

RIVER MURRAY ACT 2003: ANNUAL REPORT 2012-2013 SUPPORTING DOCUMENT



Government of South Australia
Department of Environment,
Water and Natural Resources



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Contributing Programmes and Projects

A range of government agencies have responsibilities to contribute towards achieving the *River Murray Act 2003* (the River Murray Act) Objects and Objectives for a Healthy River Murray (ORMs). Agencies were asked to nominate current projects that were relevant in 2012-2013 and to describe the outcomes achieved. Projects were often collaborations between agencies, with the community or scientific groups.

Agencies nominated projects for which they were either the lead or a major partner.

Projects and programmes are listed under the relevant lead agency and grouped against the four key ORM:

- River Health;
- Environmental Flows;
- Water Quality; and
- The Human Dimension.



1. Department of Environment, Water and Natural Resources

The Department of Environment, Water and Natural Resources (DEWNR) is responsible for administering the *River Murray Act 2003* (the River Murray Act), including coordinating referrals across other agencies and ensuring referral and compliance mechanisms are in place. It administers and provides a South Australian position on a range of national initiatives including the National Water Initiative and is the lead agency for the South Australian Government's implementation of the Basin Plan, the Murray-Darling Basin (MDB) Agreement, the Intergovernmental Agreement to Address Water Over-Allocation and Achieving Environmental Objectives in the Murray-Darling Basin (known as The Living Murray Agreement) and programmes being undertaken by the Murray-Darling Basin Authority (MDBA).

DEWNR also manages extensive areas of land as directed by *the National Parks and Wildlife Act 1972*, the *Crown Land Management Act 2009*, and the *Coast Protection Act 1972*. DEWNR manages native vegetation through the *Native Vegetation Act 1991* and protects heritage values through the *Heritage Places Act 1993* and *Historic Shipwrecks Act 1981*. Natural resources including those in the MDB area are protected through DEWNR's administration of the *Natural Resources Management Act 2004* (NRM Act) and the *Wilderness Protection Act 1992*.

1.1 River Health

Development of the Murray-Darling Basin Plan

In 2012-2013, the South Australian Government worked hard to campaign for key changes to the Murray-Darling Basin Plan (Basin Plan). Some key achievements of this campaign included:

- strong community and industry support for the Government's response to the Basin Plan, including the "Fight for the Murray" campaign which saw over 19,000 people pledge support, attracted over 28,000 followers through Facebook and Twitter, and resulted in over 5,000 letters being sent to the Prime Minister;
- comment on the revised Proposed Basin Plan on 9 July 2012 through the Murray-Darling Basin Ministerial Council as well as a separate South Australian Government notice of disagreement;
- subsequent South Australian Government notice of disagreement on the Altered Proposed Basin Plan to the Commonwealth Water Minister, as well as feedback through a Murray-Darling Basin Ministerial Council consensus response in August 2012;
- science review of the Authority's additional Basin Plan modelling, completed in October 2012;
- South Australian Government submission to the House Standing Committee on Regional Australia inquiry into the Water Amendment (Water for the Environment Special Account) Bill 2012;
- South Australian Government submission into the Senate Environment and Communications Committee inquiries into the Water Amendment (Long-Term Average Sustainable Diversion Limit Adjustment) Bill 2012 and Water Amendment (Water for the Environment Special Account) Bill 2012.

The Basin Plan was adopted by the Commonwealth Minister on 22 November 2012. Some of the key provisions in the Plan and associated changes to the Water Act 2007 that will benefit South Australia include:

- provisions that can return up to 3,200 GL of water to the environment (a significant improvement from the original proposed 2,750 GL);



- 'end of system' objectives, targets and actions including salinity targets and water level and Murray Mouth openness objectives for Coorong, Lower Lakes and Murray Mouth and the river below Lock 1;
- provisions to deliver environmental flows and manage water quality and salinity; and
- improved arrangements for supporting the delivery of critical human water needs including the establishment of a conveyance water reserve that will improve water security for South Australia.

Government officials are now working with the MDBA and other jurisdictions to develop a Basin Plan implementation agreement to provide clarity on jurisdictional implementation obligations and to outline collaborative working arrangements.

Intergovernmental Agreement on Implementing Murray-Darling Basin Reform

On 27 June 2013, the South Australian Government signed the Intergovernmental Agreement on Implementing Murray-Darling Basin Reform (the Intergovernmental Agreement). The Intergovernmental Agreement is an agreement between the Australian Government and other Basin states that outlines how the MDBA, Commonwealth and Basin States will work together to support the delivery of the sustainable diversion limit (SDL) adjustment mechanism and implement measures to address constraints that impact upon the delivery of environmental water and other Basin Plan water reforms. Signing the Intergovernmental Agreement secures for South Australia an additional \$445 million of Commonwealth funding for environmental infrastructure and industry diversification measures.

Murray-Darling Basin Plan: South Australian Implementation Strategy 2013-2019

Coinciding with the signing of the Intergovernmental Agreement (see above), South Australia released the *Murray-Darling Basin Plan: South Australian Implementation Strategy 2013-2019* (Basin Plan Implementation Strategy). The Basin Plan Implementation Strategy is a key document that will guide the State's implementation of the Basin Plan and its related programmes, outlining the key actions that will be pursued during the six-year transition period to ensure the Basin Plan is fully integrated into South Australia's water management arrangements.

The Premier's Basin Plan Taskforce

During 2012-2013 a taskforce of DEWNR officers supported the SA Government to influence Basin Plan changes. Formal responses on the draft Basin Plan were provided through the MDB Ministerial Council on 9 July 2012 and 27 August 2012. The Basin Plan was adopted on 22 November 2012, and on 20 March 2013 the disallowance period for the Plan ended in the Commonwealth Parliament.

Following the adoption of the Basin Plan, the DEWNR taskforce was wound up having completed its role. The Premier's Basin Plan Taskforce, which was comprised of Ministers and senior Government officials, was also concluded following the passage of the Basin Plan through its final hurdle in the Commonwealth Parliament in March 2013. The South Australian Government is now focussing on ensuring the Basin Plan is effectively implemented to achieve beneficial outcomes for the River and its communities.

Removal of Narrung Bund

The Narrung Bund was constructed during the drought as an emergency intervention measure to allow water levels in Lake Albert to be managed independently from those of Lake Alexandrina to ensure that acid sulfate soils remained inundated. It was constructed as part of the Lake Albert Water Level Management Project which also undertook a significant water pumping programme during the drought.



In September 2010, a section of the bund was removed, reconnecting the Lower Lakes for the first time in approximately four years. The removal of Narrung Bund took place in two phases. Phase 1 was completed in 2011-2012 and involved the removal of imported construction material. Phase 2 involved the dredging of material displaced during construction, so as to reinstate a navigable channel between Lake Alexandrina and Lake Albert. Phase 2 fully removed the bund and was completed on 10 October 2012.

Since full removal of the Narrung Bund, and the reinstatement of hydrological connectivity between Lake Alexandrina and Lake Albert, water level management has sought to improve salinity levels in Lake Albert.

Coorong, Lower Lakes and Murray Mouth Project

The Coorong, Lower Lakes and Murray Mouth (CLLMM) Recovery Project is part of the South Australian Government's \$610 million Murray Futures programme, funded by the Australian Government's Water for the Future Initiative.

The \$137 million, five-year (2012-2016) funding agreement between the Commonwealth and South Australia for the CLLMM Recovery Project is in place, and is currently funding important works such as vegetation, managing acid sulfate soils, protecting native fish populations and habitats, conducting investigations into delivering additional flows to the Coorong South Lagoon, and engaging with the community including the Ngarrindjeri. Achieving the outcomes of the CLLMM Recovery Project will also directly support the economic, cultural and social wellbeing of regional communities. The project already delivers a number of outcomes on ground, such as:

Coorong, Lower Lakes and Murray Mouth Vegetation Programme

A vegetation programme was undertaken to support the restoration of ecological functions across the CLLMM region. Following improved Murray-Darling inflows to the Lower Lakes in 2011-2012, the programme adapted to higher water levels by concentrating effort and investment in shore erosion zones.

The planting of native species, including sedges in 2012-2013, reduced shoreline erosion, provided habitat and food sources, encouraged the natural bioremediation of acid sulfate soils, and assisted in restoring wetland health. An important component of the vegetation programme continues to be the involvement of the local community and Ngarrindjeri groups in planning, seed collection, propagation, planting, monitoring, and site maintenance. The vegetation programme will have planted more than one million plants by the end of the winter 2013. This brings the total planting effort to 1.85 million plants since 2011. A fencing programme complements planting and seeding activities by protecting plants from grazing by livestock, with a total of around 200 kilometres of fencing to be installed over the life of the project to protect Lake Alexandrina and Lake Albert shorelines, and native plants that are naturally regenerating.

The Regional Pest and Weed Management Plan was produced in 2012, to allow focussed, region-wide pest control works to be undertaken to protect and support the revegetation activities. Since then, strategic pest and weed control works have focussed on managing the threat of several woody weeds at key environmentally important sites, and buffering existing revegetation sites to limit re-infestation.

Ecological Monitoring in the Coorong, Lower Lakes and Murray Mouth Region

Monitoring activities in 2012-2013, undertaken in accordance with the Monitoring Framework for the CLLMM Recovery Project, included soil, water quality (surface, groundwater and sediment pore water) and ecological (zooplankton, aquatic invertebrates, fish, birds, habitat usage relating to revegetation and native seagrasses such as *Ruppia*).



Monitoring activities have provided insight into the ecological effect of three years of continued barrage flows to the CLLMM site and its post-drought recovery. Results have indicated that the ecological health of the site continues to improve since flows from the River Murray to the Lower Lakes, and barrage flows, have returned.

Critical Fish Habitat Project

Two rounds of native fish re-introductions to four sites in the Lower Lakes were undertaken in 2012-2013. Approximately 5,500 threatened small-bodied fish were successfully re-introduced into the four sites.

Fish monitoring in spring 2012 and autumn 2013 recaptured a total of 93 threatened native fish, with a likely mixture of re-captured, re-introduced individuals as well as the progeny of re-introduced fish. Wild recruitment was observed for three of the four species re-introduced (Murray hardyhead, Yarra pygmy perch and Southern pygmy perch). Whilst positive signs of population establishment were exhibited by all species, they are presently at a limited number of sites and in very low numbers.

The Critical Fish Habitat Project is now complete and resulted in the release of a total of approximately 15,890 individual threatened native fish.

Lower Lakes Acid Sulfate Soils Research

As part of the CLLMM Recovery Project "Lower Lakes Acid Sulfate Soils Research Project", the following investigations were undertaken in 2012-2013 to fill key knowledge gaps and to inform management of variable Lake levels in the CLLMM site under future low inflows:

- using available acid sulfate soil information to development an acid sulfate soils conceptual model for the Lower Lakes system;
- investigations into the toxicological and synergistic effects of acidification on key aquatic organisms;
- investigations into the rates of recovery of acidic sediments and what is driving recovery in different sediment types and locations; and
- investigations into the significance of surface and groundwater interactions in reducing or increasing the risk of acidification.

The Living Murray Lower Lakes, Coorong and Murray Mouth Icon Site Programme

The Lower Lakes, Coorong and Murray Mouth (LLCMM) is one of six The Living Murray (TLM) icon sites in the Murray-Darling Basin. During 2012-2013 a number of programmes were continued, including:

- condition and intervention monitoring in the Lakes and Coorong (focusing on fish, vegetation, bird and invertebrate communities);
- environmental water prioritisation and delivery;
- implementation of the LLCMM Icon Site Environmental Water Management Plan;
- community engagement (through community and scientific advisory panels); and
- delivery of the Indigenous Partnerships Project with the Ngarrindjeri Regional Authority.



Lower Lakes, Coorong and Murray Mouth Icon Site Condition Monitoring Programme

TLM LLCMM Icon Site condition monitoring programme is undertaken in collaboration with the Murray Futures CLLMM Project. TLM LLCMM Icon Site Environmental Water Management Plan has set 16 ecological targets. The monitoring programme is designed to inform progress against the targets. By collecting long-term data on fish, vegetation, bird, and invertebrate communities, informed decisions about lake-level cycling, barrage operations, and environmental water needs can be developed. The MDBA also funded two intervention monitoring projects in the LLCMM Icon Site in 2012-2013: winter lamprey monitoring at the barrage fishways and *Ruppia* monitoring in response to summer environmental water delivery. All information is collated annually in a synthesis report on the condition of the LLCMM Icon Site for the MDBA.

Murray Mouth Barrage Operations

The Murray Mouth (near Goolwa) remained open during 2012-2013. SA Water and DEWNR continued to monitor and assess bathymetry and sand accumulation in the Murray Mouth and surrounding channels via monthly aerial assessments and on-water bathymetric surveys. Barrage operations decisions are supported through fortnightly meetings with DEWNR, MDBA, Commonwealth Environmental Water Office (CEWO), and SA Water staff.

The Living Murray Chowilla Floodplain Icon Site

The Chowilla floodplain forms part of one of six TLM icon sites in the Murray-Darling Basin. During 2012-2013 a number of activities were continued, including:

- condition monitoring focussing on fish, vegetation, birds, and groundwater;
- intervention monitoring including projects focussing on fish movement and management of hypoxia;
- environmental water planning and delivery;
- implementation of the Chowilla Floodplain Icon Site Environmental Water Management Plan and development of the Chowilla Regulator Operations plan;
- community engagement activities including facilitation of the Chowilla Floodplain Community Reference Committee; and
- delivery of the Indigenous Partnerships Programme.

Chowilla Creek Environmental Regulator

Construction work on the Chowilla Creek environmental regulator (and ancillary structures) recommenced in May 2012 after lengthy delays due to high flows, and has continued during 2012-2013. Construction is scheduled for completion in early to mid-2014. Work to upgrade the weirs on Pipeclay and Slaney creeks has commenced.

When the construction of all structures is complete, their operation will enable inundation of up to one third of the Chowilla floodplain, even under relatively low flow conditions, helping to achieve ecological objectives and preserve the values of the Chowilla floodplain icon site. Numerous ecological investigations have been undertaken to inform the preparation of an Operations Plan for the Chowilla Creek regulator and associated infrastructure. The Operations Plan is being developed in consultation with a range of scientists and river operators, and includes details regarding operations, governance, monitoring, and risk management. Consultation and engagement activities have also continued throughout 2012-2013, with regular tours and media presentations occurring.



Review of Murray-Darling Basin Agreement

The Review of the Murray-Darling Basin (MDB) Agreement (the Review) was initiated in September 2010 with the primary objective being to “examine options for improving the management of water resources in the MDB, in particular the shared water resources of the River Murray System, to better meet future needs”. The Review was overseen by a Review of the Agreement Taskforce (Taskforce) comprising representatives from all parties to the MDB Agreement plus the MDBA, and chaired by the Commonwealth Department of Sustainability, Environment, Water Population and Communities (DSEWPaC).

Key outcomes and achievements for 2012-2013 included the finalisation of:

- a codification framework for the River Murray System, which sets a new standard of clarity and transparency for governments, river communities and stakeholders and establishes much greater insight into the high level decisions that guide the day-to-day operation of the River Murray System;
- four documents detailing the current assessment, operations and accounting arrangements for the water resources of the River Murray System (plus other supporting documents), including how those arrangements pertain to the Murray-Darling Basin Agreement and its related instruments;
- a wholly revised ‘Objectives and Outcomes for River Operations in the River Murray System’ document with associated Specific Objectives and Outcomes;
- the development of a report summarising the policy constraints to environmental water delivery under the Murray-Darling Basin Agreement. The report will now be used by the MDBA as key input to the development of the Basin Plan Constraints Management Strategy.

The Review work programme formally wound up at the end of the 2012-2013 period. A final report for the Basin Officials Committee is to be prepared by the Taskforce to summarise the work undertaken to date, and provide recommendations about how to progress incomplete work and outstanding issues.

SA River Murray Annual Operating Plan for 2012-2013

In 2012-2013, an inter-agency South Australian River Murray Operations Working Group developed the South Australian River Murray Annual Operating Plan for 2012-2013. The Plan sought to optimise the delivery of water resources to, and within, South Australia to accommodate the needs of all water users, including the environment.

1.2 Environmental Flows

Determination of the Environmental Water Requirements for the Coorong, Lakes Alexandrina and Albert Wetland of International Importance

The development of the *Environmental Water Requirements (EWR) Report for the Coorong, Lower Lakes and Murray Mouth Site* (Lester et al. 2011) outlines the flow and water level requirements to support the Ramsar-listed ecological character of the region, and to maintain the site as a healthy, productive and resilient wetland of international importance. The EWR Report forms a key element of the overall strategy (Long-Term Plan) for the management of the CLLMM region.

Since their development in 2011-2012, the EWRs outlined in the report by Lester et al. have been used as the evidence-base in negotiations to support the development of the Basin Plan, particularly in relation to the water requirements of the site and minimum outcomes to avoid degradation. The EWRs, together with analysis of the Basin Plan and monitoring data, have been used to influence the development of annual environmental watering priorities,



the delivery of environmental water to South Australia, and the development of an updated Ecological Character Description report and Ramsar Information Sheet for the Ramsar site.

Riverine Recovery Project

The Riverine Recovery Project (RRP) is a key component of South Australia's Murray Futures programme, funded under the Australian Government's Water for the Future Initiative. Through investment of more than \$87 million, the RRP aims to improve ecological outcomes for floodplains and wetlands, use environmental water more effectively, provide social benefits, and deliver up to 15 GL of environmental water savings to the Commonwealth to help protect or restore environmental assets in the MDB. This is in addition to the \$9.2 million worth of environmental works at the Pike Floodplain, Katfish Reach, and Yatco Lagoon.

Achievements in 2012-2013 included the completion of feasibility and design phases for environmental works at the Pike and Katfish Floodplain, with hopes to include up to eight wetland sites in the Lower River Murray in 2013-2014. Work in 2012-2013 included ecological baseline surveys, extensive landholder consultation, development of wetland management plans, and hydrological requirements to guide implementation of projects and future management.

To support wetland and other activities in the Lower River Murray, development of a Management Action Database (the Database) has commenced. The Database will enable scheduling of wetland monitoring and management actions, facilitate water accounting, and assist with information management. Partnership arrangements have been agreed upon with the Ngarrindjeri Regional Authority and the First Peoples of the River Murray and Mallee Region Indigenous Nation, to support delivery of project activities, ongoing communications, consultation, and engagement with stakeholders.

Environmental Watering

Delivery of environmental water plays a vital role in supporting the current and future health of the South Australian River Murray and its floodplains and wetlands. South Australia received approximately 1,075 GL of environmental water (289 GL from The Living Murray (TLM) and 786 GL of Commonwealth Environmental Water (CEW)) during 2012-2013. The majority of this water was used to manage the water levels of the Lower Lakes, increase barrage releases, and enhance a small flow pulse in the river channel during summer. In addition, there was 100 ML of TLM environmental water delivered to Brandy Bottle wetland on the Chowilla Floodplain.

Ecological monitoring at the Chowilla and LLCMM TLM icon sites continued and recent results indicate an improved ecological condition following the high flows of 2011 and 2012. However, considerable improvement is still required for the long-term ecological health of the system.

Reports on the outcomes of condition monitoring at Chowilla and the Lower Lakes, Murray Mouth and Coorong for 2012-2013 have been developed, outlining volumes of water, sites watered and ecological outcomes achieved. The River Murray Environmental Watering Report for 2011-2012 can be seen at: http://www.environment.sa.gov.au/about-us/Reports/Annual_reports.

Establishment of an Environmental Water Reserve

DEWNR has developed a position paper regarding the establishment of environmental water holding as an administrative function within the Department. As a result of agreement with the Commonwealth, South Australia now holds environmental water on a Minister's licence which forms the basis of the holding. This water is intended to contribute to the ecological objectives outlined in the annual environmental watering plan. In 2012-2013, 2 GL of entitlement and 12 GL of allocation were delivered from this licence to improve the biodiversity of the LLCMM.



Development of the 2012-2013 Annual Environmental Watering Plan for the South Australian River Murray

The South Australian Government developed environmental water proposals for the South Australian River Murray for 2013-2014. These proposals were prioritised within South Australia and the final priorities were submitted to the MDBA to meet the requirement under the Basin Plan to submit such priorities by 31 May annually. The proposals were also submitted for TLM environmental water plan. An annual South Australian River Murray environmental watering plan was developed and submitted to the Commonwealth Environmental Water Holder (CEWH) for consideration in allocating environmental water. The annual priorities and plan can be found at: www.environment.sa.gov.au.

Environmental Water Requirements of the Ecological Assets of the River Murray in South Australia

The EWRs for the South Australian River Murray floodplain and for the Lower Lakes, Coorong and Murray Mouth continued to be assessed in 2012-2013 through the hydro-ecological analysis of the MDBA modelling of relaxing constraints for the Basin Plan water recovery scenarios. In the annual environmental watering report for the South Australian River Murray, South Australia has commenced reporting achievement of the EWRs.

A project through the Goyder Institute for Water Research commenced in 2012-2013 to establish environmental water requirements for the South Australian River Murray channel. This project will be completed in late 2013 and the information will be used in the development of the South Australian River Murray Long Term Watering Plan, as well as inform annual priorities and real-time management of environmental water.

1.3 Water Quality

Goolwa Channel Water Level Management Project

Phase 3 in the removal of the Clayton Regulator involved returning the regulator site as closely as possible to its pre-construction bathymetry and was completed on 24 October 2012.

Funding from the Australian Government, for full removal of the Currency Creek Regulator, was secured in July 2012. In late 2012, preparations were made and a tender process was completed to secure a contractor for full removal. The on-ground works for removal of the Currency Creek Regulator have been phased similarly to the removal of the Clayton Regulator and must comply with approval conditions under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). Removal of the Currency Creek Regulator has involved the removal of clean sand material to a disposal site on-land, and the mixed mud wave material to a water-based disposal site. Returning the site at Currency Creek as close as practicable to pre-construction bathymetry commenced on 20 February 2013 and is planned for completion and demobilisation in late 2013.

Lower Lakes Water and Soil Monitoring Programme

Water quality monitoring was undertaken in the Lower Lakes in 2012-2013, as part of a Lower Lakes monitoring programme, to guide adaptive management responses to future periods of low inflows and rewetting events.

In 2012-2013 water quality monitoring continued to show that pH levels are within the Australia and New Zealand Environment and Conservation Council (ANZECC) water quality guidelines (pH between 6.5 and 9) since the return of the higher water levels in the Lower Lakes. Surface waters in some locations continue to show low levels of acidity and these sites continue to be monitored to see if and how acid sulfate soils may affect the acidity of surface water.



As of mid-2013, salinity in Lake Alexandrina was around 600 EC as a result of continued inflows. However, it still remains high in Lake Albert (close to 3,500 EC) due to difficulties in cycling water through the Narrung Narrows into Lake Albert.

Along with water quality, acid sulfate soil monitoring occurred in the Lower Lakes in 2012-2013. The monitoring indicated that acidification hazards remain high since sampling was undertaken in early 2012, with minor increases in soil pH observed at two sites in Lakes Alexandrina (Point Sturt) and Albert Point (Campbell Park). However, the Lakes' sediments continue to pose a high acidification hazard upon drying and they are therefore likely to further acidify or rapidly re-acidify if they are once again exposed to oxygen. This has the potential to negatively impact surface waters and ecosystem health.

Investigations into the Coorong South Lagoon Salinity Reduction Scheme and South East Flows Restoration Projects

A proposal for the Coorong South Lagoon Salinity Reduction Scheme, to pump saline water from the South Lagoon to the Southern Ocean, was formally withdrawn from the CLLMM Recovery Project in April 2013. Hydrological modelling has indicated that there is a very low risk that the trigger point (salinity above 120 g/L) for implementation of the Scheme will be reached before 2014-2015, the final year that implementation would be possible under the CLLMM Recovery Project.

Concurrently, a decision was made to pursue the development of the South East Flows Restoration Project (SEFRP) to direct additional flows from the South East to the Coorong South Lagoon, using a combination of widened existing drains and newly constructed drains. Feasibility investigations and community consultation were held in 2012-2013, including hydrological modelling of potential additional flows and the development of a concept design. This phase informed the development of a business case for the project, which was submitted to the Australian Government in April 2013.

Drainage Disposal Basins

DEWNR operates and maintains 17 drainage disposal basins and related pipelines, pumps and caissons in the Riverland area. At Renmark, full replacement of the turbine pumps at the DEWNR-owned Caisson 5 was undertaken in 2012-2013. The pump gantry was also in poor condition and was replaced together with the installation of a new electrical control system. Ongoing operation and maintenance of each disposal basin has continued during the year including routine maintenance and pest control work such as rabbit and weed control.

Noora Disposal Basin

Saline groundwater from Salt Interception Schemes between Loxton and the South Australian border is pumped and evaporated at the Noora Disposal Basin. Significant work was undertaken at the Noora Drainage Basin during 2012-2013 to maintain fire breaks, fences and gates, and continue the weed control programme. These actions will help native plantings to establish and survive competition from other plants. A new native tree planting initiative commenced in May 2013 funded by a Commonwealth Biodiversity Fund grant.

River Vessel Waste Disposal Stations

There are 13 River Vessel Waste Disposal Stations situated along the River Murray in South Australia, which accept River vessel sewage and general waste free of charge. A station upgrade programme continued during 2012-2013 to meet increased houseboat traffic, accept black and grey water and solid waste, and to modernise ageing facilities nearing the end of their useful life.



Remediation of the onshore facilities at Morgan was completed in June 2013 and involved new pipework, refurbished septic tanks and a new concrete base.

The Walker Flat Waste Disposal Station remained out of service for part of the year due to a high risk of riverbank collapse. After four years of closure and ongoing monitoring remedial investigations determined that the station was once again safe for public use and was reopened in December 2012.

Modelling for Proposed Chowilla Regulator

The upgraded Chowilla groundwater model was used to estimate the potential changes in salt load under a range of Chowilla environmental operating regimes to inform the development of the Chowilla Operations Plan.

Salinity Management Programme

Salinity is a significant issue for South Australia due to the state's location on the lower reach of the River Murray, the natural geological structure of the MDB in which the River Murray acts as a drain for salt out of the landscape, the influence of human development, and the ultimate implications of salinity in terms of water quality for all uses including metropolitan Adelaide.

Key achievements to manage salinity in 2012-2013 included:

- delivery of South Australia's obligations under Schedule B to the MDB Agreement, including South Australia maintaining a positive balance on the Basin Salinity Management Strategy (BSMS) Salinity Registers;
- policy advice to influence changes to the Water Quality and Salinity Management chapter of the Basin Plan;
- completion of peer review and accreditation of several groundwater models to support annual update of entries on the BSMS Salinity Registers;
- active engagement with the MDBA and the CEWH to develop policy principles for accounting for salinity impacts of environmental watering; and
- policy input into the revision of the South Australian River Murray Water Allocation Plan.

For more information on salinity management go to: <http://www.environment.sa.gov.au/managing-natural-resources/river-murray/water-quality-issues/salinity>

For MDBA reports go to: <http://www.mdba.gov.au/services/publications>

Real-Time Management of River Murray Salinity

Real-time salinity management, also referred to as operational salinity management, involves making decisions on optimal infrastructure operation to achieve salinity (and other water quality) targets.

In 2012-2013 operational salinity management decisions were guided by South Australia's River Murray Annual Operating Plan. The Basin Plan, adopted in November 2012, also includes targets for managing water flows across the MDB and has provided further guidance for the management of real-time salinity. The water quality targets for managing water flows included in the Basin Plan relate to dissolved oxygen, recreational water quality and salinity.



In 2012-2013 salinity at the Basin Plan target reporting sites within South Australia remained below target due to periods of above entitlement flows and implementation of the BSMS. Salinities in Lake Albert at Meningie for 2012-2013 remained above pre drought levels with an average salinity of 3,000 EC.

In 2013-2014, the River Murray Annual Operating Plan will ensure the water quality and salinity targets in the Basin Plan are met.

Development of MODFLOW Groundwater Models

A series of MODFLOW numerical groundwater models have been developed for the length of the River Murray in South Australia from the border to Wellington. These models enable South Australia to meet obligations under Schedule B of the MDB Agreement and the BSMS, support salinity management decisions and inform planning, design and implementation of salt interception scheme infrastructure. A key component of groundwater model development is the accreditation process conducted by the MDBA. Accreditation involves a process of independent peer review of each model and ensures the models are sufficiently robust to be used as the basis for BSMS Salinity Register entries. In 2012-2013 the Waikerie to Morgan Numerical Groundwater model was accredited and the Woolpunda groundwater model was updated with new data and an improved understanding of the system obtained from 20 years of operating salt interception schemes in the area.

1.4 Human Dimension

WaterWise Communities

The WaterWise Communities initiative began in late 2009 as a partnership between the State Government, the Local Government Association of South Australia (LGA) and SA Water. It encouraged councils, residents, businesses, schools, churches, and sporting and recreational facilities to pledge their commitment to being responsible users of water.

The programme was expanded during 2011–2012 through the translation of personal water plans and magnets with water saving tips into 17 languages targeting 15 prominent ethnic groups throughout South Australia. The programme continued to be promoted throughout 2012-2013 through a dedicated section on the Water for Good website where registration was available and water saving checklists could be downloaded.

At 30 June 2013, 47 councils, 3874 householders, 45 businesses, 82 community groups, and 101 schools had registered through WaterWise.

Coorong, Lower Lakes and Murray Mouth Ngarrindjeri Partnerships Project

The Ngarrindjeri Regional Authority (NRA) formed the Ngarrindjeri Yarluwar-Ruwe Programme Group (NY-R) in early 2011-2012 as the key mechanism for coordinating Ngarrindjeri natural resource and cultural heritage management. DEWNR and the NRA entered into a long-term service agreement to the value of \$4.8 million in 2011-2012 to support the delivery of the CLLMM Ngarrindjeri Partnerships Project, a key element of the CLLMM Recovery Project.

The Partnerships project is underpinned by the whole-of-government *Kungun Ngarrindjeri Yunnan Agreement 2009* between the NRA and the South Australian Government. The NRA is leading the delivery of the project, which seeks to build core organisational capacity of the NRA so as to support the Ngarrindjeri in engaging with the CLLMM Recovery Project and progress long-term Caring for Country aspirations.



In 2012-2013 a range of training and development initiatives were implemented and the NRA commenced establishing partnerships with Natural Resources Management (NRM) Boards and other State agencies, in order to play a major NRM role in the region.

Meningie Lakefront Habitat Restoration

Lakefront habitat restoration has been undertaken adjacent to the township of Meningie as part of the Meningie Lakefront Habitat Restoration Project, undertaken in conjunction with a community reference group, the Ngarrindjeri community, the Coorong District Council, and local school students. In 2012-2013 the project included the completion of community planting of approximately 10,000 local native plants, out of a project total of approximately 55,000 plants, and the completion of wetland infrastructure installation and bank stabilisation works. Through these activities the project seeks to increase habitat for local species, restore and prevent further degradation of eroded banks, and provide improved amenity for the local community and visitors to the area. The 2012-2013 monitoring of a concrete drain, that was naturalised into a wetland corridor in 2011-2012, has shown that this work has contributed to improved water quality flowing into the lake and has increased wetland habitat.

River Murray Water Allocation Decision Framework 2012-2013

The River Murray Water Allocation Decision Framework (the Framework) is required to assist with the distribution of South Australia's 1,850 GL Entitlement Flow in accordance with Tier 1 water sharing arrangements under Schedule H of the Water Act 2007 (Water Sharing Schedule) and the MDB Agreement. No special water sharing arrangements were required for 2012-2013.

The Framework document can be found at: <http://www.environment.sa.gov.au/managing-natural-resources/river-murray>.

Water Allocation Plan Administration

Water allocation plans (WAPs) for the Angas Bremer, Peake-Roby-Sherlock, Noora, and Marne-Saunders Prescribed Water Resource Areas continued to be implemented in 2012-2013. The primary focus being the provision of efficient water licensing and trade administration, water-use monitoring and reporting, and the provision of support to the South Australian Murray-Darling Basin Natural Resources Management Board (SAMDB NRM Board) for WAP reviews.

The Angas Bremer Prescribed Wells Area currently has its own WAP, but falls within the Eastern Mount Lofty Ranges (EMLR) Prescribed Water Resource Area. When the draft EMLR WAP is approved by the Minister for Sustainability, Environment and Conservation, it will encompass both areas and replace the current WAP for Angas Bremer.

On 28 February 2013, the Minister approved the release and sale of unallocated groundwater from the fractured rock and the unconfined management areas 2, 3, and 4 within the Marne Saunders Prescribed Water Resource Area. It is intended that DEWNR will undertake the sale process in 2013-2014.

The amended Mallee Prescribed Wells WAP was adopted by the Minister for Sustainability, Environment and Conservation in May 2012. The WAP provides the rules for the conversion from area-based water allocations to volumetric allocations so as to enable allowable annual volume limitations. The conversion process under the WAP is a staged process, and all area-based licence holders were advised of the steps and expected timelines for the conversion process after the WAP was adopted.



The WAPS were developed by the SAMDB NRM Board, in consultation with the local community and industry, to guide the sustainable management of the region's water resources.

Water Carryover 2011-2012 to 2012-2013

On 1 July 2011, South Australia officially gained the legal right to store water in upstream reservoirs to help manage the risks associated with future droughts and reduce the reliability on the upper states for special water sharing provisions. This right is established under Clause 91, Schedule G of the *Water Act 2007* (Cth). Carryover enables South Australia to defer some Entitlement Flow for meeting future critical human water needs and also private carryover. The arrangements for private carryover allow irrigators to manage the risk of low allocations.

In December 2011, following a period of targeted consultation, the Private Carryover Policy was finalised and water access entitlement holders were advised of the new arrangements enabling the carryover of unused River Murray water from one year to the next.

As required under the Act, South Australia provided a Deferred Water Storage and Delivery Plan to the MDBA on a monthly basis. At the end of 2012-2013 South Australia had not deferred and stored any of its Entitlement Flow due to almost continuous unregulated flow and favourable water resource conditions throughout the MDB. At the end of 2012-2013, water access entitlement holders were informed that in 2013-2014 water allocations would be 100%. Carryover of unused allocation in 2012-2013 for use in 2013-2014 did not occur, due to a high likelihood of water stored for private carryover spilling from the storages and the long extended duration of environmental water delivery. In addition, arrangements agreed under the Multi-Site Environmental Watering Trial for 2012-2013 excluded SA from deferring and storing Entitlement Flows while receiving environmental water from these trials which extended for most of the water year after the cessation of unregulated flows.

The Water Carryover document can be seen at: <http://www.environment.sa.gov.au/managing-natural-resources/river-murray/agriculture-and-industry/private-carryover-policy>.

River Murray Operations

During 2012-2013 DEWNR undertook ongoing operations to manage the River Murray according to the 2012-2013 River Murray Operating Plan. Regular South Australian inter-agency meetings were held during the year to coordinate river operation decisions. In addition, a major component of the work involved inter-jurisdictional liaison on water resource management, delivery of environmental water, and accounting practices. River flow forecasts and advice have been delivered in the form of Weekly Flow Reports and weekly media communications with ABC Riverland radio throughout the year.

During early 2012, high flows were experienced in the South Australian River Murray and DEWNR coordinated the provision of hazard management information in the form of High Flows Advice and advised a period of heightened preparedness under a declared 'Flood Watch'.

South Australian Flood Hazard Plan and Flood Risk Assessment

DEWNR undertook an annual review of the Flood Hazard Plan for South Australia in accordance with its obligations under the State Emergency Management Plan. The Flood Hazard Plan continues to recognise priorities for improved flood management of the River Murray, which aims to increase the understanding of the risks of flooding through mapping and damage assessments, to increase community awareness, and to prepare long-term management strategies for the repair, maintenance and regulation of levee banks.



Information compiled on flood risks from the 2011 and 2012 River Murray high flows events and other information such as the risk assessment and mapping were used to inform the 2012-2013 investigations into environmental watering strategies.

Renmark Paringa Flood Mitigation Planning Project

DEWNR, in partnership with Renmark Paringa Council, has undertaken a project to improve flood mitigation and develop a long-term strategy for the management of levee banks which protect Renmark from flooding from the River Murray. Funding support has been received from the National Disaster Resilience Grant scheme.

In 2012-2013, DEWNR undertook flood modelling of the River Murray and assessed the consequences of potential flooding scenarios. Work also continued on the preparation of community awareness materials and a levee bank management strategy to evaluate risks and prioritise actions to improve levee banks. Renmark Paringa Council also undertook other aspects of the project, including the clarification of property titles over levee banks and resolving land access issues.

Riverbank Collapse

Riverbank collapse in the Lower Murray (between Blanchetown and Wellington) continues to present a risk to public safety, infrastructure, the economy, and the environment. DEWNR has continued to work with local landholders and Councils to restrict access to sites at high risk of collapse.

A review was undertaken of the management options for the four high risk riverbank collapse sites (River Front Road in Murray Bridge, Caloote Southern Residential Area, Woodlane Reserve, and East Front Road in Mannum), the results of which have been released to local councils and residents. The document can be found at the following link: http://www.waterconnect.sa.gov.au/RCHIW/Documents/High_risk_site_review.pdf.

In 2012-2013, DEWNR prepared a risk assessment for internal use on the riverbank collapse hazard in the Murray and Mallee Zone and undertook an annual review of the State Hazard Plan for Riverbank Collapse. Other programme functions in 2012-2013 included continued monitoring of high-risk sites, maintenance of the riverbank collapse hotline and database, and the provision of community education materials.

In 2012-2013, a joint venture commenced with the Goyder Institute for Water Research, in conjunction with the University of Sydney and Durham University, to address key knowledge gaps into riverbank collapse processes so as to assist in developing long-term management options.

The Living Murray Icon Site Indigenous Facilitators

At the TLM LLCMM Icon Site, members of the Ngarrindjeri Regional Authority worked in partnership with DEWNR to deliver The Living Murray Indigenous Partnerships Project. Key outputs for 2012-2013 include:

- NRA input into 2013-2014 LLCMM and River Channel annual environmental watering priorities;
- assistance from Ngarrindjeri staff with TLM condition monitoring programme; and
- attendance and input into key planning and consultation committees.

For the Chowilla Floodplain Icon Site, tours were held involving local Aboriginal community members; presentations were provided to the First Peoples of the River Murray and Mallee Region; and a tour/training workshop was held involving First Peoples, participants in Aboriginal Learning on Country, and Working on Country team members so as to develop awareness and skills regarding Icon Site monitoring programmes.



River Murray Water Licensing

In 2012-2013 a total of 1,161 water trade applications were lodged with DEWNR, which included 326 applications for water access entitlements (permanent) totalling approximately 20.61 gigalitres, 8 applications for water access entitlements (temporary) totalling approximately 1.1 gigalitres and 827 applications for Water Allocation (temporary) totalling 13.08 gigalitres.



2. Department of Planning, Transport and Infrastructure

The Department of Planning, Transport and Infrastructure (DPTI) is responsible for the administration of the *Development Act 1993* and the implementation of the *30 Year Plan for Greater Adelaide*. DPTI's work is further influenced by *Water for Good* and *South Australia's Strategic Plan 2011*.

2.1 River Health

Open Space Programme

Through its Open Space Programme, DPTI is working with interested local councils along the River Murray to increase and improve opportunities for open space. In addition, DPTI has an on-going grant programme for conservation and/or recreation projects on public land, including land located within townships.

2.2 Water Quality

Water Sensitive Urban Design

The *Murray and Mallee Region Plan*, which was adopted as a volume of the *South Australian Planning Strategy* offers an integrated and coordinated vision for future land use and development in the Murray and Mallee region, and responds to changes in the agricultural and horticultural industries as well as growth in the tourism industries. It includes policies related to Water Sensitive Urban Design (WSUD) to protect the quality and function of water ecosystems from the impacts of land use and development, including that new development (i.e. residential, retail, commercial, institutional, industrial and transport) in the region should apply the principles of WSUD.

In addition, the South Australian Planning Policy Library (SAPPL) contains policies related to WSUD. Councils that have converted their development plans to include WSUD policies from the SAPPL include Murray Bridge, Coorong, Berri Barmera, Renmark Paringa, and Loxton Waikerie.

Alexandrina, Yankalilla, Karoonda East Murray and the South Mallee councils are all in the process of incorporating WSUD policies into their development plans.



3. Department of Premier and Cabinet

The Aboriginal Heritage Branch of the Aboriginal Affairs and Reconciliation Division (AARD) in the Department of Premier and Cabinet (DPC) administers the *Aboriginal Heritage Act 1988* on behalf of the Minister for Aboriginal Affairs and Reconciliation.

The *Aboriginal Heritage Act 1988* covers all areas of South Australia, providing blanket protection for Aboriginal remains and Aboriginal sites and objects of significance to Aboriginal archaeology, anthropology, history, and tradition.

3.1 Human Dimension

Officer Training

DPC-AARD conducted Aboriginal Heritage training workshops in conjunction with the SA MDB NRM Board and the South East NRM Board. DPC staff also presented a workshop on Aboriginal Heritage site management in the Adelaide and Mount Lofty Region.

Lake Bonney Cultural Heritage Management Plan

Registration of Lake Bonney (along with other significant sites in the Riverland) onto the Register of Aboriginal Sites and Objects are currently pending approval. Registration would confirm their significance under the *Aboriginal Heritage Act 1988* and provide certainty to land managers as to appropriate management measures.



4. Environment Protection Authority

The Environment Protection Authority (EPA) is responsible for maintaining the water quality of the River Murray as directed by the *Environment Protection Act 2003* and the associated *Environment Protection (Water Quality) Policy 2003*.

4.1 Water Quality

Implementing the National Water Quality Management Strategy

The implementation of the *Water Act 2007* (Cth) directed that an integrated Basin Plan be developed, including the establishment of flow and water quality objectives consistent with the approach used in the National Water Quality Management Strategy (NWQMS).

During 2012-2013, the EPA continued to provide key scientific input into the Basin Plan process. The EPA was also involved in several cross agency planning discussions about the implementation of the water quality management components of the Basin Plan within South Australia.

Lower Murray Reclaimed Irrigation Area Investigations and Compliance

The EPA has continued to lead the monitoring, assessment, and management of acid drainage in the Lower Murray Reclaimed Irrigation Area (LMRIA). The acid problem persisted in the Lower Murray throughout 2012-2013 with 14 salt drain discharges remaining acidic with a pH of 3-5, with high levels of soluble metal present. The acid is being diluted and neutralised in a localised zone of the River Murray.

Complex water quality modelling was undertaken in 2012-2013, which suggests the Lower Murray drinking water off-takes will not be negatively affected during the return to lower (entitlement range) river flow conditions. Continued monitoring of river quality has shown good alignment with these predictions, with no exceedance of drinking water health guidelines relating to the acid issue.

Trials of various management options have been completed and documented in a remediation options report. Based on successful trials, two of these options (lime dosing of drains and sub-surface injection of lime) were identified as having potential for LMRIA-wide application. The EPA attended numerous community and stakeholder meetings on this issue in the Lower Murray. It is important to note that farming activity in the region successfully continued throughout 2012-2013, based on the approach and guidance delivered by the EPA. A summary report is being prepared on the project findings, which will be made available on the EPA's website <http://www.epa.sa.gov.au>.

This project continues to be beneficial, given the ongoing presence of severe acidity in the region and the potential return to lower river flows, and by recent information that suggests metals released though continued acidic conditions may impact aquatic ecosystems in the River Murray



Random Audit Programme for River Boat Vessels

Works undertaken in the continued roll out of the Code of Practice for Vessels and Facility Management (marine and inland waters) during 2012-2013 included:

- interstate promotion of the EPA's Code of Practice for Vessel and Facility Management (marine and inland waters) and the Australian Standard for Greywater Treatment on Inland Waters (sponsored by the EPA) to encourage NSW and Victorian vessels to reduce pollution so that it does not flow down to South Australia;
- provision of timely advice to industry and the community on the requirements of the Code, including development of extensive supporting information;
- engaging with all private and commercial vessel owners operating on the River Murray on a case by case basis to ensure a commitment (and firm timeframe) to comply with the Code;
- further development and implementation of an interactive vessel management database to manage the compliance of the approximately 1,600 vessels operating on the River Murray;
- facilitation of ongoing testing and the development of greywater treatment systems installed on vessels in the River Murray as well as working with potential and existing treatment system manufacturers to provide technical support to assist in the successful development and commercialisation of these systems;
- formalisation and licensing of slipways and marinas along the River Murray and facilitation of the Clean Marina programme, in conjunction with the Boating Industry Association of South Australia, to encourage and inform all marina managers as to their legislative responsibilities; and
- the roll out of a process where industry accredited inspectors are available to inspect and assess private vessels operating on inland waters for compliance with wastewater requirements as per the Code. The process was based on the successful DPTI Boat Code programme and developed in consultation with industry and boat owners. Positive feedback has been received from the inspectors and the public alike with the accreditation system and processes. Further work is needed in 2013-2014 to complete the formalisation of the programme to allow it to sustain itself into the future.

Sand Dumping and Bank Stabilisation

Sand dumping was a significant concern during the drought as river residents attempted to shore up riverbanks, cover the smell of acid sulfate soils, and create artificial beaches, as many metres of riverbed and mud became exposed due to low water levels. EPA officers, supported by DEWNR, DPTI and Local Government, led a programme to inform and educate river residents against this practice and warn of potential penalties as the practice has the potential to cause harm to the River, therefore breaching the general duty of care in the River Murray Act, as well as the *Environment Protection (Water Quality) Policy 2003*. With river levels returning to pre-drought levels, the focus is shifting to bank stabilisation and restoration.

With continued high flows and river levels, as well as a recent surge in, and return to, recreational boating activities within the River Murray, the EPA along with Local Government continue to receive many enquiries regarding bed and bank score as well as erosion protection.

Work undertaken in 2012-2013 has included:

- conducting audits and sending out letters of compliance;
- continuing the enforcement campaign to increase awareness and reduce the instance of importing and dumping sand along the banks of the River Murray for amenity purposes;
- providing timely advice to sand dumping and bank stabilisation questions and alternatives; and



- working closely with local community groups, commercial product developers and the SAMDB NRM Board to deliver a number of regional test sites (Berri Community Rowing Club was completed in 2011-2012) that can be used to promote alternatives to sand and rock bank stabilisation.

Evaluation of Proposals for Development

The EPA, by virtue of the *Development Act 1993* (through the declaration of the River Murray Water Protection Area under the *Environment Protection Act 1993*) as well as the provisions of the River Murray Act, has been offering advice and providing direction to planning authorities for consideration of, or attachment to, development approvals to avoid/minimise the potential impacts of such developments upon water quality and other environmental values. This includes providing advice on applications regarding jetties, boat ramps, retaining walls, dwellings, land divisions, intensive animal keeping, dredging, and wastewater treatment plants.

Work undertaken in 2012-2013 has included:

- on-site meetings with developers, residents and local councils to discuss proposed plans that may affect River Murray water quality;
- written advice to Councils and DPTI outlining consistency with existing legislation and EPA conditions for development; and
- progressing the creation of a response matrix for development applications to simplify and maintain consistency in the response process.

Along with this work, EPA officers have visited a number of Councils along the River Murray to discuss water quality and how potential developments may have adverse effects on the river, as well as to discuss alternatives and thoughts on future sustainable development in the region.

Audit Compliance and Enforcement

The EPA has a comprehensive audit, compliance, and enforcement programme and is also responsible for certain referrals under the River Murray Act. The EPA routinely undertakes random audits and inspections on a range of licensed and unlicensed industries that have the potential to have an impact on River Murray water quality. Compliance is enforced through a range of instruments including letters, fines, environment protection orders, clean up orders, and prosecution.

Major issues requiring enforcement in 2012-2013 included sand dumping, illegal development reparation (affecting water quality of the river), riparian grazing, pesticide mismanagement and clean up, abandoned vessels, water fires, sewage spills, and (to a lesser extent) diesel spills into the river. All of these issues were dealt with using a range of approaches, including verbal advice, letters, environment protection orders, and emergency response.

4.2 Human Dimension

Clean River Programme

The rise in noise, nuisance and wave action, generated from the increase in recreational and commercial use of the River Murray, has been reported as having an adverse impact on other River users as well as the riverine environment. Past years of drought seem to have exacerbated the issue of erosion and, when combined with increased wave energy, continue to cause problems.

Programme work undertaken in 2012-2013 included the facilitation of the "River Murray Boating and Recreational Advisory Group" a new community-based group that was established by concerned river users to develop strategies



which aim to enhance the experience of river users and manage their impact on the environment and other river users.

During 2012-2013, a number of strategies were developed. The strategies aimed to produce content relating to stewardship of the riverine environment, the education of all river users, the determination of the impacts of each activity on the riverine environment, as well as changing behaviours so that river activities may be enjoyed safely and sustainably.



5. Primary Industries and Regions South Australia

Primary Industries and Regions South Australia (PIRSA) through the South Australian Research and Development Institute (SARDI) undertakes significant research regarding the ecology of the River Murray, as well as its floodplains and wetlands. SARDI also assists the irrigation industry through research and extension including irrigation modernisation and irrigation efficiency programmes. In this regard, PIRSA has worked in partnership with the Water Industry Alliance and the irrigation sector to develop the South Australian River Murray Sustainability Programme. PIRSA also administers the *Fisheries Management Act 2007*, which aims to protect, manage, use and develop the aquatic resources of the state, in particular the River Murray in a manner that is consistent with ecological sustainable development.

5.1 River Health

Flow and Fish Ecology in the Coorong

This study provides the first comprehensive and quantitative assessment of fish assemblages of the Murray Mouth and Coorong region under prolonged drought conditions. The study examined reproductive biology of fish species in the region, assessed the relationships between flows and fisheries production, and developed salinity tolerance thresholds of juveniles for key Coorong species. The results of the study emphasised that the maintenance of a salinity gradient and connectivity between the freshwater, Coorong, and marine systems are paramount to the ecological health of the Coorong fish community and the fishery.

A final Fisheries Research and Development Corporation (FRDC) report will be published and is entitled "Flow Related Fish and Fisheries Ecology in the Coorong, SA".

Coorong Fish Condition and Barrage Release Intervention Monitoring

Fish condition has been monitored annually from 2008 to 2013 by SARDI in the Murray Estuary and Coorong. The work has occurred so as to assess the population and recruitment status of Black bream, Greenback flounder and Small-mouthed hardyhead, with reference to ecological targets in the CLLMM Icon Site Condition Monitoring Plan and the Environmental Management Plan. More specifically, spawning and recruitment of these species have been assessed, and information on biological performance indicators have been reported and compared with previous years or upon an 'intervention' as outlined in the CLLMM Icon Site Environmental Management Plan. The project was funded by TLM Programme through DEWNR.

With the current barrage releases, intervention monitoring has been undertaken by SARDI in the last three years (2010-2013) to assess the changes in fish assemblage structure, distribution and recruitment, and population recovery in the Murray Estuary and Coorong. A range of hypotheses were tested regarding fish response to the flow events. The results support the importance of freshwater flow in restoring estuarine fish habitat and facilitating the recruitment of estuarine and diadromous species in the Coorong. The project was funded by DEWNR through the Murray Futures CLLMM Programme.



Murray Flood Ecology Project

To achieve the greatest ecological benefits from available environmental water in the River Murray, it is vitally important to know how the biological systems respond to various flow scenarios. The Murray Flood Ecology (MFE) project funded by the Goyder Institute is a unique opportunity to undertake time-critical ecological investigations and measure how biological systems respond and recover when water is restored to the River Murray system after a long period of drought. The project is lead by SARDI with collaborative research undertaken by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the University of Adelaide, and Flinders University.

The research outcomes will inform environmental flow management and policy development in order to maximise the ecological outcomes from available water. The project will generate important knowledge to help South Australia continue to adapt and thrive in a water-scarce environment. A number of technical reports of MFE research tasks have been published on the Goyder Institute website. A project synthesis report is being prepared and will be available in the near future.

Murray Cod Closure

PIRSA announced the continuation of management arrangements, which were initially implemented in 2011, for Murray Cod for the 2012-2013 year. The Murray Cod fishery was open to recreational catch and release fishing from 1 January to July 31 2013, with a seasonal closure and a trolling ban from 1 August to 31 December 2013. Chowilla was closed to fishing for Murray Cod for the 2012-2013 year.

Recreational Fishery Management Plan

PIRSA has commenced development of a management plan for the recreational fishery in South Australia under the *Fisheries Management Act 2007*.

Lower Lakes and Coorong Management Plan

PIRSA has commenced development of a management plan for the Lower Lakes and Coorong Fishery under the *Fisheries Management Act 2007*.

River Murray Freshwater Catfish

Since 1997, the South Australian River Murray Freshwater Catfish (*Tandanus tandanus*) has been a protected species under the fisheries legislation. The protection was the result of scientific data that indicated the species had experienced a significant decline in distribution and abundance along the South Australian River Murray.

As high flows in the River Murray continue, recreational fishers have reported an increase in the number of River Murray Freshwater Catfish unintentionally being caught. PIRSA has established a Catfish working group to understand the current stock status and provide advice on the future management of Catfish. An FRDC project has been funded to promote a co-management approach with local fishers to determine the preliminary stock status of the River Murray Freshwater Catfish population. The project will be undertaken towards the end of 2013.

Reducing the Impact of Salinity on the Ecological Processes and Productive Capacity of the River Murray System

During 2012-2013, PIRSA sought Expressions of Interest from parties interested in commercially utilising water from the Woolpunda Scheme of the Woolpunda, Waikerie and Qualco Salt Interception Scheme network. This commercial activity supports inland aquaculture whilst significantly reducing the impact of salinity in the Murray-Darling Basin.



Referral of Aquaculture Activities within the River Murray Floodplains

PIRSA notifies DEWNR, as part of the aquaculture licence assessment process, for land-based aquaculture licence proposals within the Murray-Darling Basin. Notifications occur both directly to the Department and through referrals to the local council under the development assessment process. This ensures any issues relating to the River Murray Act 2003 can be considered and fed back into PIRSA's licence assessment process.

5.2 Environmental Flows

Monitoring Ecological Response to Commonwealth Environmental Water Release

This project is funded by DSEWPaC and the CEWO to undertake investigation and intervention monitoring for the short term (less than one year) environmental and ecological responses in the lower River Murray to environmental water provided by the Commonwealth. It will report on the benefits of CEW received in South Australia during 2012-2013 and, where possible, demonstrate the environmental and ecological responses associated with CEW objectives.

A series of hypotheses have been established for 2012-2013, which link to relevant CEW objectives, based on conceptual understanding of the life histories of relevant biota and ecological processes, and what responses may be expected from the flow scenarios and CEW delivery. The project is lead by SARDI with collaborative work conducted by the University of Adelaide, CSIRO, University of Western Australia, DEWNR and SA EPA. The project will not only demonstrate environmental water outcomes, but also provide important information for optimising the ecological outcomes in future provisions of environmental water, which also contributes to adaptive management.

Field sampling and laboratory processing have completed in 2012-2013, and a final project report will be prepared in 2013-2014.

5.3 Human Dimension

South Australian River Murray Improvements Programme

The Water Industry Alliance (WIA) commenced development of a bid for a \$240 million water recovery and industry assistance programme in May 2011.

In October 2012, then Commonwealth Minister for Water, the Hon Tony Burke MP, announced a commitment of \$265 million for South Australian River Murray communities to occur over a six year period, commencing in 2013-2014. The funding commitment included the \$240 million River Murray Improvements Programme (RMIP), with the return of 40 GL of water access entitlement to the Commonwealth to count toward Basin Plan water recovery targets, and an additional \$25 million for a complementary regional development research and innovation programme.

Draft business cases for the RMIP were presented to the Commonwealth in December 2012 and February 2013, with the final business case and programme proposals for the \$265 million South Australian River Murray Sustainability Funding Package being submitted on 21 May 2013. In August 2013, the announcement of \$265 million in measures to secure the health and sustainability of the River Murray, its industries and communities in South Australia was welcomed by the state.



Native Fish Strategy

The Native Fish Strategy (NFS) is a 50 year programme seeking to recover native fish back to 60% of its pre-European level.

The NFS Coordinator supported:

- the Fishers for Habitat Forum;
- attended Riverland field days;
- the provision of technical advice and support for the Katfish demonstration reach;
- pest species management; and
- the recovery of threatened species (such as the Murray Cod and Catfish).

The SA Native Fish Advisory Panel members also contributed to the NFS by providing advice to the NRM Council in relation to native fish recovery and management in the MDB.

Fish Habitat Network

PIRSA held two forums in May 2013 to support the Fish Habitat Network (FHN), which aimed to raise awareness of issues affecting fish numbers and the potential of improving local fisheries through improving habitat. The FHN is a partnership of organisations across Australia that has an interest in fish habitat rehabilitation. There are currently 17 partners, including government, recreational fishing, and industry organisations.

Recreational Bag, Boat and Size Limit Review

PIRSA periodically reviews recreational bag, boat and size limits. These reviews aim to update the existing limits by taking into account fishery stocks, harvest shares, recent biological research and the principle that recreational fishing is considered a sport/pleasure activity and is not managed to provide a return on investment in boats or fishing gear. The reviews seek advice from fisheries scientists, fisheries managers, compliance officers and key recreational fishing stakeholders.

Regional Development Fund

The South Australian Government has restructured the Regional Development Infrastructure Fund to establish the Regional Development Fund. The Regional Development Fund aims to increase the prosperity of regional communities by facilitating projects and programmes that support sustainable economic development. The Regional Development Fund is a \$3 million per annum, merit-based grant programme to deliver on PIRSA's Regional Development Objectives, and the South Australian Government's seven strategic priority areas.

The broad objectives of the Regional Development Fund are to support regional economic development by facilitating:

- the creation of new regional employment and the attraction of new investment;
- projects and programmes that are strategically important for the State, the regions, and a major industry sector; and
- projects and programmes that directly support the Government delivering its seven strategic priorities.

There are two programme streams under the Regional Development Fund:

Stream 1: Growing Stronger Regions - \$1.4 million per annum.



Stream 1 provides support to the non-metropolitan Regional Development Australia (RDA) committees for programmes that address at least one of the following South Australian Government seven strategic priorities:

- creating a vibrant city;
- renewing our neighbourhoods to make them safe and healthy;
- an affordable place to live for everyone;
- every chance for every child;
- growing advanced manufacturing;
- realising the benefits of the mining boom for all South Australians; or
- premium food and wine from our clean environment.

Each RDA can access funding from \$50,000 to a maximum of \$200,000 each year for eligible programmes.

Stream 2: Creating Competitive Regions - \$1.6 million per annum

Stream 2 targets non-metropolitan private sector businesses, industry associations, community organisations, regional local government, and the South Australian non-metropolitan RDA Associations. Applicants in Stream 2 can access funding from \$50,000 to a maximum of \$200,000 for eligible projects. Projects that come within this stream aim to:

- grow advanced manufacturing;
- realise the benefits of the mining boom for all South Australians; or
- produce premium food and wine from South Australia's clean environment.



6. South Australian Murray-Darling Basin Natural Resources Management Board

The South Australian Murray-Darling Basin Natural Resources Board (SAMDB NRM Board) implements a range of relevant programmes and projects under the direction of its Regional Natural Resources Management Plan 2009. Natural Resources South Australian Murray-Darling Basin regional staff are employed by DEWNR and work to achieve the targets of the regional NRM Plan developed by the SAMDB NRM Board.

6.1 River Health

Threatened River Murray Fauna Recovery Programme

Work on Regent Parrots, a threatened species, continued with new information collected using trackers. Information collected included data on what the birds are feeding on, working with Zoos SA on the health issues of some birds, as well as use of a nest camera in order to determine the competition and behaviour of the Regent Parrot at breeding sites.

A community education campaign was run, allowing the community to call 1-800-Parrot enabling community volunteers within the SA Regent Parrot Recovery Team to record sightings of Regent Parrots. This group has been nominated for a Premier's NRM Award for their contribution to research and innovation.

Hogwash Bend has been proclaimed as a Conservation Park, with management guidelines developed to assist in the protection of the largest known Regent Parrot breeding colony in South Australia.

Riverland Ramsar Site Management Plan

A Riverland Ramsar project was initiated, with funding from the Australian Government's Caring for Our Country programme, to implement the priority actions from the management plan and assist with improving the ecological character of the Ramsar site. This involved on-ground works to remove pest plants and animals, habitat restoration and ecological monitoring. The project included conservation land, crown land, and engaged with 16 private landholders who live and work within the Ramsar site.

Wetland and Floodplain Programme

In 2012-2013 the Wetland and Floodplain programme continued to provide ecological and hydrological technical support to 50 wetland projects, many of which had community and landholder involvement. This included providing advice on the management of wetlands for ecological benefit, monitoring and the collection of wetland ecological data, and assisting with infrastructure operation. Wetland on-ground works were successfully completed at 15 priority wetland sites covering 850 hectares of aquatic habitats. These included rehabilitation works for threatened species, designs for structures at Terinogie, environmental watering at Whirlpool Corner, infrastructure at Banrock Wetlands, and removal of flow barriers at Tolderol.



In 2012-2013, the Wetland and Floodplain programme continued to deliver on a substantial component of the Riverine Recovery Project: Phase 1a. Management objectives, hydrographs, and draft Wetland Plans have been completed for 22 managed wetlands along the River Murray. This work included community and landholder engagement at the 22 sites to ensure stakeholder endorsement of the plans. Objectives of wetland management included maintaining important key habitats and features of River Murray wetlands, such as aquatic and riparian vegetation, and providing habitat for important fauna such as the nationally threatened Southern Bell Frog. Wetlands are now being managed for wetting and drying as per their management plans and ecological data has been collected including fish, frog, and bird surveys.

6.2 Environmental Flows

Environmental Watering

As DEWNR reported in section 1.2 of this document, South Australia received approximately 1,075 GL of environmental water (289 GL from TLM environmental water and 786 GL of CEW) during 2012-2013.

A portion of the environmental water was allocated by the CEWH and delivered by the Wetlands and Floodplain Programme to three priority wetland sites along the River Murray in South Australia during 2012-2013. Two of the wetlands, Dishers Creek and Berri Evaporation Basin, were allocated water to maintain habitat for the nationally threatened fish species, the Murray hardyhead. Whirlpool Corner wetland received Commonwealth water to provide habitat for waterbirds to the help maintain River Red Gum regeneration that had established around the edge of the wetland following the higher flows in 2010-2011 and 2011-2012.

6.3 Water Quality

Community Stream Sampling Programme

The community stream sampling programme has continued to support more than 40 community groups across the SA MDB region. The Programme supports communities within the SA MDB NRM region with skills and knowledge to monitor, report, and communicate water quality parameters such as salinity, nutrient levels, turbidity, and pH levels. The information obtained is used by groups to better understand their local water resources. In addition, this local-scale monitoring is used to enhance the regional water resource picture.

In 2012-2013, the SAMDB NRM Board supported the continued operation and development of an online database that became operational in June 2010. Recommendations to improve the adequacy and appropriateness of monitoring programmes have been implemented from past reviews and strengthening feedback, as well as a "Change Exchange" forum that took observed and measured change since 2007 into account. The extent of knowledge and observations presented by the community was impressive. Environmental change was reported from approximately 40 monitoring projects. Catchment summaries continue to be developed to report against resource condition.

Automatic Weather Monitoring Network

The SAMDB NRM Board continued to manage the network of 38 automatic weather stations and automated rain gauges. During 2012-2013, there was a heavy emphasis on upgrading temperature, global solar radiation, and wind speed sensors through re-calibration or replacement. The visits to the sites as a whole remained largely the same as the previous season (data pending) and recent surveys in one target zone of the Murray Mallee has shown that out of 134 landholders surveyed 78.4% (105 landholders) were using the localised weather data. Without detailed verification, this suggests a farmed area of potentially over 225,000 ha. The data provided by the automatic weather



stations helps to indicate evaporation rates for wetlands and other key areas to calculate water savings. The stations are also utilised to inform on-farm irrigation management, which in turn leads to efficient irrigation practices and a reduced amount of drainage into the River.

Commonwealth Water for the Future Programme

During 2012-2013, the SAMDB NRM Board was successful in attracting in-principle funding through Round 3 of the Australian Government's On-Farm Irrigation Efficiency Program (OFIEP). The \$36.5 million of funding will support the delivery of over 200 individual irrigator projects and deliver water savings in excess of 12GL whilst continuing to deliver on Round 2 of the On-Farm and Private Irrigation Infrastructure Projects undertaken during the 2011-2012 period.

Community Land and Water Management Plan Initiatives

During 2012-2013 irrigated crop surveys were undertaken across the Qualco-Sunlands, Rilli, Media, Sherwood, Riverland North, Waikerie Private, Pike and Murtho regions equating to a total of 13,591 irrigated hectares. Irrigation efficiency assessments were completed for the Bookpurnong to Lock 4 and Taylorville North regions, and further assessments commenced in the Pike and Murtho regions.

Community Land and Water Management Plan upgrade activities came to completion in the Pyap to Kingston on Murray region with the development of the pilot Land and Water Management Plan (LWMP) for the region and an upgrade of the Taylorville North LWMP commenced. Implementation activities continued in Bookpurnong to Lock 4 and the Angas Bremer. Groundwater investigations were completed in Bookpurnong to Lock 4 and Taylorville, and commenced in Pike and Murtho.

A range of supporting services continued to be provided to growers through the analysis of local weather and climate data, as well as soil-moisture monitoring data derived from the reference sites developed in the River Murray Corridor and the Murray-Mallee. These services were promoted by post and through grower interaction.

Irrigation Research and Development

In 2012-2013, SAMDB NRM Board continued its collaboration in the development of the Irri-Eye trial in the Bookpurnong to Lock 4 irrigation district. At the end of the 2012-2013 year, the data was evaluated by the Bookpurnong to Lock 4 Environmental Association in conjunction with the Regional Land & Water Management Planning Coordinator. Several anomalies have been identified between the use of the imagery and actual crop water use requirements that will require further in field testing in 2013-2014. Overall the Irri-Eye project has proven to date that, even at the coarse resolution provided, the tool can greatly assist resource managers to work with irrigators and irrigation communities by better identifying and correlating high water use requirement periods. The community engagement and data usage component of the overall project concept will be advanced further in 2013-2014.

6.4 Human Dimension

Water Allocation Plan for the River Murray Prescribed Watercourse

In developing a new draft WAP for the River Murray, SAMDB NRM Board, in partnership with DEWNR, are progressively developing a range of policy discussion papers for engagement with the River Murray Advisory Committee as a first review step. Some key policy areas being developed for wider engagement include salinity zoning, as well as environmental and wetland management. Multiple levels of engagement are planned up to



December 2013, subject to the development and finalisation of the discussion papers. Formal consultation on the draft plan is expected in the second half of 2014.

Natural Resource Management School Education

In 2012-2013, 72 schools in SA MDB were involved with the SAMDB NRM Board's NRM Education Programme. The Programme provides a critical role in contributing to the knowledge, skills, and confidence of young people and educators to manage natural resources more sustainably.

A range of initiatives were delivered including Focus Sites for Sustainability, NRM School Grants, teacher professional development workshops, classroom education sessions, Waterwatch and Weed Warriors programme, and youth voice opportunities including the River Murray Youth Council and Junior Youth Environment Forums. The students of the River Murray Youth Council developed a YouTube video on their six day trip to the headwaters of the River Murray, showcasing the issues affecting the Basin and the communities that depend upon it. The video can be seen on the following link: <http://www.youtube.com/watch?v=1GcAnfex1SU>.

NatureLinks

The River Murray-South East NatureLink has been steadily working with the regional partners to deliver considerable on-ground conservation outcomes. Key partners include Local Action Planning Associations, Aboriginal learning on Country programme, non-governmental organisations (NGO's), and the State Herbarium. Through these partnerships there has been considerable work done including threatened flora protection works, a major stewardship programme delivered, and continued support of threatened fauna projects. The collaborative and partnership approach is beginning to become fully realised with a strong network and significant projects being undertaken.

Friends of Riverland Parks

In 2012-2013, Friends of the Riverland Parks undertook:

- revegetation works at Moorook Game Reserve (at two locations within the reserve);
- revegetation continued in the Katarapko section of the River Murray National Park, in the upland rise around the edge of the floodplain. It was completely cleared of vegetation in the days of the early settlement. Boneseed and Gazanias were the main weed removal targets this year with fox baiting continuing as usual;
- surveys of two active Malleefowl mounds located in Pooginook and Cooltong Conservation Parks;
 - a four day biological survey was also conducted in these two parks as part of a ten year fauna monitoring programme. Regular fox baiting is also a focus in these parks
- removal of an old fence line in Pooginook Conservation Park, removal of tyres from Murtho Forest, and rubbish taken from Cooltong Conservation Park;
- the nationally threatened Regent Parrot became a focus for members during the breeding season with sightings and nest records being made.

Save the Lake Bonney Group have completed the marker upgrade and signage in Loch Luna Game Reserve. A partnership project between the Friends of Lake Bonney SAMDB NRM Board (funded by NRM community grants) allowed for the completion of a signage project at Chambers Creek (Loch Luna Game Reserve) in 2012-2013.



Aboriginal Partnerships Project

The SA MDB Aboriginal Partnerships Project aims to increase the participation of the Aboriginal community in natural resources management, increase cultural awareness within the NRM community, and protect and restore cultural assets.

A highlight of the project in 2012-2013 has been the continued success of the Aboriginal Learning on Country (ALoC) and the Working on Country programmes. These programmes provide training and employment to Aboriginal community members. ALoC projects continue to take place at Monarto Zoological Park, while the DEWNR project continues to work on Pike River, Chowilla, and other public land. ALoC projects have continued at Raukkan and at the Kungun Centre in the Riverland, which is hosted by the Aboriginal Lands Trust, where trainees participate in projects along the river from Berri to Mannum. The Riverland Working on Country project continues, with six aboriginal rangers employed and receiving conservation and land management training.

A new project called the Aboriginal Heritage Project has commenced, which involves working closely with the NRA and First Peoples of the River Murray and Mallee. This initiative will increase regional effort for management, protection of cultural heritage values, and engagement with relevant Aboriginal communities. The project will provide greater certainty that regionally significant cultural heritage sites are being protected in line with legislative requirements.

Local Action Planning

In 2012-2013, SA MDB continued to support the region's 10 Local Action Planning (LAP) groups to engage extensively with their local communities in NRM programmes. The LAP groups played a major role in the delivery of on-ground works for Natural Resources, SA MDB's biodiversity, wetlands, NRM Education and land management programmes. They also undertook a variety of activities including raising community awareness, building community skills and knowledge, supporting the recruitment and retention of volunteers, and assisting the community to access technical and financial assistance.

Adaptation Planning for Natural Resources Management in the SAMDB NRM Region

The goal of this programme is to increase the capacity of the region to adapt to climate change impacts, enabling added resilience across all sectors. It provides an integrated step toward economic, social, and environmental well-being in the face of climate change. Phase 1 of a regional integrated vulnerability assessment of this programme has been completed and funding received for Phase 2, which will complete the gap identification, integrated vulnerability assessment and complete the Regional Adaptation Plan by mid-2014. The steering committee is also supporting regional governance, by supporting a regional sector agreement consistent with the state process and the *Climate Change and Greenhouse Emissions Reduction Act 2007*.

Water Allocation Plan for the Eastern Mount Lofty Ranges

In August 2012, after responding to all submissions received as part of public consultation, the Board handed the draft WAP to the Minister. The Minister has undertaken his own engagement on the draft plan with the NRM Council.

During the consultation period, the Board along with DEWNR improved upon the WAP in response to the quality of comments made through the submission process. As a result, some significant changes, some requiring further technical and policy work, are required before being able to finalise the WAP. The SAMDB NRM Board in partnership with the Adelaide and Mount Lofty Ranges Natural Resources Management Board (AMLR NRM Board) and DEWNR



continue to scope the works required to secure the return of low flows in the Eastern and Western Mount Lofty Ranges.



7. South Australian Tourism Commission

The South Australian Tourism Commission (SATC) sets the strategic direction for tourism in the state through its State Tourism Plan. SATC works closely with key industry and government partners to strengthen the tourism industry within South Australia. The SATC has developed Destination Action Plans (DAPs) to focus and prioritise projects to achieve the goals set out in state and regional strategies. The SATC is focused on delivering long-term growth for South Australia's tourism industry.

7.1 Human Dimension

Murraylands Integrated Strategic Tourism Plan 2009-2014

The Murraylands Integrated Strategic Tourism Plan was implemented by Murrayland stakeholders (i.e. Mid Murray Council, the Rural City of Murray Bridge, etc). SATC engages with Murraylands Councils, Regional Development Australia Murraylands and Riverland, and Murraylands Tourism Partnership through the Destination Action Plan (DAP) process.

The document may be viewed by following the link below:

http://www.murraybridge.sa.gov.au/webdata/resources/files/20090609_appendix_876-1-5.pdf

Riverland Destination Action Plan 2012-2015

The Riverland DAP is a partnership between SATC and Destination Riverland to market and develop the region over the next three years. It lists 19 actions to increase visitor numbers and yield to the region, which includes promotion in New Zealand of South Australia Riverland holidays, investigating options for local backpacker accommodation and developing a major new event for the region.

Recent outcomes from the DAP process include:

- the development of a regional brand positioning with Destination Riverland;
- 'Best Backyard', a Riverland component of the intrastate marketing campaign which included press advertising, launched in October 2012;
- a grant from the 'Tourism Development Support Programme' to Pike River for the development of eco accommodation; and
- a grant as part of the 'New Product Support Programme' to Wilkadene for a shearing shed function centre and micro-brewery experience.

The Riverland DAP can be viewed at the following link:

<http://www.tourism.sa.gov.au/assets/documents/About%20SATC/riverland-destination-action-plan.pdf>

Murray River, Lakes and Coorong Destination Action Plan 2012-2015

The Murray River, Lakes and Coorong DAP is a partnership between the SATC and Murraylands Tourism Partnership that prioritises resources from SATC and regional stakeholders. The DAP supports the Murraylands Tourism Strategy, focusing on specific actions that SATC is able to assist with.



The Murray River, Lakes and Coorong DAP has a number of actions, including:

- developing a plan to develop one new commercial tour or attraction per year for the next three years;
- testing and developing new experience concepts for the region; and
- raising awareness and encouraging the use of new media and GPS technology to enhance and modernise experiences.

Some of the recent outcomes from the DAP process include:

- development of a regional brand positioning with Murraylands Tourism Partnerships;
- the intrastate programme 'Best Backyard' had a focus on the Murray River, Lower Lakes and Coorong and featured digital, print and outdoor advertising;
- the issuing of a grant under the 'New Product Support Programme' to Canoe the Coorong for the development of a new Penguin Island Tour;
- and the sponsorship of two events through the Regional Events and Festivals Programme.

The Murray River, Lakes and Coorong DAP can be found at the following link:

<http://tourism.sa.gov.au/sa-tourism/regions.aspx>



8. SA Water

SA Water, under the direction of the *Water Industry Act 2012*, is responsible for maintaining the drinking water supplies of South Australia, including water that is sourced from the River Murray. It is also the delegated authority under the Minister for Water and the River Murray for managing a range of water infrastructure throughout the state.

8.1 River Health

Incorporating Fish-ways into Engineering Structures

Work to complete the two remaining fishways under the Sea to Hume Dam Fishway programme has recommenced following the return to low flow scenarios in the River Murray. It is expected that both fishways will be completed in the 2013-2014 financial year, provided river flows remain below threshold flows of ~ 20,000 ML per day. Separate funding from the Commonwealth Government has been made available to provide additional fishways at the Murray Mouth Barrages. SA Water is working with DEWNR to design the fishways with construction due to be undertaken over three years.

8.2 Environmental Flows

Aquifer Recharge, Storage, and Recovery

The two large stormwater reuse schemes (using aquifer storage), located at Barker Inlet Wetlands and the Adelaide Airport, are about to be commissioned. The Barker Inlet scheme was initially delayed because of the presence of carp, which caused water quality issues. This has now been controlled and the scheme is ready for commissioning.

The Lochiel Park scheme currently has issues relating to water quality, due to the presence of pesticides in the wetland water. Investigations are underway to determine the source of the pesticide.

The Aldinga recycled water Aquifer Storage and Recover scheme has completed its third cycle, with improvements in salinity of the extracted water being evident in 2012-2013.

8.3 Water Quality

Algal Bloom Detection

Algal blooms can potentially occur when there are available nutrients, low flows, and suitable temperatures in a water body. Some cyanobacteria (blue-green algae) produce by-products such as taste and odour compounds and, when present in high concentrations, can present health concerns unless appropriate treatment is carried out. During 2012-2013 SA Water continued with its comprehensive River Murray water quality monitoring programme at 23 key locations, with specific monitoring to detect any algal blooms. This included the use of water quality probes fitted with special sensors for the determination of in-situ cyanobacterial biomass, enabling an early detection of algal blooms in the river and implementation of appropriate management and operational actions.



Drinking Water Exclusion Zones

Exclusion zone buoys were installed at all 17 SA Water River Murray off-takes to keep boats and houseboats a certain distance clear of the inlets to water treatment plants. Algal booms were installed at five sites in 2012-2013 at water treatment plants at Swan Reach, Blanchetown, Cobdogla, Renmark, and Tailem Bend. A further three sites are due for installation in the 2014 calendar year. These are: Swan Reach Township, Cowirra and Cadell.

Salt Interception Schemes

SA Water, on behalf of the MDBA and the Minister for Water and the River Murray, is responsible for the construction, operation, and maintenance of salt interception schemes within South Australia. The construction of the Murtho Salt Interception Scheme continued in 2012-2013 and commissioning is well underway with the scheme expected to be fully operational by September 2013. The high river flows during 2011 and 2012 necessitated the temporary decommissioning of 45 floodplain bores in the Bookpurnong and Loxton schemes for both operational and public safety reasons. With flows receding to more normal levels in early 2013, the borefields have been progressively recommissioned and are expected to be fully operational by August 2013.

8.4 Human Dimension

Adelaide Desalination Plant

The Adelaide Desalination Project achieved several significant milestones during the 2012-2013 financial year, including the successful operation of both 50 GL per annum plants at full capacity by 31 October 2012. The formal Deed of Project Handover for Operations, for the full project, including the 100 GL/annum expansion works, was executed on 12 December 2012.

The Adelaide Desalination Plant has achieved all of its objectives to date, including delivery of a fully functional 100 GL per annum desalinated drinking water supply capacity to the SA Water network from a source that is climate independent, delivery of the completed project within the original approved budget of \$1.824 billion, and within the original Cabinet and Parliamentary Public Works Committee approval date (end of December 2012). Additionally, as part of the Funding Agreement, under which the Commonwealth contributed \$328 million to the Adelaide Desalination Plant, both State and Commonwealth Governments have funded a return of 6 GL of water to the River Murray per annum for environmental allocation, and a further allocation of up to 120 GL over a 10-year rolling period. From December 2012 to June 2013, the Adelaide Desalination Plant has supplied approximately 25.4 GL of desalinated drinking water into the existing customer supply network. The total production volume of desalinated drinking water since the October 2011 commencement of operation is approximately 42.5 GL up to 30 June 2013.

Wastewater Re-use

Customers have connected to the Bird-in-Hand recycled water scheme, with the target of 100% summer reuse being achieved during the 2012-2013 summer period via onsite and offsite reuse. An opportunity to increase reuse of the Glenelg to Parklands recycled water scheme has been identified, with a trial being conducted this summer to determine feasibility. The two large stormwater reuse schemes (using aquifer storage) are about to be commissioned. Once fully operational these schemes will replace over 600ML of potable water use.



School Educational Programmes

The SA Water Brainwave programme provides free learning curriculum and resources to primary and secondary students and teachers throughout the state. In 2012-2013 the Brainwave attracted a total audience of 17,367 students (9,919 from metropolitan schools and 7,448 from regional schools).

Programmes included workshops, treatment plant tours, science labs, theatre shows, and school visits. The entire suite of programmes and resources were free of charge and travel reimbursements were offered to disadvantaged schools, with 40 per cent of students attending the Brainwave programmes in 2012-2013 being from disadvantaged schools. Under the current Memorandum of Understanding (MOU) with the Department for Education and Child Development (DECD) SA Water employed a full time consultant teacher to ensure learning experiences reflected the curriculum and the needs of the school community. In addition to Brainwave, SA Water also worked in partnership with the Smith Family to deliver the metropolitan and regional Next Steps programme, aimed at assisting high school students to develop essential recruitment skills to prepare them for the workforce. In December 2012 SA Water hosted the Aboriginal Summer School for Excellence in Technology and Science (ASSETS) programme, a national event held annually for year 11 Aboriginal students.

Community Education Programme

SA Water's community education programme included tours of water and wastewater treatment plants, community presentations, and sessions at the new Kauwi Interpretive Centre at the Adelaide Desalination Plant. In 2012-2013 the community programmes attracted a total audience of 1,313 people.



Appendix 1: List of Acronyms

AARD	Aboriginal Affairs and Reconciliation Division, Department of Premier and Cabinet (Government of South Australia)
ALoC	Aboriginal Learning on Country
AMLR NRM Board	Adelaide Mount Lofty Ranges Natural Resources Management Board (Government of South Australia)
ASSETS	Aboriginal Summer School for Excellence in Technology and Science
ANZECC	Australia and New Zealand Environment and Conservation Council
BSMS	Basin Salinity Management Strategy
CEW	Commonwealth Environmental Water
CEWH	Commonwealth Environmental Water Holder
CEWO	Commonwealth Environmental Water Office
CLLMM	Coorong, Lower Lakes and Murray Mouth
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Cth	Commonwealth
DAP	Destination Action Plan
DECD	Department for Education and Child Development (Government of South Australia)
DEWNR	Department of Environment, Water and Natural Resources (Government of South Australia)
DPC	Department of Premier and Cabinet (Government of South Australia)
DPTI	Department of Planning, Transport and Infrastructure (Government of South Australia)



DSEWPac	Department of Sustainability, Environment, Water, Population and Communities (Australian Government)
EMLR	Eastern Mount Lofty Ranges
EPA	Environment Protection Authority (Government of South Australia)
EWR	Environmental water requirements
FHN	Fish Habitat Network
FRDC	Fisheries Research and Development Corporation
LAP	Local Action Planning
LGA	Local Government of South Australia
LLCMM	Lower Lakes, Coorong and Murray Mouth
LMRIA	Lower Murray Reclaimed Irrigation Area
LWMP	Land and Water Management Plan
MDB	Murray-Darling Basin
MDBA	Murray-Darling Basin Authority
MFE	Murray Flood Ecology
MOU	Memorandum of Understanding
NFS	Native Fish Strategy
NGO	Non-Governmental Organisation
NRA	Ngarrindjeri Regional Authority
NRM	Natural Resources Management
NWQMS	National Water Quality Management Strategy



NY-R	Ngarrindjeri Yarluwar-Ruwe
OFIEP	On-Farm Irrigation Efficiency Programme
ORM	Objectives of a Healthy River Murray
PIRSA	Primary Industries and Regions South Australia (Government of South Australia)
RDA	Regional Development Australia
RMIP	River Murray Improvement Programme
RRP	Riverine Recovery Project
SAMDB NRM Board	South Australian Murray-Darling Basin Natural Resources Management Board (Government of South Australia)
SA	South Australia
SAPPL	South Australia Planning Policy Library
SARDI	South Australian Research and Development Institute
SATC	South Australian Tourism Commission (Government of South Australia)
SDL	Sustainable Diversion Limit
SEFRP	South-East Flows Restoration Project
TLM	The Living Murray
WAP	Water Allocation Plan
WIA	Water Industry Alliance
WSUD	Water Sensitive Urban Design





Government of South Australia
Department of Environment,
Water and Natural Resources