



# **Brisbane Water Management Study Sediment Management Plan FINAL**

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**Prepared for Gosford City Council\***

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Cover Photograph: Brisbane Water entrance navigation channel near Little Box Head looking south-east towards Box Head (30 June 2008).

## Document Control

Version	Status	Date	Author		Reviewer	
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# 1 Introduction

This Sediment Management Plan (SMP) aims to provide a framework for the implementation of sediment management, primarily in the form of maintenance dredging works for navigational purposes, within the Brisbane Water Estuary. The Plan incorporates a summary of dredging processes.

## 1.1 Site Description

Brisbane Water estuary is a large estuarine water-body within the Gosford Local Government Area and is a northern tidal arm of Broken Bay. The estuary is subject to tidal exchange with the Bay, the Hawkesbury River and the Pacific Ocean. The estuary's catchment includes the major areas of Gosford to the north and Woy Woy, Ettalong, and Umina to the south. Smaller urban catchments (e.g. Pretty Beach, Green Point, Saratoga, Davistown, Empire Bay and Hardy's Bay) also discharge stormwater run-off from the eastern foreshore of Brisbane Water estuary. The three major creek systems feeding the estuary are Narara Creek, Erina Creek and Kincumber Creek. The entrance of the estuary is situated between Box Head (Bouddi National Park) and Ettalong/Ocean Beach, and is partially filled with the sand of the Ettalong Point Shoal.

## 1.2 Overview of Sediment in the Estuary

Sediment within the Brisbane Water estuary is comprised of three general types:

- Marine origin (generally coarse, sandy material);
- Estuarine origin (generally fine, muddy material); and
- Fluvial origin (combination of coarse and fine sediment).

Of the three aforementioned sediment types, marine and fluvial sediments are most commonly dredged for the purposes of maintaining navigation.

Reclamation and anecdotal reports of disposal of sediment into the estuary associated with terrestrial works or placement of dredge spoil represent a separate source of sediments.

Cardno (2008) indicates that sediments tend to become progressively more contaminated the closer they are to urban areas, as urban inputs affect sediment quality. Marine sediments usually have good sediment quality, whereas estuarine and fluvial sediments often have poor sediment quality (due to higher contamination levels).

In certain locations, the periodic mobilisation and deposition of sediment into the Brisbane Water estuary has taken place and is expected to continue into the future. Sedimentation in the estuary may lead to:

- The impairment of navigational channels, leading to the restriction of maritime-based operations, employment and recreation;
- Health and safety issues for on-water activities;
- Reduction in water quality in upstream and semi-enclosed areas due to impaired tidal flushing; and
- Potential impacts on biodiversity due to reduced recruitment.

### **1.3 Relevant Studies**

This SMP has been prepared to form a sub-plan of the *Brisbane Water Estuary Management Study* (Cardno, 2010) and to be consistent with the *Brisbane Water Navigation Channel Proposed Maintenance Dredging Review of Environmental Factors* (Cardno, 2009b).

## 2 Sediment Issues and Options

### 2.1 Sediment Accretion Issues

Through the community consultation stage of the *Brisbane Water Estuary Management Study* (Cardno, 2010), the local community identified a general requirement for maintenance dredging in several areas within the Brisbane Water estuary where residents had anecdotal reports of sediment deposition or accumulation (e.g. a location where a vessel had previously had access, was now restricted). A number of issues were raised by the community in relation to sedimentation and dredging, primarily for navigational purposes. These are listed in **Table 2.1**. In this Table, "Zone" refers to the Brisbane Water Estuary Management Zones outlined by Cardno (2010). The location of the sediment management issues are presented in **Figure 2.1**.

### 2.2 Sediment Management Options

A number of the management options identified by Cardno (2010) relate to dredging works. These management options are provided in **Table 2.2** and correspond to the dredging issues presented in **Table 2.1**. In **Table 2.1**, "Corresponding Option ID" refers to the identification numbers of corresponding management options listed in the *Estuary Management Study* (Cardno, 2010). Sediment management options (scenarios) have been evaluated by Cardno (2010) using the Coastal Lake Assessment and Management (CLAM) tool. Results are included in the *Estuary Management Study* (Cardno 2010).

The inclusion of any dredging option in **Table 2.2** does not imply that implementation of any such option will be undertaken. It must also be emphasised that any dredging option considered for implementation would require detailed consideration of feasibility and would be subject to the standard environmental impact assessment process and associated planning and approvals requirements, including obtaining necessary permits or approvals that may be required from relevant authorities. For example, the harming of seagrass can only be undertaken under special circumstances and a permit must be obtained from the Department of Industry and Investment (Fisheries).

This Sediment Management Plan does not relate to catchment source control options. Reference should be made to the *Brisbane Water Estuary Management Study* (Cardno, 2010) for further details of these options.

Public exhibition of the *Draft Estuary Management Study* (Cardno, 2009a) and the receipt of comments from Council and the community meant that a review of the dredging options was undertaken. As a result, two of the dredging options in the exhibited draft study no longer appear in the final list of options. These two options are shown in grey text in **Table 2.2** and have been included in this Sediment Management Plan for completeness.

**Table 2.1: Sediment Issues and Corresponding Option Numbers**

<b>Issue Number in EMS*</b>	<b>Management Issues Identified by the Community/Council</b>	<b>Location</b>	<b>Zone<sup>#</sup></b>	<b>Corresponding Option ID</b>
1	Sediment build-up at existing boat ramps prevents boat access for all vessels other than dinghies at Saratoga, Green Point and Davistown (opposite Kincumber Convent).	Saratoga, Green Point and Davistown	2	W25, W116
4	Sediment build-up, algae/weed build up (rotting smell) and pollution preventing boating access and causing problems regarding amenity at Victory Parade, Tascott. Issue exacerbated by stormwater discharge. Need for improved pedestrian access.	Victory Parade, Tascott	2	W36
8	Saratoga Channel: dredging option to allow it to be re-opened for navigation and help flush Saratoga inlet. Unsafe navigation due to sediment build-up. Observed reduction in the velocity of currents in major navigation channels.	Saratoga Channel	2	W25
9	Entrance to Paddy's Channel drop over: provision of safe navigation channel (dredging). No other access in and out of Brisbane Water. Seven year, gradual build-up of sediment. Observed reduction in velocity of currents.	Paddy's Channel	2	W25
10	Sediment build-up at Gosford Harbour preventing yacht access.	Gosford Harbour	2	W115
16	Unsafe navigation due to sediment build-up. Observed reduction in velocity of currents in major navigation channels.	Woy Woy Channel, near Pelican island	4	W117
27	Siltation and issues relating to boat access via channel.	Horsfield	3	W118
29A-F	Canals of St Hubert's Island in need of urgent maintenance to return to original design criteria. Also channels leading to the Island silting up.	St Hubert's Island	4	W19
40	Siltation of channel causing navigational hazard.	East of Ettalong	6	W119

Issue Number in EMS*	Management Issues Identified by the Community/Council	Location	Zone <sup>#</sup>	Corresponding Option ID
46	Sailing boats with drop/fixed keel cannot access the Broadwater.	Cockle Channel	5	W116
47	Medium to large sized craft (1m draught) cannot get in at half tide. Bay has filled up over the last couple of years. The ferries that previously ran here kept it open.	Cockle Bay, near entrance to Cockle Channel	5	W116
60	Bar mouths need dredging.	Western end of Cockle Channel	4	W116
72	Blockage of entrance and sediment accretion.	Rileys Bay	6	W121
75	Channel inadequate - have to wait for ferries to come in. Problem with SE swell. Impact on race days / regattas. Issue primarily over last 18 months.	South of Half Tide Rocks and west of Lobster Beach	6	W18
80	Shoaling of entrance affecting tidal exchange in the estuary? Need for dredging to encourage tourism and boating.	Downstream of Rip Bridge	6	W18
85	Safety issues for navigation, erosion and damage to moored boats. Wash also an issue for small boats.	East of Mulhall St, Wagstaffe	6	W119
86	Access to wharf difficult.	Hardy's Bay	6	W120
106	Navigation issue in entrance is increasingly bad. Used to be 2-way channel.	The Entrance to Brisbane Water	-	W18
129	Impacts of shoal propagation on navigability of waterways.	Ettalong Shoals, Paddy's Channel, N of Pelican Island, Cockle Channel, Saratoga	4, 5, 6	W18
178	Sediment accretion near boat ramps and loss of access.	Saratoga, Green Point,	2, 5	W25



Issue Number in EMS*	Management Issues Identified by the Community/Council	Location	Zone <sup>#</sup>	Corresponding Option ID
		Davistown		
197	Orana Street boat ramp only accessible at high tide.	Green Point	2	W25
226	Poor access via the waterway to the Centennial Street boat ramp.	Saratoga	4	W25

\* Issue number in the Estuary Management Study (Cardno, 2010)

# Zone refers to the Brisbane Water Estuary Management Zones outlined by Cardno (2010)

**Table 2.2: Management Options (Cardno, 2010) that Correspond to Dredging Issues**

Option ID	Management Goal Addressed	Strategy Outline	Location	Zone
W18	Sedimentary Processes	Periodically dredge the navigation channel up to 50,000m <sup>3</sup> in the Estuary entrance to ensure safe navigation.	Entrance	6
W19	Sedimentary Processes	Undertake an ongoing program of maintenance to restore the drainage canals of St Hubert's Island to their original design criteria.	St Hubert's Island	4
W25	Sedimentary Processes	Dredge in the Saratoga (Paddy's and Lintern) Channel(s) and around the boat ramps to permit better access.	Saratoga and Green Point	2
W115	Sedimentary Processes	Dredge to improve access to the boat pump-out and other facilities in Gosford Harbour. The dredging should be sufficient to permit access over the full tidal cycle.	Gosford Harbour	2
W116	Sedimentary Processes	Dredge to improve navigation and access to boat ramps in Cockle Channel.	Davistown	5
W117	Sedimentary Processes	Dredge to improve navigation in Woy Woy Channel near Pelican Island.	Woy Woy	4

Option ID	Management Goal Addressed	Strategy Outline	Location	Zone
W118	Sedimentary Processes	Dredge to improve navigation in Woy Woy Bay.	Woy Woy Bay	3
W120	Sedimentary Processes	Dredge to improve access to the boat pump-out and other facilities in Hardy's Bay. The dredging should be sufficient to permit access over the full tidal cycle.	Hardy's Bay	6
W121	Sedimentary Processes	Investigate options to address access and amenity issues associated with the blockage of the entrance to Riley's Bay and sediment accretion in this area.	Riley's Bay	6
W36	Sedimentary Processes	Dredge built-up sand associated with the stormwater outlet between 29-33 Victory Parade, Tascott.	Tascott	2
W119	Sedimentary Processes	Extend dredging of the Entrance Reach further upstream past Kourung Gourung Point between Ettalong Beach and Pretty Beach with a view to improving navigation.	Entrance	6



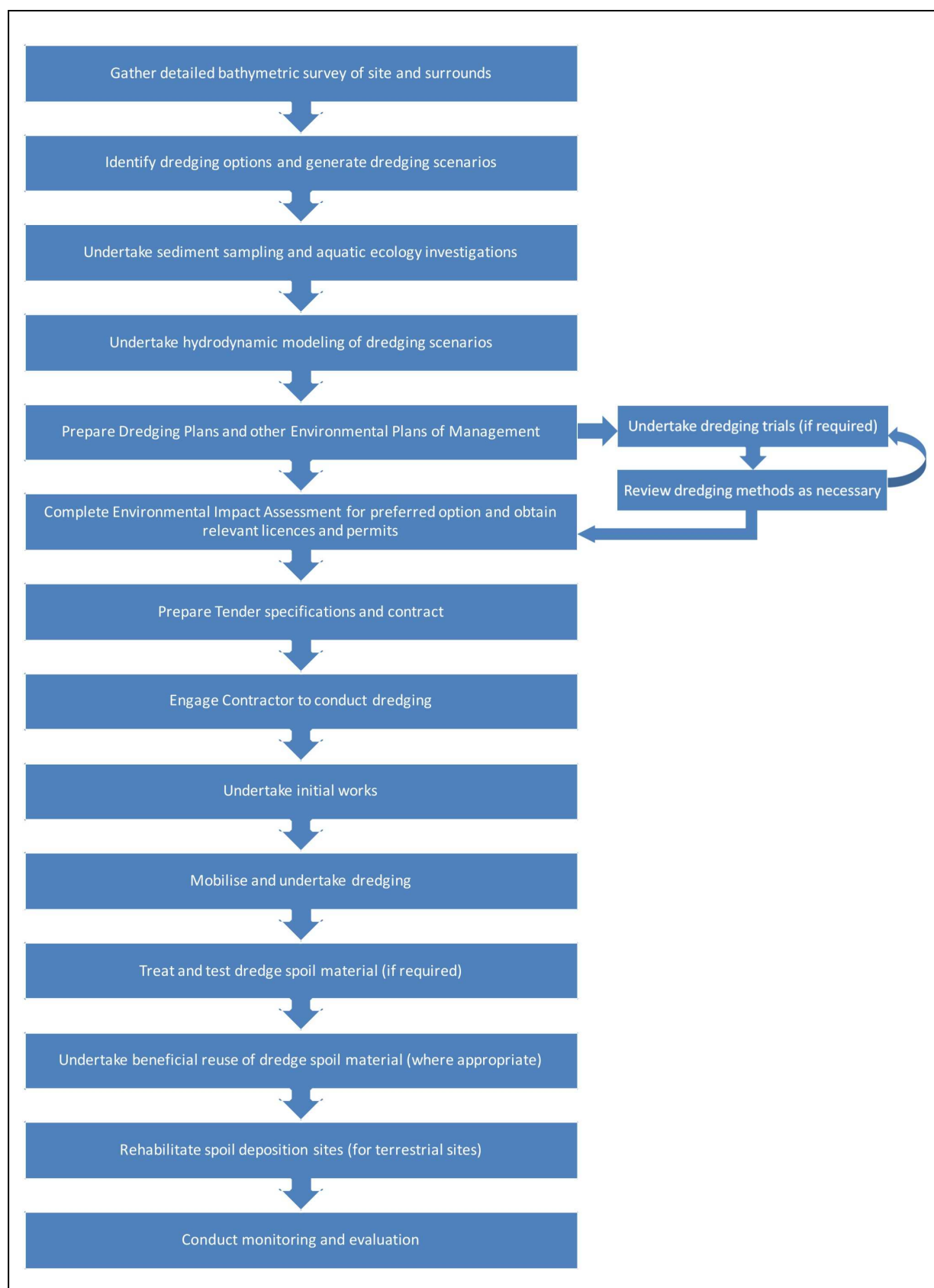
Figure 2.1: Sediment Issues Locations

## **3 Project Tasks and Timeframe**

A number of tasks need to be undertaken in order to implement and appropriately manage any dredging works for sediment management purposes in the Brisbane Water estuary. The standard environmental assessment process and associated planning and approvals requirements would apply to any dredging options that are considered for implementation.

### **3.1 Project Tasks**

A flow chart (**Figure 3.1**) has been produced to characterise the tasks associated with the options for dredging works in the Brisbane Water estuary. Further explanation of each task is given in **Section 3.2**.



**Figure 3.2: Project Tasks Flow Chart**

## 3.2 Consideration of Project Tasks

**Table 3.1** provides further detail for each of the tasks in **Figure 3.1**.

**Table 3.1: Explanation of Project Tasks**

Task No.	Task	Details
1	Gather detailed bathymetric survey of site and surrounds	Bathymetric data is required to characterise the current morphology of the estuary. Where possible, comparative historical surveys should be collated to determine the amount of sedimentation that has occurred at the site and/or its surrounds.
2	Identify dredging options and generate dredging scenarios	The depth and extent of proposed dredging should be characterised (including suitable batter slopes). Dredging options should be identified and dredging scenarios produced. Dredging options as identified by Cardno (2010) are provided in <b>Table 2.2</b> .
3	Undertake sediment sampling and aquatic ecology investigations	Sampling of proposed dredge sediments should be undertaken to ascertain grain size, sediment quality and the presence of any acid sulfate soils to establish treatment and disposal/beneficial re-use options. Aquatic ecology investigations should incorporate benthic sampling and identification of presence of aquatic vegetation, including any weed species.
4	Undertake hydrodynamic modeling of dredging scenarios	A hydrodynamic model should be utilised to evaluate the impacts of dredging scenarios on the environment.
5	Prepare Dredging Plans and other Environmental Plans of Management	Dredging plans will need to be prepared, indicating areas and depths to be dredged. Environmental Plans of Management will also need to be prepared, e.g. Acid Sulfate Soils Management Plan.
5A	Undertake dredging trials (if required)	If required, relatively small-scale dredging trials should be undertaken to assess the performance of proposed dredging methods. Trials should include the treatment, testing and beneficial reuse of dredge spoil material.
5B	Review dredging methods as necessary	Dredging methods may be revised according to the findings of the dredging trials. Further trials may need to be undertaken where necessary.
6	Complete Environmental Impact Assessment for preferred option and obtain relevant licences and permits	Environmental Impact Assessment (EIA) will need to be undertaken for any proposed dredging works. In order to legally carry out such works, licences and permits may be necessary under Commonwealth and State legislation. This information should be incorporated into the relevant EIA documents.



Task No.	Task	Details
7	Prepare Tender specifications and contract	A Tender to invite contractors to carry out the dredging works will need to be prepared.
8	Engage Contractor to conduct dredging	Based on Tender submissions, a Contractor should be engaged to carry out the dredging works.
9	Undertake initial works	The Australian Hydrographic Service should be notified of the works so that Notices to Mariners can be updated. In addition, environmental protection measures should be installed. Dredging will occur offshore (i.e. in the estuary), however onshore site preparation may be necessary in cases where deposition of dredge spoils onto terrestrial areas is being carried out.
10	Mobilise and undertake dredging	Dredging works should be undertaken in accordance with the relevant EIA document and Plans of Management.
11	Treat and test dredge spoil material (if required)	Treatment of dredge material will vary according sediment type and level of contamination, etc. Dewatering of dredge spoil material is likely to be undertaken for sediments that will be deposited in terrestrial or coastal areas, and this may include the application of additives (e.g. polymers) or the use of specialist dewatering equipment (e.g. hydroclones) to aid the dewatering process. Where required, testing of representative, treated sediment samples should be conducted to determine if the dredge spoil contains contaminants such as acid sulfate soils, which would require further treatment.
12	Undertake beneficial re-use of dredge spoil material (where appropriate)	Beneficial reuse of dredge spoil material should be undertaken in accordance with the <i>Waste Avoidance and Resource Recovery Act 2001</i> . Beneficial reuse varies according to sediment type: <ul style="list-style-type: none"> <li>- Sandy sediments are more suitable for deposition in nearby estuary locations, or, on beaches requiring nourishment (as appropriate).</li> <li>- Alluvial sediments are more suitable for deposition on nearby, terrestrial recreational reserves (as appropriate).</li> </ul>
13	Rehabilitate spoil deposition sites (for terrestrial sites)	Areas that have received dredge spoil through beneficial reuse should be rehabilitated as required, e.g. through revegetation.
14	Conduct monitoring and evaluation	Post-dredge monitoring and reporting should be conducted as required, including a Work as Executed (WAE) survey.

### **3.3 Timeframe**

The timeframe for the completion of dredging works will depend on the extent and volume of the works and the complexity of the approvals process. An example of an average timeframe for dredging works is 6-12 months from design investigations to completion.



## **4 References**

Cardno (2008) Brisbane Water Estuary Processes Study – Prepared for Gosford City Council.

Cardno (2009a). *Brisbane Water Estuary Management Study – Draft*, Prepared for Gosford City Council.

Cardno (2009b). *Brisbane Water Navigation Channel Proposed Maintenance Dredging Review of Environmental Factors*, Prepared for Gosford City Council.

Cardno (2010). *Brisbane Water Estuary Management Study – Final*, Prepared for Gosford City Council.