FLANAGAN CONSULTING GROUP

DEVELOPMENT CONSULTANTS • MANAGERS • ENGINEERS • PLANNERS

PROJECT NO: 5002/02

# Townsville Ocean Terminal

# &

# Breakwater Cove

5002/02
R-KO0123- Rev 2
30 July 2008

***Potential Operational Dredging Impacts on Water Quality***

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## 1.0 INTRODUCTION

City Pacific are the proponent for the proposed Townsville Ocean Terminal and associated residential/commercial development. In November 2007, the EIS for the proposed development was released for public comment.

Responding submissions to the EIS were received from a number of government agencies, commercial organisations and clubs and private individuals.

The Department of Infrastructure and Planning have confirmed that operation of the TOT berth and swing basin will be the responsibility of the Townsville Port Authority (TPA). Operational dredging of the TOT berth and the swing basin will be incorporated as part of the TPA's routine Port operations. Approvals, dredging methodology, disposal of dredge spoil and monitoring program will be the responsibility of the TPA.

The TPA currently has two options for disposal of dredged material from Port operational dredging:

1. Reuse of dredge spoil as part of the PoT reclamation area
2. Off shore disposal

Both of these options may be available to the TPA for disposal of material dredged as part of operational dredging from the TOT Berth and Swing Basin

The additional dredging for the TOT Berth and extended swing basin may take up to two weeks and the dredge may impact on recreational and commercial traffic. It is expected that TPA would utilise their existing mitigation strategies to minimise the impacts.

Consequently this report documents the response to submissions regarding the potential impacts of Operational Dredging of the marina and access channel on water quality.

## 2.0 BACKGROUND

The submissions and concerns regarding potential operational dredging impacts on water quality aspects of the project are summarised in Table 1: Summary of Submissions Relevant to Operational Dredging.

*Table 1: Summary of Submissions Relevant to Operational Dredging*.

| Respondent | Summary of Concern/Issue | Refer Section |
|---|---|---|
| Department of Primary Industries and Fisheries (DPIF) | Insufficient assessment and documentation of methodology of disposal for material obtained from operational dredging of cruise ship terminal. If off-shore disposal or within Port reclamation area is not an option then a permanent land based dewatering site within development site or port and a location for dewatered material will be required. | 1.0 & 3.2 |
| | Detailed discussion and evaluation of options for disposal is required. | 3.2 |
| | The EIS should identify future management options, responsibilities and testing procedures for inclusion in dredge management plan. | 3.2, 4.0, 5.0 |
| | Performance indicators: CEMP on dredging needs refinement – will dredging cease if turbidity exceeds 10% of control sites (i.e. what action will be taken) | 4.0, 5.0 |
| Environmental Protection Agency (EPA) | Describe arrangements for long term (20 year) disposal of dredge material including details of proposed material placement areas. | 3.2, 4.0, 5.0 |
| | If land based disposal, provide assessment to demonstrate water quality will meet water quality objectives and therefore maintain receiving water environmental values. | 3.2, 4.0, 5.0 |
| | Provide details of long term management arrangements of the dredge material disposal site. | 3.2, 4.0, 5.0 |
| | The operational section of the EM plan objective to include compliance with the approved dredge management plan. | 4.0 |
| | The EM plan for water quality is amended to state that all water quality monitoring will be undertaken in accordance with EPA Water Quality Sampling Manual. | 5.0 |

| | | |
|---|---|---|
| Townsville Port Authority | The length of time for a cutter suction dredge would be in harbour dredging TOT berth pocket and swing basin should be provided and the risk to maritime traffic discussed. | 1.0 |
| | Management of operational dredge spoil has not been discussed or agreed with TPA. It would be useful to have a broad impact assessment of each option to identify potential show stoppers (e.g. high water content prohibiting landfill disposal to landfill). | 3.2 |
| | Approval process and timing implications for dredging and disposal of dredged material was not discussed. | 3.2 |
| | Water quality report should justify why dredged material should not be disposed to sea. | 3.2 |
| | It is unclear if contaminant levels are likely to meet NODGMD for ocean disposal. | 3.2 |
| | The Queensland Water Quality Guidelines 2006 have a defined process for developing accepted guidelines at a local level which the project water quality study did not follow. | 5.0 |
| | Water Quality monitoring program designed for general state of environment monitoring rather than specifically for pollutant control monitoring. | 5.0 |
| | Water quality monitoring program is poorly defined. | 5.0 |
| | Report does not indicate if harbour or Ross Creek waters will be impacted. | 3.2, 4.0, 5.0 |

# 3.0 OPTIONS FOR DISPOSAL OF OPERATIONAL DREDGE SPOIL

## 3.1 Dredging Volumes

Calculations in the EIS indicated that approximately 15,000 $m^3$ would require dredging annually to maintain required depth at the cruise ship terminal and the marina and marina access channel. It is estimated that 10,000 $m^3$ of the 15,000 $m^3$ operational dredging is associated with the TOT berth and the swing basin. Consequently 5,000 $m^3$ will be the responsibility of the Body Corporate of Breakwater Cove and the operator of the marina.

The PoT submission indicated the volume calculation for maintenance of the cruise ship terminal was under estimated based on their experience of sediment accumulation and operational dredging in the Port. Taking this into account, and for the purposes of assessing dredge disposal options, an increase of +50% has been included in the volumes of operational dredging required to ensure a conservative estimate. Consequently allowance has been made for annual dredging of 7,500 $m^3$ for the marina and access channel.

## 3.2 Disposal Options

Three options are available for the disposal of dredged material from the Access Channel and Marina:

1. Off shore disposal
2. On site disposal to marina sumps
3. On-site dewatering/drying facility and disposal to approved landfill reclamation facility

The three options and implications are discussed below:

1. Off shore disposal.

   Disposal adjacent to the Great Barrier Reef Marine Park is no longer viewed favourably by legislative authorities and the Commonwealth Government.

The prospects of obtaining an off shore disposal permit for disposal of dredged material for the annual disposal of 7,500 $m^3$ resulting from the operational dredging of the marina and access channel are considered to be low.

In order to obtain a permit for off-shore disposal the Breakwater Cove Body Corporate and the Marina Operator would need to give consideration to the following:

- The potential to adversely impact the Great Barrier Reef Marine Park
- Public opinion
- The complexities required in obtaining permit for approval of offshore disposal of dredged material from Department of Water, Heritage and Arts(DWHA) and existing legislative climate.

To obtain a permit the following would be required:

- Undertake sediment characterisation to meet National Ocean disposal guidelines (0.5 m interval sampling and broad analysis and leaching criteria including heavy metals, nutrients and organics);
- Detailed environmental assessment of options and basis for need
- Establish Technical advisory committee of all stakeholders (DEWHA, EPA, DPIF, TPA, GBRMPA)
- Undertake hydrodynamic and benthic modelling of proposed disposal site

The requirement of modelling, baseline data collection for one year and the approval process is likely to take an extended period and approval can not be guaranteed. This method of disposal cannot be relied on.

It is therefore necessary for the facility to ensure that it has the capacity to treat (if necessary) and dispose of the material generated from operational dredging of the marina and access channel.

2 On site Disposal to Marina Sumps

The proposed construction plan of Breakwater Cove allows for 90,000 $m^3$ excess sump capacity in the main marina and in canal 1, canal 2 and canal 3. The volume of sump capacity can be increased in the operational works and detailed design stages, if required. Dredge Spoil from the dredging of the marina and the outer entry area can be disposed to the sump as required. The sump will have a capacity to cater for the operational dredge spoil for over 12 years. During detailed design and the operational works phase it may be decided to expand the sump capacity to allow for a greater disposal capacity for operational dredge spoil.

3 On-site Dewatering/Drying Facility and disposal off site.

A dewatering facility for operational purposes is proposed to be established at the north-eastern end of the development, adjacent to the marina entrance (refer **Figure 1 and Figure 2**). This facility may not be needed for 12 years or more due to the sump capacity within Breakwater Cove. Dredged material placed in the facility will dewater via gravity and then subject to compliance testing, disposed to Stuart Landfill or an alternative reclamation facility/reuse. The disposal criteria for Stuart Landfill is presented in **Appendix A**. Based on site activities it is highly unlikely material (post dewatering and drying) would not be suitable for disposal to Stuart Landfill,. The following will need to be considered as part of the detailed design and operational works approval:

- The dewatering facility will need to be segregated so that drained water can be isolated from dredge spoil and tested prior to discharge to marine environment via a diffuse mechanism;
- Water quality will need to meet the water quality criteria, which will be agreed in consultation with the EPA;
- Fencing or an alternative barrier will need to be installed to provide a barrier to public access to the dewatering facility;
- Proposed dewatering pond has a proposed area of approximately 10,000 $m^2$. With an assumed height of 2m above water level this equates to

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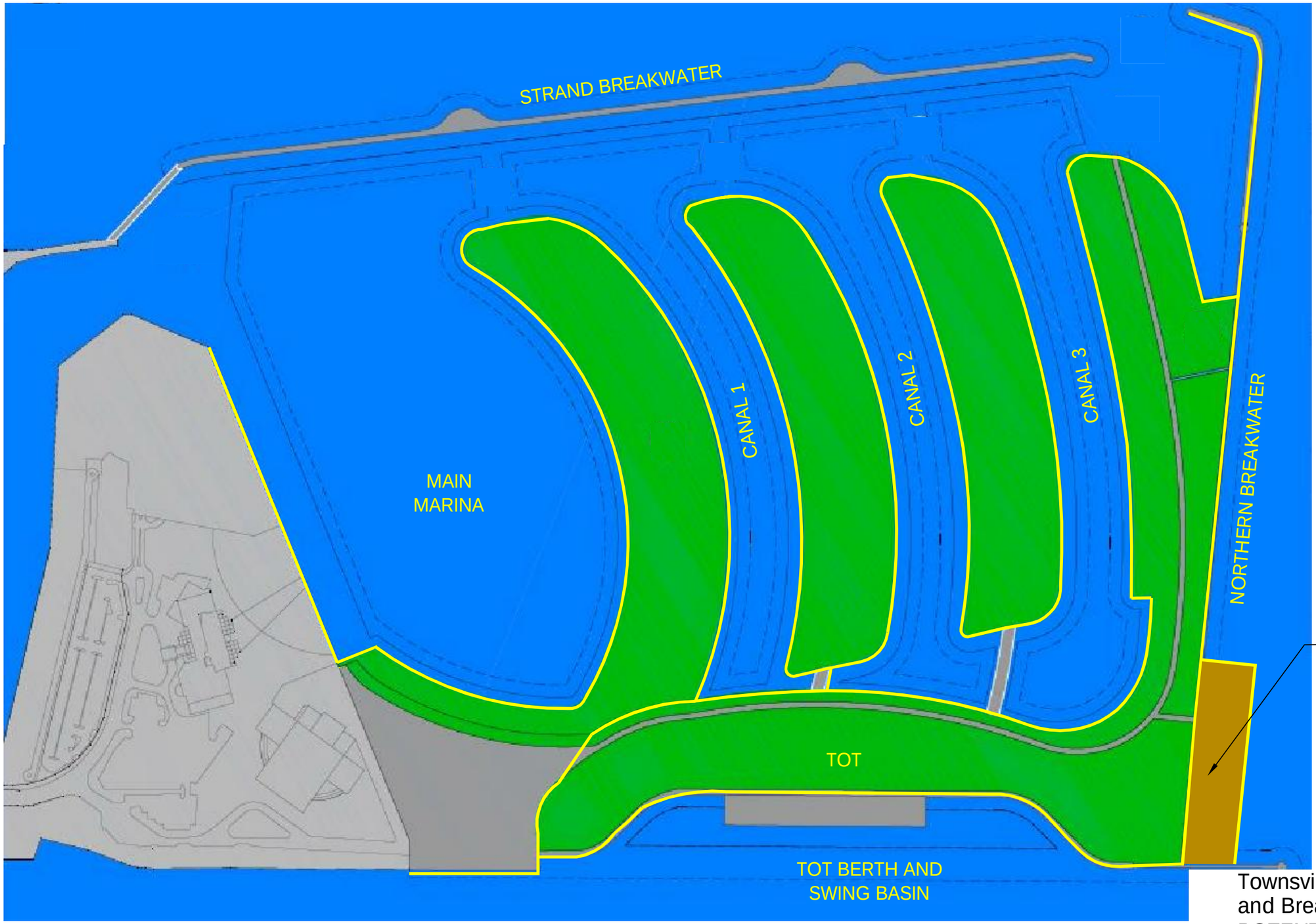


Townsville Ocean Terminal
and Breakwater Cove
POTENTIAL OPERATIONAL
DREDGING IMPACTS ON
WATER QUALITY

FIGURE 1 NOT TO SCALE

Acad No. 5002ATA 30th July 2008

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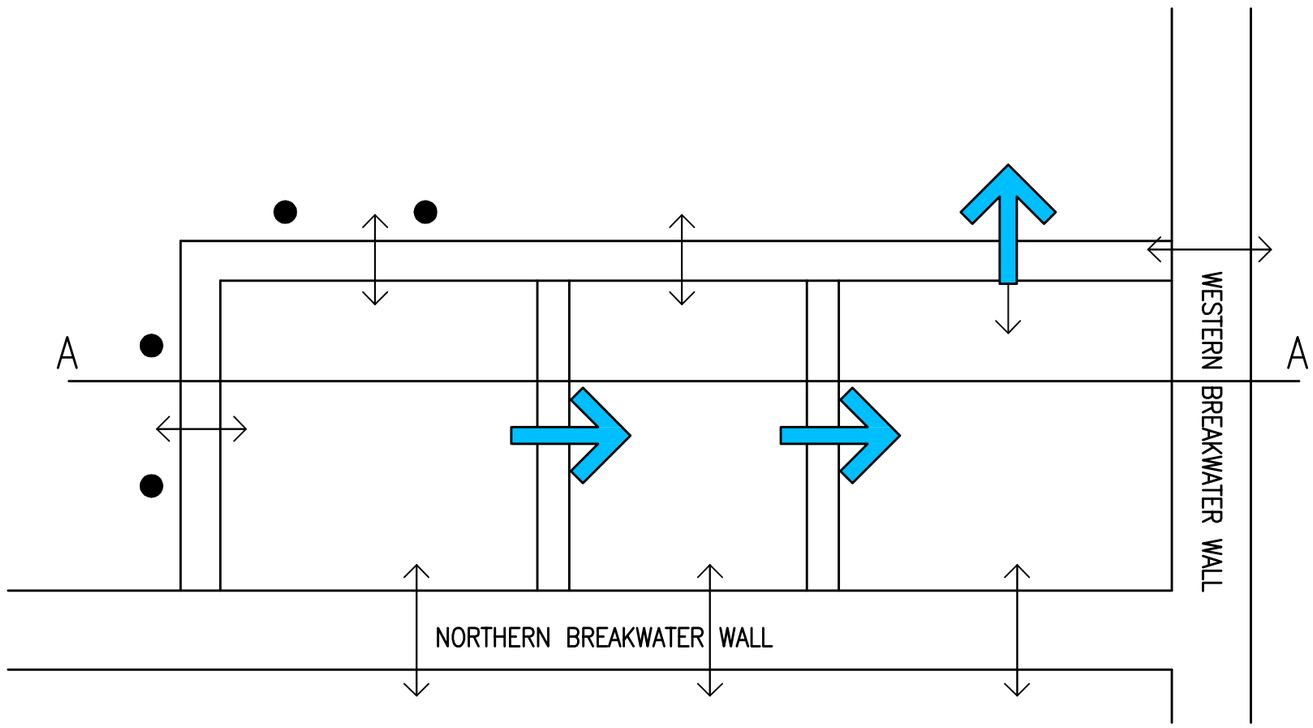
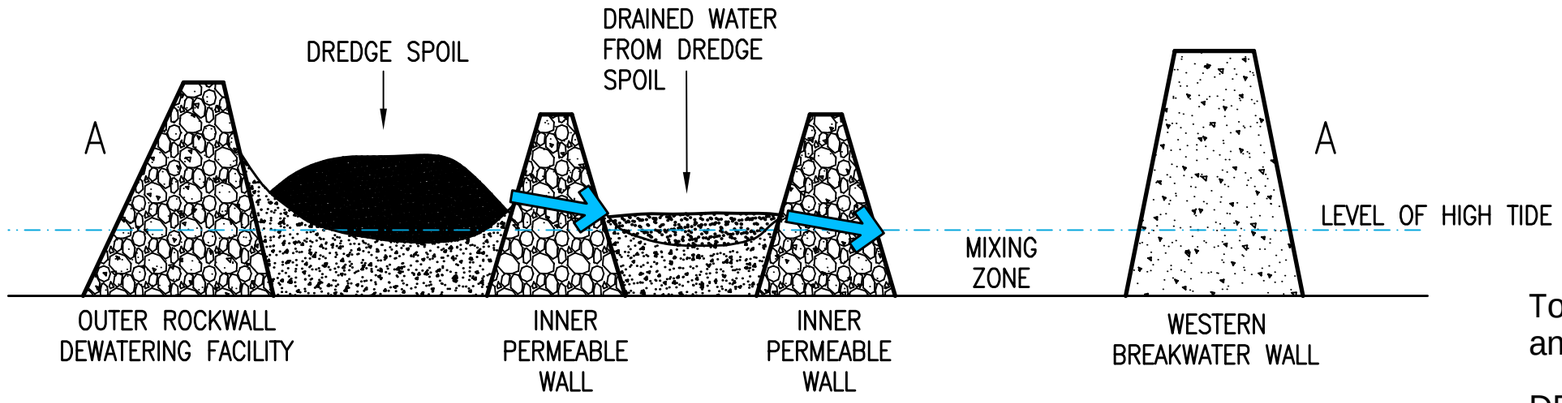



NOTES

- BERTHNG PILLONS
- TIDAL FLOW
- PRIMARY DIRECTION OF WATER FLOW FROM DREDGE SPOIL




Townsville Ocean Terminal and Breakwater Cove

DEWATERING FACILITY

FIGURE 2 NOT TO SCALE

Acad No. 5002DF 7 July 2008

a holding capacity of 20,000m$^3$. This will enable the operational dredging to be carried out on a 2-3year cycle.

On site dewatering will require the use of a clam shell dredge to keep total dredge volume below 20,000m$^3$. The water would be progressively discharged, after compliance testing, during the dewatering process.

Once dewatered, dredge spoil will be allowed to dry such that it would not liquefy and produce water during transport. It is envisaged water content would need to be less than 30% water, possibly 20% if the material has a high sand content. Dried spoil would be sampled and analysed for compliance with Stuart landfill acceptance criteria. Once analysis confirmed suitability for acceptance, materials would be progressively scraped in 10-20 cm layers and loaded into trucks for disposal to Stuart Landfill. It is estimated 1000 truck (truck and dog) movements would be required to move 20,000m$^3$ of dried dredge spoil. It is envisaged transport to landfill would be undertaken progressively over the period prior to the next dredging operations. The period for disposal will be based on ensuring that the loading and transport of trucks is carried out during periods of low utilisation of the adjacent recreational area and at times when the ocean terminal berth is not utilized..

To defer the requirement for trucks being required to transport dried dredge spoil , it is recommended that consideration be given to enlarging sump capacity for direct disposal of dredge spoil. Prior to the capacity of the sumps being reached alternate transport options such loading to barges for transport to Port reclamation areas or other disposal opportunities may become available.

## 4.0 MITIGATION AND CONTROLS

Operational dredging will eventually be required for the access channel and the marina. In order to significantly reduce materials handling, water volumes and, if required, drying times a clam shell dredge should be utilised rather than a cutter suction dredge.. A cutter suction dredge could be utilised if there is sufficient sump volume in the marina for direct emplacement without dewatering/drying. It is expected that bi-annual or tri-annual dredging operations for the access channel and the marina would be completed in a relatively short period (4-6 weeks). The primary concern for dredging is turbidity. To mitigate the risk, the following mitigation program is proposed:

1. Operational dredging to be undertaken in accordance with an approved dredge management plan;

2. Whilst dredging or potential high impact activities are in progress, a silt curtain will be installed around the dredge and emplacement areas;

3. Silt curtains shall be emplaced around emplacement sumps in marina, whilst they are being utilised for emplacement of dredge spoil;

4. To reduce the risk of adverse impact on sea grass, high potential impact activities will not be undertaken during November and December;

5. Dredging outside of the marina will be undertaken in wind speeds of less than 10 knots;

6. Dredging within the marina will be undertaken predominantly during a rising tide;

7. The dredging program, in the immediate vicinity of the marina entrance, will be undertaken during a period of low to moderate tidal flow (ideally less than 1.5 m between high and low tide);

8. Should a visible turbid plume be observed 5 m outside the silt curtain, works shall cease immediately;

9. During dredging, monitoring of turbidity and other agreed analytes, will be undertaken in accordance the water quality monitoring program which will be developed and agreed in consultation with the EPA.

10. If the yet to be agreed trigger values are exceeded, additional protective measures will be emplaced as soon as possible to improve environmental outcomes and meet the water quality criteria. These measures may include, but not be limited to:
    - Additional silt curtains
    - Reduced rate of dredging

## 5.0 CONCLUSIONS

The dredging and disposal of dredge spoil from the Marina and entry to the Marina will be the responsibility of the operator of the marina.

Initially on-site disposal of dredge spoil will be deposition of dredged material in the sumps at the base of the marina basin and the canals

When the capacity of the sumps is exhausted (nominally 12 years) a dewatering facility located outside the northern breakwater will be utilised to dewater dredge spoil prior to disposal to land fill.

To reduce the impact on the recreational facility, consideration should be given in the detailed design phase to increasing sump capacity or developing an alternative disposal option via TPA or an alternative dewatering/unloading point.

# Appendix A

# Stuart Landfill Disposal Criteria

# TOWNSVILLE CITY COUNCIL
# VANTASSEL STREET SANITARY LANDFILL, STUART
# LANDFILL ACCEPTANCE CRITERIA

## BACKGROUND INFORMATION

Selected solid industrial wastes which are known to contain hazardous constituents are presently accepted for special burial provided these wastes comply with strict acceptance criteria defined by the Townsville City Council.

This criteria is for solid waste only. It refers to the regulated waste permitted to be disposed of at Townsville City Council Landfill at Vantassel Street Stuart in accordance with Environmental Licence Number NR150 dated 16th July 1998.

Four characteristics are used to identify the hazardous nature of wastes and their suitability for disposal to landfill:

- ignitability
- corrosivity
- reactivity
- toxicity.

1. **Ignitability**
   Solid industrial wastes that are capable of causing a fire when ignited through friction, absorption of moisture, or spontaneous chemical changes under standard temperature and pressure are hazardous.

2. **Corrosivity**
   Solid industrial wastes which on dissolution exhibit a pH of 2 or less or 12.5 or greater are hazardous.

3. **Reactivity**
   Solid industrial wastes are hazardous if they have any of the following reactive properties:
   - react violently with water;
   - form potentially explosive mixtures with water;
   - generate toxic gases, vapours, or fumes dangerous to human health or the environment when mixed with water;
   - contain substances which generate toxic gases, vapours, or fumes when exposed to pH conditions between 2 and 12.5;
   - are capable of detonation or explosive reaction when subjected to a strong initiating source or if heated under confinement;
   - are readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

4. **Toxicity**

Solid industrial wastes will be classified as hazardous and require special management if:

- leaching contaminant levels in the solid waste when measured in accordance with the USEPA Toxicity Characteristic Leaching Procedure (TCLP Test) exceed the allowable concentrations for approved municipal landfills as specified in the attached table.

Other regulated wastes approved for disposal are:

- asbestos waste (for special burial);
- tyres;
- abattoir effluent (dewatered solids only);
- bacterial sludges (septic tank and sewage) (dewatered solids only);
- Fish processing wastes (liquid waste streams to be prohibited);
- Food processing wastes (liquid waste streams to be prohibited);
- Grease interceptor trap effluent and residues (dewatered solids only);
- Potentially Infectious clinical and related wastes which have been effectively treated to render them non-infectious;
- Poultry processing wastes (liquid waste streams to be prohibited); and
- Solid pharmaceutical products rendered unrecognisable (other than any substances listed under Schedule 8 of the Poisons Regulations 1978 and cytotoxic wastes).

## Prohibited Wastes

The following wastes are not accepted at the landfill:

- Liquescent waste streams or any waste capable of yielding free liquids;
- Untreated infectious and chemical wastes and liquid pharmaceuticals from clinical and related waste stream;
- Cytotoxic waste;
- Untreated sharps;
- S8 pharmaceuticals;
- All radioactive wastes, unless otherwise approved under the Radioactive Substances Act 1958;
- Pyrophoric wastes (where co-disposed with other potentially combustible);
- Explosives, ammunition, pyrotechnics or propellants; and
- Any substances which fall into the categories of ignitability, corrosivity, reactivity and radioactivity.

## Special Handling

Some waste because of its chemical/physical properties will require special handling. Apart from special wastes (asbestos, sharps, large non compactable objects, etc) some material may comply with leachate tests but have an overall contamination which exceeds safe practice. These levels are shown in brackets in the Total Contamination scale; a handling fee may apply.

| CONTAMINANT ANALYSIS | MAXIMUM CONTAMINANT CONCENTRATION IN SOLID WASTE (mg/kg) | ALLOWABLE LEACHING CONTAMINANT LEVELS (mg/L) |
|---|---|---|
| **Non Specific Contaminants** | | |
| BOD | | 20,000 |
| TOC | | 10,000 |
| Petroleum Hydrocarbons | | 50 |
| **Metals/Non-Metals** | | |
| Antimony | | 5.0 |
| Arsenic | (100) | 5.0 |
| Barium | | 100.0 |
| Cadmium | (20) | 0.5 |
| Chromium | (25) | 5.0 |
| Cobalt | | 5.0 |
| Copper | (100) | 100.0 |
| Lead | (300) | 5.0 |
| Mercury | (2) | 0.1 |
| Molybdenum | | 1.0 |
| Nickel | | 5.0 |
| Selenium | | 1.0 |
| Silver | | 5.0 |
| Thallium | | 1.0 |
| Tin | | 3.0 |
| Vanadium | | 5.0 |
| Zinc | | 500.0 |
| **Inorganic Anions** | | |
| Bromide | | 50.0 |
| Chloride | | 6,000 |
| Cyanide (total) | (250) | 5.0 |
| Fluoride | | 150.0 |
| Sulphate | | 4,000 |
| Nitrate | | 1,000 |
| **Monocyclic Aromatic Hydrocarbons** | | |
| Benzene | 20 | 1.0 |
| Ethyl Benzene | 1000 | 50.0 |
| Toluene | 600 | 30.0 |
| Xylene | 500 | 20.0 |
| Total MAH | 1000 | 50.0 |
| **Polycyclic Aromatic Hydrocarbons** | | |
| Anthracene | | 0.7 |
| Benzo (a) anthracene | | 0.05 |
| Benzo (a) phenanthrene | | 0.05 |
| Benzo (a) pyrene | (1) | 0.02 |
| Chrysene | | 0.1 |
| Dibenz (a,h) anthracene | | 0.02 |
| Dibenz (a,h) pyrene | | 0.1 |
| Dimethylbenz (a) anthracene | | 0.05 |
| Fluoranthene | | 0.2 |
| Indeno (1,2,3-Cd) pyrene | | 0.1 |
| Napthalene | | 0.7 |
| Phenanthrene | | 0.1 |
| Pyrene | | 0.7 |
| Total PAH | 1000 (20) | 1.0 |
| **Phenolic Contaminants** | | |

| | | |
|---|---|---|
| Non halogenated compounds | | |
| Phenol | 250 (5) | 10.0 |
| m-Cresol | 500 | 20.0 |
| o-Cresol | 500 | 20.0 |
| p-Cresol | 500 | 20.0 |
| Total non-halogenated phenol | 500 | |
| Halogenated phenols | | |
| Chlorophenol | 5 | 0.1 |
| Trichlorophenol | 20 | 1.0 |
| Pentachlorophenol | 20 | 1.0 |
| Total halogenated phenol | 20 | |
| **Chlorinated Hydrocarbons** | | |
| Chlorinated Aliphatic Compounds | | |
| Carbon Tetrachloride | 10 | 0.3 |
| 1,2 Dichloroethane | 20 | 1.0 |
| 1,1 Dictloroethene | 1 | 0.03 |
| Tetrachloroethene | 20 | 1.0 |
| Trichloroethene | 25 | 3.0 |
| Total chlorinated aliphatic | 50 | |
| Chlorinated Aromatic Compounds | | |
| Chlorobenzene (total) | 200 | 10.0 |
| Hexachlorobenzene | 1 | 0.02 |
| Total chlorinated aromatic | 200 | |
| **Pesticides** | | |
| Organochlorine | | |
| Aldrin | | 0.01 |
| Chlordane | | 0.06 |
| Dieldrin | | 0.01 |
| DDT | | 0.03 |
| Endrin | | 0.01 |
| Heptachlor | | 0.03 |
| Lindane | | 1.0 |
| Methoxychlor | | 1.0 |
| Toxaphene | | 0.05 |
| Total organochlorine pesticides | 10 | |
| Herbicides | | |
| 2,4-D | | 1.0 |
| 2,4-DB | | 2.0 |
| MCPA | | 2.0 |
| 2,4,5-T | | 0.02 |
| Total herbicides | 50 | |
| Carbamates | | |
| Carbaryl | | 0.6 |
| Carbofuran | | 0.3 |
| Total carbamate pesticides | 50 | |
| Organophosphorus | | |
| Diazinon | | 0.1 |
| Parathion | | 0.3 |
| Methyl Parathion | | 0.06 |
| Total Organophosphorus | 10 | |

| **CONTAMINANT ANALYSIS** | **MAX. CONTAMINANT LEVELS IN SOLID INDUSTRIAL REFUSE (mg/kg)** |
|---|---|
| **Petroleum Hydrocarbons** | |
| Total Petroleum Hydrocarbons $C_6$-$C_9$) | 1,000 |
| Total Petroleum Hydrocarbons ($C_9$-$C_{18}$) | 10,000 |
| Total Petroleum Hydrocarbons (>$C_{18}$) | 50,000 |