MARCH 2008

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Aqua Australis

NEWSLETTER OF THE HYDROLOGICAL SOCIETY OF SOUTH AUSTRALIA

OPPORTUNITIES FOR THE HYDSOC

Dear Members,

Thanks to your annual membership fees, your participation at our seminars, and the careful management of our funds by our priceless Treasurer, the Society is in very good financial shape. Indeed, the Society now has several opportunities to expand the use of its funds to promote the wise use of water resources across the state. For example, in the last year, profits from two of our seminars were donated to the "Waterfind Environmental Fund" (see AGM article inside) and to the "Scientific Expedition Group" for the Gammon Ranges project. For this year, our proposed activities will include:

1. Expanding our support for the Ian Lang Prize for graduate and post-graduate students;
2. Further strengthening our relationship with the University sector by sponsoring an ARC-linkage Grant on the topic of Water Sensitive Urban Design.

How can you help? While very small, your annual membership fees provide the financial basis for our activities. Please maintain your HYDSOC membership and encourage your colleagues and co-workers to become new members. It only takes a few minutes to do the paper work, it is very affordable, but it will help us continue and expand the Society's activities in the years to come.

We are in the process of organising a series of seminars and technical meetings for the year – I am looking forward to meet you at these events.

Sébastien Lamontagne
Chairperson
HYDSOC

AN UNWELCOME SEACHANGE

Professor Barry Brook

One of the clearest and most worrying signs that something odd is happening to Earth's climate is that sea levels are rising steadily. Records of long-term tidal gauges show that sea levels were 200 mm higher at the start of the twenty-first century than 100 years before, correlating with a globally averaged rise in temperature of 0.75 degrees. Recent and very precise satellite measurements taken over the past few decades have confirmed this trend. How much of a concern is this change?

Such a rate and magnitude of sea level rise is certainly not unprecedented in Earth's past. For instance, at the end of the last ice age, around ten thousand years ago, the oceans rose by as much as 120 m over a few thousand years, engulfing the previously dry land that connected mainland Australia to Tasmania and New Guinea. Looking deeper in time, global climate was an average of 2 to 3 degrees warmer than at present some 3 million years ago, and sea levels were 25 m above the shoreline of today.

The implications of these past changes in sea level for future rises are worrying, but uncertain. Our best models predict that the globe will heat up by anywhere between 1.5 to 6 degrees over the next century. The United Nations Intergovernmental Panel on Climate Change (IPCC), in their 2007 review, somewhat reassuringly indicated that the probable amount of sea level rise by the year 2100 will be 180 to 590 mm. Although a rise at the upper end of this range would be catastrophic for low-lying coastal and island communities and ecosystems, many societies will, at a cost, be able to adapt. However, the most recent science suggests that these IPCC projections could turn out to be gross underestimates.

The IPCC projections of sea level rise are based largely on the slow, steady and inexorable thermal expansion of the oceans (as water heats, its volume increases) with some additional contributions from the melting of mountain glaciers (almost all of which are expected to be gone by mid century). They do not include "rapid and dynamical changes in ice flow", because the IPCC was too uncertain about how likely or influential these changes might be. This means that the 180 to 590 mm projection is really a best-case scenario, given that it assumes the great icecaps of Greenland and West Antarctica remain largely intact.

(Continued on page 2)

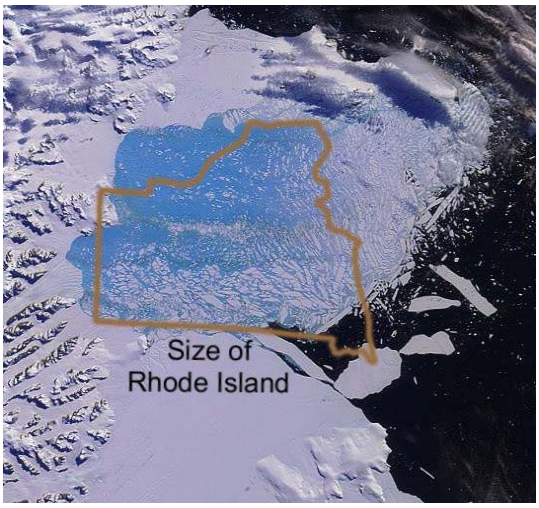
AN UNWELCOME SEACHANGE

Professor Barry Brook

(Continued from page 1)

Yet the rate of ice loss from these two polar realms, as identified by satellite measurements of the change in gravity of the ice masses, has more than doubled over the last decade. It now represents a loss of up to 150 cubic kilometres of ice per year, from each region. Similarly, the rate of sea level rise has doubled over the last 10 years, and now exceeds the upper-end predictions made by the IPCC only a few years before. The suspicion of many scientists is that this acceleration is being driven by self-reinforcing feedbacks. This includes the loss of reflectivity ("albedo") caused by sunlight striking dark exposed rock rather than white ice, the lubricating effect of melt water penetrating to the bottom of glaciers, and many other "dynamical changes".

If both Greenland and West Antarctica shed the entirety of their ice burden, global sea levels would rise by 12 to 14 m. Although these icecaps would not disintegrate within a century, the loss of even a third of their mass – quite plausible if the rate of polar ice loss continues to double each decade – would force up the oceans by at least 4 m, with disastrous socioeconomic and environmental consequences. Further, the inertia accumulated by the slowly heating, yet physically vast oceans, means that should large-scale polar melting begin, it will almost certainly be impossible to halt.



Disintegrating Larsen B ice shelf

The likelihood of such a frightening scenario unfolding is currently quite uncertain. Perhaps in 10 to 20 years, when science has accumulated considerably more information on ice flow dynamics, and measured another two decades of ice loss, we will be more confident about the true risk of catastrophic sea level rise. The question is, can we afford to wait until we are sure?

THE GAWLER RIVER FLOOD MAPPING PROJECT

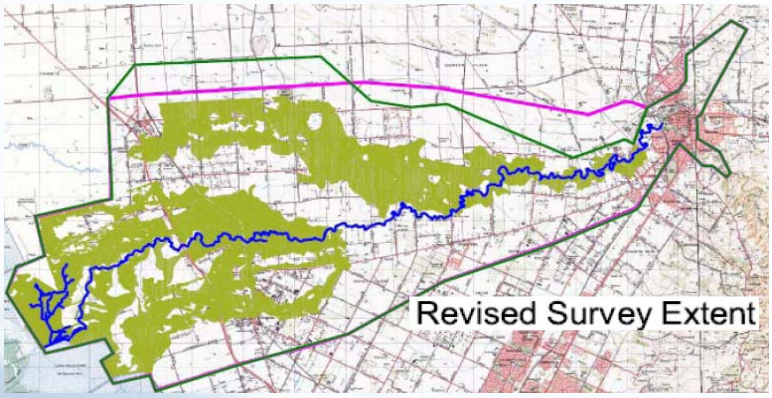
Gawler River Floodplain Management Authority

On the advice of the GRFMA Technical Assessment Panel and Mapping Project Reference Group, the target date for the completion of the GRFMA Mapping Project Stage One deliverables has been amended to mid to late February 2008.

The mapping project is being undertaken by Australian Water Environments in association with Water Technology.

Dr Bruce Eastick, Board Chair said, "Minor problems were still showing up in the model which is still to be verified by running the 1992 flood through the model. Given the importance of the findings of this project it is essential that there is a high level of confidence in the integrity of the data."

The Mapping of the Floodplain project will identify those areas of the floodplain that will remain at risk in a 1 in 100 year flood event of the March 2007 flow estimates. These estimates indicate that the ARI 100 protection outcome from the current works will not be met and that parts of Gawler and the floodplain will remain at risk post-Scheme works.



The study area will extend upstream to the North Para dam site and the Barossa / Playford Council boundary on the South Para River downstream to the coastal outfall of the Gawler River.

Stage One deliverables will include floodplain modelling for ARI 20, 50, 100, 200, & 500.

This work will be followed by Stage Two to prepare preliminary concepts for possible additional mitigation works involving existing and proposed constructed flood-ways and / or levee works to reduce the impact of flooding in the study area.

For more information go to: http://www.playford.sa.gov.au/site/page.cfm?u=412

BIOLOGICAL FILTRATION: YOU CAN TEACH AN OLD DOG NEW TRICKS

Dr Lionel Ho
Research Scientist
Australian Water Quality Centre, SA Water Corporation

Filtration of water has been practised since ancient times. Civilisations such as the ancient Greeks employed filters, such as the Hippocratic sleeve, designed by the Greek scientist Hippocrates in approximately 500 BC. This basic water filter was comprised of a linen bag used to strain visible particulates and turbidity from water. Hippocrates believed that if water tasted and smelled clean, it must be healthy for the body.

Since these ancient times, water filtration has come a long way. The discovery of microorganisms in the 17th century led to more conventional filters comprised of media such as sand and charcoal to remove these contaminants. In modern day water treatment, sand filters are still routinely employed. Similarly, granular activated carbon (GAC), a more advanced derivation of charcoal, is also commonly used. However, ion-exchange and membrane filters are now considered the next generation of water filters due to their ability to remove molecules, and even ions from water.

The advancements in analytical detection of waterborne contaminants have seen a wide range of new organic contaminants being characterised. In particular, disinfection by-products, algal toxins and endocrine disrupting chemicals are some of the contaminants which have received widespread attention in recent times due to their ability to severely compromise human health. New analytical tools have allowed for in-depth characterisation of these organic compounds; consequently, there is now the ability to potentially tailor filters to remove these contaminants based on the specific characteristics of these compounds. These tailoring processes may involve physical and/or chemical manipulation of the filtration media. For example, research has been conducted at the Australian Water Quality Centre (AWQC), a business unit of SA Water, where silica particles, coated with specific functional groups, have been investigated for their ability to remove algal toxins from water. While this study is still in its infancy, there is potential for this to result in a low-cost filtration medium which can be used in existing water treatment plants (WTPs), especially since most of these plants employ sand filters, which themselves are composed of a type of silica.

In addition to the physical/chemical manipulation of filtration media, biological manipulation may also be used to design filters to remove specific contaminants. Biofilms exist within WTP filters and these have been shown to harbour organisms which have the ability to biologically degrade contaminants. However, in most cases, biodegradation of these contaminants are site specific and can not always be guaranteed. Advancements in genetic technologies have allowed for the identification and characterisation of specific contaminant-degrading organisms, and the ability to identify the genes involved in the degradation processes.

Recent research conducted at the AWQC has identified and characterised bacteria and the associated genes responsible for the degradation of algal toxins and taste and odour compounds within biologically-active sand filters located at a South Australian WTP. Work is now being conducted to “seed” these bacteria into sand filters which were previously shown to be incapable of removing the contaminants of interest. Furthermore, the advent of genetic-based technologies such as quantitative real time polymerase chain reaction (PCR) has allowed for the development of molecular tools to screen biological filters to determine if they have the ability to remove these problematic contaminants. This screening tool has novel applications in biological filtration processes, making AWQC one of the leaders in this field. In addition, researchers at the AWQC are currently employing genetic-based technologies to develop biosensors which will be used to detect these contaminants in the environment. It is envisaged that this cutting-edge technology will result in more rapid detection of these contaminants, which will ultimately allow for more rapid and informed decisions to be made regarding effective management options for the control and mitigation of the contaminants of interest.

The platform for these genetic methods are well developed at the AWQC and proof of concept is advanced as illustrated by the work conducted with the algal compounds. The next step is to employ these genetic methods to identify and manipulate organisms within biological filters to degrade a suite of other organic contaminants in water and wastewater. If biological filtration can be optimised for these contaminants, then this will result in an additional treatment barrier, which aligns with the multi-barrier approach within the “Framework for the Management of Drinking Water Quality” under the Australian Drinking Water Guidelines. Moreover, as most WTPs employ filtration of some kind, then the costs for this treatment technology are substantially lower compared with advanced treatment options such as ozonation and membrane technology.

MAPPING THE WATERS OF THE MURRAY-DARLING BASIN

Helen Beringen

The first ever audit of surface and groundwater resources in the Murray-Darling Basin now being undertaken by the CSIRO is testament to the vital role science plays in addressing our nation's toughest challenges.

As the 'big dry', unsustainable water use, and a changing climate take their toll on Australia's fruit bowl, a research project is underway to provide the science to underpin future decision-making for the Basin which supplies at least 40 per cent of the nation's agricultural production.

The $10 million Murray-Darling Basin Sustainable Yields (MDBSY) Project is examining assumptions about sustainable water yields in light of changes in climate and development, providing the most comprehensive analysis of water availability in the Basin, which covers a seventh of the continent.

The MDBSY is the largest research contract CSIRO has taken on in its 80-year history, flowing from the November 2006 Prime Minister's Water Summit.

Dr Tom Hatton, Director of the CSIRO-led Water for a Healthy Country Flagship, which is managing the project, says it is believed to be the first water resource inventory at this scale in the world.

The project is generating a massive data set to drive a computer-based 'supermodel' of the Basin's water resources, created by linking 40 existing and new models of surface and groundwater flows and extractions within the Basin's 18 individual regions.

This is the first attempt in the Basin to dynamically link groundwater balances with surface water availability, calculating flows through and between the system's rivers, and groundwater–surface water interactions under current water-sharing arrangements, before estimating the water available under each scenario.

The development of an integrated hydrological model of the entire Basin means water management agencies can now assess the potential consequences of their management policies and decisions under dry, moderate or wet future climatic scenarios, at the level of each catchment, or across the entire Basin.

Project Manager Dr Bill Young has led a team of over 100 technical staff from over a dozen organisations and managed internal and external review processes in order to deliver robust assessments of water availability across the Basin. They are being progressively released by the Federal Government over 2007-08.

For more details of the project, read the full story in the latest issue of ECOS, http://www.publish.csiro.au/?nid=214 or go to the CSIRO website http://www.csiro.au/partnerships/MDBSY.html

2007 HYDSOC AGM

Sébastien Lamontagne

The Society's Annual general meeting followed by a dinner was held at the Tower Hotel on 13 December 2007. The event was a success and provided a good opportunity to catch-up with familiar and new faces. In addition to the usual Society AGM business, the evening was enlivened by two presentations and a special award.

Cameron Wood, the 2007 Ian Laing Prize winner, gave us a short seminar on the measurement of groundwater discharge to wetlands in the South-East using the environmental tracer radon-222.

This was followed by a very thought-provoking presentation by Prof. Barry Brook, the holder of the recently established Sir Hubert Wilkins Chair of Climate Change at the University of Adelaide (www.adelaide.au/directory/barry.brook).

Finally, it was with great pleasure that the Society donated the profits from the 2007 "Drought" seminar to Mark Siebentritt, the CEO of the Waterfind Environmental Fund (www.waterfind.org.au). The funds will be used to sponsor a wetland watering project in the SA Riverland.

See you in late 2008 at the next AGM!

NORTH PARA RIVER FLOOD CONTROL DAM

Steven Slarke

Located upriver of the township of Gawler, the North Para River Flood Control Dam, constructed for the Gawler River Floodplain Management Authority, was completed in December last year. The 30 metre high dam has been designed to attenuate river flood flows and provide an improved level of flooding protection to Gawler and downstream areas.

The design works undertaken by URS commenced in 2003. Firstly the dam site was selected, then the geotechnical investigations and preliminary design followed in 2004, with detailed design of the dam being completed in 2005. The dam construction works commenced in October 2006 an were completed in December 2007.

Preliminary construction works involved the excavation of 72,000 tonnes of overburden and rock, a high strength siltstone. Weathered rock was firstly ripped, then broken or blasted, and the surface meticulously prepared.

The dam structure is formed of Roller Compacted Concrete, known as RCC. This material is a combination of cement, flyash, sand, aggregate and water, mixed to make a concrete material with a density of about 2.5t/m3, and a strength of about 13MPa after six months. The concrete is produced at an on-site batching plant, transported by open-trucks, placed in 300mm layers by a bulldozer and compacted with vibratory rollers.

The main dam structure is formed from 98,000 tonnes of RCC. It has a vertical upstream wall, with 900mm high by 720mm wide downstream steps and is 225 metres in length across the river at its crest. The crest incorporates a 150 metre wide primary spillway, which will overtop in large floods. The main dam also features twin 1.8 metre diameter high level outfall pipes, abutment channel walls and a downstream stilling basin to prevent erosion of the river bed.

Normal or low flows are passed through a two metre diameter steel low level outfall pipe. Higher flood flows are 'throttled' by the low level outfall pipe, with water levels building up behind the dam, effectively storing the flood waters. Once the flood event has passed, the stored water is released through the low level outfall pipe and the water levels behind the dam recede.

In flood events when the water level reaches the dam crest (expected to represent about a 1 in 100 year flooding event), the volume of water stored behind the dam will be about 9.5 million cubic metres, with a peak flood flow of about 110 cubic metres per second passing the dam.

The secondary spillway structure has a crest level of 84.0m AHD, 27 metres above the riverbed level, and is designed to pass flows during a 1 in 1,000 year flooding event.

The secondary spillway structure, 220 metres long, is positioned on higher ground at the main dam's left abutment, and is formed of a further 13,000 tonnes of RCC.

The North Para River Flood Control Dam is the first dam to be constructed in South Australia in over two decades.

North Para Flood Control Dam, September 2007

IMPACTS OF CHANGING LAND USE ON SUBSURFACE WATER RESOURCES IN SEMI-ARID REGIONS

Dr Bridget Scanlon recently visited Australia to present her research in a presentation called 'Impacts of Changing Land Use on Subsurface Water Resources in Semi-arid Regions'.

This was funded by the Birdsall-Dreiss Lectureship, awarded by the Geological Society of America - Hydrogeology Division. The Birdsall-Dreiss Lecturer is chosen each year by a panel of former Birdsall-Dreiss Lecturers, who consider the research excellence and communication ability of the prospective candidates.

The presentation outlined how the expansion of agriculture over hundreds of years has caused widespread changes in land use. In the past 300 years, cultivated cropland has increased globally by 560% and pastureland by 660%. Irrigated agriculture has grown by 580% since 1990 and is projected to rise 20% by 2030 in developing countries. How has this changing land use affected water resources?

A Podcast of the Adelaide Lecture is available in Mp3 format at http://www.icewarm.com.au/userfiles/File/BridsallDreissLecture.mp3

To view the presentation click here http://www.icewarm.com.au/userfiles/File/Scanlon_BD_LULC_HP_FINAL.pdf

UPCOMING EVENTS

The Environmental Defenders Office (SA) Inc in association with the University of South Australia presents

University of South Australia

Saving the last drop: water scarcity & the law

A one day seminar - March 13th 2008
at the University of South Australia, City West Campus 8.30am-5pm

The future of our water supply is of great concern to all South Australians. The law in this area is undergoing change in order to address current and emerging issues such as urban water reuse and consideration of alternative water sources such as desalination plants.
Questions with respect to water pricing and trading, and the legal framework for urban water supply also wil be addressed.
With the help of prominent legal, government and community speakers, this seminar will provide an overview of legislative and other responses to this most important issue.

Sessions include:

- Water Reuse - underground storage
- Water Reuse - surface options
- Alternative water supplies - desalination etc.
- Water supply - legal & economic aspects

Featured speakers include: Nick Xenophon, *Senator, Commonwealth Parliament of Australia*, Paul Leadbeter, *Norman Waterhouse*, Professor Simon Beecham, *University of SA* & Dr David Cunliffe, Principal Water Quality Adviser, Department of Health

Registrations:
http://edosaconference.org.au/
Environmental Defenders Office (SA) Inc.
Ph: (08) 8410 3833 Fax: (08) 8410 3855 SA Country Freecall: 1800 337 566
Office: 1st Floor, 408 King William St (SE Cnr Gilles St), Adelaide, SA [Post: GPO Box 170, Adelaide, SA, 5001]

Ground Water and Public Policy

May 19-21, 2008,
Green Center on the Colorado School of Mines Campus in Golden, Colorado, USA .

An Ice Breaker will be held from 5:30-7:30 PM Sunday May 18. Golden, Colorado is located at the foot of Lookout Mountain, 13 miles west of downtown Denver, on the majestic Front Range of the Colorado Rockies.

The conference will include keynote speakers on a wide range of topics, contributed oral presentations and poster sessions (both oral and poster papers will be published in a proceedings volume), exhibitors, short courses, and software demonstrations. The purpose of this conference is to bring together model users and developers to exchange ideas on the latest innovations in model applications, discuss the capabilities and limitations of currently available codes, and explore the needs and directions for future developments.

http://typhoon.mines.edu/events/modflow2008/

The Organising Committee of

water down under 2008

invites all professionals with an interest in hydrology, water resources and the environment to join colleagues in

ADELAIDE, SOUTH AUSTRALIA 15-17 APRIL 2008.

Pre-Conference workshops are scheduled for 14 April and a number of post-Conference field trips 18 April. Early bird registrations need to be received by 31st December.

http://www.waterdownunder2008.com/welcome.htm.

2nd International Salinity Forum

Salinity, Water and Society – Global issues, local action
New approaches for tackling the salinisation of water resources.
Includes irrigation, dryland and urban salinity, and salt water intrusion

Adelaide Convention Centre
Adelaide, South Australia, Australia
31 March – 3 April 2008

• Exchange cutting edge knowledge about the science, policies and management practices relating to salinity, and particularly its associated water and human dimensions;
• Cement and enhance the international network of scientific, engineering, policy and community interests associated with salinity;
• Provide a forum for translating scientific knowledge about salinity into sound policy, management and on-ground actions to secure long-term food production, protect land, water and vegetation resources and enhance quality of life globally.

http://www.internationalsalinityforum.org/

CONTACT HYDSOC

http://www.hydsoc.org

PO Box 6136, Halifax Street
ADELAIDE SA 5000

Executive Committee

Chairperson
Sebastien Lamontagne
Phone: 8303 8713
Email: sebastien.lamontagne@csiro.au

Vice
Martin Lambert
Phone: 8303 5838
Email: mlambert@civeng.adelaide.edu.au

Treasurer
Bill Lipp
Phone: 8343 2508
Email: bill.lipp@saugov.sa.gov.au

Secretary
Ken Schalk
Phone: 8273 3100
Email: ken.schalk@tonkin.com.au

Committee

Linton Johnston
Phone: 8366 2600
Email: l.johnston@bom.gov.au

Emma MacKenzie
Phone: 8378 8000
Email:
emma.mackenzie@austwaterenv.com.au

Marion Santich
Phone: 8273 9114
Email:
marion.santich@adelaide.nrm.sa.gov.au

David Seeliger
Phone: 8273 3100
Email: david.seeliger@tonkin.com.au

Sarah Webster
Phone: 8405 4324
E-mail: swebster@pb.com.au

There is currently a vacancy for a committee member.

Editor

Renae Eden
Phone: 8280 5910
Email: renae@deltaenvironmental.com.au

MEDIA WATCH

Successful applicants for the 'Irrigation Modernisation Planning Assistance' programme announced

Funding of $4.6 million has been awarded to 14 irrigation water providers across Australia to assist them develop modernisation plans to identify and consider the range of options available to modernise their water delivery infrastructure and reduce water losses in the irrigation distribution system that they own and operate. Senator Wong's announcement, as well as a list of the successful applicants, may be found at the following website:
http://www.environment.gov.au/minister/wong/2008/index.html

$50 million down payment on the River Murray

Senator Penny Wong launched the first round of water entitlement purchasing as part of the Government's plan to restore the health of the Murray- Darling Basin.
http://www.environment.gov.au/minister/wong/2008/index.html

SA water groups to merge

The South Australian Premier, Mike Rann, announced that the Water Security Advisory Group and Task Force will be combined to form a new Water Security Council.
http://www.abc.net.au/news/stories/2008/02/12/2160973.htm

Filtered Murray water for more regional communities

17 South Australian communities are receiving filtered water from the River Murray for the first time under a $54 million State Government water quality project. Nine new water treatment plants and six pipelines were constructed near the Murray in regional South Australia through Stage 3 of the Country Water Quality Improvement Program.
http://www.premier.sa.gov.au/news.php?id=2826

Murray to drop despite Qld floods

The latest report on water storage in the Murray system warns that river levels are likely to be lower than last year, despite recent flooding in Queensland. The report says there is a 75 per cent chance there will be less water in the system in June this year, compared with a year earlier.
http://www.abc.net.au/news/stories/2008/02/05/2155056.htm

Trial to look at algae control in Torrens Lake

A biological filtration system aimed at improving water clarity that could eventually help control toxic blue-green algae blooms across Torrens Lake was installed February 13, positioned near the University of Adelaide footbridge
http://www.premier.sa.gov.au/news.php?id=2763

SAWater data online

River Murray data comes from a number of different areas – along the River Murray, at SAWater locks and weirs and the Goolwa Barrages. SAWater reservoir levels can be viewed online. This information is updated daily, and compares current levels with records from the same time last year. SAWater have also recently added a metropolitan water consumption graph, updated weekly and offering links to the following:

- Check on River Murray levels
- View the Cumulative Weekly Consumption Comparison
- Reservoir levels
- Access updates on water restrictions
- Find out more about the Water Proofing Adelaide project

http://www.sawater.com.au/SAWater/WhatsNew/WaterDataUpdate/

Action to improve Adelaide coastal waters

An action plan being developed to improve the quality of Adelaide's coastal waters will enhance extensive efforts already underway to address problems identified by the recently released Adelaide Coastal Waters Study .
http://www.premier.sa.gov.au/news.php?id=2822

Airborne Geophysics: Aiding Salinity Management

The National Action Plan for Salinity and Water Quality (NAP) identified airborne geophysical surveys as a means of obtaining high resolution, cost effective spatial information to assist with salinity management. This technology, adapted from the mineral exploration industry, was put to the test in the $3.8M South Australian Salinity Mapping and Management Support Project (SA SMMSP), funded jointly by the Australian and South Australian Governments, under the NAP program
http://www.dwlbc.sa.gov.au/salinity/projects/airborne_geophysics/index.html