per departure
- There would be wider benefits to the Queensland cruising industry due to increasing attraction of Queensland as a cruise destination, which would be further augmented by home porting as this would allow cruises travelling north to originate out of Cairns and thus cut the travelling times from ports with home porting facilities further south
- There will also be benefits to non-cargo shipping as vessels will be able to leave the port fully loaded and will not need to visit another port to take on more fuel or cargo.

A major justification for the project stems from 'economic efficiency' gains in terms of direct benefits. The current situation where the larger cruise ships need to anchor off the coast and ferry passengers into Yorkeys Knob before bussing the majority into the city is inefficient, not only in extra costs of shore transfers and bus transfers, but also in time cost. In these circumstances also, generally crew are unable to come ashore for leave and some passengers are discouraged from coming ashore, especially if weather conditions are poor.

Project Options and Alternatives

Do Nothing and Alternative Options

Based on the findings of the demand study and the trend toward larger cruise vessels operating in the Asia-Pacific cruise market, if Cairns wishes to retain its position as a premier world cruise destination and realise the economic benefits predicted, then it must embrace mega cruise ships and provide them with access in close proximity to the city.

In this context, the EIS has examined alternative options for achieving the objectives of the project as follows:

- Use of an alternative site to the port with new jetty for mooring large-size cruise ships (Yorkeys Knob and Yarrabah)
- Improved tendering alternatives
- Minor upgrades to existing infrastructure, without upgrade of the existing channel

None of these options were found to deliver equivalent benefits to those outlined for the project.

Whilst the alternative of construction of a long trestle wharf at Yorkeys Knob would result in a significant reduction in the volume of dredge material requiring disposal, this option has been assessed as having unacceptable visual impacts, navigational safety impacts, significant impacts to the natural environment, and unacceptable costs associated with construction and maintenance of such a structure. The cost of the trestle wharf at Yorkeys Knob is estimated to be $400m. Furthermore, this option does not improve passenger and crew access to the CBD as they will still need to transfer by bus.

The option of Yarrabah Jetty is considered a complementary location to Cairns rather than an alternative. Yarrabah Jetty provides access to a cultural and eco-tourism experience which is different to that offered by the Cairns CBD and is not aimed at the mass cruise market. A cruise terminal at this location does not offer any port services or fuel options and is located a considerable distance from Cairns. Given its significant cultural heritage attributes, it is likely there could be potential cultural heritage challenges in expanding the jetty to the size required to cater for all classes of cruise ships.

Dredge and Placement Methodologies

The EIS examined various dredging and placement options for the purpose of modelling, assessing impacts and mitigations.

Capital Dredging Equipment

The channel will be dredged using two types of dredging plant. The total volume of material to be dredged is approximately 4.4 million m3. The material to be dredged ranges from very soft clay through to stiff clays. Dredging of both the inner port and outer channel would occur concurrently. Two methodologies were considered and modelled using two types of dredge plant to undertake the capital dredging. For both methodologies the best likely and worst likely scenarios were modelled and the predicted impacts are described in the relevant chapters of Section B.

The first methodology considered to undertake the dredging would be to conduct a single, one-off capital dredge campaign to widen and deepen the channel using a medium-sized Trailing Suction Hopper Dredge (TSHD) in combination with a mechanical (backhoe) dredge. This is the most efficient method of dredging materials in the channel, cognisant of the water depth involved in terms of safe navigation and underkeel clearance. This methodology assumes that the TSHD undertakes all dredging in the outer channel and the backhoe completes all inner port dredging. The second scenario assumes that the TSHD undertakes all dredging in the outer channel and a combination of backhoe for the stiff materials and TSHD for the less stiff materials is used in the inner port.

Unlike other port projects in the GBR region, the very soft, silty clays found in Trinity Bay will facilitate a methodology that can significantly reduce the need for overflowing the hopper of the TSHD dredge vessel. This will, in turn, minimise the turbidity plumes generated by the dredge and ensure the fine material is more effectively captured in the vessel's hopper for transport to the DMPA. As will be outlined later, operating the dredge with constrained overflow will further reduce temporary impacts on water quality and associated marine habitats, particularly in more sensitive nearshore environments.

The expected duration of dredging to remove the volume required in the outer shipping channel for both methodologies is between 18 and 21 weeks, noting the exact timing will be subject to the size of vessel used and the geotechnical conditions of the channel which will be surveyed in greater detail before work begins.

Stiffer clays in the inner port will need to be dredged by a backhoe, but softer material in this area can be removed efficiently by the TSHD (again with constrained overflow requirements) or by the backhoe. The first methodology assumes that all of the work in the inner port is undertaken by the backhoe and this requires 34 weeks of dredging. The alternative methodology considered a combination of TSHD and backhoe in the inner port resulting in an overall program of 21 weeks (21 weeks for TSHD and 19 weeks for backhoe dredging). In reality, the preferred scenario will likely be a combination of the two modelled methodologies and will involve a TSHD for around 21 weeks and a backhoe dredge in the inner port for around 23 weeks. This will likely result in an overall dredging campaign of approximately 23 weeks.

Modelling assessments for the inner port presented in **Chapter B5** and **Appendix D** have examined water quality impacts from both the backhoe dredge operation as well as prospective TSHD operations in the inner port area operating in tandem. Modelling of this case has shown using a combination of the backhoe dredge for stiffer material and TSHD for softer material in the inner port will not result in markedly greater impacts on water quality than a backhoe for the whole inner harbour dredging, assuming the TSHD operates with constrained overflow.

Dredging Methodology

An assessment of the dredge methodology was undertaken, in particular, the overflow component of the TSHD, to determine the most acceptable dredge methodology. Two options were considered for further modelling, both based on good environmental practice to achieve minimal impacts:

- No overflow option based on using the TSHD with no overflow
- Constrained overflow option based on limiting TSHD overflow.

The assessment of the dredging methodologies has indicated that operating the TSHD with constrained overflow (based on limiting it to 10 minutes per load for a maximum of 50 percent of loads in the non-stiff material and limiting overflow to 60 minutes per load for any stiff material) produces only marginally increased water quality impacts above operating with no overflow. On this basis, both options have been adopted and taken forward for assessment as part of the EIS.

This is in contrast to the option of full production overflow of all loads by the dredge. While improving production rates and the reducing the duration of dredging, modelling of this scenario indicated much more acute and widespread water quality impacts would be likely to occur.

Staging Methodology Analysis

As part of the methodology analysis, the EIS has also examined staging options including:

- Multiple/progressive capital dredging campaigns – with at-sea disposal
- Multiple/progressive capital dredging campaigns – with placement of material on land.

These staged options would use the TSHD similar to the vessel used for the annual maintenance dredging campaigns. This option considered progressively widening and deepening the shipping channel over a five-year period in combination with planned maintenance campaigns. The capital dredge material could then be placed at sea or on land over a phased basis.

A progressive or staged approach to dredging and placement does not provide significant advantages over completing the capital dredging in one campaign but does introduce some project risks such as:

- There is almost no incremental benefits accrued through partial dredging as the full dredging scope is required to enable any of the targeted mega class vessels to enter the Port of Cairns
- The significant upfront cost and the time delay until the economic benefits are realised will reduce the financial viability of the project
- The current vessel used for maintenance dredging, TSHD Brisbane, has limited availability due to its on-going commitments to maintenance dredging in other Queensland ports and, therefore, staging presents risks associated with the availability of the dredge and the appropriate time windows to undertake the dredging
- A multiple campaign with the smaller dredge will require an increase in the overall dredging duration offset by a reduction in the amount of dredging undertaken each year
- The existing conditions and resilience of the marine environment (water quality, seagrass, etc.) may change from year to year during the progressive campaign necessitating the review of relevant dredge triggers for impact, possible work stoppages and new corrective actions. A single campaign allows consideration of the current condition of the system and to design and implement an effective reactive monitoring program to protect those existing resource values present at the start of the campaign. The multiple campaigns, therefore, will need to be flexible to address changing environments and this may add cost and time to the project
- While progressive dredging and placement improves the capacity of a land-based placement site to accept the material (with drying and consolidation possible between campaigns) thereby reducing the storage footprint and environmental impact, it does not fully overcome planning, safety and environmental constraints of the land-based sites, including significant uncertainty and risks associated with management of Acid Sulphate Soils (ASS) and tailwater (as discussed further below). Due to the limited drying capacity in Cairns' tropical environment, it may not be possible to conduct land-based multiple placement in concurrent years, thus resulting in an overall longer timeframe to achieve the required design requirements.

As such, none of these staged approaches present significant benefits over the single capital dredging campaign approach outlined by the project.

Dredge Material Placement Options

Background

Historical Marine Placement

Although Trinity Inlet is a natural harbour, access to the sea is across a broad shallow mudflat. Since the declaration of the Port in 1876, it has been necessary to maintain an access channel through these mudflats by regular dredging to remove sediment which collects in the channel. The first capital dredging works were undertaken within the access channel and berths in 1887. Since then, numerous capital dredging campaigns have been undertaken progressively widening and deepening the channel to its current width of 90 m at a declared depth of -8.3 m LAT. The channel is about 13.2 km from its outer extent to the port area.

Historical Land Reclamation

The Port Authority owned and operated its own dredge, The Trinity Bay, between 1913 and 1974 and during this period a small proportion of the annual dredging in Trinity Inlet was used to reclaim land for urban areas and future industrial land. This reclamation was at a very slow production rate over many years and used only certain portions of the material. The remainder was placed in Trinity Bay. Typically, volumes of fewer than 100,000 m^3 were used per campaign in combination with other fill and sand.

Historically, the impacts of Potential Acid Sulphate Soils (PASS) and uncontrolled turbidity release were not as well understood as today and such placement methods would not meet contemporary environmental management requirements.

The potential to place dredged material on land or use it for reclamation in Cairns is now heavily constrained due to:

- Residential development
- Habitat, heritage and environmental resource protection areas
- Indigenous cultural heritage values
- High value agricultural land
- Scenic and recreation areas
- Flood prone land.

Dredge Material

The dredged material consists of fine-grained, unconsolidated marine sediments and is saline. It is classified as very soft, silty clays of low strength, from an engineering perspective, and of low agricultural value. The material consolidates slowly and contains large volumes of water, which together with runoff from rainfall, means large areas of land would be required for settlement ponds to ensure discharge waters are acceptable for release into waterways.

Given the characteristics of the material and its high water content it is logistically difficult to handle.

The most likely beneficial use of the dredged material is placement on land for use as fill following dewatering. Other beneficial uses, such as use of the material for construction materials (bricks), to cap landfills, or to create artificial islands and similar concepts, have been discounted due to engineering, environmental or economic limitations.

As outlined in **Chapter B4**, extensive field sampling and laboratory testing in accordance with GBRMPA's requirements has confirmed dredge material removed by the project is suitable for at-sea placement.

The material to be dredged for the channel expansion works was also tested and found to contain significant volumes of PASS. Whilst impacts associated with such soils are relatively easy to manage when they remain wet and are placed at sea, considerable treatment would be required if placed on land in order to avoid acidification and the potential release of elevated concentrations of heavy metals when exposed to air.

Options Assessment Methodology

The National Assessment Guidelines for Dredging (NAGD) state that, 'all alternatives to ocean disposal need to be evaluated, including the environmental, social and economic impacts of each disposal option'.

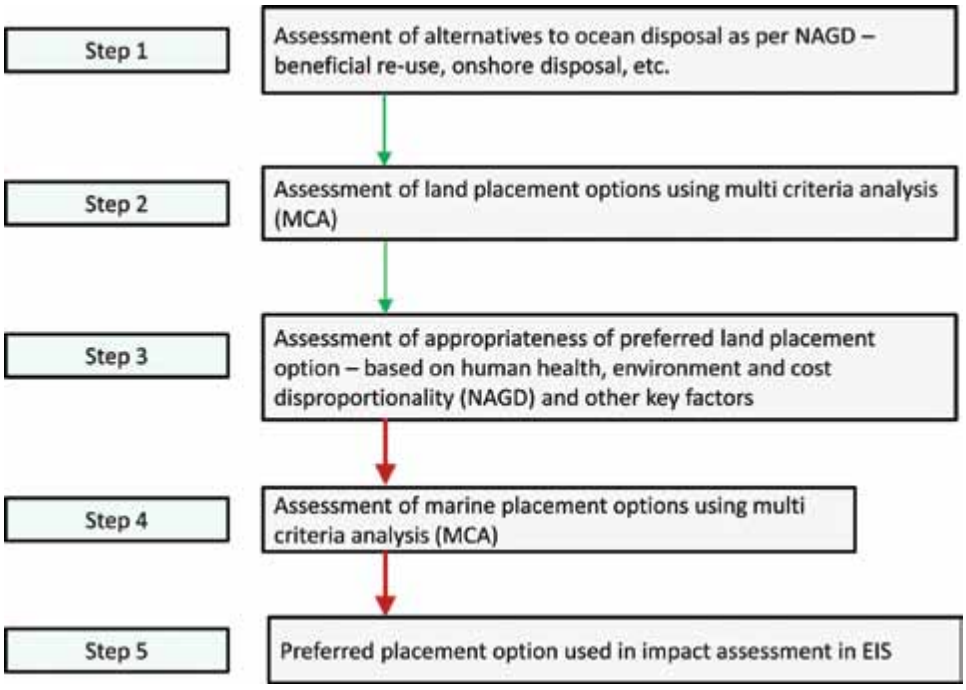
Chapter A2 of the EIS outlines investigations to address the requirements of both Governments in relation to examining options for dredge material disposal to understand potential environmental impacts associated with both land and marine disposal sites.

The methodology used for the assessment is shown in **Figure ES-5**. This methodology is consistent with guidance provided within the NAGD.

The methodology used was presented and workshopped with Federal and State statutory agencies in April 2014 and the findings of the workshop were used to inform the final MCA process.

Cognisant of the characteristics of the dredged material and land requirements, five land-based sites and five marine sites were identified for investigation and comparative assessment as outlined below.

Figure ES-5 DMPA Options Assessment Methodology



Land-Based DMPA Options

Five potential land-based sites have been investigated to verify the optimal land based DMPA preferred option. Their locations are shown in **Figure ES-6** and include:

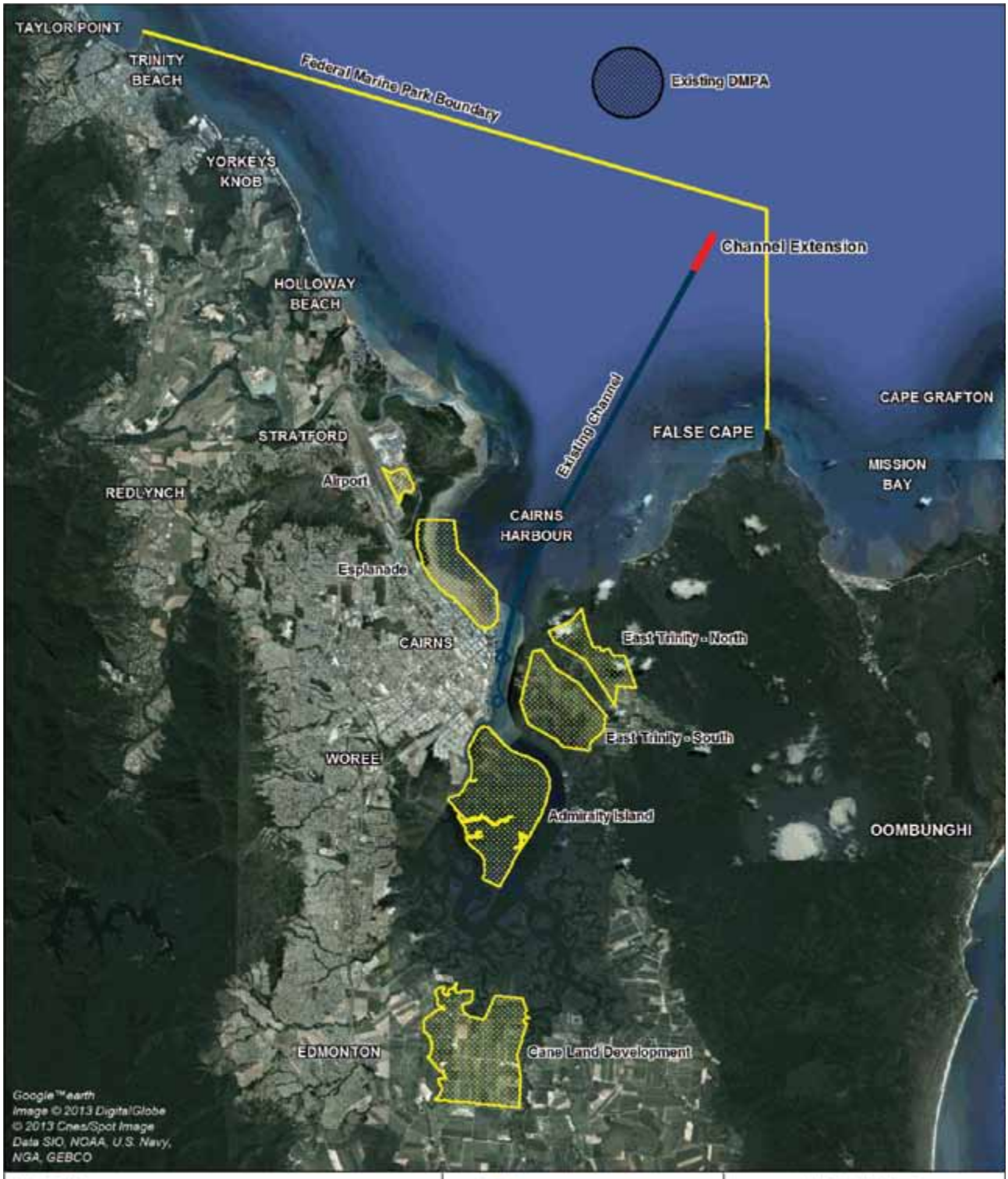
- East Trinity (which could be used for both disposal purposes or future re-use of the dredged material as fill for development following treatment)
- Cairns Airport (future re-use area)
- Esplanade (disposal or future re-use area)
- Cane Farm Development (future re-use area)
- Admiralty Island (disposal area only).

The main technical requirement of the land-based option is to provide a suitably sized area to dewater the dredge material, treat potential PASS and establish the associated infrastructure. Certain key design requirements were considered key to site viability:

- On relatively flat land
- Close to existing drainage or creek lines to enable tailwater discharge
- Distant from areas subject to coastal erosion or storm surge, or otherwise engineered to be resistant to such impacts
- Within a reasonable distance (<11 km) to enable pumping of the dredged material from a mooring site
- Secure dewatering areas which need to be fenced as there are inherent public safety issues with the soft nature of the material while it is in the process of dewatering.

Schematic engineering layouts for each location were developed, in order to determine a potential configuration of the site used for dredge placement and to determine the engineering logistics of how each site could be constructed and filled (time, plant, materials, transport, cost).

Figure ES-6 Land Based DMPA Options



These five sites were selected on the basis of:

- Identification and investigation as part of previous studies
- Proximity to the dredging footprint (noting that the dredge material can only be pumped over a finite distance even with booster pumps)
- The availability of a large area of land for treatment
- Known planning constraints
- Consultation with relevant State and Federal agencies and stakeholder feedback.

The option assessment has included a MCA (scoring system) for relevant environmental, social, planning and economic criteria so the different options can be compared and ranked. A summary of the MCA evaluation of the five land-based options is shown in **Table ES-1**.

In addition to management of PASS risks from the marine dredge material being oxidised as discussed above, key environmental considerations for land-based placement include:

- Loss of habitat at or adjacent (edge effects) to the placement site including from pipeline alignments
- Large volumes of tailwater generated during placement and associated impacts on hydrology and water quality from the release of this tailwater back to the marine environment
- Stormwater runoff following the active placement process while the material is drying
- Infiltration of saltwater into groundwater and impacts on surrounding environments and land uses.

Key human health and safety considerations include:

- Characteristics of each site that relate to health, including the intended end use
- Characteristics of the dredge material that relate to health and the associated health effects from potential contamination of land, air and water
- Safety risks (pipe blow outs, bund failures, working in soft reclamation material)
- Sensitive receivers (both direct and indirect) and vulnerable groups of people
- Impacts to health due to potential breeding of mosquitoes
- Social impacts that have health effects.

Key planning and governance issues include:

- Ownership/tenure of land where placement site is situated
- Cultural heritage items, places and values
- Consistency with regional/local planning intent (zoning, permissible use) and community expectations
- Potential amenity impacts on surrounding land uses
- Noise, air, odour impacts
- Traffic and haul routes.

Table ES-1 Evaluation of Land Placement Options

Category and criteria	Criteria Weighting	Criteria Weighting	Land Placement Options						
			East Trinity		Cane Land	Admiralty Island	Airport	Esplanade	
			Placement	*Develop*	*Develop*	*Placement*	*Develop*	*Placement*	*Develop*
Environmental									
Water quality impacts	50%	30%	3	3	3	2.5	2.5	2.5	2.5
ASS issues		10%	2	2	4	3	4	4	4
Habitat values/habitat loss		50%	2	2	3	2	1	1	1
Air/noise/odour impacts		5%	3	3	3	4	2	2	2
Pests		5%	3	4	3	2	2	2	4
Sub-total		***100%***	***2.40***	***2.45***	***3.20***	***2.45***	***2.15***	***2.15***	***2.25***
Social									
Cultural heritage/native title	20%	35%	2	2	3	2	4	3	3
Traffic		25%	4	3	2	3	3	3	2
Community benefit		20%	2	4	3	2	5	2	3
Amenity issues		20%	3	4	4	4	2	2	4
Sub-total		***100%***	***2.70***	***3.05***	***2.95***	***2.65***	***3.55***	***2.60***	***2.95***
Legislative/Planning									
Land use planning/tenure/ approvals	10%	100%	4	4	2	3	2	2	2
Sub-total		***100%***	***4.00***	***4.00***	***2.00***	***3.00***	***2.00***	***2.00***	***2.00***
Economic/Logistics									
Area available/volume	20%	20%	6	6	6	6	2	6	6
Pumping equipment/distance		20%	2	2	1	3	4	4	4
Costs		40%	3	2	1	3	3	3	2
Length of dredge campaign		20%	3	3	1	2	3	3	3
Sub-total		***100%***	***3.40***	***3.00***	***2.00***	***3.40***	***3.00***	***3.80***	***3.40***
Overall Score	**100%**		**2.82**	**2.84**	**2.79**	**2.74**	**2.59**	**2.56**	**2.60**

Key cost and logistical issues include:

- Containment of the placed material, noting the placement area will need to have impermeable bunds of sufficient height to contain and protect it from flooding, storm surge and other hazards
- Acceptable pumping distances between the dredge vessel and the reclamation/bunded containment site (generally 10km but dependent on the use of booster pumps or plant)
- Adequate space for management of dredge tailwater (treatment train and sedimentation ponds) taking into account the tropical environment in the Far North with heavy rainfall
- Long-term management, monitoring and surveillance of the placement site (possibly over 10 years during drying/ treatment) and associated fencing to prevent public/fauna access.

Preferred Land-Based DMPA Option

Of the five sites investigated, the East Trinity site was considered the most suitable and preferred land disposal site on the basis that:

- It is of sufficient size to accommodate a large volume of capital dredge material produced by the project, including the large volume of tailwater produced from hydraulic placement
- It is reasonably isolated from the Cairns urban population, thereby limiting air/noise/odour and amenity impacts
- It is predominantly State land (currently held as an environmental reserve) and would not require acquisition of freehold land (although it has potentially significant cultural heritage constraints)
- It was the most cost effective of the land-based sites for disposal, and while extremely expensive, it would be possible over time and with the implementation of ground treatment techniques, to strengthen the placed material to a level to facilitate future development of the site.

Appropriateness of the preferred land placement site at East Trinity

The NAGD states that a sea dumping permit shall be refused, 'if the determining authority finds that appropriate opportunities exist to re-use, recycle or treat material without undue risks to human health or the environment or disproportionate costs'.

On this basis, a more detailed assessment was undertaken of the East Trinity site in **Chapter A3** of the EIS to assess the following:

1) Its appropriateness (based on an assessment of relevant planning, environmental and social impact criteria)
2) Human health (and safety) impacts from land-based placement
3) Cost disproportionality.

Appropriateness

A concept design and construction methodology for placing the material at East Trinity has been prepared and used in the appropriateness assessment (refer **Figure ES-7**). As part of this design, site requirements have been assessed to include the following elements:

- Creation of a pump-out berth in Trinity Inlet, dredge pipeline, dredge ponds and discharge points for tailwater
- Storage capacity of 10 to 12.5 million cubic metres (required to cater for high water to solids ratio due to dredging and pumping to shore processes)
- A full 520 hectares for initial storage
- Bund heights to meet 50-year storm events plus wave (3.5 m AHD) or 1.0 m to 1.5 m above existing bund walls
- A bund wall of 22 km – requiring the importation of one million cubic metres of clay
- Design, procurement and construction period of approximately three years for dredge ponds
- Lime treatment of PASS requiring an estimated 240,000 tonnes of lime with additional lime treatment and imported fill for development of the site.

The appropriateness of placement of the capital dredge material at the East Trinity site was assessed in the context of the key criteria shown in **Table ES-2** which also identifies the key findings of the preliminary assessment.

Figure ES-7 East Trinity Concept Placement Plan

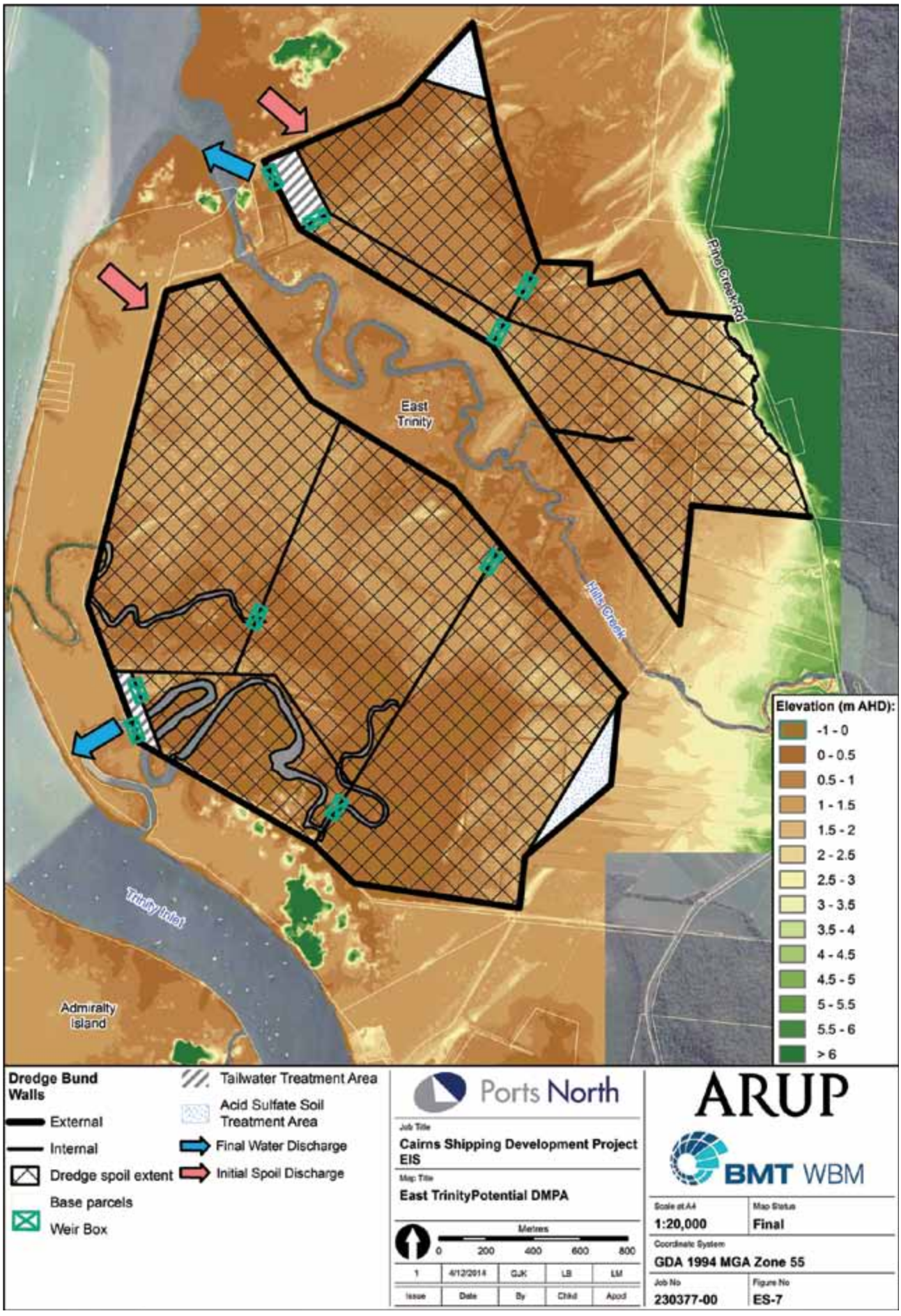


Table ES-2 Appropriateness of the East Trinity Site for Placement of Dredge Material

Appropriateness Criteria	Summary of Key Findings
Consistency with long term planning intent	• The area is zoned as an environmental reserve. The intent to use East Trinity for dredge material placement/disposal is not consistent with this zoning • There is no current alignment between the use of the East Trinity site for a future urban land use with long-term growth and statutory land use plans for the city and/or Cairns region. The area currently has no service provision from Cairns Regional Council CRC.
Impacts to on site habitat values	• 14 years of rehabilitation has been undertaken to restore ecosystems at the site. Estuarine habitat values are expected to increase as the site's ASS management progresses. • The site contains a large area of rehabilitating native forest and estuarine vegetation communities which form part of the Trinity Inlet Nationally Important Wetland. These areas are likely providing habitat for numerous threatened and migratory species listed and protected under the Environment Protection and Biodiversity Conservation (EPBC) Act • The estuarine wetlands adjacent to the site form part of the Trinity Inlet Fish Habitat Area. It is one of the most important in Queensland, providing nursery habitat for recreationally and commercially important fish species • Avoidance of existing habitats, regenerating and/or rehabilitated areas of the site cannot be assured.
Tenure and governance (including cultural heritage)	• The site is held in state tenure as an environmental reserve. A change in the classification of the reserve would be required to use it for material placement • The current site manager is the Queensland Government (DSITIA) which is overseeing restoration efforts. It is unclear what entity would manage the site following construction and placement. Native title has been extinguished over part of East Trinity however, native title still remains over the near shore and access areas on the seaside of the bund wall. Indigenous parties have expressed an interest in managing the existing East Trinity site in its present condition. An Indigenous Land Use Agreement and Cultural Heritage Management Plan would need to be developed.
Impacts to surface and ground water quality	• There are risks associated with the management of tailwater during construction to protect the environmental values of receiving environments. Likewise, stormwater runoff from large rain events following construction would need to be monitored and managed • The scale of PASS treatment required is unprecedented and there is a high risk of acidic (or alternatively alkaline) run off. Technologies to manage dredge material on land (generally related to sand or sandy mud) are untested at this scale and with the qualities of the material present (predominantly silts and clays) for the project • Placement of the marine mud on a terrestrial environment has the potential for saline intrusion into the groundwater aquifer and to mobilise acidic groundwater.
Withstanding coastal hazards	• Mapped as an area prone to storm tide inundation. • High cost of bund wall (3+ m height) will be required to protect placed material from storm events • Leakage and failure a significant risk (with potentially serious environmental impacts) given cyclonic activity and long settlement periods.

Human Health and Safety Risks

Key human health and safety risks from placement at the East Trinity site were identified and assessed as follows:

- Risk of traffic incidents on haul roads due to increased vehicular movements
- Risk to site workers from:
  - Inhalation or contact with harmful substances, including hydrated lime used to treat ASS
  - Contact with hazardous fauna species (e.g. crocodiles, snakes, etc.)
  - Contact with mosquitoes and/or biting insects which can have a variety of health risks ranging from irritation to ongoing illness (i.e. Ross River Fever)
- Risk to public health from the effects of lighting, noise or air pollution
- Risks to worker and public safety related to dredge material consolidation stage (e.g. risk of falling into unstable material).

Most of the potential impacts could be effectively managed through measures such as good communication, traffic management plans, health and safety plans, etc. The risk of most concern is that of members of the public illegally entering the site and falling into unstable material. East Trinity is isolated, and its size makes it difficult to effectively restrict public access. The current site managers report regular illegal access to the site despite signage and fencing as it is a popular location for fishing/crabbing.

Cost Proportionality

Cost estimates were developed based on a concept design and construction methodology for the East Trinity site. This included costings for preparation of the site to receive the material (bunding, site access, roads, etc.), establishing a dredge mooring area and pipeline from the mooring to the reclamation site and the costs associated with the dredge campaign (e.g. dredging, sailing to the mooring point, mooring and pumping the material on to the site and then repeating this cycle). In addition to the placement costs, the cost estimate also looked at ongoing treatment of the material for a period of 10 years. The treatment works include the drying of the dredge material and the application of lime to neutralise the PASS. Due to the poor engineering characteristics of the dredge material, further lime strengthening (land farming) works are required to enable possible site development and construction. The cost estimate also includes indirect costs such as engineering design, project management fees and ongoing monitoring and potential offset costs.

Based on these assumptions, the total cost for dredging and placement of material at East Trinity is estimated to be approximately $365m for the disposal scenario with the cost escalating to approximately $440m for the development scenario when considering the additional associated treatment of the material required. This compares to a total estimated cost for dredging with marine placement at approximately $102m. The difference represents an increase in costs of approximately 300–400 percent.

An assessment of the value of East Trinity as a future development site examined options ranging from rural to urban purposes. This concluded none of the development options were viable (RPS, 2014).

Even with a favourable estimate of the value of the improved land following treatment (which is not supported by investigations to date), the cost of land-based placement at the East Trinity site is still disproportionate to the cost of disposal of the dredge material at sea.

East Trinity Appropriateness Conclusion

Overall, based on the findings of the appropriateness assessment, the human health and safety impact assessment and the cost proportionality assessment, the EIS has concluded that the East Trinity site, at this time, is not appropriate for dredge material placement and consideration has been given instead to the investigation of the preferred marine placement option.

Changing Circumstances – Land Placement Options

There are a number of emerging issues related to port development and dredging that could lead to a change in the assessment processes for capital dredging. A number of key environmental reports, port project announcements, and environmental and cost considerations could, in the future, open the opportunity to reframe the criteria for assessing the acceptability of undue risk to human health or the environment or disproportionate costs included in the appropriateness test outlined in the NAGD. If this does occur, particularly around the measure of cost disproportionality, then it provides an opportunity for further examination of East Trinity as a fill placement site option.

As detailed above, due to the outcomes of the appropriateness assessment, a full environmental impact assessment was not undertaken on the East Trinity land placement site as part of the EIS because key indicators of appropriateness, human health and cost disproportionality under NAGD were not met by the site.

If East Trinity is subsequently deemed appropriate for further investigation more extensive assessments must be undertaken. **Part D** of the EIS has been prepared for this purpose; to provide a more detailed Review of Environmental Factors (REF) for the East Trinity site and to guide these future assessments should they be required.

Marine DMPA Options

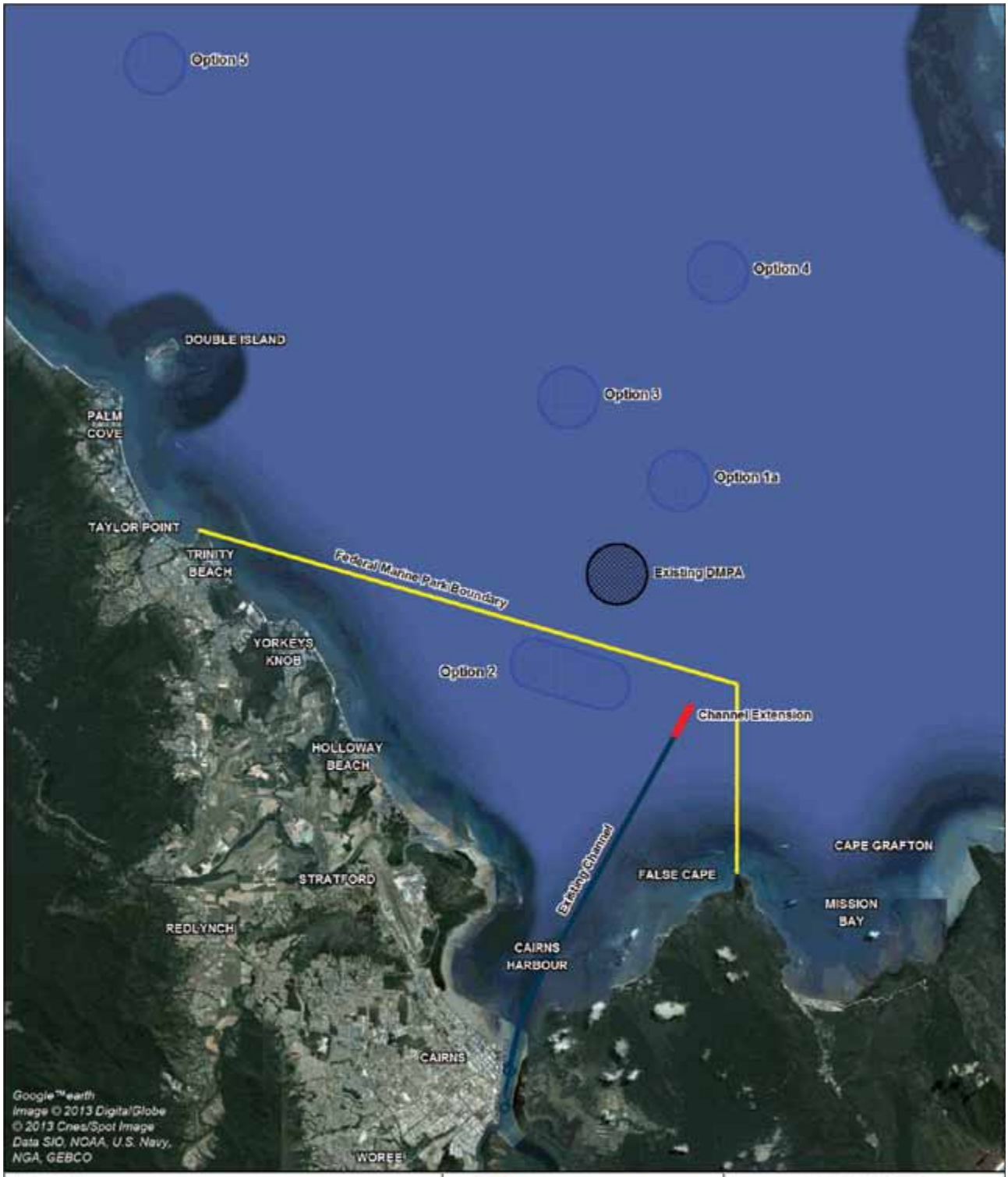
The Initial Advice Statement (IAS) for the project in 2012 identified an investigation area immediately seaward of the existing approved DMPA site within the boundaries of the GBRWHA and GBRMP and for which the port already holds a long-term approval for maintenance dredge material disposal.

In addition to this site, four other marine sites were selected for investigation based on:

- Previous studies (including two alternative marine sites modelled as part of GBRMPA's Improved Dredge Material Management for the Great Barrier Reef Region [SKM/APASA 2013]);
- Consideration of the effects of different water depths on the retentiveness of the DMPA
- Known planning constraints (inclusion of a shallow site located outside of the GBRMP was identified for comparative investigation with deeper sites in the marine park); and
- Consultation with relevant State and Federal agencies.

Investigation, including dispersion modelling, was undertaken on the five potential marine sites as part of the EIS to verify an optimal marine DMPA location. The location of the five sites is shown in **Figure ES-8 Marine DMPA Options**.

Figure ES-8 Marine DMPA Options



As with the land-based options assessment, the marine DMPA options assessment included an MCA for relevant environmental, social, planning and economic criteria so the sites can be compared and ranked.

Based on previous studies, five marine placement sites were identified for further assessment to determine a preferred marine placement option. These options include:

Option 1A – Optimisation of Option 1 which was an extension of the existing DMPA within the Great Barrier Reef Marine Park.

Option 2 – Inshore site outside of the Great Barrier Reef Marine Park and in the World Heritage Area.

Option 3 – Midshore site within the Great Barrier Reef Marine Park.

Option 4 – Offshore site within the Great Barrier Reef Marine Park.

Option 5 – Northerly site within the Great Barrier Reef Marine Park.

Assessments of dredge material re-suspension potential and associated water quality impacts were undertaken for each option based on modelling over a typical 12-month period (i.e. excluding cyclones) and the comparison of material quantity dispersed for each site is summarised below.

Table ES-3 Comparison of Material Quantity Dispersed

Option	Average Depth (m AHD)	Dredge Material Dispersed (x103 tonnes)	Percentage Dispersed (%)
1A	-19.2	2	0.1
2	-10.5	958	26
3	-18.6	26.7	0.7
4	-28.7	0.005	0.0
5	-19.0	756	21

Assessments of the five marine placement options also included consideration of potential impacts to sensitive ecological receptors and world heritage values, seabed substrate and benthic ecology, fisheries, amenity and tourism, planning, capacity, shipping and navigation, distance from dredge area and project costs. A summary of the evaluation of the five options is included below.

Table ES-4 Evaluation of Marine Placement Options

Category and Criteria	Criteria Weighting	Criteria Weighting	Marine Placement Options				
			Option 1A	Option 2	Option 3	Option 4	Option 5
Environmental							
Re-suspension/water quality	50%	40%	5	2	5	6	2
Water quality/world heritage values		40%	5	3	5	4	4
Seabed substrate/ benthic ecology		20%	4	4.5	4	2	3
Sub-total		***100%***	***4.8***	***2.9***	***4.8***	***4.4***	***3.0***
Social							
Fisheries	20%	50%	2	3	2	2	3
Amenity and tourism		50%	4	3.5	4	2.5	2.5
Sub-total		100%	***3.0***	***3.3***	***3.0***	***2.3***	***2.8***
Legislative/Planning							
Marine park planning	10%	100%	2	5	2	2	2
Sub-total		***100%***	***2.0***	***5.0***	***2.0***	***2.0***	***2.0***
Economic/Logistics							
Bathymetry/capacity	20%	30%	6	2	6	6	6
Shipping and navigation		10%	6	3	6	3	6
Distance from dredge area		10%	5	6	4	3	1
Project cost		50%	5	6	4	3	1
Sub-total		***100%***	***5.4***	***4.5***	***4.8***	***3.9***	***3.0***
Overall Score	**100%**		**4.28**	**3.50**	**4.16**	**3.63**	**2.85**

From the initial modelling and preliminary assessment of the five sites, Option 1A was identified as the shortlisted site on the basis that it:

- Is in deeper water (18m-22m) and is predicted to be almost fully retentive (99.9 percent) in the context of the behaviour of material when modelled over a typical 12-month period. It was further predicted by modelling to be 98.9 percent retentive under cyclonic and extreme weather conditions
- Is situated between nine and 15km from seagrass and coral reef environments including the outer reef
- Has a seabed surface with no vegetation or hard substrate that could act as a fish aggregation point and has a high proportion of fine sediments which is 'like for like' with the dredge material proposed to be placed there
- Has similar, unremarkable benthic habitat values to the existing DMPA which has been shown to recolonise with benthic organisms rapidly following disturbance by placement
- Has sufficient capacity to function both for placement of the capital dredging as well as future maintenance campaigns in the long term (+20 years capacity)

- Is situated away from known anchorage areas and shipping lanes
- Is situated close to the channel – minimising dredge steaming times, and as such, reducing the overall duration of capital dredging for the project compared to a site further offshore (and closer to the reef) or a land-based site where pump out is required.

All available marine placement sites are located in the Great Barrier Reef WHA. The shortlisted site (Option 1A) is situated in the deeper waters of the GBRMP. It is at some distance (kms) from sensitive receptors and has a very high degree of retentiveness due to its location and depth. On this basis Option 1A was selected as the option for further investigation. The technical chapters in **Part B** and management plans in **Part C** have been prepared based on the assessment against the Terms of Reference of this shortlisted option. This assessment concluded that Option 1A provided the best environmental and financially sustainable outcome.

The project studies focused on the design and management of the project in a manner to deliver a high level of environmental performance including the following:

- Through additional navigation studies the channel design was reduced to minimise the capital and future maintenance dredging requirements
- Rigorous testing of the dredge material confirming its uncontaminated status and suitability for unconfined sea disposal in accordance with the NAGD
- Comprehensive modelling to determine the optimal placement site to avoid turbidity impacts in the nearest sensitive receptors both during dredge material placement and long term due to the retentive nature of the site
- Minimising the duration of dredging to allow the timing of the dredging to avoid significant period of ecosystem sensitivity such as coral spawning, seagrass growth and fish spawning periods
- Mitigation of water quality impacts by constraining overflow dredging operations in the channel and hence limiting the amount of fine material available for re-suspension and dispersion in Trinity Bay
- Corrective action triggers proposed under a reactive monitoring program to validate the impact predictions as well as monitor impacts and protect marine resources utilising the latest scientific findings and independent experts
- While the best practice dredging methods, mitigation and monitoring are proposed to avoid significant impacts the EIS also presents a range of possible environmental offset initiatives to both compensate for unavoidable minor temporary impacts but also to achieve a net environmental benefit and contribute to the improvement of reef resilience.

The project is somewhat unique in comparison to other recently undertaken or considered capital dredging projects in the Great Barrier Reef region:

- Unlike bulk and break bulk cargo expansions this project does not involve a significant number of additional ships entering the GBRWHA, actually reduces the number of cruise ships at anchorage within the GBR Marine Park and poses a minimal risk to marine animals
- The project is limited to channel development
- Dredge material characteristics, being fine marine mud (silts and clays), are challenging when used for land reclamation or other re-use options due to Potential Acid Sulphate, extensive drying times and risk in terms of containment and settling of tailwater to reduce turbid run off from land as opposed to sandy, denser silts and stiffer clay material in other capital projects elsewhere
- The capital dredging and placement are in areas subject to previous capital and maintenance dredging and placement of similar material and, hence, are more proven in terms of environmental performance
- The tropical climate of Cairns and the lack of surrounding low habitat value vacant land further constrains the ability to provide an environmentally acceptable land based solution
- Due to the like for like nature of the ambient seabed material and the proposed capital dredging material, the impacts of both initial placement and any re-suspension are lower on the resilience of the surrounding habitat which has evolved through regular episodes of elevated turbidity and sediment accumulation in the bay over geological timescales
- The nature of the selected marine placement site within the relatively sheltered Trinity Bay area provides a generally lower energy and almost fully retentive marine placement option as opposed to more exposed Points and less protected areas off the coastline.

Changing Circumstances - Marine Placement Options

There are a number of emerging issues related to port development and dredging that could lead to a change in the assessment processes for capital dredging. A number of key environmental reports, port project announcements, and environmental and cost considerations could change the options available for assessment for capital dredging disposal. Following completion and submission of the draft EIS and prior to its public release, the Federal Minister for the Environment announced in November 2014 that legislation would be put in place using the Great Barrier Reef Marine Park Act to ban all capital dredging disposal into GBRMP and, subsequently, in March 2015, GBRMPA commenced consultation on this new regulation.

In addition to the proposal by the Federal Minister for the Environment to ban all capital dredging disposal into GBRMP, the Queensland Government, in 2014, released the Queensland Ports Strategy that prohibited dredging within and adjoining the Great Barrier Reef World Heritage Area for the development of new, or expansion of facilities outside of the five Priority Port Development Areas (PPDAs), being the Ports of Brisbane, Gladstone, Hay Point/Mackay, Abbott Point and Townsville for the next 10 years. The Queensland Ports Strategy included transitional arrangements allowing this Cairns Shipping Development Project to proceed to the EIS assessment and approval phase as it was a development proposal that had commenced the assessment process.

Subsequent to the Queensland Ports Strategy, the Queensland Government and Federal Government released the Reef 2050 Long Term Sustainability Plan in 2015 which includes the following actions:

- **WQA14** – Restrict capital dredging for the development of new or expansion of existing port facilities to within the regulated port limits of Gladstone, Hay Point/Mackay, Abbott Point and Townsville.
- **WQA18** – In 2015 legislate to ban sea based disposal of capital dredge material in the Great Barrier Reef Marine Park and in the balance of the Great Barrier Reef World Heritage Area from Port related capital dredging.
- **WQA20** – The Queensland Government will require all proponents of new dredging works to demonstrate their project is commercially viable prior to commencement.

The Reef 2050 Long Term Sustainability Plan is silent on transitional arrangements and it is understood that transitional arrangements from the Queensland Ports Strategy will apply.

As a consequence of proposed GBRMPA regulation to put an end to disposal of capital dredge material in the GBRMPA, the shortlisted marine option (Option 1A) as well as Options 3, 4 and 5 are unlikely to be available. The technical chapters detailing the impacts and assessment of Option 1A were completed prior to the announcement of the proposed change to legislation on capital dredging disposal in the GBRMP and have been retained in this EIS for completeness.

Only marine Option 2 is not impacted by the proposed regulation change as it is outside of the GBRMP in nearshore waters. The EIS process identified the following key characteristics of Option 2:

- Water depth of approximately -9.0m LAT compared to -18 to -22m LAT for Option 1A
- Outside of the Great Barrier Reef Marine Park but within the State Marine Park
- In closer proximity to nearshore sensitive receptors (eg, seagrass meadows) and the Northern Beaches
- More dispersive site relative to other options due to water depth with a 26 percent dredge material dispersed (1.14M cubic metres of material leaving the dredge material placement site) compared to 0.1 percent based on preliminary two dimensional modelling of Option 1A
- Significantly larger Zones of Influence relative to Option 1A with some Zones of Low to Moderate Impact extending along the coast
- Likely to cause cumulative stress on sensitive receptors (seagrass/coastal corals)
- Similar seabed benthic ecology and substrate material as the dredge material but the site may support sparse seagrass which would be lost using this site
- Less valuable commercial fisheries area due to water depth relative to Option 1A
- Larger footprint required due to need to spread the material thinner due to reduced water depth
- Located adjacent to Port of Cairns anchorage area and minor impacts on shipping
- Close to dredging area which will reduce sailing time and dredging costs
- Risk of re-suspension of dredge material migrating back into the channel.

Appropriateness of Option 2

As part of the multi-criteria assessment, all marine options were compared and ranked with Option 2 being the lowest ranking marine-based option based on environmental and water quality considerations. Further 3D modelling of Option 2 and a full assessment of this option against the Terms of Reference could be undertaken but this will require additional field studies and the rewriting of all of the technical chapters in **Parts B** and **C**. Based on preliminary assessment of Option 2, it is considered unlikely that a full EIS of Option 2 would show that this option is appropriate for placement of the large volume of capital dredge material proposed for the project. This option may also not be available if the Queensland Government legislates a ban of sea based disposal in the Great Barrier Reef World Heritage Area.

Conclusions

Following the Queensland Government's announcement to improve cruise shipping access to Trinity Inlet, Ports North commenced studies for an EIS in accordance with the Terms of Reference from both the Federal and State Governments in April 2013.

The Cairns Shipping Development Project is a community project that will support Cairns in taking its place as one of the premier cruise destinations in Australia, capitalising on the booming global cruise industry.

It has been demonstrated in the EIS that the infrastructure improvements associated with the project can respond to and increase demand in cruise shipping by improving access and facilities at the port and generating significant and ongoing benefits for the broader North Queensland economy.

By improving access for large cruise ships to the Port of Cairns, the project will inject an estimated $673 million in 2016 dollars (approx. $27m per annum) into the regional economy and create up to 680 extra jobs by 2041 significantly boosting local business, tourism and the economy. Port efficiencies for general cargo ships will increase and the project will enable future growth of the HMAS Cairns Navy Base.

However, it is equally recognised that protection of the region's major tourist drawcard, the Great Barrier Reef and other values that attract visitors, is an integral component of any proposal seeking to promote tourism opportunities in the region.

East Trinity

The EIS considered five land-based options. East Trinity was determined to be the shortlisted land-based option. An assessment of East Trinity was undertaken under the NAGD and, based on the environmental risks, human health and safety impact assessments and cost disproportionality, the East Trinity site, at this stage, was determined to be not appropriate for dredge material placement.

Changing circumstances and prospective legislative changes that have arisen since the draft EIS was submitted will potentially ban all marine placement of capital dredge material associated with the Project at sea. A number of key environmental reports, port project announcements, and environmental and cost considerations could, in the future, open the opportunity to reframe the criteria for assessing the acceptability of risks to human health or the environment and disproportionate costs of land-based placement included in the appropriateness test outlined in the NAGD and provide an opportunity for further examination of East Trinity as a fill placement site option as outlined in **Part D** of the Draft EIS.

Marine Site

The EIS considered five marine-based options. The marine based options assessment included a multi criteria assessment of relevant environmental, social, planning and economic criteria and Option 1A, a site within the GBRMP, was determined to be the shortlisted marine site based on its environmental and economic performance. As the EIS determined that there was no appropriate land-based sites based on the applicable assessment criteria at the time, the shortlisted marine based site, Option 1A, was fully assessed against the Terms of Reference concluding that the placement of dredge material at that site was environmentally sustainable. The technical chapters in **Parts B** and **C**, were completed based on the project utilising an at-sea DMPA, Option 1A, which is in the GBRMP.

The original placement option for the dredge material determined by this EIS is an offshore DMPA in the GBRMP (Option 1A). This was considered the best overall outcome when compared to the risks and disproportionate costs of land-based placement and also due to the Option 1A site being close to fully retentive even under extreme weather conditions.

Following completion of the draft EIS and prior to its public release, the Federal Minister for the Environment announced in November 2014 that legislation would be enacted using the Great Barrier Reef Marine Park Act to ban all capital dredging disposal into the GBRMP and, subsequently, in March 2015, GBRMPA commenced consultation on this new regulation.

Subject to this legislative change, the shortlisted option (Option 1A) as well as Options 3, 4 and 5 are likely to be no longer be available for consideration as placement sites.

The technical chapters detailing the impacts and assessment of Option 1A were completed prior to the announcement of the proposed change to legislation on capital dredging disposal in the GBRMP and have been retained in this EIS for completeness.

Option 2, the inshore at sea disposal site which is outside of the GBRMP, could still be available even with the proposed legislative changes announced by the Federal Minister for the Environment. However, this site does not have the same environmental performance as Option 1A and, based on the preliminary environmental assessments undertaken to date, is not considered likely to be appropriate. Further detailed assessment of the Option 2 site for the placement of capital dredge material is not considered warranted on this basis and this option may not be available if the Queensland Government proceeds to legislate a parallel ban of sea based disposal in the Great Barrier Reef World Heritage Area.

Outcomes

East Trinity, the shortlisted land-based option, could be further pursued as a land-based placement option if Government assesses that the additional costs can be justified. **Part D** of the EIS outlines the additional studies that would be required and the range of issues that would need to be resolved in order for the East Trinity site to be considered as the preferred material placement option.

Option 1A, the shortlisted marine-based disposal site, is considered the best overall environmental, economic and social outcome and, if the Government legislative changes do not occur, it is the preferred site and the basis of the project description (**Chapter A4**) and the technical chapters (**Part B**) and management plans (**Part C**) included in the EIS.