11 AUGUST 2015

GEORGE TOWN – PROPOSED CRUISE BERTHING FACILITY

EAB REVIEW OF CONSULTATION DRAFT ENVIRONMENTAL STATEMENT, TECHNICAL APPENDICES & NON-TECHNICAL SUMMARY

This report represents the Environmental Assessment Board's (EAB) review of the Environmental Impact Assessment (EIA) for the proposed cruise berthing facility. The EAB comprises representatives from the Department of Environment (DoE), the Port Authority, Department of Tourism, National Roads Authority, Planning Department and the National Museum.

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1. Overview of EIA Process

Legal requirements

The Environmental Impact Assessment (EIA) was carried out in order to assist Cabinet in the decision-making process for the proposed cruise berthing facility (CBF). As the project represents a major infrastructure development the provisions of the Framework for Fiscal Responsibility (transposed into the Cayman Islands Public Management & Finance Law, 2013) require that a comprehensive EIA is undertaken to inform the development and refinement of the Business Case for the project (Schedule 6, sections 15 & 16). Commitments 3, 4 and 5 of the Cayman Islands Environmental Charter require that environmental impact assessments are undertaken before any major projects are approved and establish a commitment to open and consultative decision-making on developments and plans which may affect the environment. Furthermore, affirmations contained within the Cayman Islands Constitution Order 2009 indicate that the Cayman Islands will be *"a Country that respects, protects and defends its environment and natural resources as the basis of its existence"* and *"a Country that manages growth and maintains prosperity while protecting its social and natural environment"*.

Part 7, section 43 of the National Conservation Law (2013) outlines the provisions for Environmental Impact Assessment (EIA). Whilst this Part of the Law is not yet in effect, section 43 of the Law was used as the overarching framework for the EIA, albeit functions of the National Conservation Council were undertaken by the Environmental Assessment Board (EAB).

Terms of Reference

The EAB for this project was convened in September 2013 by the Minister of Environment, at which point the Terms of Reference (ToR) for the EIA were prepared by Mott Macdonald. The ToR were subject to consultation with the EAB, key stakeholders and the public (details of which are appended to the ToR). The EAB-approved Final ToR were published in December 2013 and have provided the parameters against which the technical assessments have been conducted and the standards against which the ES has been reviewed.

The ToR also call for adherence to the International Finance Corporation (IFC) of the World Bank Group's Performance Standards on Environmental and Social Sustainability. The Performance Standards are intended to provide guidance on how to identify risks and impacts, and are designed to help avoid, mitigate and manage risks and impacts 'as a way of doing business in a sustainable way'. The IFC Performance Standards are used by financiers, insurers and investors in connection with financing and guarantees of specific or general business activities. Performance Standards[1] determined to be applicable to this EIA are:

> Performance Standard 1: Assessment and Management of Environmental & Social Risks and impacts.

[1] http://www.ifc.org/wps/wcm/connect/115482804a0255db96fbffd1a5d13d27/PS_English_2012_Full-Document.pdf?MOD=AJPERES

Performance Standard 2: Labour and Working Conditions

Performance Standard 4: Community, Health, Safety & Security

Performance Standard 5: Land acquisition and involuntary resettlement

Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

Performance Standard 8: Cultural Heritage

Following a competitive tendering process led by the project Steering Committee, W.F. Baird & Associates was instructed in April 2014 to undertake the EIA (and engineering specifications for the project) in accordance with the agreed ToR and the DoE's 'Guidelines on the Preparation of an Environmental Statement' (2012).

2. Public Consultation & Stakeholder Engagement

The ToR required that stakeholder engagement, consultation and disclosure guidelines of the Equator Principles and Performance Standard 1 of the IFC of the World Bank Group, were used to inform best practice for conducting the EIA. Accordingly, stakeholder engagement is an on-going process with requirements for information disclosure, consultation and engagement throughout all project phases. These Principles and Standards call for consultation to be undertaken about a project's environmental and socio-economic aspects, with relevant stakeholders, in order to take their views into account. Furthermore, it is advised that the extent and degree of engagement required by the consultation process should be commensurate with the project's risks and adverse impacts, and concerns raised by stakeholders.

ToR Public Consultation

In accordance with the provisions of IFC Performance Standard 1, public consultation commenced as part of the early scoping process when the TOR for the EIA were established. The ToR underwent a 21-day consultation period, with public comments reviewed and incorporated into the ToR, as appropriate.

EIA Public Consultation

A 28-day public consultation period for the draft Environmental Statement, Technical Appendices and Non-Technical Summary commenced on 5 June 2015 and ended on 3 July 2015. All documentation was posted on the Ministry of DATT and DoE websites, with hard copies of documents made available in the Government Administration Building and the DoE's offices. The public were invited to submit written comments (via email, post or hand delivery) for review and response by the EIA consultants and the EAB. At the close of the 28 day consultation, 473 written submissions were received. Of these responses, approximately 73% indicated their opposition and approximately 24% indicated their support for the project (approximately 3% were neutral/unclear/undecided).

A public meeting was also held at Mary Miller Hall on 9 June 2015 to discuss the results of the EIA. Attendance sheets and a head count from the event indicate that approximately 250 people were in attendance.

A summary of EIA consultation responses has been published, in accordance with Performance Standard 1, which requires that Affected Communities are informed in a timely manner about the result of the consultation process and how their suggestions and concerns have been considered.

3. Overview of Scope of EIA & Areas of Uncertainty

As a general overview, the EAB found the data collection and results outlined in the ES and Technical Appendices to be robust given the time limits which CIG imposed from the outset for completion of the EIA. The EAB believes that the EIA would have benefited from an extended data collection programme to capture some seasonal variations e.g. the traffic counts, noise and air quality modeling to have been carried out in high season rather than off-peak; the results of the extended wave monitoring to capture the winter season could been assessed in the current EIA etc.

Project Alternatives

In accordance with Cabinet-issued Policy Guidelines, included in the Strategic Outline Case and carried through in to the Outline Business Case and ToR, the assessment of alternatives was confined to options within the existing George Town Harbour. The EIA assessed a number of configurations (approximately 10) for a two finger pier within GTH, with a focus upon functionality of the piers (ease of navigation, risk of downtime, impact on cargo and tender operations, impact on existing anchorages, additional land area etc.), environmental impacts (impact of footprint on reefs, dredge and disposal volume, impact on coastal processes etc.) and socio-economic impacts (impact on diving & watersports, visual/aesthetic impacts). The EAB is satisfied that the refinement of the project layout through the alternatives assessment carried out by the consultants has resulted in a configuration which minimizes the environmental effects of this project as defined in the ES, whilst meeting the operational requirements of the cruise lines and CIG.

Cargo Operations

The scope of the EIA pertained only to cruise berthing and did not call for an assessment of the capacity of existing or future cargo operations. The ToR did, however, stipulate that the EIA should consider the interface between cruise and cargo operations and how cruise berthing may affect cargo operations during construction and operation of a berthing facility. Therefore, whilst the Environmental Statement (ES) refers to the opportunity to expand existing cargo operations, this has not been scoped (e.g. traffic, air quality, visual impact, requirement for additional dredging etc.) or adequately assessed in the context of this EIA.

Geological Information

The EAB is concerned about the validity of some of the assumptions in the EIA and potential risks to the project due the lack of accurate geological information. The ToR stated that:

> *"further ground investigation studies will be required to assess the density of materials and stratigraphy and the presence of localized faults or voids. These studies will be completed to inform the outline design on which the environmental assessment will be based and any mitigation to be recommended."* (ToR, s. 3.3.3, p. 22)

Due to cost constraints, these studies did not form part of the EIA and, the historic information that was available, was deemed by the EIA consultants to be *"insufficient to define the spatial extent and thickness of loose versus cemented material within the project footprint"* (ES, Chapter 7, s. 9.3.4).

As a consequence, the ES confirms that the lack of comprehensive site specific subsurface investigations (which includes geophysical and geotechnical investigations and a probabilistic seismic hazard assessment) represents a significant uncertainty in the project with respect to:

- The methodology (type of equipment and potential for blasting) and rate at which dredging can be performed.
- The dredged material disposal methodology.
- The turbidity modelling results (the quantity and type of fine material in the seabed affects the size and concentration of suspended sediments in the dredge plume).
- The risk for liquefaction of the land reclamation area during an earthquake and the design measures needed to counteract this effect.
- The rate at which sediment infilling of berth pockets could occur and the resulting maintenance dredging that will be required (p. 17 of NTS and Chapter 7 of ES).

The importance of having detailed, high quality geotechnical survey data at an early stage of the project is confirmed in the UNEP publication 'Dredging and Port Construction around Coral Reefs' (PIANC Report No. 108, 2010). The Report cautions that *"gaps in bathymetry and geotechnical data may cause significant cost implications and/or delays to the whole project"* (p.13).

In addition, the absence of baseline information regarding the structural integrity/condition of buildings in George Town Harbour area represents an area of uncertainty regarding the potential effects of vibration during construction works (p.30, NTS). Furthermore, there is uncertainty regarding the potential requirement for blasting. This is particularly relevant to sensitive heritage assets in close proximity to the project site such as the National Museum and Elmslie Memorial Church.

Implementation of Mitigation Measures

The ES and accompanying RIAM tables provide a range of measures to mitigate, to varying degrees, the negative effects of construction and operation of the proposed facility. However, the Government has not yet indicated which of these measures it is prepared to commit to and therefore, there may be some impacts which do not get mitigated for in the development process. **Before proceeding with the decision-making process, it is of absolute importance that the CIG obtain costs for implementation of the mitigation measures proposed in the ES.** This is critical in order to obtain an overall cost for the project and to provide a clear indication to the public and Governmental departments of the impacts of the project with and without mitigation measures in place, and any residual impacts i.e. those impacts which will occur even with mitigation measures in place. Furthermore, **the EIA consultants have clearly**

indicated that if the project advances, it must do so with the infrastructural support of the NRA's "List of Priority Road Network Improvements" which are intended to 1) improve traffic circulation in the CBD due to anticipated traffic growth over the next 10 years + and 2) facilitate travel movements to/from the CBD and its periphery and the current port facility (in its current operational configuration). Further, implementation of aspects of the George Town Revitalisation Plan were shown to substantially mitigate key issues associated with the growth in traffic expected regardless of whether or not the cruise berthing facility is implemented.

4. Overview of Key Impacts Arising from Project, Proposed Mitigation Measures & Residual Impacts

This review focusses upon the impacts of greatest significance. The EAB reminds Cabinet to also bear in mind other impacts associated with the proposed project which are documented in the ES e.g. amenity impacts during construction (noise, vibration, dust) and their recommended mitigation measures.

The impacts of greatest significance have been separated into those which occur during the construction phase and those in the operational phase i.e. post construction.

A. DREDGING & CONSTRUCTION IMPACTS

This section relates to those impacts resulting from dredging, land reclamation and the construction of the piers. The ES confirms that the dredging phase will take 1 to 4 months depending on the nature of materials to be dredged and the dredging methodology; the post-dredging works are expected to take up to 3 years to complete. Hereinafter, 'construction' refers to all of these works. The construction impacts should be considered against the background of the predicted increase in cruise arrivals during the construction period. Cruise arrivals fluctuated between 2010 to 2014, with cruise tourism arrivals increasing by 16.9% from 1,375,872 in 2013 to 1,609,555 in 2014 (Caribbean Tourism Organisation). It is anticipated that by the end of 2015, cruise passenger arrivals will be approximately 1.7 million and beyond this, the Department of Tourism confirms that further increases are expected.

Impacts related to the construction phase have been categorized in the following areas:

i. Water clarity

Impact of construction on water clarity in George Town Harbour (GTH)

Turbidity and suspended sediment created by dredging, land reclamation and dredge spoil disposal activities will have significant effects on the clarity and quality of the water within GTH and its environs. The UNEP publication 'Dredging and Port Construction around Coral Reefs' (PIANC Report No. 108, 2010) outlines the significant challenges of dredging limestone and coral material, which tend to release colloidal materials into the water column creating milky white "clouds", which stay in suspension for prolonged periods and spread over large areas under the action of currents, wind and waves. The UNEP Report notes that these sediment clouds or plumes *"are of major concern due to the significant light reduction (turbidity) they cause in the marine environment, even in very low concentrations"* (p.13).

Background levels of suspended sediments in GTH were determined by the EIA consultants to be less than 2 mg/l. In general, corals are negatively impacted by exposure to suspended sediment concentrations of 10-20mg/l. Whilst the corals in GTH do experience higher levels of natural turbidity during storm events, the duration of this turbidity is short (1-3 days) and the sediment in suspension is

typically sand (which falls out of suspension relatively quickly due to its coarse nature) and not silty fines, which result from dredging calcareous rock and which remain in suspension for longer durations.

While the precise dredging methodology has not yet been determined, the ES indicates that due to the small size of the operation a backhoe dredge is recommended for a project of this size, which is the slower of the two dredging methods and therefore potentially extends the duration of impacts. The EAB concurs with the findings of the EIA, that the impact of dredging on water quality in GTH represents a major issue in the construction phase of the project. RIAM Table 11.3 scores this as a **'Significant negative impact (-D)'**, which the ES confirms results in a slight improvement with mitigation (installation of turbidity barriers); however, the overall value of the impact remains a **'Significant negative impact (-D)'**.

Impact of reclamation discharges on water quality

The project includes a land reclamation area of 7.7 acres, which will be filled with dredged materials. The process of creating this area will result in further loading of suspended sediment in GTH. The size of the land reclamation area limits the retention time to allow settlement of fines, which means that excess water which must be discharged to the sea will include suspended sediments. The EAB concurs with the findings of the EIA, that the impact of reclamation discharges on water quality in GTH represents a major issue in the construction phase of the project. RIAM Table 11.3 scores this as a **'Significant negative impact (-D)'** which the ES confirms results in a slight improvement with mitigation (construction of berms to contain run off); however, the overall value of the impact remains a **'Significant negative Impact (-D)'**.

Impact of dredge material disposal on water clarity.

Modelling for discharge of excess dredge material from a split-hull hopper barge indicates that levels of suspended sediments between 1 and 10 mg/l concentration will extend to the shore for disposal points at 1, 2 and 3km offshore, as shown in Figure 11.17 of the ES.

The EAB concurs with the findings of the EIA, that the impact of dredge material disposal on water clarity in GTH represents a major issue in the construction phase of the project. RIAM Table 11.3 scores this as a **'Significant negative impact (-D)'** which following mitigation (measures involving manipulating the distance of the discharge point from shore) reduces the impact from 'Significant Negative Impact' (-D), to a **'Moderate Negative Impact' (-C).**

Given the significance of impacts on water clarity associated with these activities, it is essential that all recommended mitigation measures be implemented, should CIG approve this project.

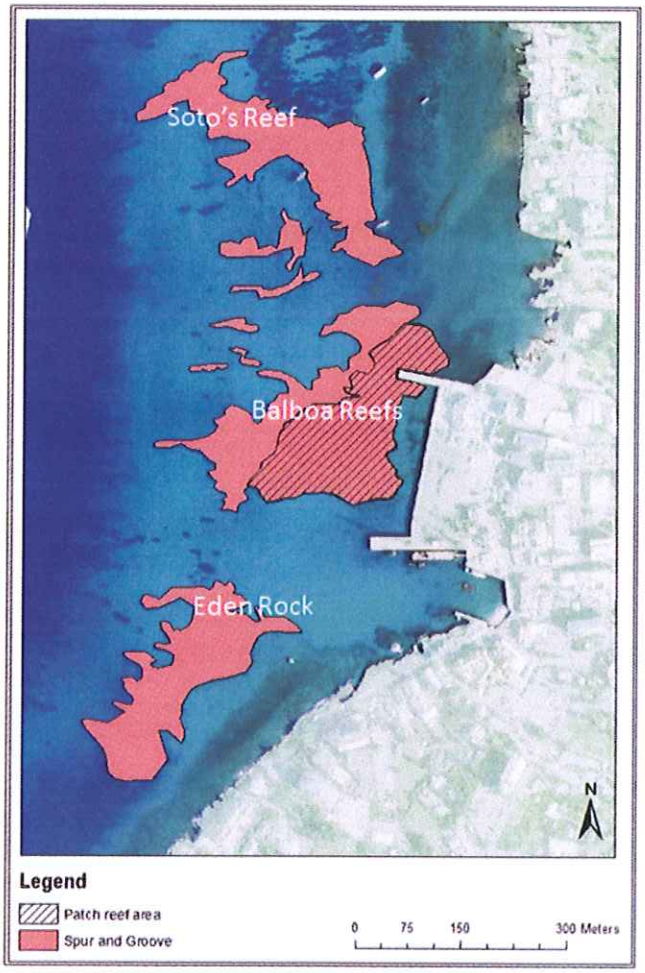
ii. Effects on coral reefs & marine resources

The EAB supports the results of the impact assessment reported in the marine ecology chapter of the ES and supporting appendices; the review outlined below does not attempt to capture all of the impacts identified in the ES, but focuses upon those impacts judged by the EAB to be most significant.

As acknowledged in the ES, the project site is located within the Seven Mile Beach Marine Park and contains coral reef habitat and marine resources which are of significant ecological and economic value. Of the coral species identified within the dredging footprint, one species – *Acropora cervicornis (staghorn coral)* – is listed as being Critically Endangered on the International Union for the Conservation of Nature (IUCN) Red List. A further Critically Endangered species – *Acropora palmata* (elkhorn coral) – occurs within the area adjacent to the dredging footprint, which will experience 'lethal' and 'sub-lethal' sedimentation/turbidity levels (as defined in the ES, p.237).

The ToR required that the assessment of impacts on marine ecology follow the IFC Performance Standard 6 (PS6) 'Biodiversity Conservation and Sustainable Management of Living Natural Resources'. It also provided that the assessment take into account national legislation, policy and plans, including: the National Biodiversity Action Plan, 2009; the National Conservation Law, 2013; the Cayman Islands Constitution Order, 2009; Schedule 2 Part 1 Bill of Rights, Freedoms and Responsibilities, para 18 – Protection of the Environment; and, the Environment Charter. Compliance with PS6 is intended to address compliance with national laws, regulations and permits that pertain to environmental issues whilst also meeting international industry best practice.

It is predicted that the dredging required as part of this project will result in the permanent, irreversible removal of approximately 15 acres of coral reef habitat. For clarity, 'coral reef habitat' comprises different components which include live coral, bare coral substrate and rubble/sand/hardpan. In addition to live coral cover, old dead coral or bare substrate is frequently overgrown by crustose coralline algae (CCA or reef cement) which has intrinsic functional value and is essential to ongoing coral recruitment. It is a flawed assumption that healthy reefs are comprised of 100 per cent live coral tissue. On average, reefs across the Caribbean region are comprised of less than 10% live hard (*Scleractinian sp.*) coral; Grand Cayman's reefs have been assessed using various methods as having an average live hard coral cover of 25% to 30%. However, it should be borne in mind that "percentage live hard coral cover" is an indicator of the overall health of the reef and this metric should not be taken to mean that only 25%-30% of the reef is alive. The EIA results indicate that the reef habitats in GTH showed live hard coral cover between 10% and 30%. See Figure below.



Reef Name	Surface Area (ha)	Surface Area (acres)
Soto's Reef (section)	3.5	8.7
Balboa Reefs(Spur and Groove)	2.9	7.2
Balboa Reefs(Patch reefs)	3.2	7.9
Eden Rock	3.0	7.4
Total Reef Area	**12.6**	**31.2**

Reef Type		
Spur and Groove	**(ha)**	**(acres)**
Total spur and groove surface area	**9.4**	**23.2**
Complex topography (gullies, tunnels)		
High relief spurs	2-7 m	
Coral cover variable	14-30 %	
• Hard coral species	26	
• Species threatened under ESA	6	

Mixed Patch Reef	**(ha)**	**(acres)**
Total mixed patch reef surface area	**3.2**	**7.9**
Patch reefs , hard pan substrate, sand		
Mixture of low relief patches	1-2 m	
Discontinuous coral cover	~10-14 %	

Figure extracted from Appendix J1 of ES (Figure 3.1 Description of the three reef areas surveyed in GTH. Included are surface area estimations, description of reef type, and coral cover)

The marine habitat in the project footprint is comprised of approximately 7-8 acres of topographically complex reef spurs and approximately 7-8 acres of low relief patch reefs scattered across a sandy and hard pan reef flat. The high relief of the "spur and groove" formations converge into a network of grottos and tunnels that form a complex habitat supporting a diverse assemblage of hard and soft corals, sponges and fish. Closer to shore, the patch reefs and the reef flat serve as a habitat, nursery and foraging grounds for an equally diverse population of reef dwellers. These zones are integral components of the coral reef ecosystem, each playing a role in the life cycle of reef fauna, and should be treated as a whole.

Direct impacts arising from construction, in particular dredging, will include loss of habitat complexity and ecosystem functions provided by the habitat. Habitat loss and reduced ecological functionality are generally associated with drastic declines in overall abundance and diversity of marine organisms, including fish. Additionally, the ecosystem degradation and loss of biodiversity arising from the removal of coral reef habitat compromises the ability of the system to continue supporting ecosystem related

goods and services for present and future generations, including fisheries productivity and non-consumptive uses such as tourism and recreation.

RIAM Table 16.5 identifies this destruction of coral reef habitat as being in the highest tier of negative impacts – a **Major negative change/impact (-E)** and even with mitigation (a proposed coral relocation programme) this impact is still classified as being a **Significant negative impact (-D)** after mitigation measures have been implemented.

The EAB concurs with the findings of the EIA that a coral relocation programme **will not achieve "no net loss"** of the resource and success is not guaranteed. Further it is an expensive undertaking with many variables to be considered, for example, the three-dimensional nature of much of the coral reef within the dredging footprint (spur and groove formation, with some spurs reaching a height of 10-13 ft/3-4m) is one such variable which presents serious challenges. Identifying an appropriate recipient site is another variable which is essential to the success of any coral relocation plan. Transplanting a section of a reef from GTH to a recipient site (assuming a suitable site can be identified) will not replace the functionality of the existing habitat, which takes a long time to establish. All of these factors make it is difficult to predict the success of a coral relocation programme in the long term.

If proceeding with the project, CIG will need to factor in the likely costs of devising and implementing a relocation programme for the coral reef habitat currently located within the dredging footprint. Order of magnitude costs provided in the ES, range from CI$20 to CI$140 per square foot (approximately US$250 to US$1,800 per square metre). If this estimate was applied, for instance, to 10 acres of coral habitat then costs would range from approximately US$10M to US$73M.

Aside from the direct impacts resulting from the dredging of reef habitat, the NTS indicates that the indirect impacts will affect an additional 15-20 acres of coral reefs and associated marine habitats located within approximately 650 ft (220m) either side of the project footprint. These indirect impacts result primarily from elevated turbidity and sedimentation levels particularly during dredging, land reclamation works and pier construction. Specifically, the ES indicates that elevated levels of sedimentation and turbidity is likely to result in increased potential for, amongst other impacts:

i. bleaching and coral mortality;
ii. reduced coral recruitment, and
iii. susceptibility to disease.

The ES confirms that within the zones of lethal and sub-lethal sedimentation the excessive turbidity and sedimentation will represent a major stress on coral systems which can impact negatively on the long terms resilience of the system. Of great concern to the EAB is the vulnerability of the reefs in GTH (and all of Cayman's reefs and reefs globally) as a result of immediate threats from anthropogenic (man-made) stressors, including coastal development, dredging, run-off, over-fishing and climate change. These reef systems therefore have limited capacity to withstand additional significant stress arising from the project, which may cause the entire GTH reef system to rapidly deteriorate resulting in high levels of

mortality of coral and other marine species and a resultant phase shift from coral dominated to algal dominated reefs (an ecological 'tipping point').

RIAM Table 16.5 indicates that the deployment of silt barriers, air screens, berms and bunds reduces the impact of turbidity from being a **Significant negative impact (-D)** to a **Moderate negative impact (-C)**. Whilst this represents a marginal improvement, it by no means provides full mitigation against coral smothering and mortality. Furthermore, the effectiveness of silt screens is dependent upon a number of factors, including the type of screens used, method of deployment, weather conditions (wind speed, direction and sea state) and the characteristics of the sediment (e.g. fines) being contained.

Adaptive management techniques (e.g. suspending dredging operations if turbidity reaches a pre-determined threshold) have also been recommended to mitigate the effects of turbidity and sedimentation of reefs adjacent to the dredge area. The EAB has significant concerns regarding the utility of this measure given the significant burden imposed on the contractor to monitor in 'real time' the sedimentation and turbidity levels at these locations, as well as the significant implications to the project cost and timescale for completion arising from works being stopped when thresholds are exceeded. Additionally, the ES points out that even if sub-lethal sedimentation and turbidity thresholds are maintained during dredging it is the overall duration of dredging activities (and therefore the length of time that corals are exposed to sediment stress) that will influence the amount and extent of dredging related mortality of coral and other fauna.

The effects of deep water disposal of dredge material upon deep water marine flora and fauna has not been fully assessed, this is likely partly due to uncertainties surrounding the dredging methodology, composition of dredged material, disposal site location and methodology. This therefore may represent an area requiring further investigation if a decision to proceed with the project is reached.

The comments in this section also need to be considered against the requirements outlined in the IFC Performance Standard 6 (PS6). For the purposes of implementation of this standard, habitats are categorised as modified, natural and critical. PS6 requires that a biodiversity offset should be designed and implemented to achieve measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity; however, a net gain is only required in critical habitats.

The EAB judges that the affected marine environment within the project site is classified as natural habitat i.e. areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition. PS6 specifies that a project proponent will not significantly convert or degrade natural habitats unless all of the other following are demonstrated:

- no other viable alternatives within the region exist for development of the project on modified habitat;

- consultation has established the views of stakeholders including Affected Communities, with respect to the extent of conversion and degradation; and
- any conversion or degradation is mitigated according to the mitigation hierarchy.

In areas of natural habitat, PS6 prescribes that mitigation measures are required to be designed to achieve no net loss of biodiversity where feasible. One could propose that the project footprint has the characteristics of a 'critical habitat' due to the presence of Critically Endangered IUCN Listed species (as outlined earlier). Where a site is identified as being a critical habitat, mitigation strategies are required to achieve 'net gains' of those biodiversity values for which the habitat was designated. However, the EAB has concluded that the project site does not meet all of the requirements of the critical habitat designation and so has opted for the lower designation of 'natural habitat'.

iii. Heritage assets

The proposed project will result in the loss of the Balboa in its current location. IFC Performance Standard 8 "Cultural Heritage' requires that where a project proponent (CIG) encounters tangible cultural heritage that is replicable i.e. an asset that can be moved to another location, the proponent should seek to restore the functionality of the cultural heritage in a different location, including the ecosystem processes needed to support it.

The ES confirms that the feasibility of the relocation needs to be informed by in-depth structural data on the condition and integrity of the Balboa. Furthermore, that relocation would involve moving the structure in large elements to preserve the wreck and the marine life it supports (p. 272, ES). Should the project proceed, the EAB strongly recommends that this work is undertaken in order to satisfy the requirements of Performance Standard 8. The cost implications of the data collection and the relocation should be included in the overall project costs.

The EAB concurs with the findings of the EIA, that the impact to the Balboa represents a significant issue in the construction phase of the project. RIAM Table 17.5 scores this as a **'Significant negative impact (-D)'** which following mitigation (relocation of the Balboa, with preservation of its structural integrity and the coral and other marine life it supports) remains a **'Significant Negative Impact' (-D).**

iv. Socio-economic effects

Loss of environmental goods and services

The ES includes a Preliminary Economic Valuation of Ecosystem Goods and Services provided by GTH reefs (Appendix J2), which establishes that the marine resources in GTH have a significant economic value. This value was estimated by assessing the ecosystem goods and services, including cultural services such as tourism and recreation, regulating services such as shoreline protection, supporting services such as primary production and provisioning services (e.g. fisheries). The estimated total economic value of these goods and services was in the order of CI$19-22M per year, with this value

being dominated by tourism and recreation, in particular watersport activities. N.B. The estimate is based upon a combination of direct data collection and literature derived values, and is therefore subject to some uncertainty due to the assumptions required to develop the estimate.

Dredging and construction will result in the permanent loss of the goods and services provided by the reefs within the dredging footprint (and the likely loss of goods and services provided by adjacent reefs due to indirect impacts) with an estimated economic loss in the order of CI$16-27M over the anticipated 2.5 - 3 year period of construction. **The EAB therefore strongly recommends that the Outline Business Case is updated to reflect those economic losses which are attributable to the loss of environmental resources and accompanying goods and services.**

Micro & Macro Economic Impacts

The ES documents those positive micro and macro-economic impacts which are assumed will occur if the project is realized, based upon the finding of the Outline Business Case. The ES does not identify any significant positive socio-economic impacts during the construction phase, above and beyond what is contained in the OBC. RIAM Table 20.8 categorises the creation of jobs in the construction phase as being a **'Significant Positive Impact (+D)'.**

Tendering Operation - Surveys undertaken as part of the socio-economic assessment indicate that Caribbean Marine Services (CMS) – the tender operators – will cease all operations at the start of construction. CIG will therefore need to identify a replacement tender service for cruise ships during the construction period. Aside from this significant consideration, RIAM Table 20.8 identifies the loss of tender services as being a **'Major Negative Impact (-E)'**) associated with the loss of livelihoods of 40 tender operators (captain, line-men) and supporting services such as mechanics. Consideration will need to be given to the implementation of recommended mitigation measures (which include compensation for loss of income and revenues, skills training & alternative livelihood opportunities) in an attempt to reduce the negative impact to this sector in line with the predicted reduction in the level of impact to **Significant negative -D.**

Watersports/Recreational Businesses - Due to the negative environmental impacts of the project identified in the ES during construction and the physical presence of dredging and construction equipment in GTH area, the impact to watersports businesses which rely upon GTH for their livelihoods/income has been assessed as **'Significant Negative (-D)'** and remains significantly negative even after the implementation of recommended measures (which includes compensation for loss of income and revenues, skills training & alternative livelihood opportunities). These impacts include the dislocation of businesses within and immediately adjacent to GTH and the associated loss of jobs.

Retail & Restaurants – The cumulative effects of construction-related impacts are predicted to have a **'Significant Negative (-D)'** effect on retail in the GTH area and are assessed as having knock-on negative implications for the wider economy (p. 346). Even with recommended mitigation measures

(implementation of measures to attract visitors downtown to minimize loss of patronage), these impacts remain categorised as **significantly negative (-D)**.

v. Traffic & transport

During the construction phase there will be an increase in heavy vehicles on Harbour Drive and around George Town Central Business District. The ES identifies impacts of construction traffic as being a **'Moderate Negative Change/Impact (-C)'**, which through mitigation (traffic management plan) may be reduced to a **'Negative Change/Impact (-B)'**. Other impacts identified in the ES include the effects of these vehicles (wear and tear on existing roadways) and delays and intermittent closures of Harbour Drive and other roads.

vi. Amenity & visual impact

As previously indicated, dredging and construction for the proposed project will take place in close proximity to the point of disembarkation for cruise passengers. The visual and amenity impacts associated with the works are categorized in the RIAM Table 20.8 as being a **'Moderate Negative (-C)'**, with mitigation measures including information sharing with stakeholders and the general public regarding the negative visual and amenity (noise, vibration, dust, ongoing poor water clarity etc.) impacts during construction. Given that the construction works will take up to 3 years to complete, the EAB believes that the potential negative economic impact of the construction activity on both cruise and stayover visitors should not be underestimated.

B. OPERATION

i. Seven Mile Beach

We note the conclusions in the ES that no large scale changes to the prevailing sediment transport patterns will arise as a result of the project. The EAB is satisfied that the results of the sediment transport modelling confirm/verify previously understood mechanisms for sediment transport regimes between George Town Harbour and Seven Mile Beach (SMB).

ii. Water Clarity

Sediment Resuspension

The ES highlights that water quality in GTH and its environs will be affected during operation of the cruise berthing facility due to resuspension of sediment from cruise ship propellers and an increase in boat traffic. The ES acknowledges that there is considerable uncertainty in the modelling results including the severity, spatial extent and duration of the resulting turbidity plumes. This notwithstanding, the EAB is concerned that resuspension of sediments from the dredged area will be a

constant source of turbidity for GTH and a source of chronic sedimentation for ecologically and economically important reefs in the area.

Proposed mitigative action includes vacuuming of the dredged seabed to remove fines (after primary dredging), installation of seabed stabilization or protection in critical areas to reduce or eliminate the effects of propeller-induced resuspension, the utilization of tug boats to position vessels and the implementation of operational controls, including limiting vessel approach speed and power application during berthing and de-berthing. The first three of the measures introduce additional cost implications for the project which have thus far not been factored in to the overall project cost.

Sediment Deposition & Maintenance Dredging

Whilst significant sediment infilling of the dredge basin is not expected under non-hurricane conditions, during storms and hurricanes sedimentation will likely occur with the requirement for maintenance dredging in order to restore the design depths of the basin. Post hurricane Ivan, the DoE observed significant sediment deposition in the harbour area. This did not a pose a problem for the continuation of cruise operations given the use of tenders. However, should this project be approved, the CIG needs to be mindful of this impact for cruise operations following hurricane events and the environmental and cost implications of the requirement for such dredging and timely mobilisation of the equipment.

Mitigative action proposed in the ES includes over-dredging of the port basin to accommodate sedimentation during a severe hurricane. This has implications for project costs and disposal of surplus dredge material.

iii. Effects on coral reefs & marine resources

The negative effects of sediment and turbidity described in the construction phase, also occur in the operational phase of the project due to the requirement for maintenance dredging and resuspension of sediments caused by repeated cruise ship propeller activity during berthing and de-berthing. RIAM Table 16.5 categorises the continued degradation of habitat and diminished ecosystem functionality as being a **Moderate Negative Change/Impact (-C)** with no measures proposed to mitigate these chronic impacts.

iv. Climate Change & Extreme Weather Events

RIAM Table 11.3 indicates that as a result of the project, the impacts from extreme weather events and climate change will result in a **'Moderate Negative Impact' (-C)** and that this impact cannot be mitigated. However, the ES chapter indicates that the project will not increase storm surge in GTH or flooding along the shoreline or in George Town (p.114-115). This conflicting information requires clarification as this has been highlighted by the public as an important area of concern.

v. Traffic & Transport

The ES identifies the need for the implementation of a number of mitigation measures should the project proceed, including:

i) Implementation of the NRA's List of Priority Road Network Improvements
ii) Implementation of the George Town Revitalization Plan
iii) Implementation of a number of pedestrian priority improvements along Harbour Drive.

All of these have potentially significant cost implications for the project, which need to be factored in at the decision-making stage.

vi. Socio-Economic Impacts

Macro & Micro Economic impacts

Based on the information provided in the OBC these are expected to be in the order of US$245M and 999 Full Time Equivalent man-years by the year 2036. This assumes a hypothetical year-on-year 1% growth in annual visitor volume. In terms of micro-economic benefit, the ES identifies that a larger numbers of cruise visitors could increase sales and revenues in the George Town business district. RIAM Table 20.8 categorises these as being **'Significant Positive impacts (+D)'**.

Tender & Watersports Operators - Impacts identified under the construction phase for tender operators, dive and watersports excursion business that use GTH will continue during the operation phase e.g. the continued decline of businesses due to the long-term impact associated with the loss of coral reefs and ecosystems in the harbour (P.348, ES). RIAM Table 20.8 categorises these as being **'Significant Negative impacts (-D)'** for watersports operators and a **'Major Negative Impact (-E)'** for tender operators. With mitigation, both are assessed as reducing to an overall **'Moderate Negative Impact (-C)'**. However, the mitigation measures required to realise this reduction in impact are themselves significant and include assisting business operators in recouping losses through some means of compensation and/or alternative business opportunities. It is also contingent upon dive shops using alternative sites and increased visitor arrivals and longer time on shore for longer excursions, as well as successful relocation of the Balboa to a location with no restricted access.

Carrying Capacity of Natural Resources & Attractions

The project will result in increased pressure on other natural resources outside of GTH due to restricted or prohibited access during construction, as well as larger number of visitors during operations. The ES identifies the need to undertake carrying capacity studies of those natural attractions which will function as alternative sites or locations for watersports and recreational activities, resulting from the predicted dislocation of businesses from GTH. This applies both during the construction and operation phase. This is identified in RIAM Table 20.8 as being a **'Significant Negative Impact (-D)'**.

vii. Impact on Character of GTH

The loss of the panoramic views and vistas of GTH from shore and from the sea looking landward is one of the most subjective aspects of the EIA, yet it has a significant, permanent, irreversible effect on the character and appearance of GTH and Hog Sty Bay. Additionally, changes in the appearance of the uniquely clear and visually appealing waters which are part of the defining character of George Town Harbour, and which set it apart from most other working harbours in the Caribbean, will have a lasting negative impact. These impacts are difficult to quantify and truly understand until the changes occur. Furthermore, the extent to which these attributes of GTH form part of the destination appeal to cruise visitors has also not been quantified and may also be influenced by the 7.7 acres of landside development.

viii. Cruise Operations

Island-based resources

Consideration must be given to potential cruise ship demand for island-based resources e.g. potable water and solid waste disposal. The ES recommends that consideration is given to providing a potable water line to each berth to allow cruise ships to take on water (p.316). However, the ES does not make it clear whether these will be actual requirements of the cruise ships but this issue needs to be considered by relevant Government authorities given the cost and resource implications for the Country.

Tendering vs. berthing

The ES (p.310) considers two scenarios for disembarkation rates, one with four Carnival Magic-sized vessels at berth and a second, with two Carnival Magic-sized vessels and two Oasis class-sized vessels at berth. The ES concludes that for both of these scenarios, the disembarkation rates with a cruise berthing facility is within the range of passenger disembarkation rates achieved with tendering i.e. cruise berthing will not result in a quicker rate of disembarkation. Furthermore, the ES notes that whilst a cruise berthing facility will allow passengers to disembark onto land directly from a ship, it will increase the travel distance to the terminal and George Town i.e. the walk from a cruise ship at berth to Harbour Drive will range from approximately 1,200-1,800 feet, as compared to approximately 450 feet with the existing tender operation. Finally, other issues to consider include the lag time which can result from the berthing of cruise ships.

5. Conclusions & Recommendations

- There is a legal requirement to consider the findings of the EIA in the decision-making process, including the results of the public consultation.

- The absence of the geotechnical and geophysical data is a significant uncertainty in the project, which has both environmental and cost implications if the project moves forward.

- Before proceeding with the decision-making process, the EAB recommends that CIG makes a decision on the mitigation measures that will be implemented as part of this project, should it proceed. It is critical that costs for each agreed implementation measure are obtained in order to arrive at an overall cost for the project and to provide a clear indication of the impacts of the project with and without mitigation, and any residual impacts.

- If the project advances, it must do so with the infrastructural support of the NRA's "List of Priority Road Network Improvements" and implementation of aspects of the George Town Revitalisation Plan which were shown to substantially mitigate key issues associated with the growth in traffic expected regardless of whether or not the cruise berthing facility is implemented.

- The impacts of dredging, reclamation and disposal on water quality and clarity within GTH represent major impacts for the project. The EAB is also concerned that the resuspension of sediments from the dredged area due to cruise ship propellers and an increase in boat traffic, will be a constant source of turbidity for GTH and a source of chronic sedimentation for ecologically and economically important reefs in the area.

- Water clarity issues will have knock-on effects in terms of socio-economic impacts i.e. impacts to water sports businesses within the GTH area, which rely upon the existing excellent water clarity, as well as ecological impacts on marine resources due to additional stress on corals and other marine organisms sensitive to light availability and the presence of sediment in the water column.

- It is predicted that the dredging will result in the permanent, irreversible removal of approximately 15 acres of coral reef habitat and the impacts are compounded by the findings that a coral relocation programme will not achieve "no net loss" of the resource, is expensive and success is not guaranteed. Indirect impacts, arising primarily from elevated turbidity and sedimentation levels, will affect an additional 15-20 acres of coral reefs and associated marine habitats located within approximately 650 ft (220m) either side of the project footprint.

- The existing vulnerability of the reefs in GTH means that they have limited capacity to withstand additional significant stress arising from the project. The ES indicates that there will be

continued habitat degradation and diminished ecosystem functionality due to ongoing turbidity and sedimentation impacts during the operation phase of the project. The EAB is concerned that if the project proceeds, these chronic impacts may cause the entire GTH reef system to rapidly deteriorate resulting in high levels of mortality of coral and other marine species and a resultant phase shift from coral dominated to algal dominated reefs (an ecological 'tipping point').

- Loss of coral reef habitat in GTH will result in the loss of the ecosystem goods and services provided by these marine resources. A Preliminary Economic Evaluation estimates the value of these goods and services in the order of CI$19-22M per year, with this value being dominated by tourism and recreation, particularly in GTH. The EAB therefore strongly recommends that the Outline Business Case is updated to reflect those economic losses which are attributable to the loss of environmental resources and accompanying goods and services.

- The successful relocation of the Balboa cannot be guaranteed. The ES confirms that the feasibility of the relocation needs to be informed by in-depth structural data on the condition and integrity of the Balboa.

- The Outline Business Case indicates that positive macro and micro economic benefits will be derived from the project – 999 FTE man-years and in the order of US$245M by the year 2036. However, the ES identifies a number of negative micro and macro economic impacts arising from the project – loss of tender operator jobs, disruption to and dislocation of watersports businesses which depend upon GTH reefs and effects on retail and restaurants in the GTH due to loss of patronage during construction.

- The ES identifies the need to undertake carrying capacity studies of those natural attractions which will function as alternative sites or locations for watersports and recreational activities, resulting from the predicted dislocation of businesses from GTH.

- Dredging and construction for the proposed project will take place in close proximity to the point of disembarkation for cruise passengers. Given that the construction works will take up to 3 years to complete, the EAB believes that the potential negative economic effect of the visual amenity impacts of the construction activity (on both cruise and stayover visitors) should not be underestimated.

- The impacts from extreme weather events and climate change have been assessed in the EIA as being moderately negative, with no potential for mitigation. However, the ES chapter indicates that the project will not increase storm surge in GTH or flooding along the shoreline or in George Town. This conflicting information requires clarification as this has been highlighted by the public as an important area of concern.

Having reviewed the ES and Technical Appendices, the EAB concludes that there are a number of major negative impacts associated with this project, both in the construction and operational phases. Furthermore, many of these impacts, even with the application of recommended mitigation measures, still result in significantly negative residual impacts, which in some instances are permanent and irreversible.

Order of magnitude economic values have been estimated for the loss of environmental goods and services derived from coral reef habitats within GTH, which will be directly and indirectly adversely impacted by the project. The Outline Business Case now needs to be updated to take into account these monetised impacts outlined in the ES. The Government will need to utilise this updated Business Case together with a full consideration of the remaining significant adverse impacts, for which no monetary value has been derived, in order to arrive at an informed decision regarding whether to proceed with this project.

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