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Department of Transport and Main Roads

Report for Gold Coast Waterways Access Needs Study

Final Report

December 2010



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Executive Summary

Context and Purpose of the Study

This study documents the marine industry's perceived need in relation to navigational channel profiles in Gold Coast waterways. It also provides estimates of the investment required to establish and maintain the identified profiles, and assesses the merits of that investment. This document was co-funded by the Department of Infrastructure and Planning and was developed in part to inform their Southern Moreton Bay Marine Infrastructure Master Plan.

Stakeholder Consultation

Consultation consisted of three key components: a stakeholder reference group, which provided guidance at key points in the project; an e-survey of vessel owner's perceptions and use of channels; and one-on-one interviews with about 30 key marine industry businesses. As part of the Master Plan, presentations were also made to various industry and community forums.

Identified User Demand

Throughout the course of the consultation, several alternative channel profiles were identified. This culminated in a final "Recommended" profile, which tempered perceived need with consideration of costs. This led to industry stakeholders modifying some requests to balance costs with relative benefits. The profiles – width and depth – for "primary", "secondary" and "other" channels provided in the recommended profile are the basis for further discussion and analysis in the rest of this study.

Preliminary Dredging Strategy

A five-year strategy to establish the recommended profile is outlined and discussed as one possible approach. Maintenance works, to re-establish previously dredged profiles, are included in Years 1-3 of the program. Year 1 is 2008-09 and those works were all completed or commenced prior to 30 June 2009. The capital works, involving activities in areas not previously dredged, are scheduled for Years 3-5, with the major investment skewed towards the end of the program, to allow time to secure both approvals and funding. Once the network is established, an annual maintenance dredging investment will be required; this investment is scheduled to commence in Year 4 of the program.

Benefit Cost Analysis

The total cost to establish the network has been estimated at \$27m, including \$9m in maintenance and \$18m in capital works. The total five-year cost of \$33m includes the estimated annual maintenance allocation of \$3m in Years 4 and 5. A range of benefits were identified and costed, with a net benefit stream of \$441m identified over a 20-year period. This benefit stream is substantially larger than the estimated costs of \$78m over the same period; the Economic Internal Rate of Return (EIRR) is calculated as 35.2 and stands up well to several sensitivity tests.

Funding Options

On the basis of the economic analysis, the investment is warranted. However, this study was to identify a partnered solution, which included industry participation. A State/Local government partnership has been established and dialogue with industry is progressing, but outcomes remain uncertain. There have been suggestions that significant costs savings are available, notably through commercialisation of dredged sand. A strategy has been identified to test market interest and identify the potential to reduce capital funding requirements. Progression of this study is dependent on further development of the partnership,



market interest, and finalisation of the Marine Infrastructure Master Plan.

Figure 1 Study Area – Map 1 of 2

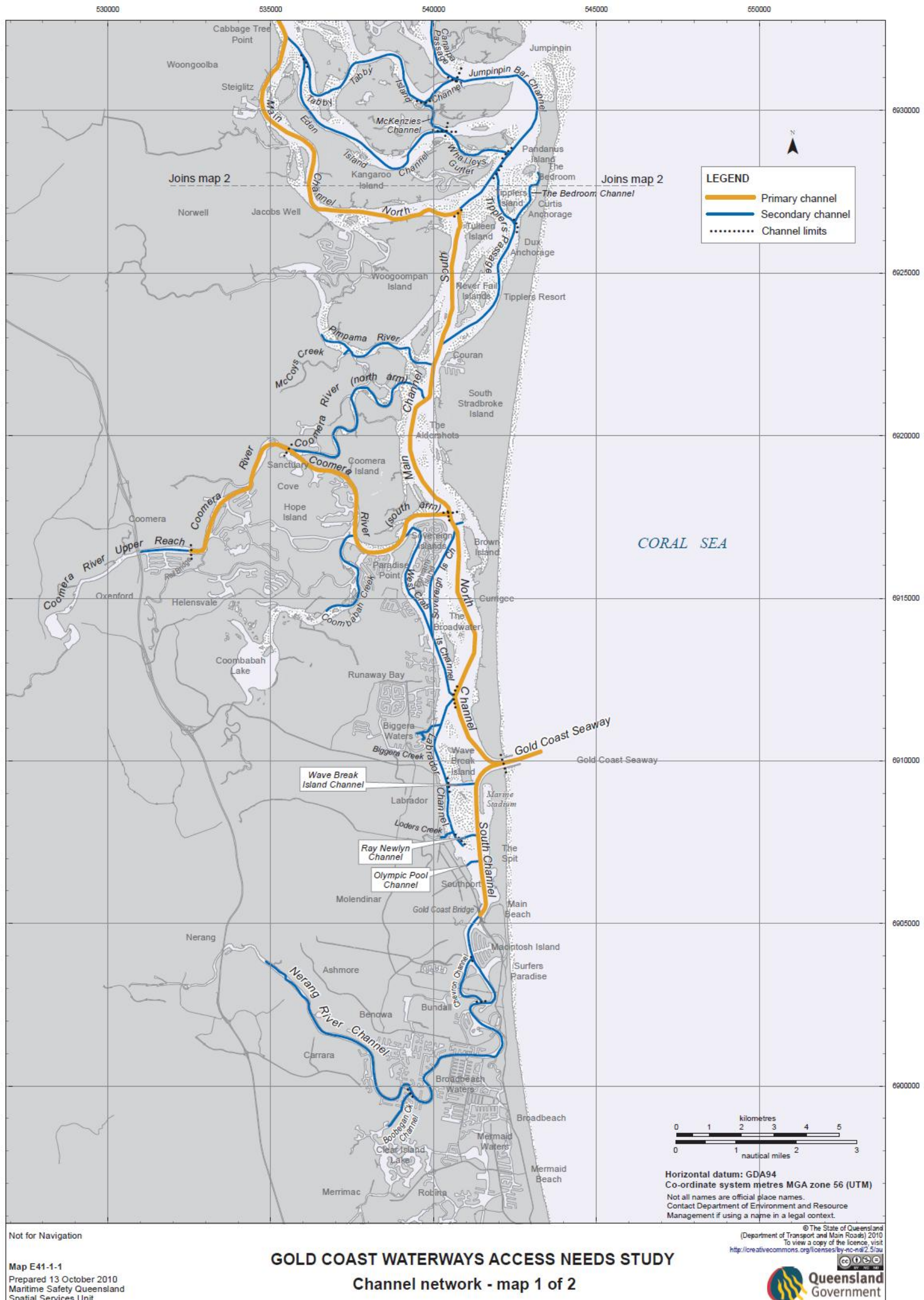
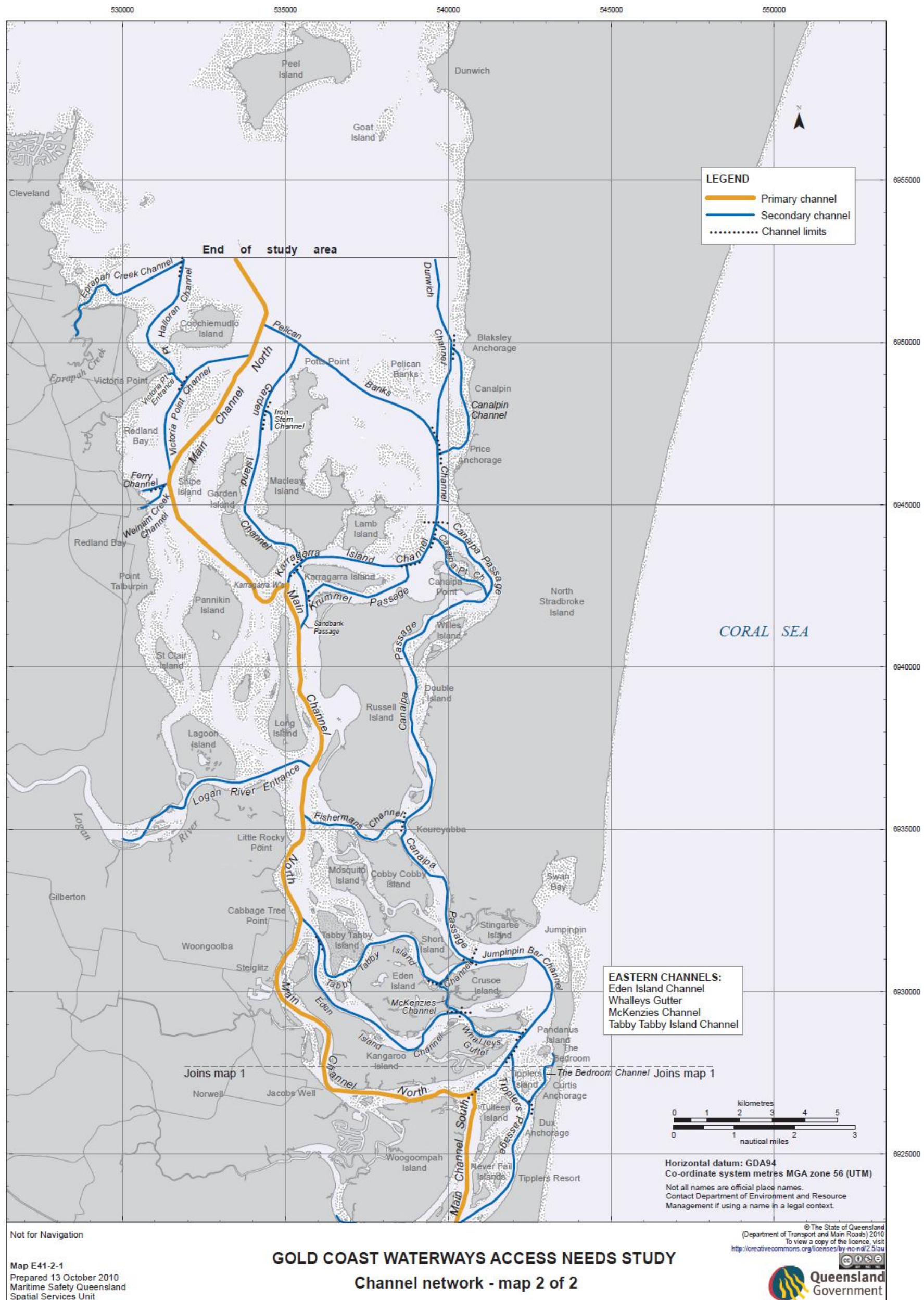


Figure 2 Study Area – Map 2 of 2





1. Introduction

1.1 Project Overview

The Gold Coast Waterways Access Needs Study was initiated by the Department of Transport and Main Roads in response to stakeholder demand for a programmed commitment to navigational channel maintenance and a government expectation that funding for any such programme include industry participation. The Access Needs Study builds on work previously undertaken by the former Gold Coast Waterways Authority and the subsequent Gold Coast Harbours Authority, particularly the 1998 report "Meeting Dredging Needs in Gold Coast Waterways".

The Access Needs Study was also developed to inform the Queensland Government Southern Moreton Bay Marine Infrastructure Master Plan project (Master Plan), and was co-funded by the lead agency for the Master Plan, the Department of Infrastructure and Planning. The targeted industry (user) perspective and relatively narrow economic analysis undertaken in this report will be put into a broader stakeholder and economic perspective as part of the Marine Infrastructure Master Plan process.

Recent reports have highlighted a concern that the combination of traffic and inadequate depth/width of navigable channels in the Gold Coast waterways is restricting access and suppressing growth of marine-related industries, which rely on navigable channels. This project is designed to define recreational and commercial demand for access to a maintained navigational channel network and recommend how that can be sustained for Gold Coast waterways.

1.2 Project Aim

The overall aim of the project is to develop a channel dredging strategy that meets the ongoing needs of key stakeholders and has an agreed funding arrangement and responsibilities to provide for the successful implementation of the strategy.

1.3 Report Purpose

The purpose of this report is to present and discuss:

- ▶ Consultation processes employed and outcomes produced;
- ▶ Identified navigational demand and a recommended channel network;
- ▶ A preliminary dredging strategy, including estimated costs;
- ▶ Analysis of the costs and benefits of the recommended channel network; and
- ▶ Management and funding strategies.



2. Consultation

2.1 Overview

A Study Reference Group was established to provide focussed input to the development of the project and provide a conduit to the involvement of the broader boating community through the linkages to industry and recreational groups and their members.

Other consultation undertaken included an e-survey and face-to-face meetings with key industry representatives as part of the economic analysis. The e-survey was developed and posted on the project website. Invitations to undertake the survey were sent to stakeholder groups. Following receipt and analysis of the e-questionnaire, feedback was provided to the Study Reference Group on the findings.

2.2 Study Reference Group

A Study Reference Group (SRG) was established comprising representatives of key stakeholder organisations. The Study Reference Group provided focused input to the development of a “Recommended” channel network, including consideration of the results of the e-survey, which reflects a broader stakeholder view, including recreational vessel owners, of satisfaction with existing channels and desired outcomes.

The Study Reference Group met and provided advice at key stages in the project, including:

- Review of the “Base Case” channel network from the 1998 Harbours Authority study;
- Development of a “SRG” channel network reflecting updated demand;
- Participation in, and promotion of, the e-survey;
- Consideration of the Base Case and SRG networks compared to the “e-survey” network median channel profile values;
- Identification of a “Recommended” channel network following consideration of the estimated costs of establishing and alternative channel network profiles SRG and e-survey channel networks.

Study Reference Group Members included:

- Gold Coast Marine (formally Gold Coast Marine Industry Association Queensland Charter Vessel Association);
- Super Yacht Base Australia;
- Marine Queensland;
- Volunteer Marine Rescue;
- Queensland Charter Vessel Association;
- Marina Industries Association of Australia;
- Queensland Small Craft Council; and
- Gold Coast City Council.



2.3 Industry Stakeholder Analysis

A detailed program of one-on-one direct interviews with a broad cross section of Gold Coast's water-based industry personnel was undertaken as part of the economic analysis discussed in Section 5 of this report. The primary goal was to determine how the commercial sector understood (i) the significance of current waterways/channel conditions, and (ii) the implications of proceeding/not proceeding with additional investment in dredging in primary and secondary channels on the Gold Coast.

Industry stakeholders interviewed included representation from the following commercial sectors: management and business operators of the Gold Coast marine precinct, boat building, commercial boat sales, dry boat storages, commercial fishing, houseboat operators, boat charters, water taxis and water ferries, marina operators, Southport Yacht Club management and tourism service providers.

Approximately thirty (30) 1 to 1½ hours interviews were held in the study area. Appendix A provides a synopsis of the findings of these discussions, on an issue/by issue basis. In addition to the face-to-face interviews, a number of telephone interviews were also held with various industry personnel.

Key findings which emerged from the industry interviews were:

- Additional capital dredging to achieve at least 3m LAT of water depth in all main channels is regarded as a pre-condition for continued commercial viability.
- The range of commercial boat building/yacht activity is significant and requires that the growth in investment in new technology and training must continue, in parallel with continued investment in maintenance dredging.
- The next generation of commercial activity at the GCC Marina is in support for super yachts and blue water cruising yachts.
- Developing a super yacht base on the Gold Coast is conditional upon having significant depth of water for the yachts to reach the GCC Marine precinct for refit/maintenance work.
- The sustainable future of tourism on the Gold Coast is inextricably linked to continued water-based/sailing activity. The water-based natural assets cannot be allowed to slowly deteriorate with silting, with a corresponding decline in the quality of tourist/visitor/day recreational experiences.
- A new form of a waterways management authority is urgently required to be re-established to guide and coordinate recreational/commercial interests in relation to the Gold Coast's waterways.

2.4 e-Survey

2.4.1 Methodology

The e-Survey was developed by GHD in consultation with the Department of Transport and Main Roads, including Maritime Safety Queensland. The Department of Transport and Main Roads approved the e-Survey on 31 October 2007 and the e-Survey was live on the GHD project webpage from Monday 5 November 2007 until Monday 14 January 2008.

The e-Survey was promoted through the existing Study Reference Group networks, with the link to the e-Survey e-mailed to individual SRG members on Monday 5 November 2007.

The e-Survey was planned to be closed on 3 December 2007, however it was extended twice (including correspondence with SRG members with feedback on the number of responses and a request to resend original e-Survey link) to allow for a greater number of completed surveys to be received.



Activities undertaken to promote awareness of the Access Needs Study and the e-Survey included:

- ▶ 27 July 2007 - Channel 9 Gold Coast – Minister Paul Lucas interview following helicopter tour of Gold Coast Waterways;
- ▶ 29 November 2007 - media release by Minister John Mickel on e-Survey;
- ▶ 4 December 2007 - Courier Mail article - "Attack on dredging";
- ▶ 14 December 2007 - Channel 9 Gold Coast - television interview with Paul Stenhouse of the Department of Transport and Main Roads;
- ▶ Article in Cruising Helmsman (February 2008);
- ▶ Updates on the Department of Transport and Main Roads' website; and
- ▶ The e-survey was available on the project website: <http://www.ghd.com.au/goldcoastwaterways>.

As at the close of business Monday 14 January 2008, 316 responses were received.

2.4.2 Notes on Reading e-Survey Data

The following points should be considered when reading the data from the e-Survey:

- ▶ Written responses from respondents, available in a separate volume, have been left as entered and interpreted by GHD, this includes not correcting spelling mistakes or grammatical errors (including where respondents have entered text in capitals, the capital text has been left)..
- ▶ "2004 MSQ" depth/width is an estimate by GHD of the average depth/width of the various channels indicated on the 2004 MSQ charts for the study area:
 - MB7 Couran to Redland Bay, Boating Safety Chart, Second Edition 2004; and
 - MB6 Nerang River to Couran, Boating Safety Chart, Second Edition October 2004.
- ▶ The estimated 2004 MSQ depth is not a 'surveyed' depth and it is also not a minimum depth available throughout each channel.
- ▶ All depths are in metres below LAT (Lowest Astronomical Tide). Width refers to the distance at the base of the channel between batters. The area dredged is often wider than this to provide a stable slope, or batter, at the edges of the channel.
- ▶ "Primary" channels refer to demand. These channels carry the most vessel traffic and are therefore viewed as having a higher priority for dredging.
- ▶ "Secondary" channels are important network channels, but carry less traffic and are therefore viewed as having a lower dredging priority.

2.4.3 Summary and Analysis of e-Survey Results

Vessels Recorded in e-Survey

The 316 respondents provided data on 429 vessels. Table 1 and Figure 3 provide a breakdown of types of vessels. The features of these vessels (length, draft and beam) are set out in Table 2.



Table 1 Vessels Recorded in e-Survey

Vessels	Number	Percentage in e-Survey
Commercial	30	7.0%
Tour Group/Site Seeing	12	2.8%
Trawler/Fishing	1	0.2%
Charter Fishing	3	0.7%
Other	16	3.7%
Recreational Sailing	58	13.5%
Recreational Power Boat	258	60.1%
Super Yacht	7	1.6%
Other	76	17.7%
Total Vessels Identified	429	100.0%

Figure 3 Vessels identified in e-Survey

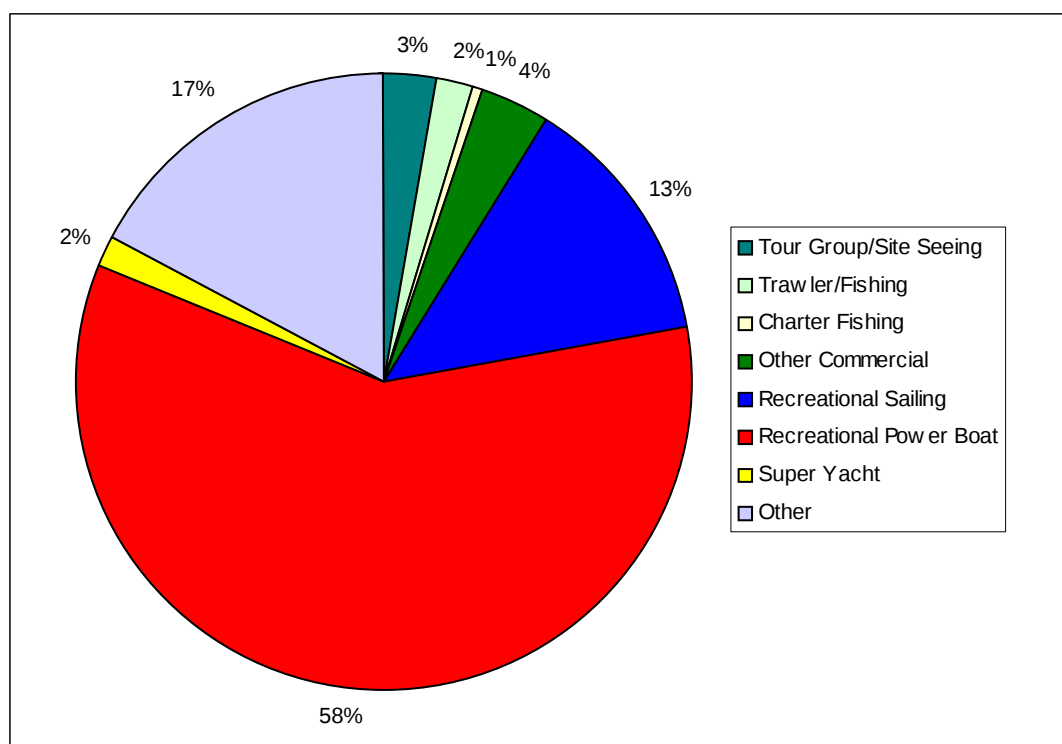


Table 2 Features of Vessels

Length	Number of Responses
Less than 6m	129
6m to 12m	170
12m plus	144
Draft	
Less than 0.5m	86
0.5m to 1.5m	193
More than 1.5m	106
Beam	
Less than 2m	90
2m to 4m	209
4m or wider	135

Channels

A breakdown of channel use is provided in Figure 4. Responses from the e-Survey per channel are set out in Table 3. Table 4 provides a breakdown of comments per channel and Table 5 provides a breakdown of general comments received about dredging in the Study Area.

Figure 4 Regular Usage of Identified Channels

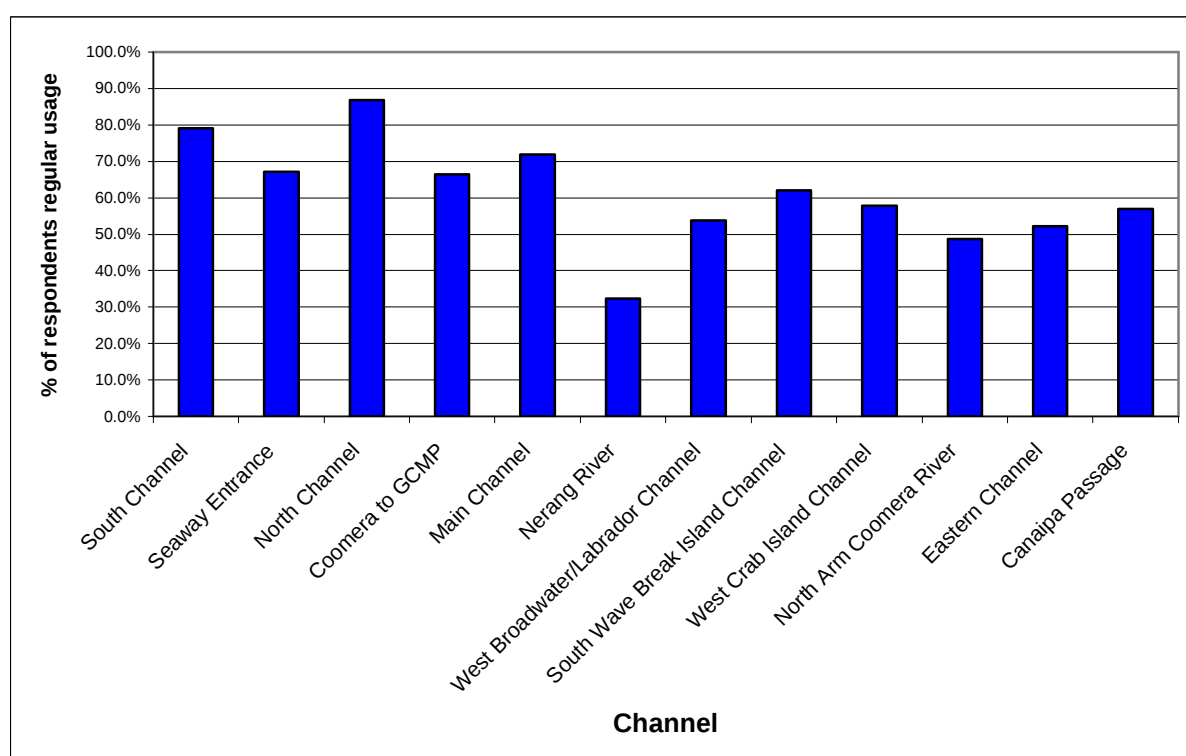




Table 3 Summary of Channel Data

	Use Regularly		Depth (LAT)				Width			
	#	% of all respondents	Happy with Existing Depths				Happy with Existing Widths			
			#	% Respondents (question only)	Median Requested	2004 MSQ ¹	#	% Respondents (question only)	Median Requested	2004 MSQ ²
Primary Channels										
South Channel	250	79.1%	57	22.8%	4.0	5.0	105	42.0%	100	100
Seaway	212	67.1%	52	24.5%	7.0	>10.0				
North Channel	274	86.7%	40	14.6%	3.0	2.0-5.0	109	39.8%	60	40
Coomera River	210	66.5%	35	16.7%	3.5-4.0	2.5-3.5	86	41.0%	60	40
Main Channel	227	71.8%	17	7.5%	3.0	2.0	84	37.0%	60	40
Secondary Channels										
Nerang River	102	32.3%	13	12.7%	3.0	0.2-2.0	51	50.0%	40	40
Labrador Channel	170	53.8%	16	9.4%	3.0	1.0-2.0	65	38.2%	40	40
South Wavebreak Island Channel	196	62.0%	15	7.7%	3.0	2.0	65	33.2%	40	40
West Crab Island Channel	183	57.9%	19	10.4%	3.0	2.0	75	41.0%	40	40
North Arm Coomera River	154	48.7%	8	5.2%	2.5	1.0	52	33.8%	50	40
Eastern Channels	165	52.2%	22	13.3%	3.0	1.5	66	40.0%	40	40
Canaipa Passage	180	57.0%	12	6.7%	3.0	1.5-2.5	70	38.9%	40	40

¹ This is an assessment of available depth for navigation, refer to section 2.4.2

² This is an assessment of available depth for navigation, refer to section 2.4.2



Table 4 Summary of Comments per Channel

	General Dredging Requirement	Alignment	Safety	Congestion	People (speed)	Navigation	Maintenance	Boat Size	Environmental	Economic	Happy with Channel	No Comment	Total
Primary Channels													
South Channel	40	0	8	12	5	10	4	6	1	0	5	10	101
Seaway Entrance	30	0	18	0	0	5	24	5	1	0	7	7	97
North Channel	38	6	6	10	5	8	10	8	2	0	3	5	101
Coomera to GCMP	26	0	3	2	6	5	4	6	1	5	1	5	64
Main Channel	39		3	0	6	8	10	6	1	3	2	5	83
Secondary Channels													
Nerang River	25	0	2	1	0	2	1	0	1	0	0	2	34
Labrador Channel	48	0	0	4	1	3	0	0	0	1	2	3	62
South Wave Break Island	41	0	4	4	1	4	0	9	1	0	1	3	68
West Crab Island Channel	36	1	2	3	1	3	2	0	0	0	2	6	56
North Arm Coomera River	32	0	3	0	5	6	0	2	1	0	0	2	51
Eastern Channels	32	0	1	0	2	5	1	3	0	0	0	2	46
Canaipa Passage	57	2	0	0	0	2	1	2	2	0	0	3	69
Total	444	9	50	36	32	61	57	47	11	9	23	53	832
%	53.4%	1.1%	6.0%	4.3%	3.8%	7.3%	6.9%	5.6%	1.3%	1.1%	2.8%	6.4%	



Table 5 Summary of Further/Additional Comments

Issue Category	Number
General dredging requirement	84
Alignment	1
Safety	17
Congestion	0
People (speed)	5
Navigation	7
Maintenance	6
Boat Size	0
Environment	10
Economic	5
Happy with current channels	1
Positive response to e-Survey	5
No Response	2
Total	143



3. Identified Channel Networks

3.1 Historical Channel Network

The channel network for Gold Coast waterways has been defined for some time by the presence of navigational aids and published charts and guides that show the location of navigational aids, indicative depths, shoals and other features relevant to navigation.

Appendix B discusses each of the channel segments, including historical dredging projects. These projects have largely been funded through ad hoc allocations, as opposed to a programmatic approach to maintaining any particular standard.

Several principles have historically been applied to promote efficiency and effectiveness in the expenditure of allocations for dredging. One is to relocate navigational aids, based on survey data, to provide navigational access without the need for dredging. This is cost-effective on both a project basis, and in the long-run, as it tends to locate channels where the natural forces are most likely to sustain them.

Another is to set the depth of dredging projects at the level of the majority of the channel seabed in the survey area. This focus on shoals minimises cost, as well as potentially providing a more sustainable profile – less likely to quickly infill, because it mimics natural conditions.

Finally, there has been an attempt to observe seasonal fluctuations and take advantage of “natural dredging”. This is particularly applicable to the seasonal formation of shoals on the sand delta in front of the Seaway.

The natural state of the waterways is flux. Historical management has been an attempt to balance available funding, user demand, and natural processes. Mechanisms such as “Notice to Mariners” and signage have been used to promote safe navigation between dredging events.

3.2 Navigational Needs and Identified Channel Networks

As the number of vessels, as well as the size of vessels, has increased, user demand for a more programmatic approach to channel maintenance has increased. The intention of this study is to establish an accepted channel network that defines the depth and width of channel segments that broadly addresses navigational needs and is likely to be sustainable given environmental, economic and engineering constraints.

While a channel network of this sort is common for areas such as commercial ports, there is no similar general use channel network in Queensland, or most parts of Australia, except perhaps the canal system on the Gold Coast.

The consultation described in Section 2 provided four alternative channel networks, reflecting various views of current usage requirements and feasibility. These alternative channel networks included consideration of current and proposed usage. The four alternative networks are:

- ▶ “Base Case” refers to the 1998 GCHA report, option 3.
- ▶ “SRG” refers to the first revision of that report done by the SRG, bringing it up to date with evolution in boat size.
- ▶ “e-Survey” refers to the median values of depths and widths reported by participants in the “e-survey”.



- ▶ “*Recommended*” refers to the depths and widths the SRG agreed to after considering the capital and maintenance costs associated with different options.

Table 6 summarises the identified depth and width for these four alternative channel networks. The preliminary dredging strategy presented in the next section of this report relies on the Recommended channel network. This profile is the culmination of the consultation process, reflecting consideration by the SRG of the:

- ▶ Various usage requirements expressed through consultation;
- ▶ Estimated cost to maintain a particular profile in a given area; and
- ▶ Perceived need to maintain different levels of access in each channel segment.

All depths are in metres below LAT (Lowest Astronomical Tide). Width refers to the distance at the base of the channel between batters. The area dredged is often wider than this to provide a stable slope, or batter, at the edges of the channel.

Table 6 introduces three new segments, “Main Channel (South)” and “Main Channel (North)”, and “Seaway Entrance”, that do not appear in the earlier tables. Previously in this report, the two main channel segments were treated as a single segment – “Main Channel”. The reason for this differentiation is that the final SRG recommended width for these two segments is different (60m and 40m, respectively); the depths are identical (2.5m). The Seaway Entrance was not previously identified as an area for dredging, but was recommended by the SRG in the final round of discussions. The Seaway Entrance is discussed further in Appendix B.



Table 6 Profile of Identified Channel Networks

Primary Channels	Base Case (width, m)	Base Case (depth, m)	SRG (width, m)	SRG (depth, m)	e-Survey (width, m)	e-Survey (depth, m)	Recommended (width, m)	Recommended (depth, m)
South Channel	100	4.5	100	4.5	100	4.0	100	4.5
North Channel ³	40	3.5	60	4.0	60	4.0	100 / 60	3.5
Main Channel (South)	40	2.5	60	4.0	60	3.0	60	2.5
Main Channel (North)							40	2.5
Coomera River Lower Reach	40	3.5	60	4.0	60	3.5-4.0	40	3.5
Seaway Entrance							100	6.0
Secondary Channels								
Nerang River	40	2.5	40	2.5	40	3.0	40	1.0
Labrador Channel	40	2.5	40	2.5	40	3.0	40	2.0
South Wavebreak Island Channel	40	2.5	40	2.5	40	3.0	40	2.5
West Crab Island Channel	40	2.5	30	2.5	40	3.0	40	2.5
Coomera River Upper Reach (South Branch)	40	2.5	40	2.5			40	2.5
Coomera River (North Branch)	40	2.5	30	2.0	50	2.5	40	1.0
Eastern Channels	40	2.5	40	2.5	40	3.0	40	2.0
Tipplers Passage	40	2.5	40	2.5			60	2.0
Canaipa Passage	40	2.5	40	2.5	40	3.0	40	2.5

³ Under current approvals, the North Channel is ~100m wide at the Seaway, tapering to 40m at the "Deep Hole", where it meets with the West Crab Island and Labrador Channels



3.3 Other Channels within the Network

There is limited or nil survey data available for many other established channels in the network. The Study Reference Group was not asked to suggest profiles (width, depth) for these channels and generally there have been few requests to dredge in these areas, or safety concerns expressed by Maritime Safety Queensland. As a result, dredging has not been undertaken in most of these channels. Proposed profiles based on known and/or expected use are provided in Table 7 for some of these channels, several of which are important for commercial vessels, including passenger transport.

All established channels within the study area that are not included in the recommended network profile will be surveyed periodically to establish a baseline and monitor channel bathymetry. Where a sand bar formation in a secondary channel creates unsafe channel access and this cannot be rectified by the relocation of beacons to provide sufficient depth of water, dredging within the sand bar formation will be pursued, subject to funding and granting of necessary approvals, to remove the material.

Generally the proposed channel depth will be the average depth plus 500 mm to allow for insurance dredging. Insurance dredging refers to additional dredging deeper than the design depth – the depths as proposed in this study – to provide a period of time before dredging in the channel is again required to restore the design depth. The general suggested profile for these channels is 30 metres width by 2.0 metres depth.

The list below is not meant to be exhaustive or final. It does not attempt to document all existing marked navigation channels within the study area, nor does it seek to lock-in the suggested profile. These channels were not subject to the same degree of consultation as other channels in this study. They are essentially outside the primary scope of this study, but are included in recognition of the fact that the study is not intended to be a static document. Rather, it is only a starting point.

It is intended to reflect most of the network, but there is also a need for flexibility in the future to accommodate evolving demand. Appropriate consultation, particularly with regulatory agencies, will be required for these other channels as needs develop. This section is intended to provide clarity for future planning and discussions.

Table 7 Other Channels

Secondary Channels	Type of Dredging	Width (m)	Depth (m)
Erapah Creek	Capital	30	2.0
Weinam Creek	Capital	30	2.0
Victoria Point	Maintenance	30	2.0
Logan River Entrance	Capital	30	2.0
McKenzies Channel	Capital	30	2.0
Whalley's Gutter	Capital	30	2.0
Krummel Passage	Capital	40	3.0
Biggera Creek	Maintenance	30	2.0
Pimpama River	Capital	30	2.0
Sovereign Islands Channel	Capital	40	2.5



4. Preliminary Dredging Strategy

4.1 Introduction

This section provides a strategy to establish and maintain the “recommended” channel profiles. This is a preliminary strategy, which could be altered to accommodate changes in the channels by natural phenomenon or funding considerations.

This analysis necessarily involves a number of assumptions, most significantly the variability of natural processes. Tides and currents constantly redistribute sediments. The recommended profiles attempt to balance navigational requirements and excessive costs due to unacceptably rapid infill. The recommended profiles generally reflect bed levels that are close to existing natural contours.

This profile should generally infill gradually, requiring dredging of the channel segment on a 3-7 year basis. When the need for dredging arises, the majority of the channel should be near the recommended profile. Experience indicates that certain “choke points” infill at a quicker rate, producing a bar or “speed bump” in the navigation channel. The goal is to dredge when the choke points reach the recommended channel depth. This should result in nil to minimal removal of material over most of the channel segment, with the majority of the dredge material coming from choke points. The ability to meet this goal is dependent on the rate of infill at choke points, funding and other variables.

Another significant assumption for the cost estimates is the existing profiles. The survey data used may be several years old, and the channel bathymetry may be significantly different when a project is initiated. This could obviously occur even where survey data is current at the time of the study, particularly for projects that are towards the end of the five-year program.

Another variable is escalation of the cost of dredging. This is driven to a substantial extent by the cost of fuel. Allowing for these trends is beyond the scope of this study. However, there are potential cost savings available as a result of the implementation of this study. These cost savings will, to some extent, offset the existing costs, thereby providing a cushion against cost escalation and other variables such as infill at an adverse rate due to natural processes.

Potential cost savings are largely attributable to two factors. The first is an intention for this study, in conjunction with the Marine Infrastructure Master Plan, to provide the basis for the issuance of a coordinated permit mechanism that reduces both the time and uncertainty associated with the current project-by-project approach. The second, facilitated by the coordinated permitting, is the ability to utilise long-term procurement mechanisms, replacing project-by-project tendering processes with an alternative such as a single five or ten-year contract for programmed works. In addition, coordinated permitting will hopefully provide environmental and/or social benefits in terms of identifying locations for the deposition of dredged sand to stabilise erosion areas and/or establish beaches.

Table 8 summarises the type of dredging that will be required to establish the recommended profile. For each channel segment, the table indicates whether establishing the recommended width, depth and length of the channel requires maintenance dredging or capital dredging (these could also include maintenance dredging). Capital dredging could be required because the segment has never been dredged (width, depth and length all capital) or as a result of a recommended increase in the depth and/or width of the segment. In the case of length, a capital reference does not mean that the entire length requires dredging (or would ever require dredging); however, dredging could in the future occur anywhere along the length, if necessary to remove shoaling.



Table 8 Type of Proposed Dredging for Identified Channels

Primary Channels	Last Dredged	Type of Dredging (width)	Type of Dredging (depth)	Type of Dredging (length)
South Channel	2009	Maintenance	Maintenance	Maintenance
North Channel	2004-05	Capital	Maintenance	Capital
Main Channel (South)	1990	Capital	Capital	Capital
Main Channel (North)	1997-98	Maintenance	Maintenance	Capital
Coomera River Lower Reach (South Branch)	2004-05	Maintenance	Maintenance	Maintenance
Seaway Entrance	Never	Capital	Capital	Capital
Secondary Channels				
Nerang River	1989-90	Maintenance	Maintenance	Capital
Labrador Channel	Never	Capital	Capital	Capital
South Wavebreak Island Channel	1999-00	Maintenance	Maintenance	Maintenance
West Crab Island Channel	1990-91	Maintenance	Maintenance	Capital
Coomera River Upper Reach (South Branch)	2002	Maintenance	Maintenance	Maintenance
Coomera River (North Branch)	Never	Capital	Capital	Capital
Eastern Channels	1984-85	Capital	Capital	Capital
Tipplers Passage	1989-90	Capital	Capital	Capital
Canaipa Passage	1995-96	Maintenance	Maintenance	Capital
Other Channels				
Eprapah Creek	Never	Capital	Capital	Capital
Weinam Creek	Never	Capital	Capital	Capital
Victoria Point	Unknown	Maintenance	Maintenance	Maintenance
Logan River Entrance	Never	Capital	Capital	Capital
McKenzies Channel	1984	Maintenance	Maintenance	Maintenance
Whalley's Gutter	1987-88	Maintenance	Maintenance	Capital
Krummel Passage	Never	Capital	Capital	Capital
Biggera Creek	1996-97	Maintenance	Maintenance	Capital
Pimpama River	Never	Capital	Capital	Capital
Sovereign Islands Channel	Never	Capital	Capital	Capital



4.2 Five-Year Dredging Program to Establish Network

This section presents a five-year program of works to establish the network, through a combination of maintenance (re-establishing the recommended profile, where it matches the profile of previous dredging projects) and capital (areas not previously dredged, or where proposed dredging extent exceeds historical dredging) dredging projects. Upon completion of all of the projects in the five-year program, the recommended network profile will have been established. Once established, an ongoing maintenance program will be required in perpetuity to ensure channels meet the designated profiles.

The volume of material that must be removed to establish the recommended profile in each channel has been estimated based on best available survey information. For most channels, port, starboard and centre readings were taken at 50-metre chainage intervals. Volumes were then calculated for both the channel section and the batters (stable slopes to either side of the channel). While this involves some interpolation, and some survey data is dated, the estimates are considered to be generally conservative.

Table 9 provides an indication of the surveyed channel profile compared to the recommended profile. The estimated volume of material that needs to be removed from each channel to establish the profile is provided, as a total and as the split between channel and batter sections. The “% No Dredging” column indicates the proportion of the channel that meets or exceeds the recommended profile. Finally, two “cover” depths are provided. “Maximum Cover” is the difference between the shallowest point on the survey and the recommended profile. “Average Cover” indicates how thick the layer would be if the volume were evenly distributed over the percentage of the channel that requires dredging.

The five-year program is shown in Table 10. Figures 3 and 4 show the approximate locations of the capital and maintenance projects proposed for each year of the program. Dredging costs were estimated by assuming a standard cost of \$19,200/day (12 hour day, 1 dredger) and a production rate of 800 cubic metres per day. Other possible costs such as mobilisation, project management, procurement, survey and environmental were not factored in. The actual cost, as well as the rate of extraction per day will vary with factors such as the type of dredge and the distance from the dredge site to the deposition site.

Approximately one-third of the works to establish the network (based on either cost or volume) are maintenance – re-establishing previously dredged profiles. These are all scheduled for Years 1-3 of the program. Projects scheduled for Year 1 (2008-09) were either completed or commenced during that period. The Year 2 projects have all been programmed for 2008-10. The Year 3 maintenance projects, which complete the initial “catch-up” maintenance works, have also been tentatively programmed.

The capital components are scheduled for Years 3-5 (2010-13) of the program, and are skewed towards the later part of that period. This provides time to secure approvals, which are more complex than approvals for maintenance dredging projects. It also provides time to consider alternative strategies for procurement, dredging and spoil management, and financing. This is discussed further in Chapter 6.

The overall dredging costs for the five-year program are summarised at the bottom of Table 10. Approximately \$9.0m worth of “catch-up” maintenance is provided in Years 1-3. The total capital component is approximately \$18m; as discussed above, this ramps up from Year 3 forward. The estimated ongoing maintenance requirement of \$3.0m per year is shown starting in Year 4.

Actual dredging needs will vary as a function of natural processes. This program is only indicative and is also dependent on approvals and funding. However, historical experience indicates that these natural variations are cyclical – providing both ‘ebb’ and ‘flow’ – so once the channels are established, it should be possible to maintain a reasonable standard throughout the network with an allocation of \$3m per year.



Table 9 Indicative Profile Relative to Recommended Profile

Primary Channels	Length (m)	Total Volume (m3)	Maximum Cover (mm)	Channel			Batters		
				% Total Volume	% No Dredging	Average Cover (mm) ⁴	% Total Volume	% No Dredging	Average Cover (mm)
South Channel	4,800	34,000	1,400	67%	88%	336	34%	70%	350
North Channel	8,200	40,000	1,300	75%	84%	277	25%	75%	241
Main Channel (South)	5,850	7,000	1,300	84%	93%	246	24%	91%	107
Main Channel (North)	26,550	395,000	2,600	92%	56%	766	8%	55%	257
Coomera River Lower Reach (South Branch)	10,950	178,000	1,800	76%	32%	484	24%	29%	471
Seaway Entrance	1,700	46,000	2,100	82%	73%	792	18%	77%	403
Secondary Channels									
Nerang River	13,700	12,000	1,000	81%	90%	180	18%	89%	182
Labrador Channel	5,800	143,000	1,900	94%	23%	791	6%	21%	558
South Wavebreak Island Channel	800	15,000	1,900	93%	50%	824	5%	47%	189
West Crab Island Channel	8,000	55,000	1,900	93%	34%	250	8%	36%	107
Coomera River Upper Reach (South Branch)	1,200	460	500	11%	98%	50	89%	72%	122
Coomera River (North Branch)	6,800	13,000	1,300	57%	81%	145	44%	59%	558
Eastern Channels	13,200	87,000	2,000	90%	64%	402	11%	59%	194
Tipplers Passage	6,500	14,000	1,400	93%	89%	289	9%	74%	95
Canaipa Passage	9,100	73,000	2,300	91%	72%	659	9%	71%	152

⁴ Depth of cover if estimated volume is evenly distributed over the part of the channel that requires dredging (for example, over 12% of the channel, if the % No Dredging is 88%).



Table 10 Five-Year Dredging Strategy

Primary Channels	Capital			Maintenance			Total Cost
	Year	Volume	Cost	Year	Volume	Cost	
South Channel				1	83,000	1,220,000	1,200,000
North Channel				1	5,000	150,000	1,100,000
	3	14,000	335,000	3	26,000	625,000	
Main Channel (South)	3	7,000	170,000				
Main Channel (North)	5	330,000	7,920,000	2	65,000	1,100,000	9,020,000
Coomera River Lower Reach				1	32,000	480,000	1,680,000
				2	53,000	1,200,000	
Seaway Entrance	3	46,000	1,100,000				1,100,000
Secondary Channels							
Nerang River	4	12,000	285,000				285,000
Labrador Channel	4	143,000	3,430,000				3,430,000
South Wavebreak Island Channel				1	26,000	380,000	380,000
West Crab Island Channel				1	15,000	450,000	3,250,000
				3	100,000	2,800,000	
Coomera River Upper Reach (South Branch)				2	500	12,000	12,000
Coomera River (North Branch)	5	48,000	1,160,000				1,160,000
Eastern Channels	5	87,000	2,100,000				2,100,000
Tipplers Passage	4	14,000	345,000				345,000
Canaipa Passage	4	48,000	1,150,000	2	23,000	555,000	1,150,000
Totals – Year 1		-	-		161,000	2,680,000	2,680,000
Totals – Year 2		-	-		141,500	2,862,000	2,862,000
Totals – Year 3		67,000	1,605,000		126,000	3,425,000	5,030,000
Totals – Year 4 ⁵		217,000	5,210,000		-	3,000,000	8,210,000
Totals – Year 5		465,000	11,180,000		-	3,000,000	14,180,000
Grand Total		749,000	17,995,000		428,500	14,967,000	32,962,000

⁵ Annual maintenance allocation included in Year 4 and 5 (and continuing thereafter, in perpetuity)

Figure 5 Five Year Dredging – Map 1 of 2

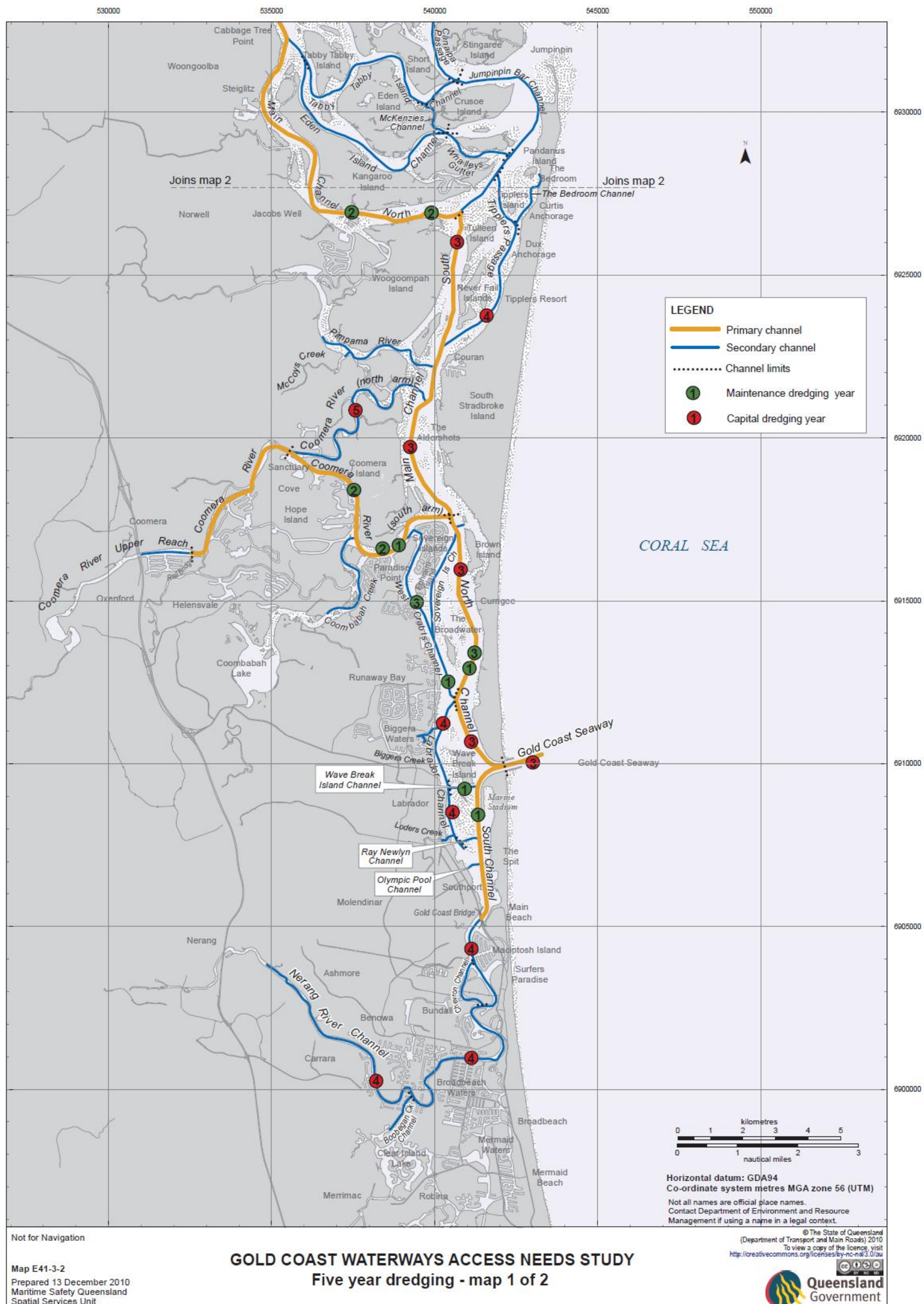
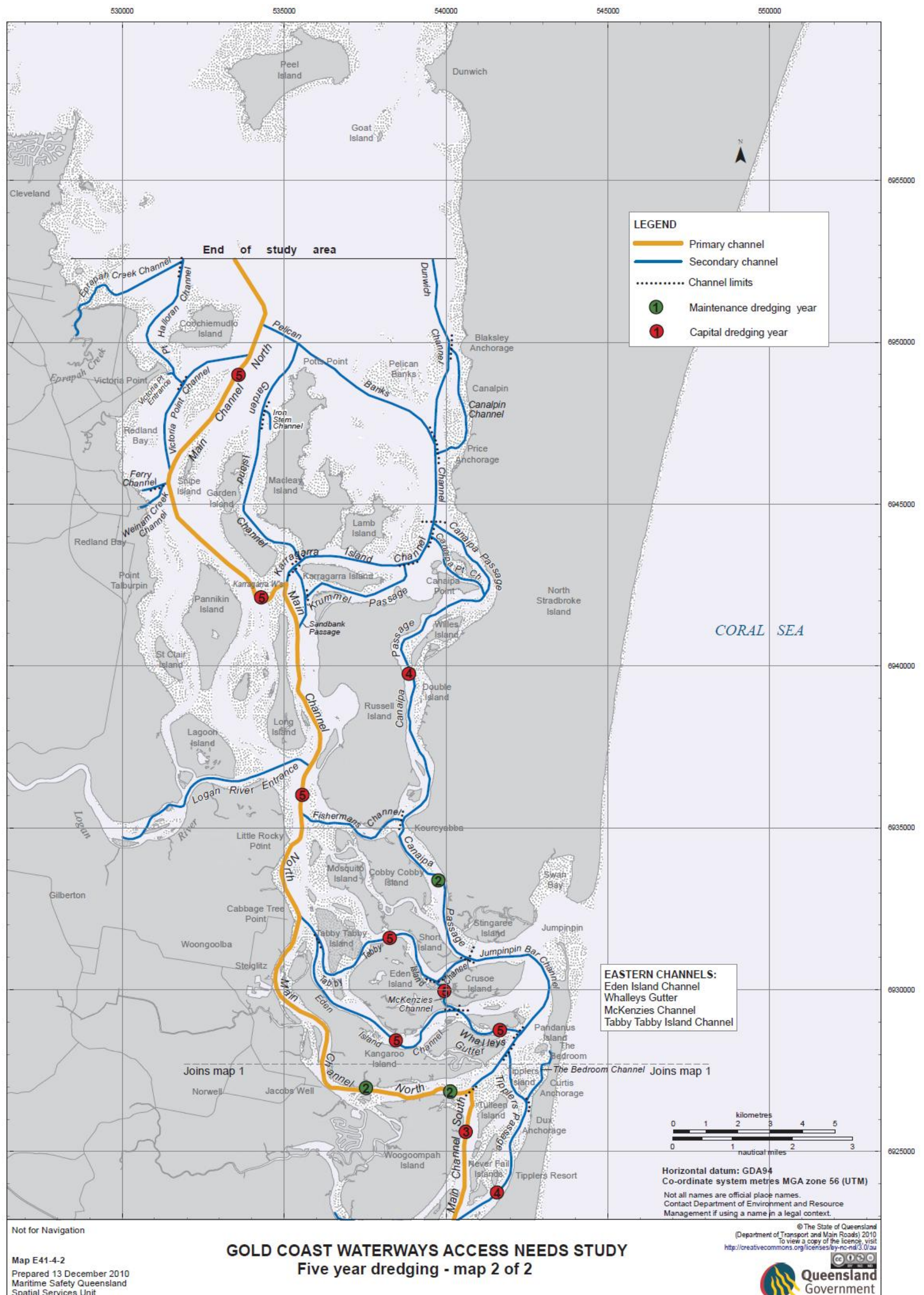


Figure 6 Five Year Dredging – Map 2 of 2





4.3 Notes on Identified Channel Segments

The general goal is to establish a profile that addresses navigational demand in a cost-effective manner. Experience and scientific theory suggest that channel profiles that are close to the natural bathymetry will generally be more sustainable. The mobilisation costs associated with a dredging project mean that it is generally more cost-effective to limit the frequency of dredging projects.

Insurance dredging is the mechanism used to provide extra capacity in the channel depth to allow for infill and extend the interval between dredging projects. However, this mechanism is limited by the fact that a deeper channel will infill at a more rapid rate, if there is sediment adjacent to the channel at a shallower depth. The goal is to strike the balance that provides an economically efficient outcome.

Historically, a margin of approximately 0.5m has been provided in the study area for insurance purposes. This means that a channel segment with a recommended depth of 3.0 metres would be dredged to 3.5m. Ideally, this would provide a 3-7 year window of time before infill produces areas in the channel with a depth of less than 3.0m.

In some areas, the rate of observed infill has been more rapid. An example is the South Channel, just adjacent to the Seaway, between Wavebreak Island and Doug Jennings Park. The permits for this segment were recently amended to allow for dredging to a greater depth in an attempt to provide a longer interval before unacceptable shoaling.

The depths in the recommend profile are the desirable navigation standard. This means that the depth for approvals and dredging projects will be greater. This strategy is intended to be dynamic. Implementation of a programmed dredging regime will allow a more accurate estimate of the rate of infill. Based on this information, there may be a need to seek approval for a revised profile to provide greater infill capacity, or to revise the channel design depth to reflect a more sustainable profile.

Appendix B presents specific considerations regarding all the channel segments in the network, including a history of recorded dredging events. Note that, as discussed above, all of the depths in this study refer to the depth below the Lowest Astronomical Tide (LAT). The tidal range in the study area is approximately 1.5m to 2.0m. This means that at high tide (two times per day) the channel depth will be 1.5m to 2.0m more than the depths in this study.



5. Economic Analysis

5.1 Introduction

This section of the report summarises economic and financial analyses undertaken for “a channel dredging strategy which supports future stakeholder-stated navigation needs during the next decade”⁶ and beyond to 2029.⁷ This summary is supported by technical documentation that has been provided as attached appendices to enable review by Queensland Treasury and other concerned individuals and organisations, particularly those that might be partners in funding implementation of the strategy.

5.2 Purpose of the Economic Analyses

The key question for this analysis is: “Should government commit to programmed dredging of a channel network in Gold Coast waters?” Government involvement is typically supported when there is “market failure” – when the private sector is not adequately addressing “market demand” – meeting stakeholder expectations. Media coverage and interviews conducted with industry stakeholders, as reported earlier in Section 2 of this document, suggests that there is a clear public perception of a market failure in relation to the profiles for the navigational channels included in the consultation.

From an economic perspective, this market failure can be attributed to the public good or common property ownership characteristics of waterways. This arises from the inability of the private sector to control and charge for use of the waterways. This inability is due to both technical difficulties and societal expectations. Legally, the public, through government, owns the channel beds.

It can also be argued that the markets for recreational boating on the Gold Coast Waterways are incomplete, do not cover all risks to users and do not extend infinitely far into the future. Hence, there is an a priori rationale supporting public sector involvement in a dredging strategy for the waterways.

To use an analogy, navigational channels can be equated to roads. Roads are typically considered as a public good – a monopoly service provided by government. Despite a range of opinions about the extent to which public infrastructure can or should be privatised, the government model still prevails.

In the case of roads, there are both local roads and major highways. Local roads and, on the Gold Coast, canals, are maintained by local government. While there is an acknowledged State road network in Queensland, there has not been a similar commitment to a State “channel network”.

Navigational aids are provided, but there are no established channel standards and dredging has been largely ad hoc. There are isolated incidents, such as ports, State Boat Harbours, and the Gold Coast Seaway that are publicly maintained. Typically, commerce (such as in a port) or other concerns such as flooding, are the driver for dredging. The concept of a publicly maintained channel network to facilitate transportation for recreational vessels between destinations is uncommon.

A commitment to establish and maintain a channel network for recreational vessels, as envisioned by this document, would represent a relatively unique commitment by the Queensland Government. The key purpose of this study is to establish whether there is a net benefit to the State from investing in the establishment and ongoing maintenance of such a network on the Gold Coast.

⁶ Gold Coast Waterways Access Needs Study Terms of Reference, 2007, p. 3.

⁷ A 20-year period (2009-2029) is typical for economic analyses; presumably, maintenance would continue in perpetuity.



5.3 The Nature of the Project Analyses

Two separate analyses have been undertaken for this part of the study:

- ▶ A Cost-Benefit Analysis of the economic justification for government funding of the initial dredging program, using Queensland Treasury and Council of Australian Governments (COAG) Guidelines and the 20-year period from 2008/09 to 2027/28; and
- ▶ A financial analysis of the historic and current levels of user fees and related government fees and charges collected from recreational and commercial boat owners and operators, including opportunities for increased cost recovery to fund the ongoing maintenance costs.

Typically, governments support capital investment in infrastructure where the perceived 'public interest' benefits are unambiguous and can be shown to significantly outweigh the costs of implementation. How the project is to be sustained over the life of the project is a key issue.

Typically public sector infrastructure projects are developed and appraised over a minimum of 20 years. Cost considerations include both ongoing funding requirements and the potential to recover costs from beneficiaries. The goal is a sustainable outcome that maximises investment benefits.

The preceding chapter detailed a five-year investment program to establish the network to the "recommended profile". A perpetual maintenance expenditure is also required; the five-year program in the preceding chapter allowed for that annual investment to commence in Year 4, following completion of the initial maintenance work to re-establish the profiles for previously dredged sections. This investment scenario has been used as the basis for the analyses in this chapter.

This exact scenario may not eventuate; due to a number of factors. The ability to complete the five-year program is dependent on securing the necessary approvals and financing. This is particularly critical in relation to proposed capital dredging, which requires both significant investment and extensive consideration by regulatory agencies. Market consultation could result in contractors identifying more cost-effective strategies for establishment and maintenance of the program. These cost savings could require the program schedule to be accelerated or delayed, by affecting approvals (due to different methodologies), or government or market investment requirements, as examples.

As the ultimate investment scenario depends on negotiation between financing partners, and potentially expressions of interest from the market, this study can only provide approximate guidance by considering a likely scenario. From an economic analysis perspective, while the flow of benefits might change somewhat with different investment scenarios, the net result will most probably be substantially unchanged. The key issue is the extent to which the State should fund both (a) the initial capital and maintenance dredging and (b) the subsequent annualised maintenance/support program.

5.4 Economic Methodology

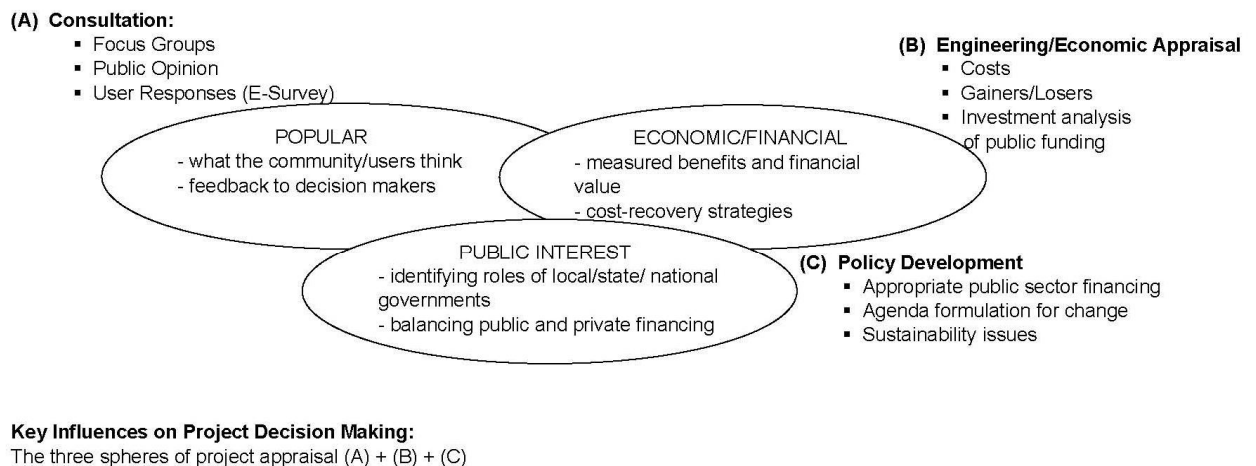
5.4.1 Strategic Overview

The separate economic and financial analyses of the proposed dredging strategy for the Gold Coast waterways has relied upon the completion of three interlocking areas of activity. These have been:

- ▶ Consultation
- ▶ Technical/Economic Appraisal
- ▶ Policy Development

Figure 7 provides a schematic overview of how the various consultancy activities have been able to identify the strategic significance of the project. The nature of the interlocking themes of (a) popular opinion, (b) economic/financial findings and (c) the role of the public interest (in terms of State Government acceptance) can also be clearly recognised.

Figure 7 Strategic Overview of the Gold Coast Waterways Navigation Needs Assessment



5.4.2 Economic Appraisal and Logic

Typically, the success of public sector projects, such as proposed for the Gold Coast waterways, depends on the initial design, the timely availability of funds and the size and distribution of the benefits. For this Gold Coast project, it has been necessary to ensure that the proposed dredging investment will contribute to the State's welfare, beginning at the local and regional level; that the project is financially viable; that recurrent costs will be met; and that the distribution of both costs and benefits is deemed acceptable or 'fair' at the State level. The sources of funding are also an important policy consideration; the State Government has signalled a need for public funding to be supplemented by funding from other stakeholder constituencies.

The start-point for the iterative economic appraisal/assessment of the proposed dredging program has been the identification of the nature of the 'with' and 'without' conditions expected over the 20-year time period 2008/09 to 2027/28. This 'with' and 'without' comparison attempts to measure the incremental benefits arising from the investment. The need to forecast the likely economic performance of sectors dependent on the waterways is difficult. However, detailed one-on-one interviews with informed industry sector personnel have yielded a range of reliable data, capable of cross-checking from iterative field interviews and available research data.⁸

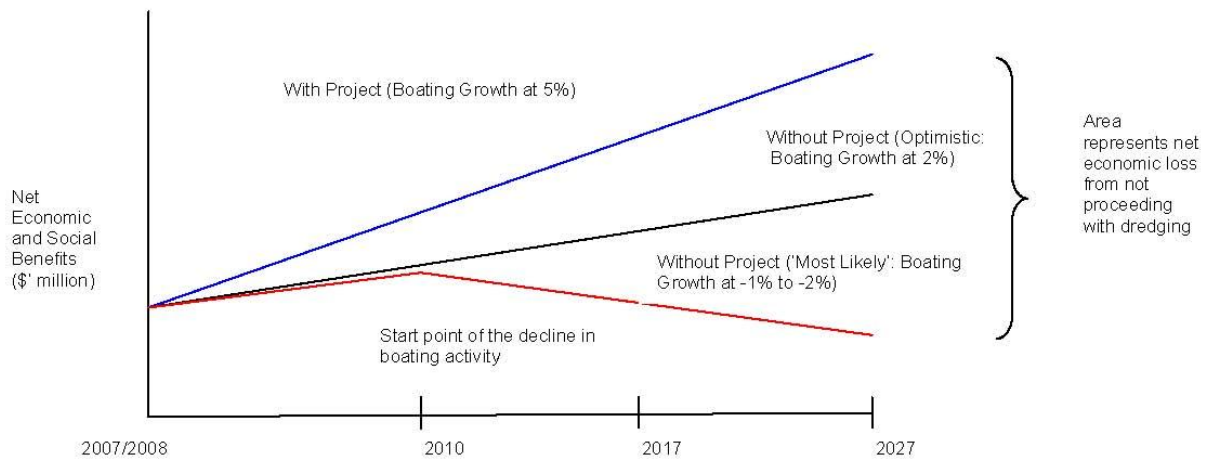
Figure 8 provides an overview of how the 'with' and 'without' project situation has been perceived and the nature of the underlying logic to establish the incremental benefits. It is important that the economic

⁸ Of particular assistance has been the Queensland Department of Tourism, Regional Development and Industry report "The Marine Research Report", 2007.

appraisal does not overestimate the nature of the benefits. Hence, the impact of likely growth, in a 'without' investment future, has been considered.

Based on direct interview data obtained from a broad range of stakeholders, it has been possible to establish that capacity constraints for recreational and commercial boating on the Broadwater and for most of the channels will be reached by 2010. The point at which no further supply is likely to be available at peak periods of boating can be recognised in Figure 8, which diagrammatically illustrates how various growth or 'non-growth' scenarios are likely to develop. In the 'no dredging' scenario, future growth in recreational demand cannot be realistically assumed to occur.

Figure 8 With' and 'Without' Channel Deepening - Economic Loss Identification



With the project, annual boating activity (with various forms) is expected to grow, in the range of 5 - 11% per annum, over the next 20 years. In the 'without' project case, the most positive scenario is that marine-related activities will grow at a lower annual rate as the impact of the reduced draught or depth 'cap' takes effect. In the worst case scenario, overall recreational boating volumes, by 2010, will begin to decline in absolute terms, as siltation in all primary or main channels and secondary channels reduces the opportunities for boating across the Gold Coast waterways' area of influence.

Increased congestion, limited capacity for deeper draught vessels and increased safety risks can be expected. The Gold Coast will lose its position as the primary recreational boating centre in Australia. The region's commercial boat building and yacht manufacturing capability will slowly decline. Significant export sales of boats and yachts will be lost and employment levels will be reduced as the manufacturing activity downsizes, and as the image of the Gold Coast as a major boat building centre is downgraded.

Detailed one-on-one interviews with more than thirty (30) industry representatives and boating-user personnel have indicated a broad range of concerns associated with not proceeding with channel deepening, both in terms of (i) capital and maintenance dredging to establish adequate channel profiles across the waterways, and (ii) future maintenance dredging to maintain depths and widths.



5.4.3 Substitution Effects

The Gold Coast waterways have been widely recognised as an important location for recreational boating and commercial boating involving tourism. This can be identified from (a) the numbers of recreational boats registered; (b) the size of the marina industry and related boat moorings; and (c) the scale of boat building/yacht construction and servicing/maintenance.

In the 'do-nothing' or no dredging scenario, the extent to which recreational and commercial boating activity can be relocated to other locations along Queensland's coastline has been considered. Boat ownership and marina facilities represent significantly fixed investment items. Residents of the Gold Coast are most unlikely to relocate in order to continue boating. Similarly, the Coomera commercial facilities cannot be relocated, should water access continue to be limited.

Anecdotal evidence suggests that a decline in commercial boat building and repair work in the Gold Coast due to the condition of the channels would result in a loss of employment in the industry for the sector and the Queensland economy. At issue is the extent to which specific boat building skills will relocate to NSW (the Newcastle area) and the Perth/Kwinana area of WA. Tradespersons who leave the export-oriented boat construction sector in Queensland for employment in the domestic building industry represent permanent losses to Queensland's export capacity.

5.5 Economic Analysis

5.5.1 Economic Costs

Table 11 summarises the estimated costs of dredging for each year, based on the 5-year program presented in Section 4. This represents the costs to establish (and, from Year-4 forwards, maintain) the "recommended" profile, which resulted from:

- ▶ Industry personnel recommendations (commercial, recreational and tourism sectors);
- ▶ Recommendations of the Study Reference Group; and
- ▶ Results of the e-survey of recreational boating interests and boat owners.

The five-year program to establish the network requires an investment of approximately \$27 million. This includes a "catch-up" maintenance expenditure of approximately \$9 million in years 1-3 of the program to restore previously dredged areas to the historically established profiles. The remaining \$18 million is allocated across years 3-5 to address the capital investment required to undertake dredging in areas not previously dredged and to increase the width and/or depth of channels beyond that previously dredged, as required for the "recommended profile".

In addition to the initial \$9.0 million maintenance expenditure in years 1-3, there is a perpetual maintenance expenditure of approximately \$3.0 million per year. The five-year program in the preceding chapter allowed for that annual investment to commence in year 4, following completion of the initial maintenance work to re-establish the profiles for previously dredged sections. This ongoing investment is analogous to annual maintenance programs for other forms of publicly-owned infrastructure such as motorways, roads and port/harbour dredging for designated commercial ports.



Table 11 Dredging Costs: Maintenance, Capital and Annual Maintenance (2008 Prices \$)

Program Year	As of 30 June	Maintenance ¹	Capital ²	Annual Maintenance ³
Year 1	2009	2,680,000		
Year 2	2010	2,862,000		
Year 3	2011	3,425,000	1,605,000	
Year 4	2012		5,210,000	3,000,000
Year 5	2013		11,180,000	3,000,000
Sub-total		8,967,000	17,995,000	3,000,000 / yr

Notes:

- 1: Maintenance dredging refers to works to re-establish depths/widths in previously dredged channel segments.
- 2: Capital dredging is work to deepen and/or widen previously dredged channels or any work in channels not previously dredged.
- 3: Annual/periodic dredging to maintain depths and widths as established by the initial capital and maintenance investment.

5.5.2 Economic Benefits

A broad range of economic benefits and/or avoided costs were identified, quantified and monetised to assess the merit of State Government investment in the recommended dredging program. Each of the benefits was estimated on a conservative basis and reflect economic or resource effects at the local, regional and state level. Benefits were not assumed to accrue until after the network was established – following the completion of capital works based on the 5-year program (adding to the conservative estimates). Central to the benefit estimation has been the concept of identifying the shadow price or opportunity costs of not proceeding with a dredging program.

All benefits were derived from a comparison of the 'with' project effects and the 'no-dredging' option. Hence, benefits have been estimated on an incremental basis. None of the benefits include 'willingness to pay', as distinct from actual payments. Where benefits have been derived from commercial operations, the estimate reflects the gross margin or gross revenue, rather than the total expenditure. This is particularly important in tourism/recreation sectors where the 'leakage' of expenditures from outsourcing can be high. If the total expenditures are recorded as losses, or dis-benefits, the size of the penalty can be overstated, in the 'with' and 'without' comparison.

Care has been taken to ensure that there has been no double counting of benefits. Individual benefit items reflect economic and financial losses or costs in the do-nothing or no dredging option. For example, the estimated losses in the marina sector relate to marina fees and turnover and do not include tourist spending on marina charters or recreational spending on day trips from marinas.

The analysis identified significant benefits associated with commitment to the dredging program; alternatively, not undertaking the dredging will result in a range of losses, or economic cost penalties. Table 12 summarises the identified range of benefits. Detailed discussion regarding the key benefits of the proposed dredging program, typically defined as avoided losses, is provided in Appendix C. No financing costs have been estimated in any of the economic benefits.



Table 12 Range of Benefits (Avoided Losses) (2008 \$ million) (No GST/Taxes)

	Year Ended June	Domestic Visitor Spending	Recreational Boating	CMP Refits/ Maintenance	CMP Employment	Marinas Income	Marinas Employment	Marinas Brokerage	Commercial Boat Revenues	Super Yacht Revenues
1	2009									
2	2010									
3	2011									
4	2012									
5	2013									
6	2014	4.20	2.08	1.74	1.39	0.27	3.38	2.04	0.72	0.38
7	2015	4.72	2.25	1.97	1.52	0.28	3.76	2.11	0.82	0.44
8	2016	5.25	2.43	2.22	1.65	0.29	4.15	2.18	0.92	0.51
9	2017	5.79	2.61	2.47	1.77	0.30	4.55	2.25	1.01	0.59
10	2018	6.34	2.81	2.74	1.90	0.31	4.96	2.32	1.10	0.68
11	2019	6.91	3.01	3.03	2.03	0.32	5.37	2.39	1.19	0.78
12	2020	7.48	3.23	3.33	2.15	0.33	5.80	2.47	1.26	0.88
13	2021	8.07	3.45	3.64	2.28	0.34	6.24	2.55	1.33	1.00
14	2022	8.67	3.69	3.97	2.41	0.35	6.68	2.63	1.38	1.13
15	2023	9.28	3.95	4.32	2.53	0.36	7.14	2.71	1.44	1.28
16	2024	9.90	4.21	4.68	2.66	0.37	7.61	2.80	1.48	1.44
17	2025	10.54	4.49	5.06	2.79	0.38	8.09	2.88	1.51	1.61
18	2026	11.22	4.78	5.47	2.92	0.39	8.60	2.97	1.54	1.64
19	2027	11.93	5.09	5.92	3.06	0.39	9.14	3.05	1.58	1.67
20	2028	12.70	5.42	6.40	3.22	0.40	9.72	3.14	1.61	1.70
Total		123.00	53.50	56.97	34.27	5.07	95.20	38.48	18.88	15.73
% Total		27.9%	12.1%	12.9%	7.8%	1.1%	21.6%	8.7%	4.3%	3.6%

Note: See Appendix C for detailed discussion of each benefit stream.

The most significant benefit stream is Domestic Visitor Spending, which along with Marinas Employment accounts for nearly one-half of the total estimated avoided losses. Also significant are Recreational Boating and Coomera Marine Precinct (CMP) Refits/Maintenance, collectively representing approximately one-quarter of the benefit stream.

In addition to the economic benefits identified above, a range of non-quantifiable secondary or intangible benefits, or impacts of proceeding with dredging, were identified:

- Increased amenity value from increased resident/tourist satisfaction with the boating experience;
- Increased navigational safety, collisions and groundings, from increased channel capacities;
- Increased capital investment in expanding marinas and commercial boating/tourist craft;
- Long-term employment opportunities due to greater confidence in future boating activity;
- Potential increased opportunities for ferry services with associated transport benefits; and
- Reduced repairs and/or insurance costs associated with vessels running aground.



All of these externalities are positive; no negative externalities were identified. Environmental effects were not assessed as the impacts of dredging depend on methodology and there are environmental effects associated with not dredging – the damages caused by vessels running aground and disturbing the bottom.

Environmental factors are acknowledged, but considered to be the realm of the approvals process. Environmental mitigation costs, if any, have also not been accounted for, however, an intent of this programmatic approach to dredging is understood to be a similarly coordinated approach to environmental monitoring; as such, both cost savings and improved environmental outcomes could be available, relative to the current or no project scenario.

5.6 Economic Results

A conventional discounted cash flow (DCF) analysis was completed to develop the range of cost-benefit analysis results. A time period of 20 years was assumed. No multiplier effects from expenditure flows or employment estimates have been included. All cost and benefit items have been expressed in 2008 constant prices.

The discount rate used (7.0%) was as advised by the Queensland Treasury in March 2008. This rate was also consistent with Commonwealth Government infrastructure projects. No residual values were included in the economic analyses related to capital investment in dredging, as the channels were considered to require annual maintenance dredging for the prescribed waterways depths to be assured.

Table 13 provides an annualised summary of the net benefit stream from the recommended dredging program. These results may be regarded as conservative estimates of avoided costs with dredging. All benefits and costs were assumed to accrue to the local/regional/state economy; hence, all Commonwealth tax effects have been eliminated.

No quantification or estimation of environmental externalities has been made in relation to the potential 'gains' and 'losses' from proposed dredging. No specific evidence of environmental dis-benefit or negative impact was available to be quantified, monetised and included. A case-by-case analysis of potential environmental dis-benefits would be required. This was beyond the time and resource scope of this study.

In addition to the nine individual benefit streams listed above, a further range of less tangible, yet important, benefits from the dredging program are summarised below. The most significant intangible benefits relate to decreased house values along the waterways and the importance of improving the image of the Gold Coast as a desirable destination for interstate/international yacht visits.

- ▶ **Avoided Dis-benefits (Avoided Losses)**
 - Loss of revenue from potential ferry services (e.g., South Stradbroke Island to Surfers Paradise).
 - Decreased house values along select waterways/canals, with increased siltation.
 - Decreased Gold Coast City Council land rates along select waterways/canals.
- ▶ **Additional Benefits**
 - Induced investment in rehabilitation of commercial properties adjacent to navigation channels.
 - Increased capacity for recreational boating and improved on-water safety standards.
 - Improved image of the Gold Coast as a destination for interstate/international yacht visits.
 - Additional incentives for the commercial sector to invest in water-based tourism activities.



Table 13 Estimated Net Benefit Stream (2008 Constant Prices: No GST/Taxes) (\$ million)

	Year Ended 30-June	Maintenance	Capital	Annual Maintenance	Total Dredging Costs ¹	Total Benefits ²	Net Benefit Stream
1	2009	2.68			2.68	0.00	-2.68
2	2010	2.86			2.86	0.00	-2.86
3	2011	3.43	1.61		5.03	0.00	-5.03
4	2012		5.21	3.0	8.21	0.00	-8.21
5	2013		11.18	3.0	14.18	0.00	-14.18
6	2014			3.0	3.0	16.22	13.22
7	2015			3.0	3.0	17.88	14.88
8	2016			3.0	3.0	19.59	16.59
9	2017			3.0	3.0	21.35	18.35
10	2018			3.0	3.0	23.16	20.16
11	2019			3.0	3.0	25.02	22.02
12	2020			3.0	3.0	26.93	23.93
13	2021			3.0	3.0	28.89	25.89
14	2022			3.0	3.0	30.91	27.91
15	2023			3.0	3.0	33.00	30.00
16	2024			3.0	3.0	35.14	32.14
17	2025			3.0	3.0	37.36	34.36
18	2026			3.0	3.0	39.53	36.53
19	2027			3.0	3.0	41.83	38.83
20	2028			3.0	3.0	44.29	41.29
	Total	8.97	18.00	51.00	77.96	441.10	363.14

Notes:

1: All dredging costs as shown in tables 10 and 11, above.

2: Total benefits is the sum of individual benefit streams, as shown in Table 12 above.

The overall economic viability of the dredging can be recognised from the following criteria:

- ▶ Economic internal rate of return (EIRR): 35.22%
- ▶ Net present value (NPV) : \$129.98 million
- ▶ Benefit-Cost Ratio (BCR) : 3.89

A range of sensitivity tests (or what 'ifs') were undertaken to test the robustness of the results:

What if:	EIRR (%)
▶ Total dredging costs increased by 20%	30.77%
▶ Domestic visitor spending was reduced by 20%	29.32%
▶ Capital dredging was delayed by one year	30.59%

In summary, the proposed investment by the State Government of \$27.0 million in new capital and maintenance dredging for the Gold Coast waterways, and the commitment of \$3.0 million per annum for ongoing maintenance beginning Year 4, is expected to generate significant economic benefits for the local/regional/state economies. The overall project viability is highly robust. Risk factors are not likely to be significant to the final result.



5.7 Contributions of Existing User Fees and Revenues

Table 14 details user fees and revenues contributed by individuals and businesses to various State agencies in relation to the Gold Coast waterways. Where relevant, capital and maintenance dredging volumes are assumed to be identical to those in the economic analysis.

Three key agencies receive fees and revenues:⁹

- ▶ Department of Transport and Main Roads (DTMR)
- ▶ Department of Natural Resources and Water (DNRW)
- ▶ Environmental Protection Agency (EPA)

Accessing relevant State Government data and records was difficult. The estimated contributions to the various agencies by individuals and businesses for 2006/07 are:

State Agency	\$ Million	% of Total User Fees and Revenues
▶ DTMR	\$2.3 million	76.7
▶ DNRW	\$0.5 million	16.7
▶ EPA	\$0.198 million	6.6

Table 14 also reports the forecast fees and revenues likely to be generated by waterways-dependent users for 2007/08. The forecast estimate is \$2.998 million, only slightly higher than the 2006/07 estimate. Since 1996/97, total user fees and revenues have declined overall. This is largely the result of the surrender of significant seabed leases to the DNRW. DTMR's share of total revenues has remained largely constant over the past decade. This is despite the steady growth in recreational boat registrations of approximately 5 per cent per annum since 1996/97.

The various agencies have argued that the scope to significantly increase charges beyond CPI and real economic growth targets is quite limited. Community pressure to limit fee increases to the CPI, and possibly an additional growth rate based on economic growth, are strong and well united.

Given the uncertainty of the completion of new developments associated with the proposed new marina complex south of The Seaway and various proposals for resort developments to the north of the Broadwater, it is difficult to accurately forecast future user-related fees and revenues. No other major new sources of user fees and revenues are foreseen.

For future strategic planning purposes, the likely annual range of user fees and revenues is from \$3.2 to \$3.4 million for the next decade (in 2008 prices). This excludes any new forms of additional user fees or major increases in existing levies and charges.¹⁰ Fees should be indexed to be based on the CPI, to reflect all increases in agency costs of collection and administration.

⁹ During the course of this study, Machinery of Government changes were put into effect. As a result, Queensland Transport and Main Roads were amalgamated to form the Department of Transport and Main Roads. References to Queensland Transport in this document have been updated to reflect the new name. The Environmental Protection Agency and Department of Natural Resources and Water were also amalgamated, to form the Department of Environment and Resource Management. References to the former agencies have been retained, to distinguish the individual revenue streams that existed at the time of the analysis.

¹⁰ During the course of this study, boating registration fees were increased. An allocation has been tentatively made for dredging needs in Gold Coast waterways from this increased revenue stream. This is discussed further in the next chapter.



Table 14 Summary of Fees and Other State Government Revenue (Recreational and Commercial) (\$ 000's)

Year	Department of Transport and Main Roads (DTMR)					DNR		EPA			Total
	Recreational ^{1/}	Commercial ^{2/}	Other (Marine Safety)	Marina Levy ^{3/}	Subtotal	Seabed Leases	Subtotal	Building Approvals	Dredging Royalties ^{7/}	Subtotal	Total Revenues
1996/7	930.9	1,047.6	394.1		2,372.6	2,352.3	2,352.3	106.5	20.0	126.5	4,851.4
2004/5	676.3 ^{1/}	952.0	-	510.0	2,138.3	1,150.0 ^{4/}	1,150.00	110.0 ^{6/}	33.0	143.0	3,431.3
2005/6	914.9	961.2	-	523.2	2,399.3	690.0	690.0	130.0 ^{6/}	40.0	170.0	3,259.3
2006/7	730.4	970.8	-	545.5	2,246.7	550.5	550.5	145.0 ^{6/}	42.0	187.0	2,984.2
2007/8 (forecast estimate)	775.0	975.0	-	550.0	2,300.0	500.0 ^{5/}	500.0	150.0	48.0	198.0	2,998.0

Notes:

^{1/} From 2004/5, the restructured recreational fee base covers private marine licenses, registration of boats (new, renewal) and transfer fees.

^{2/} From 2004/5, estimates cover a revised range of commercial fees and licenses.

^{3/} The Gold Coast marina levy is the only levy of its type in Queensland. It covers all commercial marina operators and yacht clubs. Commercial/rental properties with more than one permanent mooring structure are included. This levy originated with the Gold Coast Waterways Authority and is included in the 1996/7 estimates.

^{4/} Since 2004/5, a significant number of marine seabed leases have been surrendered. Southport Yacht Club and Versace are major revenue sources.

^{5/} Excludes the forecast marine lease revenue from the proposed new Marina, south of the entrance.

^{6/} Limited growth since the completion of most building sites on the canals.

^{7/} Dependent on availability of dredging capacity and dredging contracts.



6. Funding and Management Options

6.1 Introduction

An initial intent of this study was to negotiate an agreed funding partnership that included government and industry stakeholders. This was not achieved during the initial course of this study. However, following the initial consultation and analysis for this study, while the Master Plan was being finalised, officers from the Department of Transport and Main Roads continued to work with Gold Coast City Council officers and with industry stakeholders, primarily through Marine Queensland.

These efforts resulted in a very favourable response from Gold Coast City Council, with the Mayor and the Minister for Transport signing a Heads of Agreement in July 2009. Marine Queensland has been part of discussions between the State and Council regarding development of a Memorandum of Understanding to guide the cooperative management of dredging and a range of other marine and foreshore issues related to Gold Coast waterways.

While Marine Queensland has signalled a positive industry interest in the initiative, securing a funding commitment has been problematic. In part, this has been exacerbated by the effect of the Global Financial Crisis on the local marine industry. Another factor is that "Industry" is also not a homogenous entity; rather it is a collection of businesses. While Marine Queensland is able to assist, negotiation is still difficult. Finally, there is a significant sentiment that the marine industry already makes substantial contributions to the State economy, through payroll taxes, GST on fuel and in a number of other ways. Some stakeholders feel that government does not do enough for industry in return and their existing contributions should be sufficient to pay for dredging.

As discussed above, funding is available for Year 1 and 2 projects, from a combination of the Department of Transport and Main Roads funding and proposed joint ventures with Gold Coast City Council, marina operators, and property developers. These projects are scheduled to take place during the 2008-09 and 2009-10 fiscal years. Allowance has also been made to progress the final "catch-up" maintenance projects scheduled for Year 3 of the program.

Funding is not available at this stage for the capital works. There have been suggestions from industry that significant cost savings are available, from commercialisation of sand reserves and other efficiencies that could accrue from a programmatic approach and long-term planning, permitting and procurement. Previous attempts to combine sand extraction and dredging had mixed results, so there is an awareness of the need to consider competing interests.

Implementation of this strategy is also contingent on environmental approvals. Environmental considerations could affect the proposed schedule; the estimated costs; and/or the recommended profiles. While this study provides significant information relevant to the issuance of approvals, it lacks important details, notably the type of dredging equipment that will be used and the alternatives for handling dredged material.

The State has proposed, in partnership with Gold Coast City Council and Marine Queensland, to pursue an expression of interest process in relation to this study. The intention is to gauge industry interest, solicit innovative approaches, and identify both cost saving opportunities and potential non-fiscal benefits. Ideally, a long-term dredging plan should include the identification of both areas where material needs to be removed, as well as opportunities for beneficial use. Commercialisation of sand is one example, but there may also be opportunities to create habitat and/or enhance destinations.



The information gleaned through this process will inform funding considerations; however, it is also intended to support approvals processes. Currently, approvals are undertaken in an ad-hoc, project-by-project basis. An intention of the expression of interest process is to identify opportunities for improved management and environmental outcomes.

No allowance has been made in this study for factors that can adversely affect management costs/performance, such as variations in the cost of dredging. The most obvious variable affecting demand is weather, which can neither be predicted nor controlled. The partnership between the State, Council and industry is intended to provide a responsive and responsible management framework. The expression of interest process is intended to scope procurement and service provision alternatives to identify optimal strategies for allocation of responsibility and risk. While the cost of services generally escalates, rather than declines, it is hoped that significant cost savings can be achieved.

This study is a sub-component of the Master Plan. While dredging is a significant issue for the Master Plan, it is not the only issue that will potentially require funding and consideration of partnered governance models. The above discussion reflects initiatives that have been progressed by the Department of Transport and Main Roads, in partnership with Council and Marine Queensland, while the Master Plan has progressed.

This has been necessary due to the high level of demand for dredging, and has been possible due to the increase in boating registration fees, and the high level of support from Gold Coast City Council for a partnered approach. However, the initial objective was to provide a solution that included an industry contribution. Cost savings through sand commercialisation may satisfy this political mandate, or allowance may be made for the effects of the Global Financial Crisis. Alternatively, consultation on the Master Plan may alter the shape of the debate.

Implementing the program recommended in this study is subject to consideration of the Master Plan by the State Parliament following consultation. The Department of Transport and Main Roads will continue to develop the partnered approach outlined above while the Master Plan is being finalised. While there is strong support for this approach, a range of alternatives are briefly discussed below as a precaution.

6.2 “Do Nothing” – continuation of ad hoc project based funding

The existing situation is economically inefficient. It lacks certainty, which is important for business investment, and the outcomes in terms of channel navigability are uneven – good after a project, but deteriorating to poor if inadequate funding or other impediments cause an unacceptable lag between projects. It is also expensive in terms of project related costs, such as obtaining approvals and procurement of dredging services. Resources are also expended responding to complaints and responding to political inquiries. A lack of committed funding and ready approvals creates a poor ability to respond opportunistically to ad-hoc partnerships with developers and leverage funding.

6.3 “State funding” – the State picks up the full tab

This has been politically objectionable, but it is supported by the principal of the waterways as public assets. Their nature as public goods suggests that a pure, user-pays, market-based solution to their maintenance is economically inappropriate. Public goods by nature are difficult to control, defying the fundamental market principal of control and ownership. The Marina Levy and boating registration fees represent a sectoral contribution, creating a quasi user-pays system. However, deeper drafted vessels



benefit differentially and the existing fee structure may not adequately reflect relative benefit. If demand exceeds available funds, investment decisions may not reflect industry priorities.

6.4 “Coalition funding” – some partnership is derived to fund the recommended profile

A coalition would necessarily involve some complication in terms of relationship management, relative to the “State Funding” scenario discussed above. However, it would satisfy the political mandate that the State be partnered. More importantly, a coalition would provide a mechanism for managing expectations. There will inevitably be difficulties associated with implementing the program or maintaining the network once it is established. The need for dredging will vary based on natural processes, which may be predictable over time, but are likely to exhibit “lumpy” behaviour. Available funding may be inadequate in some years, and there will be a need to prioritise dredging needs. A coalition that includes industry users provides the opportunity to share the decision of how funds should be allocated, minimising the potential for criticism and adverse media coverage. Industry would benefit from a positive image of the waterways, and politicians would welcome reduced criticism.

6.5 “Industry funding” – Governments back off and leave it to industry

As discussed above, the waterways exhibit a public good nature that discourages effective market-based approaches. While individual businesses may undertake dredging near their sites, they are discouraged from comprehensive dredging as this expenditure would benefit everyone, while disadvantaging those that bear the cost. Even if industry were to respond, it is unlikely to result in a well-maintained network of navigation channels. Congestion would be likely to occur in the “good” spots (where dredging had occurred). Permitting could be problematic and, if delays result, illegal actions could arise.

6.6 “Waterways authority” – A statutory entity with revenue sources

There is significant nostalgia for this sort of solution. What is poorly understood is that the former Gold Coast Waterways Authority was not fully self-funding. Its revenue sources catered for a proportion of its expenses, but the State Government carried most of the capital debt associated with the Sand Bypass and Seaway construction. While the Authority did conduct some dredging, this was limited and far less comprehensive than the program presented here. The unit cost of dredging has also increased substantially. An appropriately funded authority could of course be created, however, as a general principal the State avoids the creation of proprietary funding sources, except where a corporatised government business, such as a port, has the potential to earn enough revenue to cover its debts, and pay a dividend. The key advantage of the former waterways authority was probably its broad sole jurisdictional control. Much of the dredging would have been conducted “by right” without the need for permits. It is unlikely that this sort of sole responsibility would be recreated today.



Appendix A

Summary of Industry Responses



Responses below are reported as recorded by GHD. No attempt has been made to edit or otherwise alter statements for either typographical clarification or to address matters that may be the subject of dispute or conflict with other information in this study

Nature of Issue	Range of Responses
1. Importance of increased channel depths for industry.	- Initial development of the Gold Coast City Marina in 1999/2000 was based on a channel depth of 3.5 m LAT. This was never achieved. (<i>Note: This issue is discussed in Appendix B.</i>) - Preferred depth to reach GCC Marina is 3.5 LAT. 3.0 LAT could be acceptable. - Future dredging requirements need to consider market needs. - power boats: a 35 m boat needs a draught of 2-3 m. - cruising yachts: a 35 m boat needs 4-5 m draught. - racing yachts: >5 m due to deep competitive keels. - Super yacht maintenance refit or equipment checks would require 3.5 m LAT at both channels to reach the GCC Marina. 80-90% of all cruising yachts manufactured at the GCC Precinct are exported by road. - Power yachts cannot be properly trialled due to water depth and wash (testing engines at full thrust). - All yachts activity (cruising, power) use the South channel to access the GCC Precinct. North Channel is too shallow. Was usable in 1999. - Deeper water in North Channel would decrease the pressures on South Channel of both commercial and recreational boating. - GCC Precinct cannot now build 100' boats/yachts due to the water depth, despite strong market enquiries. - In 2006, the GCC Precinct lost several contracts for cruising yacht refits due to adequate water depth. These ranged from \$2.5 million to \$9 million. - Future boat/yacht building is with composite materials. Carbon fibre is more expensive. There will always be a demand for steel yachts/boats. These will require more regular refits. This will require a larger lift crane. - The future of yachting is with larger (blue water) yachts. Eventually, the small super yachts will disappear (< 40'). - The future of the new precinct at Coomera, further from Beattie road housing, will also be heavily dependent on adequate water depth. - The Gold Coast waterways are not a port. There is no program of maintenance dredging, as exists with ports. Attracting new boating/yacht business requires marketing and good image projections. Adverse publicity in the USA as to adequacy of water depths is not encouraging new international interest. - Missing potential markets for future commercial growth are: cruising/blue water yachts; and super yachts. Neither category can reach the GCC



Nature of Issue	Range of Responses
	Precinct. ▶ There's a direct relationship between future investment in new support infrastructure at the GCC Precinct and deeper channel access. Current lift capacity is 165 tonnes. There is a need for a 300-500 tonne lift for super yachts. This is dependent on additional water depth. ▶ There are at least 6 new industrial/commercial developments which would be commenced if new dredging was decided (currently constrained). - several engine/propeller servicing firms; - additional fibreglass moulding; - new refit business with hybrid marine engines; - dry boat stacking; - yacht interior refitting; and - passenger ferry services. ▶ If there was 3.5 m LAT and with tides (1.5 m), 5 m of water depth would accommodate 80% of all super yachts. The Gold Coast waterways and the GCC Precinct could be promoted quickly to dispel growing negative perceptions of the Gold Coast.
2. Role of Recreational Boating	▶ The Gold Coast tourism experience is fundamentally committed to and dependent upon the waterways. ▶ The Gold Coast is the premier boating centre of Australia. This position needs to be protected by maintenance dredging. ▶ Power boat ownership and size of power boats is growing. 2-3 m LAT is necessary for larger boats; > 10 m length is now common. ▶ Growth in new marinas, as planned, will see more traffic in the main north and south channels. More congestion is inevitable. Hence, maintenance dredging is necessary to ensure maximum use of available waterway capacity. ▶ The dredging and maintenance of all waterways channels and boating areas should be to benefit all gold Coast boating/yachting interest: - visitors, - residents, and - industry. ▶ Historically, boating was for families with boats < 10'. Now 30' boats are common. Overall growth in recreational boating is 7-10 per cent per annum, depending on growth criteria. ▶ Loss of recreational boating activity, with reduced future growth, will slowly penalise the economy of the Gold Coast. A further 10 years of a 'non-maintenance' dredging policy will see the decline of boating as a Gold Coast tourism attraction. ▶ Dry storage of smaller boats nearby is a growing problem. Wet berth capacity at the 'low' end of the market is increasingly more expensive (an affordability issue). More road space will be occupied with towing of boats/yachts, adding to traffic congestion in the Gold Coast.



Nature of Issue	Range of Responses
3. Future of Super Yachts on the Gold Coast	▶ The Gold Coast is well positioned to develop a future super yacht base, following the growth in world-wide super yachts (770 world-wide > 80' in length). Depth of water is a key determinant, together with suitable berths. Limited berth space is available at Southport (5 berths). ▶ Cairns attracts the largest number of super yachts to Queensland. In the cyclone season (Dec. - Mar.), the super yachts move south. Hence, the need to develop a base. ▶ Minimum water depth of 3.5 m LAT plus 1.5 m of tide is required for super yachts in all channels. This is not available outside the main south channel. ▶ The GCC Precinct is not reachable for super yachts. Refit work on super yachts will require a larger lift. Painting is a key requirement of super yachts. Cannot be done on the water at Coomera, as is done in Europe. Hardstand areas are limited at the Precinct. ▶ Significant potential gross revenue could be generated for the Gold Coast economy with additional super yacht visits, and a base. Gross economic impact is estimated at \$160 million in 2006. Average yacht servicing/refits range from \$2 million - \$5 million (these are scheduled 12-18 months in advance). ▶ Major competitors to a Gold Coast super yacht base are: Brisbane, and Sydney. Both have superior refit/maintenance facilities available.
4. Relationship of growth of the Gold Coast economy and employment levels in the marine sector and channel dredging.	▶ The GCC Marina Precinct currently employs 4,500 employees. A further 1,500-1,600 are employed in a 50-km radius. ▶ The GCC Marina has 16 subleases. Approximately \$320,000 is generated in GC Council rates. ▶ Gold Coast City Council collects revenues from 64 individual berths on the Coomera River. ▶ The GCC Marina is now fully developed. The next phase of growth is for super yacht/cruising yacht refit/maintenance. This is dependent on increased water depth. ▶ New technical training courses to handle new products, such as carbon fibre, are required. This investment will be dependent on being able to build larger yachts. Continued investment in technology is necessary to maintain the Gold Coast's competitive edge in boat building. ▶ Refit contracts have been turned down due to inadequate channel access. This work is possible with skills, but not lift equipment. ▶ The Gold Coast must continue to ensure preconditions exist for new investment in commercial facilities/services. Otherwise, a slow decline in manufacturing will take place. Brisbane and Newcastle are major competitors. ▶ Possible for the Gold Coast to sell up to 2 million cu. m. of sand from dredging to the building industry (avoid Brisbane's building sector importing sand from Gatton & Toowoomba).



Nature of Issue	Range of Responses
5. Importance of tourism in relation to investment in Gold Coast waterways.	▶ The image of the Gold Coast as a water 'playground' must be maintained. Adverse publicity needs to be avoided. Visitor growth must be maintained. ▶ Recreational boating for residents and tourists is a major source of revenue and employment. Average daily expenditures on boating/yachting can range from \$60-\$200. ▶ Increased investment in restaurants/entertainment facilities and in support infrastructure will be necessary to replace aging facilities. Hence, boating activity growth must continue at a minimum of 5 per cent per year. ▶ International tourism expenditures from visiting super yachts/ cruising yachts can be maximised if all facilities and services are available. International quarantine and customs services are not in place on the Gold Coast. Visits are often diverted to Brisbane. ▶ Specific issues relating to recreational yachting in the Broadwater have arisen: - charts are unreliable; - increased problems of yachts running aground; - yachting experiences are often now disappointing with shallow depths; and - old club memberships are not being renewed and future club growth is constrained. ▶ Emergence of new forms of passenger services using ferries is constrained. Operating speeds for services will be limited, making timetables difficult. ▶ Slower power boat speeds in the Broadwater and channels are necessary as siltation continues. Reduced speeds are a major deterrent to recreation enjoyment and to more frequent visits to the facilities. ▶ A new form of 'high level' waterways management is required to provide a forum for urgent recreational and commercial concerns.
6. Future Management of the Waterways	▶ The previous Gold Coast Waterways Authority served a number of useful purposes. It provided direct dialogue with industry and government. ▶ How to prioritise urgent dredging tasks is limited now, as it depends on DTMR staff. There is no forum for industrial boating personnel to advise of problems. ▶ The critical need for an annual maintenance budget would be further understood with some form of 'Waterways Commission'. ▶ The absence of gazettal of the Gold Coast waterways as a harbour has limited the scope of State involvement in future infrastructure planning and investment. ▶ A new management organisation could represent all stakeholders and assist in determining priorities for ongoing dredging. ▶ Recreational users and commercial interests need a regular forum to explain mutual issues and needs. ▶ Adverse local press and domestic/international visitor commentary can be objectively managed by an authority or commission.



Appendix B

Notes on Identified Channels



Channel	Last Surveyed	Notes
Primary Channels		
South Channel	2007	Roughly north-south alignment along the Broadwater, from the Seaway to the Sundale Bridge. This is the widest and deepest segment in the channel network (other than the Seaway itself). Survey information is current and dredging has been undertaken on a relatively frequent basis (1989-90, 1993-94, 1997-98, and 2009). Channel stability is reasonably good for most of the channel at the existing profile, which is the same as the recommended profile. The northern end of the segment, near the Seaway, has experienced shoaling following recent dredging projects. Surveys indicate that the most likely source of this is spillage from the large sand deposit across the front (eastern side) of Wavebreak Island. The permit for this channel segment was recently amended to allow dredging to a deeper depth in this northern end of the channel, providing more of a gradual taper between the Seaway at 6.0m and the rest of the channel at 4.5m. Sand in this area is governed by policy dating from the days of the former Beach Protection Authority that requires that it be maintained within the coastal system. Historical dredging projects have deposited sand south of the Seaway for beach nourishment purposes when Gold Coast City Council has identified a need and had available funding to pay the additional cost of transport from the Seaway to the deposition site. Alternatively, sand has been deposited off the eastern side of South Stradbroke Island just north of the Seaway. Both of these practices satisfy the intent of the requirement to maintain sand in the coastal system. A tender has been let for dredging of the northern portion of the channel, near the Seaway, as part of the State/Gold Coast City Council Southport Broadwater Foreshore Parklands project (a Q150 project to celebrate the 150 th anniversary of Queensland's statehood).
North Channel	2008	Roughly north-south alignment, from the Seaway to the Coomera River. Like the South Channel, this is a heavily used segment and has been surveyed and dredged relatively frequently (1984-5, 1986-87, 2004-05), although the dredging events have been generally smaller, suggesting a relatively greater stability. As with the South Channel, shoaling tends to develop near the Seaway, however, in this case the source of sand appears to be deposits on either side of the channel at the northern edge of Wavebreak Island and along the western edge of South Stradbroke Island. The approved channel width is 100m wide from the Seaway to the Deep Hole (where it meets the West Crab and Labrador Channels), then 40m wide from the Deep Hole to the Coomera River; the recommended profile increases the width north of the Deep Hole from 40m to 60m. The permit for the channel segment which shoals just north of Wavebreak Island is currently being amended to dredge to a greater depth to provide greater intervals between dredging events. The increased channel width north of the Deep Hole to 60m may improve stability in the observed shoaling areas between dredging events. If not, it may be desirable to seek approval for a wider width, and/or greater depth near the Seaway, to provide a transition zone similar to that recently established for the South Channel. Although it is not required by policy, dredged sand from this area is generally taken out through the Seaway and deposited off the Eastern side of South Stradbroke Island or taken south for beach nourishment.



Channel	Last Surveyed	Notes
Main Channel (South)	2007	Roughly north-south alignment, from the Coomera River to the northern end of Tulleen Island. At the southern end, it is a continuation of the North Channel. At the northern end, it connects to the Main Channel (North), which heads initially in a westerly direction towards Jacobs Well. Alternatively, from this point there is also a channel that heads north-easterly towards Jumpinpin Bar and Canaipa Passage, an alternative to the Main Channel for north-south passage to Moreton Bay. There is relatively recent survey information for the very northern end of the channel. There have been few dredging projects in this segment. The SRG recommended that the width be increased from 40m to 60 due to the amount of vessel traffic along this segment. Dredged sand from this area would most likely be taken out through the Seaway and deposited off the eastern side of South Stradbroke Island or taken south for beach nourishment, although cost savings could be realised if deposition opportunities closer to the channel could be identified.
Main Channel (North)	2007	From Tulleen Island to Macleay Island, via Cabbage Tree Point. Largely a north-south alignment, although the southern portion follows an east-west alignment. Comprehensive dredging of the entire segment has never been conducted, but there have been a number of dredging projects along this segment in problem shoaling areas (Jacobs Well in 1985-86, 1988-89, 1989-90, 1992-93 and 1997-98; and Cabbage Tree Point in 1990-91). Three shoaled areas in the east-west alignment are scheduled to be dredged in 2009-10. Although recent survey data is available for part of this segment, data is either lacking or dated for a significant portion of the channel. The available data indicates that the majority of the length of the channel provides the recommended profile, requiring no removal of material. Nevertheless, due to the relatively long length of this channel segment relative to other channels in the network, dredging of this segment accounts for about 40% of the total capital volume in the program. For this reason, the proposal in the Marine Infrastructure Master Plan for a sand rehandling site at the mouth of the Logan River is of critical importance to the dredging program. Absent alternatives such as the identification of suitable areas near this channel segment for sand deposition for beach nourishment, shoreline stabilisation, or the creation of islands, the cost of dredging this segment could escalate significantly due to increased transport distance and associated time and cost for dredging. Historically, there were areas where deposition was allowed, however, more recently this has been discouraged and material has been removed to land for development purposes when opportunity allows.



Channel	Last Surveyed	Notes
Coomera River Lower Reach (South Branch)	2006	From Sovereign Island to the Gold Coast Marine Precinct (Beattie Road) along a roughly east-west route. At the eastern end it intersects with the North Channel and the Main Channel (South). At the Gold Coast Marine Precinct, it continues on as the Coomera River Upper Reach (South Branch). A channel was dredged from the mouth to the upstream end of the Sanctuary Cove development in approximately 1983-85. Dredging of the channel was extended upstream to approximately Beattie Road for flood mitigation purposes as part of the Hope Island development. In 1999/2000, the entire channel was dredged from the mouth to the rail bridge in conjunction with the development of the Gold Coast Marine Precinct. The eastern portion to Sanctuary Cove was dredged again in 2004-05. The Department of Transport and Main Roads, with funding support from other State agencies and the Gold Coast City Council have completed three phases of a strategy for the long-term management of dredge spoil. The fourth phase is currently being undertaken. The channel bed from approximately Sanctuary Cove to the Broadwater is mostly clean sand suitable for ocean deposition or high-quality re-use. Above this point, to the Marine Precinct, a range of finer silts make it unacceptable for ocean deposition. It is not contaminated and can be beneficially reused, however, a land-based site is required for dewatering and it must be blended if it is intended for any load-bearing applications. The strategy considered a number of options, including beneficial uses such as the creation of islands for bird habitat, and concluded that construction of a permanent land-based rehandling facility was superior to other options based on a multi-criteria analysis of a range of criteria (engineering, environmental, social). The intended depth of this segment has been a source of some ongoing confusion and debate. The deepest permitted depth for historical dredging projects has been 3.5m. Based on the principles related to insurance dredging discussed above, this should translate into a 3.0m deep channel in terms of the depths as presented in this study. However, complaints have been made about the need for dredging when shoaling between 3.0m and 3.5m has arisen, on the basis that the channel is intended to have a 3.5m depth. The SRG recommended depth presented in this study is 3.5m requiring amendment of the permits and dredging to approximately 4.0m. There is evidence of some erosion and bank destabilisation, particularly along the northern side of the channel near Santa Barbara. There have also been complaints from residents along the southern side concerned about vessel wake affecting their pontoons. There has been general concerns expressed about the volume of traffic on the river and the Department of Transport and Main Roads has undertaken several reviews resulting in revised speed limits. Observed bank destabilisation is probably attributable to a number of factors, with the relative contribution uncertain, including: dredging, increased boat traffic, increased vessel sizes, particular activities such as water skiing or more recently wake-boarding and natural processes including increased flood velocities from hardening of the tributary catchment. These considerations are likely to arise in relation to a request to modify the existing approvals to allow for a deeper depth.



Channel	Last Surveyed	Notes
Seaway Entrance	2008	The area of open ocean to the east of the Seaway. There are only two access points in the study area to the ocean, the Seaway, and Jumpinpin Bar. The Bar has never been dredged and is subject to shoaling. The Seaway is maintained by the Sand Bypass System. The jetty south of the Seaway houses ten "jet" pumps that suck up sand when the system is operating (evenings and weekends, when sand is present to pump, to utilise off-peak electricity,). The sand is pumped underneath the Seaway and discharged north of the Seaway off South Stradbroke Island. The design intent of the Seaway was to maintain a 6.0m depth in the channel. Since its construction in 1986, this depth has been maintained, without the need for dredging. While the Seaway has maintained or exceeded its design profile, there are shoals in front of the entrance. At design, the Seaway and Sand Bypass system allowed for the possibility of maintenance dredging of the entrance at approximately five-year intervals. Dredging was not conducted initially or since the time of construction. In response to concerns about shoaling, the Department of Transport and Main Roads engaged Cardno MBK in 2002 to assess the existing bypass efficiency. The existing efficiency was estimated at 69%. A range of capital projects, including extension of the existing jetty, were estimated to be capable of improving this to 90%, at a cost of approximately \$5.0 million. The option of dredging at 5-year intervals was assessed as capable of providing 100% efficiency at a cost of \$5.3m (75,000 cubic meters). The involved dredging the full width of the Seaway (300m), plus northern and southern sand traps, to a depth of 6.0m. The proposed program allows for dredging of the entrance. The estimated cost, at roughly 10% of the cost of capital options, may be a reasonable alternative. However, the width of 100m may be too narrow to be stable for a reasonable interval. If it provides a five-year window before dredging, this may be preferable to capital options. However, if infill occurs at a greater rate, it may be more appropriate to seek capital funding rather than pursue maintenance dredging of the entrance in future years. A wider width could unacceptably increase costs. This requires further consideration, but may be undertaken as a pilot, to determine the sustainability of the option.
Secondary Channels		
Nerang River	2003	From the Sundale Bridge to Ross Street. Continuation of the South Channel upstream. The only record of dredging of the Nerang River for navigational purposes is a small project in 1989-90. There have been requests to dredge the river, including a petition to the State Parliament in recent times. While some of the requests and signatories are concerned about navigation, flood mitigation has also been a significant driver. Gold Coast City Council recently conducted a benefit cost analysis of flood mitigation strategies that included as an option dredging of the Nerang River. This option was not considered cost-effective and an alternative strategy with a better return, raising of the Hinze Dam wall, is currently being pursued. The River was historically used for barge traffic to transport timber from the town of Nerang up to Brisbane (the Seaway was built to stabilise the mouth of the Nerang River in 1986). The Nerang River is relatively wide and shallow, in contrast to the relatively narrow profile of the Coomera River (in general, wider rivers tend to be shallow and narrower rivers deeper). This profile restricts opportunities for cost-effective maintenance of a deep navigation channel. Because of the width and shallowness of the river, a deep narrow navigation channel is likely to be quickly filled in by the large volume of available material to the side of the channel. Dredging a wider width would add significantly to the cost, approaching sums that would generally only be justified if there were benefits such as flood mitigation. This is a very important navigational channel as it provides access for the majority of the canals on the Gold Coast to the Broadwater, Seaway and the Moreton Bay Marine Park. The recommended depth of 1.0m represents a compromise between concerns over the ability to maintain a channel and its importance as a link in the network.



Channel	Last Surveyed	Notes
Labrador Channel	1990	From Runaway Bay to Southport, along the western edge of the Broadwater in a north-south alignment. At the northern end there is a four-way intersection, providing access to the West Crab Island Channel and the North Channel. At the southern end, it terminates at Howard's Landing, just south of Smith Street. Although there was a small amount of dredging in this channel behind Wavebreak Island in 1984/85, there are no recorded dredging projects for navigational purposes along this segment in recent times and permits will be required. Survey information is limited and there is concern about the potential for hard substrate – "coffee rock" – that could limit the practical depth of the channel. Updated surveys and core sampling will be required. This is an important north-south alternative that reduces traffic in the North and South channels and allows for a separation of large and small vessels. This is particularly important along the western side of Wavebreak Island, as the area where the Seaway and North and South channels meet can have very heavy traffic volumes. The recommended depth of 2.0m retains the status of this area as an alternative for smaller vessels. Sand from the southern end of this channel is subject to the former Beach Protection Authority policy.
South Wavebreak Island Channel	2007	An east-west channel between the North Channel and the Labrador Channel, paralleling the southern edge of Wavebreak Island. Current surveys available; dredged in 1983-4, 1986-7, 1999-00. This is an important navigational link and shoaling in recent times has generated a number of complaints. As with the South Channel, sand removed from this channel is to be retained within the coastal system. A tender has been let for dredging of this channel, along with part of the South Channel, as part of the State/Gold Coast City Council Southport Broadwater Foreshore Parklands project (a Q150 project to celebrate the 150 th anniversary of Queensland's statehood).
West Crab Island Channel	1997	Along the western side of Sovereign Islands to Runaway Bay in a roughly north-south alignment. Terminates at the four-way intersection at the southern end (Labrador Channel and North Channel) and at the Sovereign Islands bridge at the northern end. Shoaling has historically occurred near Runaway Bay at the southern end of the channel. This area was dredged in 1982-83 and 1990-91. Existing approvals include permission to remove material from a triangular wedge at the southern end of the channel where most of the shoaling occurs, however, the total volume that can be removed from that area in any single dredging event is currently restricted. The permit for the channel segment which shoals at the southern end is currently being amended to dredge to a greater depth to provide greater intervals between dredging events.
Coomera River Upper Reach (South Branch)	2006	From the Gold Coast Marine Precinct to the railway bridge at Coomera. The navigation channel from the rail bridge to the M1 road bridge was dredged recently by a developer as part of the River Links Estate. The estimated quantity to establish the recommended profile is minimal. The actual cost is likely to be significantly more than that shown in Table 10; this is due to errors in the formula for estimating very small quantities and minimum mobilisation costs. Given that the channel appears to be close to the recommended profile and there has been very low demand for dredging in this area, the scheduled dredging may not occur until later in the program, although if it can be done in a cost effective manner, opportunistic dredging may be pursued. The east-west section of this channel is quite wide. The recommended profile should be stable as it appears to be close to the natural bed, however, this could also be a reflection of recent dredging. There has been some speculation that this area may be a source of sediment for the lower sections of the river and that more comprehensive dredging might have downstream benefits. The area may be suitable for water based recreation such as water skiing due to its width and relatively low traffic. It has been used recently as a float plane take-off and landing area.



Channel	Last Surveyed	Notes
Coomera River (North Branch)	2004	The North Branch of the Coomera River connects the Coomera River near Sanctuary Cove and the Main Channel South. It provides an important alternative for some traffic. It is a less direct route, but is popular with vessels wishing to travel to or from the north, and has a naturally shallow profile, but is suitable for shallow draft vessels, including houseboats that are popular with tourists. The recommended profile of 1.0m maintains this natural depth, but seeks to ensure consistent navigational access. The area has never been dredged, so approvals will be required. There are declared RAMSAR wetlands in this area, so Commonwealth approvals will also be required.
Eastern Channels	1990	This refers to a network of channels between Woogoompah Island and Jumpinpin, including: Whalley's Gutter, Eden Island Channel and Taby Taby Island Channel and the channel located between Cabbage Tree Point and Crusoe Island south of Eden Island. Survey coverage for this area is limited. Spot dredging has been carried out in a number of locations (McKenzies Channel in 1983-84; Whalley's in 1984-85 and 1987-88; Tabby Tabby 1987-88; Eden Island 1984-85). These channels provide convenient access between the Steiglitz/Jacobs Well area and Jumpinpin, which is the only ocean access between the Seaway and the top of North Stradbroke Island. The recommended profile is relatively shallow, reflecting the "local" access character of these channels.
Tipplers Passage	2007	The north-south passage east of the Never Fail Islands and west of South Stradbroke Island. Connects to the Main Channel (South) at the southern end and the Jumpinpin Bar Channel at the northern end. Dredging projects were conducted in 1984-85, 1987-88 and 1989-90. The recommended profile allows for an increased width of 60m, reflecting the SRG's perception that this area is subject to heavy traffic. This channel provides access to Tipplers resort, which has been a popular weekend destination. The resort was recently purchased by Gold Coast City Council and it is slated to become a focus for eco-tourism. It is uncertain whether this will alter the popularity of the passage for boating traffic. Amendments to existing permits will have to be sought for the increased width. Approvals will be required to dredge this channel.
Canaipa Passage	2007	This channel provides an alternative passage to the Main Channel (North) for vessels travelling from the southern Broadwater up to Moreton Bay. The channel runs from Jumpinpin in the south to Russell Island in the north, east of Russell Island and west of North Stradbroke Island. Recent survey coverage is limited to known shoaling areas. Dredging projects were carried out in the Slipping Sands area in 1989-90 and 1995-96. The sand dredged from these projects was used for beach nourishment in the area of the fishermen's huts. The program includes dredging in this area in the year-2 to address current shoaling and a more comprehensive capital dredging project in year-4.
Other Channels		
Eprapah Creek		This segment is towards the northern edge of the study area, just above Point Halloran, to the west of Coochiemudlo Island. It provides access to marine industry zoned land adjacent to Beveridge Road. There is no current survey information, although it reportedly has reasonable access except at the mouth. The owner of a marine business in the area has expressed an interest in having the channel dredged and may be willing to undertake the capital component and has access to an approved dredge spoil disposal area. The dredge spoil is silt/mud, potentially with acid sulphate soils, that will have to be disposed of to land. This type of bed material is typical of the north-western edge of the study area. Approvals will require consideration of marine park concerns.
Weinam Creek		Weiman Creek is an important marine precinct at the southern end of Redland Bay providing transport services for the Bay Islands. Redland City Council has been undertaking planning studies for the area, which will be incorporated into the Marine Infrastructure Master Plan. Any project is likely to include capital dredging and consideration will have to be given to the allocation of responsibility for maintenance dredging.



Channel	Last Surveyed	Notes
Victoria Point		There are no records of dredging in this area. It does support relatively high demand ferry services and the area is naturally shallow, so dredging may have occurred in the past and the potential for future demand is relatively high.
Logan River Entrance		The Logan River entrance has not been dredged for navigational purposes. There is limited survey information, however surveys undertaken recently in conjunction with a development proposal, and anecdotal information, suggest that the river itself is relatively deep past the very shallow area at the entrance where it meets the Main Channel (North). The Marine Infrastructure Master Plan includes consideration of a "Grey Boat" marina just upstream from the entrance. The marina would be constructed following the extraction of mineral sand resources. The sand handling site has been proposed as a possible location for the processing of dredged material from the Main Channel (North) and adjacent channels. Dredging of this segment is not included in the program for this study as it was not identified as a priority in consultations. If development in this area is recommended in the Master Plan, then arrangements for capital and maintenance dredging will need to be addressed. The developer has indicated that they would be willing to undertake the capital dredging component.
Krummel Passage		This is an east-west passage between Canaipa Passage and the Main Channel (North), running between Russel Island and Karragarra Island. The passage is frequently used by ferries that service the islands. The recent Marine Park rezoning included proposals for "Go Slow" zones along this segment out of concern for Dugongs. This raised some concerns about potential impact on ferry services. There is limited survey data available, although there is some reported shoaling in the area of the Karragarra W's. There are no known records of dredging in this area. It has not been included in the program, but dredging may be pursued based on demand, shoaling and/or safety concerns.
Biggera Creek		Biggera Creek intersects the western side of the Labrador Channel just to the north of Wavebreak Island. It was dredged in 1996-97 from the Labrador Channel to the Lands End bridge by Queensland Transport. Gold Coast City Council have dredged the creek from the bridge upstream to the confluence of the Runaway Bay connection canal for flood mitigation purposes.
Marine Stadium		The Marine Stadium, or "Bum's Bay", is the body of water just south of the Seaway and enclosed by land on three sides: Doug Jennings Park to the north; the Spit to the east; and 'the finger' to the west. It was created when the Seaway was constructed in 1986 to provide a calm water intake for the Sand Bypass plant and a safe anchorage. It is also popular as a protected swimming area and marine events have also been staged there. It was dredged in 1998-99.
Pimpama River		This is an east-west channel meeting the Main Channel (South) at the eastern end and stopping at the western end of Woongoompah Island. There is no record of this channel having been dredged. Environmental considerations are likely to be a constraint in this area.
Sovereign Islands Channel		Generally with a north-south alignment this channel meets the North Channel just south of the Coomera River at the northern end and meets the West Crab Island Channel east of the Runaway Bay Marina on the southern end. There is no record of dredging for this channel; it has naturally maintained an adequate profile. Due to the key linkage it provides, a demand for dredging would probably result from shoaling.



Appendix C

Detailed Discussion of Identified Benefits (Avoided Costs/Losses)



Domestic Visitor Spending

Based on Tourism Queensland visitor data for the year of September 2007 for the Gold Coast, approximately 3.8 million domestic visits were recorded to the Gold Coast region in general, and to Surfers Paradise in particular. Of this total, approximately 29 per cent or 1.1 million were involved in specific sightseeing and enjoyment of the Broadwater and waterways, based on visits to and use of the Broadwater and use of the northern channels by boat, and bus/car visits to destinations such as Sanctuary Cove. Total visitor demand is forecast by Tourism Queensland to grow annually by 1.6 per cent over the next 10 years. The Gold Coast's Broadwater and waterways represent key natural assets and endowments for the tourism industry. Should siltation continue, the ability of the waterways to handle increasing visitor and resident demand will be seriously affected, resulting in a downturn in visitor demand and a diminution of the visitor's experience.

In the 'do-nothing' case, future water-based resident boating/visitor activity is likely to decrease gradually over time. Tourism Queensland's daily average expenditure per visitor has been estimated at \$97. This represents a value added or gross margin of \$37 per visitor (40%). The likely economic loss of water-based visitor demand and expenditure is estimated at \$1.3 million in 2012, increasing to \$9.9 million by 2028, in the 'without' dredging case.

Recreational Boating (Avoided Losses)

The Gold Coast's Broadwater and channels represent one of the most significant boating and sailing destinations in Australia. Over the past three decades, the growth of power boating and sailing on the Broadwater and associated waterways has grown significantly, with annual growth rates ranging between 5 - 12 per cent. Over the next 10 years, the forecast growth in demand is estimated at 4 per cent per annum. However, unless the depth and width of water in the channels is increased to meet the requirements of larger boats and the increased volume of boating and sailing, future growth will be constrained. This assumes that existing boat ramps will be adequate. At issue for the recreational boating/sailing sector is the on-water capacity of the Broadwater and channels, rather than the launching of boats/yachts. Congestion on the water and water safety will become more significant issues with increased demand for a decreasing level of channel capacity (in terms of depth and width). Based on a weighted average cost of daily expenditures on sailing and power boating of \$38 per day (\$30 for sailing and \$40 for power boating [after fuel is deducted])¹¹. Annual losses in recreational, boating activity have been forecast. In the 'do-nothing' option, recreational activity is forecast to slow over the next 10 years, to an average annual rate of 2 per cent, and to decline by one per cent per year, after 10 years as siltation becomes a major issue. The estimated losses in the 'do-nothing' case are estimated to range from \$0.49 million in 2012 to \$8.3 million in 2028.

CMP (Coomera Marine Precinct) Refits/Maintenance (Avoided Losses)

The Gold Coast waterways support a major boat building and marina service sector. The Gold Coast City Marina and adjacent complexes at Coomera is a major manufacturer of pleasure boats and yachts and services a wide range of marine craft. One-on-one interviews with key personnel at the Coomera River facilities were undertaken. It has been estimated that approximately \$32 million is generated annually from the refit and maintenance of boats, which reach the Coomera facility by various channels. This work is totally dependent on water access. Siltation is now a key issue for attracting/bidding work for the larger boats. In the 'do-nothing' option, it is expected that refit work will slowly decline and will

¹¹ Fuel expenditures have been deducted from the daily visitor and residential recreational expenditures as it is a major import item and does not remain in the local economy.



result in annual reductions in gross revenues and gross margins of between \$0.4 million and \$0.16 million.

CMP (Coomera Marine Precinct) Employment (Avoided Losses)

The Coomera marine facility and associated boat manufacturing facilities nearby are estimated to generate/support more than 4,400 direct and indirect jobs. Of this total, approximately 160 employees are directly employed in boat repairs/refits/maintenance work which is solely waterways-dependent. The on-site wage/salary component has been estimated at \$6.33 million. This salary figure excludes Commonwealth tax payments. Should the waterways siltation problem continue to limit access in the 'no-dredging' option, it is likely that related refit/maintenance employment will slowly decline, with an estimated 2 per cent annual reduction per annum over 10 years. The annual reductions in employment will lead to reduced local area expenditures on food/entertainment/living components. Such a decline in employment would also have major implications for the local housing sector.

Marinas – Income, Employment, Brokerage

It is estimated by the marina sector that there are approximately 3,240 commercial marina berths directly dependent on adequate water depths and widths in the Gold Coast Broadwater and adjacent channels. Allowing for marinas south of the Brisbane River, the total number of berths is approximately 4,610 berths. A total workforce of 220 skilled personnel is also dependent on the satisfactory future performance/utilisation of the marinas. In addition, the marinas support a broad range of ancillary businesses associated with tours, boat rentals, on-shore restaurants and kiosks, brokerage businesses and marine engineering repairs/refits. Should the Gold Coast Broadwater and channels become progressively shallower, in the 'do-nothing' option, a range of economic cost penalties can be expected. These include: (a) loss of marina revenues and returns on investment, (b) reductions in full-time marina employment, and (c) reductions in net returns from commercial boat brokerage businesses.

Based on an estimated \$6,000 per berth per year (a minimum fee), the gross turnover of the marine sector directly linked to the Broadwater and channels is estimated at between \$21 and \$34 million per annum. Any future decline in occupancy and berth demand will be a major economic penalty.

The current level of full-time employment in the marine sector needs to be maintained. It is currently estimated at between \$7.7 and \$10.5 million. In the 'do-nothing' situation, it is likely that this level of employment would be reduced by 10 per cent over 10 years. Future job opportunities for the local communities will be denied.

The sales of power yachts and related luxury marine craft are largely conducted at marinas. Yacht brokerage revenue and employment are expected to decline overtime if dredging is not undertaken. It is difficult to estimate brokerage revenues. A minimum of \$5 to \$6 million is the current minimum estimate which is likely to be adversely affected, with any future decline in power boating.

Commercial Boat Revenues

The Gold Coast waterways are a major base for its many tourist attractions. A broad range of activities including charter boat hire, 'Tall Ships', 'Whale Watching', restaurant/dining cruises and Broadwater cruises are available. Since the early 1990's, the significance of charter/game fishing has declined and has been replaced by tourist-specific activities. However, with the continued siltation of the Broadwater, the range of activities possible and the visual appeal of the area will continue to be further downgraded. Future revenue and employment levels will be adversely affected in the 'do-nothing' option.



The potential to develop high-speed ferry services to/from South Stradbroke Island to Surfers Paradise is constrained by the current depth of channels. Pending future dredging investment in the channels, the opportunity to develop a 150-passenger service on a daily basis remains 'on hold',

A further decline in the volume of charter boat work is forecast to continue with the 'do-nothing' dredging option. A 2 per cent decline per annum over the next 10 years is forecast, from the current annual estimate of \$1.65 to \$1.85 million.

Super Yacht Revenues

An interesting potential growth opportunity for Queensland tourism is the emergence of super yacht visits. In 2007, it is estimated that approximately 80 international super yachts visited Queensland. At issue is the level of direct economic benefit to Queensland centres. Based on data from Southport Yacht Club, approximately 20 visits were reported in 2007. Revenues were generated from (i) berthage fees, (ii) provision of food/beverages, (iii) sales of fuel, and (iv) logistics/services. Currently, Southport Yacht Club has six berths available for super yachts. Future super yacht berth investment will take place if the south channel, in particular, is further dredged to ensure a full 5 m of depth, together with the seaway entrance.

With appropriate channel depths, it is possible that the number of super yacht visits to the Gold Coast could grow by 10 per cent per annum (increasing from 20 in 2008 to approximately 135 by 2027). However, with no further dredging of the South channel and the seaway, such growth will be limited.

Additional Benefits Identified and Costed, But Not Included in Estimates

The following benefits were identified and costed, but were not included in the final economic analysis. The rationale for excluding each of these benefits is discussed below.

Yacht/Power Boat Damages

A major cost element in power boating and yachting is insurance. The major issue relates to the limited capacity of channels in terms of depth and width. Over the past five years, the level of insurance claims paid for the repair of yachts and power boats has increased. In 2007, it has been estimated that insurance claims relating to boat/yacht damage incurred directly from hull groundings/ propeller groundings and related craft damage due to the shallowness of channels, and the shoaling of sand deposits in water depths deemed safe by the marine charts, were from \$3.5 to \$3.9 million. All damages occurred in the Broadwater and adjacent channels. Single damages range from \$5,000 to \$60,000 per vessel. These claims are not related to marine repair issues raised in Section 3.1.3.

In the 'do-nothing' option, it is forecast that insurance claims associated with vessels running aground will continue to escalate. With increasing utilisation of the channels and the Broadwater for all ferries of water-based boating, the severity and frequency of accidents related to shallowness is a key waterways management issue. Speed is not considered to be a contributing factor. It is the unreliable nature of many of the channel markings at night which is the major concern.

The decision to exclude this potential benefit stream was due to the perceived inability to capture monies from insurance companies and/or the lack of certainty that premiums would actually be reduced. An additional uncertainty is the extent to which damages occur within navigational channels; dredging will not remedy pilot error or poor judgement. Finally, it is recognised that damages do generate economic activity in regards to repairs, so the avoided cost is arguably discounted by a loss in maintenance.



Water Transport

The Gold Coast's Broadwater and associated channels to the north of Surfers Paradise offer excellent opportunities for water-based passenger transport. A major new venture involving solar power-assisted passenger ferries to link the northern population centres to Surfers Paradise has been proposed. Regular ferry services would operate from Paradise Point to Coomera, Sanctuary Cove, Hope Island, Australia Fair, Sea World, etc., to the Convention Centre. Its future commencement is totally dependent on sufficient water depth in specific channels to run at between 10-15 knots. With current water depths, speed restrictions of 6 knots will prohibit commercial operations and the achievement of acceptable travel/commuter times. Regular and efficient ferry operations require strict adherence to timetabling¹².

A range of tangible benefits from the introduction of this ferry system will be lost if channel depths are not increased. These losses will include:

- ▶ Potential savings of 1,500 cars a day, with mode shifts from car to ferry for work commuting;
- ▶ A net loss of full-time employment of 64 staff; and
- ▶ The loss of maintenance revenues (gross margins) associated with supporting the fleet of ferries. A total investment of \$15 million in the ferries (to be built at Coomera) would also be lost if the services cannot be scheduled as required.

The decision to exclude this benefit stream was due to the incomplete nexus between speed restrictions and channel profiles. While depth can be a factor in determining appropriate speed restrictions, a number of other factors are significant. In the case of both the Nerang and Coomera rivers, the width of the waterway, traffic density, the presence of structures such as pontoons and jetties, bank stability and historical level of complaints are all contributing factors to existing restrictions, which would not necessarily be addressed by increasing the depth or width of these channels.

¹² Solar Coast Cats is a Gold Coast company which has negotiated a contract with the Gold Coast City Council to implement ferry services by December 2009. Speed restrictions have been suggested as a major constraint to service provision.



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