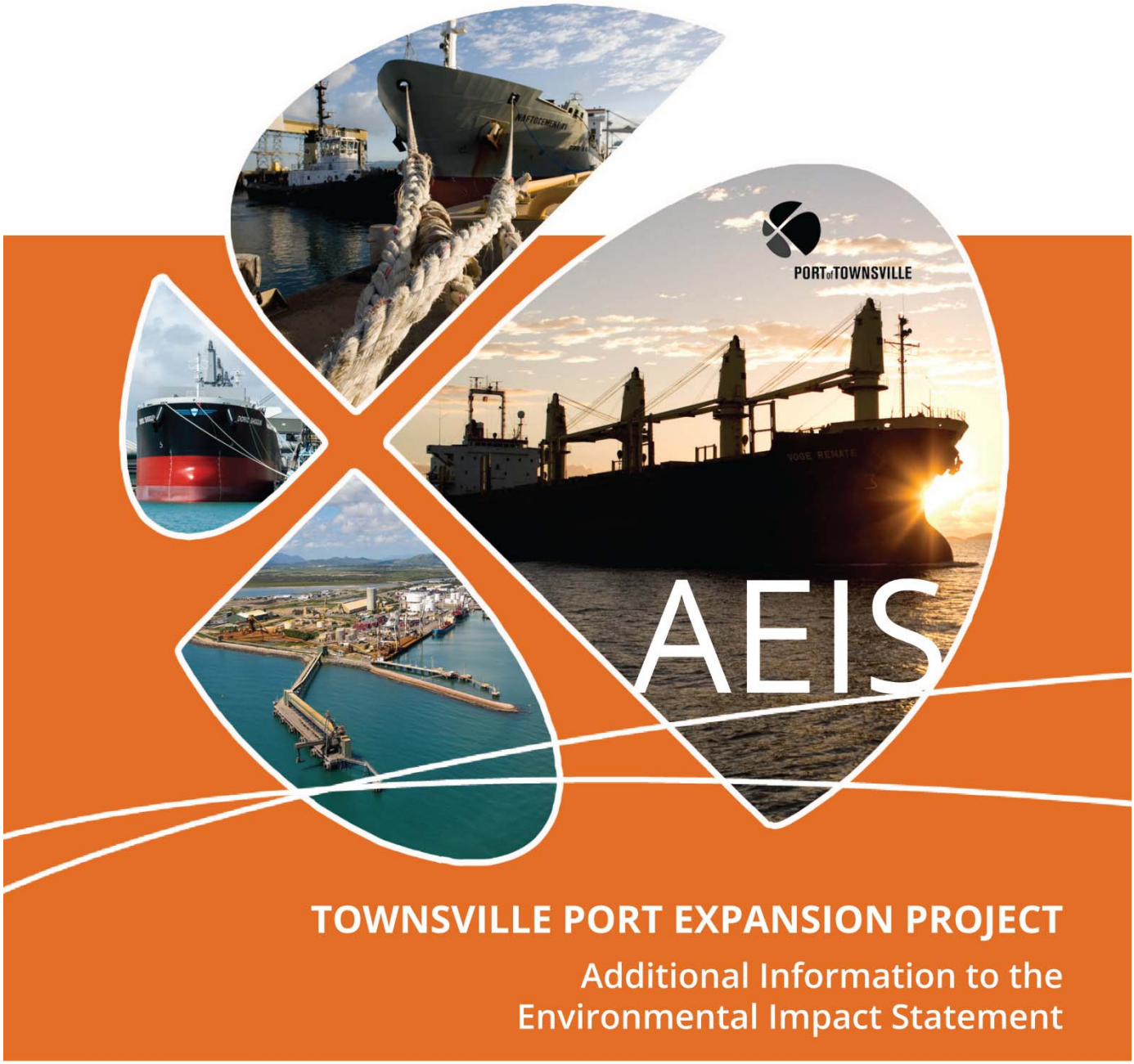

TOWNSVILLE PORT EXPANSION PROJECT

Additional Information to the Environmental Impact Statement

TOWNSVILLE PORT EXPANSION PROJECT

SECTION 7

Marine Sediment Quality

AECOM BMT WBM

7.0 Marine Sediment Quality

7.1 Introduction

Marine sediment quality of the Project area and surrounds are discussed in Chapter B.5 (Marine Sediment) of the Environmental Impact Statement (EIS). Maintenance dredging of port areas has been undertaken in Cleveland Bay for over 100 years in order to maintain navigable shipping channels, berths and vessel swing basins. Capital dredging works have also been required from time to time as a result of expansion to Port of Townsville (POTL) infrastructure. Therefore, marine sediments in Cleveland Bay, particularly in the vicinity of port infrastructure and the main shipping channel (i.e. the Port Expansion Project footprint) have a long history of regular disturbance from dredging activities.

However, as discussed in the Water Quality section (Section 6.0), while it is accepted that there is some level of anthropogenic sources of sediments in Cleveland Bay (dredging, port activities and other urban development), the general consensus is that the sediment in Cleveland Bay is predominantly derived from sediments deposited during the Holocene period (e.g. Larcombe and Ridd 1994, and Orpin 1999).

Catchment land use practices and discharges from anthropogenic coastal sources have at times resulted in elevated levels of nutrients and other contaminants in places, particularly in Ross River, Ross Creek and nearshore areas of Cleveland Bay. Coastal sediments throughout Cleveland Bay also have the potential for acid generation when exposed to the air because of their natural sulphur content (i.e. potential acid sulfate soils as discussed in Chapter B.5 of the EIS).

Marine sediments in the reclamation area, outer harbour, Platypus Channel and Sea Channel are broadly characterised by two strata, described by Golder (2008a) as follows:

> *The surface layer of recent (in a geological timescales sense) seabed sediments generally consisted of approximately 60 to 70% silts and clays with some sand zones (i.e. a mixture of soft silty clay to clayey silt, with loose sand, silty sand and clayey sand also present). Shell fragments and organic materials commonly occurred in this layer. The surface materials represented potential acid sulfate sediments and, also due to their soft and compressible nature, were considered unsuitable for use as reclamation fill or as the foundation support material for marine structures. This surface layer had a thickness of approximately 1 to 1.5m on the seabed in the outer harbour and reclamation areas. In the Platypus and Sea channels this surface layer was usually thinner, in the order of 0.5 to 1.0m.*
>
> *Beneath the surface layer was a subsurface layer of harder sandy clays and sands (i.e. a mixture of stiff to hard clays and sandy clays, with dense clayey sands and sands also present).*

A number of submissions were received in response to the EIS which are relevant to marine sediment quality. Key issues raised from the submission process include:

- inadequate assessment of mercury and cyanide in dredged material
- inclusion of diuron and furan data in assessment
- adequacy of sediment quality data
- assessment of particulate nutrients.

Responses to these key issues raised in submissions are provided in the following sections.

7.2 Response to Submissions

7.2.1 Inadequate assessment of mercury and cyanide in dredged material

Seven submissions raised matters on inadequate assessment of mercury and cyanide in dredged material which could be released into the water column as a result of capital dredging. Specifically, the submissions questioned if high concentrations of mercury and cyanide are located within a deposition layer (approximate depth of 2 m), believed to have originated from mining practices in the early 1900s in the Charters Towers area. Submissions suggest that mercury and cyanide from gold mining practices may have been transported down the Burdekin River and into Cleveland Bay.

A range of studies have analysed mercury in sediments at various sediment depths in Cleveland Bay and none of these studies have found mercury levels in elevated concentrations. Golder (2008b) found that mercury concentrations were below laboratory detection limits (and screening levels) in all samples in the outer harbour. URS (2008) measured trace metal/metalloid concentrations at Berth 11, adjacent to Townsville outer harbour, and found that all trace metals/metalloids (including mercury) were below screening levels.

Based on historical sampling bioavailability and ecotoxicity testing of sediment by Hydrobiology (2003a), found that mercury concentrations were below screening levels in all samples. Most recently, POTL has only analysed sediment samples for nine key metal/metalloid contaminants of concern (antimony, arsenic, cadmium, chromium, copper, nickel, lead, silver and zinc) because all others had been found consistently below the limits of detection. Furthermore, mercury is not considered a contaminant of concern for the Port of Townsville (GHD, 2008) and as a result is not part of the routine monitoring program.

URS (2010) reported that there are no known natural resources of mercury (Hg) in the Port of Townsville catchment area. Nevertheless, URS (2010) analysed for mercury in the analysis of Berth 12 dredge area sediments and found that mercury was in low concentrations and below NAGD screening levels for all samples.

In regards to cyanide, it is not typically tested as part of sediment quality studies due to its limited presence in environment. Therefore, it is considered highly unlikely that cyanide would be present in concentrations of concern in marine sediments in Cleveland Bay.

Notwithstanding the above, the potential impacts from mercury and cyanide will be reduced as the revised Project design now includes placement of all dredge material in reclamation instead of the marine DMPA.

Based on the above, it is considered highly unlikely that mercury and/or cyanide would present a risk from disturbance of dredge material as part of the PEP. Further testing of marine sediments prior to dredging, as part of sediment Sampling and Analysis Plan, provides a further safeguard to ensure this outcome.

7.2.2 Inclusion of dioxins and furans data in assessment

Two submissions raised the lack of data for dioxins and furans in the marine sediment quality assessment. Specifically, the submission suggested that all data be presented and discussed, including the dioxin and furan data that is known to have been collected in early 2013.

Geochemical Assessments (2013) conducted sediment sampling and analysis on behalf of POTL for their maintenance dredging permit. On request from DEHP, this sampling also included testing for dioxins and furans.

As the EIS was submitted in late 2012, this data was not yet available for inclusion in the Marine Sediment chapter of the EIS. However, the Geochemical Assessments (2013) report is now available and the findings can be summarised as follows.

- Concentrations of dioxins/furans in sediment at the Port of Townsville decrease with distance from fluvial inputs. The concentration of dioxins/furans in a single core in Ross Creek suggests a historical source of these contaminants.
- Concentrations of dioxins/furans in sediment at the Port of Townsville (maximum 18.4 pg TEQ/g) are higher than those reported for other areas in Queensland, but well below background values for these contaminants in Port Jackson. The mean concentration of dioxins/furans in sediment within maintenance dredge areas within the Port of Townsville was 1.80 pg TEQ/g (maximum 3.06 pg TEQ/g).
- There is no widely accepted sediment quality guideline value for dioxins/furans in Australia. The mean concentration of dioxins/furans in all sediments collected in maintenance dredging areas at the Port of Townsville (1.80 pg TEQ/g medium bound) exceeded the Canadian Environmental Quality Guideline ISQG value (0.85 pg TEQ/g), but not PEL value (21.5 pg TEQ/g) for these compounds in sediment. Adjusting the reported concentrations of dioxins/furans in the sediment by an amount reported for blank concentrations would reduce mean concentrations of PCDD/Fs in maintenance dredge sediment to 1.30 pg TEQ/g.

Geochemical Assessments (2013) concluded by stating that the sediment quality assessment found that maintenance dredge areas are not enriched in dioxins/furans above ambient baseline levels and therefore sediment proposed for dredging in POTL's maintenance dredge areas is classified as acceptable for unconfined ocean disposal.

As dioxins/furans would be restricted to the upper layers of sediment deposited over the last few decades (i.e. maintenance dredging material), lower layers of consolidated sediment (capital dredging material) would be expected to contain lower levels of dioxin/furans than the upper layers discussed above.

7.2.3 Adequacy of sediment quality data

Five submissions raised the inadequacy of sediment quality data used in the assessment of marine sediment in the EIS. In particular, the submission raised that all sediments (to the full extent of dredge depths) had not been tested as per the National Assessment Guidelines for Dredging (NAGD) 2009, and the sediment quality assessment was based on limited historical data.

The EIS acknowledged that further testing of sediments would be required at a later stage as part of a detailed sediment Sampling and Analysis Plan required for a Sea Dumping Permit from the Commonwealth government. However, the revised project design now includes placement of all dredge material in reclamation, sediment testing (including a full sediment chemistry assessment) will still be undertaken to inform how the material will be managed in the reclamation.

7.2.4 Assessment of particulate nutrients

Five submissions raised the inadequacy of the assessment on particulate nutrients in the EIS. Specifically, the submissions stated particulate nutrients were not included in the sediment analysis.

In response to these submissions, the assessment of nutrients in sediment focused on dissolved nutrient species (e.g. ammonia and nitrate) due to the known toxic effects on aquatic biota, particulate nutrients (i.e. total nitrogen and total phosphorus) were also included in the assessment and discussed in the Marine Sediment chapter (Chapter B.5) and the Marine Water Quality chapter (Chapter B.4) of the EIS.

As part of the EIS, sediment samples were collected from sediments at six sites and analysed for particulate nutrient concentrations in porewater and elutriates. Of particular relevance are the relationships of the elutriate results to relevant water quality guideline values. This is because the elutriate tests attempt to measure resultant water column concentrations following some degree of dilution (dilution of 1:4).

The results presented in Chapter B.5 (Marine Sediment) of the EIS indicated that total nitrogen (TN) in elutriate samples (initial dilution of 1:4) from the six sites ranged from 0.3 mg/L to 2.35 mg/L, while total phosphorus (TP) ranged from 0.02 mg/L to 0.04 mg/L. These values are slightly elevated when compared to water quality guideline values (QWQG 2009), which are 0.2 mg/L for TN and 0.02 mg/L for TP. However, NAGD (2009) states that a dilution of 1:4 would greatly overestimate water quality impacts, given that, within an initial four-hour dilution period following dredging, dilutions in the order of a hundred times or more (and often much more) would normally be expected.

Therefore, made in the EIS in regard to dissolved nutrients, concentrations of particulate nutrients would likely be diluted sufficiently during dredging and that negligible impacts would be expected. Furthermore, the revised design now has all dredge material being placed in reclamation (i.e. no unconfined marine placement), further reducing the potential impacts to the marine environment.

7.3 Revised Environmental Impact Assessment

7.3.1 Legislation and policy

Since the initial release of the EIS, there have been important legislative changes at both the State and Commonwealth level. A new regulation under the *Great Barrier Reef Marine Park Regulations 1983* (Cth) was introduced on 2 June 2015 which sets out to prevent the placement of capital dredge material in the Marine Park. Specifically, the regulation prevents GBRMPA from granting permission for placement of capital dredge material in the Marine Park.

In addition, the *Sustainable Ports Development Act 2015* (Qld) prevents approval being granted for capital dredging areas that are in the Great Barrier Reef World Heritage Area but outside the Great Barrier Reef Marine Park unless it is for a priority port and in accordance with that port's Master Plan, or if the development is the subject of an EIS process started before the act came into effect. The Port of Townsville is a priority port under the Act and the PEP is the subject of an eligible EIS process.

The PEP design has been revised so that there is no longer a requirement for placement of dredge material at the DMPA, therefore negating the need for a Sea Dumping Permit under the *Environment Protection (Sea Dumping) Act 1981* and associated sediment sampling in accordance with the National Assessment Guidelines for Dredging (NAGD).However, a sediment Sampling and Analysis Plan will still be required prior to dredging and placement in reclamation.

7.3.2 Design refinement

The project design has been revised as described in Section 2.0 of the AEIS. This revision focusses on amendments to the extent of dredging and reclamation works. As a result of these changes, additional sediment quality data was collected in these areas (Appendix A1).

Furthermore, all dredge material will now be placed into reclamation, with unconfined marine placement in a marine DMPA no longer part of the project design.

7.3.3 Supporting studies

Supporting studies relevant to this section of the AEIS include Appendix A1 (Additional Field Studies Report), which includes additional sediment quality data collected in areas affected by the revised design.

7.3.4 Revised assessment

7.3.4.1 Impact assessment

Despite refinements to the project design (i.e. no marine placement), sediment quality data will still be collected prior to commencement of works as part of a Sampling and Analysis Plan. The impacts as summarised in Chapter B.5 (Marine Sediment) of the EIS generally remain relevant, except for those that relate to unconfined marine placement in the marine DMPA (as all dredge material will be placed into the extended reclamation).

7.3.4.2 Mitigation measures

Mitigation measures to reduce the impact on marine sediment quality are outlined in the updated Construction and Operational EMPs provided in Appendices B2 and B3 of the AEIS, and summarised in Table 7.1.

7.3.5 Summary

The following table summarises the revised impact assessment based on the design refinement, including a revised risk rating, any mitigation measures that are required, and a revised residual (mitigated) risk rating.

Table 7.1 Summary of Marine Sediment Quality Impacts and Mitigation

Element	Primary Impacting Process	Updated Risk Rating			Mitigation Measures	Mitigated Risk Rating
		Magnitude	Likelihood of impact	Risk Rating		
Disturbance and mobilisation of contaminated sediments during construction	Dredging in the outer harbour area	Moderate	Possible	Medium	Undertake further sediment testing prior to commencement of works. If contaminated hotspots are detected, material will be dredged only using a mechanical dredger and not a TSHD to reduce mobilisation of contaminants.	Low
	Dredging in Platypus and Sea channels	Moderate	Unlikely	Low	See above for Dredging in the outer harbour area.	Low
Placement of material in reclamation	Acid sulfate soil oxidation and release	Moderate	Possible	Medium	ASS management practices – refer to ASS report.	Low
	Dewatering of dredge material	Moderate	Possible	Medium	Monitor and manage dewatering, seepage or runoff waters if they occur (see DMP).	Low
Operational impacts to future marine sediment quality	Potential decline in sediment quality, in or adjacent to Project footprint, as a result of increased trade product handling and storage	Low	Possible	Low	Undertake risk based monitoring and/or regular sampling in accordance with NAGD.	Low

7.4 Conclusion

The refined design for the PEP is not expected to significantly impact upon marine sediment quality values on site or within the surrounding area and with the implementation of mitigation measures to manage impacts as described above and in the construction and operational EMPs, the overall impact to marine sediment quality is considered low.