Clontarf/Bantry Bay Estuary Management Plan

Final Report

May 2008

Clontarf/Bantry Bay Estuary Management Working Group

Manly Council resolved at its Planning & Strategy Committee meeting on Monday 8 May 2006 to establish the Clontarf / Bantry Bay Estuary Management Working Group, as a sub-committee of the existing Manly Harbour Foreshores Management Committee. This Working Group has overseen the development of the EMP with involvement of representatives from the community, Precincts, Aboriginal Heritage Office, Council's Scientific Advisory Panel, Council staff and relevant state government agencies. Members of the Group are:

Group	Representing Organisation	Name
Councillors	Manly Council	Dr. Peter Macdonald
	Manly Council	Dr. Judy Lambert AM
Precinct	Clontarf Precinct	Carlo Bongarzoni
Community		John Connor
		Matt Hayes
		Lyn Green
		Philippa Giles
Aboriginal	Local Government – Aboriginal Heritage Office	David Watts
Govt	Dept of Lands	Stan Rees
	Dept of Environment & Climate Change	Daniel Wiecek
	Dept of Primary Industries (Fisheries)	Paul Schuetrumpf
	NSW Maritime	Anita Robinson
Scientific Advisory Panel		A/Prof Jan Ritchie
Council	Manly Council	Dr. Rafiqul Islam

Internal Staff Working Group

In order to support the Working Group and to obtain expert contribution in the formulation of the EMP, an *Internal Staff Working Group* was also formed. The present membership of this group is:

Name	Position
Eduard McPeake	Manager, Community & Environmental Partnership Branch
Ted Williams	Manager, Civic Services
Hanno Klahn	Land & Property GIS Officer
-	Precinct Coordinator
Chris Kraus	Bushland Management Coordinator
Michael Diba / Mark Purday	Town Planner / Senior Strategic Planner
Brett Maina	Environmental Education Projects Officer
Judy Reizes	Community Projects Officer, Manly Environmental Centre
Anna Nikolov	Social Planner
Lee Lau	Water Cycle Management Team Leader
Tim Macdonald	Coastal Management Team Leader
Rafiqul Islam	Estuary Management Officer

Contributions of the Clontarf/ bantry Bay Estuary Management Working Group and Internal staff Working group are highly acknowledged. Acknowledegements are also due to Vaughan Middleton, Ted Pirola, Michael Galloway, Dalene Amm, Kym Thrift, John MacRitchie, Justin Shupe, Skye Rose (Manly Council), Phil Hunt (Aboriginal Heritage Office), Karen Kennedy (Sydney Metropolitan Catchment Management Authority), Brian Graham (Department of Water & Energy), Craig Morrison (Sydney Coastal Council Group), James Sakker (Department of Primary Industries) for their contributions and review of the EMP. Scott Macher was Estuary Management Officer during initial stages of formulation of this EMP.

Preparation of this EMP is financed from the Environment Levy of Manly Council and a grant under the Estuary Management Program 2005-06 of the Department of Environment & Climate Change (DECC)

Vision of the Clontarf/Bantry Bay Estuary Management

"A thriving community, enhanced by heritage and lifestyle, where residents and visitors work together to live in harmony with the unique natural environment, both on land and in the sea."

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i. EXECUTIVE SUMMARY

The Clontarf / Bantry Bay Estuary Management Plan (EMP) was adopted by the Council at its Planning & Strategy Committee meeting on 12 May 2008. Prior to this, public exhibition of the Plan occurred during 17 March – 21 April 2008 and a final endorsement of the Plan by the Clontarf / Bantry Bay Estuary Management Working Group on 28 April 2008. Supporting documents include an Estuary Processes Study describing the baseline condition and an Estuary Management Study describing management objectives, options and impacts. These documents were finalised in August and November 2007, respectively.

About the Plan

This Plan is prepared through the process outlined in the NSW Estuary Management Manual. Extensive community consultation was initiated through establishing a community participated Working Group and conducted through mechanisms including, display panels, information sharing through Precinct newsletters and Council's webpage, formal questionnaire surveys and community Field Days.

This Plan addresses the portion of the Middle Harbour estuary and foreshore that aligns with the Manly Local Government Area border. The study area covers 350 hectares, with a perimeter of 11.5km, and takes in the suburbs of Balgowlah Heights, Clontarf and Seaforth. The entire study area is covered within the Sydney Harbour Foreshores and Waterways Area and also within the Sydney Metropolitan Catchment Area.

The Plan has been developed in response to legislative requirements and community issues in accordance with current best practices for the management of estuaries and its catchment. The development of an Estuary Management Plan is identified in Manly Plan 2007-2010 and Sustainability Strategy 2006.

Preparation of this EMP fulfils implementation of Action C1.3.4 (*Establish a Community Working Group and undertake Estuary Management Plan for Clontarf and Bantry Bay coastline areas*) of the Manly Sustainability Strategy.

The Plan addresses the following 10 broad based key issues, derived from community consultations:

- Water quality & pollution,
- Aquatic/intertidal habitat conservation & management,
- Bushland/terrestrial habitat conservation & management,
- Sedimentation & beach erosion,
- Hazards & risks including climate change,
- Estuary use,
- Access,
- Foreshore infrastructure & facilities,
- Heritage conservation & management and
- Monitoring.

The Plan has been developed under the following vision statement:

"A thriving community, enhanced by heritage and lifestyle, where residents and visitors work together to live in harmony with the unique natural environment, both on land and in the sea."

This Estuary Management Plan is a strategic plan with a long-term time frame of 15- 20 years and firmed up implementation program of 5 years. This plan will be reviewed and revised every 5 years and a new implementation program will be adopted in line with priorities of the period.

This Estuary Management Plan has evolved through incorporation of strategic directions from a number of Council's management documents and land use planning instruments. In order to embed estuary management as part of Council's core business, the adopted Plan will link into documents such as: Manly Plan**,** Manly Sustainability Strategy**,** Manly Social Plan**,** Coastline & Estuary Management Plans**,** Manly Local Environmental Plan**,** Development Control Plans (DCPs)**,** and Plans of Management.

Strategic Framework & Management Strategy

A series of goals and objectives for the future management of the Clontarf/Bantry Bay Estuary were developed on the basis of information received through community and stakeholder consultation. For each management issue a goal has been defined, along with a range of management objectives that have been further translated into management options. The Plan follows the four basic principles of Ecologically Sustainable Development (ESD) and also considers the State Plan, state-wide targets set by the Natural Resources Commission and regional targets set by the Sydney Metropolitan Catchment Management Authority (SMCMA).

This Plan sets 10 Goals and 35 Objectives to be addressed through 85 Management Options (**Table A**). Only 53 of these are new activities. Of these 53, 15 management options are proposed for immediate implementation, 25 within 2 years, 12 within 3-4 years and only 1 at later years. Overall, 22 management options have been rated to have high priority, 56 as medium priority and only 7 as low priority.

Strategic Management Options

Strategic management options cover a wide range of structural and non-structural solutions. These are briefly summarised here addressing each of the 10 key management issues.

Options addressing Water Quality & Pollution

A total of 12 management options are proposed (Table A and detailed in Section 4.1) to address five objectives: reduction of pollutant loads, sewage discharges, sustainable use of groundwater; pollution levels at public swimming enclosures and continuation of education programs.

Five of these are high priority management options and relate to continuation of existing GPTs, formulation of comprehensive Stormwater Management Plan, confirmation of location of sewage overflow points and managing feacal coliform and enterrococci levels at public swimming enclosures. The remaining seven management options have medium priority.

Four of the management options are on-going activities. Four options that have been proposed for immediate implementation relate to confirmation of location of sewage overflow points, addressing high feacal coliform and enterrococci levels at Sangrado swimming enclosure and investigations/survey into groundwater and greywater use in the study area.

Options addressing Aquatic/Intertidal Habitat Conservation & Management

A total of 14 management options are proposed (Table A and detailed in Section 4.2) to address five objectives: preserving seagrass beds, eradication of *Caulerpa taxifolia*, maintainance of existing mangrove population, protection of areas of ecological significance and investigation into factors affecting areas of high ecological value.

Only one high priority management option relates to increased enforcement of boating restrictions over seagrass beds. Further ten management options have medium priority.

Six of the management options are on-going activities. Two options that have been proposed for immediate implementation relate to enforcement of boating restrictions on seagrass beds and implementation of ‘Fisher Bay Mangrove Expansion Program’.

Options addressing Bushland/Terrestrial Habitat Conservation & Management

A total of 10 management options are proposed (Table A and detailed in Section 4.3) to address three objectives: continuation of Council’s bushland management program, establishment of native vegetation corridors and encouraging community participation.

There are no high priority management options identified. However, nine management options have medium priority. Six of the management options are on-going activities. One option that has been proposed for immediate implementation relates to identification of adhoc tracks from private properties.

Options addressing Sedimentation & Beach Erosion

A total of three management options are proposed (Table A and detailed in Section 4.4) to address two objectives: to gain a comprehensive understanding on estuarine sediment transport patterns and mitigating foreshore accretion/erosion processes.

All three management options have been rated as of high priority and relate to a comprehensive study on estuarine sediment transport patterns, mitigation measures for erosion prone sites and addressing siltation of the Clontarf swimming enclosure.

None of the management options are on-going activities. One option that has been proposed for immediate implementation relate to a comprehensive study on estuarine sediment transport patterns.

Options addressing Hazards & Risks including Climate Change

A total of seven management options are proposed (Table A and detailed in Section 4.5) to address two objectives: identification of existing and potential hazards and implications of sea level rise.

Only one high priority management option relates to preparing Council's policy and strategy documents incorporating the 4th IPCC and other regional and national projections. The remaining six management options are each categorised in medium priority.

One of the management options are on-going activity. One option that has been proposed for immediate implementation relate to assessing stability of seawalls protecting public lands.

Options addressing Estuary Use

A total of 13 management options are proposed (Table A and detailed in Section 4.6) to address three objectives: safe and enjoyable public areas, encouraging boating use and supporting recreational fishing.

Of them, three high priority management options relate to installation of adequate waste recycling stations, supporting jetski and commercial fishing bans. The remaining 10 management options are each categorised in medium priority.

Eight of the management options are on-going activities.

Options addressing Access

A total of four management options are proposed (Table A and detailed in Section 4.7) to address three objectives: maintenance of the Manly Scenic Walkway, increased disabled access and facilitation of dog-walking.

One high priority management option relates to installation of adequate dog faeces bins and bag dispensers. Two management options are categorised in medium priority.

Two of the management options are on-going activities of the Council.

Options addressing Forshore Infrastructure & Facilities

A total of eight management options are proposed (Table A and detailed in Section 4.8) to address five objectives: rationalisation of mooring places, construction of public boats landing facilities, establishing dinghy and kayak storage facilities, improvement of usability of public swimming enclosures and betterment of general amenities.

Four high priority management options relate to installation of dinghy and kayak storage facilities, restoration of collapsed Sangrado swimming enclosure and enhancement of general amenities such as public toilets and street lights. The remaining four management options are each categorised in medium priority.

Two management options are already on-going activities. Four options that have been proposed for immediate implementation relate to construction of a public floating pontoon, installation of dinghy storage, installation of rods to tie boats and restoration of collapsed Sangrado swimming enclosure.

Table C: Summary of Proposed Management Options

Objectives	Management Options	Responsible Agency (ies)	Performance target	Estimated Cost			Time Frame	Priority	Remarks
				Capital	Operational	Total			
(WQ) WATER QUALITY									
Goal: Ensure that the water quality of the estuary is suitable for maintaining healthy natural aquatic ecosystems, and for recreational pursuits									
WQ 1 Reduce the level of catchment sourced pollutants sufficiently.									
WQ1.1. Formulate comprehensive Stormwater Management Plan for Manly LGA encompassing the study area.		MC (NR)[1]	Management Plan completed	0	70,000	70,000	Within 3- 4 years	High	
WQ1.2. Continue maintaining existing gross pollutant traps (GPTs) in the Clontarf catchment.		MC (NR)	Efficient GPT maintenance	-	50,000	50,000	On -going	High	
WQ1.3. Install new Stormwater Quality improvement Devices (SQIDs) at priority locations taking into account current best practice technologies.		MC (NR & C&US)	SQIDs installed	150,000	-	150,000	Within 3- 4 years	Medium	
WQ1.4. Install pit inserts in litter hotspots throughout the study area.		MC (C&US)	Pit inserts tried and installed in hotspots	30,000	15,000	45,000	Within 2 years	Medium	
WQ 2 Reduce sewage discharges from sewage overflows within the catchment									
WQ2.1. Confirm, with Sydney Water, the presence of all sewage overflow points within the Clontarf / Bantry Bay study area including the five known ones.		Sydney Water, MC (NR)	All overflow points known and mapped	-	-	Staff time	Immediate	High	
WQ 3 Ensure that faecal coliform and enterococci levels at designated public swimming enclosures comply with standard recommendations.									
WQ3.1. Work with relevant agencies to minimise *faecal coliforms* and *enterococci* levels at all three public swimming enclosures.		Harbour Watch, Sydney Water, MC (NR)	Bacterial contamination managed & water quality improved	2,000	10,000	12,000	On-going	High	
WQ3.2. Investigate & seek to address possible sources of high faecal coliforms and enterococci levels in Sangrado swimming enclosure.		Sydney Water, MC (NR)	Investigation Report	0	2,000	2,000	Immediate	High	
WQ 4 Ensure sustainable use of different sources of water									
WQ4.1. Undertake a comprehensive study on Clontarf groundwater aquifer to identify present extraction rate, recharge and other relevant issues.		MC (NR), DWE	Study Report completed	0	45,000	45,000	Immediate	Medium	
WQ4.2. Monitor extracted groundwater for salinity and other parameters for early signs of contamination.		MC (NR)	Salinity & other parameters monitored	0	9,000	9,000	Within 2 years	Medium	
WQ4.3. Assess current grey water direct diversion (GDD) uptake within Manly Council (including the study area) through undertaking a residential survey.		MC (S&C, NR & CEP)	Survey Report completed	0	10,000	10,000	Immediate	Medium	Student project
WQ4.4 Make rainwater tank and associated infrastructure purchases by residents more attractive and thereby facilitate reduced stormwater generation.		MC (CEP), Sydney Water, SMCMA	Increased use of Rainwater tank rebate	-	-	Existing program	On-going	Medium	
WQ 5 Continue water quality and waste management education programs									
WQ5.1. Introduce Manly Council's Seachange (integrated pollution prevention) program in the study area to educate sustainable stormwater management & pollution prevention		MC (CEP)	Number of Educated increased	0	40,000	40,000	On-going	Medium	
(AH) AQUATIC/INTERTIDAL HABITAT CONSERVATION & MANAGEMENT									
Goal: Restore and maintain a healthy and diverse mix of aquatic and intertidal habitats that will maintain and improve biodiversity and ecological functions of the estuary.									
AH 1 Preserve and maintain existing seagrass beds.									
AH1.1. Encourage NSW DPI to prepare periodic up-to-date seagrass distribution maps.		NSW DPI, MC (NR)	Updated seagrass map	-	-	Staff time	On-going	Medium	
AH1.2. Encourage NSW Maritime and NSW DPI to increase the enforcement of boating restrictions over seagrass beds. Develop interpretative signage to notify seagrass beds as protected areas.		NSW DPI, NSW Maritime, MC (NR), SMCMA	Enhanced community awareness, signage installed	0	10,000	10,000	Immediate	High	

[1] AHO – Aboriginal Heritage Office; CPS – Corporate Planning & Strategy (of MC); C & US – Civic & Urban Services (of MC); DADU – Development Assessment & Determination Unit (of MC); DECC – Department of Environment & Climate Change; DWE – Department of Water & Energy; NSW DPI – NSW Department of Primary Industries; GO- Greenhouse Office; SCCG – Sydney Coastal Councils Group; P&R – Parks & Reserves (of MC); MEC – Manly Environment Centre (of MC); WS – Waste Services (of MC); MC – Manly Council; P&S – Planning & Strategy (of MC); NR – Natural Resources (of MC); SMCMA – Sydney Metropolitan Catchment Management Authority.

Objectives	Management Options	Responsible Agency (ies)	Performance target	Estimated Cost			Time Frame	Priority	Remarks
				Capital	Operational	Total			
AH 2 Eradicate where possible or bring under control *Caulerpa taxifolia* from within and around Middle Harbour.									
AH2.1. NSW DPI to continue to keep NSW Maritime, Manly Council and community informed of the updated information on distribution of *Caulerpa taxifolia*.		NSW DPI, NSW Maritime, SMCMA,SCCG, MC (NR)	Updated information distributed regularly	-	-	Staff time	On-going	Medium	
AH2.2. Encourage NSW DPI to continue implementing the 'Control Plan for *Caulerpa taxifolia* in NSW'.		NSW DPI, SMCMA, SCCG, MC (NR)	Control Plan implemented	-	-	Staff time	On-going	Medium	
AH 3 Maintain areas of key intertidal ecosystems and investigate possibility of its expansion.									
AH3.1. Protect existing mangroves and carry out regeneration activities.		MC (P&R), DPI	Mangrove population maintained or enhanced	-	4,000	4,000	On-going	Medium	
AH3.2. Design and implement the Fisher Bay Mangrove Expansion program.		MC (P&R), NSW DPI	Mangrove expansion Program implemented	30.000	15,000	45,000	Immediate	Medium	
AH3.3 Identify, map, protect and enhance saltmarsh habitat within the study area		MC (P&R), DPI, SMCMA	Saltmarsh areas maintained and enhanced	0	0	0	Within 2 years	Medium	
AH 4 Ensure all areas of ecological significance are properly protected and conserved.									
AH4.1. Encourage DECC and NSW DPI to continue to enforce declared protected areas of ecological significance through various means of legal to voluntary measures.		MC (NR), DECC, NSW DPI, SMCMA	*Areas protected through increased patrol*	-	-	Staff time	On-going	Medium	
AH4.2. Encourage DECC to undertake a study of possible penguin nest sites in Middle Harbour and community to report penguin sightings		DECC, MC (NR), Precincts	Study completed	-	-	Cost to DECC Staff time	Within 2 years	Low	
AH4.3. Support volunteer'groups to facilitate conservation and protection of aquatic and intertidal habitats.		MC (CEP)	Volunteer groups supported	0	10,000	10,000	On-going	Medium	
AH4.4. Work with NSW DPI to disseminate information brochures outlining the importance of aquatic habitats and the penalties involved in harming them.		MC (CEP) NSW DPI	Brochure disseminated	-	-	Staff time	Within 2 years	Medium	
AH 5 Define factors affecting areas of high ecological value and develop and implement measures to address them.									
AH5.1. Continue to collate, analyse recent knowledge and study factors affecting degradation of ecologically important/critical habitats.		MC (NR)	Updated knowledge collated & studies undertaken	-	-	Staff time	Within 2 years	Low	
AH5.2. Investigate best practice beach raking in other Councils and incorporate that knowledge for possible implementation at Clontarf. Improve Council staff knowledge regarding eco sensitivities in beach raking and other services.		MC (CS), SCCG	Knowledge gained & applied	-	-	Staff time	Within 2 years	Low	
AH5.3. Retain rocky foreshores and cliff-lines as important coastal habitat. Where new upgrading or building of seawalls needed, ensure to incorporate recent knowledge on seawall restorations supporting ecological habitat		MC (CS, US & NR)	Knowledge gained & utilized	-	-	Staff time	Within 3-4 years	Low	
(TH) BUSHLAND/TERRESTRIAL HABITAT CONSERVATION & MANAGEMENT **Goal: *Protect and enhance urban bush land and native vegetation areas***									
TH 1 Continue to manage Council's bushland management program.									
TH1.1. Prepare a comprehensive bushland management plan and develop a staged implementation program.		MC (P&R)	Bushland Management Plan prepared	0	40,000	40,000	Within 3-4 years	Medium	
TH1.2. Prepare management plans for the six identified SEPP 19 bushlands, to fulfill		MC (P&R)	Management Plans	0	60,000	60,000	Within 2	Medium	

Objectives	Management Options	Responsible Agency (ies)	Performance target	Estimated Cost			Time Frame	Priority	Remarks
				Capital	Operational	Total			
statutory requirement.			prepared				years		
TH1.3. Identify adhoc tracks from private properties entering bushlands and approach property owners to ensure their safety and continued maintenance at an appropriate and specified standard.		MC (P&R)	Tracks identified and owners contacted	-	-	Staff time	Immediate	Medium	
TH1.4. Council to continue to be an active participant in the Die-Back Working Group		MC(P&R), SCCG	Contributory & active participant	-	-	Staff time	On-going	Medium	
TH1.5. Involve the Precinct to discuss the issue of view maintenance with property owners.		MC (P&R), Precincts	Meetings held as required	-	-	Staff time	On-going	Medium	
TH 2 Establish native vegetation corridors linking natural bushland areas.									
TH2.1. Investigate possibility of establishing corridors linking different bushlands and assess their ecological significance.		MC (P&R)	Assessment Report	0	5,000	5,000	On 5th or later year	Medium	
TH2.2. Continue and reassess Council's Street Tree Planting Program within the study area.		MC (P&R)	Recommended list prepared & Program continued	-	-	Staff time, existing program	On-going	Low	
TH 3 Encourage and establish community participation in bush regeneration program and in native plants on public and private lands									
TH3.1. Continue Community Bush Care Volunteers program in the study area.		MC (P&R)	Program supported & continued	0	25,000	25,000	On-going	Medium	
TH3.2 Continue publication of 'Bushland News' and circulate widely in the community		MC (P&R)	Publication continued	0	15,000	15,000	On-going	Medium	
TH3.3. Continue annual 'Native Plant Giveaway' program to support residents in maintaining native vegetations on private properties.		MC (P&R, CEP)	Program continued	0	30,000	30,000	On-going	Medium	
(SE) SEDIMENTATION & BEACH EROSION **Goal:** ***Manage erosion and sedimentation to reduce their impact on the natural environment and recreational amenity***									
SE 1 Generate comprehensive understanding on estuarine sediment transport patterns of the area									
SE1.1. Carry out a comprehensive study on estuarine sediment transport patterns		MC (NR), DECC	Study Report	0	50,000	50,000	Immediate	High	Grant funding obtained
SE 2 Mitigate foreshore accretion/erosion processes at priority areas.									
SE2.1. Define and implement mitigation measures for erosion prone sites.		MC (NR, US)	Mitigation measures implemented	20,000	80,000	100,000	Within 3-4 years	High	
SE2.2. Define and implement measures to address siltation at the Clontarf swimming enclosure.		MC (NR, US)	Mitigation measures implemented	0	60,000	60,000	Within 2 years	High	
(HR) HAZARDS & RISKS INCLUDING CLIMATE CHANGE **Goal:** ***Assess, minimize and mitigate risks from natural hazards including climate change***									
HR 1 Identify existing and potential hazards and establish mitigation measures									
HR1.1. Commission a geotechnical study for specific sections of foreshore areas to identify and prioritise risks, and establish risk based management options.		MC (NR, US)	Geotechnical Study Report	0	50,000	50,000	Within 3-4 years	Medium	
HR1.2. Undertake inspections to assess stability of seawalls protecting public lands. If upgrading is required, promote eco- friendly sea walls.		MC (US & NR)	Regular Inspection Reports	0	0	0	Immediate	Medium	Study combined with SE1.1
HR1.3. Work with the State Emergency Services (SES) and other agencies to continuously update Emergency Action Plan including evacuation procedures in the event of storm surges and tsunami.		SES, MC (CS & NR)	Emergency Action Plan updated	0	10,000	10,000	Within 2 years	Medium	

Objectives	Management Options	Responsible Agency (ies)	Performance target	Estimated Cost			Time Frame	Priority	Remarks
				Capital	Operational	Total			
HR 2 Consider the potential implications of sea level rise on the estuary and its surrounds as a result of climate change.									
HR2.1. Assess impact of climate change on areas of ecological significance and devise adaptive measures		MC (NR), SCCG,	Ecological impact map	0	20,000	20,000	Within 3-4 years	Medium	
HR2.2. Work with the Sydney Coastal Councils Group to develop a regional/ local level climate change model considering protection provided by existing seawalls and rocky foreshores.		SCCG, DECC, MC (NR)	Model Results & Impact Report	-	-	Staff time, SCCG project	Within 2 years	Medium	
HR2.3. Collaborate with the Sydney Coastal Councils Group/ Macquarie Uni /CSIRO project investigating climate change adaptations in Manly.		SCCG, DECC, MC (NR)	Adaptation Action Plan	-	-	Staff time	On-going	Medium	
HR2.4. Revise/Update Council's policy and strategy documents incorporating federal and/or state guidelines/recommendations regarding climate change adaptations		MC (CPS)	*New or revised policy documents to accommodate CC*	-	-	Staff time	Within 2 years	High	
(EU) ESTUARY USE **Goal:** ***Improve and meet the environmental, socio-economic and recreational needs of estuary use***									
EU 1 Create safe, sustainable and enjoyable public areas for diverse user groups.									
EU1.1. Ensure safe public access to foreshores including maintenance of natural vegetation.		MC (P&R)	*Safety of access paths improved*	0	50,000	50,000	Within 2 years	Medium	
EU1.2. Install adequate garbage and waste recycling stations in public places.		MC (WS)	Recycling stations installed	30,000	25,000	55,000	On-going	High	
EU1.3. Liaise with relevant state authorities regarding the consolidation of existing signage with signage more sympathetic to the area.		MC (CEP, NR)	Signage replaced with new ones	0	20,000	20,000	Within 3-4 years	Medium	
EU1.4. Promote natural features of 'Clontarf - Sandy Bay- Fisher Bay – Ellery's Punt Reserve' parts of the study area.		MC (NR), Tourism NSW	Brochure prepared	0	10,000	10,000	Within 3-4 years	Medium	
EU1.5 Develop & implement Pickering Point Landscape Development Program		MC (D&T, P&R, NR)	Development program implemented	0	50,000	50,000	Within 3-4 years	Medium	Landscape Plan immediately
EU1.6. Promote community events and education programs to achieve sustainable use of the estuary.		MC (CEP), NSW Maritime & NSW DPI	Community events & Education programs promoted	0	30,000	30,000	On-going	Medium	
EU 2 Encourage boating use including kayaking within the estuary that minimises its social and environmental impact, whilst not compromising the amenity or safety.									
EU2.1. Facilitate and encourage non-motorised boating activities (kayaking, wind surfing etc) in the waterways.		MC (CEP, NR), NSW Maritime	Facilities created	-	25,000	25,000	On-going	Medium	
EU2.2. Encourage NSW Maritime to enforce current speed limits and mooring restrictions by increased patrolling.		NSW Maritime	Patrolling increased	-	-	Staff time	On-going	Medium	
EU2.3. Encourage NSW Maritime to consider a designated 'boat exclusion zone' at Clontarf to ensure safety of swimmers.		NSW Maritime, MC (NR)	Proposal prepared and considered	-	-	Staff time	Within 2 years	Medium	
EU2.4. Support continuation of jetski (PWC) ban		MC (NR)	Ban supported	-	-	Staff time	On-going	High	
EU2.5. Continue program, with NSW Maritime & Council's Starboard Right & Green (SR&G) program, to educate boat owners about waterway etiquettes and possible impact on marine environment.		MC (CEP)	Education program continued	-	25,000	25,000	On-going	Medium	
EU 3 Support sustainable recreational fishing in the estuary									
EU3.1. Support continuation of ban on commercial fishing.		MC (NR), SCCG,	Ban supported	-	-	Staff time	On-going	High	
EU3.2. Encourage NSW DPI & NSW Health to monitor Dioxin levels in Sydney Harbour		NSW DPI, NSW	Dioxin Level monitored	-	-	Staff time	Within 2	Medium	

Objectives	Management Options	Responsible Agency (ies)	Performance target	Estimated Cost			Time Frame	Priority	Remarks
				Capital	Operational	Total			
waters.		Health, SCCG					years		
(AC) ACCESS **Goal:** ***Ensure safe public accessibility of waterways, foreshores and other areas of the estuary.***									
AC 1 Maintain Manly Scenic Walkway (MSW) regularly and continuously improve its use value									
AC1.1. Enhance maintenance schedule and retain and enhance the native vegetation along the Manly Scenic Walkway.		MC (P&R)	Maintenance enhanced	0	100,000	100,000	On-going	Medium	
AC 2 Increase disabled access (where practically possible) to parks and bays in the study area									
AC2.1. Audit disability access of all parks and bays within the study area.		MC (P&S)	Audit completed	-	-	Staff time	Within 2 years	Medium	
AC3 Facilitate dog-walking including possibility of establishing off-leash dog areas.									
AC3.1. Assess, in consultation with nearby residents, possibility of declaring Sandy Bay tidal flats as off-leash dog area.		NSW Maritime MC (P&R)	Off-leash dog area continued	-	10,000	Staff time	Within 2 years	Low	
AC3.2. Install adequate dog faeces bins and bag dispensers.		MC (WS)	Facilities established	0	20,000	20,000	On-going	High	
(FI) FORESHORE INFRASTRUCTURE **Goal:** ***Improve social amenity through rationalisation of foreshore structures which are sympathetic to social and ecological needs and manage public risks.***									
FI 1 Rationalise mooring places to minimise the impact on ecologically important seagrass beds.									
FI1.1. Work with NSW Maritime to introduce seagrass friendly moorings		NSW Maritime, SCCG, SMCMA	Moorings introduced	-	-	Staff time	Within 2 years	Medium	
FI1.2 Work with NSW Maritime to realign and maintain the same number of permanent moorings in front of Clontarf beach for the safety of swimmers and protection of seagrass beds.		NSW Maritime, MC (NR)	Moorings realigned	-	-	Staff time	Within 2 years	Medium	
FI 2 Facilitate public boat landing facilities at suitable sites within the study area									
FI2.1. Construct a public floating pontoon beside Sangrado swimming enclosure and encourage NSW Maritime to assess for other boat landing facilities within the study area.		MC (US), NSW Maritime	Pontoon constructed and assessment made	50,000	20,000	70,000	Immediate	Medium	Grant funding obtained
FI 3 Establish dinghy and kayak storage facilities at suitable locations within the study area									
FI3.1. Install horizontal dinghy and kayak storage racks at Sandy Bay in consultation with nearby residents and dinghy owners.		MC (US, Design & Technical)	Storage rack	7,000	4,000	11,000	Immediate	High	
FI3.2. Install rods/poles at Gurney Crescent & Castle Circuit to tie dinghies & kayaks and educate owners regarding protection of trees & middens, and decrease erosion of foreshore		MC (CEP), Precincts	Rods/poles installed & Education program initiated	2,000	900	2,900	Immediate	High	
FI4 Maintain and improve usability of public swimming enclosures of the study area									
FI4.1. Assess and implement options to restore collapsed Sangrado swimming enclosure		MC (US)	Sangrado swimming enclosure restored	150,000	-	150,000	Immediate	High	
FI.5 Better general amenities, traffic and safety at foreshore areas, public reserves and beaches									
FI5.1 Enhance general amenities such as public toilets, street lights etc. at convenient locations		MC (Urban Services)	Facilities enhanced	-	75,000	75,000	On-going	High	
FI5.2 Improve and facilitate traffic management around public reserves and beaches		MC (Urban Services), RTA	Improved traffic management	0	16,000	16,000	Within 3-4 years	Medium	
(HC) HERITAGE CONSERVATION **Goal:** ***Ensure that all Aboriginal, natural and cultural and heritage items in the area are preserved and protected in consultation with appropriate bodies.***									

Objectives	Management Options	Responsible Agency (ies)	Performance target	Estimated Cost			Time Frame	Priority	Remarks
				Capital	Operational	Total			
HC 1 Ensure that all 22 sites of Aboriginal heritage significance are properly identified, recorded and protected under the applicable State and Federal legislations.									
HC1.1. Review Aboriginal Site Management Report for Manly Council (2006) and associated reports to prioritize management needs and develop a plan of implementation.		AHO, MC (P&S)	Prioritisation done	-	-	Staff time	On-going	Medium	
HC1.2. Construct boardwalk type structure where MSW bisects Aboriginal midden at Sandy Bay.		MC (P&R), AHO	Boardwalk installed	-	-	-	Immediate	High	Implemented already
HC1.3. Prevent damage to Aboriginal middens in critical condition.		AHO, MC (P&S, US, P&R)	Physical protection done	0	40,000	40,000	On-going	High	
HC1.4. Confirm and prepare a number of Aboriginal sites suitable for public visitation.		AHO, MC (P&S)	Brochure on selected sites	0	6,000	6,000	On-going	Medium	
HC2 Ensure that all sites of natural and cultural heritage are identified and registered under the relevant legislation and in Council planning instruments.									
HC2.1. Assess heritage significance of 'Laura Street Wharf' and propose its inclusion in the heritage list.		MC (P&S)	Assessment made	-	-	Staff time	Within 2 years	Low	
HC2.2. Interpret old tram line near the Spit Bridge to signify historical past.		MC (P&S)	Feasibility study & implementation	0	5,000	5,000	Within 2 years	Low	
HC3 Increase community awareness of the significance of Aboriginal, natural and cultural heritage through adequate signage.									
HC3.1. Organise awareness campaign to highlight heritage conservation including heritage talk to school children		AHO, MC (P&S, CEP)	Regular campaign organised	0	25,000	25,000	On-going	Medium	
HC3.2. Develop management guidelines for sites that are located within private properties.		AHO	Guidelines prepared	0	15,000	15,000	Within 3-4 years	Medium	
(M0) MONITORING **Goal:** ***Measure the condition and usage of the estuary to gauge the effectiveness of the Estuary Management Plan in achieving its goal and management objectives***									
MO 1 Develop and implement a Monitoring Program (including key indicators) to assess improved management of the estuary									
MO1.1. Develop a comprehensive monitoring program including key indicators and mechanisms of monitoring in consultation with relevant organisations.		MC (NR, Environmental Health)	Monitoring Program made	0	30,000	30,000	Within 2 years	Medium	
MO1.2. Monitor the environmental health of the estuary, including water quality, erosion/accretion, bush lands, ecological diversity and abundance.		MC (Environmental Health, NR, P&R)	Monitoring initiated and continued	50,000	80,000	130,000	Within 2 years	High	
MO2 Monitor the public usage of Clontarf/Bantry Bay estuary and its surrounds.									
MO2.1. Monitor use of the Manly Scenic Walkway.		MC (P&R)	Monitoring initiated and continued	0	10,000	10,000	Immediate	Medium	
MO2.2. Monitor the use of waterways at different points of the estuary.		MC (CEP), NSW Maritime	Monitoring initiated and continued	0	9,000	9,000	Within 2 years	Medium	
MO3 Assess possibility of establishing participatory monitoring by the community									
MO3.1. Establish participatory monitoring and encourage community participation		MC (CEP), MEC	Concept developed & discussed	0	5,000	5,000	Within 2 years	Medium	
MO4 Update, refine and revise the Estuary Management Plan.									
MO4.1. Review monitoring results and revise/update management options.		MC (NR)	Results reviewed & Options revised	-	-	Staff time	Within 3-4 years	Medium	

Options addressing Heritage Conservation

A total of eight management options are proposed (Table A and detailed in Section 4.9) to address three objectives: protection of all 22 sites of Aboriginal heritage significance, identification of all sites of natural and cultural heritage and increased community awareness.

Two high priority management options relate to construction of protection structure to an Aboriginal midden at Sandy Bay and prevention of damage to Aboriginal middens in critical conditions. Four management options are categorised in medium priority.

Four of the management options are on-going activities. One option that has been proposed for immediate implementation relate to construction of protection structure to an Aboriginal midden at Sandy Bay.

Options addressing Monitoring

A total of six management options are proposed (Table A and detailed in Section 4.10) to address four objectives: development and implemention of a Monitoring Program, monitoring public use of the estuary, establishing community monitoring and use of monitoring results to revise the EMP.

Only one high priority management option relates to monitoring the environmental health of the estuary. The remaining five management options are categorised in medium priority.

None of the management options are on-going activities. One option that has been proposed for immediate implementation relate to monitoring of use of the Manly Scenic Walkway.

Funding Requirements

The total cost of implementing (including 1-5 years of operation and maintenance) the 85 management options addressing 10 key management issues is approximately $2.10 million (**Table B**). An estimated $ 406,000 will be required to implement 15 options proposed for immediate implementation (**Table C**).

Table B: Summary of estimated cost

Management Issues	Number of Management Options	Estimated Cost ($)			
		High priority	Medium Priority	Low priority	Total
Water Quality	12	134,000	299,000	0	**433,000**
Aquatic Habitat	14	10,000	59,000	0	**69,000**
Terrestrial Habitat	10	0	175,000	0	**175,000**
Sedimentation & Erosion	3	210,000	0	0	**210,000**
Hazards & Risks	7	0	80,000	0	**80,000**
Estuary Use	13	55,000	210,000	0	**265,000**
Access	4	20,000	100,000	0	**120,000**
Foreshore Infrastructure	8	383,900	86,000	0	**469,900**
Heritage Conservation	8	40,000	46,000	5,000	**91,000**
Monitoring	6	130,000	54,000	0	**184,000**
	85	**982,900**	**1,109,000**	**5,000**	**2,096,900**

Some actions require an on-going commitment from existing staff rather than the outlay of expenditure and this is noted as 'Time'. Some recommended actions require significant capital costs, especially where large-scale works are involved such as restoring collapsed swimming enclosure and foreshore protection structures.

As indicated elsewhere, implementation responsibility of all proposed management options rests with a number of agencies including Manly Council. Hence, adoption of this EMP does not commit Council to allocate immediate funding. Funding from different alternative sources will be pursued (**Annex B**). These include but are not limited to:

- Council's Environment Levy (subject to a budget bid process);
- Council's General Revenue Budget (subject to a budget bid process);
- State Government's Estuary Management Program (50% subsidy funding subject to a submission process);
- NSW Coastal Catchments Initiative; and

- Other Commonwealth and State Government funded programs.

Implementation Plan

Agencies involved: Manly Council (MC) is the principal implementation/management agency of the Clontarf/ Bantry Bay Estuary Management Plan. Responsibility for implementing the options is spread across local government (planning, management and works staff), state government agencies and volunteer community groups. The following agencies will be involved in implementation of one or more relevant management options either in the main or supporting roles.

- Department of Environment and Climate Change (DECC);
- NSW Maritime;
- Department of Primary Industries (DPI);
- Sydney Water;
- Department of Water & Energy;
- Sydney Coastal Councils Group (SCCG);
- Aboriginal Heritage Office (AHO);

Other agencies likely to be involved are Sydney Metropolitan Catchment Management Authority (SMCMA), SES and RTA.

Implementation Time frame: Of 85 management options proposed in this EMP, 32 options are on-going activities of the Council and/or other agencies. Among newly proposed 53 options, 15 have been proposed for immediate implementation (**Table C**), 25 within two years, 12 within 3-4 years and only 1 on 5th or later years.

To be incorporated into the Manly Plan: The management options proposed in this Estuary Management Plan will gradually be mainstreamed in to the rolling three year Manly Plan. The Manly Plan is the key planning document driving the operations of Council. Efforts will be made to incorporate priority options in to the next Manly Plan 2008 – 2011 and subsequent Plans.

Collaborative Partnership with other agencies and neighbouring Councils: Manly Council, as being the main implementor of the EMP, plans to conclude collaborative partnership agreements with other relevant agencies and neighbouring Councils either specifically for this EMP or for overall LGA. Manly Council has signed a Memorandum of Understanding 'Manly Council and Sydney Water Partnership' in July 2000 to work together to achieve, within the framework of Total Catchment Management and Ecologically Sustainable Development. Similar agreements can be initiated with other agencies.

Manly Harbour Foreshores Management Committee to coordinate: Manly Harbour Foreshores Management Committee, from which the Clontarf/Bantry Bay Estuary Management Working Group was formed, will co-ordinate implementation of the EMP. The Committee, reconstituted to accommodate a number of Coastal/Estuary Management Committees/Working Groups will be serviced by the Coastal Management Team of Council

Opportunities for community involvement: Many of the management strategies adopted for Clontarf/Bantry Bay estuary offer opportunities for community involvement particularly activities such as revegetation projects, participatory monitoring programs and environmental education, as well as general monitoring of plan implementation and effectiveness.

Reporting through three mechanisms: Reporting on implementation of the EMP will be achieved through four mechanisms: internal Council reporting process, Annual Reports to the community, Council website and regular Harbour Foreshore Committee meetings.

EMP to be reviewed every 5 years: The Estuary Management Plan will be reviewed every 5 years to accommodate priorities of the period, requirements of new/amended legislations and Council's policies and guidelines. During the process, there will be a mechanism to identify new issues and conflicts concerning the estuary management and ensure their incorporation into a revised plan. A program for the following 5 years will

be developed by designating priority to any new actions and reassigning priority to the remaining actions. These programs should be fed back into and form the revised EMP for the next 5 years.

Table C: Management Options proposed for immediate implementation

Sl. No.	Management Options	Responsible Agencies	Estimated Cost ($)			Remarks
			Capital	Operational	Total	
	High Priority					
1	**SE1.1.** Carry out a comprehensive study on estuarine sediment transport patterns (Study to be combined with HR 1.2)	MC (NR), DECC	0	50,000	50,000	50% DECC grant approved
2	**FI3.1**. Install horizontal dinghy and kayak storage racks at Sandy Bay in consultation with nearby residents and dinghy owners.	MC (US, Design & Technical)	7,000	4,000	11,000	
3	**FI4.1.** Assess and implement options to restore collapsed Sangrado swimming enclosure.	MC (US)	150,000	0	150,000	
4	**AH1.2.** Encourage NSW Maritime and DPI (Fisheries) to increase the enforcement of boating restrictions over seagrass beds. Develop interpretative signage to notify seagrass beds as protected areas.	DPI (Fisheries), NSW Maritime, Manly Council-NR, SMCMA	0	10,000	10,000	
5	**FI3.2.** Install rods/poles at Gurney Crescent & Castle Circuit to tie dinghies & kayaks and educate owners regarding protection of trees & middens, and decrease erosion of foreshore	MC (US, CEP), Precincts	2,000	900	2,900	
6	**WQ3.2.** Investigate & seek to address possible sources of high faecal coliforms and enterococci levels in Sangrado swimming enclosure.	Sydney Water, MC (NR)	0	2,000	2,000	
7	**WQ2.1.** Confirm, with Sydney Water, the presence of all sewage overflow points within the Clontarf / Bantry Bay study area including the five known ones.	Sydney Water, MC (NR)	0	0	0	Already implemented
8	**HC1.2.** Construct boardwalk type structure where MSW bisects Aboriginal midden at Sandy Bay.	MC (P&R), AHO	0	0	0	Already implemented
	Medium Priority					
9	**WQ4.1.**Undertake a comprehensive study on Clontarf groundwater aquifer to identify present extraction rate, recharge and other relevant issues.	MC (NR), DWE	0	45,000	45,000	
10	**WQ4.3.** Assess current greywater direct diversion (GDD) uptake within Manly Council (including the study area) through undertaking a residential survey.	MC (S&C, NR & CEP)	0	10,000	10,000	Student project
11	**HR1.2.** Undertake inspections to assess stability of seawalls protecting public lands. If upgrading is required, promote eco- friendly sea walls.	MC (US & NR)	0	0	0	HR 1.2 and SE1.1 will be a combined study
12	**FI2.1** Construct a public floating pontoon beside Sangrado swimming enclosure and encourage NSW Maritime to assess for other boat landing facilities within the study area	MC (US), NSW Maritime	50,000	20,000	70,000	Partial funding received from NSW Maritime
13	**MO2.1.** Monitor use of the Manly Scenic Walkway.	MC (P&R)	0	10,000	10,000	Student project
14	**AH3.2.** Design and implement, the 'Fisher Bay Mangrove Expansion Program'.	MC (P&R), DPI (Fisheries)	30,000	15,000	45,000	
15	**TH1.3.** Identify adhoc tracks from private properties entering bushlands and approach property owners to ensure their safety and continued maintenance at an appropriate and specified standard.	MC (P&R)	0	0	0	Staff time
		Total	**239,000**	**166,900**	**405,900**	

ii. ABBREVIATIONS

AHO	Aboriginal Heritage Office
ANZECC	Australian and New Zealand Environment Conservation Council
CAP	Catchment Action Plan
CBBEMP	Clontarf/Bantry Bay Estuary Management Plan
CBD	Central Business District
CC	Climate Change
CMA	Catchment Management Authority
CSIRO	Australia's Commonwealth Scientific and Industrial Research Organisation
DCP	Development Control Plan
DDT	Dichloro-Diphenyl-Trichloroethane
DEC	The former NSW Department of Environment and Conservation
DECC	NSW Department of Environment and Climate Change
DIPNR	The former NSW Department of Infrastructure Planning and Natural Resources
DNR	The former NSW Department of Natural Resources
DoP	NSW Department of Planning
DPI	NSW Department of Primary Industries
DWE	NSW Department of Water & Energy
EIS	Environmental Impact Statement
EMP	Estuary Management Plan
EMS	Estuary Management Study
EPA	NSW Environment Protection Authority (DEC, recently changed to DECC)
EPI	Environmental Planning Instrument (includes LEP, REP and SEPP)
EPS	Estuary Processes Study
ESD	Ecologically Sustainable Development
GDD	Greywater Direct Diversion
GIS	Geographic Information System
GPT	Gross Pollutant Trap
GSE	Graduate School of Environment, Macquarie University
IPA	Intertidal Protected Area
IPCC	Inter-Governmental Panel for Climate Change
LEP	Local Environmental Plan
LGA	Local Government Area
MC	Manly Council
M & E	Monitoring & Evaluation
MSW	Manly Scenic Walkway
NHT	Natural Heritage Trust
NRC	Natural Resources Commission
NRM	Natural Resources Management
NSW	New South Wales
PoM	Plan of Management
PWC	Powered Water Crafts
RAN	Royal Australian Navy
REP	Regional Environmental Plan
RTA	Road Transport Authority
SAP	Scientific Advisory Panel (of the Manly Council)
SCCG	Sydney Coastal Councils Group
SEPP	State Environmental Planning Policy
SES	State Emergency Services
SHOROC	Shore Regional Organisation of Councils (Manly, Pittwater, Mosman, Warringah)
SMCMA	Sydney Metropolitan Catchment Management Authority
SQID	Stormwater Quality Improvement Device
SREP	Sydney Regional Environmental Plan
SREPP	Sydney Regional Environmental Planning Policy
UWS	University of Western Sydney
WPA	Wetlands Protection Area

iii. LIST OF TABLES

iv. LIST OF FIGURES

1. ABOUT THE PLAN

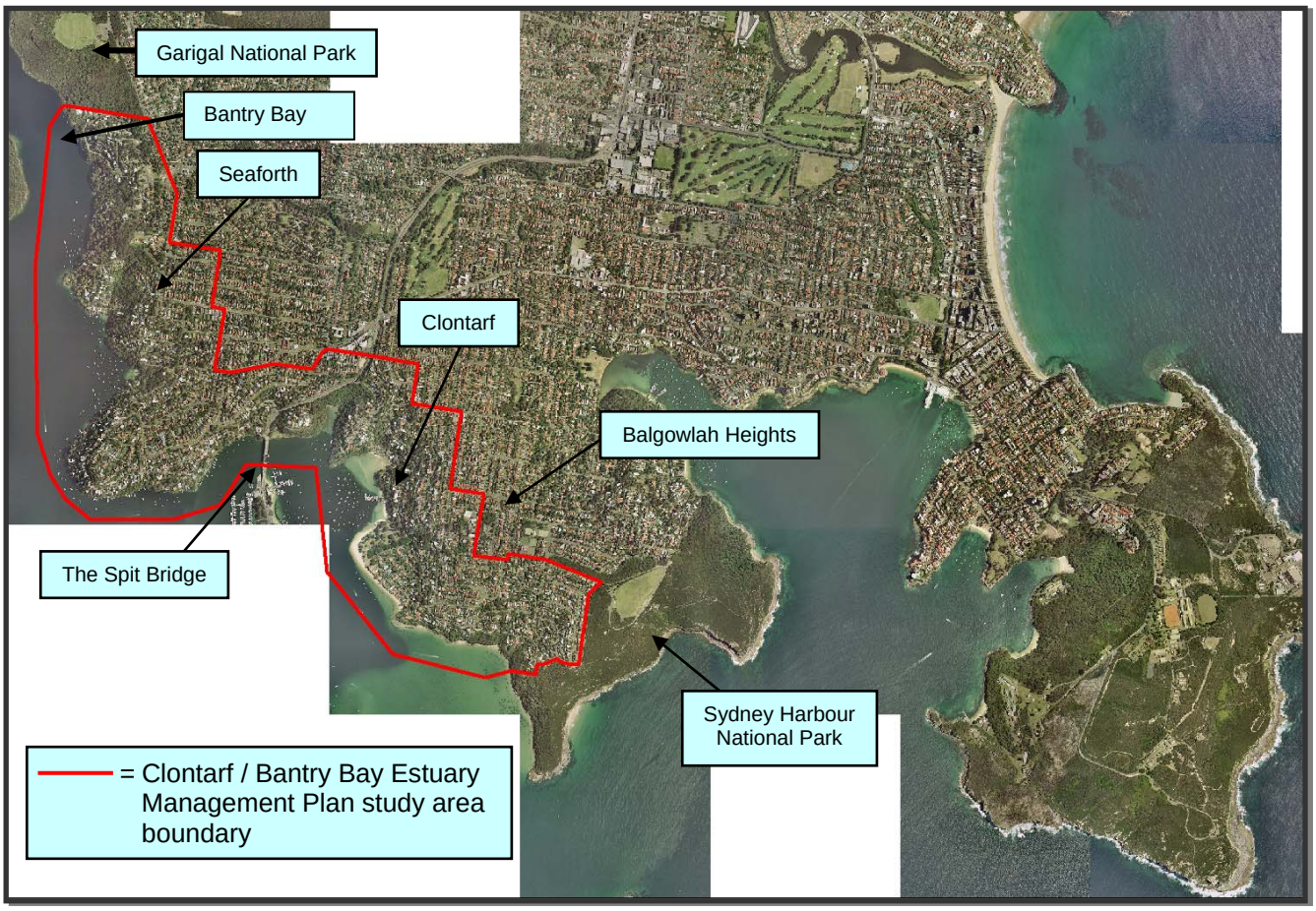
1.1 TITLE

This plan is the *Clontarf / Bantry Bay Estuary Management Plan*.

1.2 MANAGEMENT AREA

This study addresses the portion of the Middle Harbour (part of the greater Port Jackson / Sydney Harbour) estuary and foreshore that corresponds with the Manly Local Government Area border. The boundaries of the study area (**Figure 1.2**) are Sydney Harbour National Park at the south-eastern extremity and Garigal National Park at the north-western extremity. The study area boundary on the terrestrial side is the ridgeline, to ensure that the Plan adopts a total catchment management focus, which incorporates the relevant sub-catchments that drain to the foreshore. On the aquatic side the boundary extends to approximately the middle of the waterway.

Figure 1.2 – Aerial view of the Clontarf / Bantry Bay study area



The study area covers an area of approximately 350 hectares, with a perimeter of approximately 11.5km, and takes in the suburbs of Balgowlah Heights, Clontarf and Seaforth, and also the local Precinct Community Forum areas of Balgowlah Heights, Clontarf and Seaforth. The Spit Bridge, a landmark connecting the northern beaches with Sydney, which is also state heritage listed, is located halfway between the foreshores of the study area.

The entire study area is covered within the Sydney Harbour Foreshores and Waterways Area and excluded from the legally defined NSW coastal zone. The study area is located in five of the nine zones under Sydney Harbour: W1 (Maritime Waters), W2 (Environment Protection), W5 (Water Recreation), W6 (Scenic Waters – Active Use) and W8 (Scenic Waters – Passive Use).

The entire study area is also covered within the Sydney Metropolitan Catchment Area. This larger catchment has an area of 1860 sq.km. and involves 39 LGAs including Manly.

1.3 PLANNING FRAMEWORK & PURPOSE OF PLAN

The State Government co-ordinates key strategic initiatives for the sustainable management and use of important natural resources. The Department of Climate Change (DECC) provides financial and technical assistance to councils to help develop and implement sustainable estuary management plans through the Estuary Management Program. The Program was commenced in 1992 to assist local government to better manage estuaries through a strategic process outlined in the NSW Estuary Management Manual[2]. It targets a broad range of issues and engages local communities in the process. The program focuses on improving or maintaining the overall health and functionality of an estuary, and maintaining the integrity of the whole system - its chemical, physical, and biological properties, as well as its economic, recreational, and aesthetic values.

The State Government provides significant annual funding to assist councils to prepare and implement the plans. The Department administers the Estuary Management Program, but program decisions and activities are carried out by the committees of local government.

As indicated above, DECC provides a strategic process for the development of Estuary Management Plans in NSW, through its 'Estuary Management Manual'. The present status in the planning process is presented in **Figure 1.3.**

1.3.1 Estuary Management Working Group

The Estuary Management Program encourages local communities to take responsibility for managing their own estuaries. Stakeholders work together to identify problems in the estuary, evaluate various management options, develop specific actions to address those problems, and create and implement a formal Estuary Management Plan to restore and protect the estuary.

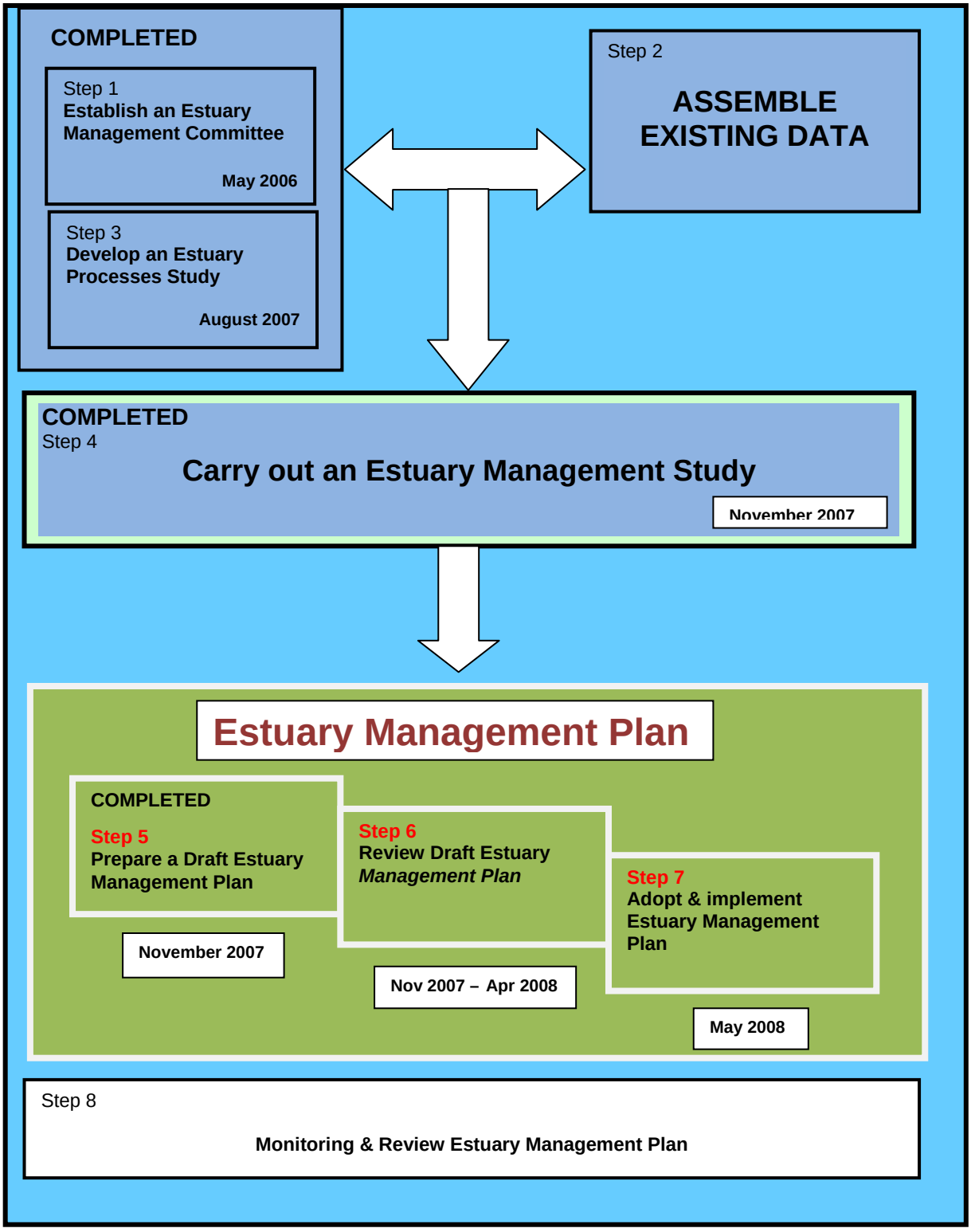
As the first step in the planning process of the preparation of an EMP, Manly Council resolved at its Planning & Strategy Committee meeting on 8 May 2006 to establish the Clontarf / Bantry Bay Estuary Management Committee, as a sub-committee of the existing Harbour Foreshores Management Committee. This committee has been renamed as the 'Clontarf / Bantry Bay Estuary Management Working Group'. The group, at present, has representations from the Manly Council, community Precincts, Government organisations, Manly Council's Scientific Advisory Panel, neighbouring councils, local community and from the Aboriginal community. The relevant government departments include:

- Department of Environment and Climate Change (DECC);
- Department of Lands;
- NSW Maritime; and
- Department of Primary Industries (DPI).

The Working Group met 11 times during formulation of the EMP between September 2006 and April 2008.

2 As part of a Coastal Protection Package, the NSW Government proposed that a new Coastal Zone Management Manual be prepared to support recent amendments to the *Coastal Protection Act 1979* and provide details on coastal processes, governance arrangements and management issues for local councils, CMAs and other agencies with coastal zone responsibilities. DECC is drafting the manual as two volumes. During 2006–07, a draft of volume 1 was prepared, which will be released for public comment later in 2007 (but has not been released). Volume 1 covers the process for developing coastal zone management plans and relevant resource management information. Volume 2 will provide appendices to support coastal planning. (DECC 2007).

Figure 1.3 – Present Status in the Estuary Management Planning Process



In order to support this Working Group and to obtain expert contribution to the process study, an *Internal Staff Working Group* was also formed. The Group formally met four times but communicated extensively on individual levels.

1.3.2 Community Consultation

A vital part in the estuary management planning process is community involvement and action. Hence, an extensive awareness campaign and consultations were undertaken through the following mechanisms in the formulation process of the Clontarf / Bantry Bay Estuary Management Plan.

Display Panels: A series of A3 Display Panels were created to assist in marketing the EMP development. They were designed and used for various events and displays. A4 laminated posters were displayed on the door of all four Freebie Hop, Skip & Jump buses to reach as many people as possible.

Webpage: A webpage, created on Manly Council's website (http://www.manly.nsw.gov.au/Clontarf--Bantry-Bay-Estuary-Management-Plan.html) allowed easy access to information relevant to the plan.

Precinct Newsletters: Articles were regularly sent to the Precincts for inclusion in monthly newsletters.

Survey: Two survey forms were produced to assist people in providing input into the development of the EMP – a comprehensive survey and a brief survey. The survey forms were distributed through various means, and were emailed or posted to people upon request. A total of 120 filled in survey forms were returned.

Field Days: Two community consultation field days were held within the study area –Clontarf Reserve (21 October 2006) and Seaforth (12 November 2006). The Seaforth field day was held as part of the Seaforth Centennial Event.

1.3.3 Data Compilation & Estuary Processes Study

The Data Compilation & Estuary Processes Study (MC 2007) describes the 'baseline condition' of the Clontarf / Bantry Bay estuary. The study report, completed in August 2007, contains 10 key chapters titled introduction, study area, natural environment - physical processes, natural environment - ecological processes, human interventions and usage, processes and impacts, interaction between processes, community consultations and key concerns, significance and values of the estuary and data gaps. One important aspect of a processes study concerns the determination of the extent to which human activities have modified or disrupted natural estuarine processes, particularly in regard to impacts on water quality, flora, fauna and public amenity.This study has been extensively reviewed and endorsed by Clontarf/Bantry Bay Estuary Management Working Group.

1.3.4 Estuary Management Study

The Estuary Management Study (MC 2007), completed in November 2007, is based on the Estuary Processes Study and available additional data and study results. The purpose of an estuary management study, according to the Estuary Management Manual (NSW 1992), is to define management objectives, options and impacts.

The study has:

- identified the planning framework relevant to management of the estuary;
- developed and evaluated management goals and objectives; and
- developed and evaluated management options that will achieve the objectives.

1.3.5 Estuary Management Plan

The processes and management studies provided the factual basis for the formulation of this Estuary Management Plan, which takes into account the considered view of all parties on the Clontarf/Bantry Bay Estuary Management Working Group.

Plans usually require trade-offs and compensatory balances, particularly between ecological and anthropogenic needs and this will doubtless be the case with the Clontarf/Bantry Bay system where human impact in the

catchment has had an impact on the water quality of the estuary and on the flora and fauna of both the estuary and its catchment.

The First Draft
The first draft was prepared and circulated to members of the 'Clontarf / Bantry Bay Estuary Management Working Group'. The report was discussed at the Working Group meeting on 03 December 2007. Daniel Wiecek at the DECC contributed written comments on the draft.

On the basis of discussions, all management options were further scrutinised, some modified and some merged with others. A revised list and the draft EMP was discussed with the Internal Staff Working Group. A draft Final Report was shared with relevant Divisions/Branches within the Council and also with NSW Maritime, DPI Fisheries, Aboriginal Heritage Office, Sydney Water, Department of Water & Energy and Sydney Metropolitan Catchment Management Authority.

Review of the Final Draft
The final draft, accommodating comments and suggestions from different agencies, was distributed to members of the 'Clontarf / Bantry Bay Estuary Management Working Group' for review, comments and contribution.

The 'Clontarf / Bantry Bay Estuary Management Working Group', at its meeting on 22 February 2008, endorsed the Final Draft and recommended to Council for public exhibition.

Public Exhibition: The Final draft of the Estuary Management Plan was placed on public exhibition from 17 March to 21 April 2008. The community was also invited to attend a community information day on 29 March 2008 to facilitate stakeholder and community input and comment on the EMP.

A total of 78 submissions were received. Submissions contained statements on the overall acceptance of the EMP. Of all submissions, 70 were on the issue of Sandy Bay as dog off-leash area. A majority (64) of submissions strongly supported the status quo (i.e to continuation of Sandy Bay as dog off-leash area) and six submissions indicated concern over increased dog activities and suggested regulations through timed access.
There were 7 submissions on dinghy storage issue. Submissions in general supported preserving the present character of Sandy Bay and opposed installation of dinghy storage systems that impinge upon the visual character and/or views.

The 'Clontarf / Bantry Bay Estuary Management Working Group', at its meeting on 28 April 2008, has reviewed all submissions, endorsed and recommended the Final Draft to Council for adoption.

Adoption and Implementation: This final Estuary Management Plan was presented to the Council for consideration. The report was formally adopted at the Council meeting on 12 May 2008.

1.3.6 Purpose of the Plan

In many ways, formulation of the plan is the most important part of the estuary planning process because it translates the understanding developed in previous stages into practical actions directed squarely at improving the wellbeing of an estuary. It is clear from the simple aim specified in the estuary management manual "…estuary management plans should reflect the agreed position of regulatory authorities and interested parties in relation to the future nature conservation, rehabilitation and development of the estuary…" that an effective estuary management plan needs to achieve a balance between anthropogenic and ecological needs. To be effective, any such plan also requires community support and it must be capable of cost-effective implementation by means of direct expenditure (e.g. remediation) and management control of estuarine and catchment practices (e.g. planning/development controls).

At its most simple level, as defined in the Estuary Management Manual (1992), an Estuary Management Plan "… consists of a scheduled sequence of recommended activities that need to be undertaken to achieve the estuary management objectives…"

1.4 STATUS OF PLAN

The Clontarf/Bantry Bay Estuary Management Plan has been developed in response to legislative requirements and community issues in accordance with current best practices for the management of estuaries and its catchment.

The Clontarf/Bantry Bay Estuary Management Plan has been prepared under the NSW Government's Estuary Management Program. The Program is designed to fulfil the requirements of the NSW Estuary Management Policy 1992 and the NSW Coastal Policy 1997. However, as the Clontarf/Bantry Bay estuary management area comes under the purview of Sydney harbour catchment, the most important guiding document is the Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 under the Environmental Planning & Assessment Act 1979.

The development of Estuary Management Plan is identified in Council's Manly Management Plan 2007-2010 (MC 2007) and Sustainability Strategy 2006 (action C1.3.4) (MC 2006). The initiation of the Clontarf/Bantry Bay EMP has been indicated as part of the draft North East Subregional Strategy (E2.1) (DoP 2007).

Plans of Management

Under the NSW Local Government Act 1993, Council is required to prepare Plans of Management (PoMs) for Public Land classified as 'Community Land'.

Clontarf/ Bantry Bay Estuary Management Plan has been developed to address all requirements for community land management under the NSW Local Government Act 1993 and NSW Crown Lands Act 1989. Community lands within the study area refer to Seaforth Reserve, Fisher Bay Reserve, Clontarf Reserve, Sangrado Park, JAF Fenwick Park, Gurney Crescent Reserve, Rignold Street Reserve and Sandy Bay Reserve (Fig 2.1). Plans of Management exist for 32 parcels of land (**Appendix A**). However, there is no PoMs for six parcels of land. It is the intention of Council that this EMP will serve as the PoMs for these areas unless the decision is made to develop a separate PoM at a later stage.

1.5 STRATEGIC VISION

Visioning is an important element in any planning process. Setting the future vision ensures strategic long term thinking and avoids focus on daily issues.

Wider community participation in this vision development is not only important but crucial. Manly Council has routinely, for the last two decades, involved the community in setting vision through programs like myManly, Futures Forum and Surfing the Future. Surfing the Future provides a direction to aim towards for the year 2025 for Manly Local Government Area. It establishes a 'road map' and identifies major themes. The Social Plan 2004 and Manly Sustanability Strategy 2006 as well as short-term strategy documents, are developed based on themes established under Surfing the Future.

Following this, a vision for the study area was prepared by the Clontarf / Bantry Bay Estuary Management Working Group, to assist in the Estuary Management Planning process. In setting this vision, the State Plan, state-wide targets by the Natural Resources Commission and the vision of the Sydney Metropolitan Catchment Management Authority (SMCMA) have been considered. The following vision aims to provide a general statement about the future desired state of the study area:

"A thriving community, enhanced by heritage and lifestyle, where residents and visitors work together to live in harmony with the unique natural environment, both on land and in the sea."

This vision statement, from the onset, establishes the importance of visitors, heritage and living in harmony with the natural environment and influences setting up of management objectives.

1.6 KEY MANAGEMENT ISSUES & GOALS

A long list of management issues was identified during community consultations. This long list of management issues were further discussed in detail in the 'Clontarf / Bantry Bay Estuary Management Working Group' meetings held on 30 October, 27 November and 11 December 2006. Issues requiring future management are presented under 10 key broad based headings (with 2-letter code shown within bracket) and have been followed throughout this report.

For each management issue, a goal has been set (**Table 1.6**). These have been discussed, scrutinized and agreed at the Clontarf/Bantry Bay Estuary Management Working Group meeting dated August 13, 2007.

Table 1.6: Key management issues and goals set

Key Management Issues	Goals
Water Quality & Pollution (WQ)	1.0 Ensure that the water quality of the estuary is suitable for maintaining healthy natural aquatic ecosystems, and for recreational pursuits
Aquatic/Intertidal Habitat Conservation & Management (AH)	2.0 Restore and maintain a healthy and diverse mix of aquatic and intertidal habitats that will maintain and improve biodiversity and ecological functions of the estuary.
Bushland/Terrestrial Habitat Conservation & Management (TH)	3.0 Protect and enhance urban bush land and native vegetation areas
Sedimentation & Beach Erosion (SE)	4.0 Manage erosion and sedimentation to reduce their impact on the natural environment and recreational amenity
Hazards & risk including climate change (HR)	5.0 Assess, minimize and mitigate risks from natural hazards including climate change
Estuary Use (EU)	6.0 Improve and meet the environmental, socio-economic and recreational needs of estuary use
Access (AC)	7.0 Ensure safe public accessibility of waterways, foreshores and other areas of the estuary.
Foreshore infrastructure & facilities (FI)	8.0 Improve social amenity through rationalisation of foreshore structures which are sympathetic to social and ecological needs and manage public risks.
Heritage Conservation (HC)	9.0 Ensure that all Aboriginal, natural and cultural heritage items in the area are preserved and protected in consultation with appropriate bodies.
Monitoring (MO)	10. Measure the condition and usage of the estuary to gauge the effectiveness of the Estuary Management Plan in achieving its goal and management objectives

In general, set goals and objectives relate to the general goal of the NSW State Rivers and Estuaries Policy, 1992, Estuary Management Policy 1992 and management principles described in relevant regional plans (Sydney Regional Environmental Plan – Sydney Harbour Catchment 2005, Sydney Metropolitan Draft Catchment Action Plan 2006, Draft Subregional Strategy: North East Subregion, July 2007) and also Manly Local Environmental Plans and different strategy documents.

1.7 DURATION OF PLAN

The Estuary Management Plan is a strategic plan with a visionary long-term time frame of 15- 20 years with firmed up implementation program of 5 years. The plan will be reviewed and revised every 5 years and a new implementation program will be adopted in line with priorities of the period.

1.8 MANAGEMENT AGENCIES

Manly Council (MC) is the principal management agency of this plan. Council has for many years undertaken remedial and maintenance works to enhance the estuarine environment. In recent years the emphasis has been on understanding the functioning of the coastal and estuary catchments as an integrated ecosystem. The completion of the estuary processes study and estuary management study was a significant step in the move towards holistic management.

The following agencies will be involved in the Clontarf/ Bantry Bay Estuary Management Plan. Agencies have been identified against each management option.

- Department of Environment and Climate Change (DECC);
- NSW Maritime;
- Department of Primary Industries (DPI);
- Sydney Water;
- Department of Water & Energy;
- Sydney Coastal Councils Group (SCCG);
- Aboriginal Heritage Office (AHO);

Further description of these agencies are presented in **Appendix B**.

Other agencies likely to be involved are Sydney Metropolitan Catchment Management Authority (SMCMA), NSW Health, RTA and Clontarf Marina.

1.9 RELATIONSHIP TO OTHER PLANS

This Estuary Management Plan has evolved through incorporation of strategic directions from a number of Council's management documents and land use planning instruments (**Table 1.9a**). The adopted Estuary Management Plan will eventually be mainstreamed in to these documents in order to embed estuary management as part of Council's core business.

Table 1.9a Outline of key Council documents with relationship to Clontarf/Bantry Bay EMP

Management Documents	Relationship to the document
Manly Plan 2007-2010	The Manly Plan is the key planning document driving the operations of Council. It is a rolling three year plan that identifies a range of objectives and strategies that Council will implement in providing programs, services and facilities. Substantial commitment to estuary management should be identified here.

<table>
<tr><th>Management Documents</th><th>Relationship to the document</th></tr>
<tr><td>Manly Sustainability Strategy 2006</td><td>It is a 10 year strategy and addresses the vision through the six principles and 10 broad programs.

The Clontarf/Bantry Bay Estuary Management Plan (EMP) contributes to the MSS program: Coastline and Estuary Management Program to achieve the principle C: A Natural and Sustainable Manly'. The objective of the Coastline and Estuary Management Program is to manage the terrestrial and marine environment interface to balance environmental conservation and the enjoyment of the area by user groups and ensure that Manly's coastlines are recognised for their important natural and cultural heritage.

Preparation of this EMP fulfills implementation of Action C1.3.4 of Manly Sustainability Strategy 2006.

Further, this EMP addresses following actions of Manly Sustainability Strategy:

<table>
<tr><td>B1.1.1 (interaction with Precinct Forums)</td><td>C1.3.8 (incorporate CC information)</td></tr>
<tr><td>B1.1.4 (host sustainability focussed events)</td><td>C1.3.11 (interpretive signage)</td></tr>
<tr><td>C1.1.3 (introduce SEAchange program)</td><td>C1.3.12 (participate with SCCG)</td></tr>
<tr><td>C1.1.6 (water quality monitoring)</td><td>C1.3.13 (work closely with SMCMA)</td></tr>
<tr><td>C1.1.24 (groundwater extraction and recharging monitoring)</td><td>C1.3.16 (promote community involvement)</td></tr>
<tr><td>C1.2.1 (map aquatic flora & fauna)</td><td>C1.3.18 (cyclic evaluation of EMP)</td></tr>
<tr><td>C1.2.5 (implement Starboard R & G program)</td><td>C1.6.11 (Little Penguin monitoring)</td></tr>
<tr><td>C1.2.6 (Involvement of local residents)</td><td>C1.7.4 (linking habitat corridors)</td></tr>
<tr><td>C1.2.10 (control of Caulerpa taxifolia)</td><td>C2.1.4 (rainwater harvesting)</td></tr>
<tr><td>C1.2.11 (review of beach raking)</td><td>C2.1.9 (promote rainwater tanks)</td></tr>
<tr><td>C1.2.15 (eco-friendly mooring buoys)</td><td>C2.1.20 (monitor greywater use)</td></tr>
<tr><td>C1.3.2 (seawall stability)</td><td>D2.2.5 (management plan for Aboriginal heritage</td></tr>
<tr><td>C1.3.3 (hazard information)</td><td>D2.2.9 (Increased community awareness)</td></tr>
<tr><td>C1.3.5 (prioritised actions)</td><td></td></tr>
</table>
</td></tr>
<tr><td>Manly Social Plan 2004-2009</td><td>The Manly Social Plan 2004-2009 was adopted by Council in November 2004. The Social Plan was developed on the basis of consultation with the community and service providers, to identify issues affecting the wellbeing of the people in Manly. This consultation generated a series of priority issues. Action plans to address the priority issues are being implemented as on-going across Manly Council divisions and in collaboration with external agencies such as the Manly Community Centre, and state level government.

Manly Council's strategic directions, including a focus on social and environmental sustainability provide the context for the Manly Social Plan. The Clontarf/Bantry Bay Estuary Management Plan considers issues and actions addressed in the plan.</td></tr>
<tr><td>Council Policies</td><td>Policies should be updated or where necessary, created to reflect Council's position on important estuary and catchment management issues. This makes the position explicit and more likely to be reflected in how the whole of Council operates.</td></tr>
<tr><td>Coastline & Estuary Management Plans</td><td>The Clontarf/Bantry Bay Estuary Management Plan considers issues and actions addressed in the following plans:
• Manly Lagoon Estuary Management Plan
• Cabbage Tree Bay Management Plan</td></tr>
</table>

Management Documents	Relationship to the document
	• Forty Baskets Coastline Management Plan • Little Manly Coastline Management Plan • Manly Ocean Beach Coastline Management Plan
Manly Local Environmental Plan 1988 (now being revised)	The Manly Local Environment Plan (LEP) details the zoning of land within the Manly Council area. The LEP also identifies Items of Environmental Heritage, Environmentally Sensitive Areas, Foreshore Scenic Protection Areas and Potential Acid Sulphate Soils and provides planning controls for the on-going appropriate management of each of these items and areas. This LEP is now being reviewed and updated in accordance with the NSW Planning Reforms and amended Planning legislation. The adopted Estuary Management Plan will eventually be mainstreamed in to the Manly LEP in order to embed estuary management as part of Council's core business.
Development Control Plans (DCP)	DCP's are plans that control development activity in the Council. Engineering Guidelines for development and Water Sensitive Urban Design are both examples of Guidelines that have been turned into DCP's. Where robust management of development is required to protect the estuary, the Estuary Management Officer should work with planners to revise/modify DCP's that aid the long-term management of the estuary.
Plans of Management	Individual plans of management are very useful for describing Council's vision for managing public land. These are used to manage significant catchment habitats, recreation on the estuary and general foreshore management. This Clontarf/ Bantry Bay Estuary Management Plan has been developed to address all requirements for community land management under the NSW Local Government Act 1993 and NSW Crown Lands Act 1989 and acts as a Plan of Management for community lands of the study area.

This Estuary Management Plan has evolved through incorporation of strategic directions from a number of key documents of external stakeholders (**Table 1.9b**). Consideration should be given to linking to these documents to ensure that estuarine management responsibilities are carried through to their core business as well.

Table 1.9b Outline of key external documents with relationship to Clontarf/Bantry Bay EMP

Management Documents	Relationship to the document
Sydney Metropolitan Catchment Action Plan 2007	The Sydney Metropolitan Catchment Management Authority (SMCMA) has drafted a Catchment Action Plan (CAP) in August 2007. The plan applies to a catchment area of 1860 square sq. km. (the area extends offshore to include state waters to the three nautical mile limit) accommodating 39 Local Government Areas including Manly. The catchment is divided into eight sub-catchments including the Middle Harbour. Activities of catchment management relates to 5 themes including 'Estuarine, Coastal & Marine'. The target for the Estuary, Coast and Marine theme is 'By 2016, there is an improvement in the condition of estuaries and coastal lake ecosystems'. The theme target has further been translated into management targets as:

Management Documents	Relationship to the document
	• By 2008, review existing Estuary Management Plans to assess key stakeholders capacity to undertake identified high priority actions. • By 2016, promote and support the implementation of all high priority actions identified in existing and new Estuary Management Plans.
Sydney Regional Environmental Plan - Sydney Harbour Catchments 2005: the Harbour REP	This is the most important planning document relevant for the Clontarf/Bantry Bay EMP study area. The Harbour REP covers the area of Sydney Harbour. It establishes planning principles and controls for the catchment as a whole as follows: • All waterways are classified into one of nine zonings as a mean of identifying appropriate location for a wide variety of uses; • The working Harbour is preserved by retaining a prosperous working waterfront and an effective transport corridor, including port and maintenance facilities, naval and aviation uses, commercial and marinas and boatsheds. • The zoning plan aims to improve water safety and amenity by better locating and consolidating certain uses in specific locations. It identifies potential locations for marinas and limits private facilities for residential developments.; • Public access to the foreshore is enhanced, providing for public boat launching ramps, recreational and club facilities and appropriate development controls. The study area is located in five of the nine zones covered in Harbour REP. These zones are: W1 (Maritime Waters), W2 (Environment Protection), W5 (Water Recreation), W6 (Scenic Waters – Active Use) and W8 (Scenic Waters – Passive Use).
Sydney Harbour Foreshores and Waterways Area – Development Control Plan 2005	This document compliments the Harbour Regional Environmental Plan. The DCP provides detailed design guidelines for development and criteria for natural resource protection for the locations identified as Foreshores and Waterways Area. In this DCP, different landscape character types in and around Sydney Harbour are recognised. Four different landscape character types exist in the Clontarf/Bantry Bay EMP study area. These are Landscape Character Type 1 (Middle Harbour in general), Type 3 (residential bays such as Fisher Bay, Powder Hulk Bay), Type 4 (residential long shores such as Seaforth) and Type 6 (main beaches along Clontarf). Further, and as part of the DCP of this Harbour REP, the Department of Environment & Climate Change has mapped Ecological Communities and Landscape Characteristics. Within the foreshores and waterways area boundary a number of aquatic and terrestrial ecological communities have been identified within the Clontarf/Bantry Bay EMP study area including seagrass beds, mixed rocky intertidal and sand, urban development with scattered trees, open forest and sandy beaches.
Sydney Metropolitan Strategy 2005	The Metropolitan Strategy is a broad framework to secure Sydney's place in the global economy by promoting and managing growth. It is a strategic document that outlines a vision for Sydney over the next 25 years. It is also the start of a process to bring the State Government, local government, stakeholders and the community together to discuss, review and then make decisions to guide the future of Sydney's economy, environment and communities.

Management Documents	Relationship to the document
Draft Subregional Strategy: North East Subregion, July 2007	A key objective of the Metropolitan Strategy is to protect Sydney's natural environment from the impacts of growth for dual benefit: our waterways, biodiversity, clean air and heritage are protected; and development processes are streamlined with greater certainty. This Strategy will contribute to the many initiatives underway to improve the health of Sydney's waterways, by ensuring new development is located and designed to meet the community's aspirations for our rivers, coasts and estuaries. More detailed planning follows via regional strategies and subregional strategies. There will be 10 sub-regional plans, to support Sydney Metropolitan Strategy. The LGAs of Manly Council, along with Pittwater and Waringah constitute under North East Sub-region. The North East Subregion is well known for its natural environment including coastline, waterways and national parks. Growing sustainability requires manageing the environmental impact of development and reducing consumption of natural resources as well as safegurding assets from natural hazards, which are expected to increase over time with climate change. The strategy includes, among others, actions to: improve the health of waterways, coasts and estuaries; protect the loss of biodiversity; conserve and manage Aboriginal and other cultural heritage; and respond to the risk of climate change and sea level rise.
Sharing Sydney Harbour Access Program 2003	Sharing Sydney Harbour Access Program is a NSW Government initiative to improve public access to and enhance the recreational enjoyment of Sydney Harbour and its tributaries for the people of and visitors to Sydney and assists in addressing demand for improved public access to its foreshores and waterways. The Access Plan provides the framework for developing and implementing specific access improvement projects. The Access Plan identifies opportunities to improve access to the foreshores and waterways for a range of recreational users including pedestrians, cyclists and recreational boaters. The plan has been jointly prepared by Department of Planning and NSW Maritime and provides an integrated approach to the development of a catchment-wide network of access ways. The Sharing Sydney Harbour Access Program was launched in February 2003 to assist with implementing the Sharing Sydney Harbour Access Plan. The NSW Government has recently announced that the Program will be extended over five years to provide $6.75 million until 2013. Grant is available for specific capital works projects such as walking tracks, cycle paths, new public waterfront parks, jetties, pontoons and boat launching facilities.
Sydney Regional Coastal Management Strategy 1998	This strategy was prepared by the Sydney Coastal Councils Group, represented by 15 Local Councils including Manly, to coordinate and integrate relevant coastal planning and management activities, and the responsible organisations, to improve coastal management in Sydney. This strategy applies to the coastal areas between Pittwater local government area and Sutherland local government area, including all areas that were previously excluded from the NSW Coastal Zone. The primary aim of the present strategy is "to protect and conserve terrestrial and marine ecosystems in the study zone, and to manage the social and economic conditions to achieve this, through the implementation of identified, sustainable coastal planning and management practices."

Management Documents	Relationship to the document
	At present, the Group is guided by a three-year 'Strategic Plan 2005-2008'.

1.10 SUPPORTING DOCUMENTS

Key supporting documents in relation to this Plan are:

- Clontarf/Bantry Bay Estuary Management Study, Manly Council, November 2007

  Described in section 1.3.4

- Clontarf/Bantry Bay Data Compilation & Estuary Processes Study, Manly Council, August 2007

  Described in section 1.3.3

2. THE MANAGEMENT AREA

2.1 LOCATION & SETTING

This study area relates to the northern portion of the Middle Harbour (part of the greater Port Jackson / Sydney Harbour) estuary and foreshore that corresponds with the Manly Local Government Area boundary. It covers an area of 350 hectares between Castle Rock and Bantry Bay and includes parts of Balgowlah Heights, Clontarf and Seaforth suburbs. The Spit Bridge, a landmark connecting northern beaches with Sydney, is located halfway along the foreshore of the study area. Population of the study area, according to 2001 census, is 5,873. Table 2.1a details some of the key characteristics that are generic for the Middle Harbour estuary system, and Table 2.1b details some of the key characteristics that are specific to the Clontarf / Bantry Bay study area.

Table 2.1a – Key Characteristics of the Middle Harbour Estuary System

Characteristic	Detail
Longitude	151.283ºE
Latitude	33.828ºS
Estuary Classification	Tide Dominated (OzEstuaries, 2006) Wave Dominated (Ryan et al, 2003)
Interim Biogeographic Region	Sydney Basin
Interim Marine & Coastal Region	Hawkesbury Shelf
Estuary Length	12 kilometres (Willing & Partners, 1999)
Entrance Width (of Middle Harbour estuary)	720 metres (Manly Council GIS)
Mean Maximum Wave Height at Clontarf Beach	<0.5 m
Mean Wave Period	6.96 seconds
Maximum Wave Period	13.50 seconds
Tidal Range (Sydney Harbour)	1.82 metres (Lawson and Treloar, 2003)
Tidal Classification	Microtidal
Tidal Period	Semi Diurnal

Source: OzEstuaries, 2006 (unless stated otherwise)

Table 2.1b – Key Characteristics of the Clontarf / Bantry Bay Study Area

Characteristic	Detail
Area	349 hectares (Manly Council GIS)
Estuary Length	5.2 kilometres (Manly Council GIS)
Perimeter	11.5 kilometres
Intertidal Flats Area	Approximately 2.4 hectares (Manly Council GIS)
Saltmarsh / Saltflat Area	0 (NSW Government Department of Planning, 2005)
Mangrove Area	Approximately 0.05 hectares (Manly Council GIS)
Seagrass Area	1.8 hectares
Maximum Depth	33 metres (Willing & Partners, 1999)

Source: OzEstuaries, 2006 (unless stated otherwise)

The entire study area is covered within the Sydney Harbour Foreshores and Waterways Area and excluded from the legally defined NSW coastal zone. The entire study area is also covered within the 'Sydney Metropolitan Catchment Area'.

Ownership of and management responsibilities for the land and seabed within the study area is shared by a number of government authorities and Manly Council. In general, land ownership of Clontarf/Bantry Bay EMP study area consists of private, Crown, Manly Council, Department of Environment & Climate Change, Sydney Water and Energy Australia owned and administered land, with Crown Land representing by far the major

public land holding. NSW Maritime is responsible for the management of waterways and the Department of Lands is the land owner of the seabed.

2.2 HISTORY

The study area has a rich history, beginning with extensive Aboriginal occupation, which is evidenced through the many middens that are still present. The area was used extensively by the Aboriginals, known locally as the Gayemal clan of the Guringai tribe. The oldest Aboriginal site known in the Manly LGA is dated to about 4100 years before present. There are 22 recorded Aboriginal sites within the study area. Following European settlement in Sydney, the study area was slowly developed, until improved access made the area more desirable. In 1850 a punt began running from the Spit giving easier access to the north side. Access was further enhanced in 1924 with the opening of the first Spit Bridge. By the 1970s the area was already extensively developed.

2.3 NATURAL & CULTURAL SIGNIFICANCE

2.3.1 Natural Environment – Physical Processes

The estuary within the study area exhibits semidiurnal tidal characteristics, with two high and two low tides each day. The area is not fed by any permanent creeks; however various water courses provide freshwater inflows during and after rain. In periods of wet weather, the estuary becomes stratified with the more buoyant fresh water sitting as a thin layer on the surface of the salt water.

Groundwater is an integral part of the “water cycle” and maintains the dynamics of estuarine and near-shore marine water bodies. The major aquifer class, in the study area, is consolidated porous rocks containing limited quantities of groundwater. However along the foreshores there occurs the aquifer termed ‘unconsolidated sediments’. This aquifer contains significant groundwater resources with a well defined water table that is responsive to recharge events, and even tidal influences in some cases.

Wind waves generated in Middle Harbour are generally less than 0.1m in height. Ocean swell waves penetrate lower Middle Harbour through the heads of Sydney Harbour, and undergo severe refraction and diffraction. The only place in the study area that is subject to waves from a consistent direction is the lower half (Castle Rock Beach to Sandy Bay), where ocean swell waves run along the shore. Sediment has been observed to move along the shore in the same direction, providing possible evidence of a longshore current.

Significant storm events affecting the Middle Harbour area are known to have occurred in April 1893, June 1923 and May-June 1974. The 1974 storm reported wall collapse near Middle Harbour Yacht Club and minor beach erosion at the Spit and Clontarf. The study area experienced waves and high winds from a recent storm on June 9-10, 2007 which resulted in a cruiser washing ashore at Clontarf but no serious erosion. The study area also experienced the impact of a tsunami on May 22, 1960 when a strip 100 yards by 60 yards wide was swept away from Clontarf Reserve Point Park.

From the Spit Bridge to the north western extremity of the study area, the foreshore is predominantly stable rock, with estuarine mud on the sea floor. This area is beyond the normal limit of ocean waves, and is reasonably deep, therefore creating a relatively stable sedimentary environment. However, the lower reaches, from Castle Rock Beach to the Spit Bridge, consists largely of unstable sandy shores, with a mixture of marine sand and estuarine mud on the sea floor. The estuary in this section consists of both a shallow sand bar and a deep channel. The marina at Clontarf lies directly in the path of the sand transport corridor between the tidal delta and Sandy Bay. However, the beach profile appears to have been modified from its natural state, due to the irregular shape of the shoreline between Clontarf Reserve and Sandy Bay. The large sand flat of Sandy Bay transforms into a narrow beach with a steep drop-off on either side of Clontarf Marina, and then back into a sand flat to the south of the marina. There are many forces impacting on this part of the estuary, creating a complex system.

2.3.2 Natural Environment – Ecological Processes

The ecosystems within the study area are highly fragmented and have signs of the many pressures placed on them through development and high usage.

The marine environment within the study area has a diverse range of habitats. There are significant seagrass beds within the study area: the largest bed is adjacent to Castle Rock Beach and reasonably large meadows exist at Clontarf and Sandy Bay. Compared to the past, large losses of seagrass have been reported. There are several relatively deep holes within the mud basin section that provide habitat, with the deepest located upstream of the Spit Bridge. The mud basin provides habitat for various species, including invertebrates such as worms and molluscs. Over 570 species of fish have been recorded in greater Sydney Harbour, and it is likely that a large proportion of these are also present within the study area. The list includes 3 endangered, 5 vulnerable and 18 protected species.

The intertidal area within the study area has a range of habitats including rocky reefs and platforms, sandy beaches and mudflats, a few remaining mangroves and artificial habitat including seawalls, jetties and pontoons. The entire foreshore of the study area is protected as Intertidal Protected Area (IPA). Many types of algae (eg- red, green, brown) inhabit the intertidal zone, providing a food source for the many grazing invertebrates. Numerous types of invertebrates, such as worms, crabs and molluscs, can be found in the sediment. There is only one small pocket and few individual mangroves remaining within the study area. However, no salt marsh has been identified. A total of 62 species are known to be present in or directly adjacent to (and hence expected to also be in) the study area. The majority of these species are invertebrates. The Little Penguin is often sighted within the study area but no information is available on its nesting place. It feeds in the estuary during the day and nests on land during the night.

The terrestrial environment within the study area has seen the largest change. Bushland reserves occur in a total 18.5 hectares and are scattered throughout the study area. Six reserves have SEPP 19 status under EP&A Act, requiring preparation of management plans. Smaller patches of bushland on both public and private land do exist throughout, and in some places provide corridors between the reserves. There are seven specific vegetation communities present within these reserves. A total of 3 amphibian, 49 birds, 6 mammal and 13 reptile species have been recorded. Grey-headed Flying Fox (*Pteropus poliocephalus*) is the only threatened species recorded.

2.4 CURRENT CONDITION

2.4.1 Human Interventions

Human activities have altered and modified the natural system of the study area. Foreshore development has been extensive. The first and major foreshore development in the study area happened with the construction of the Spit Bridge in 1924 (which was replaced by the existing bridge in 1958) and some other developments prior to this at the site: first punt operation in 1849, ferry operation in 1880 and tram services in 1900. Seawalls, both public and private, exist throughout the study area. Total length of seawalls is 2.4km, that approximately 46% of the foreshore length. Swimming baths/enclosures, Clontarf Marina and walkways including Manly Scenic Walkway are some other developments on the shore. Public access to foreshore is available at several points. There is no public pontoon/jetty in the study area but one to be constructed soon. There are sailing and yacht clubs providing boating facilities and contributing to estuary use through a number of events including racing, training etc. Manly Council is extracting 1.64 mega litres of groundwater at a depth of 6.1m for irrigation of Clontarf Reserve. Many private properties are also abstracting groundwater. Stormwater now flows through 16.0 km artificial drainage networks. The estuary is used actively for walking, swimming, boating & sailing and passive recreation (eg- reading, meditation, picnicking) with reasonable degree of use for kayaking, recreational fishing, sunbathing and walking dogs. Dogs are allowed on a leash in the Clontarf Reserve. These alterations have all impacted the natural environment.

2.4.2 Processes & Impacts

With most parts of the Clontarf/Bantry Bay EMP study area being highly urbanised, there is significant pressure placed on water quality health. Despite the reported improvements in water quality recently, pollution is indeed still evident, particularly in times of rain when stormwater transports terrestrial pollutants into the estuary. Loads of pollutants in the estuary from the study area have been estimated at 2250 kg/year of total nitrogen; 260 kg/year of total phosphorus; 180 kg/year of copper, 230 kg/year of lead, 490 kg/year of zinc, and 128,000 kg/year of sediment. Four Gross Pollutant Traps (GPTs) are currently installed in the Clontarf / Bantry Bay Catchments. The Department of Primary Industries has placed a ban on all commercial fishing within Sydney Harbour including the study area, because of the presence of elevated levels of dioxins in fish and crustaceans.

Of the three swimming pool/baths, Sangrado bath has the highest level of bacterial contamination. There are five known sewer overflow locations within the study area.

The study area is used extensively by a variety of vessels, particularly between Castle Rock Beach and Seaforth Bluff. This section of the waterway is the only access between greater Sydney Harbour and upper Middle Harbour, so all vessels wishing to travel between the two must pass through. Boat generated waves over time can cause foreshore erosion and weaken sea walls. They can impact on habitat. Boating can, in addition, impact on water quality via spills, anti-foul paints, littering from boats and from marinas where boats are washed and fixed etc. A No Wash Zone is in place between Clontarf Point and Seaforth Bluff. An 8 knot speed limit zone is also in place, between Clontarf Point and d'Albora Marina (Mosman side of Spit Bridge).

Erosion in the study area occurs along beaches, in front of stormwater outlets, along ad hoc access tracks, and where foreshore protection structures such as seawalls are collapsing. Beach erosion has been experienced at 4 sections of Clontarf Beach and Sandy Bay with varying degrees of severity, and fluctuations over time. Accelerated erosion occurs as a result of the concentration of stormwater flows through artificial drainage networks. The study area, specially the Clontarf Swimming area, also regularly experience siltation. The study area is susceptible to slope and cliff instability, with a large landslip having occurred at Seaforth Crescent in 1956.

An ecosystem health card has also been developed for the study area.
The study area will experience many of the impacts of climate change, with the low lying areas close to the foreshore likely to be subject to greater impacts than the elevated areas. These impacts are likely to include: sea level rise; increases in extreme weather events; temperature increases; reductions in water availability; altered hydrology and increased flash flooding; and more frequent and more severe droughts (Hennessy et al, 2006).

2.5 CURRENT UTILISATION

The current land use remains predominantly residential development (65.5%), followed by road surfaces (22.0%) and open spaces and parks (10.2%). Pockets of bushland remain scattered throughout the area (which total 18.5 hectares in size), occurring mostly around the immediate estuary foreshore. Manly Scenic Walkway and Harbour to Hawkesbury Walking Tracks run through the study area. The estuary is used actively for walking, swimming, boating, sailing and passive recreation (eg- reading, meditation, picnicking). In addition, the estuary is also popular for kayaking, recreational fishing, sunbathing and walking dogs. Sandy Bay tidal flat is, for the last two decades or more, being used as off-leash dog area.

The study area is zoned under both the *Manly Local Environment Plan* 1988 and the *Sydney Regional Environmental Plan - Sydney Harbour Catchments 2005* or simply the Harbour REP. The Manly LEP establishes land use zones within the study area as zone 2 – Residential, 3 – Business Zone, 5 – Special Uses Zone, 6 - Open Space and Zone 8 – National Parks existing. The foreshores and waterways of the study area are located in five of the nine zones under Sydney Harbour REP: W1 (Maritime Waters), W2 (Environment Protection), W5 (Water Recreation), W6 (Scenic Waters – Active Use) and W8 (Scenic Waters – Passive Use).

There exist conflicts between different user groups and the impacts that competing users have on the environment. Examples of some of these conflicts identified include:

- Seawalls for protection of properties versus their damaging impact on natural ecosystem
- Groundwater abstraction and possible saline water intrusion in aquifer
- Beach raking for safety versus its impact on invertebrates
- Dog walking off leash and impact on shore birds
- Powered and sailing boats and their wake impacting on seawalls and beach erosion
- Access to mooring versus their impact on seagrass beds, ability to spread *caulerpa taxifolia*
- Powered boats and the safety aspects for swimmers and kayakers
- Ad hoc boat storage and its impact on amenity and habitat:
- Ad hoc access ways to foreshore for convenience versus destruction of habitat.

3. STRATEGIC FRAMEWORK & MANAGEMENT STRATEGY

3.1 GENERAL

The Estuary Management Plan is a tool for integrating the needs and values of the environment within the development-based planning framework of local and state government. Therefore, the focus of the Plan is on addressing environmental concerns through a series of actions that are both effective and easy to implement.

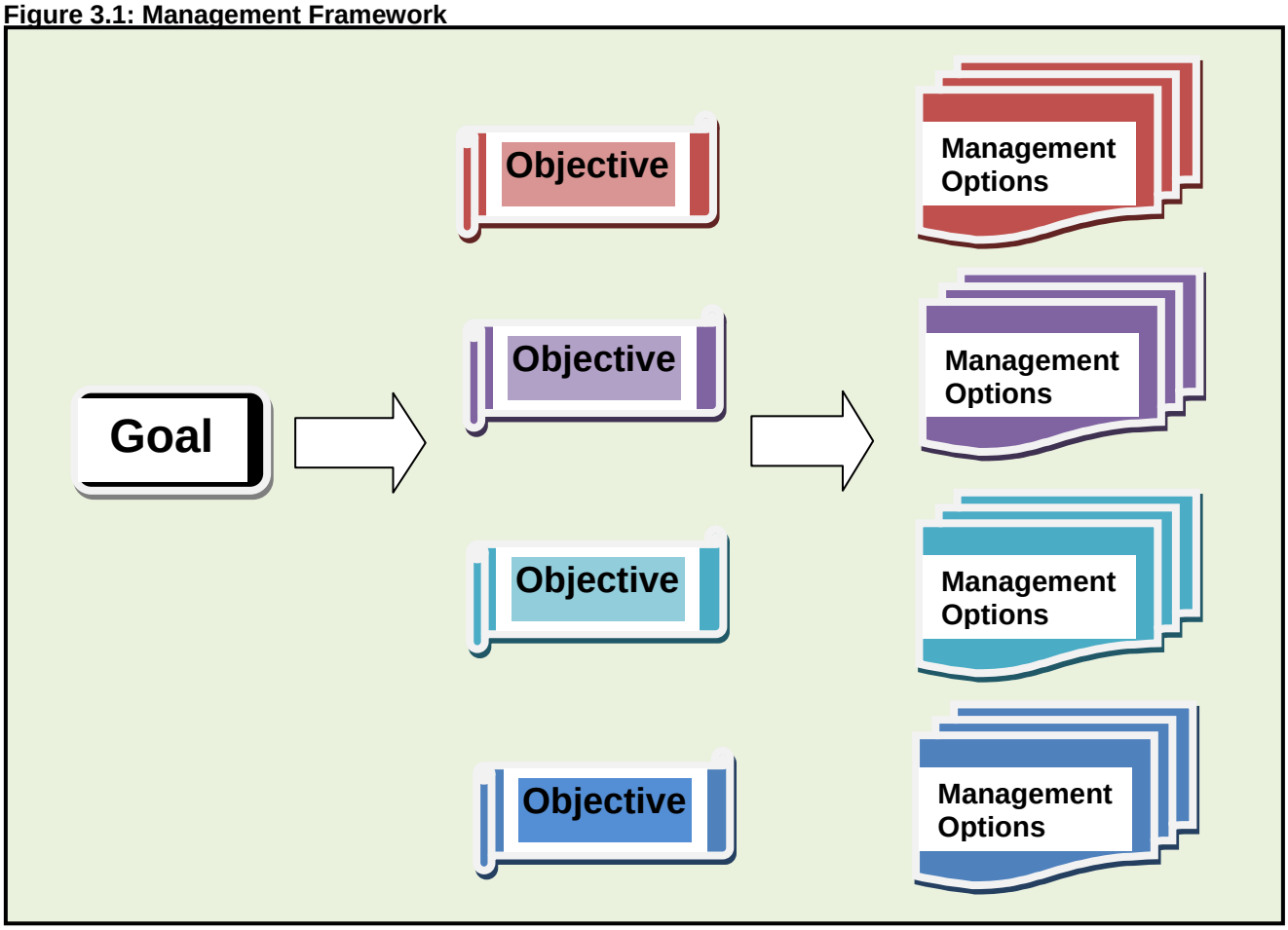
A series of goals and objectives for the future management of the Clontarf/Bantry Bay Estuary were developed on the basis of information received through the community and stakeholder consultation, input from the the Clontarf / Bantry Bay Estuary Management Working Group and a sound appreciation of estuarine processes and human interactions.

Key management issues and goals have already been described in section 1.6.

Management Objectives provide the 'goal posts' towards which future management of the Clontarf/Bantry Bay Estuary should be directed. In short, the objectives aim to rectify the problems or issues facing the estuary, whilst preserving and enhancing its inherent values.

For each management issue a goal has been defined, along with a range of management objectives that have been further partitioned into management options (**Figure 3.1**).

Figure 3.1: Management Framework



3.2 MANAGEMENT PRINCIPLES

The basis for the Estuary Management Plan needs to be Ecologically Sustainable Development (ESD). ESD is development that aims to meet the needs of the present, while conserving our ecosystems for the benefit of future generations. By following the principles of ESD, we should be able to reduce the likelihood of serious environmental impacts arising from our present day economic activities.

There are four basic principles of Ecologically Sustainable Development (ESD):

1. Conservation of biological diversity and ecological integrity;
2. Social equity, including inter-generational equity;
3. Improved valuation, pricing and incentive mechanisms; and
4. The precautionary principle.

These principles form the basis of matters to be considered in deciding whether projects are consistent with ecologically sustainable objectives.

3.3 STATE & OTHER TARGETS

NSW Government released the State Plan on 14 November 2006. It is tipped as 'A New Direction for NSW'. The Plan reflects the hopes and goals of people across NSW and the priorities for the public sector. The Plan sets out clear targets for improved outcomes and service delivery. The Plan contains 14 long term social, economic and environmental goals and 34 priority areas for action for NSW. The Priority E4 of the State Plan is

"Better outcomes for native vegetation, biodiversity, land, rivers and coastal waterways".

This has been translated into state-wide targets (**Box A**) by the Natural Resources Commission (NRC) and adopted by the Government in the State Plan.

At regional level, the Sydney Metropolitan Catchment Management Authority (SMCMA) has completed its draft Catchment Action Plan (CAP). The draft CAP will guide the activities of the SMCMA while forming the basis for partnerships with the community, business, industry and government. The draft CAP will assist the SMCMA in ensuring that natural resource management projects are undertaken in priority areas within the catchment, and that these projects lead to the best outcomes for the environment and the community. There are five themes: biodiversity, land, water, community and coastal. Under each of these, there are the Catchment Targets and Management Targets (Coastal targets in **Box B**).

Box A NRC targets adopted in the State Plan 2006

Biodiversity
Macro-environmental
1. By 2015 there is an increase in native vegetation extent and an improvement in native vegetation condition
2. By 2015 there is an increase in the number of sustainable populations of a range of native fauna species

Specific priorities
3. By 2015 there is an increase in the recovery of threatened species, populations and ecological communities
4. By 2015 there is a reduction in the impact of invasive species

Water
Macro-environmental
5. By 2015 there is an improvement in the condition of riverine ecosystems
6. By 2015 there is an improvement in the ability of groundwater systems to support groundwater dependent ecosystems and designated beneficial uses
7. By 2015 there is no decline in the condition of marine waters and ecosystems

Specific priorities
8. By 2015 there is an improvement in the condition of important wetlands, and the extent of those wetlands is maintained
9. By 2015 there is an improvement in the condition of estuaries and coastal lake ecosystems

Land
Macro-environmental
10. By 2015 there is an improvement in soil condition

Specific priorities
11. By 2015 there is an increase in the area of land that is managed within its capability

Community
Macro-environmental
12. Natural resource decisions contribute to improving or maintaining economic sustainability and social well-being

Specific priorities
13. There is an increase in the capacity of natural resource managers to contribute to regionally relevant natural resource management

Box B SMCMA Catchment & Management Targets, August 2007 - COASTAL

CATCHMENT TARGET ECM1 – ESTUARIES AND LAKES
By 2016, there is an improvement in the condition of estuaries and coastal lake ecosystems.

Management Target ECM1.1 – Marine Pests
By 2008, a risk assessment for key pest species and vectors has been undertaken

Management Target ECM1.7 – Estuarine Vegetation Management, Sydney Harbour
By 2008, mapping of all estuarine vegetation in Sydney Harbour is completed.

Management Target ECM1.8 -Estuarine Vegetation Management, Estuaries and Lakes
By 2010, mapping of all estuarine vegetation in Port Hacking, Botany Bay, Manly Lagoon, Dee Why Lagoon, Curl Curl Lagoon, and Narrabeen Lagoon is completed.

Management Target ECM1.9 -Estuarine Vegetation Management, Setting Priorities
By 2010 for Sydney Harbour and 2012 for Port Hacking, Botany Bay and Narrabeen Lagoon, key sites of estuarine vegetation are prioritised for protection and/or rehabilitation in terms of ecological value and level of risk.

Management Target ECM1.10 -Estuarine Vegetation Rehabilitation
By 2016, the extent, condition and connectivity of estuarine vegetation is maintained and/or improved by facilitating the protection and rehabilitation of estuarine vegetation at all high priority sites.

Management Target ECM1.3 – Best Management Practice in Marine-based Industries
By 2014, Best Practice Guidelines and/or Environmental Management Systems have been developed and adopted by all marine based industries.

Management Target ECM1.4 – In-stream & Marine Structures
By 2010, guidelines for the ecologically sensitive design and installation of in-stream and marine structures, including jetties, seawalls, moorings, and marinas have been developed.

Management Target ECM1.5 – Estuary Management Plans
By 2016, Estuary Management Plans have been implemented, facilitated by the Sydney Metropolitan Catchment Management Authority.

CATCHMENT TARGET ECM2 – COAST AND ECOSYSTEMS
By 2016, there is improvement in the condition of coastal landforms and ecosystems.

Management Target ECM2.1 – Invasive Species
By 2016, all vegetation in dune areas on public land is rehabilitated to reduce weed cover by 20% from the June 2007 baseline.

Management Target ECM2.2 – Beach Area
By 2016, institutional and technical processes are in place to achieve maintenance of the mean beach area as at 2006.

Management Target ECM2.3 – Intertidal Rock Platforms, Intertidal Protected Areas & Aquatic Reserves
By 2012, council rangers have the capacity and resources to enforce the NSW Fisheries Management Act, 1994 in Intertidal Protected Areas and Aquatic Reserves.

Management Target ECM2.4 -Marine Protected Areas

By 2016, there is an increase in the extent of Marine Protected Areas.

Management Target ECM2.5 – Coastline Management
By 2016, the Sydney coastline is covered by a Coastline Management Plan.

CATCHMENT TARGET ECM3 – MARINE WATERS
By 2016, there is an improvement in the condition of marine waters and ecosystems.

Management Target ECM3.1 – Sewerage Management
By 2016, five major sewage recycling projects, each with a minimum 20% reduction in the 2007 discharge have been implemented.

4. STRATEGIC MANAGEMENT OPTIONS

Strategic management options were formulated covering a wide range of structural and non-structural solutions. Responsibility for implementing the options is spread across local government (planning, management and works staff), state government agencies and volunteer community groups.

This Plan sets 10 Goals and 35 Objectives to be addressed through 85 Management Options (**Table 4.1**). Only 53 of these are new activities. Of these 53, 15 management options are proposed for immediate implementation, 25 within 2 years, 12 within 3-4 years and only 1 at later years. Overall, 22 management options have been rated to have high priority, 56 as medium priority and only 7 as low priority.

Maps showing locations of management options are presented in **Appendix D.**

Table 4.1 Facts & Figures about proposed management options

Management Issue	Objectives set	Options proposed	Priorities			Activity Type		Implementation Time Frame of new activities			
			High	Medium	Low	On-going	New	Immediate	Within 2 years	Within 3-4 years	On 5th or later
Water Quality	5	12	5	7	0	4	8	4	2	2	0
Aquatic Habitat	5	14	1	9	4	6	8	2	5	1	0
Terrestrial Habitat	3	10	1	9	0	6	4	1	1	1	1
Sedimentation & Erosion	2	3	3	0	0	0	3	1	1	1	0
Hazards & Risks	2	7	1	6	0	1	6	1	3	2	0
Estuary Use	3	13	3	10	0	7	6	0	3	3	0
Access	3	4	1	2	1	2	2	0	2	0	0
Foreshore Infrastructure	5	8	4	4	0	2	6	4	2	0	0
Heritage Conservation	3	8	2	4	2	4	4	1	2	1	0
Monitoring	4	6	1	5	0	0	6	1	4	1	0
Total	**35**	**85**	**22**	**56**	**7**	**32**	**53**	**15**	**25**	**12**	**1**

4.1 OPTIONS ADDRESSING WATER QUALITY & POLLUTION

With most parts of the Clontarf/Bantry Bay EMP study area being highly urbanised, there is significant pressure placed on water quality. It is important to note that the Middle Harbour catchment is one large interconnected system. Tidal fluctuations and freshwater flows ensure that water is mixed throughout the estuary, and the pressures placed on the health of the estuary may originate from any part of the greater Sydney Harbour catchment. Conversely though, these flows that mix the water are also extremely effective in flushing the estuary of contaminants after periods of rainfall. Groundwater is also part of the interconnected system and has the risk of salinization if over extracted.

Goal
Ensure that the water quality of the estuary is suitable for maintaining healthy natural aquatic ecosystems, and for recreational pursuits

Anecdotal reports suggest that water quality within Middle Harbour has improved in recent times. However, there is limited data available that supports this anecdotal evidence of improvements in water quality. Pollution is indeed still evident, particularly in times of rain when stormwater transports terrestrial pollutants into the estuary. Stormwater in Clontarf / Sandy Bay area has been cited, during community consultations, as a major problem.

A total of 12 management options are proposed addressing five different objectives. Of these, five management options have been rated as of high priority and the remaining seven management options have medium priority.

Four options are proposed for immediate implementation. Four management options are already on-going activities of the Council.

Objectives	Strategic Management Options	Implementation timeframe*	Priority
WQ 1 Reduce the level of catchment sourced pollutants sufficiently.	**WQ1.1.** Formulate comprehensive Stormwater Management Plan for Manly LGA encompassing the study area.	Within 3- 4 years	High
	WQ1.2. Continue maintaining existing gross pollutant traps (GPTs) in the Clontarf catchment.	On -going	High
	WQ1.3. Investigate feasibility of installing new Stormwater Quality improvement Devices (SQIDs) at priority locations taking into account current best practice technologies.	Within 3- 4 years	Medium
	WQ1.4. Install pit inserts in litter hotspots throughout the study area.	Within 2 years	Medium
WQ 2 Reduce discharges from sewage overflows within the catchment	**WQ2.1.** Confirm, with Sydney Water, the presence of all sewage overflow points within the Clontarf / Bantry Bay study area including the five known ones.	Immediate	High
WQ 3 Ensure that faecal coliform and enterococci levels at designated public swimming enclosures comply with standard recommendations.	**WQ3.1.** Work with relevant agencies to minimise *faecal coliforms* and *enterococci* levels at all three public swimming enclosures.	On-going	High
	WQ3.2. Investigate & seek to address possible sources of high faecal coliforms and enterococci levels in Sangrado swimming enclosure.	Immediate	High
WQ 4 Ensure sustainable use of different sources of water.	**WQ4.1**. Undertake a comprehensive study on Clontarf groundwater aquifer to identify present extraction rate, recharge and other relevant issues.	Immediate	Medium
	WQ4.2. Monitor extracted groundwater for salinity and other parameters for early signs of contamination.	Within 2 years	Medium
	WQ4.3. Assess current greywater direct diversion (GDD) uptake within Manly Council (including the study area) through undertaking a residential survey.	Immediate	Medium
	WQ4.4. Make rainwater tank and associated infrastructure purchases by residents more attractive and thereby facilitate reduced stormwater generation.	On-going	Medium
WQ 5 Continue water quality and waste management education programs	**WQ5.1.** Introduce Manly Council's Seachange program in the study area to educate sustainable stormwater management and pollution prevention	On-going	Medium

DETAILS OF MANAGEMENT OPTIONS

Objective
WQ 1 Reduce the level of catchment sourced pollutants sufficiently.

WQ1.1. Formulate comprehensive Stormwater Management Plan for Manly LGA encompassing the study area.

Context: *This option involves formulation of a comprehensive Stormwater Management Plan for the study area. The Plan should contain detailed information on existing catchment conditions, stormwater management objectives, existing stormwater management, potential stormwater management options, evaluation of management options, adopted management plan and implementation. Community consultation is an important requirement in developing this plan.*

Recommendations from Middle Harbour Catchment Stormwater Management Plan (Willing & Partners 1999) and Northern Beaches Stormwater Management Plan (Patterson Britton & Partners 1999) will be reviewed. However, Manly Council has conducted a stormwater quality desktop study (MC 2006) including modeling encompassing all six sub-catchments within the study area. This report has been appended in the Clontarf/Bantry Bay Estuary Processes Study. These reports provide basic information in formulation of the Management Plan.

In the comprehensive plan, among others, emphasis should be placed to amend Council's planning instruments and policies to ensure that water sensitive urban design principles are incorporated into the design of all development proposals and works programs within the catchment

Actions:

- *Review earlier Management Plans & recent modelling study*
- *Carry out a community consultation program*
- *Rerun the model with latest available data*
- *Liaise with the Sydney Water*
- *Formulation of the Report*

Advantages: *Provides a holistic approach to stormwater management of the area. The report will provide more structured and prioritized actions considering all options. The Plan contributes to cost savings for piecemeal efforts.*
Disadvantages: *Plan preparation is time consuming and costly. Value of the Plan is lost if not implemented readily. Funding may not be available for implementation of priority actions.*

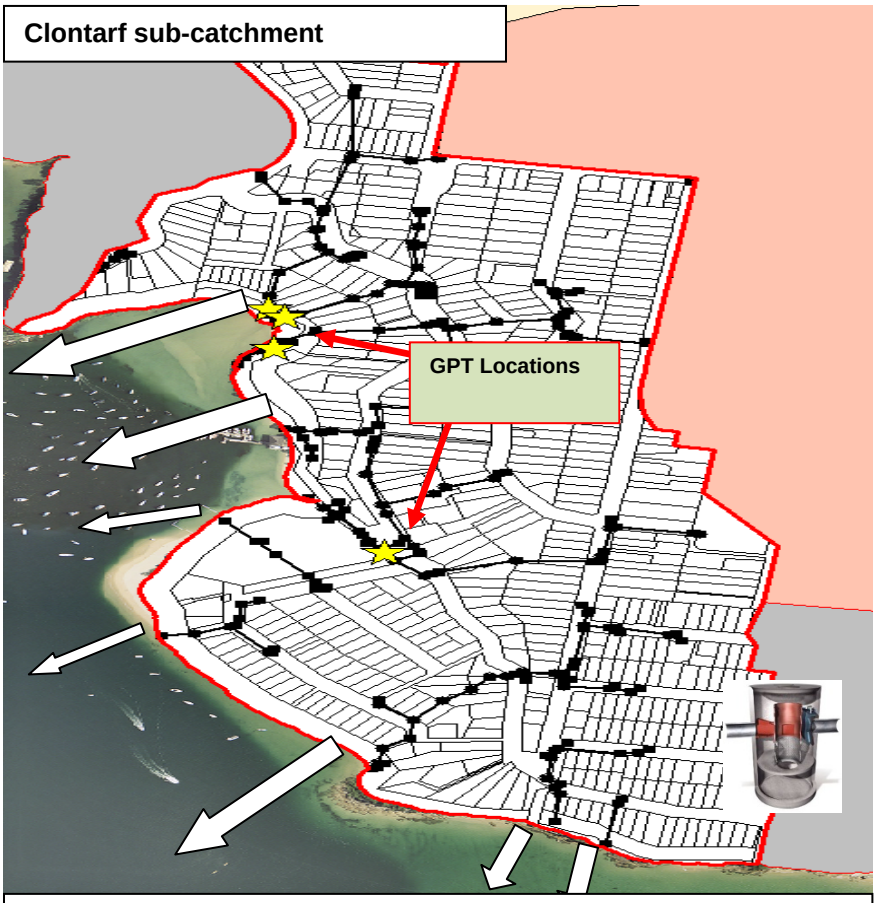
Objectives addressed: *WQ1* ***,*** *WQ2, WQ3, WQ4, WQ5, TH2, EU1, MO2, MO4*
Addressing NRC targets (State Plan 2006): *9 – improvement in estuaries ecosystems*
Addressing SMCMA targets: *Management target W3.5 – complete Stormwater Management Plans*

Performance Target: *Management plan completed*
Indicative Cost: ***$*** *70,000*
Time Frame: *To be implemented within 3-4 years*
Responsible Agency: *Manly Council – Natural Resources*
Priority: *High*

WQ1.2. Continue maintaining existing gross pollutant traps (GPTs) in the Clontarf sub-catchment.

Context: *Four Gross Pollutant Traps (GPTs) are currently installed in the Clontarf sub-catchments. These capture gross pollution and litter, sediment, and a limited percentage of nutrients and metals present in stormwater, improving the quality of catchment-generated stormwater entering Middle Harbour. All four GPTs are located near the popular swimming and recreation area of Clontarf.*

GPTs are currently inspected immediately after heavy rainfall (following 20 mm or greater) and routinely once every 8 weeks. This routine has proved to be efficient and is carried out to remove pollutants re-captured from stormwater, minimising pollutant decomposition, and minimising re-suspension of pollutants into Middle Harbour. Scientific research has demonstrated GPTs to be capable of capturing up to 23% of nutrients and metals, and 56% of sediment in stormwater generated in the catchments.



Black lines indicate stormwater lines, black dots indicate pits, and white arrows indicate stormwater discharge locations and directions.

Actions: *The option involves continuation of the present maintenance schedule*

Advantages: This option would result in a reduction of pollutants (including nutrients and sediments) entering the estuary from catchment sources. This would improve the overall water quality of the estuary, particularly in the Clontarf sub-catchment and would provide a more healthy aquatic habitat and recreational amenity.
Disadvantages: *Increased maintenance cost*

Objectives addressed: *WQ1, WQ3, EU1*
Addressing SMCMA targets: *Management target W3.3 – performance of stormwater improvement devices*

Performance Target: *Efficient GPT maintenance, water quality improvement*
Indicative Cost: *$ 50,000*
Time Frame: *On-going*
Responsible Agency: *Manly Council – Natural Resources*
Priority: *High*

WQ1.3. Install new Stormwater Quality Improvement Devices (SQIDs) at priority sub-catchments taking into account current best practice technologies.

Context: *All six sub-catchments within the study area drain directly into the waters of Middle Harbour. Manly Council is commited to contribute to improving stormwater quality to protect the health of harbour waterways. Council has already installed 4 GPTs at one of the sub-catchments, Clontarf.*

At present, there is community demand to install Stormwater Quality Improvement Devices (SQIDs) at other sub-catchments. Any future installation of new SQIDs will be based on best practice technologies.

Two sub-catchments, Sangrado and/or the Spit, are proposed as priority sub-catchments for the installation of new SQIDs.

Actions:

- *Assess current best practice technologies including street sweeping opportunities*
- *Assess locations at proposed priority sub-catchments*
- *Install SQIDs based on available funding resource.*
- *Liaise with Sydney Water.*

Advantages: *Installing new SQIDs within the catchment would reduce the catchment-based pollutant loads to the estuary. As the study area is only a small part of the estuary, benefits would be more localized. Improvements to the estuarine water quality could be expected. This would in turn improve the aquatic habitat, possibly resulting in more abundant or diverse aquatic fauna. Improved water quality would also increase the recreational amenity of the estuary.*
Disadvantages: *Increased cost; both as large capital cost and on-going maintenance costs. Cannot be implemented if funding is not secured. If GPTs are not adequately maintained (cleaned) they can foster bacterial growth within the structures and can serve as a pollutant source.*

Objectives addressed: *WQ1 , TH2, EU1*
Addressing SMCMA targets: *Management target W3.3 – performance of stormwater improvement devices*

Performance Target: *SQIDs installed*
Indicative Cost: *$ 150,000*
Time Frame: *To be implemented within 3-4 years*
Responsible Agency: *Manly Council – Natural Resources & Urban Services*
Priority: *Medium*

WQ1.4. Install pit inserts in litter hotspots throughout the study area.

Context: *Pit inserts are very effective in capturing gross pollutants before they enter the stormwater system and receiving waterways. Consisting of a fine mesh, they can be installed inside stormwater pits throughout each catchment to filter gross pollutants, sediments, organics & particulate bound pollutants. The captured pollutants are stored in the mesh in a dry state, and their location at street level means that pollutants are easily removed.*

Actions:

- *Install pit inserts into selected stormwater pits.*
- *Establish cleaning regime / schedule with Civic Services*
- *Monitor their performance and analyse cost and ease of maintenance*
- *If successful, install pit inserts in litter hotspots*

Advantages: *Pit inserts are relatively cheap to install compared to other engineering methods of stormwater treatment, although the limited storage of each unit means that they need to be installed at many locations throughout each catchment.*
Disadvantages: *Pit inserts must be cleaned regularly, adhering to the maintenance schedule and subject to rainfall, or they can contribute to blockages and localised flooding.This will result in asset (pit insert) failure, through collapse in the drains.*

Objectives addressed: WQ1
Performance Target: *Pit inserts tried & installed in hotspots*
Indicative Cost: *$45,000*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *Manly Council – Urban Services, Civic Services and Natural Resources*
Priority: *Medium*

Objective
WQ 2 Reduce discharges from sewage overflows within the catchment

WQ2.1. Confirm, with Sydney Water, the presence of all sewage overflow points within the Clontarf / Bantry Bay study area including the five known ones.

Context: *There are five known designed sewage overflow points in the Clontarf / Bantry Bay Catchments currently registered in Manly Council's GIS system. It is not known whether there are other sewage overflow points. No survey has been undertaken to detect all sewage overflow points within the study area. It is also not known what extent these overflows contribute to the bacterial load in water within the estuary. High bacterial loads to the estuary, particularly during rainfall events, are currently causing pollution. Water quality near Sangrado enclosure is affected by bacterial contamination from sewage overflows.*

Overflow No.	*Catchment*	*Address*	*Location*	*Suburb*
SN436OF01	*Bligh Crescent*	*Bligh Cr.*	*In-road*	*Seaforth*
SMSE1OF02	*Sangrado Street*	*Sangrado St.*	*Bush-NP*	*Seaforth*
SMSE1OF01	*The Spit*	*Battle Bvd*	*Private*	*Seaforth*
SMCL5OF01	*Clontarf*	*Amiens Rd/Holmes Ave*	*In-road*	*Clontarf*
SMCL5OF02	*Castle Rock Reserve*	*Ogilvy/Weekes Rd*		*Clontarf*

Actions:
- *Liaise with Sydney Water to identify all designed sewage overflow points and request latest modelled information on predicted overflow events per ten years, and predicted overflow volumes (m3).*
- *Check out other overflow hot spots such as leaks*
- *Map additional points, if any, on Manly Council's GIS system.*

Advantages: Although this option only involves discussions with Sydney Water at this stage and would not have any direct impacts on the existing conditions, it could initiate works by Sydney Water that would result in a reduction of pollutant loads to the estuary.
Disadvantages: *There are no disadvantages identified*

Objectives addressed: *WQ1, WQ2, WQ4, TH2, FI4*
Addressing SMCMA targets: *Management target W1.8 –stormwater*

Performance Target: *All overflow points known and mapped*
Indicative Cost: *Staff time*
Time Frame: *Immediate*
Responsible Agency: *Sydney Water - Wet Weather Overflow Abatement Program, Manly Council – Natural Resources*
Priority: *High*

Information contributed by Sydney Water

There are 5 confirmed directed overflows in the study area. The estimated frequency and volume of discharges from these overflows for a 10 year period is included in the following table:

Overflow No.	Location	Suburb	Overflows	
			Number/10 years	Vol (ML)/10 years
SN436OF01	Bligh Cr.	Seaforth	0	0
SMSE1OF02	Sangrado St.	Seaforth	18	2,500
SMSE1OF01	Battle Bvd	Seaforth	71	5,300
SMCL5OF01	Amiens Rd/Holmes Ave	Clontarf	2	5
SMCL5OF02	Ogilvy/Weekes Rd	Clontarf	148	4,700

With regards to sewer leakage, the Dry Weather Leakage Reduction Program has not been extended to the catchments of the study area and for this reason recent dry weather water quality data has not been collected and the current leakage status is unknown.

Objective
WQ 3 Ensure that *faecal coliform* and *enterococci* levels at designated public swimming enclosures comply with standard recommendations

WQ3.1. Work with relevant agencies to minimise *faecal coliforms* and *enterococci* levels at all three public swimming enclosures.

Context: *The NSW DECC Harbourwatch Program was established in November 1994 to monitor and report on water quality in the harbour, bay and estuarine swimming areas of Sydney. The Harbourwatch Program monitors and reports on water quality at 59 swimming sites including all three public swimming enclosures within the study area, Clontarf, Sangrado & Pickering Point. Beachwatch staff collects water samples at all sites every sixth day in accordance with NHMRC (1990) guidelines for recreational use of water. All samples are transported to one laboratory for microbiological analysis.*

There is designed sewage overflows located near the three public swimming enclosures within the study area. It is desired that these overflows are redirected elsewhere to contribute to improved water quality in swimming enclosures.

Actions:

- *Collaborate with the NSW DECC Harbourwatch Program to obtain regular water quality data.*
- *Inform the community about trends in water pollution at these swimming enclosure sites, including directing the community to the "predictive" water quality guide for this swimming enclosures on the Harbourwatch webpage.*
- *Install cautionary signage, if needed*
- *Liaise, through Sydney Water-Manly Council Partnership, to discuss possible redirection of designed overflow points away from public swimming enclosures*
- *Investigate the possibility of removing the stormwater pipe draining into Clontarf pool*
- *As per WQ 2.1, Liaise with Sydney Water to request latest modelled information on predicted overflow events per ten years, and predicted overflow volumes (m3).*

Advantages: *This option would provide valuable information on the water quality of the estuary in general and around public swimming pools in particular. This option is essential to measure any changes in water quality that could be the result of the implementation of other management options.*
Disadvantages: *There are no apparent disadvantages*

Objectives addressed: *WQ3 , EU1, FI4, MO1, MO2, MO3*
Performance Target: *Bacterial contamination managed & water quality improved*
Indicative Cost: *$ 12,000*
Time Frame: *On-going*
Responsible Agency: *NSW DECC Harbour Watch, Sydney Water, Manly Council – Natural Resources*
Priority: *High*

WQ3.2. Investigate & seek to address possible sources of high *faecal coliforms* and *enterococci* levels in Sangrado swimming enclosure.

Context: *Sangrado Bath is the most heavily polluted swimming enclosure of the three within the study area and has a history of bacterial contamination. It achieved 100% compliance with faecal coliform guidelines for only two years between 1999 and 2007. In all of the other years its compliance was*

lower than the other sites. Compliance with enterococci guidelines was much worse, with only three years between 1999 and 2007 above 80% compliance, and one year below 30% compliance.

Sangrado Bath lies downstream of Gurney Crescent, and should theoretically be expected to have similar or better water quality than Gurney Crescent as it experiences greater tidal flushing, dilution, and circulation. The fact that it doesn't may indicate a localised point source of pollution, most likely a sewage leak or overflow. This is likely related to the presence of one of the five designed sewer overflow points in the study area, located close to the bath.

Actions:

- *The option involves preparing a report finding the source of high faecal coliforms and enterococci levels and suggesting remedial measures.*

  The issue was raised at the Sydney Water-Manly Council Partnership meeting on 27 September 2007. Sydney Water has committed to look into the matter and submit a report shortly.
- *As per WQ 2.1, Liaise with Sydney Water to request latest modelled information on predicted overflow events per ten years, and predicted overflow volumes (m3)*

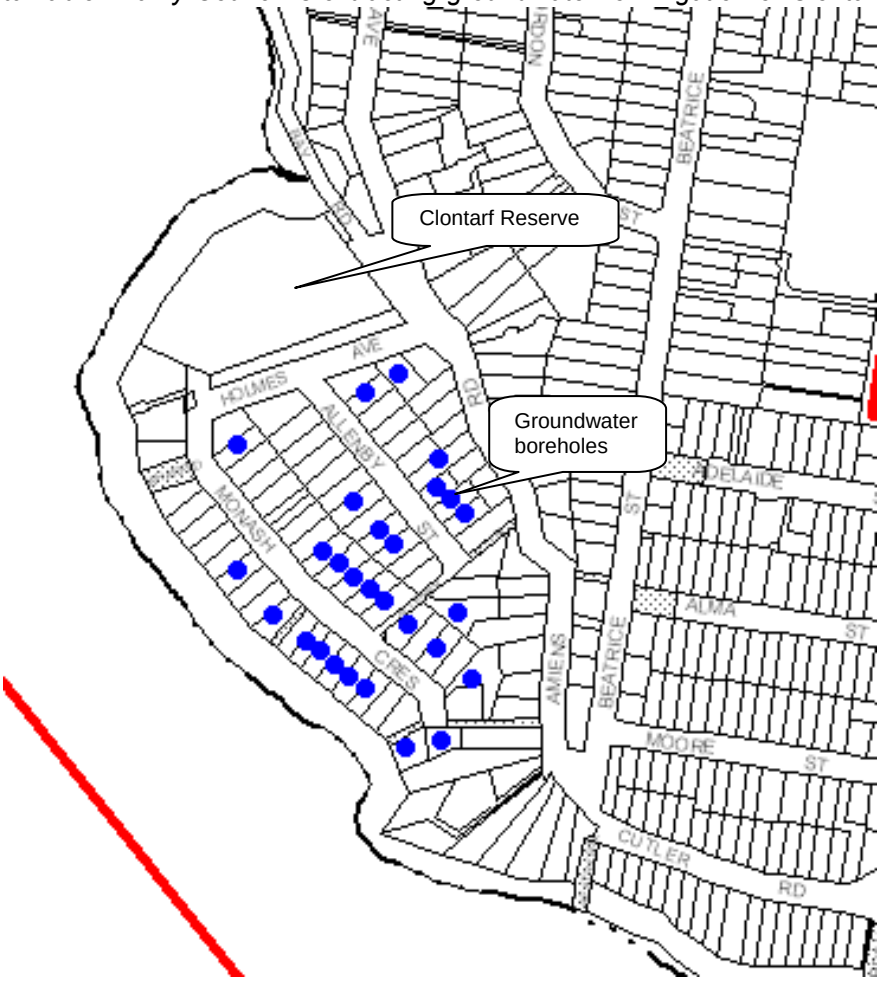
Advantages: *Identification of possible source facilitates correct mitigation measures*
Disadvantages: -

Objectives addressed: *WQ3 , EU1, FI4*
Performance Target: *Investigation Report, schedule mitigative or further action.*
Indicative Cost: *$ 2,000*
Time Frame: *Immediate. Council, at its Planning & Strategy Committee meeting on 10 September 2007, has resolved to refurbrish/replace the Sangrado bath. This will be done in conjunction with construction of a wharf and pontoon*
Responsible Agency: *Sydney Water, Manly Council – Natural Resources*
Priority: *High*

Objective
WQ 4 Ensure sustainable use of different sources of water

WQ4.1. Undertake a comprehensive study on Clontarf groundwater aquifer to identify present extraction rate, recharge and other relevant issues.

Context: *Groundwater is an attractive and viable alternate water source for irrigation of public and private land. However, groundwater is not an endless resource, and care needs to be taken to ensure that extraction rates are sustainable. Manly Council is extracting groundwater for irrigation of Clontarf Reserve. Many nearby private properties are also extracting groundwater for irrigation and where sub-surface excavation for car parks and structures have intercepted the water table. At present, extraction of groundwater is concentrated near to Clontarf Reserve. Groundwater abstraction, from bores so close to the estuary, can lead to seawater intruding into the freshwater aquifer. This could render the use of the groundwater unsuitable if contaminated by higher salinity, and permanently alter soil characteristics.*



A comprehensive investigation will be undertaken, in conjunction with the Department of Water and Energy (DWE), to measure total extraction and recharge rates of the aquifer at Clontarf (and potentially other areas, if required), to determine if the current yields are sustainable. Once the

sustainability of the current situation is determined, DWE should be approached to take appropriate actions to resolve licensing issues.

Actions:

- *Obtain list of residential license holders (list obtained 6 September 2007 through Wayne Connors, NSW Department of Water & Energy)*
- *Council will update its GIS database showing all known groundwater boreholes (updated 28 September 2007)*
- *Undertake a comprehensive investigation (outsourced if funding available)*
- *Undertake survey of Council wide (including study area) householders utilising groundwater and cross-check with DWE licences to identify registered and unregistered groundwater users*
- *Encourage residents with bores to install rainwater tanks to reduce dependence on groundwater*
- *Take actions as per recommendations*

Advantages: *Will provide valuable information on groundwater extraction and recharge. This will contribute to an understanding of sustainable groundwater use.*
Disadvantages: *There are no apparent disadvantages*

Objectives addressed: *WQ4 , HR1*
Addressing NRC targets (State Plan 2006): *6 – improvement in the ability of groundwater systems*
Addressing SMCMA targets: *Management target W4.1 – sustainable groundwater extraction*
Addressing actions under Manly Council's MSS 2006: *C1.1.24 – groundwater extraction and recharge monitoring*

Performance Target: *Study report completed*
Indicative Cost: *$45,000*
Time Frame: *Immediate*
Responsible Agency: *Manly Council – Natural Resources, DWE*
Priority: *Medium*

WQ4.2. Monitor extracted groundwater for salinity and other parameters for early signs of contamination.

Context: *With recent droughts, groundwater has become an attractive and viable alternate water source for irrigation of public and private land. Many properties along the immediate beachfront at Clontarf are extracting groundwater for residential irrigation purposes. All bores are assumed to access the same connected aquifer. Excessive groundwater abstraction, from bores so close to the estuary, can lead to sea water intruding into the freshwater aquifer.*

Actions:

- *Select 10 residential license holders and discuss salinity & importance of monitoring program*
- *Monitor salinity levels weekly by measuring Electrical Conductivity (EC) in micro siemens per centimetre (µS/cm) using an ECScan Low meter. Salinity levels (EC) in freshwater range from 0 to 800 µS/cm and brackish water ranges from 1600 to 4800 µS/cm. Truly saline waters have levels greater than 4800 µS/cm and seawater is approximately 56000 µS/cm.*
- *Monitor bacterial contamination every six months and other heavy metals on annual basis.*
- *Analyse results for any sign of early contamination and to indicate a trend and/or seasonal variation*
- *Take necessary remedial measures if a trend of increasing salinity is detected.*

Advantages: *Will provide valuable information on early sign of groundwater salinity and indications of seawater intrusion in freshwater aquifer.*
Disadvantages: *There are no apparent disadvantages*

Objectives addressed: *WQ4, MO1*

Addressing NRC targets (State Plan 2006): *6 – improvement in the ability of groundwater systems*
Addressing SMCMA targets: *Management target W4.3 – groundwater quality*
Addressing actions under Manly Council's MSS 2006: *C1.1.24 – groundwater extraction and recharge monitoring*

Performance Target: *Salinity & other parameters monitored*
Indicative Cost: *$ 9,000*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *Manly Council – Natural Resources*
Priority: *Medium*

WQ4.3. Assess current greywater direct diversion (GDD) uptake within Manly Council (including the study area) through undertaking a residential survey.

Context: *GDD is currently exempt from Council approval but presents the greatest risk for aquifer (groundwater) contamination, due to no treatment and minimal Local, State, or Federal government control. A survey of households would provide Council with a greater understanding of this new and rapidly emerging risk to groundwater resources. It would also provide a baseline for future survey comparison.*

Actions:

- *Undertake survey of Council wide (including study area) householders utilising greywater direct diversion (GDD)*
- *Incorporate options for GDD into Council's approval process*

Advantages: *Increased understanding of presently unknown component of water cycle in the catchment*
Disadvantages: *Cost*

Objectives addressed: *WQ4, MO1*
Addressing SMCMA targets: *Management target LD1-6 – greywater*
Addressing actions under Manly Council's MSS 2006: *C2.1.20 – monitor greywater use*

Performance Target: *Survey / Study report completed*
Indicative Cost: *$ 10,000 (possible student project)*
Time Frame: *Immediate*
Responsible Agency: *Manly Council – Standards & Compliance (Environmental Health), Natural Resources, CEP*
Priority: *Medium*

WQ4.4. Make rainwater tank and associated infrastructure purchases by residents more attractive and thereby facilitate reduced stormwater generation.

Context: *Increased community installation of rainwater tanks at an individual residential scale, would greatly reduce the volume of stormwater entering Middle Harbour, through disconnecting the large roof areas of residential properties from the stormwater network. This would decrease the proportion of stormwater swept off-site from residential properties, and the capacity of stormwater to entrain and transport land based pollutants into the Middle Harbour estuary. In particular it would also decrease the pollution load from residential land-uses in the catchment through containing nutrient and other pollution on-site. Residential land-uses were estimated to be the greatest source of nutrients and the second-greatest source of heavy metals and sediment in Middle Harbour. Installation of rainwater tanks throughout the catchment would also decrease stormwater flows onto the Middle Harbour foreshores, minimising the likelihood of beach erosion at each outfall.*

Manly Council, at present, encourages residents to install rainwater tanks as a means to reduce stormwater flows into Middle Harbour, and establish an alternate water source for their gardens and/or

properties through its 'Manly Rainwater Tanks Program'. It also encourages new developments and modifications to existing developments to install rainwater tanks to meet BASIX requirements.

Sydney Water's new Rainwater Tank Rebate Program became available to Manly households from July 01, 2007. The program provides up to $1500 in rebates to install new rainwater storage systems in existing homes. Information on Sydney Water's Rainwater Tank Rebate Program can be found at www.sydneywater.com.au/SavingWater/InYourGarden/RainwaterTanks/.

Actions:

- *This option supports continuation of existing programs. Involve local Precincts to facilitate dissemination of best practice messages in regard to residential rainwater harvesting and the associated benefits.*
- *Use Council forums including the Mayor's weekly message, precinct committees, and other forums to increase community understanding of the benefits of rainwater tanks, not just for water saving in the home, but also stormwater volume reduction and pollutant prevention into aquatic waterways.*
- *Survey of houses in Manly Council (including study area) to determine rainwater tank uptake (baseline). Future survey to monitor increases.*

Advantages: *Reduce the volume of stormwater entering Middle Harbour, through disconnecting the large roof areas of residential properties' from the stormwater network. This would decrease the proportion of stormwater swept off-site from residential properties, and the capacity of stormwater to entrain and transport land based pollutants into the Middle Harbour estuary.*
Disadvantages: *Cost and community acceptance dependant*

Objectives addressed: *WQ1, WQ2, WQ3, WQ4, WQ5*
Addressing actions under Manly Council's MSS 2006: *C2.1.4 – rainwater harvesting & stormwater reuse; C2.1.9 – promote rainwater tanks*

Performance Target: *Increased use of rainwater tank rebate*
Indicative Cost: *No additional cost, existing program*
Time Frame: *On-going*
Responsible Agency: *Manly Council – CEP, Precincts, Sydney Water, SMCMA*
Priority: *Medium*

Objective
WQ 5 Continue water quality and waste management education programs

WQ5.1. Continue Manly Council's Seachange program in the study area to educate sustainable stormwater management and pollution prevention

Context: *The Stormwater Environment Action (SEA Change) program focuses on the environmental education of residents, businesses and the wider local community to achieve improved water quality for Manly's water ways. It is an integrated program bringing together various disciplines and backgrounds to coordinate and implement a project that includes:*

- *Environment Education*
- *Water Quality Monitoring*
- *Compliance Support*
- *Cleansing and Maintenance*

The Seachange stormwater management program has traditionally targeted pollution prevention from prioritised catchments utilising structural and non-structural tools. This model has been effective in targeting considerable pollutant load reduction over the past 5 years.

Stage III of the program could see application to a target catchment in the study area. During stage III, it is recognized that multiple objectives can be achieved from integrating flood management and

stormwater re-use, and alternate water sourcing into the pollution prevention model. The model would see monitoring, science, action, and community engagement / communication within the catchment.

Action: *The option involves introducing this program at a priority site within the study area.*

Advantages: This option has the potential to significantly reduce pollutant input to the estuary, thereby improving water quality and increasing the recreational and ecological amenity of the estuary.
Disadvantages: The program requires significant funding for application of water quality monitoring, and multiple branches of Council. Usually only a relatively small percentage of residents would take the steps necessary to reduce pollutant runoff. Hence, to ensure that changes are permanent, the education program would need to be on-going.

Objectives addressed: *WQ1, WQ5*
Addressing actions under Manly Council's MSS 2006: *C1.1.3 – Introduce SEA Change program*

Performance Target: *Increased community education and uptake of best practice water cycle management. Improved water quality from targetted catchments.*
Indicative Cost: *$40,000*
Time Frame: *On-going*
Responsible Agency: *Manly Council – CEP*
Priority: *Medium*

4.2 OPTIONS ADDRESSING AQUATIC/INTERTIDAL HABITAT CONSERVATION & MANAGEMENT

The key habitat management priority for the study area is to protect habitats of high ecological and estuarine value. It is more cost effective to protect these areas now than to rehabilitate them in the future if habitats are allowed to deteriorate.

A total of 13 management options are proposed addressing five different objectives. Of these, one management option has been rated as of high priority, eight as medium priority and the remaining four options as low priority. Two options are proposed for immediate implementation. Six management options are already on-going activities.

Goal

Restore and maintain a healthy and diverse mix of aquatic and intertidal habitats that will maintain and improve biodiversity and ecological functions of the estuary.

Objectives	Strategic Management Options	Implementation timeframe*	Priority
AH 1 Preserve and maintain existing seagrass beds	**AH1.1.** Encourage NSW DPI to prepare periodic up-to-date seagrass distribution maps.	On-going	Medium
	AH1.2. Encourage NSW Maritime and NSW DPI to increase the enforcement of boating restrictions over seagrass beds. Develop interpretative signage to notify seagrass beds as protected areas.	Immediate	High
AH 2 Eradicate where possible or bring under control *Caulerpa taxifolia* from within and around Middle Harbour.	**AH2.1.** NSW DPI to continue to keep NSW Maritime, Manly Council and community informed of the updated information on distribution of *Caulerpa taxifolia*.	On-going	Medium
	AH2.2. Encourage NSW DPI to continue implementing the 'Control Plan for *Caulerpa taxifolia* in NSW'.	On-going	Medium
AH 3 Maintain areas of key intertidal ecosystems and investigate possibility of its expansion.	**AH3.1.** Protect existing mangroves and carry out regeneration activities.	On-going	Medium
	AH3.2. Design and implement the Fisher Bay Mangrove Expansion program.	Immediate	Medium
	AH3.3 Identify, map, protect and enhance saltmarsh habitat within the study area	Within 2 years	Medium
AH 4 Ensure all areas of ecological significance are properly protected and conserved.	**AH4.1.** Encourage DECC and NSW DPI to continue to enforce declared protected areas of ecological significance.	On-going	Medium
	AH4.2. Encourage DECC to undertake a study of possible penguin nest sites in Middle Harbour and community to report penguin sightings	Within 2 years	Low
	AH4.3. Support volunteer groups to facilitate conservation and protection of aquatic and intertidal habitats.	On-going	Medium
	AH4.4. Work with NSW DPI to disseminate information brochures outlining the importance of aquatic habitats and the penalties involved in harming them.	Within 2 years	Medium

Objectives	Strategic Management Options	Implementation timeframe*	Priority
AH 5 Define factors affecting areas of high ecological value and develop and implement measures to address them.	***AH5.1.*** Continue to collate, analyse recent knowledge and study factors affecting degradation of ecologically important/critical habitats.	Within 2 years	Low
	AH5.2. Investigate best practice beach raking in other Councils and incorporate that knowledge for possible implementation at Clontarf. Improve Council staff knowledge regarding eco sensitivities in beach raking and other services.	Within 2 years	Low
	AH5.3. Retain rocky foreshores and cliff-lines as important coastal habitat. Where new upgrading or building of seawalls needed, ensure to incorporate recent knowledge on seawall restorations supporting ecological habitat	Within 3-4 years	Low

*After adoption of the EMP

DETAILS OF MANAGEMENT OPTIONS

Objective
AH 1 Preserve and maintain existing seagrass beds.

AH1.1. Encourage NSW DPI to prepare periodic up-to-date seagrass distribution maps.

Context: *Significant seagrass beds occur within the study area. The largest seagrass bed is found adjacent to Castle Rock Beach. Clontarf and Sandy Bay also have reasonably large meadows of seagrass. Surveys of seagrasses in NSW were conducted in 1985 and 2005. The most recent survey has shown that the total area of seagrass within NSW has increased slightly from 154km2 to 159km2 (DPI 2007). A 1981 Seagrass Map of Port Jackson produced for the Sydney Metropolitan Catchment Management Authority of the time indicates a significant stand of seagrass in Sandy Bay, much larger than that indicated by DPI in the current seagrass map. Of the 144 estuaries surveyed in 2005, 64 recored a net increase in seagrass area and 52 a net decrease compared to 1985. Because of this, periodic updating of maps is important.*

Action: *The option involves periodic up-to-date maps of seagrass distribution within the study area.*

Advantages: *Such periodic maps will be useful to understand trends in loss or gain in seagrass beds. Effective measures can be planned based on results from periodic maps.*
Disadvantages: *There are no apparent disadvantages*

Objectives addressed: *AH1, AH4*
Addressing NRC targets (State Plan 2006): *3 – recovery of ecological communities; 9 – improvement in estuaries ecosystems*
Addressing SMCMA targets: *Management target B1.1 – vegetation mapping; ECM1.7 – estuarine vegetation management, Sydney Harbour*
Addressing actions under Manly Council's MSS 2006: *C1.2.1 – identify and map aquatic flora and fauna*

Performance Target: *Updated seagrass maps*
Indicative Cost: *Staff time*
Time Frame: *On-going*

Responsible Agency: *NSW DPI, Manly Council – Natural Resources*
Priority: *Medium*

AH1.2. Encourage NSW Maritime and NSW DPI to increase the enforcement of boating restrictions over seagrass beds. Develop interpretative signage to notify seagrass beds as protected areas.

Context: : *Seagrass beds are fragile habitats that can be impacted by natural events such as storms and by human induced stressors. Many seagrass beds have been degraded through the combined effects of coastal development, dredging and reclamation, sediment and nutrient runoff and the recreational use of our waterways. Mangroves and seagrass are protected under the Fisheries Management Act 1994. Inappropriate boating can cause seagrass loss. Seagrasses can be preserved by adhering to the following:*

- *Avoid driving boats across shallow, weedy areas, as boat propellers can directly damage seagrass.*
- *Boats should be driven within marked channels wherever possible to avoid seagrass beds.*
- *Avoid anchoring on seagrass beds, as anchors can dislodge seagrass plants.*
- *Ensure all foreshore structures over seagrass (Zostera spp.) incorporate seagrass friendly designs eg mesh decking.*
- *Relocate moorings, in consultation with NSW Maritime, to an area away from seagrass.*

Actions:

- *Develop interpretative signage to notify seagrass beds as sensitive areas.*
- *Initiate education program.*

Advantages: *Education will help facilitate protection of seagrass beds by recreational boaters. This will enhance ecological richness of the estuary*
Disadvantages: *None*

Objectives addressed: *AH1, AH4, AH5, EU2*
Addressing NRC targets (State Plan 2006): *3 – recovery of ecological communities; 9 – improvement in estuaries ecosystems*
Addressing SMCMA targets: *Management target ECM1.10 – estuarine vegetation rehabilitation*
Addressing actions under Manly Council's MSS 2006: *C1.2.15 – no anchoring on seagrass beds*

Performance Target: *Enhanced community awareness, signage installed*
Indicative Cost: *$10,000*
Time Frame: *Immediate*
Responsible Agency: *NSW Maritime, NSW DPI, Manly Council- Natural Resources, SMCMA*
Priority: *High*

Objective
AH 2 Eradicate where possible or bring under control *Caulerpa taxifolia* from within and around Middle Harbour

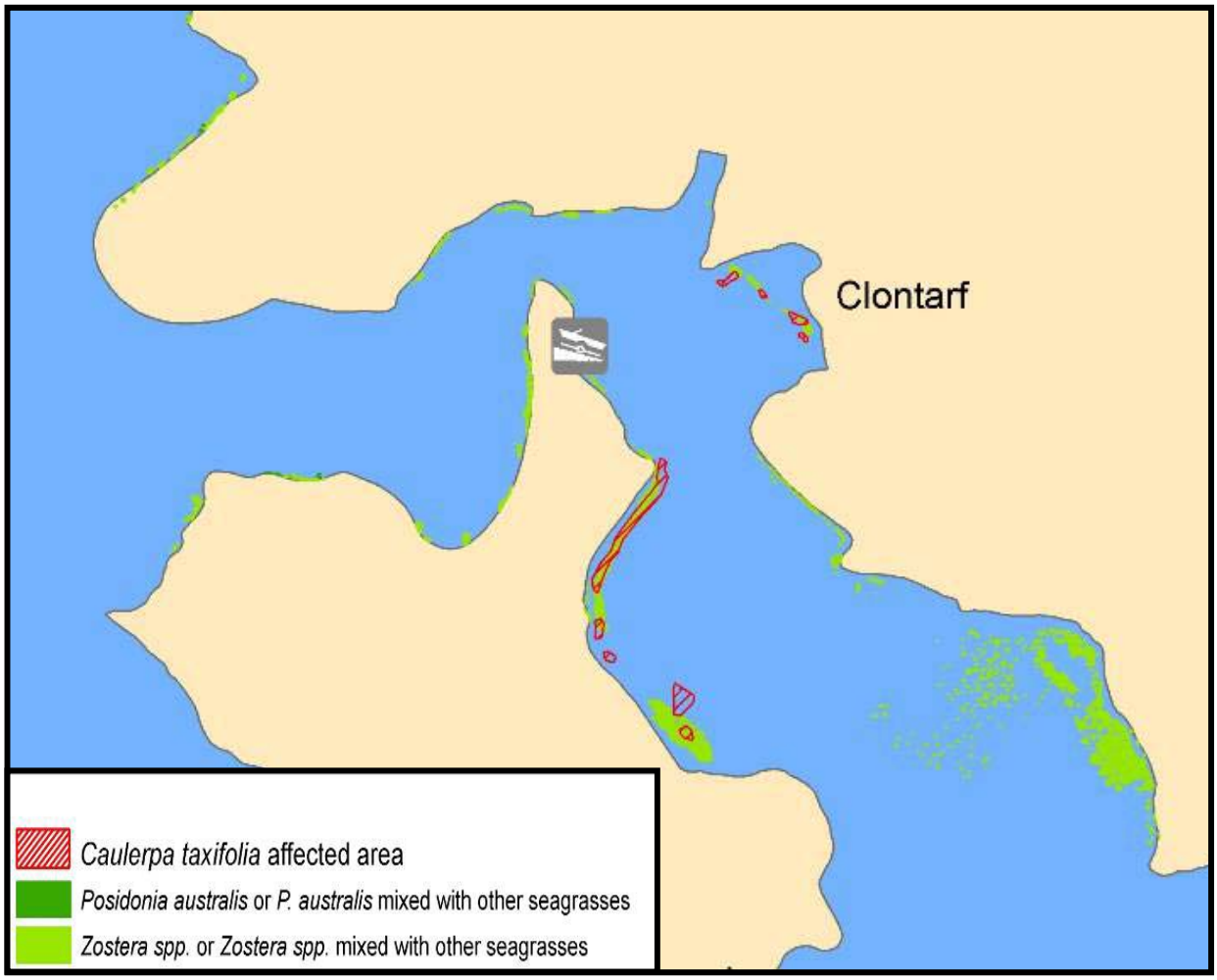
AH2.1. NSW DPI to continue to keep NSW Maritime, Manly Council and community informed of the updated information on distribution of *Caulerpa taxifolia*.

Context: *Caulerpa taxifolia is an extremely fast growing aquatic weed that can recolonise from fragments as small as 1mm. These attributes make it a great concern for the marine environment. Caulerpa has been recorded within the study area at Clontarf, and also at other areas in Middle harbour in close proximity to the study area (see Figure opposite). Caulerpa populations are known to fluctuate between seasons, and this has certainly been the case at Clontarf, with the population expanding, contracting, and moving location between seasons (DPI, 2006). Hence, an updated*

distribution map is important to minimise further spread of the weed species. Fortunately, results from NSW DPI research indicate that seagrasses are likely to be able to co-exist with Caulerpa.

Actions:

- *Obtain regularly updated map from NSW DPI*
- *Incorporate information on Council's GIS database*
- *Disseminate information to community and boat users*



Advantages: *Updated information will help in taking preventive measures to stop spread of Caulerpa taxifolia.*
Disadvantages: *There are no apparent disadvantages*

Objectives addressed: *AH2*
Addressing NRC targets (State Plan 2006): *4 – reduction in the impact of invasive species; 9 – improvement in estuaries ecosystems*
Addressing SMCMA targets: *Management target ECM1.1 – marine pests; ECM1.6 – community marine pest awareness;*
Addressing actions under Manly Council's MSS 2006: *C1.2.10 – Control of Caulerpa taxifolia*

Performance Target: *Updated information distributed regularly*
Indicative Cost: *Staff time*
Time Frame: *On-going*
Responsible Agency: *NSW DPI, NSW Maritime, SMCMA, SCCG, Manly Council - NR*
Priority: *Medium*

AH2.2. Encourage NSW DPI to continue implementing the 'Control Plan for *Caulerpa taxifolia* in NSW'.

Context: *Caulerpa taxifolia is currently being managed by NSW DPI. Council, NSW Maritime and the SMCMA support NSW DPI in their endeavours to control and eradicate this species from Clontarf and other areas of the Middle Harbour estuary, particularly by way of community education programs and implementation of the NSW Caulerpa Control Plan.*

NSW Department of Primary Industries have been undertaking extensive research into Caulerpa taxifolia, to determine the most effective ways of controlling it, and also limiting its spread to other waterways. Various methods of control have been trialled, including:

- *Salt Treatment – smothering outbreaks with thick layers of salt to poison the plant*
- *Matting – covering outbreaks with matting to remove its ability to photosynthesise*
- *Hand picking – divers remove outbreaks by hand*

The various methods have had limited success, although none have proven to be completely effective in all situations (DPI, 2006).

Action: *The option involves continued implementation of the Control Plan. Through effective information campaign, encourage community including estuary users to continue to report sighting of Caulerpa taxifolia.*

Objectives addressed: *AH2, AH5*
Addressing NRC targets (State Plan 2006): *4 – reduction in the impact of invasive species; 9 – improvement in estuaries ecosystems*
Addressing actions under Manly Council's MSS 2006: *C1.2.10 – Control of Caulerpa taxifolia*

Performance Target: *Control Plan implemented*
Indicative Cost: *Staff time*
Time Frame: *On-going*
Responsible Agency: *NSW DPI, SMCMA, SCCG, Manly Council - NR*
Priority: *Medium*

Objective
AH 3 Maintain areas of key intertidal ecosystems and investigate possibility of its expansion

AH3.1. Protect existing mangroves and carry out regeneration activities.

Context: *There is only one small pocket and a few individual mangroves remaining within the study area. They are located at:*

- *Fisher Bay – only a few trees*
- *Powderhulk Bay – a small pocket near the swimming enclosure*
- *Pickering Point – several individual trees scattered along the point*

Mangroves are extremely important to intertidal ecosystems, as they provide habitat, shelter and a source of food (Lynch & Burchmore, 2006). They also provide a buffer between the terrestrial environment and the estuary, and can filter runoff before it reaches the waterway.

Action: *This option involves protecting the existing population and planting of more mangrove seedlings in existing isolated pockets to increase this habitat type.*

Advantages: *Maintaining and expanding important habitat type in the study area.*
Disadvantages: *There are no apparent disadvantages*

Objectives addressed: *AH3, AH4, EU4*

Addressing NRC targets (State Plan 2006): *3 – recovery of ecological communities; 9 – improvement in estuaries ecosystems*
Addressing SMCMA targets: *Management target ECM1.10 – estuarine vegetation rehabilitation; ECM2.3 – intertidal rock platforms, intertidal protected areas & aquatic reserves*

Performance Target: *Mangrove population maintained or enhanced*
Indicative Cost: *$4,000*
Time Frame: *On-going*
Responsible Agency: *Manly Council – Parks & Reserves, NSW DPI*
Priority: *Medium*

AH3.2. Design and implement the Fisher Bay Mangrove Expansion program.

Context: Mangroves are extremely important to intertidal ecosystems, as they provide habitat, shelter and a source of food (Lynch & Burchmore, 2006). They also provide a buffer between the terrestrial environment and the estuary, and can filter runoff before it reaches the waterway. At present, mangroves occur only in 0.05 ha of the study area. However, an opportunity exists to expand

mangroves in Fisher Bay. The bay, at preliminary examination, is found to be ideally suited for mangrove regeneration. At present, only very few mangrove plants exist in Fisher Bay. It is proposed to initiate a "Fisher Bay Mangrove Restoration/Expansion program" in hatched area. Extensive community support and involvement can be generated in developing and implementing this program.

Actions:

- *Undertake further investigations on suitability of the Fisher Bay for mangrove regeneration.*
- *Prepare a formal proposal for the program*
- *Discuss the program with NSW DPI and other relevant agencies to secure grant funding*
- *Organise seedlings and other logistics*
- *Encourage community/ interest groups. Precincts within Manly LGA to work collaboratively in planting and care taking.*
- *Monitor site implementation, seedling health and ecological improvements.*

Advantages: *The mangrove population within the study area will be greatly increased and contribute in restoration of an important intertidal ecosystem*
Disadvantages:- *loss of sandy beach/ mud flat habitat type, important for waders*

Objectives addressed: *AH3*
Addressing NRC targets (State Plan 2006): *1 – increase in native vegetation extent; 3 – recovery of ecological communities; 9 – improvement in estuaries ecosystems*
Addressing SMCMA targets: *Management target ECM1.10 – estuarine vegetation rehabilitation; ECM2.3 – intertidal rock platforms, intertidal protected areas & aquatic reserves*

Performance Target: *Mangrove expansion program implemented*
Indicative Cost: *$45,000*
Time Frame: *Immediate*
Responsible Agency: *Manly Council – Parks & Reserves, NSW DPI*
Priority: *Medium*

AH3.3. Identify, map, protect and enhance saltmarsh habitat within the study area.

Context: *Saltmarsh is often found adjacent to mangroves. However, according to West et.al. (2004), no saltmarsh has been identified within the study area. The saltmarsh was picked up in the Sydney Harbour Foreshore and Estuarine Vegetation Mapping that has been undertaken recently for the SMCMA. There is indication of saltmarshes at Fisher Bay, Clontarf Point & Castle Rock Reserve.*

Action: *This option involves liaison with SMCMA to obtain recent mapping data, devise ways to protect existing saltmarsh areas and enhance these areas with buffers behind the saltmarsh to allow for sea level rise.*

Advantages: *Maintaining and expanding important habitat type in the study area.*
Disadvantages: *None*

Objectives addressed: *AH3, AH4, EU4*
Addressing NRC targets (State Plan 2006): *3 – recovery of ecological communities; 9 – improvement in estuaries ecosystems*
Addressing SMCMA targets: *Management target ECM1.10 – estuarine vegetation rehabilitation; ECM2.3 – intertidal rock platforms, intertidal protected areas & aquatic reserves*
Addressing actions under Manly Council's MSS 2006: *C1.2.1 – identify and map aquatic flora and fauna*

Performance Target: *saltmarsh areas maintained and enhanced*
Indicative Cost: *staff time*
Time Frame: *within 2 years*
Responsible Agency: *Manly Council – Parks & Reserves, NSW DPI, SMCMA*
Priority: *Medium*

Objective
AH 4 Ensure all areas of ecological significance are properly protected and conserved

AH4.1. Encourage DECC and NSW DPI to continue to enforce declared protected areas of ecological significance.

Context: *The study area has significance for its remaining natural habitat: marine, intertidal and terrestrial. In recognition of the diverse array of habitat types, the NSW State Government, under its Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005, has zoned large parts of the study area as Environmental Protection, which aims to "provide for the protection, rehabilitation and long term management of the natural and cultural values of the waterways and adjoining foreshores. In addition, the entire foreshore of the study area is protected as an Intertidal Protected Area (IPA) under the Fisheries Management Act, 1994 due to the significance of the remaining rocky habitats and intertidal species. Large areas of the study area have also been designated as a Wetlands Protection Area (WPA) by the NSW State Government. There exists several floras and fauna recorded as threatened, making the study area important.*

Actions:

- *Educate the community about marine protected areas*
- *Involve and encourage Council rangers to patrol protected areas*
- *Show protected areas on Council's GIS data base*

Objectives addressed: *AH1, AH3, AH4, HR2, MO1*
Addressing NRC targets (State Plan 2006): *1 – increase in native vegetation extent; 3 – recovery of ecological communities; 9 – improvement in estuaries ecosystems*
Addressing SMCMA targets: *Management target ECM2.3 – intertidal rock platforms, intertidal protected areas & aquatic reserves*

Performance Target: *Areas proteced through increased patrol*
Indicative Cost: *Staff time*
Time Frame: *On-going*
Responsible Agency: *Manly Council – Natural Resources, DECC, NSW DPI, SMCMA*
Priority: *Medium*

AH4.2. Encourage DECC to undertake a study of possible penguin nest sites in Middle Harbour and community to report penguin sightings

Context: *The Little Penguin feeds in the estuary during the day and nests on land during the night. Little penguins have been sighted near the Spit Bridge. However, it is unknown whether the Little Penguins that are regularly sighted throughout the study area (as per community consultation for the EMP) are from the endangered North Head Population, or whether they are separate and nesting somewhere in Middle Harbour.*

Action: *The option involves a study to locate penguin nest sites in order to facilitate their protection. Manly Council to liaise with DECC to determine if they can carry out this study.*

Advantages: *This will identify possible penguin nest within the study area and help in implementing protection measures.*
Disadvantages: *Identified penguin nest runs the risk of intentional damage*

Objectives addressed: *AH4*
Addressing SMCMA targets: *Management target ECM1.16 – community marine pest awareness*
Addressing actions under Manly Council's MSS 2006: *C1.6.11 – Little Penguin monitoring*

Performance Target: *Study completed*
Indicative Cost: *Cost to DECC, Staff time*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *Manly Council – Natural Resources, Precincts, DECC*
Priority: *Low*

AH4.3. Support volunteer groups to facilitate conservation and protection of aquatic and intertidal habitats.

Context: *There exist a number of volunteer groups, such as Coast Care, Harbourkeepers, Coastkeepers, Ecodivers, Fishcare to help protect the estuarine and coastal environment and their aquatic and intertidal habitats. Volunteers would talk to estuary and coastal users about conservation issues, protection issues, risks, and help in a range of activities, such as ocean care days, use and monitoring surveys and community events.*

Anyone, aged 18 years or over and with a keen interest in coast, estuary, fishing, boating and the conservation of estuarine resources and habitat, has the opportunity to be involved as volunteers.

Volunteers will be expected to give approximately one day per month to assist the program, and occasionally attend events. They will be involved in helping create better awareness among estuary users and the wider community about estuarine and coastal issues, but won't have enforcement powers. Volunteers will be issued with clear identification as well as a distinctive hat, shirt and backpack containing the necessary documentation.

Action: *The option involves support to different existing volunteer groups*

Objectives addressed: *AH4, AH5, EU1*
Addressing NRC targets (State Plan 2006): *1 – increase in native vegetation extent; 3 – recovery of ecological communities; 9 – improvement in estuaries ecosystems*
Addressing SMCMA targets: *Management target C1.2 – stakeholder partnership; C1.3 – education and training; ECM1.6 – community marine pest awareness*
Addressing actions under Manly Council's MSS 2006: *C1.2.6 – Involvement of local residents; C1.3.16 – Encourage community involvement*

Performance Target: *Volunteer groups supported*
Indicative Cost: *$6,000*
Time Frame: *On-going*
Responsible Agency: *Manly Council - CEP*
Priority: *Medium*

AH4.4. Work with NSW DPI to disseminate information brochures outlining the importance of aquatic habitats and the penalties involved in harming them.

Context: *Human interactions with the environment can have a significant and potentially devastating effect on its inherent values and quality. Providing further education regarding the estuary, its aquatic habitats and the potential impacts of humans may increase awareness of the environment which may then result in greater consideration of environmental issues in general day-today life. The option involves distribution of Seagrass Factsheets (DPI Prime Fact 629)* and other information outlining the importance of aquatic habitats and the penalties involved in harming them to educate the community and help protect the environment.

Actions:

- *Disseminate brochure through MEC, Precincts and other opportunities*

Objectives addressed: *AH4, MO1*

Addressing SMCMA targets: *Management target C1.3 – education and training*
Performance Target: *Brochure disseminated*
Indicative Cost: *Staff time*
Time Frame: *Within 2 years*
Responsible Agency: *Manly Council – CEP, NSW DPI*
Priority: *Medium*

Objective
AH 5 Define factors affecting areas of high ecological value and develop and implement measures to address them

AH5.1. Continue to collate, analyse recent knowledge and study factors affecting degradation of ecologically important/critical habitats.

Context: *The ecosystems within the study area are highly fragmented. The different habitat types have signs of the many pressures placed on them through development and high usage. Some of these pressures are known and some are still unknown. Many studies are, however, on-going at research institutes and universities.*

Actions:

- *Collate relevant information and knowledge about degradation of ecological habitats from scientific literature.*
- *Liaise with Universities to obtain information/research relevant to the study area.*
- *Survey the proximity of seagrass beds to stormwater outlets/sewage overflow points to determine if there is negative impact on these beds from scouring flows, sedimentation and/or nutrient loads. Prioritise retrofitting problem outlets with flow reduction devices, GPTs etc*
- *Identify site specific key factors*
- *Devise management options to arrest degradation*.

Objectives addressed: *AH4, AH5*

Performance Target: *Updated knowledge collated & studies undertaken*
Indicative Cost: *Staff time*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *Manly Council – Natural Resources*
Priority: *Low*

AH5.2. Investigate best practice beach raking in other Councils and incorporate that knowledge for possible implementation at Clontarf. Improve Council staff knowledge regarding eco sensitivities in beach raking and other services.

Context: *Beach raking is currently carried out daily on Clontarf beach. This captures gross pollutants not captured by street sweeping or other pollutant reduction measures. This activity is known to be detrimental to the ecology of the intertidal area. Marine debris such as seagrass wrack (not rubbish) washed up on the shore provides an important source of food and habitat for a diverse range of invertebrate species that live in the sand, which are an important part of the intertidal food chain. Raking of the beach removes this habitat and food source.*

Mosman Council (2005) has introduced hand cleaning on Chinamans beach to minimise the impact on beach invertebrates.

Actions:

- *Review relevant literature including Mosman Council's report*
- *Trial hand cleaning on Clontarf beach for 2-3 months and monitor results*
- *Depending on the result of trials, continue hand cleaning or beach raking.*

Advantages: *The gained knowledge will help in balancing between safe beach and eco-sensitive beach management. Beach raking is a routine practice in popular beaches.*
Disadvantages: *Alternative to beach raking is hand picking. Implementation of hand picking is laborious and time consuming.*

Objectives addressed: *AH4, AH5*
Addressing actions under Manly Council's MSS 2006: *C1.2.11 – Review of beach raking*

Performance Target: *Knowledge gained and applied*
Indicative Cost: *Staff time*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *Manly Council – Civic Services, SCCG*
Priority: *Low*

AH5.3. Retain rocky foreshores and cliff-lines as important coastal habitat. Where new upgrading or building of seawalls needed, ensure to incorporate recent knowledge on seawall restorations supporting ecological habitat

Context: *Rocky foreshores and cliff lines are important coastal habitat in the study area. However, seawalls are gradually replacing considerable portions of these natural habitats. Seawalls, both public and private, are now common features of landscapes in shallow coastal waters of urbanised areas. Approximately 46% of the foreshore length within the study area is seawall lined.The Centre for Research on Ecological Impacts of Coastal Cities of the University of Sydney is undertaking extensive research on seawalls.*

As one example, many seawalls in North Sydney have been repaired to be structurally sound while being used experimentally to test the effects of different forms of building walls on the marine life. In some parts of the wall, holes between the blocks have been filled or the grouting made flush with the sandstone blocks. In other parts of the wall, holes are left unfilled or the grouting indented, leaving "crevices" between the blocks. In another project elsewhere in the harbour, small holes and grooves are being made in the sandstone blocks themselves, again in an attempt to increase local marine diversity by increasing complexity of their habitat. Yet elsewhere, small "caves" have been built into the wall to test whether such structures support the same forms of life as found in holes that form naturally.

Actions:

- *Identify and map natural rocky foreshores.*
- *Establish contact with the Centre for Research on Ecological Impacts of Coastal Cities of the University of Sydney to have updated knowledge*
- *Explore formal collaboration between the Manly Council and the Centre*
- *Ensure new construction of seawalls accommodates recent knowledge*

Advantages: *Newly designed seawalls will support ecological habitat*
Disadvantages: *Construction of newly designed seawalls could be complicated*

Objectives addressed: *AH4, AH5*

Addressing SMCMA targets: *Management target ECM1.4 – in-stream and marine structures*

Performance Target: *Knowledge gained and applied*
Indicative Cost: *Staff time*
Time Frame: *To be implemented within 3-4 years*
Responsible Agency: *Manly Council – Civic Services, Urban Services & Natural Resources*
Priority: *Low*

4.3 OPTIONS ADDRESSING BUSHLAND/TERRESTRIAL HABITAT CONSERVATION & MANAGEMENT

Goal

Protect and enhance urban bush land and native vegetation areas

Bushland reserves occur in a total 18.49 hectares and are scattered throughout the study area. Smaller patches of bushland on both public and private land do exist throughout, and in some places provide corridors between the reserves. Die back is an issue in parts of the study area and results from several factors. Inappropriate fire frequency has also impacted on the terrestrial environment. The State Environmental Planning Policy (SEPP) No. 19 - Bushland in Urban Areas is targeted to protect and preserve bushland within the greater Sydney area.

A total of 10 management options are proposed addressing three different objectives. Of these, none has been rated as of high priority, nine as medium priority and one as low priority management options. One option is proposed for immediate implementation. Six management options are already on-going activities of the Council.

Objectives	Strategic Management Options	Implementation timeframe*	Priority
TH 1 Continue to manage Council's bushland management program.	**TH1.1.** Prepare a comprehensive bushland management plan and develop a staged implementation program.	Within 3-4 years	Medium
	TH1.2. Prepare management plans for the six identified SEPP 19 bushlands, to fulfill statutory requirement.	Within 2 years	Medium
	TH1.3. Identify adhoc tracks from private properties entering bushlands and approach property owners to ensure their safety and continued maintenance at an appropriate and specified standard.	Immediate	Medium
	TH1.4. Council to continue to be an active participant in the Die-Back Working Group	On-going	Medium
	TH1.5. Involve the Precinct to discuss the issue of view maintenance with property owners.	On-going	Medium
TH 2 Establish native vegetation corridors linking natural bushland areas.	**TH2.1.** Investigate possibility of establishing corridors linking different bushlands and assess their ecological significance.	On 5th or later year	Medium
	TH2.2. Continue and reassess Council's Street Tree Planting Program within the study area.	On-going	Low
TH 3 Encourage and establish community participation in bush regeneration program and in native plants on public and private lands	**TH3.1.** Continue Community Bush Care Volunteers program in the study area.	On-going	Medium
	TH3.2 Continue publication of 'Bushland News' and circulate widely in the community	On-going	Medium
	TH3.3. Continue annual 'Native Plant Giveaway' program to support residents in maintaining native vegetations on private properties.	On-going	Medium

*After adoption of the EMP

DETAILS OF MANAGEMENT OPTIONS

Objective
TH 1 Continue to manage Council's bushland management program

TH1.1. Prepare a comprehensive bushland management plan and develop a staged implementation program.

Context: *Manly has a rich diversity of natural landscapes protected in around 55 hectares of bushland reserves. Nearly 90% of Manly's natural environment has been degraded to some extent due to human activities (MC 1997).*

The Local Government Act 1993 requires that all Councils establish Plans of Management for their Parks and Reserves. The management of bushland areas within Manly are covered by a number of plans and programs. Plans of Management that cover bushland areas have the objectives of ensuring the on-going ecological viability and biodiversity of the land, protection of aesthetic and scientific values, restoration of degraded bushland and to protect landforms and bushland as a natural stabiliser of the soil surface. Whilst these plans and programs satisfy the requirements of the Local Government Act 1993 (as amended), there is merit in preparing a Bushland Management Plan for Manly to encompass all the bushland areas.

A Bushland Management Plan would focus on preserving and regenerating Manly's bushland areas. The Plan would detail the staging, appropriate techniques and methodology for implementation of bushland restoration, various site specific Plans of Management, Threatened Species Conservation Act 1995 and the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999.

Actions: *The preparation of a Bushland Management Plan would be undertaken in consultation with the various volunteer bushcare groups and the Community. The plan should address regular regeneration, weeding, view maintenance, managed bushfires and stormwater runoff issues. The aims and objectives of the plan are to:*

- *manage bushland for its aesthetic, recreational, educational and scientific value to the community, and to maximise these values as part of Manly's natural heritage*
- *manage bushland in a way that maintains biodiversity of indigenous species in the long term*
- *fulfil Council's responsibilities under other community and Government plans and programs and NSW legislation.*

Advantages: *Provides a holistic approach to bushland management of the area. The report will provide more structured and prioritized actions considering all options..*
Disadvantages: *Plan preparation is time consuming and costly. Value of the Plan is lost if not implemented readily.*

Objectives addressed: *WQ1, AH4, TH1, TH2, TH3, TH5, TH6, EU1, EU4, AC2*
Addressing NRC targets (State Plan 2006): *1 – increase in native vegetation extent; 3 – recovery of ecological communities*
Addressing SMCMA targets: *Management target B1.2 – rehabilitation potential and priority setting*

Performance Target: *Bushland Management Plan prepared*
Indicative Cost: *$40,000*
Time Frame: *To be implemented within 3-4 years*
Responsible Agency: *Manly Council- Parks & Reserves*
Priority: *Medium*

TH1.2. Prepare management plans for the six identified SEPP 19 bushlands, to fulfill statutory requirement.

Context: *The general aim of SEPP No. 19 - Bushland in Urban Areas is to protect and preserve bushland within the greater Sydney area. It requires that bushland not be disturbed without the consent of Council. The SEPP also provides for the preparation of management plans for SEPP 19 Bushlands. This Policy is integrated into Council's Development Application process. The following six reserves within the study area have the State Environmental Planning Policy No.19 (SEPP 19) status:*

- *Castle Circuit Foreshore (4.04 ha)*
- *Pickering Point – partly (0.73ha)*
- *Gurney Reserve (2.52 ha)*
- *Sangrado Reserve (1.69 ha)*
- *Castle Rock to Clontarf Point (1.20 ha)*
- *Ogilvy Road Reserve (2.47 ha)*

Action: *The option involves preparation of management plans for all these six bushlands.*

Advantages: *Statutory requirement is fulfilled. These bushlands will be subjected to planned and structured management.*
Disadvantages: *Attention is diverted to preparation of plan rather than actually managing bushlands*

Objectives addressed: *TH1*
Addressing NRC targets (State Plan 2006): *1 – improvement in native vegetation condition; 3 – recovery of ecological communities; 9 – improvement in estuaries ecosystems*

Performance Target: *Management Plans prepared*
Indicative Cost: *$60,000*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *Manly Council – Parks & Reserves*
Priority: *Medium*

TH1.3. Identify adhoc tracks from private properties entering bushlands and approach property owners to ensure their safety and continued maintenance at an appropriate and specified standard.

Context: *Pathways have been illegally made to create access to areas such as beaches, formal walking tracks (e.g.- Manly Scenic Walkway) and recreation areas, with many originating from private properties. These tracks are often poorly constructed, and exacerbate problems such as erosion, compaction of soil, and weed dispersal. As many of the tracks are also on Council land, they pose a liability risk to Council. The adjacent figure illustrates the issue, with an illegal pathway that has been created between a private property and the Manly Scenic Walkway, with resultant erosion at the base of the stairs. Some of the existing ad hoc pathways (e.g. Gurney Crescent) are the only way to the foreshore and are very difficult to traverse. An option may be to improve these paths as formal access ways to a safe and approved standard.*

Initial efforts to improve public access to the estuary foreshore should focus on the removal of private encroachments that either obstruct public access to or inhibit enjoyment of public foreshore open space. Council would be responsible for managing public access and constructing additional facilities and services around the foreshores of estuary.

Actions:

- *Identify all adhoc tracks originating from private properties*
- *Prepare safety & maintenance standard for tracks*

- *Approach property owners to ensure their safety and continued maintenance*
- *Enforce closure for failing to ensure safety and continued maintenance*

Advantages: *Safety and maintenance issues are addressed. Risks to Council are minimised. Adhoc tracks are either safer or closed*
Disadvantages: *Complicated, will be difficult to implement, specially identifying boundaries*

Objectives addressed: *TH1, AC1, AC2*
Performance Target: *Tracks identified and owners contacted*
Indicative Cost: *Staff time*
Time Frame: *Immediate*
Responsible Agency: *Manly Council- Parks & Reserves*
Priority: *Medium*

TH1.4. Council to continue to be an active participant in the Die-Back Working Group

Context: *Manly Council is an active participant in the Sydney Harbour Dieback Working Group, a network of land management agencies focusing on the management of vegetation dieback on the lower North Shore of Sydney Harbour. The Working Group is advised by the Botanic Gardens Trust and the University of Sydney, and actively supported by the Sydney Coastal Council Group. The Goal of the Working Group is to protect bushland in the Sydney Harbour region by minimising the risk of the spread and impact of Phytophthora cinnamomi.*

Action: *The option involves continued participation in the working group.*

Objectives addressed: *TH1*
Performance Target: *Contributory & active participant*
Indicative Cost: *Staff time*
Time Frame: *On-going*
Responsible Agency: *Manly Council – Parks & Reserves, SCCG*
Priority: *Medium*

TH1.5. Involve Precincts to discuss the issue of view maintenance with property owners.

Context: *Views are important for all residents, particularly for harbour side properties. Residents do not like tall trees to obstruct their views of the waterway. Incidents of cutting, even poisoning of trees have been reported recently as residents attempt to maintain harbour & estuary views.*

Actions: *Consult with harbour side residents during bush regeneration through the involvement of Precincts.*


Courtesy: Manly Daily,

Objectives addressed: *TH1,TH3*
Addressing SMCMA targets: *Management target C2.1 – community decision-making*
Addressing actions under Manly Council's MSS 2006: *B1.1.1 – Social capital through interaction with Precinct Forums; B1.1.2 – Support Precinct Forums*

Performance Target: *Meetings held as required*
Indicative Cost: *Staff time*
Time Frame: *On-going*
Responsible Agency: *Manly Council – Parks & Reserves, Precincts*
Priority: *Medium*

Objective
TH 2 Establish native vegetation corridors linking natural bushland areas

TH2.1. Investigate possibility of establishing corridors linking different bushlands and assess their ecological significance.

Context: *Bushland reserves occur in a total 18.49 hectares and are scattered throughout the study area. Smaller patches of bushland on both public and private land do exist throughout, and in some places provide corridors between the reserves. Skelton et al (2004) identified important corridors between the Castle Circuit Foreshore and Pickering Point reserves, and also the Castle Rock to Clontarf Point and Weekes Road reserves. These corridors are extremely important habitat features, and allow for fauna to move throughout the study area and maintain populations. These corridors can also be used for bird habitat. Seek University collaboration in doing assessments through student projects.*

Further Council is preparing Biodiversity Strategy, which will accommodate more strategic approach to establish green corridors at Manly LGA. Significance of corridors proposed in this EMP will be assessed in relation to Biodiversity Strategy.

Actions:

- *Revisit identified corridors and assess any other new one*
- *Assess ecological significance of each of these corridors*
- *In planning corridors, follow 'Guidelines for the Development of Bird Habitat' (www.birdsinbackyards.net)*
- *Initiate plant regeneration strengthening these corridors*
- *Incorporate corridors in the LEP*

Advantages: *Identified corridors will enrich flora and fauna of the area and create interconnectivity between different bushlands. These links will encourage faunal movement over a wider area*
Disadvantages: *It will be difficult to control spread of weeds and other noxious plants in the area.*

Objectives addressed: *AH4, TH2*
Addressing NRC targets (State Plan 2006): *1 – improvement in native vegetation condition*
Addressing SMCMA targets: *Management target B3.2 – connectivity and corridors*
Addressing actions under Manly Council's MSS 2006: *C1.7.4 – link existing and potential habitat corridors*

Performance Target: *Assessment Report & new vegetation*
Indicative Cost: *$5,000*
Time Frame: *To be implemented on 5th or later years*
Responsible Agency: *Manly Council – Parks & Reserves, NR*
Priority: *Medium*

TH2.2. Continue & reassess Council's Street Tree Planting Program within the study area.

Context: *Manly Council's policy is to maintain the attractiveness, appeal and amenity of the area by preserving healthy trees in recognition of the value and importance of trees held by the community. Trees play an important part in maintaining the health of our environment, they help to protect soil and water supplies, provide habitat, food, shelter and protection for wildlife. Trees in urban areas act as extensions of and links between core bushland, also known as bushland corridors. However, there exists no list of recommended trees within the Council.*

The Manly Council Tree Preservation Order 2001 applies to all trees in the Manly LGA. It is illegal to remove or prune any trees on public land, parks, bushland reserves or foreshore areas.

Actions:

- *Review the present program of tree plantation*
- *Develop a comprehensive list of site specific recommended and appropriate trees*
- *Accommodate view eminence by selecting suitable plant type*

Objectives addressed: *AH4, TH2*
Performance Target: *Recommended list prepared & program continued*
Indicative Cost: *Staff time, existing program*
Time Frame: *On-going*
Responsible Agency: *Manly Council-Parks & Reserves*
Priority: *Low*

Objective
TH 3 Encourage and establish community participation in bush regeneration program and in native plants on public and private lands

TH3.1. Continue Community Bush Care Volunteers program in the study area.

Context: *The Manly Council Bushcare Program encourages the community to get involved and help protect and restore precious urban bushland. Bushcare groups work each week in a variety of bushland areas.*

Bushcare activities include

- *encouraging natural bushland regeneration by removing weeds*
- *native plant and weed species identification*
- *recreating bushland by planting native species*
- *erosion control and mulching*
- *recreating habitat.*

Council supports the bushcare program by providing qualified supervisors, tools and gloves to use on site, plants and mulch as needed and any additional support.

Action: *The option involves continuation of the program.*

Objectives addressed: *AH6, TH3, MO3*
Addressing SMCMA targets: *Management target C1.2 – stakeholder partnership*
Addressing actions under Manly Council's MSS 2006: *C1.3.16 – Encourage community involvement*

Performance Target: *Program supported & continued*
Indicative Cost: *$25,000*
Time Frame: *On-going*
Responsible Agency: *Manly Council- Parks & Reserves*
Priority: *Medium*

TH3.2. Continue publication of 'Bushland News' and circulate widely in the community

Context: *Manly Council publishes Bushland News regularly and circulates widely among the community. It contains news about bushcare activities, council initiatives, technical information and other information. This newsletter is popular among readers.*

Action: *The option involves continuation of the newsletter.*

Objectives addressed: *AH6, TH3*
Addressing SMCMA targets: *Management target C1.1 – awareness and education programs for priority communities*

Performance Target: *Publication continued*
Indicative Cost: *$15,000*
Time Frame: *On-going*
Responsible Agency: *Manly Council- Parks & Reserves*
Priority: *Medium*

TH3.3. Continue annual 'Native Plant Giveaway' program to support residents in maintaining native vegetations on private properties.

Context: *Manly Council organises an annual 'Native Plant Giveway' program. This program is very popular and encourages community involvement in habitat improvement while educating about pressures on flora from provate development.*

Action: *The option involves continuation of the program.*

Advantages: *Support restoration of native vegetation, especially on privately owned backyards.*
Disadvantages: *None*

Objectives addressed: *AH4, TH3*
Addressing NRC targets (State Plan 2006): *1 – increase in native vegetation extent*
Addressing SMCMA targets: *Management target C1.2 – stakeholder partnership*
Addressing actions under Manly Council's MSS 2006: *B1.1.4 – Host sustainability focussed neighbourhood events*

Performance Target: *Program continued*
Indicative Cost: *$30,000*
Time Frame: *On-going*
Responsible Agency: *Manly Council- Parks & Reserves, CEP*
Priority: *Medium*

4.4 OPTIONS ADDRESSING SEDIMENTATION & BEACH EROSION

Sediment processes are extremely complex, with many different factors influencing the sediment budget and movement for any given system. Natural beach systems are not static, and beach erosion and accretion occurs constantly over time. It is mainly the lower reaches of the study area, from Castle Rock Beach to the Spit Bridge that consist largely of unstable sandy shores, with a mixture of marine sand and estuarine mud on the sea floor. The estuary in this section consists of both a shallow sand bar and a deep channel, and is influenced by ocean waves, which, when combined with human pressures, creates a dynamic and ever-changing estuary system.

Goal

Manage erosion and sedimentation to reduce their impact on the natural environment and recreational amenity

A total of three management options are proposed addressing two different objectives. All three have been rated as of high priority. One option is proposed for immediate implementation.

Objectives	Strategic Management Options	Implementation timeframe*	Priority
SE 1 Generate comprehensive understanding on estuarine sediment transport patterns of the area	**SE1.1.** Carry out a comprehensive study on estuarine sediment transport patterns	Immediate	High
SE 2 Mitigate foreshore accretion/erosion processes at priority areas.	**SE2.1.** Define and implement mitigation measures for erosion prone sites.	Within 3-4 years	High
	SE2.2. Define and implement measures to address siltation at the Clontarf swimming enclosure.	Within 2 years	High

*After adoption of the EMP

DETAILS OF MANAGEMENT OPTIONS

Objective
SE 1 Generate comprehensive understanding on estuarine sediment transport patterns of the area

SE1.1. Carry out a comprehensive study on estuarine sediment transport patterns

Context: *The broad issue of sediment movement (both erosion and accretion) in the Castle Rock Beach to Spit Bridge section of the study area is a significant issue according to the results of community consultation and findings of the processes study. According to limited research undertaken in the early 1980s for the Clontarf Marina, sediment processes throughout this area are linked. A detailed understanding is needed before mitigatory measures are undertaken.*

Actions:

- *Undertake a photogrammetric study of the area*
- *Undertake additional hydro surveys of the area, as required*
- *Based on these studies, obtain a comprehensive understanding of sediment transport pattern of the area*
- *Utilize findings to formulate and/or modify management options.*

DECC has already undertaken a photogrammetric study. Council has also been granted a fund to carry

out this study under the 2007-08 Estuary Management Program of the DECC.
Advantages: *A comprehensive study of the entire system will provide greater understanding of the sediment budget and movement throughout the lower reaches of the Middle Harbour estuary. Findings have implications on navigability around Clontarf Marina, erosion at different sites, siltation of Clontarf pool and related management options to address these issues.*
Disadvantages: *Costly, may not be implemented if grant is not approved*

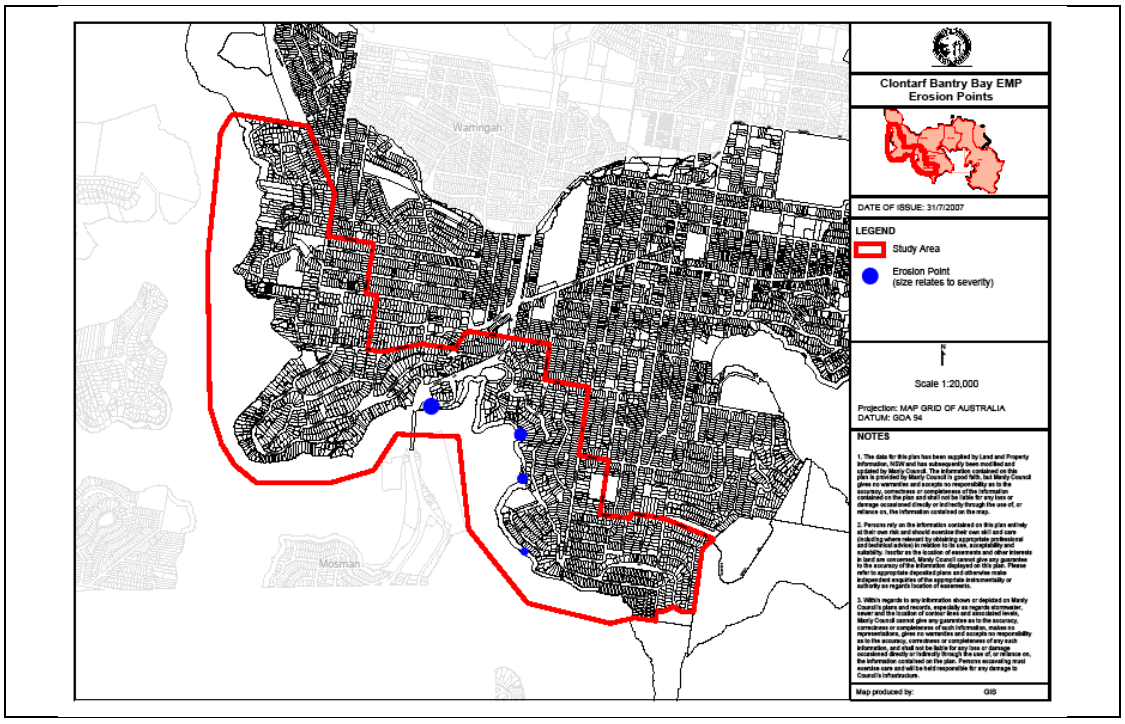
Objectives addressed: *AH1, SE1*
Addressing SMCMA targets: *Management target LD1-1 – erosion and sediment control*

Performance Target: *Study Report*
Indicative Cost: *$50,000*
Time Frame: *Immediate*
Responsible Agency: *Manly Council – NR, DECC*
Priority: *High*

Objective
SE 2 Mitigate foreshore accretion/erosion processes at priority areas.

SE2.1. Define and implement mitigation measures for erosion prone sites.

Context: *Erosion is an intrinsic natural process but in many places it is increased by human land use and also at stormwater outlets. Excessive erosion, however, does cause problems, such as receiving water sedimentation, ecosystem damage and outright loss of soil. Beach erosion has been experienced in sections of Clontarf Beach and Sandy Bay with varying degrees of severity (Figure, next page), and fluctuations over time. Outcomes of beach erosion have included the undermining of seawalls and foreshore garden beds and exposure of buried rocks.*



Actions: *Further detailed investigation of bank erosion mechanisms and remediation options for each site affected would need to be conducted prior to implementing work associated with this option. Preference should be given to soft-engineering for remediation works, such as shoreline re-grading and revegetation, rather than construction of additional rock walls around the foreshore.*

Advantages: *Risks at erosion prone sites are prevented or minimised*
Disadvantages: -

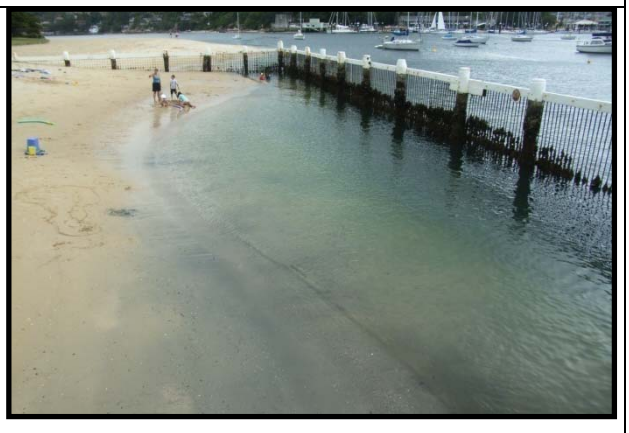
Objectives addressed: *SE2, EU1*
Performance Target: *Mitigation measures implemented*
Addressing SMCMA targets: *Management target LD1-1 – erosion and sediment control*

Indicative Cost: *$100,000*
Time Frame: *To be implemented within 3-4 years*
Responsible Agency: *Manly Council – NR, Urban Services*
Priority: *High*

SE2.2 Define and implement possible measures to address siltation at the Clontarf swimming enclosure.

Context: *The swimming enclosure at Clontarf Beach is used regularly by locals and tourists who visit the beach every year. However at low tide there is so little water in the pool that it is virtually unusable (Figures a & b). This is a heritage listed pool.*

The pool lies directly in the path of the sand transport corridor between the tidal delta and Sandy Bay, and disrupting this natural flow of sand may have undesirable consequences further down the corridor. Further, as the supply of sand is continuous, the enclosure simply fills back up, and the dredging would need to be done regularly to maintain depths. Dredging has been undertaken in the enclosure in the past, and sand returned to the pool in a month (GSE, 1990).

Figure a - Clontarf Swimming Enclosure at Low Tide, 20/12/1949		**Figure b – Clontarf Swimming Enclosure at Low Tide, 03/01/2007**
		

Possible options to make this pool usable could be:

a) Regular dredging prior to the start of summer season
b) Flow guide bunds to force flow water towards the pool, thus preventing siltation
c) Relocating the pool forward towards deeper water
d) Shifting the pool, probably 80-100 meters south

All these options are costly, require a detailed understanding of sediment transport patterns, are subject to heritage assessment and will have impacts on boating, ecology and estuarine/sediment processes. However, as this is located near the study area's most popular reserve, status quo is not desirable and may not be acceptable. The community has identified its desire for the pool to be made usable.

Actions:

- *Initiate a feasibility study to evaluate all four and other options to make the pool usable.*
- *Obtain feedback from community and boating organisations*
- *Engage NSW Maritime, DECC and NSW DPI in the consultation process*
- *Identify grant funding opportunities*
- *Implement desirable and feasible option*

Advantages: *This popular swimming enclosure is made usable again responding to public demand*
Disadvantages: *Implementation of possible solutions is costly and each may have negative impacts on boating, ecology and sediment processes.*

Objectives addressed: *SE2, EU1, FI4*
Addressing SMCMA targets: *Management target LD1-1 – erosion and sediment control*

Performance Target: *Mitigation measures implemented*
Indicative Cost: *$60,000*
Time Frame: *Within 2 years, shortly after completion of the study (SE1.1)*
Responsible Agency: *Manly Council – NR, Urban Services*
Priority: *High*

4.5 OPTIONS ADDRESSING HAZARDS & RISKS INCLUDING CLIMATE CHANGE

General hazards affecting the study area include beach erosion, shoreline recession, storms, coastal inundation, slope and cliff instability. Of these, beach erosion is addressed in separate section. Longer term risks from tsunami and climate change impacts are also hazards affecting the study area.

Goal

Assess, minimize and mitigate risks from natural hazards including climate change

The most up to date assessment of Australia's changing climate is provided in "Climate change in Australia: technical report 2007". The key findings of this report includes that by 2030, temperatures will rise by about 1 ºC over Australia – a little less in coastal areas, and a little more inland - later in the century, warming depends on the extent of greenhouse gas emissions. If emissions are low, warming of between 1 ºC and 2.5 ºC is likely by around 2070, with a best estimate of 1.8 ºC. Under a high emission scenario, the best estimate warming is 3.4 ºC, with a range of 2.2 ºC to 5 ºC.

In addressing climate change, Council will be using *Climate Change Adaptation Actions for Local Government*, developed as part of the Australian Government's National Climate Change Adaptation Program. The primary objective of this report is to identify climate change adaptation actions that are applicable to Australia's climatic conditions and climate impact risks as currently predicted (using CSIRO 2001 scenarios) and that can be implemented by Australian local governments.

Council is also aiming to prepare a Climate Change Impacts and Risk Management Action Plan.

A total of seven management options are proposed addressing two different objectives. Of these, one has been rated as of high priority and the remaining six as medium priority management options. One option is proposed for immediate implementation. One management option is already an on-going activity of the Council.

Objectives	Strategic Management Options	Implementation timeframe*	Priority
HR 1 Identify existing and potential hazards and establish mitigation measures	**HR1.1**. Commission a geotechnical study for specific sections of foreshore areas to identify and prioritise risks, and establish risk based management options.	Within 3-4 years	Medium
	HR1.2. Undertake inspections to assess stability of seawalls protecting public lands. If upgrading is required, promote eco-friendly sea walls.	Immediate	Medium
	HR1.3. Work with the State Emergency Services (SES) and other agencies to continuously update Emergency Action Plan including evacuation procedures in the event of storm surges and tsunami.	Within 2 years	Medium
HR 2 Consider the potential implications of sea level rise on the estuary and its surrounds as a result of climate change.	**HR2.1.** Assess impact of climate change on areas of ecological significance and devise adaptive measures	Within 3-4 years	Medium
	HR2.2. Work with the Sydney Coastal Councils Group to develop a regional/ local level climate change model considering protection provided by existing seawalls and rocky foreshores.	Within 2 years	Medium

Objectives	Strategic Management Options	Implementation timeframe*	Priority
	HR2.3. Collaborate with the Sydney Coastal Councils Group/ Macquarie Uni /CSIRO project investigating climate change adaptations in Manly.	On-going	Medium
	HR2.4. Revise/Update Council's policy and strategy documents incorporating federal and/or state guidelines/recommendations regarding climate change adaptations	Within 2 years	High

*After adoption of the EMP

DETAILS OF MANAGEMENT OPTIONS

Objective
HR 1 Identify existing and potential hazards and establish mitigation measures

HR1.1. Commission a geotechnical study for specific sections of foreshore areas to identify and prioritise risks, and establish risk based management options.

Context: *Hazards within 'Castle Rock to the Spit Bridge' section involve beach erosion, siltation, storm surge, shoreline recession, inundation, stormwater erosion, slope and cliff instability and climate change. All these hazards do not pose equal risks to all parts of the section. This option involves a comprehensive geotechnical study including review of earlier studies to prioritise risks.*

Having defined the type, nature and risks of different hazards, the study should establish risk based management options.

Actions:

- *Commission a geotechnical study for the hazard prone section of the study area*
- *Present preliminary results and assess risks*
- *Prepare hazard risks map*
- *Engage community in defining risk management options*
- *Adopt risk management options in Council's general management plans.*
- *Install appropriate warning signs advising the community of known potential hazards.*

Advantages: *All potential risk locations are identified, appropriate warning signs erected and other mitigation measures implemented.*
Disadvantages: *None*

Objectives addressed: *SE1, HR1, EU1*
Addressing actions under Manly Council's MSS 2006: *C1.3.2 – Undertake Hazard Definition Studies & monitor seawall stability; C1.3.3 – coastal processes on foreshore/beach areas*

Performance Target: *Geotechnical Study Report*
Indicative Cost: *$50,000*
Time Frame: *To be implemented within 3-4 years*
Responsible Agency: *Manly Council-NR, Urban Services*
Priority: *Medium*

HR1.2. Undertake inspections to assess stability of seawalls protecting public lands. If upgrading is required, promote eco- friendly sea walls.

Context: *Based on findings of the geotechnical study (option HR1.1), regular inspections should be carried out, especially after storms, to assess conditions of seawalls protecting public properties. Site*

inspections should include, but not necessarily be limited to a visual assessment of the condition of the walls and inspection pits to confirm foundation levels where necessary to determine soil properties of the foundation and backfill material. Appropriate geotechnical analysis will be required to determine the stability of the seawall's under design scour conditions.

Avoid building new seawalls or renewing old seawalls where possible - use soft engineering alternatives. If a seawall is necessary, investigate options for biodiversity-friendly designs that also minimise wave refraction and reflection.

Actions: *This option involves regular inspection of seawalls, especially after storms. If upgrading is found necessary, construct biodiversity-friendly seawalls (option AH5.4). Incorporate these requirements in Development Applications for foreshore structures.*

Objectives addressed: *SE3, HR1, EU1*
Addressing SMCMA targets: *Management target ECM1.4 – in-stream and marine structures*
Addressing actions under Manly Council's MSS 2006: *C1.3.2 - Monitoring seawall stability*

Performance Target: *Regular Inspection Report*
Indicative Cost: *0 (to be combined with study proposed under SE1.1)*
Time Frame: *Immediate*
Responsible Agency: *Manly Council- Urban Services & NR, SMCMA (on bio-diversity friendly sea walls)*
Priority: *Medium*

HR1.3. Work with the State Emergency Services (SES) and other agencies to continuously update Emergency Action Plan including evacuation procedures in the event of storm surges and tsunami.

Context: *The State Emergency Service (SES) is an emergency and rescue service dedicated to assisting the community. It is made up almost entirely of volunteers, with 232 Units located throughout New South Wales. The Manly Unit was established in 1960. The SES is responsible for preparing plans for flood and storm emergencies. So far, three different plans, NSW State flood Plan, NSW State Storm Plan and NSW State Tsunami Plan have been prepared. As the study area poses risks from storms, tsunami and other hazards, it is necessary to have a local Emergency Action Plan in place.*

Actions:

- *Work with the SES to prepare a local Emergency Action Plan in consultation with the community*
- *Involve Community to take responsibilities during emergency*
- *Enlist new volunteers*
- *Continue training program for volunteers*

Objectives addressed: *HR1, HR2, AC1*
Performance Target: *Emergency Action Plan updated*
Indicative Cost: *$10,000*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *SES, Manly Council- Civic Services & NR*
Priority: *Medium*

Objective
HR 2 Consider the potential implications of sea level rise on the estuary and its surrounds as a result of climate change

HR2.1. Assess impact of climate change on areas of ecological significance and devise adaptive measures

Context: *In a preliminary assessment, the ecosystems of the study area are considered to be highly vulnerabile to the impacts of climate change. It is believed that natural ecosystems have low resilience to the effects of climate change. Hence, there is a need to plan and implement adaptive measures to prevent further damage to critical ecosystems of the study area.*
Actions: *Overlay map of areas of ecological significance (option AH4.1) on climate change impact area map (option HR2.2), define vulnerable ecosystems and devise adaptation measures.*

Advantages: *Impacts on ecosystems of the study area will be specified. Adaptive measures will lessen further damage to critical ecosystems.*
Disadvantages: *None*

Objectives addressed: *HR2*
Addressing actions under Manly Council's MSS 2006: *C1.3.8 – Incorporate latest climate change information*

Performance Target: *Ecological impact maps*
Indicative Cost: *$20,000*
Time Frame: *To be implemented within 3-4 years*
Responsible Agency: *Manly Council - NR, SCCG*
Priority: *Medium*

HR2.2. Work with the Sydney Coastal Councils Group to develop a regional/ local level climate change model considering protection provided by existing seawalls and rocky foreshores.

Context: *Manly Council is collaborating, at present, with the Sydney Coastal Councils Group (SCCG) to understand implications of climate change at the regional level through participation in susceptibility modeling. In a preliminary assessment, Manly LGA has been found to possess a moderate degree of vulnerability to climate change. The study area, however, faces high vulnerability to sea level rise, ecosystems degradation and extreme rainfall and subsequent stormwater management. It has been indicated that the present modeling does not consider the level of protection provided by barriers like existing seawalls. Model results will have to be refined to accommodate protection from existing barriers.*

Action: *The option involves continuation of collaboration.*

Objectives addressed: *AH4, AH5, HR1, HR2*
Addressing actions under Manly Council's MSS 2006: *C1.3.8 – Incorporate latest climate change information; C1.3.12 – Participate on the Sydney Coastal Council group*

Performance Target: *Model Results & Impact Report*
Indicative Cost: *Staff time, SCCG project*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *SCCG, DECC, Manly Council- NR*
Priority: *Medium*

HR2.3. Collaborate with the Sydney Coastal Councils Group investigating climate change adaptations in Manly.

Context: *Manly Council is collaborating, at present, with the Sydney Coastal Councils Group in a systems approach to regional climate change adaptation strategies. In this project, CSIRO and the University of Sunshine Coast are contributing partners. Based on the vulnerability assessment, a suitable local level adaptation strategy and subsequent adaptation action plan will be prepared.*

Action: *The option involves continuation of collaboration. Use recent guideline document 'Climate Change Adaptations for Local Government (DEWR & AGO 2007)'.*

Objectives addressed: *HR2*
Addressing actions under Manly Council's MSS 2006: *C1.3.8 – Incorporate latest climate change information; C1.3.12 – Participate on the Sydney Coastal Councils group*

Performance Target: *Adaptation Action Plan made*
Indicative Cost: *Staff time*
Time Frame: *On-going*
Responsible Agency: *SCCG, DECC, Manly Council - NR*
Priority: *Medium*

HR2.4. Revise/Update Council's policy and strategy documents incorporating federal and/or state guidelines/recommendations regarding climate change adaptations

Context: Based on the recently released 4th IPCC results, the CSIRO and the Bureau of Meteorology has recently released 'Climate change in Australia: technical report 2007'. This report provides the most up to date assessment of Australia's changing climate. Implications of these assessments on Manly LGA and the findings of the on-going adaptation studies (Manly Council – SCCG) can only be mainstreamed through revising Council's policy and strategy documents.

Actions: *This could be best achieved by integrating these measures into the existing strategic planning activities and risk management practices of Council. The process should be undertaken in accordance with the guidelines provided by the Australian Greenhouse Office in its publication - Climate Change Impacts and Risk Management – A Guide for Business and Government and Climate Change Adaptations for Local Government (DEWR & AGO 2007).*

Objectives addressed: *HR2*
Performance Target: *New or revised policy documents accommodating CC*
Indicative Cost: *Staff time*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *Manly Council – Corporate Planning & Strategy*
Priority: *High*

4.6 OPTIONS ADDRESSING ESTUARY USE

The public spaces and waterways within the study area are used extensively for various types of passive and active recreation, with the more easily accessible areas in the lower half of the study area being the most popular. Boating (power and sail), kayaking, rowing, walking, swimming, picnicking, and fishing are all popular activities that are regularly undertaken. The facilities and environment of the estuary and foreshores should be improved in such a way that will encourage enhanced water and land-based use of the estuary.

Goal

Improve and meet the environmental, socio-economic and recreational needs of estuary use

A total of 13 management options are proposed addressing three different objectives. Of these, three have been rated as of high priority and the remaining 10 as medium priority management options. Seven management options are already on-going activities of the Council.

Objectives	Strategic Management Options	Implementation timeframe*	Priority
EU 1 Create safe, sustainable and enjoyable public areas for diverse user groups.	**EU1.1.** Ensure safe public access to foreshores including maintenance of natural vegetation.	Within 2 years	Medium
	EU1.2. Install adequate garbage and waste recycling stations in public places.	On-going	High
	EU1.3. Liaise with relevant state authorities regarding the consolidation of existing signage with signage more sympathetic to the area.	Within 3-4 years	Medium
	EU1.4. Promote natural features of 'Clontarf - Sandy Bay- Fisher Bay – Ellery's Punt Reserve' parts of the study area.	Within 3-4 years	Medium
	EU1.5. Develop and implement Pickering Point Landscape Development Program.	Within 3-4 years	Medium
	EU1.6. Promote community events and education programs to achieve sustainable use of the estuary.	On-going	Medium
EU 2 Encourage boating use including kayaking within the estuary that minimises its social and environmental impact, whilst not compromising the amenity or safety.	**EU2.1.** Facilitate and encourage non-motorised boating activities (kayaking, wind surfing etc) in the waterways.	On-going	Medium
	EU2.2. Encourage NSW Maritime to enforce current speed limits and mooring restrictions by increased patrolling.	On-going	Medium
	EU2.3. Encourage NSW Maritime to consider a designated 'boat exclusion zone' at Clontarf to ensure safety of swimmers.	Within 2 years	Medium
	EU2.4. Support continuation of jetski (PWC) ban.	On-going	High
	EU2.5. Continue program, with NSW Maritime & Council's Starboard Right & Green (SR&G) program, to educate boat owners about waterway etiquettes and possible impact on marine environment.	On-going	Medium

Objectives	Strategic Management Options	Implementation timeframe*	Priority
EU 3 Support sustainable recreational fishing in the estuary	**EU3.1.** Support continuation of ban on commercial fishing.	On-going	High
	EU3.2. Encourage DPI (Fisheries) & NSW Health to monitor Dioxin levels in Sydney Harbour waters.	Within 2 years	Medium

*After adoption of the EMP

DETAILS OF MANAGEMENT OPTIONS

Objective
EU 1 Create safe, sustainable and enjoyable public areas for diverse user groups

EU1.1. Ensure safe public access to foreshores including maintenance of natural vegetation

Context: *In order to improve public access to the foreshores and increase opportunities for public recreational use of foreshore reserves, some facilities may need to be upgraded. Wherever possible, and appropriate, public access ways should be confined to areas of low conservation significance. Any foreshore restoration or rehabilitation works necessary should also be undertaken as a part of the access improvement works. Council would be responsible for managing public access and constructing improved facilities and services around the foreshores of estuary.*

Actions:

- *Assess safety condition of existing access paths & facilities*
- *Improve safety condition*
- *Maintain natural vegetation along existing paths*

Objectives addressed: *AH4, EU1, MO2*
Performance Target: *Safety of access paths improved*
Indicative Cost: *$50,000*
Time Frame: *Within 2 years*
Responsible Agency: *Manly Council – Parks & Reserves*
Priority: *Medium*

EU1.2. Install adequate garbage and waste recycling stations in public places.

Context: *Waste from public places is collected twice daily by Council. There are eight 120-litre bins and 16 240-litre bins in public places within the study area including five recycle bins at Clontarf Reserve. Benefits of recycling include conservation of natural resources, for example, forests, energy and water; reduced amount of waste disposed in landfill and reduced greenhouse gases (carbon dioxide, methane, nitrous oxide). It has been identified during community consultations that recycling bins are inadequate. Community consultation identified that there are currently an inadequate number of general waste bins, especially in Ellery's Punt Reserve.*

Actions: *The option involves reassessment of bin numbers and locations to adequately attend to waste collection.*

Objectives addressed: *WQ1, WQ3, EU1*
Performance Target: *Recycling stations installed*
Indicative Cost: *$55,000*
Time Frame: *On-going*

Responsible Agency: *Manly Council – Waste Services*
Priority: *High*

EU1.3. Liaise with relevant state authorities regarding the replacement of existing signage with signage more sympathetic to the area.

Context: *Signs play an important role in the management of natural areas. This communication tool provides an important link between the various management authorities and the public. Signs can be used to orientate visitors (directional), inform them about their surroundings (interpretive), or influence their behaviour (managerial).*

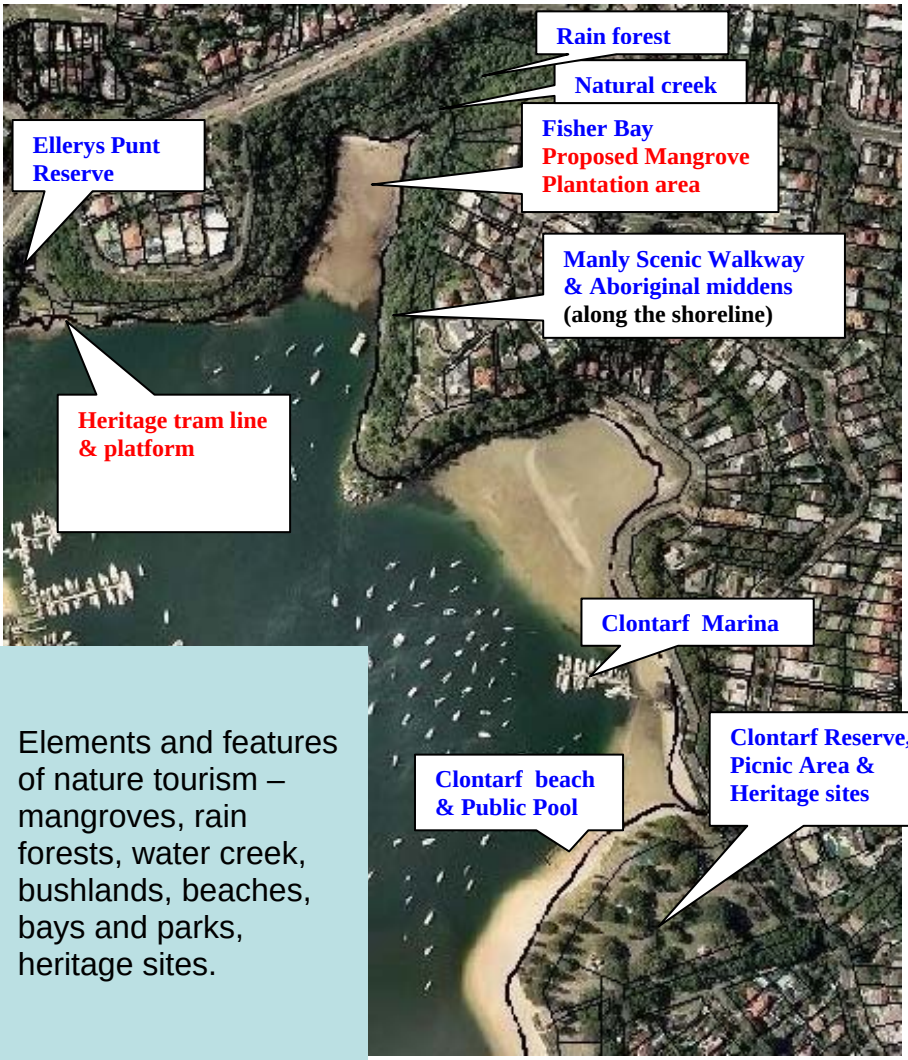
The improper, inconsistent or excessive use of signs may weaken their value as a means of communication and adversely affect the scenic amenity of the area and the quality of visitor experiences. Uniform sign design including appearance, construction and placement contributes to a recognisable identity for the management authority.

Actions: *This option involves replacement of such signage with signage more sympathetic to the area.*

Advantages: *Reduction of many signages in any particular locations. Replaced signage should be simpler and easy to understand*
Disadvantages: *Important information/warnings may be lost with replaced signages.*

Objectives addressed: *WQ7, AH6, EU1, EU5, HC3*
Addressing actions under Manly Council's MSS 2006: *C1.3.11 – Interpretive signage at high profile recreational areas*

Performance Target: *Signage replaced with new ones*
Indicative Cost: *$20,000*
Time Frame: *To be implemented within 3-4 years*
Responsible Agency: *Manly Council – CEP, NR*
Priority: *Medium*



Elements and features of nature tourism – mangroves, rain forests, water creek, bushlands, beaches, bays and parks, heritage sites.

EU1.4. Promote natural features of Clontarf – Sandy Bay – Fisher Bay – Ellery's Punt Reserve' parts of the study area.

Context: *The study area, being more natural and green, is a destination of mainly nature lovers and family visitors. There is an opportunity to enhance estuary and eco-based visitation in the study area.*

Clontarf Reserve, Sandy Bay, Fisher Bay and Ellerys Punt Reserve together can advantageously be promoted as an 'Eco-educational Trail'. This part has all the elements and features – rain forests, mangroves, fresh water creek, bushlands, beaches, bays, parks and heritage sites. Manly Scenic Walkway runs through the area.

Actions:

- *Develop brochure and place interpretive signage at strategic locations*
- *Develop a school education program*

Advantages: The trails would serve to educate the public about the considerable values of the estuary and its environs to the local flora and fauna. With a better knowledge of the environmental values, the public would be less likely to damage or threaten these values either intentionally or unintentionally.
Disadvantages: Poorly designed eco-educational trails could potentially do more harm than good, if increased traffic disturbs the native flora and fauna.

Objectives addressed: *AH3, AH4, EU4, MO2*
Performance Target: *Brochure prepared*
Indicative Cost: *$10,000*
Time Frame: *To be implemented within 3-4 years*
Responsible Agency: *Manly Council - NR*
Priority: *Medium*

EU1.5. Develop and implement Pickering Point Landscape Development Program.

Context: *Pickering Point offers spectacular view of the middle harbour. It has rocky shores, O.7ha bushland area, mangrove patches and Aboriginal midden. A concrete footpath (with steps) zigzags down the steep slope to the foreshore area, where there is a small sandy beach and Gurney Crescent Swimming Enclosure. The point has its own aesthetic beauty. This has attracted people from the locality. Visitors have cited access problems and lack of parking and other facilities. The site is part of a wildlife corridor.*

Actions: *The following activities will be undertaken as part of the development program:*

- *Foreshore access improvements*
- *Weed removal*
- *Re-vegetation of endemic native plants & managed fire to facilitate natural seed germination*
- *Stormwater management*
- *Protection of Aboriginal midden*

As part of the Program, recommendations by Skelton (2008) will be reviewed and a Landscape development plan of the area will be prepared initially for further consultation with the Precinct and local community. Based on agreed actions, Development Program will gradually be implemented.

Objectives addressed: *WQ1, TH2, EU1, FI4, FI5, HC1*
Addressing SMCMA targets: *Management target B5.1 – weed management strategy; ECM 1.10 – estuarine vegetation; ECM 2.3 – intertidal rock platform, intertidal protected areas & aquatic reserves*

Performance Target: *Development program implemented*
Indicative Cost: *Staff time + $50,000*
Time Frame: *Landscape Plan to be made immediately; Development program to be implemented within 3-4 years*
Responsible Agency: *Manly Council – Design & Technical, P&R, NR*
Priority: *Medium*

EU1.6. Promote community events and education programs to achieve sustainable use of the estuary.

Context: *Targeted community events and education programs contribute to sustainable use of natural resources. Education should target the appropriate and considerate use of foreshore areas. This would include:*

- *Litter collection and disposal;*
- *Picking up dog faeces (with bins provided);*
- *Conservation of foreshore habitats and the ecology of the intertidal zone;*
- *Areas unsuitable for swimming;*
- *Consideration of wading or roosting migratory birds (and the potential disturbance by humans, dogs and noisy activities).*
- *Responsible bait collection and compliance with Fisheries Bag Limits.*

Community events, such as Clontarf 700, a recently initiated swimming event held in December, can be used to promote sustainable use of the estuary

Actions: *This option involves education of users of the foreshore areas. Signage should be placed at key access points, while follow-up education should be carried out through specific or general mail-outs (e.g. with general Council rates notices). Manly Council can support and promote 'Clontarf 700' and use the event to promote messages of sustainable use of the estuary.*

Objectives addressed: *WQ6, AH6, TH5, SE1, EU4, EU5*
Addressing SMCMA targets: *Management target C1-1 – awareness and education programs for priority communities*
Addressing actions under Manly Council's MSS 2006: *C1.3.16 – Encourage community involvement*

Performance Target: *Education programs*
Indicative Cost: *$30,000*
Time Frame: *On-going*
Responsible Agency: *Manly Council – CEP, NSW Maritime & NSW DPI*
Priority: *Medium*

Objective
EU 2 Encourage boating use including kayaking within the estuary that minimises its social and environmental impact, whilst not compromising the amenity or safety

EU2.1. Facilitate and encourage non-motorised boating activities (kayaking, wind surfing etc) in the waterways.

Context: *Non-motorised boating activities such as sailing, rowing, kayaking, windsurfing and canoeing are popular activities in the study area. Kayaking is increasing in popularity as an individual pastime and as a commercial recreation activity. The use of non-motorised vessels provides access for water-based sightseeing and nature appreciation without the intrusive sounds and smells associated with motorised vessels. Potential impacts of non-motorised vessel based activities include fire, as well as littering and erosion, which are most noticeable on shore near anchorages and where people land vessels to go ashore. However, the impacts of nonmotorised vessels on bank erosion are generally less than those of motorised vessels owing to the different design, displacement and speed of non-motorised vessels.*

Actions: *The option involves facilitating (option 8.3.1) and encouraging non-motorised boating.*

Objectives addressed: *EU2*
Addressing NRC targets (State Plan 2006): *12 – natural resources decisions to improve econoimc sustainability and social well-being*
Performance Target: *Facilities created*
Indicative Cost: *$25,000*
Time Frame: *On-going*
Responsible Agency: *Manly Council – CEP, NR, NSW Maritime*
Priority: *Medium*

EU2.2. Encourage NSW Maritime to enforce current speed limits and mooring restrictions by increased patrolling.

Context: *The vast majority of users of Middle Harbour estuary do the right thing and are considerate of others. However, like most waterways, there is a small element of the boating community that continues to disobey restrictions and behaves inappropriately.*
Actions: *NSW Maritime, with assistance of the Water Police and other regulatory agencies, should consider ways that they can increase patrols of the estuary to enforce compliance with the boating rules and regulations.*

Objectives addressed: *EU1, EU2*
Performance Target: *Patrolling increased*
Indicative Cost: *Staff time*
Time Frame: *On-going*
Responsible Agency: *NSW Maritime*
Priority: *Medium*

EU2.3. Encourage NSW Maritime to consider a designated 'boat exclusion zone' at Clontarf to ensure safety of swimmers.

Context: *There is overall support of the community to boating and other recreational activities but the safety issue is very important. Clontarf Beach is used by swimmers and recreational boating in a largely harmonious manner. However, boats are not supposed to anchor within a certain number of metres from shore (particularly on a swimming beach). Boats clearly trespass within this limit on a regular basis and smaller boats even anchor on the shoreline posing a very serious safety concern for*

small children and adults alike. Boats mooring close to shore and landing at Castle Rock Beach are a safety hazard for children.

A 'swimming only' enclosure would restrict use of kayaks, windsurfers and small boats – but this is not necessary. There was a proposal to close off Clontarf Beach to kayaks and boats some time ago, for alleged safety reasons but it failed for lack of resident support. A corridor for boats and kayaks is proposed.

Actions:

- *Discuss further with the community and boat owners regarding proposed corridor*
- *Work with NSW Maritime to investigate possibility of a corridor (marked with buoys)*
- *Assess enforcement and safety of child swimmers*

Advantages: *Will ensure safety of swimmers*
Disadvantages: *None*

Objectives addressed: *EU1, EU2*
Performance Target: *Proposal prepared and considered*
Indicative Cost: *Staff time*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *NSW Maritime, Manly Council - NR*
Priority: *Medium*

EU2.4. Support continuation of jetski (PWC) ban.

Context: *The NSW State Government placed a ban on Jet Skis in October 2001 within Sydney Harbour including Middle Harbour. There are 8,300 registered jet skis in NSW. While jet skis represent only eight per cent of all boating licenses, they accounted for 29 percent of all complaints (2000) to the Waterways Authority and 28 percent of all infringements. Water Police report indicated Clontarf in Middle Harbour as one of the hot spots where 50 jet skis get together. The request for the ban has come from councils, environmental groups, police and citizens' groups. The Government has taken these tough measures in response to:*

- *the excessive use of police resources to monitor jet ski behaviour;*
- *safety concerns relating to jet skis;*
- *concerns about the impact of jet skis on native animals;*
- *hazard to other harbour craft such as ferries and pleasure and commercial craft;*
- *noise nuisance to families on the coastline and on the water.*

The penalties for breaching the exclusion zone will be:

- *A $800 on-the-spot fine and disqualification for two years for a first offence;*
- *A $1,200 on the spot fine and disqualification for four years for a second offence; and*
- *A $1,500 fine and disqualification for life for a third offence.*

Action: *The option involves continued support of the ban.*

Objectives addressed: *EU1, EU2*
Performance Target: *Ban supported*
Indicative Cost: *Staff time*
Time Frame: *On-going*
Responsible Agency: *Manly Council- Natural Resources*
Priority: *High*

EU2.5. Continue program, with NSW Maritime & Council's Starboard Right & Green (SR&G) program, to educate boat owners about waterway etiquettes and possible impact on marine environment.

Context: *The social acceptability and community ownership of waterway usage could be improved by increasing the knowledge base of all boat users in relation to acceptable and safe forms of boating. Starboard Right & Green is a marine environmental education program undertaken by Manly Council. It aims to educate recreational boat users (RBU's), industry and the general community about ways to interact with the marine environment in a sustainable way. The program targets five key marine issues*

- *Caulerpa taxifolia - raising awareness of the invasive seaweed that is colonising Manly's waterways*
- *Waste - encouraging the proper management of waste during marine activities*
- *Pollution – encouraging the minimisation of pollution as a result of marine activities*
- *Little (Fairy) Penguins – raising awareness about the existence and protection of Manly's critically endangered Little Penguin colony*
- *Seagrass – raising awareness about ways to protect this vital habitat in our marine ecosystems*

Manly's marine environment is highly diverse and supports many delicate ecosystems and an abundance of life, including 16 protected, vulnerable, or endangered species, such as the Little Penguin. Starboard Right & Green aims to educate people about the preservation of this marine environment to ensure its survival for future generations to enjoy.

Action: *The option involves continuation of the program.*

Objectives addressed: *EU2, EU5*
Addressing NRC targets (State Plan 2006): *12 – natural resources decisions to improve econoimc sustainability and social well-being*
Addressing SMCMA targets: *Management target C1.1 – awareness and education programs for priority communities*
Addressing actions under Manly Council's MSS 2006: *C1.2.5 – Implement Starboard Right & Green program*

Performance Target: *Education program continued*
Indicative Cost: *$25,000*
Time Frame: *On-going*
Responsible Agency: *Manly Council – CEP*
Priority: *Medium*

Objective
EU 3 Support sustainable recreational fishing in the estuary

EU3.1. Support continuation of ban on commercial fishing.

Context: *A ban has been placed on commercial fishing as a precautionary measure due to test results revealing elevated levels of dioxins in fish and crustaceans across the Harbour, including Parramatta River and other connected tidal waterways. This fishing closure took effect at 5:00pm on 10 February 2006 and remains in effect until 9 Feb 2011, unless sooner amended or revoked.*

Recreational fishing in the Harbour has not been banned, but fishers are urged to follow dietary advice on the consumption of seafood from the Harbour and to be aware of existing fishing restrictions. Consult NSW DPI to obtain the relevant brochure. An expert panel has recommended that fish and crustaceans caught west of the Sydney Harbour Bridge should not be eaten. For fish caught east of the Sydney Harbour Bridge, recommended dietary limitations apply. Higher amounts of some fish and crustacean species may be eaten.

Action: *The option involves continued support of the ban.*

***Objectives addressed*:** *AH4, EU1, EU3*
Addressing NRC targets (State Plan 2006): *12 – natural resources decisions to improve economic sustainability and social well-being*

Performance Target: *Ban supported*
Indicative Cost: *Staff time*
Time Frame: *On-going*
Responsible Agency: *MC (NR), SCCG,*
Priority: *High*

EU3.2. Encourage NSW DPI & NSW Health to monitor Dioxin levels in Sydney Harbour waters.

Context: *The Department of Primary Industries acts on advice from NSW Health and the NSW Food Authority on fish contamination issues. The Department of Primary Industries also acts on advice from the Department of Environment and Climate Change on ecosystem contamination issues. When advised by these agencies, the Department of Primary Industries takes action by implementing fishing closures where appropriate, communicating health warnings where appropriate, and assisting these agencies with sampling of fish.*

About 400 fish have been tested in total as part of the comprehensive testing regime that ran until December 2006 (DPI 2007). Some good news for the State's anglers was that several recreational fish species caught east of the Sydney Harbour Bridge were found to be relatively free of dioxin. Unfortunately, the tests for commercial species such as Bream, Prawns and Squid are so high as to make it impossible for commercial fishing to return to the Harbour in the foreseeable future.

Action: *The option involves continued support of monitoring of dioxin levels.*

Objectives addressed: *AH5, EU1, EU3*
Performance Target: *Dioxin level monitored*
Indicative Cost: *Staff time*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *NSW DPI, NSW Health, SCCG*
Priority: *Medium*

4.7 OPTIONS ADDRESSING ACCESS

Access is an important management issue both for people and companion animals. The study area already has well established walkways – Manly Scenic Walkway and the Harbour to Hawkesbury Walkway. However, there is limited access to foreshores, especially along foreshores between the Spit Bridge and Castle Crescent. While there is desire and public support for unhindered access and thoroughfare along the whole of the foreshore, it is also accepted that there is no practicality in reclaiming sections of foreshores from private owners. Emphasis should be on establishing new access paths if and where appropriate including provision of disability access.

Goal

Ensure safe public accessibility of waterways, foreshores and other areas of the estuary.

A total of four management options are proposed addressing three different objectives. Of these, one has been rated as of high, two as medium and the remaining one as low priority management options. None is proposed for immediate implementation. Two management options are already on-going activities of the Council.

Objectives	Strategic Management Options	Implementation timeframe*	Priority
AC 1 Maintain Manly Scenic Walkway (MSW) regularly and continuously improve its use value	**AC1.1.** Enhance maintenance schedule and retain and enhance the native vegetation along the Manly Scenic Walkway.	On-going	Medium
AC 2 Increase disabled access (where practically possible) to parks and bays in the study area	**AC2.1.** Audit disability access of all parks and bays within the study area.	Within 2 years	Medium
AC3 Facilitate dog-walking including possibility of establishing off-leash dog areas.	**AC3.1.** Assess, in consultation with nearby residents, possibility of declaring Sandy Bay tidal flats as off-leash dog area.	Within 2 years	Low
	AC3.2. Install adequate dog faeces bins and bag dispensers.	On-going	High

*After adoption of the EMP

DETAILS OF MANAGEMENT OPTIONS

Objective
AC 1 Maintain Manly Scenic Walkway (MSW) regularly and continuously improve its use value

AC1.1. Enhance maintenance schedule and retain and enhance the native vegetation along the Manly Scenic Walkway.

Context: *The Manly Scenic Walkway (MSW), which opened in 1988, is one of the key attractions of the study area. It is also one of the popular destinations of visitors. Encompassing panoramic views of the majestic entrance to Sydney Harbour and swathes of bushland, walkers are able to contrast the old and new Australia as they pass by modern harbourside suburbs juxtaposed with Aboriginal sites, native coastal heath and pockets of sub-tropical rainforest. This walkway is regularly maintained jointly by the Manly Council and National Parks and Wildlife Services. However, there are often complaints of low maintenance and weeding.*

Actions:

- *Assess ways to increase maintenance, especially during summer season*
- *Encourage native vegetation all along the route*
- *Place interpretive signage on interesting plants*

Objectives addressed: *EU1, AC1*
Addressing NRC targets (State Plan 2006): *1 – increase in native vegetation extent; 12 - natural resources decisions to improve econoimc sustainability and social well-being*

Performance Target: *Maintenance enhanced*
Indicative Cost: *$100,000*
Time Frame: *On-going*
Responsible Agency: *Manly Council – Parks & Reserves*
Priority: *Medium*

Objective
AC 2 Increase disabled access (where practically possible) to parks and bays in the study area

AC2.1. Audit disability access of all parks and bays within the study area.

Context: *An audit is required to plan improving facilities for persons with disabilities and seniors through the provision of enhanced infrastructure and facilities. This will allow them easy access to reserves and where possible to bays and water fronts. An access audit was done around Seaforth shopping area earlier (Hockley & Stanbury 1997). The need for an audit is in line with the federal Disability Discrimination Act and also Manly Council's Social Plan 2004. People with a disability and services identified problems with wheelchair access to theatres, libraries, parks, shops, doctors' surgeries and banks. This issue was also related to the problem of uneven footpath surfaces. People with a disability and service providers identified the supply of accessible transport services including taxis for the disabled, transport for medical appointments in an emergency, and wheelchair friendly public transport and public toilets as a high priority need for Manly residents. Accompanying this issue were the problems associated with infrastructure such as a lack of waterproof bus shelters and the short time phasing of lights at intersections.*

Actions:

- *Revise Seaforth Access Audit: Findings and Recommendations based on present context.*
- *Extend Seaforth Access Audit to include parks, bays and beaches of the study area*
- *Audit all public toilets to ensure that these are wheelchair accessible..*
- *Discuss the proposal with the Access Committee, Manly Council*
- *Implement disability access at priority locations.*

Objectives addressed: *AC2*
Performance Target: *Audit completed*
Indicative Cost: *Staff time*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *Manly Council – Planning & Strategy*
Priority: *Medium*

Objective
AC3 Facilitate dog-walking including possibility of establishing off-leash dog areas

AC3.1 Assess, in consultation with nearby residents, possibility of declaring Sandy Bay tidal flat as off-leash dog area.

Context: *Dog exercising is a popular activity for many members of the community. Dogs are allowed on leash in the Clontarf Reserve during specified time and days. Alternative dog routes are marked on the Manly Scenic Walkway. Dogs are allowed off the leash in most of Council's reserves. However, dogs are not permitted on any beaches or in swimming enclosures.*

Sandy Bay tidal flat is, for two decades or more, being used as dog off-leash area. There is both desire and demand by dog owners to continue Sandy Bay as an off-leash dog area. There are also other users and residents whose interests need to be taken into account.

Area below the Mean High Water Mark (MHWM) is owned by the NSW Maritime. Council has care and control on the area above MHWM.

During public exhibition of the EMP, 70 submissions out of 78 were on the issue of Sandy Bay as dog off-leash area. A majority (64) of submissions strongly supported the status quo (i.e to continuation of Sandy Bay as dog off-leash area) and six submissions indicated concern over increased dog activities and suggested regulations through timed access.

Considering overwhelming public response and other social and environmental implications, the following actions will be undertaken based on resolution adopted by the Council.

Actions:

- *Dogs off leashes will be permitted on lands that Council controls above the mean high water mark (indicated by red border), separate to currents restrictions on Clontarf Reserve.*
- *The issues of dog activity on the tidal flat at Sandy bay below the mean high water mark will be referred to NSW maritime.*
- *Develop responsible code of conduct and place appropriate signage, in consultation with NSW Maritime.*

Objectives addressed: *EU1, EU5, AC3*
Performance Target: *Continue Sandy Bay as dog off-leash area*
Indicative Cost: *Staff time + $10,000*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *NSW Maritime, Manly Council – Planning & Strategy, Rangers*
Priority: *Low*

AC3.2. Install adequate dog faeces bins and bag dispensers.

Context: *Dogs are a valued part of our community, but their faeces contribute to stormwater pollution and, subsequently, to pollution of waterways and beaches. Uncollected dog faeces have long been the scourge of sports fields and recreation reserves, for the impact they have on both amenity and human health. Dog faeces are a significant contributor to the pollution of our estuary and bushlands, as they are washed into the stormwater system after rain. Dog faeces are a source of nutrients, a potential source of pathogens and reduce the available oxygen in water when they are broken down.*

Manly Council was participating in the Community Watch-dog Project to set up a system so dog owners could be responsible for their pets' waste and dispose of it thoughtfully. Councils recruited volunteers, many of whom were dog owners. Volunteers were trained to inform other pet owners about stormwater pollution from dog faeces and provide them with POOch Pouches (small purses that could be attached to dog leads and contained biodegradable dog litterbags).

In addition, Manly Council has already made a number of dog faeces bins and dog dispensers available at key locations. During community consultations, numbers were not regarded as adequate.
Actions:

- *run a systematic education program around dog owners and water pollution*
- *Install additional dog faeces bins and bag dispensers*
- *Schedule regular and frequent collections from these bins*
- *Install regulatory signs advising dog owners of appropriate conduct and penalties associated with non-compliance through increased patrol.*

Objectives addressed: *EU1, AC3, FI5*
Performance Target: *Facilities established*
Indicative Cost: *$20,000*
Time Frame: *On-going*
Responsible Agency: *Manly Council – Waste Services*
Priority: *High*

4.8 OPTIONS ADDRESSING FORESHORE INFRASTRUCTURE & FACILITIES

Development of the foreshore has been extensive in the study area. These developments have gradually changed the natural processes within the area. These alterations have impacted on the natural environment, and often with consequences to both humans and the environment.

Goal

Improve social amenity through rationalisation of foreshore structures which are sympathetic to social and ecological needs and manage public risks.

A total of eight management options are proposed addressing five different objectives. Of these, four have been rated as of high and the remaining four as medium priority management options. Four are proposed for immediate implementation. Two management options are already on-going activities of the Council.

Objectives	Strategic Management Options	Implementation timeframe*	Priority
FI 1 Rationalise mooring places to minimise the impact on ecologically important seagrass beds.	**FI1.1.** Work with NSW Maritime to introduce seagrass friendly moorings	Within 2 years	Medium
	FI1.2 Work with NSW Maritime to realign and maintain the same number of permanent moorings in front of Clontarf beach for the safety of swimmers and protection of seagrass beds.	Within 2 years	Medium
FI 2 Facilitate public boat landing facilities at suitable sites within the study area	**FI2.1**. Construct a public floating pontoon beside Sangrado swimming enclosure and encourage NSW Maritime to assess the need for boat landing facilities within the study area.	Immediate	Medium
FI 3 Establish dinghy and kayak storage facilities at suitable locations within the study area	**FI3.1**. Install horizontal dinghy and kayak storage racks at Sandy Bay in consultation with nearby residents and dinghy owners.	Immediate	High
	FI3.2. Install rods/poles at Gurney Crescent & Castle Circuit to tie dinghies & kayaks and educate owners regarding protection of trees & middens, and decrease erosion of foreshore	Immediate	High
FI4 Maintain and improve usability of public swimming enclosures of the study area	**FI4.1.** Assess and implement options to restore collapsed Sangrado swimming enclosure.	Immediate	High
FI.5 Better general amenities, traffic and safety at foreshore areas, public reserves and beaches	**FI5.1** Enhance general amenities such as public toilets, telephone booths and street lights at convenient locations	On-going	High
	FI5.2 Improve and facilitate traffic management around public reserves and beaches	On-going	Medium

*After adoption of the EMP

DETAILS OF MANAGEMENT OPTIONS

Objective
FI 1 Rationalise mooring places to minimise the impact on ecologically important seagrass beds.

FI1.1. Work with NSW Maritime to introduce seagrass friendly moorings

Context: NSW Maritime is currently trialing sea grass friendly moorings in an attempt to minimise the impact of boating on sea grass beds. Many private companies have patented and marketed sea grass friendly moorings. One of these mooring systems uses a single point screwed into place mooring post as the anchor point. Attached to the mooring post just below the sea bed is a set of load spreaders to stabilize the post. This is then attached to a shock absorber to the swivel head and run a hawser rope from the shock absorber to a surface buoy.

Actions: The option involves working with NSW Maritime to introduce seagrass friendly moorings in the study area.

Objectives addressed: *AH1, FI1*
Addressing SMCMA targets: *Management target ECM1.4 – in-stream and marine structures*
Addressing actions under Manly Council's MSS 2006: *C1.2.15 – eco-friendly mooring buoys on seagrass beds*

Performance Target: *Moorings introduced*
Indicative Cost: *Staff time, Cost to NSW Maritime*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *NSW Maritime, SCCG, SMCMA*
Priority: *Medium*

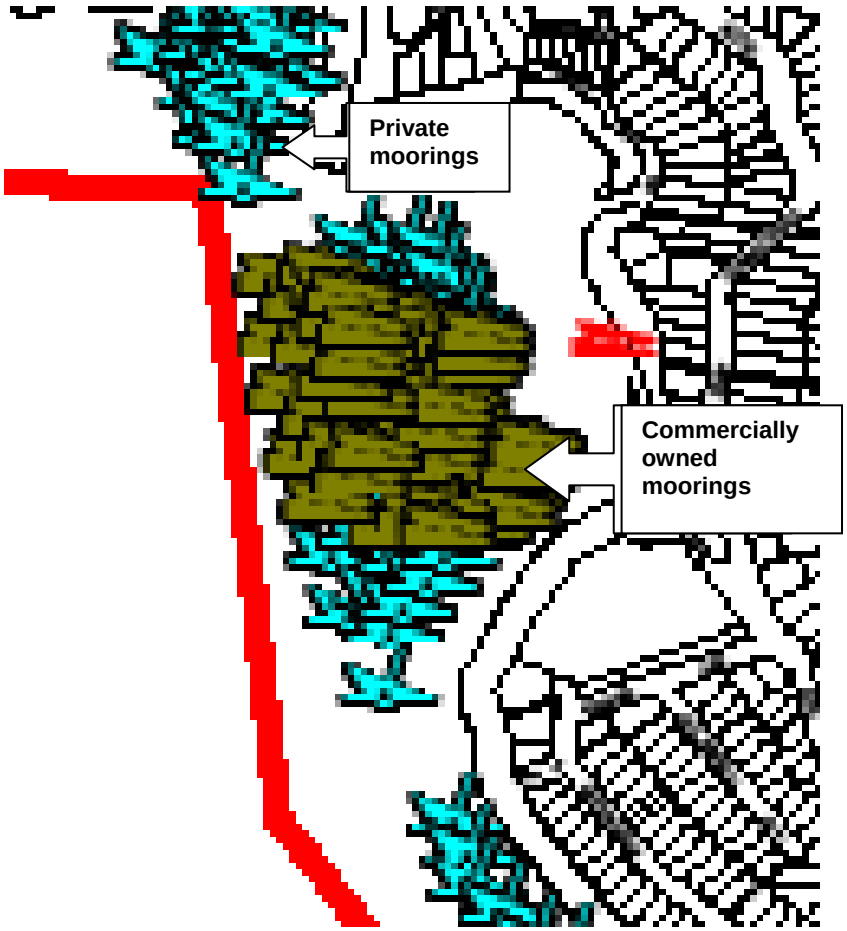
FI 1.2 Work with NSW Maritime to realign and maintain the same number of permanent moorings in front of Clontarf beach for the safety of swimmers and protection of seagrass beds.

Context: *Clontarf beach is subjected to erosion/siltation due to various factors including boating. The number of license holders along Clontarf Beach is one (Clontarf Marina) for commercial and eight for private moorings. Significant numbers of boats cram into the southern end of Clontarf beach creating a navigation and safety hazard and damage the sea bed through the dragging of anchors. These boats present a danger to swimmers in the water. Additional risk is created by sewage discharge from vessels anchoring in this popular swimming area*

Actions: *As also discussed with Nick Richards of NSW Maritime, are:*

- *That a moratorium be placed on the number of permanent moorings along Clontarf Beach*
- *That the moorings be re-aligned to form a sort of buffer to visiting day vessels*
- *That consideration be given to install where possible a small number of sea grass friendly temporary use moorings towards the Northern end of Clontarf Beach*

Objectives addressed: *EU1, FI1*
Performance Target: *Moorings realigned*
Indicative Cost: *Staff time*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *NSW Maritime, Manly Council - NR*
Priority: *Medium*



Objective
FI 2 Facilitate public boat landing facilities at suitable sites within the study area

FI2.1. Construct a public floating pontoon beside Sangrado swimming enclosure and encourage NSW Maritime to assess the need for boat landing facilities at other sites within the study area.

Context: *Pontoons and jetties within the study area are generally privately owned and are located along foreshores between the Spit Bridge and the Pickering Point. There are no public pontoon/jetties.*

However, there is a proposal to install a jetty access and public floating pontoon at Powder Hulk Bay, beside the site of the collapsed Sangrado Pool, to provide recreational boating access to the Harbour for boat owners, nearby residents and the general public. There are a significant number of boat moorings in Powder Hulk Bay which will benefit from this new access. Manly Council has already received a grant from the NSW Maritime to construct this pontoon. Detailed designs of the pontoon have already been made.

There is demand for a public pontoon near Clontarf Swimming Enclosure.

Beside, there is remnant of a 1906 wharf located off Laura Street, Seaforth. The Laura Street Wharf site is still used by mooring licensees for Seaforth to store their dinghies, as there is no other public access (personal communication, Anita Robinson, NSW Maritime).

Actions:

- *Review existing public waterway infrastructures within the study area*
- *Assess adequacy of existing public structures and identify additional needs*

- *Identify alternative locations considering public demand for a public pontoon near Clontarf Swimming Enclosure.*
- *Carry out an environmental study of any selected site*
- *Seek financial support from the NSW Maritime to build additional public pontoons within the study area.*

Objectives addressed: *EU1, AC1, FI2*
Performance Target: *Pontoon Constructed and assessment made*
Indicative Cost: *70,000*
Time Frame: *Immediate*
Responsible Agency: *Manly Council – Urban Services, NSW Maritime,*
Priority: *Medium*

Objective
FI 3 Establish dinghy and kayak storage facilities at suitable locations within the study area

FI3.1. Install horizontal dinghy and kayak storage racks at Sandy Bay in consultation with nearby residents and dinghy owners.

Context: *Lack of dinghy and kayak storage was identified as a key issue. Historically dinghies have been stored along the foreshore of Sandy Bay, Sangrado and Pickering Point. Extensive number and random storage of dinghies and other boats along the foreshore impact on the aesthetic and environmental nature of the area. Installation of horizontal dinghy storage is proposed for safety, park maintenance and liability reasons. In determining dinghy storage arrangements in the area, Council should also consult with Clontarf Marina and Northbridge/Seaforth Moth sailing Club to seek involvement in maintaining and administering dinghy storage facilities for use by those using moorings licensed directly from Waterways. This option should be explored in light of the space limitations within the reserve areas. Similar to Council facilitated formal dinghy storage facilities at Little Manly and Forty Basket, new storage is also subject to registration and 'boat storage fee' charged per annum.*

The presence of dinghies along the foreshore has been found to damage tree bark and numerous informal tracks have been formed due to inappropriate dinghy storage and access. It was also recommended that chaining boats to trees and dragging them through the bush should be prohibited. Aboriginal midden sites have also been affected in a number of locations.

During public exhibition of the EMP, 7 out of 78 submissions were on dinghy storage issue. Submissions in general supported preserving the present character of Sandy Bay and opposed any installation of dinghy storage systems that impinge upon the visual character and/or views.

Actions:
- *Remove unused dinghies & kayaks after notification to possible owners.*
- *Investigate appropriate design and location for dinghy and kayak storage facilities within Sandy Bay*
- *Seek community and Precinct feedback*
- *Introduce a dinghy registration/licensing system to establish improved storage.*
- *Regulate dinghy storage to ensure vessels are consolidated into identified dinghy storage facility*

Objectives addressed: *EU2, FI3*
Performance Target: *Storage rack established*
Indicative Cost: *$11,000*
Time Frame: *Immediate*
Responsible Agency: *Manly Council – Urban Services, Design & Technical Group*
Priority: *High*

FI3.2. Install rods/poles at Gurney Crescent & Castle Circuit to tie dinghies & kayaks and educate owners regarding protection of trees & middens, and decrease erosion of foreshore

Context: *Dinghy storage facilities can be installed at limited sites within the study area. At some sites, like Gurney Crescent and Castle Circuit, it will not be feasible to install storage facilities. It is expected that dinghy and kayak owners will continue to store dinghy by chaining to trees. The presence of dinghies along the foreshore has been found to damage tree bark and numerous informal tracks have been formed due to inappropriate dinghy storage and access. One of the alternatives is to install rods/poles to allow owners tie dinghies to these poles instead of trees. Simultaneously run educational programs and enforce compliance.*

Actions:

- *Assess and install rods/poles at convenient locations at Gurney Crescent & Castle Circuit*
- *Initiate educational programs. It aims to educate recreational boat users (RBU's), industry and the general community about ways to interact with the foreshore environment in a sustainable way.*
- *Seek community support and enforce compliance.*

Objectives addressed: *EU2, FI3*
Performance Target: *Rods/poles installed & Education program initiated*
Indicative Cost: *$2,900*
Time Frame: *Immediate*
Responsible Agency: *Manly Council – US, Precincts*
Priority: *High*

Objective
FI4 Maintain and improve usability of public swimming enclosures of the study area

FI4.1. Assess and implement options to restore collapsed Sangrado swimming enclosure.

Context: *Sangrado Bath is a 25-metre by 20-metre netted swimming enclosure in Powder Hulk Bay This bath has collapsed in August 2007 and community, in general, desire restoration of the bath.*

Unlike Clontarf Swimming enclosure, this bath does not experience siltation. However, water quality is affected by bacterial contamination from a nearby sewage overflow point. Sangrado Bath is clearly the worst of the three sites, and has a history of bacterial

contamination. It did have 100% compliance with faecal coliform guidelines for two years between 1999 and 2007, but in all of the other years its compliance was lower than the other sites. Compliance with enterococci guidelines was much worse, with only three years between 1999 and 2007 above 80% compliance, and one year below 30% compliance.

This bath is subject to significant marine growth, particularly oysters. The oysters cover not only the enclosure, but also the steps leading into the pool, and the floor of the pool. This has made the pool virtually unusable, due to the dangers associated with extremely sharp oysters.

***Actions:** Council, at its meeting on 10 September 2007, has resolved to refurbish/replace the Sangrado bath. This will be done in conjunction with construction of a wharf and pontoon (management option FI2.1).*

Following the Council motion, relevant actions are:

- *Seek community input and feedback on this decision.*
- *Design the refurbishment to incorporate the access wharf and pontoon to synergise costs subject to heritage considerations and appropriate clearances from Fisheries.*
- *Seek grant funding from appropriate sources.*
- *Review the maintenance program for the new pool.*
- *Raise the sewer overflow at Sangrado Pool at the Sydney Water Partnership meeting.*

***Objectives addressed:** EU1, FI4*
***Performance Target:** Sangrado swimming enclosure restored*
***Indicative Cost:** $150,000*
***Time Frame:** Immediate*
***Responsible Agency:** Manly Council – Urban Services*
***Priority:** High*

Objective
FI 5 Better general amenities, traffic and safety at foreshore areas, public reserves and beaches

FI5.1. Enhance general amenities such as public toilets, street lights etc. at convenient locations

***Context:** Clontarf Reserve and other reserves near beaches are popular places, specially for both local and visitor families. It is important that general amenities are not only maintained but also enhanced and upgraded. Additional public toilets and telephone booths are located conveniently for general and emergency use. Street lights are also upgraded in popular reserves.*

***Actions:** The option involves auditing of existing public facilities and in consultation with Precincts, encourage relevant agencies to establish further additional facilities. Indicate locations and directions of Clontarf Reserve and beach with additional signage on main roads.*

***Objectives addressed:** EU1, AC3, FI5*
***Performance Target:** Facilities enhanced*
***Indicative Cost:** $75,000*
***Time Frame:** On-going*
***Responsible Agency:** Manly Council – Urban Services*
***Priority:** High*

FI5.2. Improve and facilitate traffic management around public reserves and beaches

***Context:** According to community consultations, traffic is well managed at present.* Traffic / parking management is only required on Boxing Day and New Year's Day at Clontarf. Blocking of footpaths by illegal parking of cars and trucks (generally) remains a problem. Installation of more parking meters is

not favoured by resident as they attract more cars in the area. However, pedestrian crossings and traffic lights should be reviewed to facilitate better traffic arrangements and safety.

Actions:

- *Continue Freebie bus as a permanent service to the community*
- *Prune trees at Holmes Avenue for safety reasons*
- *Install a pedestrian crossing at Ethel Street (already planned)*
- *Overhaul traffic management with the proposed Seaforth town centre upgrade.*

Objectives addressed: *EU1, AC1, FI5*
Performance Target: *Improved traffic management*
Indicative Cost: *$16,000*
Time Frame: *On-going*
Responsible Agency: *Manly Council – Urban Services, Risk Manager, RTA*
Priority: *Medium*

4.9 OPTIONS ADDRESSING HERITAGE CONSERVATION

The Sydney Basin is one of the richest regions in Australia in terms of Aboriginal & other historical archaeological sites. These sites are living history. Because of lack of knowledge/information, people are not aware of the value of historical past. There is also great scientific value in these sites. By studying the shells, stones and bones, one can learn a great deal about past environments, plants and animals,

Goal

Ensure that all Aboriginal, natural and cultural heritage items in the area are preserved and protected in consultation with appropriate bodies.

The Aboriginal Heritage office has recorded 11 shelters with middens and 5 open middens within the study area (AHO 2006). Many middens are situated in rock shelters, reflective of relative abundance of cavernous overhangs to the shoreline. Middens are observed to be of varying size and length. Most midden sites are within 200 meters of a water supply. Within the study area, middens are located in Castle circuit, Pickering point, Clontarf, Sangrado and in Fisher Bay.

A total of eight management options are proposed addressing three different objectives. Of these, two have been rated as of high, four as medium and the remaining two as low priority management options. One is proposed for immediate implementation. In fact, this option has recently been implemented. Four management options are already on-going activities of the Council.

Objectives	Strategic Management Options	Implementation timeframe*	Priority
HC 1 Ensure that all 22 sites of Aboriginal heritage significance are properly identified, recorded and protected under the applicable State and Federal legislations.	**HC1.1**. Review Aboriginal Site Management Report for Manly Council (2006) and associated reports to prioritize management needs and develop a plan of implementation.	On-going	Medium
	HC1.2. Construct boardwalk type structure where MSW bisects Aboriginal midden at Sandy Bay.	Immediate	High
	HC1.3. Prevent damage to Aboriginal middens in critical condition.	On-going	High
	HC1.4. Confirm and prepare a number of Aboriginal sites suitable for public visitation.	On-going	Medium
HC2 Ensure that all sites of natural and cultural heritage are identified and registered under the relevant legislation and in Council planning instruments.	**HC2.1.** Assess heritage significance of 'Laura Street Wharf' and propose its inclusion in the heritage list.	Within 2 years	Low
	HC2.2. Interpret old tram line near the Spit Bridge to signify historical past.	Within 2 years	Low
HC3 Increase community awareness of the significance of Aboriginal, natural and cultural heritage through adequate signage.	**HC3.1.** Organise awareness campaign to highlight heritage conservation including heritage talk to school children	On-going	Medium
	HC3.2. Develop management guidelines for sites that are located within private properties.	Within 3-4 years	Medium

*After adoption of the EMP

DETAILS OF MANAGEMENT OPTIONS

Objective
HC 1 Ensure that all 22 sites of Aboriginal heritage significance are properly identified, recorded and protected under the applicable State and Federal legislations

HC1.1 Review Aboriginal Site Management Report for Manly Council (2006) and associated reports to prioritize management needs and develop a plan of implementation.

Context: *The Aboriginal Heritage office (AHO) has prepared the Aboriginal Site Management Report (2006) for Manly Council. This report has been reviewed. While 9 sites are in good to reasonable condition, others show signs of degrees of degradation because of exposure to external uses. Two of the sites are located on the Manly Scenic Walkway. This report has been used to prioritize management needs. An annual Sites Works Program 2007 has been prepared.*

Action: *The option involves continuation of Aboriginal site management through formulation of Works program. Consult and maintain liaison and seek approval with the Metropolitan Aboriginal Lands Council and Aboriginal Heritage Office.*

Objectives addressed: *HC1*
Addressing actions under Manly Council's MSS 2006: *D2.2.5 – implement management plan for Aboriginal heritage*

Performance Target: *Prioritisation done*
Indicative Cost: *Staff time*
Time Frame: *On-going*
Responsible Agency: *AHO, Manly Council – Planning & Strategy*
Priority: *Medium*

HC1.2. Install boardwalk type structures where MSW bisects Aboriginal midden at Sandy Bay.

Context: *The Manly Scenic Walkway (MSW), opened in 1988, is one of the key attractions of the study area. It is also one of the popular destinations of visitors. Walkers are able to contrast the modern harbourside suburbs juxtaposed with Aboriginal sites, specially middens. Of the* recorded 22 Aboriginal sites within the study area (personal communication, AHO). 16 are middens. One of them is located near Sandy Bay in the middle of Manly Scenic Walkway and is badly eroded. In order to protect this midden, there is need also to realign MSW or take alternative measures. In this case realignment is not possible.

Actions:
Conservation effort is already included in Aboriginal Sites Works Program 2007 (AHO 2007). The plan includes upgrading of track and viewing area.

- *Assist AHO in implementation*
- *Revise interpretive signage*

Objectives addressed: *AC2, HC1*
Performance Target: *Boardwalk installed*
Indicative Cost: *- (as already completed)*
Time Frame: *Immediate*
Responsible Agency: *AHO, Manly Council – Parks & Reserves*
Priority: *High*

HC1.3. Prevent damage to Aboriginal middens in critical condition.

Context: *Of the 22 Aboriginal sites within the study area, 16 are open middens and/or shelters with middens. Shell middens are places where the debris from eating shellfish and other food has accumulated over time and may contain: shellfish remains, bones of fish, birds, and land and sea mammals used for food, charcoal from campfires and tools made from stone, shell, and bone. Estuarine and coastal middens tend to be larger than riverbank middens.*

Many of the middens are in critical condition. Aboriginal Site Management Report (2006) for Manly Council has recorded conditions of each midden. At places, dinghies are stored on Aboriginal middens.

Actions: *The option involves supporting AHO in site conservation through Annual Works Program. In fact, Aboriginal Sites Works Program 2007 (AHO 2007) has listed five midden sites within the study area for conservation efforts: one at Sangrado Reserve and four at Fisher Bay. Boardwalk is being considered for middens on or beside Manly Scenic Walkway.*

The option HC1.2 describes protection measure of a midden at Fisher bay.

Consult and maintain liaison and seek approval with the Metropolitan Aboriginal Lands Council and Aboriginal Heritage Office.

Objectives addressed: *HC1*
Performance Target: *Physical protection done*
Indicative Cost: *$40,000*
Time Frame: *On-going*
Responsible Agency: *AHO, Manly Council – Planning & Strategy, Urban Services, Parks & Reserves*
Priority: *High*

HC1.4. Confirm and prepare a number of Aboriginal sites suitable for public visitation.

Context: *Outdoor education programs can champion ecological sustainability through activities which demonstrate and build respect for places of natural and cultural significance.*

Many sites have spiritual and cultural significance for Aboriginal people. Some of these sites can be developed for public visitation so that rich Aboriginal heritage and history are understood and appreciated. Recently, AHO has identified some of these sites.

Actions: *The following actions are proposed*

- *Confirm identified sites are suitable for public education*
- *Prepare easy and protective access to selected sites*
- *Prepare interpretative booklets*
- *Place signage encouraging behaviors which support sustainable heritage management.*

Consult and maintain liaison and seek approval with the Metropolitan Aboriginal Lands Council and Aboriginal Heritage Office.

Objectives addressed: *EU4, HC1, HC3*
Performance Target: *Public visitation initiated on selected sites*
Indicative Cost: *$6,000*
Time Frame: *On-going*
Responsible Agency: *AHO, Manly Council – Planning & Strategy*
Priority: *Medium*

Objective
HC2 Ensure that all sites of natural and cultural heritage are identified and registered under the relevant legislation and in Council planning instruments

HC2.1. Assess heritage significance of 'Laura Street Wharf' and propose its inclusion in the heritage list.

Context: *There is remnants of a 1906 wharf located off Laura Street, Seaforth (Figure a). As the record goes, "In 1906 Henry Halloran envisaged a ferry service to the city from a wharf at the bottom of stairs that go down from Seaforth Crescent alongside Laura Street. It is shown on the 1906 Seaforth subdivision plan as "under construction" (Figure b). "It will not take Seaforth long to have a fleet of regular ferry steamers equal to Manly's", stated Halloran's publicity." The ferry did not eventuate.*

The site is protected by its inclusion in the Harbour and Foreshores in the Manly LEP. However, the site is not listed individually.

Figure a. Remnants of Laura Street Wharf (08/08/2007)		**Figure b: Laura Street Ferry Wharf as shown in 1906 Seaforth Subdivision Plan**
		

Action: *The option involves assessment of heritage significance and possible inclusion as an individual heritage iten within the Manly LEP.*

Objectives addressed: *HC2*
Performance Target: *Assessment made*
Indicative Cost: *Staff time*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *Manly Council – Planning & Strategy*
Priority: *Low*

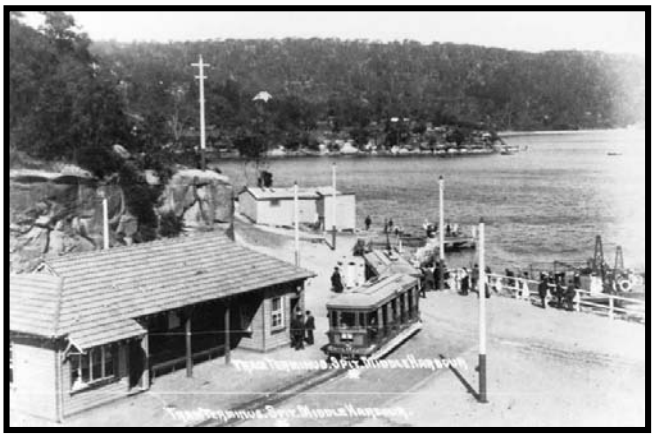
HC2.2. Interpret old tram line near the Spit Bridge to signify historical past.

Context: Trams were important means of transport in Manly LGA. The tramline was opened in 1911 and remained operational till 1939. Part of its permanent way is still evident. Some ballast that the track was laid on can still be seen near the end of Manly Scenic Walkway. It is proposed to interpret part of the track using paving, tram line, photos and other materials. This will become an attraction of the area with both historical and educational values.

Actions:

- *Establish a board with photo and historical notes*

- *Organise an opening ceremony during Heritage Week*
- *Prepare interpretative booklet*
- *Implement*



Objectives addressed: *EU4, HC2, HC3*
Performance Target: *Photo board established*
Indicative Cost: *$5,000*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *Manly Council – Planning & Strategy*
Priority: *Low*

Objective
HC3 Increase community awareness of the significance of Aboriginal, natural and cultural heritage through adequate signage

HC3.1. Organise awareness campaign to highlight heritage conservation including heritage talk to school children

Context: *There is a range of activities already being carried out in the region to promote Aboriginal heritage and culture. From the annual Guringai Festival to a local council training course, to a sign on a track visited by tourists, Aboriginal heritage is being increasingly highlighted. A large proportion of the education and training programs conducted by the AHO are held outdoors on guided walks. Awareness campaign can be based on Aboriginal Heritage Promotion (AHO 2007).*

Actions: *The option involves assisting AHO in continued awareness campaign.*

Objectives addressed: *HC3*
Addressing actions under Manly Council's MSS 2006: *D2.2.9 – Increase community awareness*

Performance Target: *Regular campaign organised*
Indicative Cost: *$25,000*
Time Frame: *On-going*
Responsible Agency: *AHO, Manly Council – P&S, CEP*
Priority: *Medium*

HC3.2. Develop management guidelines for heritage sites that are located within private properties.

Context: *Two of the 22 Aboriginal sites are located on private properties within the study area and many more within Manly LGA. One of the management options is to sign Voluntary Conservation Agreements. This will facilitate permanent protection of areas of Aboriginal sites and historic places. Agreement is registered on property title & continues with change of ownership. The Agreement is usually supported with providing assistance to landholders with local Government rate relief, state land tax concessions and financial assistance for on ground works*

Actions: *AHO can be encouraged to prepare management guidelines for these sites. Consult and maintain liaison and seek approval with the Metropolitan Aboriginal Lands Council.*

Objectives addressed: *HC1, HC3*
Performance Target: *Guidelines prepared*
Indicative Cost: *$15,000*
Time Frame: *To be implemented within 3-4 years*
Responsible Agency: *AHO*
Priority: *Medium*

4.10 OPTIONS ADDRESSING MONITORING

Monitoring is a critical component of estuary management. When used for management purposes, monitoring provides an on-going picture of the health and response of the estuary, e.g. water quality levels, species and numbers of fauna, area and productivity of seagrass beds etc. Estuarine monitoring programs can be involved and quite expensive. Hence to obtain the best value from monitoring program, monitoring objectives have to be carefully defined. Further, monitoring results need to be continuously reviewed during the program to facilitate program modification, if needed. Data compiled in the Estuary Process Study provides the baseline for subsequent monitoring.

Goal

Measure the condition and usage of the estuary to gauge the effectiveness of the Estuary Management Plan in achieving its goal and management objectives

A total of six management options are proposed addressing four different objectives. Of these, one has been rated as of high and the remaining five as medium priority management options. One is proposed for immediate implementation.

Objectives	Strategic Management Options	Implementation timeframe*	Priority
MO 1 Develop and implement a Monitoring Program (including key indicators) to assess improved management of the estuary	**MO1.1.** Develop a comprehensive monitoring program including key indicators and mechanisms of monitoring in consultation with relevant organisations.	Within 2 years	Medium
	MO1.2. Monitor the environmental health of the estuary, including water quality, erosion/accretion, bush lands, ecological diversity and abundance.	Within 2 years	High
MO2 Monitor the public usage of Clontarf/Bantry Bay estuary and its surrounds.	**MO2.1.** Monitor use of the Manly Scenic Walkway.	Immediate	Medium
	MO2.2. Monitor the use of waterways at different points of the estuary.	Within 2 years	Medium
MO3 Assess possibility of establishing participatory monitoring by the community	**MO3.1.** Establish participatory monitoring and encourage community participation	Within 2 years	Medium
MO4 Update, refine and revise the Estuary Management Plan.	**MO4.1.** Review monitoring results and revise/update management options.	Within 3-4 years	Medium

*After adoption of the EMP

DETAILS OF MANAGEMENT OPTIONS

Objective
MO 1 Develop and implement a Monitoring Program (including key indicators) to assess improved management of the estuary

MO.1.1. Develop a comprehensive monitoring program including key indicators and mechanisms of monitoring in consultation with relevant organisations.

Context: *Monitoring is a critical component of both estuary management in general and estuary process modeling in particular. When used for management purposes, monitoring provides an on-going picture of the health and response of the estuary e.g. water quality levels, species diversity, seagrass beds etc. To obtain the best value from estuarine monitoring programs, monitoring objectives have to be carefully defined before monitoring operations commence. Further, monitoring results need to be continuously reviewed during the program to facilitate program modification. It is customary to prepare an M&E (Monitoring & Evaluation) Program report describing parameters, indicators, mechanisms including frequency and agency responsible.*

Actions:

- *Prepare M&E Program report*
- *Ensure wider participation and acceptance by different agencies and interest groups*
- *Establish collaborative MoUs with other agencies to undertake monitoring program*
- *Implement*

Objectives addressed: *MO1, MO2, MO3*
Addressing SMCMA targets: *Management target C3.1 – resource condition indicators*

Performance Target: *M& E Program Report prepared*
Indicative Cost: *$30,000*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *Manly Council – NR, Environmental Health*
Priority: *Medium*

MO.1.2. Monitor the environmental health of the estuary, including water quality, erosion/accretion, bush lands, ecological diversity and abundance.

Context: *Based on the M&E Report (option 10.1.1), monitor the environmental health of the estuary.*

Actions: *In order to monitor environmental health of the estuary, the following parameters will require on-going monitoring:*

Water quality
Water quality monitoring will need to include a basic suite of physico-chemical parameters, including nutrients, as well as chlorophyll-a (a proxy for algal growth) and toxicants, such as metals. Supplementary monitoring programs assessing the phytoplankton (algae) / zooplankton relationships within Bantry Bay estuary could also be carried out, subject to funding constraints and relevant research opportunities. In addition to water quality, bacterial monitoring (i.e. faecal coliforms and enterococci) will also be required at all designated swimming areas. This is mostly covered already by the DECC Harbourwatch program. Council could also consider monitoring for faecal sterols, which is proving to be a good indicator of faecal contamination and may be a better proxy for the viruses and pathogens that pose a risk to human health. Further testing should be undertaken to determine the origins of faecal contamination of the waterway (i.e., whether from humans or animals) in order to better tailor future management options.

Stormwater around Manly is being monitored via automated stormwater samplers that have been installed in each catchment to target key pollutants of concern. These pollutants drain into and affect Burnt Bridge Creek, Manly Lagoon and Manly Beach. Information gathered by the automated stormwater samplers helps Council to understand how we can continually improve the quality of our waterways and what areas are hot spots needing more attention.

Sediments
Sediments are unlikely to change very rapidly, so monitoring of sediments can occur on a more infrequent basis. Sediments will need to be monitored for:

- *Rate of accumulation (siltation);*

- *Rate of runoff from the catchment (which can be determined by the capture rates of gross pollutant traps (GPTs) and other silt trapping devices);*
- *Toxicants;*
- *Organic and inorganic nutrients (and associated release to the water column).*

Sites of foreshore erosion will also need to be monitored to determine the rate of foreshore recession, and once remediated, to ensure that erosion processes are not continuing to degrade the foreshore.

Ecology

Habitat structure, along with species composition (diversity and abundance) will need to be monitored on a periodic basis. Again, this is unlikely to change rapidly, so monitoring can be relatively infrequent.

Similarly, short term changes in the location and extent of mudflats, sand spits and mangroves will need to be monitored to ensure that appropriate management actions are implemented to maintain a balance between estuarine habitat types. Of particular importance is the extent of Caulerpa taxifolia within the Middle Harbour estuary and adjoining waterways, and as such, more frequent monitoring of this species will be required, particularly in regard to its effects upon seagrasses habitat.

The timescale for the monitoring of the above will vary for each, from every few weeks (for bacteria I the summer swimming season) to every few years (for sedimentation rates, ecological communities and estuary usage). A detailed monitoring program will need to be developed for each, based on the objectives for monitoring and the budgetary allowances for each. It is possible that some of the longer interval ecological and social monitoring could be carried out by researchers (e.g. universities). Monitoring of other parameters may be addressed through broader state-wide programs, such as the DECC Harbourwatch program.

Objectives addressed: *WQ1, WQ2, WQ3, WQ4, WQ5, AH4, TH2, SE2, HR2, MO1*
Addressing SMCMA targets: *Management target C3.1 – resource condition indicators; C3.2 – collation of local NRM data and information*
Addressing actions under Manly Council's MSS 2006: *C1.1.6 – Continue water quality monitoring*

Performance Target: *Monitoring initiated and continued*
Indicative Cost: *$130,000*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *Manly Council – Environmental Health, NR, Parks & Reserves*
Priority: *High*

Objective
MO2 Monitor the public usage of Clontarf/Bantry Bay estuary and its surrounds

MO2.1. Monitor use of the Manly Scenic Walkway.

Context: *The Manly Scenic Walkway (MSW), opened in 1988, is one of the key attractions of the study area. It is also one of the popular destinations of visitors. Encompassing panoramic views of the majestic entrance to Sydney Harbour and swathes of bushland, walkers are able to contrast the old and new Australia as they pass by modern harbourside suburbs juxtaposed with Aboriginal sites, native coastal heath and pockets of sub-tropical rainforest. In order to enhance its use value, the Manly Scenic Walkway is comprised of a number of connecting walks, with walking grades to suit everyone. However, there is no information available about use of the walkway. It is proposed to initiate a monitoring program to assess use of the MSW.*

Actions:

- *Monitor the use of Manly Scenic Walkway at different sections during different days, time of the week and of the season.*
- *Use volunteers to carry out the survey*

- *Analyse the results to schedule and upgrade maintenance*
- *To estimate economic value of the MSW.*

Objectives addressed: *AC2, MO2*
Performance Target: *Monitoring initiated & continued*
Indicative Cost: *$10,000*
Time Frame: *Immediate*
Responsible Agency: *Manly Council – Parks & Reserve*
Priority: *Medium*

MO2.2. Monitor use of waterways at different points of the estuary.

Context: *The Middle Harbour is one of the scenic waterway in NSW. It is one of the popular destinations of boat owners and users. Non-motorised boating activities such as sailing, rowing, kayaking, windsurfing and canoeing are popular activities in the study area. Kayaking is increasing in popularity as an individual pastime and as a commercial recreation activity. The use of non-motorised vessels provides access for water-based sightseeing and nature appreciation without the intrusive sounds and smells associated with motorised vessels. However, there is no information available about use of the waterway. It is proposed to initiate a monitoring program to assess use of the waterways.*

Actions:

- *Monitor the use of Middle Hourbour waterway at different sections during different days, time of the week and of the season.*
- *Use volunteers to carry out the survey*
- *Analyse the results to schedule and upgrade maintenance and safety*
- *To estimate economic value of the waterway.*

Objectives addressed: *EU2, EU3, FI2, FI3, MO2*
Performance Target: *Monitoring initiated & continued*
Indicative Cost: *$9,000*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *Manly Council- CEP, NSW Maritime,*
Priority: *Medium*

Objective
MO3 Assess possibility of establishing participatory monitoring by the community

MO3.1. Establish participatory monitoring and encourage community participation.

Context: Open and meaningful community participation in planning and decision making on the management of estuary can contribute to the social, economic and ecological health of estuary systems. This option seeks to achieve this goal by identifying ways in which a wide sense of community ownership and involvement in estuary issues, and responsibility for them can be encouraged throughout study area. Involvement of Precincts is seen as important entry point in establishing participatory monitoring.

Actions:

- Discuss with the Precincts about the concept of participatory monitoring to identify community support.
- Establish and agree on a modality including monitoring sites and reporting format.
- Encourage community participation in result analysis, interpretation and management measures

Objectives addressed: *WQ7, AH8, TH5, HC3, MO3*

Addressing actions under Manly Council's MSS 2006: *C1.3.16 – Encourage community involvement*

Performance Target: *Participatory monitoring initiated*
Indicative Cost: *$5,000*
Time Frame: *To be implemented within 2 years*
Responsible Agency: *Manly Council- CEP, MEC*
Priority: *Medium*

Objective
MO4 Update, refine and revise the Estuary Management Plan

MO4.1. Review monitoring results and revise/update management options.

Actions: *Monitoring results will be reviewed every six months to gauge any changes in the estuary in the future, either positive or negative and to assess the success of implementation of this Plan, and if necessary, to justify modifications to actions being implemented.*

Objectives addressed: *MO1, MO2, MO4*
Addressing actions under Manly Council's MSS 2006: *C1.3.18 – Cyclic evaluation of the EMP*

Performance Target: *Results reviewed and management options revised*
Indicative Cost: *Staff time*
Time Frame: *To be implemented within 3-4 years*
Responsible Agency: *Manly Council - NR*
Priority: *Medium*

4.11 FUNDING REQUIREMENTS & SOURCES

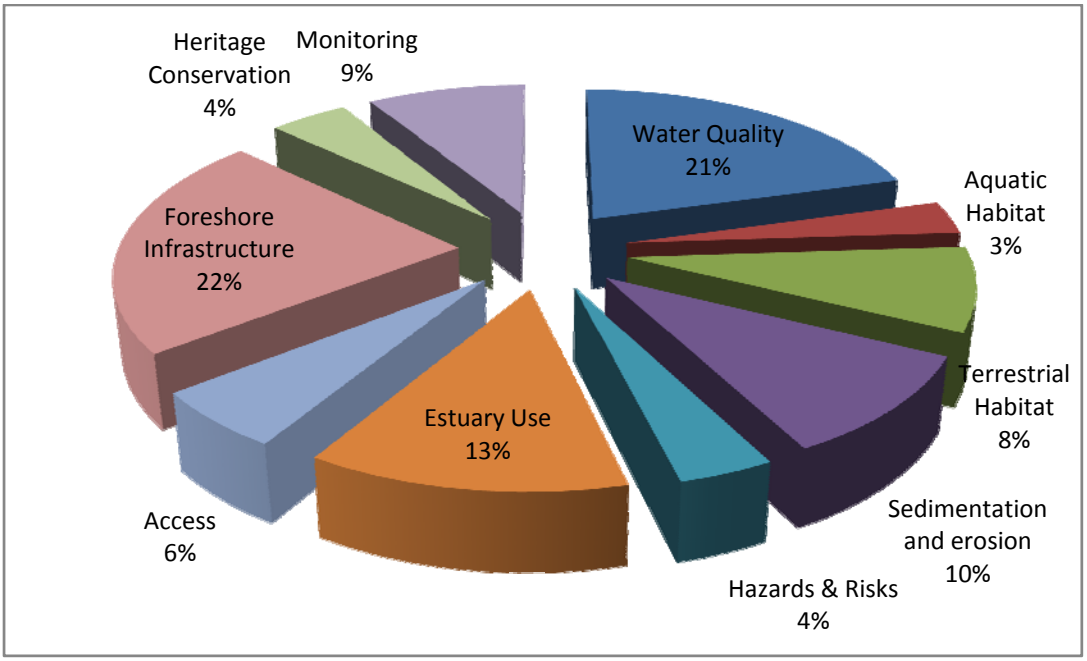
The total cost of implementing (including 1-5 years of operation and maintenance) the 85 management options addressing 10 key management issues is **$ 2,096,900**. A summary of estimated cost is presented in **Table 4.11**. However, cost of each management option is indicated with details for that individual option (Sections 4.1 -4.10).

Table 4.11: Summary of estimated cost

Management Issues	Number of Management Options	Estimated Cost ($)			
		High priority	Medium Priority	Low priority	Total
Water Quality	12	134,000	299,000	0	**433,000**
Aquatic Habitat	14	10,000	59,000	0	**69,000**
Terrestrial Habitat	10	0	175,000	0	**175,000**
Sedimentation & Erosion	3	210,000	0	0	**210,000**
Hazards & Risks	7	0	80,000	0	**80,000**
Estuary Use	13	55,000	210,000	0	**265,000**
Access	4	20,000	100,000	0	**120,000**
Foreshore Infrastructure	8	383,900	86,000	0	**469,900**
Heritage Conservation	8	40,000	46,000	5,000	**91,000**
Monitoring	6	130,000	54,000	0	**184,000**
	85	**982,900**	**1,109,000**	**5,000**	**2,096,900**

More than 50% of the total cost will be required to implement management options addressing foreshore infrastructure (22%), water quality (21%) and estuary use (13%) (**Fig 4.11**).

Fig 4.11: Cost allocations to address key issues



Funding schedule for the total estimated cost is:

Years	1	2	3	4	5	Total
$	560,500	513,500	425,800	415,800	181,300	2,056,900

Some actions require an on-going commitment from existing staff rather than the outlay of expenditure and this is noted as 'Time'. Some recommended actions require significant capital costs, especially where large-scale works are involved such as restoring collapsed swimming enclosure and foreshore protection structures.

As indicated elsewhere, implementation responsibility of all proposed management options rests with a number of agencies including Manly Council. Hence, adoption of this EMP does not commit Council to allocate immediate funding. Funding from different alternative sources will be pursued (**Annex C**). These include but are not limited to:

- Council's Environment Levy (subject to a budget bid process);
- Council's General Revenue Budget (subject to a budget bid process);
- State Government's Estuary Management Program (50% subsidy funding subject to a submission process);
- Natural Heritage Trust; and
- Other Commonwealth and State Government funded programs.

5. IMPLEMENTATION PLAN

5.1 COUNCIL MANAGEMENT PLAN

The Manly Plan is the key planning document driving the operations of Council. It is a rolling three year plan that identifies a range of objectives and strategies that Council will implement in providing programs, services and facilities to our community made up of those who live, work and visit Manly. The Manly Plan is the Management Plan for action to pursue sustainability across environmental, social and economic considerations. The management options of the this Estuary Management Plan will be implemented and mainstreamed in to the Manly Plan.

Each year, the Council allocates the organisation's annual expenditure to the five Principal Activities: governance, people & place, people services, infrastructure services and the environment, taking into account priorities identified in the various supporting Plans and Strategies and taking into account emerging issues, community feed back, advice from Manly Council's operational management, and progress towards the Manly Vision. Many program activities are on-going and are considered "core services". These operate on a continual improvement model and attract funding each year. Others are one-off initiatives which must compete competitively for funds based on merit. An exhaustive list of capital works programs are itemised as part of the budget section of the document.

The current plan is Manly Plan 2007 - 2010.

5.2 COLLABORATIVE PARTNERSHIPS

A number of state and other agencies have institutional mandate to address many issues covered under different management options. Agencies involved for each of management options are indicated in chapter 4. Manly Council, as being the main implementor of the EMP, can conclude collaborative partnership agreements with these agencies either specifically for this EMP or for overall LGA.

Manly Council signed a Memorandum of Understanding with Sydney Water entitled 'Manly Council and Sydney Water Partnership' in July 2000 to work together to achieve, within the framework of Total Catchment Management and Ecologically Sustainable Development, especially in relation to water quality monitoring and costing model, water conservation program, assett management on ocean beach – stormwater and sewer, infiltration and exfiltration program.

Similar agreements can be initiated with other agencies and neighbouring Councils (Mosman, Willoughby).

5.3 AGENCY RESPONSIBILITIES

Although Manly Council is the lead agency responsible for implementing the EMP, there will be several state Government and other agencies responsible for implementing specific management options, as per mandate of their activities. Agencies will have the main role for some and supportive role for others, as indicated in **Table 5.3a**.

Table 5.3a: Roles of different agencies in implementation of proposed management options

Agency	Management Options with Implementation Responsibilities	
	Main	Supportive
Manly Council*	WQ1.1#, WQ1.2, WQ1.3, WQ1.4, WQ2.1, WQ4.1, WQ4.2, WQ4.3, WQ4.4, WQ5.1, AH3.1, AH3.2, AH3.3, AH4.1, AH4.2, AH4.3, AH4.4, AH5.1, AH5.2, AH5.3, TH1.1, TH1.2, TH1.3, TH1.4, TH1.5, TH2.1, TH2.2, TH3.1, TH3.2, TH3.3, SE1.1, SE2.1, SE2.2, HR1.1, HR1.2, HR2.1, HR2.4, EU1.1, EU1.2, EU1.3, EU1.4, EU1.5,	WQ3.1, WQ3.2, AH1.1, AH1.2, AH2.1, AH2.2, HR1.3, HR2.2, HR2.3, EU2.3, AC3.1, FI1.2, FI2.1 HC1.1, HC1.2, HC1.4, HC3.1 TH3.3, HC3.1,

Agency	Management Options with Implementation Responsibilities	
	Main	Supportive
	EU1.6, EU2.1, EU2.4, EU2.5, EU3.1, AC1.1, AC1.2, AC2.1, AC3.2, FI3.1, FI3.2, FI4.1, FI5.1, FI5.2, HC1.3, HC2.1, HC2.2, MO1.1, MO1.2, MO1.3, MO2.2, MO3.1, MO4.1,	
NSW Maritime*	AH1.2, EU2.2, EU2.3, AC3.1, FI1.1, FI1.2, FI2.1	AH2.1, EU1.6, EU2.1, AC3.2, MO2.2
NSW DPI*	AH1.1, AH2.1, AH2.2, AH4.4, EU1.6, EU3.2	AH1.2, AH3.1, AH3.2, AH3.3, AH4.1
DECC*	WQ3.1	AH4.1, AH4.2,SE1.1, HR2.2, HR2.3
Sydney Water	WQ2.1, WQ3.2	WQ3.1, WQ4.4,
DWE	-	WQ4.1
SCCG	HR2.2, HR2.3	AH2.1, AH2.2, AH5.2, TH 1.4, HR2.1, EU3.1, EU3.2, FI1.1
AHO*	HC1.1, HC1.2, HC 1.3, HC1.4, HC3.1, HC3.2	
SMCMA	-	WQ4.4, AH1.2, AH2.1, AH2.2, AH3.3, AH4.1, HR1.2, FI1.1
SES	HR1.3	
RTA		FI5.2

* Members of the Clontarf/Bantry Estuary Management Working Group and participated in the development of the EMP
# WQ = Water Quality, AH = Aquatic Habitat, TH = Terrestrial Habitat, SE = Sedimentation & Erosion, HR = Hazards & Risks, EU = Estuary Use, FI = Foreshore Infrastructure, AC = Access, HC = Heritage Conservation and MO = Monitoring

Within Manly Council, different Divisions/Branches of Council will share responsibilities for implementing specific management options. These responsibilities have also been identified (**Table 5.3b**).

Table 5.3b: Roles of different Divisions/Branches within Manly Council in implementation of proposed management options

Division	Branch	Management Options with Implementation Responsibilities	
		Main	Supportive
Corporate Planning & Strategy	Natural Resources	WQ1.1#, WQ1.2, WQ1.3, WQ2.1, WQ4.1, WQ4.2, AH4.1, AH4.2, AH5.1, SE1.1, SE2.1, SE2.2, HR1.1, HR2.1, EU1.4, MO1.1, MO4.1	WQ1.4, WQ3.1, WQ3.2, WQ4.3, AH1.1, AH1.2, AH2.1, AH2.2, AH5.3, HR1.2, HR1.3, HR2.2, HR2.3, EU1.3, EU1.5, EU2.1, EU2.3, EU3.1, FI1.2, MO1.2
	Parks & Reserve	AH3.1, AH3.2, AH3.3, TH1.1, TH1.2, TH1.3, TH1.4, TH1.5, TH2.1, TH2.2, TH3.1, TH3.2, TH3.3, EU1.1, AC1.1, AC1.2, MO1.3	EU 1.5, HC1.2, HC1.3, MO1.2
	Urban Services	WQ1.4, HR1.2, FI3.1, FI3.2, FI4.1, FI5.1, FI5.2, HC2.2	WQ1.3, AH5.3, SE2.1, SE2.2, HR1.1, FI2.1, HC1.3

Division	Branch	Management Options with Implementation Responsibilities	
		Main	Supportive
	Planning & Strategy	HR2.4, AC2.1, AC3.1, HC2.1, HC2.2	HC1.1, HC1.4, HC1.3, HC3.1
	Design & Technical	EU1.5	
Environmental Services	Community & Environmental Partnership Branch	WQ4.3, WQ4.4, WQ5.1, AH4.3, AH4.4, EU1.3, EU1.6, EU2.1, EU2.5, MO2.2, MO3.1	TH3.3, HC3.1,
	Standards & Compliance	MO1.2	MO1.1
	Waste	EU1.2, AC3.2	
Civic Services		AH5.2, AH5.3	WQ1.4, HR1.3

WQ = Water Quality, AH = Aquatic Habitat, TH = Terrestrial Habitat, SE = Sedimentation & Erosion, HR = Hazards & Risks, EU = Estuary Use, FI = Foreshore Infrastructure, AC = Access, HC = Heritage Conservation and MO = Monitoring

5.4 COORDINATION

Manly Harbour Foreshores Management Committee, restructured to accommodate a number of existing coastal/estuary management committees and working groups, serviced by the Coastal Management Team of Council will co-ordinate implementation of the EMP.

5.5 COMMUNITY INVOLVEMENT

Many of the management strategies adopted for Clontarf/Bantry Bay estuary offer opportunities for community involvement particularly activities such as revegetation projects, monitoring programs and environmental education, as well as general monitoring of plan implementation and effectiveness. Local groups are therefore encouraged to take an active position in the management of their estuary, to liaise regularly with the community representatives on the Estuary Management Working Group, and seek out opportunities wherever possible for community participation in implementation of the strategies adopted.

5.6 REPORTING MECHANISM

Reporting on the implementation of the plan through time is to be achieved through the three following mechanisms.

Harbour & Foreshore Committee
Manly Harbour Foreshores Management Committee, with which the Clontarf/Bantry Bay Estuary Management Working Group is attached, is the primary Committee responsible for overseeing the on-going implementation of the plan. To this end, the Estuary Management Officer should be required to produce an annual plan of action of projects and works for the Committee prior to the commencement of each financial year. These plans would take into account internal Council budget constraints and include the use of the prioritising process as detailed against each action. Regular meetings of the Committee will be held so that the on-going actions and any variations to the plan can be reported on. This way all key stakeholders represented on the Committee will be kept abreast of the on-going implementation of the programs.

Internal Council Reporting Processes
Reporting of the progress of the EMP should be included in Council's annual management plan and budget process cycles. In addition, the annual report to Council should detail all the actions completed or underway as

a result of the EMP. Outcomes of the on-going implementation of the estuary management program shall be reported in the Council's regular State of the Environment reports.

Reporting to the Community and other Stakeholders
The annual EMP reports to Council will be circulated to members of the estuary management working group and other relevant state or federal government agencies or authorities, including those agencies/groups responsible for potential grant funding. The report should also be posted on existing dedicated web page for interested members of the community. The Estuary Management Plan and all supporting documents and programs are already posted on this site.

5.7 PERFORMANCE EVALUATION

The Harbour Foreshore Committee will be responsible for directing the monitoring and review process. This process will assess the performance of the Estuary Management Plan and ensure it is continually updated and improved. A Monitoring & Evaluation Program, to be developed as per the EMP, will propose an integrated program showing the relationships between recommended actions, performance indicators to be monitored, data interpretation methodology, and targets for actions where baseline data is available. This detailed monitoring and review program shall be consistent with NRC (Natural Resources Commission) and Sydney Metropolitan CMA reporting protocols clearly defining estuary and management targets.

Triple Bottom Line (TBL) accounting, currently being used within the Manly Council, is the process of identifying, assessing and reporting business activities in terms of their impact on society, the environment and economic sustainability. This reporting process is based on continuous improvement, and Council aims to produce a good triple bottom line result today and to provide an even better result tomorrow. With the adoption of the updated Manly Sustainability Strategy in 2006, Council is undertaking a full review of our current TBL reporting to further integrate the TBL process into Council operations to assist in improving the sustainability outcomes of operational decisions.

A standardised reporting format should be utilised on an annual basis to briefly evaluate the progress of the plan and the efficiency and effectiveness of management options implemented over each annual reporting period. The results of the monitoring program should become part of routine SoE reporting and also reported to the wider community via local media, Manly Councils' web page and Precinct newsletters.

This Clontarf/ Bantry Bay Estuary Management Plan is being processed through TBL reporting.

5.8 REVIEW OF PLAN

The Estuary Management Plan will be reviewed every 5 years. During the process, there will be a mechanism established to identify new issues and conflicts concerning the estuary management and ensure their incorporation into a revised plan. A program for the following 5 years will be developed by designating priority to any new actions and reassigning priority to the remaining actions. These programs are fed back into and form the revised EMP for the next 5 years.

The revised EMP will recognise any new innovations, knowledge in general or on climate change and variability in particular, decision support tools for management of the Clontarf/Bantry Bay estuary that may not have been available at the time of the initial plan development.

6. GLOSSARY

Sources:
[1] = Australian Government, Department of Environment & Heritage, 2007
[2] = OzEstuaries, 2006
[3] = Department of Natural Resources, 2006
[4] = Department of Environment & Climate Change, 2007

Accretion[2]	When average (small) swell waves deliver sediment back to the shoreline
Aeolian[2]	The erosion, transport, and deposition of material by wind, and work best when vegetation cover is sparse, or absent.
Benthic[2]	Pertaining to the seafloor (or bottom) of a river, coastal waterway, or ocean.
Catchment[2]	The area of land which collects and transfers rainwater into a waterway.
Corridor[4]	Lines of native vegetation connecting separate habitat areas that are essential for maintaining biodiversity. Corridors enable fauna to access larger habitats by encouraging mobility between areas. Corridors may also assist native plant species to spread and colonise new areas over time.
Diffraction[1]	The "spreading" of waves into the lee of obstacles such as breakwaters by the transfer of wave energy along wave crests. Diffracted waves are lower in height than the incident waves.
Estuary (definition 1)[3]	The tidal portions of river mouths, bays and coastal lagoons, irrespective of whether they are dominated by hypersaline, marine or fresh water conditions
Estuary (definition 2) [3]	a semi enclosed coastal body of water which has a free connection with the open sea and within which sea water is measurably diluted with fresh water derived from land drainage
Fetch[2]	The horizontal distance over which a wind blows in generating waves.
Flushing[2]	Exchange of water between an estuary or coastal waterway and the ocean.
Intertidal[2]	The environment between the level of high tide and low tide.
Mud[2]	Fine sedimentary material, typically comprising both inorganic (mineral) and organic material.
Organic Material[2]	Once-living material (typically with high carbon content), mostly of plant origin.
Refraction[1]	The tendency of wave crests to become parallel to bottom contours as waves move into shallower waters. This effect is caused by the shoaling process which slows down waves in shallower waters.
Seagrass[2]	Marine flowering plants which generally attach to the substrate with roots.
Seawalls[1]	Walls built parallel to the shoreline to limit shoreline recession.
Sediment Budget[1]	An accounting of the rate of sediment supply from all sources (credits) and the rate of sediment loss to all sinks (debits) from an area of coastline to obtain the net sediment supply/loss.

Semi-diurnal Tide[1]	Tides with a period, or time interval between two successive high or low waters, of about 12.5 hours. Tides along the New South Wales coast are semi-diurnal.
Shoreline Recession[1]	A net long term landward movement of the shoreline caused by a net loss in the sediment budget.
Spring Tide[2]	A tide greater than the mean tidal range. Occurs about every two weeks, when the Moon is full or new.
Storm Surge[1]	The increase in coastal water level caused by the effects of storms. Storm surge consists of two components: the increase in water level caused by the reduction in barometric pressure (barometric setup) and the increase in water level caused by the action of wind blowing over the sea surface (wind setup).
Swell Waves[1]	Wind waves remote from the area of generation (fetch) having a uniform and orderly appearance characterised by regularly spaced wave crests.
Turbidity[2]	The condition resulting from the presence of suspended particles in the water column which attenuate or reduce light penetration.
Wave Height[1]	The vertical distance between a wave trough and a wave crest.
Wind Waves[1]	The waves initially formed by the action of wind blowing over the sea surface. Wind waves are characterised by a range of heights, periods and wavelengths. As they leave the area of generation (fetch), wind waves develop a more ordered and uniform appearance and are referred to as swell or swell waves.

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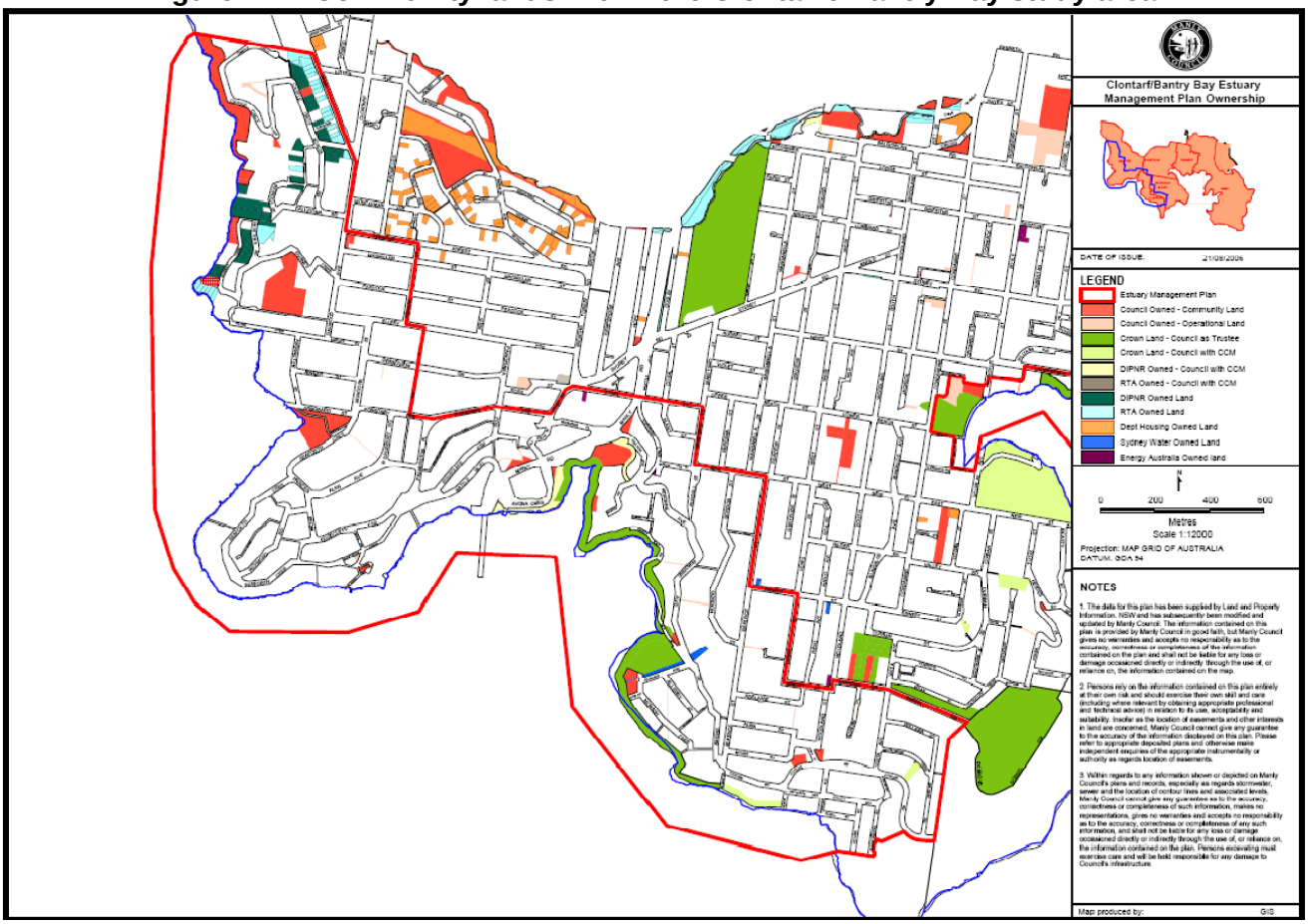
APPENDIX A: PLANS OF MANAGEMENT FOR COMMUNITY LANDS

Under the Local government Act 1993, a Council must classify Public land as either 'community' or 'operational'' land. Operational land has no special restrictionss other than those that may apply to any piece of land. Whereas community land is intended for public access and use and management is strictly governed in accordance with an adopted Plan of Management.

Figure A1 – Community lands within the Clontarf / Bantry Bay study area



Manly Council prepared, in 1996, Plans of Management (PoMs) for Community Lands fulfilling section 36 of the Local Government Act 1993. Parcels of community land for which PoMs exist are:

Title: Lot 55, DP 200638
Location: Castle Circuit, Seaforth
Description: Situated on the waterfront and has remnant of natual bushland
Owner: Manly Council
Area: 18460m^2
Category: Natural Area – Bushland & Foreshore
Ref. PoM: Bushland Reserves – Castle Circuit, Rignold St & Gurney Crescent

Title: Lot 1, DP 530015
Location: Rignold Street, Seaforth
Description: Situated on the waterfront and has remnant of natual bushland
Owner: Manly Council

Area: 1695m^2
Category: Natural Area – Bushland & Foreshore
Ref. PoM: Bushland Reserves – Castle Circuit, Rignold St & Gurney Crescent

Title: Lot 1, DP 610902
Location: Rignold Street, Seaforth
Description: Situated on the waterfront and has remnant of natual bushland
Owner: Manly Council
Area: 784m^2
Category: Natural Area – Bushland & Foreshore
Ref. PoM: Bushland Reserves – Castle Circuit, Rignold St & Gurney Crescent

Title: Lots 46-53, DP 11214
Location: Gurney Crescent, Seaforth
Description: Situated on the waterfront and has remnant of natual bushland
Owner: Manly Council
Area: 3250m^2
Category: Natural Area – Bushland & Foreshore
Ref. PoM: Bushland Reserves – Castle Circuit, Rignold St & Gurney Crescent

Title: Lot 88, DP 11214
Location: Gurney Crescent, Seaforth
Description: Reserve, underdeveloped condition, natural watercourse flowing from east to west
Owner: Manly Council
Area: 23100m^2
Category: Natural Area – Bushland
Ref. PoM: Gurney Crescent, Seaforth

Title: Lots 1 & 3, DP 508590
Location: Frenchs Forest Road, Seaforth
Description: Open Space, Public Reserve
Owner: Manly Council
Area: 670m^2
Category: General community use
Ref. PoM: Frenchs Forest Road

Title: Lot 183, DP 666691
Location: 267 Sangrado Road, Seaforth
Description: Public Reserve, Sangrado Park
Owner: Manly Council
Area: 291m^2
Category: Natural Area – Bushland, Watercourse and Foreshore, and General Community Use & Park
Ref. PoM: Sangrado Park

Title: Lot 1, DP 935966
Location: Sangrado Road, Seaforth
Description: Public Reserve, Sangrado Park
Owner: Manly Council
Area: 315m^2
Category: Natural Area – Bushland, Watercourse and Foreshore, and General Community Use & Park
Ref. PoM: Sangrado Park

Title: Lots 182 & 184, DP 4889
Location: Sangrado Road, Seaforth
Description: Public Reserve, Sangrado Park
Owner: Manly Council
Area: 10332m^2

Category: Natural Area – Bushland, Watercourse and Foreshore, and General Community Use & Park
Ref. PoM: Sangrado Park

Title: Lots 1 & 2, DP 430499
Location: Sangrado Road, Seaforth
Description: Public Reserve, Sangrado Park
Owner: Manly Council
Area: 3952m^2
Category: Natural Area – Bushland, Watercourse and Foreshore, and General Community Use & Park
Ref. PoM: Sangrado Park

Title: Lot 1, DP 231331
Location: Manly Road, Seaforth
Description: Manly Road Reserve
Owner: Manly Council
Area: 1880m^2
Category: General Community Use and Natural Area - Bushlands
Ref. PoM: Manly Road & Battle Boulevarde

Title: Lot 5, DP 25654
Location: Cutler Road, Clontarf
Description: Contains remnants of natural vegetation and landform
Owner: Manly Council
Area: 1720m^2
Category: Natural Area - Bushland
Ref. PoM: Bushland Reserve – Cutler Road

Title: Lot 9, DP 25439
Location: Cutler Road, Clontarf
Description: Contains remnants of natural vegetation and landform
Owner: Manly Council
Area: 986m^2
Category: Natural Area - Bushland
Ref. PoM: Bushland Reserve – Cutler Road

Title: Lot PT61, DP 9745
Location: Peronne Avenue, Clontarf
Description: steeply sloping area and vegetation comprising native species
Owner: Manly Council
Area: 890m^2
Category: Natural Area – Foreshore and Park
Ref. PoM: Clontarf Park

Title: Lot A, DP 434649
Location: Monash Crescent, Clontarf
Description: grassed to the edge of the sanddunes with scattered trees, on the foreshore
Owner: Manly Council
Area: 1638m^2
Category: Natural Area – Foreshore and Park
Ref. PoM: Clontarf Park

Title: Lot 1, DP 5190653
Location: Monash Crescent, Clontarf
Description: grassed to the edge of the sand dunes with scattered trees, on the foreshore
Owner: Manly Council
Area: 1119m^2
Category: Natural Area – Foreshore and Park

Ref. PoM: Clontarf Park

Title: Lot 57, DP 9745
Location: Monash Crescent, Clontarf
Description: grassed to the edge of the sand dunes with scattered trees, on the foreshore
Owner: Manly Council
Area: 626m^2
Category: Natural Area – Foreshore and Park
Ref. PoM: Clontarf Park

Title: Lot 37, DP 9521
Location: Avona Crescent, Seaforth
Description: small areas of bushland in the vacinity of Fisher Bay
Owner: Manly Council
Area: 474m^2
Category: Natural Area – Bushland, Foreshore
Ref. PoM: Fisher Bay Area

Title: Lot 1, DP 121585
Location: Linkmead Avenue, Clontarf
Description: urban bushlands, not developed
Owner: Manly Council
Area: 9163m^2
Category: Natural Area – Bushland, Foreshore
Ref. PoM: Fisher Bay Area

Title: Lot 2, DP 231330
Location: Heaton Avenue, Clontarf
Description: urban bushlands, not developed
Owner: Manly Council
Area: 1391m^2
Category: Natural Area – Bushland, Foreshore
Ref. PoM: Fisher Bay Area

Title: Lot 21, DP 614938
Location: Linkmead Avenue, Clontarf
Description: urban bushlands, not developed
Owner: Manly Council, resumed for public recreation Gov. Gaz 25/7/1980 Fol 3867
Area: 1090m^2
Category: Natural Area – Bushland, Foreshore
Ref. PoM: Fisher Bay Area

Title: Lot 2, DP 249261
Location: Laura Street, Seaforth
Description: cleared area adjacent to road
Owner: Manly Council
Area: 550m^2
Category: Park, Natural Area – Bushland, Foreshore
Ref. PoM: Laura Street Reserve and Wharf

Title: Lot 22A, DP 4889
Location: Laura Street, Seaforth
Description: Laura street wharf
Owner: Manly Council
Area: 152m^2
Category: Park, Natural Area – Bushland, Foreshore
Ref. PoM: Laura Street Reserve and Wharf

Parcels of community land for which no PoMs exist:

Title: Lot 103, DP 1047595
Location: 65 Rignold Street, Seaforth
Description: Open Space, Reserve, situated on the waterfront and has remnant of natual bushland
Owner: Manly Council
Area: 1453m^2

Title: Lot 105, DP 1048038
Location: Rignold Street, Seaforth
Description: Open Space, Reserve, situated on the waterfront and has remnant of natual bushland
Owner: Manly Council
Area: 379m^2

Title: Lot 3, DP 1110862
Location: Gurney Crescent, Seaforth
Description: Situated on the waterfront and has remnant of natual bushland
Owner: Manly Council, acquired in DIPNR subdivision, Registered 19/4/2007
Area: 1346m^2

Title: Lot 108, DP 1093218
Location: JAF Fenwick Park, Castle Crescent, Seaforth
Description: Park
Owner: Manly Council, acquired in DIPNR subdivision 9/6/2006
Area: 1180m^2

Title: Lot 9, DP 200638
Location: 7 Sandra Place, Seaforth
Description: Reserve
Owner: Manly Council
Area: 607m^2

Title: Lot 50, DP 817267
Location: Frenchs Forest Road, Seaforth
Description: Open Space, Public Reserve
Owner: Manly Council
Area: 477m^2

APPENDIX B: MANAGEMENT AGENCIES

Manly Council
Manly Council (MC) is the principal management agency of this plan.

Manly Council was incorporated as a local government body on 6th January, 1877. Manly Council is a statutory body deriving authority from the Local Government Act 1993 and other Acts enacted by the Parliament of New South Wales. The Council does not have the power to make decisions outside the legislation by which it derives its authority.

Council is responsible for the overall management of the Local Government Area (LGA) and enforcing the requirements of the NSW Local Government Act 1993, Environmental Planning and Assessment Act 1979 and the Crown Lands Act 1989 (where Council has care and control).

Manly Council is run by 12-member elected Councillors headed by the Mayor. The Council is supported by the executive General Manager and staff.

Manly Council is committed to community consultation, a key component of which is the committee-based Precinct Community Forums system. The forum approach was introduced in 1990 to extend the involvement of the community through coordinated consultation and participation. The aim is to involve all property owners, residents and workers in the decisions which affect their local area. Precinct Community Forums are groups of people who live, work or own property in a Precinct area. There are 12 Precinct Community Forums in the Manly Council area and Precinct meetings are held monthly.

Another operational arm of the Council is various issue or topic based Committees and Working Group. They meet as and when needed or at various frequencies.

MC has for many years undertaken remedial and maintenance works to enhance the estuarine environment. In recent years the emphasis has been on understanding the functioning of the coastal and estuary catchments as an integrated ecosystem. The completion of the estuary processes study and estuary management study was a significant step in the move towards holistic management.

Department of Environment & Climate Change (DECC)
The Department of Environment and Climate Change (DECC) is building on the strengths and cultures of its constituent agencies by combining knowledge, innovation, regulatory and field experience to tackle priority environmental, climate change, natural resource and cultural heritage issues for NSW.

DECC provides financial and technical assistance to councils to help develop and implement sustainable estuary management plans through the Estuary Management Program. The Program commenced in 1992 to assist local government to better manage estuaries through a strategic process outlined in the NSW Estuary Management Manual.

The Environment Protection Authority (EPA), which forms part of the Department of Environment and Climate Change NSW, is responsible for administering the Protection of the Environment Operations Act 1997 (POEO Act). An important EPA function is the issuing of environment protection licences, an essential tool for controlling the impacts of pollution on the NSW environment.

The NSW National Parks and Wildlife Service (NPWS), which also forms part of the NSW Department of Environment & Climate Change, is responsible for protecting the State's flora and fauna, and for managing and maintaining National Parks and Nature Reserves. The NPWS is also responsible for Aboriginal Heritage and sites.

NSW Department of Primary Industries
NSW Department of Primary Industries acts to foster profitable and sustainable development of primary industries in New South Wales. The department was formed in July 2004 with the amalgamation of Mineral Resources NSW, NSW Agriculture, NSW Fisheries and State Forests NSW. One of the seven Divisions,

Agriculture and Fisheries Division, promotes industry and export development by working with industry to improve the sustainability and profitability of the agriculture and fisheries sectors. Manages the sustainability of the state's fisheries resources and conserves aquatic biodiversity.

The Division has jurisdiction over all fish and marine vegetation in all waters of the state (including all private and public waters and permanent and intermittent waters) extending to 3 nautical miles offshore (and to 80Nm offshore in those fisheries for which it has jurisdiction under the Offshore Constitutional Settlement). This means that it has management responsibility for all aquatic animals (with the exception of aquatic mammals, reptiles, amphibians and birds, which are managed by the NSW Department of Environment & Climate Change) and responsibility for all marine vegetation and key aquatic habitats including seagrass, mangroves, gravel beds and snags. It has also management and research responsibilities related to threatened fish species, populations and ecological communities.

While DPI (Fisheries) is responsible for the management of all aquatic animals, the department is a state government authority with limited on-the-ground staff to effectively regulate the management of aquatic environments. As a result Manly Council's rangers are presently licensed as DPI (Fisheries) officers to assist Fisheries with some of their on-the-ground 'localised' regulation functions.

NSW Maritime

NSW Maritime (formerly Waterways Authority) is a statutory State Government body classified by NSW Treasury as a non-budget dependent general government agency. NSW Maritime is a self-funding entity.

NSW Maritime is responsible for the on-water management of all NSW navigable waters, including coastal areas, estuaries, rivers, lakes and dams to three nautical miles offshore. On-water management responsibilities include the management of safety, the protection of the marine environment from degradation by vessels, the provision of waterways infrastructure for vessels, the licensing of vessel operators, commercial vessels, on-water events, and mooring management.

NSW Maritime is the government body which owns the seabed of Sydney Harbour, North Harbour and Middle Harbour and all related tidal bays, rivers and their tributaries. Under the *Ports Corporatisation and Waterways Management Act 1995* (PC&WM Act 1995) the Waterways Authority is the landowner of Sydney Harbour and its tributaries and therefore controls Sydney Harbour.

NSW Maritime is therefore responsible for management of waterways and the sea bed from mean high water mark (MHWM) seaward. As owner of the bed of Sydney Harbour, NSW Maritime is the consent and determining authority for a variety of water-based developments and activities. NSW Maritime is now also responsible for the investigation of on-water pollution incidents and issuing clean-up and prevention notices in relation to vessels (in navigable waters that are not required to have a pilot).

Department of Water & Energy

On April 27 2007, the Department of Water and Energy (DWE) was created, which incorporates most of the functions of the former Department of Energy, Utilities and Sustainability (DEUS) and the water-related functions of the former Department of Natural Resources as well as the Metropolitan Water Directorate from the former NSW Cabinet Office.

Some of the functions of the former DEUS, such as the Energy and Water Savings Funds and Action Plans have been transferred to the new Department of Environment and Climate Change. The Accredited Service Provider program was also transferred to the Office of Fair Trading.

Sydney Water

Sydney Water, a statutory State owned corporation, wholly owned by the New South Wales Government has three equal, principal objectives:

- to protect public health
- to protect the environment
- to be a successful business.

Sydney Water provides drinking water, recycled water, wastewater services and some stormwater services to more than four million people in Sydney, Illawarra and the Blue Mountains. Drinking water is sourced from a network of dams managed by the Sydney Catchment Authority, then treated and delivered to customers' homes and businesses by Sydney Water.

Sydney Water & Manly Council interact through an official partnership arrangement

Sydney Metropolitan Catchment Management Authority
The Sydney Metropolitan Catchment Management Authority (SMCMA) is a NSW Government agency responsible for the coordination and management of Sydney's natural resources. In Sydney, natural resources include land, rivers, estuaries and coastal systems. The SMCMA was established under the Catchment Management Authorities Act 2003. The SMCMA partners with 39 local councils in the metropolitan catchment as well as State and Federal Government departments.

Aboriginal Heritage Office
The Aboriginal Heritage Office is a joint initiative by Lane Cove, North Sydney, Manly, Warringah, Willoughby, Ku-ring-gai and Pittwater councils, in a progressive move to protect Aboriginal Heritage in these areas. Part of the work of the Aboriginal Heritage office is to monitor Aboriginal Sites on a day to day basis and long term management reports are developed to ensure their preservation and protection.

Another key role of the Aboriginal Heritage office is to give the Aboriginal people and non-aboriginal people an avenue of approach to discuss issues or concerns they may have. The office is in direct contact with the Metropolitan Local Aboriginal Land Council and its many resources.

An important part of the role is to communicate with school and other groups and teach children an ethos of understanding to appreciate the unique culture of the Aboriginal people. In association with the local councils, talks, walks and activities are planned to enhance appreciation of Aboriginal culture in the wider community. A selection of information leaflets on various Aboriginal Heritage topics are available to download.

APPENDIX C: FUNDING SOURCES

There is range of financial and technical assistance available to assist implementation of the Estuary Management Plan. The following descriptions of likely sources have been provided to assist Council and the Committee with the implementation process. Potential funding opportunities continue to be developed by State and Commonwealth agencies, particularly through their environmental programs.

The Australian **Federal Government** provides a range of funding opportunities for individuals and community organisations to address important natural resource issues at a local level.

The **Coastal Catchments Initiative (CCI)** is a national programme designed to improve and protect water quality in coastal water quality hotspots, by promoting competent water quality planning. It is the primary vehicle for delivering the Australian Government's commitment to achieving significant reductions in the discharge of pollutants to agreed water quality hotspots. The hotspots have been identified through agreement with the relevant jurisdictions. Rollout of the CCI, to be undertaken in collaboration with State agencies and Natural Resource bodies is through the development of water quality improvement plans for the coastal hotspots. For more info: http://www.environment.gov.au/coasts/pollution/cci/index.html

The **Local Adaptation Pathways Program** provides funding to help local governments build their capacity to respond to the impacts of climate change. The Australian Government will provide up to $50,000 to help councils undertake risk assessments and develop action plans to prepare for the likely local impacts of climate change. The funding will also help councils integrate climate change risk assessment into their broader decision-making processes. The process should align with that outlined in the Climate Change Impacts & Risk Management: A Guide for Business and Government publication

The **Community Water Grants**, funded out of the Australian Government Water Fund, help communities save and protect water resources through practical projects that will: improve water efficiency, recycle or reuse water and address surface and groundwater health. Funding is also available to local governments. A grant of up to $50,000 (GST inclusive) is available. A total of $200 million is available over five years through to 2009-10. For more info: www.communitywatergrants.gov.au

The Department of Agriculture, Fisheries and Forestry (DAFF) manages the **Recreational Fishing Community Grants Program** which supports local initiatives to enhance recreational fishing and tourism experiences, including: on-ground activities; education and awareness raising; and protecting near shore aquatic environments. Funding is also available to local governments. Funding of up to $100,000 (GST inclusive) is available per project. For more info: www.daffa.gov.au/fisheries/recreational/recfishinggrants

The **Threatened Species Network Community Grants Program** is a partnership between WWF-Australia and the Australian Government. Funding is available for on-ground activities to protect threatened species and ecological communities such as: habitat restoration, threat mitigation through weeding and feral animal control , monitoring and surveying species populations, fencing and fire management. Funding for individual projects is limited to a maximum of $50,000 (GST inclusive). A total of $500,000 is available each year. For more info: www.wwf.org.au/ourwork/species/tsn

The **National Landcare Program** is a longstanding program within the Department of Agriculture, Fisheries and Forestry which supports the landcare movement and the sustainable use and management of natural resources. The NLP encourages landholders to undertake landcare and related conservation works by supporting collective action by communities to sustainably manage the environment and natural resources. Landcare is also strong in regional towns and metropolitan centres. NLP funding continues until the end of 2011-12, although details of the delivery arrangements from 2008-09 to 2011-12 are being developed.

The **NSW State Government** also provides a range of funding opportunities for individuals and community organisations to address important natural resource issues at a local level.

Four programs are relevant to estuaries that provide funding assistance to Local Government generally on a 50% subsidy basis. Grant applications can be lodged at any time during the financial year.

A. The **Estuary Management Program** allows local communities to develop and implement their own plans to restore and protect estuaries. The program focuses on improving or maintaining the overall health and functioning of an estuary, and maintaining the environmental, economic, recreational and aesthetic values of the system. Since its introduction in 1992, the Estuary Management Program has provided almost $30 million in grants to 570 local projects across NSW. DECC has also provided more than technical support to more than 40 local councils, as well as collaborative research projects to improve our understanding of estuaries and their natural processes. The Department also conducts a long-term state-wide estuary monitoring program.

B. The **Waterways Infrastructure Development Program** provides technical advice and funding assistance for planning studies and works to improve the recreational amenity of the waterways such as boat launching ramps, public wharves and jetties, dredging, and foreshore amenities.

C. The **Coastal Management Program** provides technical advice, data collection and funding assistance for design and construction of works and measures that reduce the potential damage from coastal processes, works that conserve or improve beaches and public reserves and for coastal studies and coastline management plans.

D. The **Floodplain Management Program** provides technical advice, data collection and funding assistance on a varying subsidy basis. Activities subsidised include studies, mitigation works and other measures that reduce the impact of flooding and flood liability on existing owners and occupiers of flood liable land (existing problems) or ensure that future development is compatible with the flood hazard (potential additional problems).

Other relevant funding opportunities are:

The **NSW Climate Change Fund** was established in July 2007. This new program is currently being developed. It includes:

- $100 million Residential Rebate Program providing rebates for hot water systems, insulation and rainwater tanks
- $30 million NSW Green Business Program
- $30 million Public Facilities program
- $100 million Renewable Energy Development Program
- $100 million Recycling and Stormwater Harvesting Program
- $20 million School Energy Efficiency program
- $20 million Rainwater Tanks in Schools program

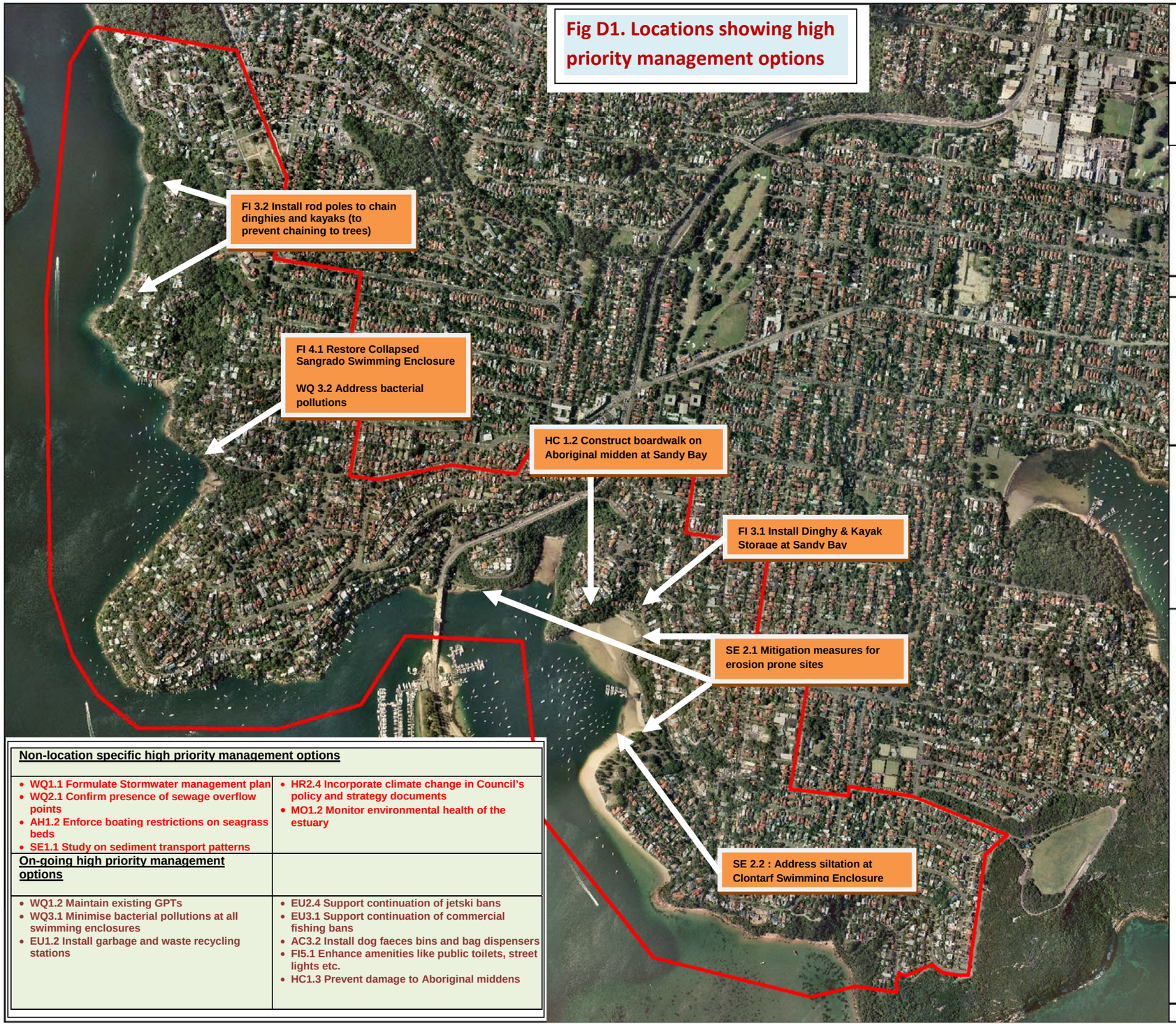
It incorporates the Water and Energy Savings Funds, the Climate Action Grants Program and funding from the Environmental Trust.

Grants are available from **Recreational Fishing (salt water) Trust Fund**, operated by NSW DPI for various groups including councils for the improvement of recreational fishing for a period of one year, up to a maximum of three years. Applications are sought in February each year but can also be submitted any time. Contact Recreational Fishing Trusts Executive Officer.

Each year up to $1.35 million is distributed on a dollar-for-dollar basis under **Sharing Sydney Harbour Access Program**, a NSW government initiative operated by the Department of Planning to improve public access to and enhance the recreational enjoyment of Sydney Harbour and its tributaries for the people of and visitors to Sydney. The Sharing Sydney Harbour Access Program was launched in February 2003 to assist with implementing the Sharing Sydney Harbour Access Plan. The NSW Government has recently announced that the Program will be extended over five years to provide $6.75 million until 2013. Grant is available for specific capital works projects such as walking tracks, cycle paths, new public waterfront parks, jetties, pontoons and boat launching facilities.

APPENDIX D: LOCATION MAPS

Fig D1. Locations showing high priority management options



Non-location specific high priority management options	
• WQ1.1 Formulate Stormwater management plan • WQ2.1 Confirm presence of sewage overflow points • AH1.2 Enforce boating restrictions on seagrass beds • SE1.1 Study on sediment transport patterns	• HR2.4 Incorporate climate change in Council's policy and strategy documents • MO1.2 Monitor environmental health of the estuary
On-going high priority management options	
• WQ1.2 Maintain existing GPTs • WQ3.1 Minimise bacterial pollutions at all swimming enclosures • EU1.2 Install garbage and waste recycling stations	• EU2.4 Support continuation of jetski bans • EU3.1 Support continuation of commercial fishing bans • AC3.2 Install dog faeces bins and bag dispensers • FI5.1 Enhance amenities like public toilets, street lights etc. • HC1.3 Prevent damage to Aboriginal middens

Clontarf/Bantry Bay Estuary Management Plan – High Priority Areas

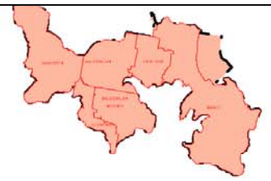


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Fig D2. Locations showing medium priority management options

Non-location specific medium priority management options

- WQ1.3 Install new SQIDs at priority locations
- WQ1.4 Install pit inserts in litter hotspots
- WQ 4.2 Monitor salinity level in extracted groundwater
- WQ4.3 Undertake survey to assess graywater diversion
- AH2.2 Implement 'Control Plan for *Caulerpa taxigolia*'
- AH3.3 Identify, map and protect saltmarshes
- AH4.4 Formulate brochure regarding aquatic habitats
- TH1.1 Prepare comprehensive bushland management plan
- TH1.2 Prepare management plans for SEPP19 bushlands
- TH 1.3 Identify adhoc tracks from private properties
- TH2.1 Establish corridors linking different bushlands
- HR1.1 Commission a geotechnical study
- HR1.2 Assess stability of seawalls
- HR1.3 Update Emergency Action Plan
- HR2.1 Assess impact of CC on areas of ecological significance
- HR2.2 Develop local climate change model
- EU1.1 Ensure safe public access to foreshores
- EU1.3 Consolidate existing signage
- EU3.2 Monitor Dioxin levels in Sydney harbour
- AC2.1 Audit disability access of parks and bays
- FI1.1 Introduce seagrass friendly moorings
- FI2.1 Overall assessment of boat landing facilities
- HC3.2 Guidelines for heritage sites within private properties
- MO1.1 Develop a comprehensive monitoring program
- MO2.1 Monitor use of the Manly Scenic Walkway
- MO2.2 Monitor use of waterways at different points
- MO3.1 Establish participatory monitoring
- MO4.1 Revise Estuary Management Plan

On-going medium priority management options

- WQ4.4 Make rainwater tank purchase popular
- WQ5.1 Continue sea-change educational program
- AH1.1 Prepare up-to-date seagrass distribution maps
- AH 2.1 Updated info on Caulerpa taxifolia
- AH3.1 Protect existing mangroves
- AH4.1 Enforce ecologically protected areas
- AH4.3 Support volunteer groups
- TH1.4 Be an active participant in Die-Back Working Group
- TH1.5 Involve Precincts to discuss view maintenance
- TH3.1 Community Bushcare Volunteer Program
- TH3.2 Bushland News
- TH3.3 Annual Native Plant Giveaway' Program
- HR2.3 Climate change adaptation project
- EU1.6 Promote community events and education programs
- EU2.1 Facilitate non-motorised boating activities
- EU2.2 Enforce current speed limits & mooring restrictions
- EU2.5 Continue Council's Starboard Right & Green program
- AC1.1 Enhance maintenance of the Manly Scenic Walkway
- FI5.2 Facilitate traffic management around beaches
- HC1.1 Develop a plan of implementation of Aboriginal Sites
- HC1.4 Identify Aboriginal sites for public education
- HC3.1 Awareness campaign to highlight heritage conservation

Clontarf/Bantry Bay Estuary Management Plan – Medium Priority Areas

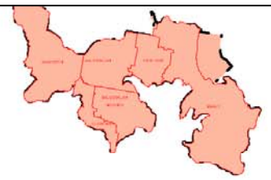

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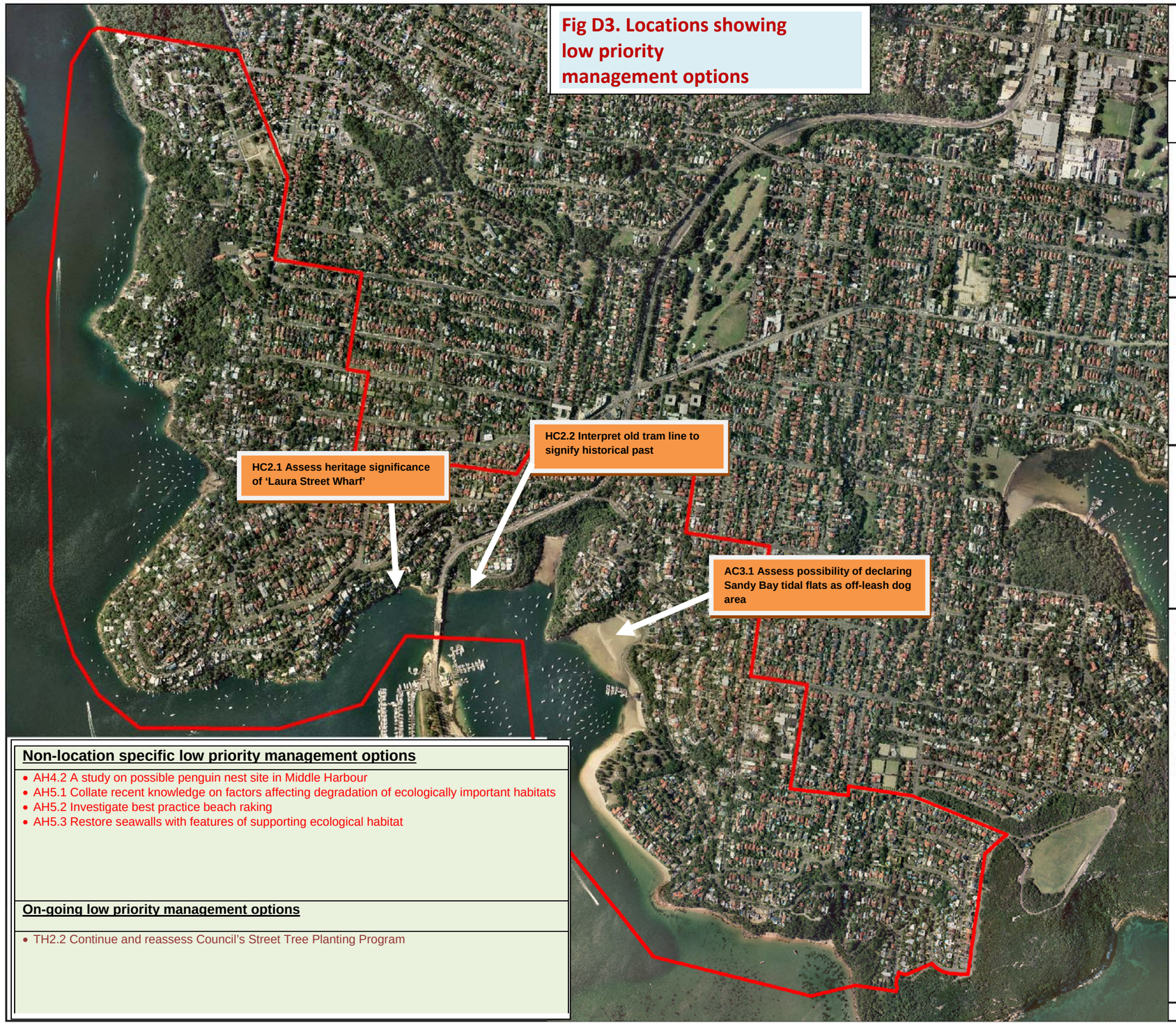
Fig D3. Locations showing low priority management options



Non-location specific low priority management options

- AH4.2 A study on possible penguin nest site in Middle Harbour
- AH5.1 Collate recent knowledge on factors affecting degradation of ecologically important habitats
- AH5.2 Investigate best practice beach raking
- AH5.3 Restore seawalls with features of supporting ecological habitat

On-going low priority management options

- TH2.2 Continue and reassess Council's Street Tree Planting Program

Clontarf/Bantry Bay Estuary Management Plan – Low Priority Areas

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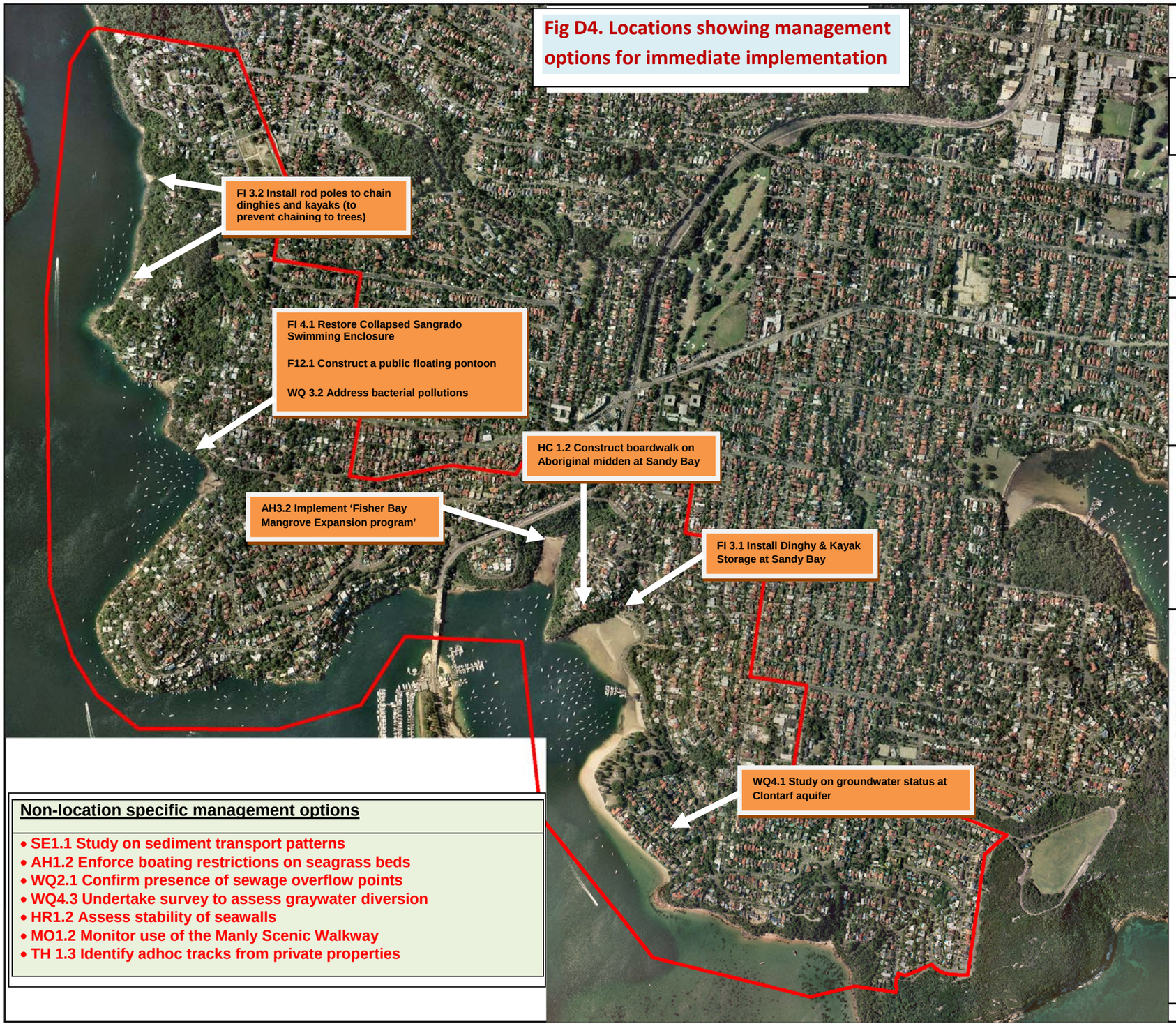
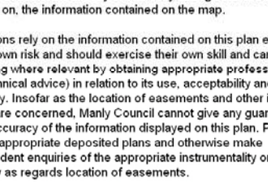
Fig D4. Locations showing management options for immediate implementation



Non-location specific management options

- SE1.1 Study on sediment transport patterns
- AH1.2 Enforce boating restrictions on seagrass beds
- WQ2.1 Confirm presence of sewage overflow points
- WQ4.3 Undertake survey to assess graywater diversion
- HR1.2 Assess stability of seawalls
- MO1.2 Monitor use of the Manly Scenic Walkway
- TH 1.3 Identify adhoc tracks from private properties

Clontarf/Bantry Bay Estuary Management Plan – Management Options for Immediate Implementation



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