



# Scientific Research and Management Strategy (SRMS)

## Overview

The Gold Coast Waterways Authority (GCWA) established a Scientific Advisory Committee (SAC) to provide technical advice related to the management of Gold Coast waterways and to support the Environmental Management Framework (EMF) for managing sand resources in Gold Coast waterways. The Gold Coast Waterways Scientific Research and Management Strategy (SRMS) was first prepared by the SAC in 2015. This version of the SRMS has been revised to reflect progress in advancing the strategy through the delivery of projects under the Scientific Research and Management Program (SRMP).

The SRMS aims to identify scientific investment priorities for achieving strategic objectives under the Gold Coast Waterways Management Strategy (2014-2023), the EMF and Sand Management Plan (SMP) and relevant projects that may be funded through the GCWA's four year Waterways Management Program from time to time.

This scope includes improving adaptive management of environmental issues related to the long term maintenance of navigational access, including boat ramps, channels, anchorages and foreshores under the SMP as set out by the EMF and within associated approvals under applicable State government legislation.

An allied, but also independently critical goal is continuous improvement of the conceptual and applied understanding of Seaway evolution, including both natural and anthropogenic influences on hydrodynamic and morphological processes. This encompasses dredging and long term operation of the Sand Bypass System and recognises the significant value of the Seaway, in terms of both monies expended and the present and future contribution to the Gold Coast economy.

The SRMS has the following purposes:

- Establish research/study streams relevant to Gold Coast waterways, the objectives and purposes of the Gold Coast Waterways Strategy, the SMP-EMF, and associated approvals
- Address strategic knowledge gaps to aid long term management of Gold Coast waterways
- Identify and scope projects that support improved implementation of the SMP & EMF
- Foster opportunities for research by local academic institutions
- Build linkages to habitat offset programs and other collaborative opportunities

The SRMS provides a number of direct benefits including:

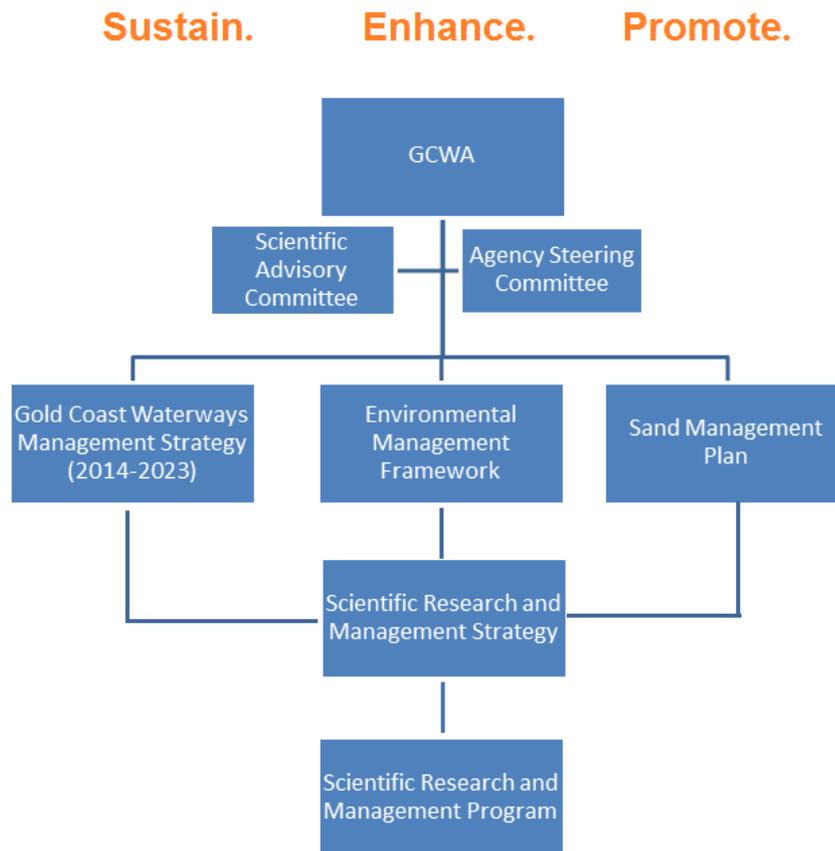
- Capturing essential baseline information about physical processes, sediment characteristics and habitat values within and across the Gold Coast waterways
- Enhancing knowledge of the impacts of human activities on waterways and their values
- Provide a central repository for scientific knowledge and data on Gold Coast waterways

The SRMS has been modelled on the successful Fish Habitat Research and Monitoring Program developed by Fisheries Queensland in 2012.

# Administration of the SRMS

This document (the SRM Strategy) describes the intent and features, the research/study streams and how the program is administered. The SRMS is reviewed periodically and updated as required (including adding to the list of potential projects based on feedback from stakeholders).

*A waterways network (and relevant facilities and reserves) that is sustainably managed to reflect and support an appropriate balance between the recreational, tourism, environmental, economic development and commercial aspirations and objectives of the Gold Coast community and visitors.*



Scoping of specific projects for investment under the SRMS is determined through ongoing consultation, primarily with the City of Gold Coast and the Agency Steering Committee (ASC) established under the Environmental Management Framework, but also with other stakeholder organisations that have similar interests and may be interested in collaborating on particular projects.

Specific funding commitments will be set out in the annual SRMP, which will detail specific investment opportunities under each Research and study stream. The SRMP will be prepared to align with GCWA program and budgeting cycles. GCWA's commitments towards the SRMP will be a matter for the GCWA Board to determine from time to time, however the SMP includes a commitment to redirecting savings from dredging approvals efficiencies to strategic investment and SRMP funding will include contributions from dredging projects in the GCWA Waterways Management Program.

A key principle underpinning the SMP and EMF is a commitment to adaptive management. Accordingly, discretionary expenditures may also occur under the SRMP to allow investment in emergent projects or issues that may arise.

The SRMS has a long-term focus, similar to the GCWA Waterways Management Strategy (10-years) and the SMP-EMF approvals (20-years). However, as noted above, the SRMP is managed as a rolling review and updated at least annually.

Procurement to undertake the identified research projects and studies is a matter for GCWA, with due consideration of advice provided by the SAC and other stakeholders. It is anticipated that procurement will be determined on a project-by-project basis and may use one or more mechanisms based on factors such as the value of the contract, the availability of skills and expertise to provide the required service(s) and the nature of the task.

# Research and Management Streams

The SRMS consist of four research and management streams:

- Stream 1: **Physical Processes**, including bathymetry, hydrodynamics and morphology
- Stream 2: **Ecosystems**, including flora, fauna, habitats and ecological values
- Stream 3: **Water and Sediment Quality**, including dredge plumes, sediment chemistry, vessel based marine pollution, stormwater quality management and similar issues
- Stream 4: **Society**, including recreation, tourism, resilience, behaviour, economy and waterways management



The research/study streams are discrete but with recognition of linkages inherent to improved management outcomes, consistent with the Gold Coast Waterways Management Strategy. Similarly, there are various issues that are multi-dimensional, including both scientific concerns that fit into one or more of the above streams, and allied issues such as regulation, economics or other social science matters. The SAC and the SRMS are primarily concerned about matters that advance understanding within one of the three streams above.

For each stream, the following are identified:

- Management objectives
- A list of completed projects under that stream
- Possible projects for future investment

Projects are further categorised within streams as either baseline research projects (generally related to surveys and monitoring of existing extent and condition) and applied research projects (generally related to addressing a specific issue, problem or opportunity).

An annual Strategic Research and Management Program (SRMP) will be prepared identifying projects considered appropriate for near-term investment. These projects will be further detailed in a brief project summary sheet (see further below).

## Stream 1: Physical processes

This stream includes research and studies related to bathymetry, hydrodynamics and seabed and riverine morphology.

### SRMP Projects

The two tables below summarise SRMP projects related to Stream 1, distinguishing between those that have been “completed” and ones that have been “initiated” as part of the SRMP.

#### Completed Projects

Project Name	Short Description	Outcome Deliverable
SRMP-000 Topo-bathy LiDAR capture in Gold Coast waterways	<p>This project captured a bank to bank bathymetric dataset with adjacent topography to 200m from the bank that is IHO Order 1b compliant to the extinction depth of the LiDAR system. A minimum 5m Digital Elevation Model (DEM) was specified, but the data was deemed adequate to produce a 2m DEM. This is only the 3<sup>rd</sup> known bank to bank data set, significantly more comprehensive than the 1983 and 2005 layers.</p> <p>The survey was conducted using a Chiroptera-I system designed for shallow water bathymetric capture and this was the first flight of this unit in Australia. The CRC for Spatial Information assisted with delivery and quality control; AAM and Leica undertook the capture and data processing.</p>	<p>Spatial layers to the ellipsoid with derived AHD and LAT products, including DEM and contours</p> <p>Final Report</p>
SRMP-001 Sediment sampling  (Stream 1 and Stream 3)	See discussion below in Stream 3	GIS layer cataloguing historical sampling and associated mapping in report, including particle size distribution characteristics
SRMP-005 Seaway Evolution – Sediment tracer study design	Report addressing the relative merits of a “tracer study”, involving the deployment and long-term monitoring of manufactured sand, to advance knowledge and understanding related to the morphological evolution of the Seaway. The report argues how and why is a tracer study is an appropriate option at this stage and presents a project design for a potential tracer study, including deployment and sampling options.	Report and study design
SRMP-006 Seaway Evolution	An investigation of the historical, present and likely future evolution of sedimentary processes (including bypassing) and morphological changes in the Seaway, Broadwater and ocean bar, to improve both qualitative and quantitative understanding of sediment budgets, causes of scouring in the Seaway, the role of bypassing and mechanisms of bar development, including Broadwater sand export.	<p>Report regarding the Seaway evolution, historical management initiatives and future management priorities.</p> <p>GIS layers, mapping and analysis regarding shoaling and scour patterns, including the Seaway delta and within the Broadwater.</p>

Project Name	Short Description	Outcome Deliverable
SRMP-007 Strategic hydrodynamic data collection program	A review of existing wave, current and tidal data sets and existing instrumentation and locations to identify long-term strategic needs and opportunities and develop a data collection program that meets GCWA's needs and maximises integration and collaboration with other stakeholders.	Catalogue of historical data sets  GIS layers, providing spatial references for fixed data stations and other available data sets  Recommended investments to fill gaps and augment data sets
SRMP-008 Wave recording in and near the Seaway entrance	Plan for the collection of data using bottom-mounted and/or Waverider surface buoy wave recorders in and near the Seaway Entrance to define ocean wave propagation properties both through the Seaway entrance to Wave Break Island and across the entrance bar to the TOS surf break ('the other side'). Data is important for improving the calibration of hydrodynamic models, which currently suffer from inconsistent results and the lack of a 'point of truth'.	Project plan for possible future investment
SRMP-009 Training walls stability risk assessment	Carry out a risk analysis of the Seaway breakwaters (training walls) to identify: <ul style="list-style-type: none"> <li>• geotechnical conditions and the effect of historic and active environmental processes on training wall stability including groundwater profile data;</li> <li>• potential failure modes and mechanisms;</li> <li>• risks and consequences of failure; and</li> <li>• potential mitigation actions</li> </ul>	Report indicating an improvement in the Factor of Safety generally for areas of concern. Report did not contribute significantly to possible mitigation actions, particularly as anticipated in relation to land-side works or other provisions to enable improved responsiveness to any failure event.

## Initiated Projects

Project Name	Short Description	Outcome Deliverable
SRMP-005 Phase 2 ARC Grant	Proposal for an Australian Research Council (ARC) Industry Linkage grant to undertake a multi-year ~\$2M study in accordance with the SRMP-005 Phase 1 report and study plan	Unsuccessful 2015/16 grant application. Reconsider possible future re-application.
SRMP-007 Phase 2 Tide gauge network	Allocation to partially implement recommendations from the SRMP-007 Phase 1 report, through installation of a tide gauge network.	Data stream to support future analysis and to use as a potential input into a SWIM (SRMP-010) "WAP" (waterways app / waterways map)
SRMP-010 SWIM (All four streams)	Smart Waterways Information Management (SWIM) See project description below in Stream 4.	Improved data access, communication and management.

<p>SRMP-011</p> <p>Currigee erosion and FHA revocation</p>	<p>The intent of this project is to undertake required studies to amend the status of the Fisheries Habitat Area (FHA) in the vicinity of Currigee, so that nourishment activities in accordance with the Sand Management Plan (SMP) can be conducted.</p>	<p>Report t outlining options for revocation of the FHA, including insight into stakeholder views on issues and opportunities related to improved management of this area</p>
<p>SRMP-012</p> <p>“CERFS”</p> <p>ARC LIEF grant</p>	<p>Proposal for an Australian Research Council (ARC) LIEF grant to establish a Coastal Engineering Research Field Station (CERFS) through the deployment of instrumentation in the Seaway and on the Sand Bypass Jetty.</p>	<p>Unsuccessful grant applications to date, but favorable feedback on most recent attempts. Possible re-application.</p>
<p>SRMP-015</p> <p>State of the Waterways</p> <p>(All four streams)</p>	<p>See description below in Stream 4</p>	<p>Improved data access, communication and management.</p>

## Identified future potential science needs:

### Baseline Projects

- Desktop - Investigate crowd-sourced bathymetry (ARGUS)
- ~~Desktop - ADCP/tide data review/acquisition strategy~~

### Applied Research Projects

- Desktop - Analyse historical bank erosion / identify hotspots throughout the network including through regime equilibrium theory
- ~~Desktop - Assess Broadwater geomorphic change 2009 composite to 2014 LiDAR~~
- ~~Field - Targeted environmental tracing / sediment mobilisation study for the seaway~~
- Desktop - Geomorphological modelling
- ~~Desktop - Revise reports on Seaway bar morphological change (and Jumpinpin?)~~
- Field - Pilot program of in-situ placement of spoil for bank management
- ~~Desktop: Geotechnical engineering analysis/modelling of Seaway training wall stability~~

## Stream 2: Ecosystems

This stream includes research and studies related to flora, fauna, their habitat and the protection and enhancement of ecological values of the Gold Coast Waterway Network

### SRMP Projects

The two tables below summarise projects related to Stream 2, distinguishing between those that have been “completed” and ones that have been “initiated” as part of the SRMP.

#### Completed Projects

Project Name	Short Description	Outcome Deliverable
SRMP-002 Marine plant habitat survey & monitoring program	A comprehensive survey of existing seagrass, mangrove and saltmarsh distributions and species composition using best-practice statistical estimation of habitat boundaries so that future monitoring can quantify changes in distribution.	GIS Layers of seagrass, mangrove and saltmarsh distribution  Report
SRMP-003 Review of seagrass sensitivities & resilience	Literature review and analysis to document known seagrass sensitivities and resilience, with a focus on information relevant to GC waterways, dredging and placement activities, and other relevant anthropogenic activities.	Report on the seagrass sensitivities & resilience, including advice on the relative significance of various threats as determined through a workshop of relevant experts.
SRMP-004 Review of seagrass nourishment and mitigation projects	Assessment of foreshore nourishment and/or mitigation projects on seagrass ecosystem response	Report  Understanding of drivers leading to successful/unsuccessful seagrass mitigation projects on the Gold Coast  Recommendations to optimise local marine plant rehabilitation and enhancement projects, including nourishment profiles
SRMP-013 Review of known shorebird habitats, distribution and threats	Literature review and data collation/analysis to identify and document known shorebird habitats, distribution and threats, with a focus on information relevant to GC waterways, dredging, spoil placement and other relevant anthropogenic activities.	Literature review of known shorebird habitat and distribution, including significance of the population.  GIS layers related to known habitat areas and historical usage.

## Initiated Projects

Project Name	Short Description	Outcome Deliverable
SRMP-004 Phase 2 Monitoring or recent nourishment areas	Monitoring of recent nourishment projects	Evaluation of actual versus predicted effects on marine plant ecosystems, including the extent of any recovery. Advice regarding possible improvements to future placement activities.
SRMP-010 SWIM (All four streams)	Smart Waterways Information Management (SWIM)  See project description below in Stream 4.	Improved data access, communication and management.
SRMP-013 Phase 2 Field investigations – Habitat use, resilience & enhancement opportunities	Targeted field surveys based on recommendations from SRMP-013 Phase 1 report, including scoping regarding potential opportunities to enhance habitat through strategic nourishment as part of dredging activities.	Supplemental data layers and report to facilitate improved dredging/nourishment planning and improved waterways and resource management.
SRMP-014 DBMP	Development of a Direct Benefit Management Plan (DPMP) to provide improved options for meeting offset obligations.	Improved environmental management outcomes and proactive management of the waterways
SRMP-015 State of the Waterways (All four streams)	See description below in Stream 4	Improved data access, communication and management.
SRMP-016 Ecosystem Services Conceptual model	Development of an Ecosystem Services Conceptual model, identifying key systems and processes that contribute to the health or decline of GC Waterways	Ecosystem Services Conceptual model

## Identified future potential science needs:

### Baseline Projects

- Field - Macro-invertebrate sampling

### Applied Research Projects

- Desktop - Strategic assessment of potential seagrass resource areas across the network based on the LiDAR outputs and likely seagrass depth ranges
- ~~Desktop/Field - Evaluation of the effectiveness of seagrass establishment/rehabilitation works that have been undertaken across the Network~~
- Field - carrying out small scale seagrass planting trials at selected locations across the Network
- ~~Desktop - Literature review on the sensitivity of local biota to dredging and setting tolerances for dredge water quality impacts~~
- Literature review - Effect of foreshore slope/depth on benthic biota recolonisation
- Field – Trials of profiling of banks/nourishment to support seagrass colonisation

- Field - Pilot project for exploring and trialling seagrass friendly moorings

## Stream 3: Water and sediment quality

This stream includes research and studies related to water and sediment quality including dredge plumes, sediment chemistry, vessel-based marine pollution, stormwater quality management and similar issues

### SRMP Projects

The two tables below summarise projects related to Stream 3, distinguishing between those that have been “completed” and ones that have been “initiated” as part of the SRMP.

#### Completed Projects

Project Name	Short Description	Outcome Deliverable
SRMP-001 Sediment sampling (Stream 1 and Stream 3)	Review existing data and develop a sampling and analysis methodology to fill key information and knowledge gaps about sediment characteristics necessary to support the SMP/EMF, including a risk-based future re-sampling program.	GIS layer cataloguing historical sampling and associated mapping in report, including particle size distribution characteristics  Plan for strategic, risk-based, sampling to address NAGD requirements, providing cost savings for future dredging projects

#### Initiated Projects

Project Name	Short Description	Outcome Deliverable
SRMP-001 Phase 2 Physical sampling	Undertake identified sampling to satisfy NAGD requirements, as well as associated sampling to improve knowledge regarding seagrass ecosystems.	Cost-effective fulfillment of NAGD requirements, which are low-risk based on historical sampling, utilizing a strategic source-based, rather than shoal-driven, sampling grid.
SRMP-001 Phase 3 Coomera River investigations	Extended investigations in the Coomera River tributary area to support planning for the Coomera River Dredge Spoil Management Facility. Included sourcing of data/reports to augment the GIS layers produced by the primary SRMP-001 report, as well as quantitative analysis of sediment volumes to inform demand planning for the dredge spoil facility.	Expansion of the SRMP-001 GIS layer cataloguing known historical sediment sampling and analysis, as well as a report to inform the CDSMF project..
SRMP-001 Phase 4 4D modelling	Data collection utilizing resistivity based technology for sub-bottom profiling, notionally within the Broadwater, Seaway and upper Coomera River.	Data layers that improve prediction of sediment characteristics, including possible fines content and location of indurated sands. Facilitates informed physical sampling to effectively and efficiently confirm strata and mitigate dredging project risk. May also provide opportunities to correlate with SRMP-002 marine plant ecosystem layers.

SRMP-010 SWIM (All four streams)	Smart Waterways Information Management (SWIM) See project description below in Stream 4.	Improved data access, communication and management.
SRMP-015 State of the Waterways (All four streams)	See description below in Stream 4	Improved data access, communication and management.

## Identified future potential science needs:

### Baseline Projects

- ~~Desktop/Field – Acquisition of Seaway geotechnical data~~
- Desktop/Field – Synthesis of available data to inform an in-situ longitudinal turbidity (NTU)/ light (PAR) monitoring program

### Applied Research Projects

- Desktop/Field - Dredge plume modelling (+ field validation of model outputs) and analysis of sedimentation flux
- Desktop - Review offsets opportunities associated with stormwater management improvement and benefits
- ~~Desktop – Review of water quality information sources, data, outcomes and research needs~~
- ~~Desktop – Map historical dredging projects/analyse surveys~~

## Stream 4: Society

This stream includes research and studies related to the behaviour of waterways users and other societal issues including economics and managing resilience. This stream aims to:

- guide a better understanding of community expectations, attitudes and behaviours towards GC Waterways,
- provide data to inform waterway managers on development of priorities actions; and
- to guide the evaluation of community engagement activities

It may include projects to further identify:

- how Gold Coast Residents use our waterways
- user information on the economic value of our waterways
- actions to ensure resilience of waterways values
- how tourist use and value our waterways
- capacity of the waterways to provide a spectrum of uses
- community values and aspirations for the waterways

### SRMP Projects

The table below summarise projects related to Stream 4 that have been “initiated” as part of the SRMP (there are no “completed” projects to date).

#### Initiated Projects

Project Name	Short Description	Outcome Deliverable
SRMP-010 SWIM (All four streams)	Smart Waterways Information Management (SWIM)  The SWIM project includes development of multi-platform, including smart-device (tablet, phone), access to geographically-based waterways information. In addition to providing community access to information, the platform will also potentially harvest community generated data, both actively (user contributed) and passively (based on usage while logged in). Secure access will enable remote interaction with systems for various business purposes, including asset management. On the broader scale, SWIM encompasses holistic integrated management of waterways related data.	Multiple outputs, including WAP (waterways app / waterways map), management of community queries, asset management and monitoring, State of the Waterways Report
SRMP-015 State of the Waterways (All four streams)	State of the Waterways Report (potential collaboration with CoGC). The State of the Waterways is a communication tool to inform and educate stakeholder on the current state of GC Waterways and GCWA (and partners).	GIS based communication tools to facilitate a “live”, continuously evolving access to data on the state of the Gold Coast waterways
SRMP-017 •Resilience of Gold Coast Waterways	Resilience is a planning concept that can be expressed as the capability to anticipate, respond to, and recover from significant multi-hazard threats in a manner that minimises the impact on public safety, health, infrastructure, security and the economy of an area.	Resilience Plan specific to the Gold Coast waterways

## Identified future potential science needs:

- Type, intensity and capacity of recreational and tourism uses of Gold Coast waterways
- The value of Gold Coast waterways to the local economy

# Scientific Research and Management Program (SRMP)

2014/15 to 2016/17



## Overview

This document outlines investments to support the Gold Coast Waterways Scientific Research and Management Strategy (SRMS). The SRMS and this Program are strongly driven by the Sand Management Plan (SMP), the Environmental Management Framework (EMF) and associated approvals for dredging and nourishment activities. The planning area for all projects is Gold Coast waterways (GCW) unless otherwise specified.

## Research and management streams

The SRMS identifies four research and management streams:

Stream 1: **Physical Processes**, including bathymetry, hydrodynamics and morphology

Stream 2: **Ecosystems**, including flora, fauna, habitats and ecological values

Stream 3: **Water and Sediment Quality**, including dredge plumes, sediment chemistry, vessel based marine pollution, stormwater quality management and similar issues

Stream 4: **Society**, including recreation, tourism, resilience, behaviour, economy and waterways management

Research projects identified for investment under this program are listed in the table below. Some projects are phased, typically including a research component that culminates in a report that recommends and/or results in further investment (phase 2, 3, etc.).

ID	Project	Stream
000	Topo-bathy LiDAR capture in Gold Coast waterways	Physical Processes
001	Strategic sediment sampling program	Water & Sediment Quality
001.2	Phase 2 – Sampling and analysis – NAGD	Water & Sediment Quality
001.3	Phase 3 – Further investigations to support the Coomera DSMF	Water & Sediment Quality
001.4	Phase 4- 4D Modelling	Water & Sediment Quality
002	Marine plant habitat survey & monitoring program	Ecosystems
003	Review of known seagrass sensitivities & resilience	Ecosystems
004	Assessment of the effects of foreshore nourishment and mitigation projects on seagrass ecosystems	Ecosystems
004.2	Field assessment of the effects of foreshore nourishment	Ecosystems
005	Seaway evolution – Sediment tracer study design	Physical Processes
005.2	Phase 2 – ARC Linkage Proposal: Improved management of tidal inlets through morphodynamic characterisation	Physical Processes
006	Seaway evolution – Morphological trends and processes	Physical Processes
007	Strategic hydrodynamic data collection program	Physical Processes
007.2	Phase 2 – Tide gauge network & turbidity monitoring stations	Physical Processes
008	Wave recording in and near the Seaway entrance	Physical Processes
009	Training wall stability risk assessment	Physical Processes
010	Smart Waterways Information Management (SWIM)	(All)
011	Currigee erosion and FHA revocation	Physical Processes
012	ARC LIEF grant – Coastal engineering research field station	Physical Processes
013	Review of known shorebird habitats, distribution and threats	Ecosystems
013.2	Field investigations – Habitat use, resilience & enhancement opportunities	Ecosystems
014	Direct Benefit Management Plan for GC waterways	Ecosystems
015	State of the Waterways	(All)
016	Ecosystem Services Conceptual Model	Ecosystems
017	Resilience Plan	Society
<b>Total investment ~\$1.8 M</b>		

