SA Water

Drinking Water Quality Report

2011-12




Government of South Australia

SA Water

This report covers the period of 1 July 2011 to 30 June 2012

A Message from our Chief Executive

John Ringham
Chief Executive

2011-12 marked the beginning of significant change for SA Water with the launch of our Strategic Plan and continued preparations for economic regulation.

Our new Strategic Plan outlines a clear direction for SA Water through to June 2016 and supports the need to continue to enhance water quality and treatment processes. By monitoring our progress and performance against all priorities identified in our Strategic Plan, we will continue to deliver water and wastewater services in efficient, responsive, sustainable and accountable ways. With the introduction of the new *Water Industry Act 2012* and the *Safe Drinking Water Act 2011* we have also continued working to ensure that our organisation meets both the needs of our customers and the requirements of the new legislations.

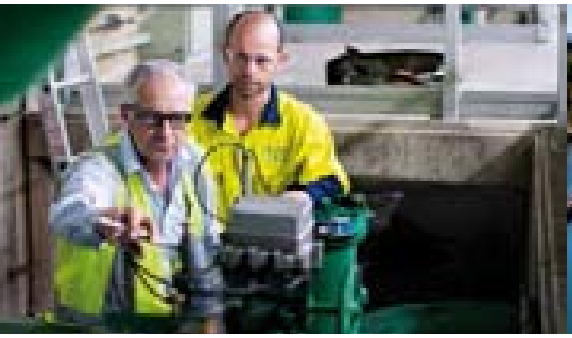
This year provided a rewarding first 12 months of our alliance contract with the Allwater Joint Venture. The transition of the contract to oversee operation of our metropolitan water and wastewater network for two thirds of our customer base has been seamless for our customers and has resulted in the continued delivery of high standards of service and water quality.

However, 2011-12 has not been without some challenges. Heavy rainfall across the upper Murray-Darling Basin saw significant inflows into the River Murray again this year, resulting in another blackwater event in South Australia. Our robust management strategies and operational responses once again successfully addressed these challenges and allowed us to continue to supply safe drinking water and meet national targets for public health in both our metropolitan and country supplies.

Our focus on drought-related challenges over recent years has resulted in projects to improve our drinking water supply systems, making them more resilient and reliable now and into the future. These have included water licensing, interconnecting the metropolitan Adelaide water networks and construction of the Adelaide Desalination Plant. The plant reached an exciting milestone in mid-October 2011 when treated water first entered Adelaide's drinking water network. The plant can now operate at 50% of its capacity and continues to be commissioned as we move towards achieving its full operational potential of 100GL per year. This report provides details of our commitment to continuous improvement in water quality, compares our water quality performance with previous years and can be used to assess our water quality improvements. The 2011-12 Drinking Water Quality Report is designed to help you better understand South Australia's drinking water quality as well as the related operational and research activities undertaken by SA Water.

I hope you enjoy reading the report and welcome your feedback. Please email customerservice@sawater.com.au or phone us on 1300 650 950.

John Ringham
Chief Executive



The SA Water and Allwater Alliance

Allwater is a joint venture between Transfield Services, Suez Environnement and Degrémont with each company bringing a wide range of water expertise to the partnership. The Alliance is about joint accountability and working collaboratively to deliver high quality drinking water to metropolitan Adelaide.

On 1 July 2011, Allwater commenced a 10-year services alliance contract with SA Water to operate and maintain metropolitan Adelaide's water, wastewater and recycled water systems. In its first year Allwater, under the Alliance, has delivered around 140 GL of high quality water to Adelaide's metropolitan customers.

Delivering high quality water to Adelaide's customers is of paramount importance and the Alliance has established an extensive series of internal performance measures to track progress and to drive improvement.

During this first year of the contract Allwater worked closely with SA Water to maintain excellent water quality. This continued through both the contract changeover period and the change of operating conditions due to the North South Interconnection System Project and the blending of differing quality water as a result of the early stages of the desalination plant commissioning. Investment in technical review and plant optimisation projects has commenced with assistance from Degrémont technical expertise. Water quality performance highlights include compliance at the customer tap of 100% for *E. coli*, colour and the metals manganese and iron.

SA Health Statement

A high level of cooperation between SA Health and SA Water was maintained throughout the 2011-12 reporting period. Communication and interagency reporting continued to support the shared aim of ensuring the supply of safe drinking water to South Australian communities.

In the 2011-12 reporting period, SA Water collected 46 959 samples for health related compliance from drinking water supplies throughout the state. Samples were analysed for microbiological and chemical parameters and results reported to SA Health in line with agreed reporting protocols. Microbiological quality was assessed in 2669 samples from customer taps in metropolitan Adelaide and 8404 samples from country drinking water supplies. Compliance with the *Australian Drinking Water Guidelines* for *E. coli* was achieved in 100% of samples from metropolitan Adelaide and 99.94% of samples from country supplies. Compliance with the *Australian Drinking Water Guidelines* for health related parameters was 99.79% for metropolitan systems and 99.54% for country areas. Overall, these results indicate that South Australian communities were provided with very safe drinking water.

There was a significant reduction in the number of Type 1 incidents in the 2011-12 reporting period compared to the previous financial year. The number of treatment related incidents, including elevated product water turbidity and disinfection failures, halved compared with the previous reporting period. Although there was a period of elevated dissolved organic carbon, the impacts were not as great as those associated with the blackwater event of the previous year. This resulted in more consistent Water Treatment Plant operation and better disinfection residual control in distribution systems.

An ongoing challenge has been the control of disinfection by-products (DBPs) throughout distribution systems. In 2011, a higher chloral hydrate guideline value was adopted for use in South Australia based on international guidelines and this resulted in no chloral hydrate incidents for the 2011-12 reporting period. This was balanced by the inclusion of criteria for brominated trihalomethanes in Version 12 of the interagency *Water/Wastewater Incident Notification and Communication Protocol* and as a result a similar number of DBP incidents were recorded in 2011-12 compared to 2010-11. However progress has been achieved by on-going DBP reduction strategies implemented by SA Water and results from later in the 2011-12 reporting period indicate that there will be a reduction in DBP related incidents in the 2012-13 financial year.

Water quality incidents were notified by SA Water in a timely and appropriate manner. Preventive actions implemented in response to incidents were clearly communicated to SA Health and advice and recommendations were accepted. As such, none of the incidents associated with drinking water supplies were considered to represent a public health risk.

Economic Regulation

In 2011-12, economic regulation of the South Australian water industry progressed significantly with the passing of the legislation.

The *Water Industry Act 2012* was passed on 5 April 2012 and officially came into effect on 1 July 2012. The new *Water Industry Act 2012* replaces the *Waterworks Act 1932*, *Sewerage Act 1929* and *Water Conservation Act 1936*.

The *Water Industry Act 2012* is a positive move for the South Australian water industry, introducing economic regulation in addition to the promotion of wise water management, competition and innovation within the industry, clear technical standards and the protection of the interests of consumers. Under the *Water Industry Act 2012* the Essential Services Commission of South Australia (ESCOSA) has responsibility for regulatory functions of the water industry.

SA Water has been evaluating internal processes and working together with ESCOSA to ensure it is prepared to meet all regulatory requirements.

Safe Drinking Water Legislation

South Australia's *Safe Drinking Water Act 2011* was passed by State Parliament in May 2011.

The Act provides a regulatory framework for drinking water providers in South Australia and will be administered primarily by SA Health with assistance from local government. Provisions in the Act are underpinned by the *Australian Drinking Water Guidelines* (ADWG 2011) and stipulate requirements for drinking water providers, including:

- Registration of drinking water providers with SA Health
- Development and implementation of risk management plans
- Establishment of approved drinking water quality monitoring programs
- Notification of incidents / non-compliance
- Audits and inspections to determine compliance with the Act
- Use of NATA accredited laboratories for testing of samples
- Reporting of water quality test results to SA Health and providing consumers with drinking water quality information.

At SA Water, our approach to managing drinking water quality through our Drinking Water Quality Management System (DWQMS) is based on the ADWG *Framework for Management of Drinking Water Quality*, meaning that we already satisfy most of the requirements outlined in the new *Safe Drinking Water Act* prior to its implementation. Details of key components are outlined in our annual Drinking Water Quality Report, which in itself addresses one of the requirements of the Act – the requirement for reporting results and providing consumers with drinking water quality information.

An implementation plan has been developed by SA Health to enable the Act to become operational. Draft Regulations have been released for public consultation and supporting guidance and resources will be developed. Consultation will also continue with SA Water throughout this process. Further information on the *Safe Drinking Water Act* can be found at: *www.sahealth.sa.gov.au/safedrinkingwateract*

Drinking Water Quality Management

SA Water manages drinking water quality from catchment to tap in line with our Drinking Water Quality Management System (DWQMS) to ensure a consistent and reliable supply of high quality safe drinking water to our customers.

This management system is based on the *Australian Drinking Water Guidelines Framework for Management of Drinking Water Quality* (ADWG 2011), endorsed by the National Health and Medical Research Council. The framework provides benchmark water quality guidelines and values for the design of a structured and systematic approach to drinking water quality management, ensuring a safe and reliable water supply.

There are 12 elements within the framework which are considered best practice:

1	Commitment to drinking water quality management
2	Assessment of the drinking water supply system
3	Preventive measures for drinking water quality management
4	Operational procedures and process control
5	Verification of drinking water quality
6	Management of incidents and emergencies
7	Employee awareness and training
8	Community involvement and awareness
9	Research and development
10	Documentation and reporting
11	Evaluation and audit
12	Review and continual improvement

To assess regularly our progress against implementation of the 12 elements of the ADWG framework, SA Water uses 'AQUALITY', a measurement and evaluation tool developed by the Water Services Association of Australia as a key performance indicator. For the 2011-12 period, a target of 86.5% implementation of the framework was set and an actual implementation of 88.4% was achieved as outlined on page six.

During 2011-12 SA Water achieved the following outcomes in relation to maintaining high water quality standards across our systems:

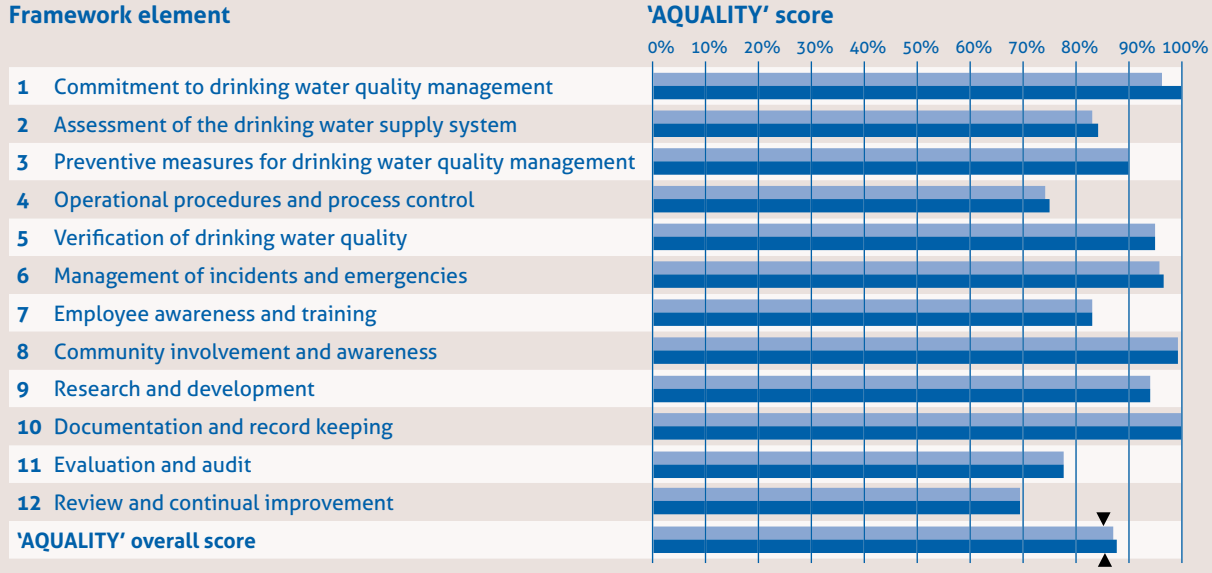
- Completion of all planned audits of our day-to-day operational processes to assess levels of awareness, training and implementation of the DWQMS
- Internal review of the implementation of the ADWG framework across the ten Riverland water treatment plants operated by our contract partner Trility, including the interface with SA Water
- Ongoing commitment to the Water Quality Network Forum established across water utilities in South Australia, Western Australia and the Northern Territory to address water quality issues specific to our geography and state-wide water supply systems in a collaborative manner
- Completion of the biennial review cycle for identified Water Quality Safety Plans and Water Quality Operating Plans
- Completion of the Corporate Water Quality Management Plan (which specifies the 12 elements of the ADWG framework)
- Development and implementation of an improved system risk assessment and process
- Development and implementation of an improved corporate Water Quality Hazard & Risk Register
- External review of the implementation of the ADWG framework within SA Water to address the gaps identified (a further external gap audit will be conducted in 2012-13 to ensure any identified gaps are successfully addressed)
- Continued work associated with the North South Interconnection System Project (NSISP) which connects the northern and southern metropolitan water supply systems. Significant components completed allow transfer of water in the eastern and northern systems from Clapham to Terminal Storage (via Wattle Park Reservoir) and Terminal Storage to Salisbury East respectively
- Phased integration of Adelaide Desalination Plant (ADP) water into the existing water supply system as NSISP components are completed.

Future strategies that are proposed for the 2012-13 period will include:

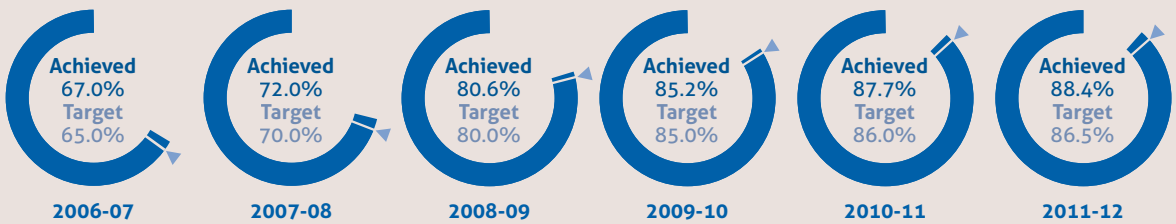
- Continue to use the 'AQUALITY' tool to determine strategies to meet our ADWG framework implementation targets. We will also continue to roll out the framework across systems managed by our contractors and seek continuous improvement to documentation, processes, procedures and practices in order to maintain high water quality standards
- In line with the *Safe Drinking Water Act 2011* SA Water will establish strategies to address and enhance initiatives required to meet regulatory requirements including risk processes, system auditing and reporting. These strategies will cover SA Water operations, its contractors and alliance partner
- Completion of outstanding components of the North South Interconnection Project (NSISP). To address any challenges in blending desalinated water with water from other sources, SA Water will introduce operational strategies and monitoring programs to ensure water quality is optimised and to prevent any water quality issues.

The 12 elements included in the *Framework for Management of Drinking Water Quality*

SA Water's progress against implementation of the *Framework for Management of Drinking Water Quality*



'AQUALITY' score across all elements



Examples of SA Water's application of the *Framework for Management of Drinking Water Quality*

1 /	Commitment to drinking water quality management	• Senior Management Team endorsed Drinking Water Quality policy in place and communicated to employees • Responsibility matrix that defines roles, accountabilities and responsibilities for quality processes developed • Communication and notification protocols with SA Health in place and reviewed • Environmental and Drinking Water Compliance Manual reviewed in consultation with the Crown Solicitor.
2 /	Assessment of the drinking water supply system	• Robust risk assessment process developed • Water Quality Safety Plans (WQSP) documenting key characteristics of the water supply system developed and reviewed every two years • Document review cycle process developed and implemented • Further improvement of WQSP format • Advanced system analysis tools used to better understand our water supply systems (e.g. hydrological, catchment, reservoir and distribution system water quality models) • Tools developed to identify trends and relationships in water quality data that may indicate potential water quality risks.
3 /	Preventive measures for drinking water quality management	• Water Quality Hazard & Risk Methodology developed with associated Water Quality Hazard & Risk Register to capture, assess, prioritise, manage and report water quality risks and preventive actions • Water Quality Operating Plans (WQOP) improved to include Critical Control Points and system-specific water quality hazards to ensure water supply systems are operated to a high standard.
4 /	Operational procedures and process control	• Water quality procedures available to support reliable achievement of the target criteria, critical limits and water quality objectives • Supervisory Control and Data Acquisition (SCADA) allows SA Water to continuously and remotely monitor and control water and wastewater assets and infrastructure • Telemetry / SCADA systems provide rapid notification of deviations in water quality, with response procedures in place to respond 24 hours a day, seven days a week • All materials in contact with drinking water are compliant with Australian Standard 4020.
5 /	Verification of drinking water quality	• Drinking Water Quality Monitoring Handbook outlines the philosophy for water quality monitoring in SA Water systems and provides guidelines for reviewing monitoring performed against the *Australian Drinking Water Guidelines* (ADWG 2011) and SA Water philosophy • Routine and event based monitoring programs in place and regularly updated for all water supply systems. This is designed to improve management and system understanding • Analytical Quality Control Program in place to verify the performance of instruments used for the measurement of various parameters to maintain water quality • National Association of Testing Authorities (NATA) accredited laboratory performs analysis of samples • Process in place to capture customer feedback and reports developed to analyse feedback to assist in determining appropriate responses to customer complaints • Automated processes are in place to flag monitoring results that are out of specification.

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6 /	Management of incidents and emergencies	• SA Health interagency *Water/Wastewater Incident Notification and Communication Protocol* updated and in place • Emergency Management Manual and Emergency Management Plan for Communication Protocols to define criteria for communications with the media • SAW Incident and Emergency Management Protocol integrates and consolidates the SA Health and internal requirements for communication during incidents • Incident Management System (IMS) in place to record and generate notification of water quality incidents to a defined list of personnel • Root Cause Analysis conducted for every Priority Type 1 and Type 1 Water Quality Incident Notification • Incident Notification and Emergency Response Training included as part of Water Quality Training Plan • Specific training sessions provided to incident managers and other staff involved in the management of water quality incidents.
7 /	Employee awareness and training	• New integrated Root Cause Analysis training course rolled out for key staff • Ongoing training program for water quality awareness, sampling, incident management and disinfection for operators reviewed and delivered to relevant staff • Regular updates provided to staff on progress against objectives and achievements • Regular knowledge sharing seminars conducted • Corporate Employee Induction package in place ensuring new staff are fully aware of their responsibilities in the production of drinking water.
8 /	Community involvement and awareness	• Community involvement policy and procedure available on corporate website • A Drinking Water Quality Report is produced annually and made available to consumers, regulators and stakeholders, and includes descriptions of relevant aspects of water quality management • The SA Water Learning Centre delivers regular information sessions on water quality and awareness programs • SA Water website provides up-to-date information for consumers, including an education site that provides information regarding water supply and water usage.
9 /	Research and development	• Dedicated Research and Innovation group to support and promote innovative ideas with potential to improve operational activities, risk mitigation and sustainable growth of our business • Communication of latest technology and research • Regular research and development workshops to evaluate water quality needs for current operations projects • New technologies regularly introduced to improve water quality management (e.g. telemetry-linked water quality monitoring, vertical profiling system for monitoring reservoir water quality, rapid methods for testing blue-green algal by-products) • Annual Research and Innovation Forum to showcase research and operational outcomes • National and international links and partnerships to ensure optimum water quality solutions.

10 / Documentation and reporting	• All information associated with drinking water quality management available to staff online via the SA Water intranet (internal internet) • Drinking Water Quality Management System (DWQMS) developed to authorise, control and review water quality related documentation • Annual Drinking Water Quality Report produced to detail SA Water's performance against the ADWG and outlines SA Water's commitment to delivering safe, reliable and high quality drinking water to South Australian communities. Included are overviews of key performance targets, achievements and areas identified for improvement.
11 / Evaluation and audit	• Long-term data sets interpreted to help improve water quality management • Waterscope database holds all analytical results for water quality monitoring conducted by SA Water and contractors, and is accessible by staff, contractors and other authorised parties • Internal audits conducted on operational based activities including contractors as per DWQMS review schedule. Summary of internal audit findings reported annually to SA Water's Technical Water Quality Committee • External audit of the DWQMS conducted by RABQSA International, Inc. qualified auditors.
12 / Review and continual improvement	• Water Services Association of Australia (WSAA) 'AQUALITY' tool used to report progress of the implementation of the ADWG framework through the DWQMS • Regular reporting of water quality and management system performance provided to Corporate & Technical Water Quality Committees including key risks, water quality performance, progress of improvements, incident response and audit results • System in place to track progress of actions from audits or agreed improvements (Action Request & Compliance System) • Comprehensive asset management plans maintained to meet short and long term needs • National and international links and partnerships to ensure optimal water quality solutions.



Our Water Supply Systems

SA Water has an extensive network of drinking water supply systems across South Australia. We provide high quality drinking water to an estimated population of 1 149 000 across metropolitan Adelaide through 8997 km of water mains, and to an estimated population of 427 000 through 17 594 km of water mains across regional communities.

Our water supply sources

Raw water for treatment is collected from a number of sources including rivers, reservoirs, aquifers and the sea.

Surface water

Treatment plants supplying the Adelaide metropolitan area are supplied with raw water collected from the Mount Lofty Ranges catchment and supplemented with water from the River Murray. Once soils in the catchment are saturated as a result of rainfall, water runs off the land and into streams. The streams flow into reservoirs where this water, together with any water pumped from the River Murray, is stored and pumped or gravity fed to water treatment plants to be filtered, disinfected and sent into the distribution network. Ten reservoirs, with a combined storage volume of almost 200 gigalitres at full capacity, and six water treatment plants supply metropolitan Adelaide's water supply systems and beyond. Outside of the metropolitan area, Middle River Reservoir on Kangaroo Island supplies a water treatment plant providing filtered and disinfected water to Kingscote and smaller communities along the transfer pipeline. In 2011-12, 46.6% of the water supplied by SA Water was provided by surface water.

River Murray

The River Murray is a key source of raw water for South Australia's water supplies. Of SA Water's drinking water supply systems, 30 source water either directly or indirectly from the River Murray, including 20 water treatment plants in the River Murray region. The River Murray also supplements metropolitan Adelaide's reservoirs (with the exception of Myponga reservoir) via two raw water pipelines: the Murray Bridge-Onkaparinga pipeline (48 km in length) and the Mannum-Adelaide pipeline (60 km in length).

Three major pipelines supply treated water from the River Murray to various regional communities. The Morgan-Whyalla pipeline (356 km long via Port Augusta and 281 km long via the undersea section from Baroota) is used to transfer treated River Murray water from the Morgan water treatment plant to the Iron Triangle cities, significant areas of the mid-north, the Yorke Peninsula, and as far as the Eyre Peninsula. The Swan Reach-Stockwell pipeline (54 km in length) supplies treated water from the Swan Reach water treatment plant to communities along its route, including communities in the Barossa Valley, and also feeds into the Yorke Peninsula supply. The Tailem Bend-Keith pipeline (133 km in length) supplies treated water from the Tailem Bend treatment plant to 13 communities in the upper South East and around Lake Albert.

The percentage of water supplied to Adelaide from the River Murray varies from year to year, with the river providing about 40% of the city's water in an average year. During 2011-12, 45.6% of water supplied by SA Water was sourced from the River Murray.

Groundwater

Groundwater is contained in underground water bodies known as aquifers. SA Water has 31 drinking water supply systems that draw water from aquifers as their primary source of domestic water. Most of these are located in the South East, Eyre Peninsula and northern region of South Australia. The Blue Lake which supplies the city of Mount Gambier is included in this as it is a volcanic crater containing groundwater from local aquifer systems. The quality and volume of water that can be extracted from an aquifer varies from region to region. During 2011-12, 6.0% of water supplied by SA Water was provided by groundwater.

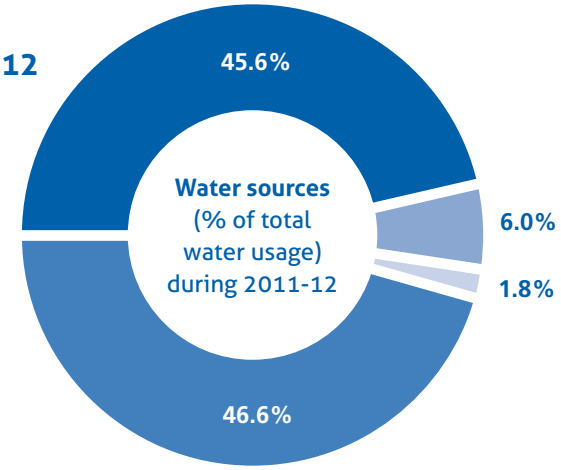
Seawater

A desalination plant with an output of approximately 300 kilolitres of drinking water per day has been in operation on Kangaroo Island since 1999 supplying the community of Penneshaw.

Introduction of desalinated drinking water from the Adelaide Desalination Plant into the distribution network commenced in October 2011. Desalinated drinking water from the plant is pumped through a transfer pipeline to the Happy Valley water treatment plant where it is blended with treated water from Happy Valley reservoir before being delivered to customers via the distribution network. In 2011-12, desalinated seawater accounted for 1.8% of South Australia's total water supply.

Water sources (% of total water usage) during 2011-12
(Total water usage: 208 144 ML)

- River Murray
- Surface Water
- Groundwater
- Seawater



During 2011-12 we continued with improvements to source water quality management strategies, including:

- Use of our state-of-the-art, solar powered, water quality profiling system installed in Myponga Reservoir to enhance reservoir and water treatment plant operational responses
- Management of cyanobacterial blooms without the need for chemical dosing in Myponga Reservoir and Little Para Reservoir
- Use of water quality probes with data loggers in reservoirs and the River Murray to provide real-time, *in-situ* data on key water quality parameters such as cyanobacterial biomass, dissolved oxygen, turbidity, pH, conductivity and temperature as part of field investigations
- Modelling of the lower River Murray to provide water quality forecasting for use in water quality risk assessments
- Continuation of an enhanced monitoring program for key water quality parameters such as metals, dissolved oxygen, dissolved organic carbon and nutrient levels at our River Murray off-takes as a response to the River Murray floodwaters and a blackwater event in early 2012.

Water treatment

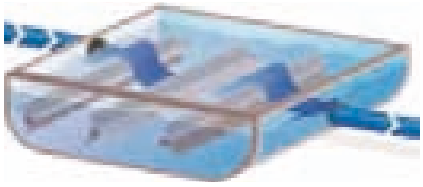
Raw water entering one of our 30 water treatment plants undergoes an extensive multiple stage treatment process.

There are 24 water treatment plants in country regions and six in the metropolitan area. Conventional water treatment processes are widely used to improve the quality of water in South Australia. However, treatment methods such as Magnetic Ion Exchange (MIEX®), membrane filtration, iron removal plants and ultraviolet disinfection have also been introduced.

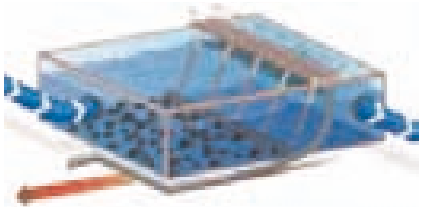
Conventional water treatment plants

SA Water's conventional water treatment plants use a seven step process to deliver safe drinking water to our customers.

Step 1: Coagulation – a chemical (coagulant) is added to the untreated raw water and reacts with impurities such as small particles and dissolved organic matter. The coagulant traps the suspended particles and most of the dissolved organic material. This process is also known as 'flash-mixing' – a description of the high mixing energy required when the coagulant is added.



Step 2: Flocculation – the coagulant combined with the captured particles is called 'floc'. Flocculation is a gentle mixing process to bring together the flocs formed in the coagulation step to form larger floc that settles more easily. Water remains in the flocculation tanks for a minimum of approximately 20-30 minutes.



Step 3: Sedimentation – water and suspended floc particles pass through to sedimentation basins where after several hours most of the floc settles to the bottom of the basins and forms a sludge. The water (now containing only a small amount of very fine floc particles) continues on to the filters. The sludge is removed from the basins for further treatment and disposal. Another technique called Dissolved-Air Flotation (DAF) adds pressurised air, causing the floc to float to the surface for removal by overflow or skimming.

Step 4: Filtration – any remaining solids are separated from the water flow by passing them through a filter. The most common filters are deep beds of sand or a sand/anthracite combination. As water passes through the filter bed, any particles remaining from the sedimentation process are trapped, resulting in clear water. More modern filter types include membranes (microfiltration or ultrafiltration).

Step 5: Disinfection – chlorine is generally added at a point between the filters and the filtered water storage tank, to destroy any microorganisms that may not have been removed in the earlier flocculation and filtration stages. The most common types of chemical disinfectant are chlorine compounds – chlorine, chlorine dioxide and chloramines. Chloramination (a combination of chlorine and ammonia) is used by SA Water for disinfection in longer water pipelines such as those in country areas, where it is longer lasting than chlorine alone. Another disinfection method is ultraviolet light (UV).

Step 6: Fluoridation – in major water supply systems, including metropolitan Adelaide and Mt Gambier, fluoride is added to the treated drinking water to help prevent tooth decay.

Step 7: Storage and distribution – after disinfection, the finished water is transferred to covered water storage tanks ready for distribution to SA Water's customers.

Iron removal plants

Eleven Iron Removal Plants (IRPs) have been constructed in towns mainly in the South East of South Australia. The presence of iron in water does not pose a risk to human health, however it can lead to brown discolouration and possible staining. The general process to remove dissolved iron from the water includes oxidation of the iron with chlorine so that it forms a precipitate or solid particles. These can then be removed through specially designed sand filters.
For a listing of IRPs please refer to the country drinking water supply system sources and treatment table on page 16.

Ultraviolet light disinfection

Exposure to adequate doses of ultraviolet (UV) light renders bacteria, viruses and protozoa non-pathogenic to humans. In the UV disinfection process the water passes through reactors which contain sufficient UV lamps to produce the required UV dose. The clarity, dissolved compounds and different organisms in the water affect the UV dose required in the disinfection process. For a listing of the water treatment plants that employ UV disinfection please refer to the country drinking water supply system sources and treatment table on page 16.

Desalination

A desalination plant at Penneshaw on Kangaroo Island uses conventional reverse osmosis technology to convert seawater into fresh drinking water. Seawater is drawn into the plant through an intake pipe and pre-screened. UV disinfection is used to minimise biological growth and filters remove most of the particulate matter. The filtered seawater is forced under high pressure through reverse osmosis membranes that allow fresh water to pass through, but very little salt. The desalinated water is re-mineralised with carbon dioxide (CO_2) and marble chips to reduce its corrosive properties and improve taste prior to chlorine disinfection and distribution to customers.

Approximately 40 litres of fresh water are produced from every 100 litres of seawater at the Penneshaw Desalination Plant as a result of an upgraded acid-dosing facility at this plant.

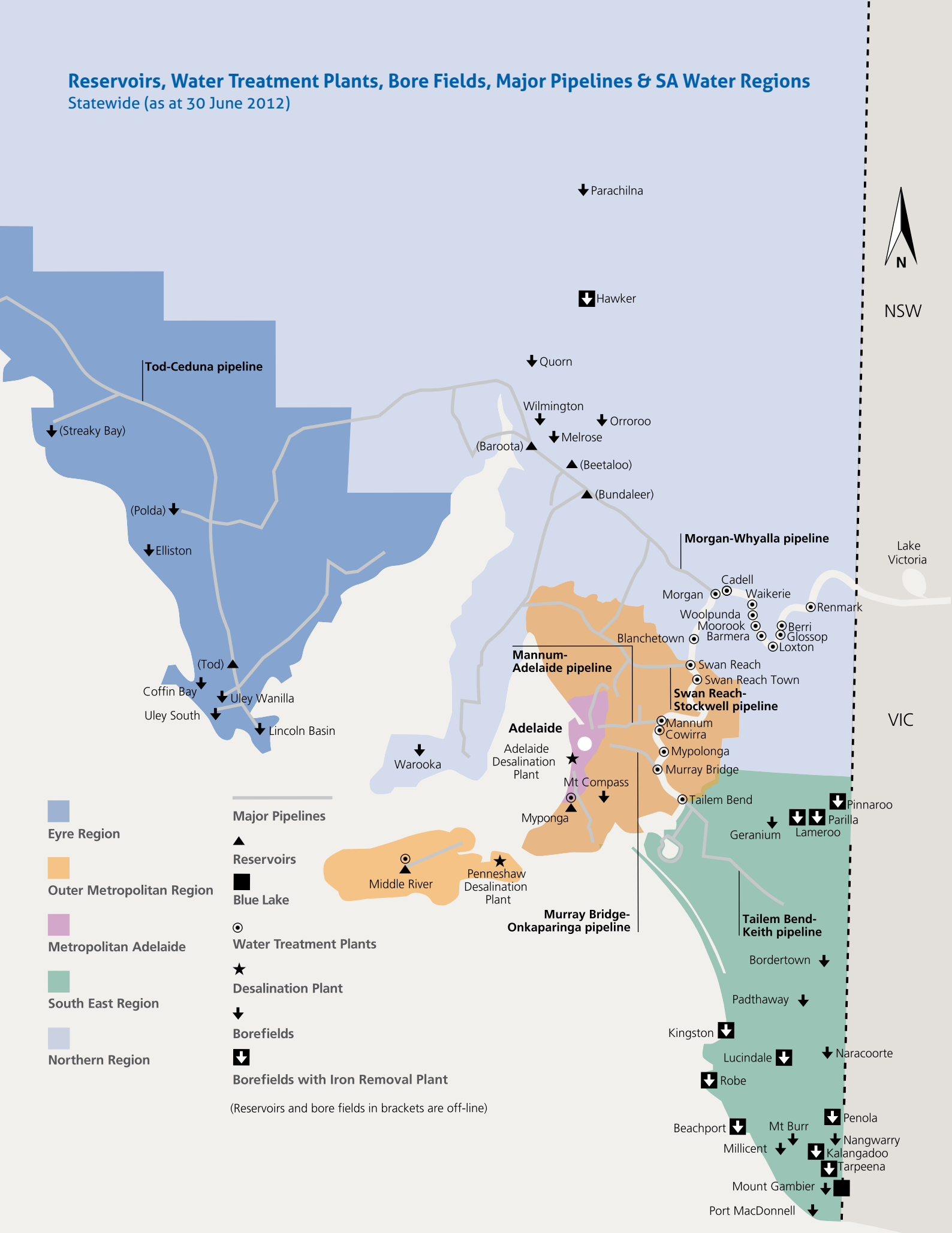
The 100GL $1.83b Adelaide Desalination Plant, at Port Stanvac also uses reverse osmosis. In July 2011 the first 50 gigalitre per annum plant produced the first desalinated drinking water, with desalinated drinking water introduced into the SA Water supply network in October 2011. Once the entire plant is operational it will have the ability to produce up to 100 billion litres of drinking water each year – about half of metropolitan Adelaide's current annual water demand.

Magnetic Ion Exchange (MIEX®)

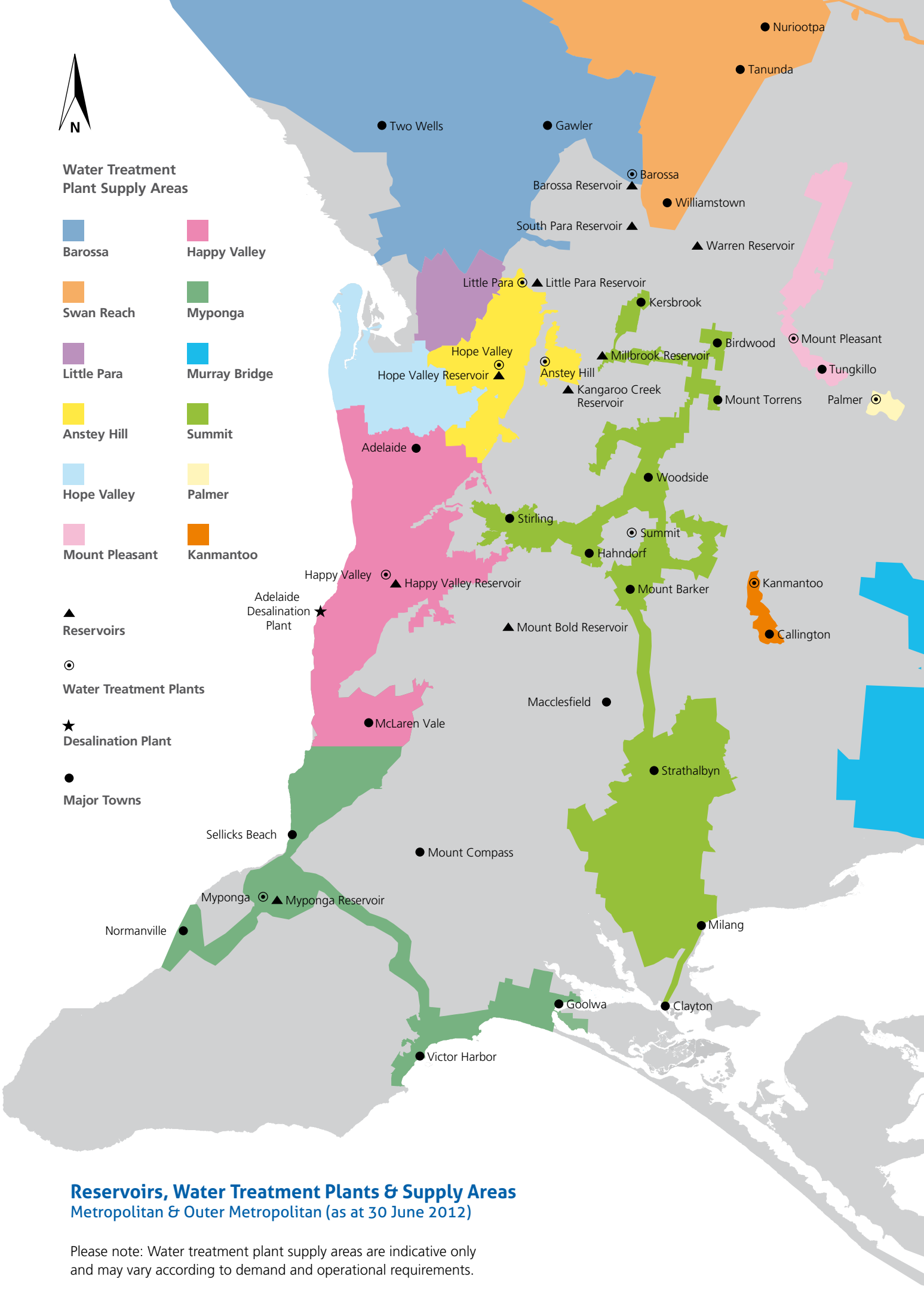
MIEX® resin is a reusable ion exchange resin designed to remove dissolved organic carbon (DOC) from water supplies. DOC is found in all natural water sources and is the result of the decomposition of organic material, which causes colour, taste and odour in drinking water. The orange/brown colour of many surface waters is attributed to DOC compounds. The MIEX® resin works by attracting DOC from the water and attaching it to the resin, which can hold a large amount of DOC. The resin, taking with it the DOC, can then be easily removed from the water due to its magnetic properties.
A small portion of the resin is diverted for regeneration to remove the attached DOC and create fresh space on the resin. However most of the resin is recirculated within the treatment process and the process is repeated, removing more DOC. Pre-treatment employing the MIEX® process results in a significant reduction in chemical usage, sludge generation and the amount of chlorine required for effective disinfection and public health protection. MIEX® was developed after years of research and team work by SA Water, Orica Watercare and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Division of Molecular Science. A number of utilities around the world are currently using this process.

Reservoirs, Water Treatment Plants, Bore Fields, Major Pipelines & SA Water Regions

Statewide (as at 30 June 2012)



See map on following page for detailed enlargement of Metropolitan and Outer Metropolitan areas.



Reservoirs, Water Treatment Plants & Supply Areas

Metropolitan & Outer Metropolitan (as at 30 June 2012)

Please note: Water treatment plant supply areas are indicative only and may vary according to demand and operational requirements.

Country drinking water supply system sources and treatment
(as at 30 June 2012)

The following table presents a listing of SA Water's country drinking water supply systems, their raw water sources and the type of water treatment / disinfection applied.

Water Supply System	Supply Source	Treatment					Disinfection			Fluoridation
		Conventional Water Treatment Plant	Iron Removal Plant	Desalination Plant	Membrane Plant	MIEX® Pre-treatment	Cl_2	NH_2Cl	UV	
Anstey Hill WTP #	Res / RM	✔ (AW)					✔			✔
Barmera WTP	RM	✔ (RW)					✔		✔	✔
Barossa WTP #	Res / RM	✔ (AW)					✔			✔
Beachport IRP	Bores		✔ (SAW)				✔			
Berri WTP	RM	✔ (RW)					✔		✔	✔
Blanchetown WTP	RM				✔ (UGI)		✔			
Bordertown	Bores						✔			
Cadell WTP	RM				✔ (UGI)		✔			
Coffin Bay	Bores						✔		✔ (back-up only)	
Cowirra WTP	RM				✔ (UGI)		✔			
Elliston	Bores						✔			
Eyre South [1]	Bores						✔			
Eyre South / Morgan WTP [2]	Bores / RM	✔ (SAW) (Morgan WTP)					✔ (at Eyre South bores)	✔ (at Morgan WTP)		✔ (at Morgan WTP)
Geranium	Bores						✔			
Glossop WTP	RM				✔ (UGI)		✔			
Happy Valley WTP #	Res / RM	✔ (AW)					✔			✔
Hawker IRP	Bores		✔ (SAW)				✔			
Kalangadoo IRP	Bores		✔ (SAW)				✔			
Kanmantoo WTP	RM				✔ (UGI)		✔			
Kingston SE IRP	Bores		✔ (SAW)				✔			
Lameroo IRP	Bores		✔ (SAW)				✔			
Loxton WTP	RM	✔ (RW)						✔	✔	✔
Lucindale IRP	Bores		✔ (SAW)				✔			
Mannum WTP	RM	✔ (RW)					✔		✔	✔
Melrose	Bores						✔			
Middle River WTP	Res	✔ (SAW)				✔	✔		✔	
Millicent	Bores						✔			
Moorook WTP	RM				✔ (UGI)		✔			
Morgan WTP	RM	✔ (SAW)						✔		✔
Morgan / Swan Reach WTP [3]	RM	✔ (Morgan WTP, SAW; Swan Reach WTP, RW)						✔	✔ (at Swan Reach WTP)	✔
Mt Burr	Bores						✔			

Water Supply System	Supply Source	Treatment					Disinfection			Fluoridation
		Conventional Water Treatment Plant	Iron Removal Plant	Desalination Plant	Membrane Plant	MIEX® Pre-treatment	Cl_2	NH_2Cl	UV	
Mt Compass	Bores						✔			
Mt Gambier	Blue Lake / Bores						✔			✔ (Blue Lake source only)
Mt Pleasant WTP	RM	✔ (SAW)			✔	✔	✔			✔
Murray Bridge WTP	RM	✔ (RW)					✔		✔	✔
Mypolonga WTP	RM				✔ (UGI)		✔			
Myponga WTP #	Res	✔ (AW)					✔			✔
Nangwarry	Bores						✔			
Naracoorte	Bores						✔			
Orroroo	Bores						✔			
Padthaway	Bores						✔			
Palmer WTP	RM				✔ (UGI)		✔			
Parachilna	Bores						✔ (back-up only)		✔	
Parilla IRP	Bores		✔ (SAW)				✔			
Penneshaw WTP	Seawater			✔ (SAW)	✔		✔			
Penola IRP	Bores		✔ (SAW)				✔			
Pinnaroo IRP	Bores		✔ (SAW)				✔			
Port Lincoln [4]	Bores						✔			
Port MacDonnell	Bores							✔		
Quorn	Bores						✔			
Renmark WTP [5]	RM	✔ (RW)					✔		✔	✔
Robe IRP	Bores		✔ (SAW)					✔		
Streaky Bay [6]	Bores / RM	✔ (SAW) (Morgan WTP)					✔ (at Eyre South bores)	✔ (at Morgan WTP)		✔ (at Morgan WTP)
Summit WTP	RM	✔ (RW)						✔	✔	✔
Swan Reach WTP	RM	✔ (RW)						✔	✔	✔
Swan Reach Town WTP	RM				✔ (UGI)		✔			
Tailem Bend WTP	RM	✔ (RW)						✔	✔	✔
Tarpeena IRP	Bores		✔ (SAW)				✔			
Waikerie WTP	RM	✔ (RW)					✔		✔	✔
Warooka	Bores						✔			
Wilmington	Bores						✔			
Woolpunda WTP	RM				✔ (UGI)			✔		

AW Operated by Allwater
Cl_2 Chlorine
IRP Iron Removal Plant
MIEX® Magnetic Ion Exchange
NH_2Cl Chloramine
Res Reservoir
RM River Murray
RW Operated by Riverland Water
SAW Operated by SA Water
UGI Operated by United Group Infrastructure
UV Ultraviolet
WTP Water Treatment Plant

supplies both country and metropolitan systems

[1] Eyre South - supplied by Lincoln Basin, Uley South and Uley Wanilla borefields

[2] Eyre South / Morgan WTP - primarily supplied by Lincoln Basin, Uley South and Uley Wanilla borefields and supplemented by Morgan WTP system

[3] Morgan / Swan Reach WTP system supplied from either Morgan WTP or Swan Reach WTP

[4] Port Lincoln system supplied by Lincoln Basin, Uley Wanilla and Uley South borefields

[5] Renmark WTP - includes supply to Cooltong

[6] Streaky Bay - Robinson Basin bores off-line, system currently supplied by Eyre South / Morgan WTP system

Metropolitan Adelaide water treatment plant sources (as at 30 June 2012)

The following tables present a listing of metropolitan Adelaide's water supply systems, their raw water sources and the type of water treatment / disinfection applied.

Water Supply System	Supply Source	Treatment					Disinfection			Fluoridation
		Conventional Water Treatment Plant	Iron Removal Plant	Desalination Plant	Membrane Plant	MIEX® Pre-treatment	Cl_2	NH_2Cl	UV	
Adelaide Desalination Plant	Seawater			✔ (AA)	✔		✔			✔
Anstey Hill	Res / RM	✔ (AW)					✔			✔
Barossa	Res / RM	✔ (AW)					✔			✔
Happy Valley	Res / RM	✔ (AW)					✔			✔
Hope Valley	Res / RM	✔ (AW)					✔			✔
Little Para	Res / RM	✔ (AW)					✔			✔
Myponga	Res	✔ (AW)					✔			✔

AA Operated by Adelaide Aqua
AW Operated by Allwater
Cl_2 Chlorine
MIEX® Magnetic Ion Exchange
NH_2Cl Chloramine
Res Reservoir
RM River Murray
UV Ultraviolet

Water Treatment Plant	Supply Sources										
	River Murray	Barossa Reservoir	Happy Valley Reservoir	Hope Valley Reservoir	Little Para Reservoir	Myponga Reservoir	Kangaroo Creek Reservoir	Millbrook Reservoir	Mt Bold Reservoir	South Para Reservoir	Warren Reservoir
Anstey Hill	● *							● *			
Barossa	○	●								○	○
Happy Valley	○		●						○		
Hope Valley	○			●			○	○			
Little Para	○				●			○			
Myponga						●					

● Direct supply (connected to a water treatment plant)

○ Indirect supply (serves as a source/storage feeding into a direct supply reservoir)

* Depending on operational configuration

Managing our water supplies

We use our Drinking Water Quality Management System (DWQMS) to manage South Australia's drinking water supply systems and to deliver safe drinking water to our customers.

A key principle of this approach is having barriers and preventive measures in place to ensure hazards are reduced from the catchment to the customer's tap. The focus of this approach is on the prevention and minimisation of hazards at the earliest point in the water quality management process and not relying solely on downstream controls.

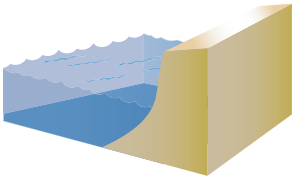
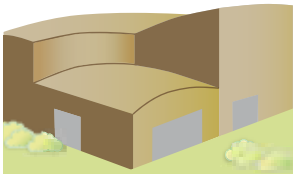
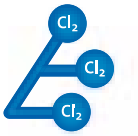
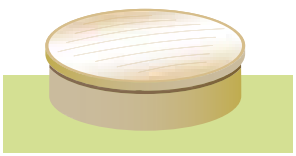
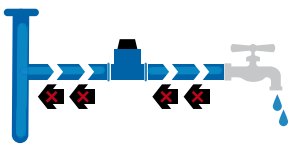
Hazards in the water can take many forms and are generally categorised into three types – biological, physical or chemical.

Examples of typical hazards found in South Australia for each of these categories include:

- biological – algal metabolites (by-products), pathogens (e.g. *Cryptosporidium*, *Giardia*, *E. coli*)
- physical – sediments (turbidity), colour
- chemical – pesticides, hydrocarbons, iron, manganese.

For each of our water supply systems we have identified potential water quality hazards and the associated level of risk using our Water Quality Risk Management Methodology. Water quality improvements identified during this process are incorporated into our Water Quality Hazard and Risk Register. The Water Quality Hazard and Risk Register is used to capture, assess, prioritise, manage and report water quality risks and preventive actions as well as capturing the actions for planning our water quality improvements, including operational and capital improvements, monitoring, procedures, training and verification. Additionally our improved risk assessment process will be integrated with other business areas of SA Water.

The following table shows the barriers, preventive measures and management objectives from catchment to tap.

Barrier	Water quality management objective	Possible hazard(s)	Example of work to prevent / minimise hazard(s)
1. Catchment 	Minimise introduction of hazards into source water	• Pathogens • Pesticides • Hydrocarbons • Iron and manganese • Sediments • Nutrients • Dissolved organic carbon	• Assessment of the 'catchment barrier status' for all supply catchments in the Mount Lofty Ranges watershed and catchments recharging SA Water's groundwater supply systems • Efforts designed to forecast pollutant influx into reservoirs from specific catchment streams, and develop targeted mitigation measures • Improved knowledge of bore aquifers • Casing integrity of aging bores assessed and replacement bores drilled.
2. Reservoir 	Minimise introduction of hazards and remove some hazards	• Pathogens • Pesticides • Hydrocarbons • Iron and manganese • Algal by-products including taste and odour compounds	• Increased understanding of algal bloom dynamics in specific reservoirs • Operation of thermistor chains and aerators in key reservoirs • Operation of a water quality profiling system in Myponga Reservoir.
3. Treatment 	Remove most hazards	• Iron and manganese • Chemicals • Algal by-products including taste and odour compounds • Pathogens	• More stringent process targets to improve hazard removal.
4. Disinfection 	Neutralise microbiological hazards and algal by-products	• Algal by-products • Pathogens	• Auto shutdown of bores in response to disinfection failure • Capital works project to improve disinfection of water supplies.
5. Chlorine Residual Maintenance* 	Manage microbiological hazards throughout systems	• Pathogens	• Water supply system operational changes, e.g. alteration of tank levels and taking tanks offline to reduce water age in the distribution systems, leading to improved maintenance of disinfection residual.
6. Closed System* 	Prevent introduction of hazards	• Pathogens • Chemicals	• Replacement of old infrastructure and improved procedures to maintain integrity of closed systems, including improved / new training in water quality procedures.
7. Backflow Prevention* 	Prevent introduction of hazards	• Pathogens • Chemicals	• Installation of backflow prevention devices.

* Barriers collectively known as distribution system

Backflow prevention

Backflow refers to the undesirable reversal of flow within drinking water supply pipes. Backflow may occur due to certain circumstances arising from the cross-connection of pipes. Back-siphonage or back-pressure may then allow contaminated water to flow back into the drinking water network. Under some circumstances (back-pressure or back-siphonage) gases, water, liquids or chemicals can flow back into the drinking water supply system. A measure of control within a consumer's premises is essential to maintain a safe potable drinking water supply. SA Water has a statutory responsibility to prevent backflow.

Our ongoing commitment to backflow prevention during 2011-12 included:

- All new 20mm water services laid included a meter with an inbuilt dual check device to prevent backflow into mains water
- Applications for new or enlarged (above 20mm) metered or non-metered services included specific instruction that a suitable backflow prevention device is required to meet the level of hazard posed by the site activity
- A database for recording the installation of high and medium hazard backflow prevention devices was maintained.

Water Quality 2011-12

During much of the first half of 2012, many locations in the southern Murray-Darling Basin were affected by a blackwater event as a result of floodwaters leading to extensive inundation of floodplains.

As in 2010-11, the effects of this again impacted water quality in the South Australian reaches of the River Murray, with water quality characterised by elevated levels of naturally occuring dissolved organic carbon, low dissolved oxygen and high colour. While the elevated dissolved organic carbon in particular presented challenging water quality for our treatment plants sourcing raw water from the River Murray, this event was not as prolonged and extensive as the blackwater episode of 2010-11. However, in order to be able to forecast and track any rapid changes in key water quality parameters, SA Water again proactively monitored the progress of the blackwater and associated changes in water quality. This provided important information for the implementation of appropriate operational actions to address any impending water quality issues and assist in the management of those water supply systems that were likely to be affected.

SA Water continued with enhancements to water quality management strategies for our catchment areas, reservoirs, groundwater systems and the River Murray during 2011-12, including working collaboratively with South Australian and interstate government agencies and other stakeholders.

The following sections provide an outline of SA Water's key strategies and new initiatives relating to water quality and their progress during 2011-12.

Changes in River Murray water quality (Murray Bridge, SA)

January 2010

River Murray towards the end of the drought.

May 2010

Distinct change in colour of river water due to high turbidity from Darling River inflows.

January 2011

During blackwater event. Dark colour due to breakdown of large amounts of organic material.

Catchments and source water

Catchment management

The first barrier for source water protection is the drinking water supply catchment. Most SA Water catchment areas are privately owned, intensively developed and co-managed by other agencies. To protect our source waters, SA Water works closely with planning and natural resource management agencies to lobby for suitable land use policies in our supply catchments and encourage the adoption of best practice land management techniques. Through the initiation of, or participation in, collaborative projects and water quality improvement initiatives we aim to achieve additional, mutual water quality outcomes. This approach ensures that we effectively and efficiently achieve our obligations under the ADWG. During 2011-12, we translated our internal risk assessment findings into specific collaborative projects and working relationships with other government agencies, to ensure that water quality improvement measures can be delivered to the benefit of SA Water's water quality objectives.

Key initiatives launched or enhanced in 2011-12 are summarised in the following table:

Catchment barrier status	As part of SA Water's Drinking Water Quality Management System (DWQMS), pollutant risks originating from the first barrier for water quality, the drinking water supply catchment, are assessed using a combination of field investigations and semi-quantitative and quantitative risk analysis methods. In 2011-12, the 'catchment barrier status' has been assessed for all supply catchments in the Mount Lofty Ranges watershed and those catchments recharging our groundwater supply systems. This effort has assisted SA Water to effectively communicate water quality risk areas from a drinking water supply perspective to internal and external stakeholders. Not only does this information provide a comprehensive information hub for each of the catchments to aid SA Water's prioritisation effort for additional mitigation measures, elements of the reports are also shared with other agencies to assist in the prioritisation of whole-of-government water quality improvement initiatives. It continues to provide key contributions to the development of the Environment Protection Authority's (EPA) Water Quality Improvement Program for the watershed.
Cryptosporidium risk in our drinking water supply catchments	Based on SA Water's *Cryptosporidium* risk assessment across all barriers for our key water supply systems, the Catchment Team has translated the outcomes into tangible projects to mitigate risk in SA Water's source water catchments. Key mitigation measures include fencing and juvenile stock removal near water courses. In 2011-12, projects have been devised to target pathogen mitigation in the catchments delivering source water to Anstey Hill and Hope Valley water treatment plants. In addition, a specific investigation into the relationship between flow (especially first seasonal runoff from catchments), water quality variables and *Cryptosporidium* loads was launched to assess whether a diversion of first flush events could reduce pathogen occurrences at the inlet of the treatment plant.
Interagency incident response protocol	Water quality incidents in the catchments require multi-agency collaboration and a clear communication and response strategy to avoid impacts to various stakeholders in the catchments. SA Water continues to work closely with the EPA to progress the development of a pragmatic response protocol for the Mount Lofty Ranges watershed.
Waste control project	Over the past ten years, SA Water has been a major contributor to the implementation of the 'Waste Control Project', a septic tank auditing and upgrade services program with the goal to reduce pathogen risk in the Mount Lofty Ranges watershed. A ten year review of the project was commissioned in 2011. The review provided an indirect measure of success of the project. The project has now been rolled into a long term program.

Monitoring and assessment of impacts of acidified sediments (Acid Sulphate Soils) near raw water offtakes	The assessment of the potential impact of acid sulphate soil-derived pollution in the River Murray and increased loads at SA Water offtakes has continued through 2011-12. Since early winter rains in 2011 resulted in the re-wetting of the drought-stricken, but acidified floodplain wetlands and the refilling of the Lower Murray Reclaimed Irrigation Area (LMRIA), SA Water has successfully collaborated on the pollution issues as part of an interagency working group. The irrigator's need to pump low pH water from the irrigation return drains to the main stem of the River Murray needed to be assessed against the risk of negative water quality impacts. SA Water has contributed to this water quality risk assessment via the use of its forecasting model (hydrodynamic and water quality model for the River Murray – Estuary, Lake and Coastal Ocean Model / Computational Aquatic Ecosystem Dynamics Model (ELCOM / CAEDYM)). This work, combined with targeted monitoring, successfully contributed to realising additional funding from the Murray Darling Basin Authority (MDBA) to the interagency team to further characterise the risks. The work aims to ensure that risks and mitigation measures are balanced between the landholders' needs to pump out the drains, and the water users (SA Water and ecology).
Cox Creek mitigation	Cox Creek nutrient mitigation works have been in operation for five years. The current monitoring program continues to evaluate the effectiveness of the sedimentation pond and wetland system in removing nutrients (in particular phosphorus) from Cox Creek in order to ultimately reduce the nutrient loading at Happy Valley Reservoir. The monitoring and evaluation program as well as a supplemental PhD thesis, focusing on the nutrient dynamics within the wetland, have provided scientific evidence that the original maintenance cycle for the system (primarily in the form of dredging of sediments) of two to three years was adequate. In 2011-12, the wetland was dredged to remove excess nutrients and improve its efficiency.
Mount Lofty Ranges Watershed – Water Quality Improvement Program	In 2011-12, the EPA continued a process of involving relevant stakeholders in developing environmental values for the Adelaide and Mount Lofty Ranges Natural Resources Management region and a water quality improvement program for the Mount Lofty Ranges watershed. SA Water is collaborating with the EPA, local government, community and other agencies by providing input into the risk assessment and mitigation program.
eWater CRC	SA Water remained an active contributing member of the eWater CRC. The CRC concluded in June 2012 and is now continuing as a separate entity, eWater Limited. eWater has been charged by the Commonwealth to assist with the roll-out of the National Hydrological Modelling Platform (a National Water Initiative). SA Water continues to work collaboratively with other SA Government agencies to develop key models for the drinking water supply catchments. Catchment water quality models are being prepared to contribute to SA Water's catchment risk assessment aspects as per ADWG.
Bushfires and prescribed burns on SA Water land	During 2011-12, SA Water developed guidelines and checklists for assessing water quality risks for prescribed burns on SA Water owned land.

In addition to the above key initiatives we continue to support activities of the State's Natural Resources Management (NRM) Boards through financial support and, where required, in-kind support. Financial support is provided through *ex gratia* payments or through a levy based on SA Water's water allocation.

Reservoirs and the River Murray

In 2011-12, a key focus was on flood-related water quality management specifically in response to changes in River Murray water quality due to the blackwater event in early 2012.

Key initiatives launched or enhanced in 2011-12 are summarised in the following table:

2012 River Murray floodwaters and blackwater event	We were again faced with floodwaters entering the River Murray during late summer / autumn 2012, leading to a blackwater event in April / May 2012 in the southern Murray-Darling Basin. This blackwater event was focused on the floodplains of the Murrumbidgee River which experienced significant flooding. From a South Australian perspective, this blackwater event was not on the scale of the event experienced in 2010-11, even though elevated levels of dissolved organic carbon still resulted in challenges for systems sourcing raw water from the River Murray. To facilitate timely operational responses to these source water quality challenges, SA Water was again proactive in initiating and participating in a number of strategies: • As was the case during the previous year's blackwater event, progress of the blackwater and the associated effects on water quality was tracked using an enhanced routine monitoring program for parameters such as metals, dissolved oxygen, dissolved organic carbon and nutrient levels. The enhanced water quality monitoring program focused on SA Water River Murray offtakes and other key locations as far upstream as Lock 9. This included weekly monitoring at 17 locations for dissolved oxygen and 22 locations for dissolved organic carbon, and providing timely updates of these results to both internal and external stakeholders. • SA Water was again a key stakeholder in the "Blackwater Monitoring Group" reconvened in early 2012 by the Murray Darling Basin Authority in response to the blackwater event. This provided a forum via teleconference for government agencies from South Australia, NSW and Victoria to discuss and share up-to-date water quality data and other information relating to the event. • SA Water's Field Response Team again played a key role during the blackwater event, including provision of immediate on-the-ground assessments, collecting field data and water samples from the River Murray and Darling River as far upstream as Mildura (NSW) for laboratory testing, to determine the water quality that our water treatment plants were likely to encounter.
Control of algae in reservoirs	The control of certain types of algae in reservoirs is an ongoing operational issue for water utilities worldwide. The traditional control method is to apply algaecides based upon copper and although these are safe and economical they can vary in effectiveness. SA Water has recently completed a large joint international project to evaluate a range of alternative techniques for the control of algae (including blue-green algae) that have potential for application in drinking water reservoirs. The project partners in this work were from Australia, the USA and Taiwan. The range of alternative methods and options tested included alternative algaecides, sediment capping agents, surface mixers, and commercial ultrasound devices. The project showed that an alternative control method based upon hydrogen peroxide was effective and is now being further evaluated in some small-scale field trials. SA Water is also involved as a partner in further fundamental research work to evaluate the effect of ultrasound on algae, with the ultimate goal being to move towards non-chemical algal control.

Testing for algal metabolites

Some cyanobacteria (blue-green algae) produce metabolites (by-products) which can present a severe health concern when present in high concentrations unless appropriate treatment is carried out. Under accelerated algal growth situations there is a need for rapid testing to determine any potential health risks. SA Water's Australian Water Quality Centre (AWQC) provides reliable, accurate and fast methods for testing algal toxins. One of these is able to simultaneously determine a total of 11 algal toxins within the following four groups: microcystins, nodularins, cylindrospermopsins and anatoxins. In 2011-12, the cylindrospermopsin and anatoxin-a method has been awarded NATA accreditation, and deoxycylindrospermopsin was added to the cylindrospermopsin method. Furthermore, a method for optimisation of algal cell lysis (rupturing) has been developed to increase the accuracy of algal toxin concentration measurement.

The new, more sensitive, field assay for saxitoxins has been included for use by SA Water's Field Response Team by optimising the cell concentration (filtration) method to allow the saxitoxin assay to be used in the field without the need for a hot acid extraction procedure.

Water quality modelling of the lower River Murray

During 2011-12, we applied our hydrodynamic and water quality model for the lower River Murray to forecast any potential water quality impacts on SA Water's drinking water supply offtakes from the rewetting of wetlands and pumping of drain water from irrigation areas in the lower River Murray.

Monitoring in the River Murray

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, which when present in high concentrations, can present health concerns unless appropriate treatment is carried out. During 2011-12, SA Water continued with its comprehensive routine water quality monitoring program at 23 key locations along the River Murray, 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.

We also installed *in-situ* on-line monitoring equipment at SA Water's Murray Bridge and Tailem Bend offtakes for monitoring temperature, dissolved oxygen, salinity, turbidity and pH, enabling us to monitor trends in these water quality parameters in real-time.

Floating algal scum booms

Floating algal scum booms were previously installed in early 2007 at Renmark, Loxton, Cobdogla, Swan Reach WTP and Blanchetown to prevent the accumulation of cyanobacteria (blue-green algal) surface scums around these water treatment plant offtakes. Following a review of the condition of these existing booms it was decided to replace these with a new, more sturdy boom type. However due to elevated water levels in the River Murray as a result of increased flows, installation of the booms was delayed during 2011-12. This will be progressed once river levels permit installation. New boom installations will include the Swan Reach town offtake, with Cadell and Woolpunda also shortlisted.

Water quality profiling system

The water quality profiling system installed in Myponga Reservoir has been providing real-time water quality data, including turbidity, pH, conductivity, temperature, dissolved oxygen, chlorophyll and blue-green algal biomass data. This data is downloaded automatically and sent to SA Water staff via email on a daily basis and provides important information for the management of reservoir water quality.

Flow meters at reservoir inlets	The installation of telemetry-linked flow meters at key reservoirs neared completion in 2011-12. This initiative included the upgrading of existing flow gauging stations and the installation of ultrasonic-type flow meters at new locations, to better manage the risks of catchment-derived pollutants from entering our reservoirs. Information will be accessible in real-time via SA Water's SCADA (Supervisory Control and Data Acquisition) system.
Early warning of harmful algal blooms in drinking water reservoirs	SA Water is an industry partner in a University of Adelaide Australian Research Council (ARC) Linkage Project entitled *Early Warning of Algal Blooms in Drinking Water Reservoirs by Means of Evolutionary Algorithms* which commenced in late 2009. The aim of the project is to develop an early warning system for cyanobacterial blooms in reservoirs by using sophisticated sensor technology and predictive modelling.
Contingency plans for removal of algae in water treatment plants	Contingency plans to maximise the removal of algae in our water treatment plants are in place. Under these plans, process changes will be implemented at plants challenged to provide enhanced treatment performance and water safety.
Blue-green algal management in reservoirs	We continued with the management of cyanobacterial (blue-green algal) blooms in Myponga and Little Para Reservoirs without the need to apply copper sulphate. This is achieved through an alternative management strategy, which includes *in-situ* field measurements of key water quality parameters, optimised management of the multiple offtake and enhanced water treatment plant processes, including the application of Powdered Activated Carbon (PAC) to remove cyanobacteria-derived taste and odour compounds.
Water quality probes	For the last five years we have used state-of-the-art water quality probes in our reservoirs and the River Murray to provide real-time *in-situ* data on key water quality parameters such as blue-green algal biomass, chlorophyll, turbidity, dissolved oxygen, pH, temperature and conductivity. These units continue to be an important tool to provide information on the possible onset of cyanobacterial (blue-green algal) blooms, track the progress of any blooms and provide an early indication of changes in water quality.
SA Water Field Response Team	The SA Water Field Response Team was implemented by SA Water in September 2007 as a response to the drought. This specialist on-call field team has the expertise to identify and investigate potential water quality issues and provide immediate on-ground assessments of areas of elevated water quality risks along the South Australian reaches of the River Murray. This response ensures early detection of any emerging water quality issues so that appropriate management and operational actions can be implemented. The field team is equipped with in-field microscopy capability and water quality monitoring probes fitted with sensors to provide real-time data on key water quality parameters such as blue-green algae, conductivity and turbidity. Rapid test kits for detecting compounds found in the blue-green algae *Microcystis* (microcystins) and *Anabaena* (saxitoxins) are also being used by the field team.

Groundwater supplies

During 2011-12, we continued with our program to secure the volume and quality of groundwater available for town water supplies.

Key initiatives launched or enhanced in 2011-12 are summarised in the following table:

Groundwater Risk Assessment Methodology	To manage the risk to groundwater supplies a Groundwater Risk Assessment Methodology was developed. This method considers the potential hazards associated with land uses above the aquifer and considers the barrier properties of the ground conditions in protecting groundwater quality. Another important barrier considered is the type and design of well construction and its integrity. This methodology was applied to Eyre Peninsula groundwater basins and risk levels were categorised according to new risk assessment tables in SA Water's DWQMS. With this work, groundwater risk assessments for all SA Water groundwater basins are now completed.
Bore assessment and replacement	The casing integrity assessment program for aging bores continued during 2010-11. Replacement bores were drilled for Mount Burr, Kalangadoo, Lucindale, Naracoorte and Kingston.
Study and monitoring of groundwater sources and resource assessment	Studies undertaken during 2011-12 included: • Recharge estimation for southern Eyre Peninsula groundwater basins using a variety of methodologies • Salinity and water level status review of the Lincoln Basin • Assessment of coastal salinity in the Uley South Basin to track the seawater / freshwater interface • Identification of the western Uley South Basin as a potential area for further wellfield development and completion of magnetic resonance sounding to determine aquifer saturated thickness and porosity • A new wellfield for supplying low salinity groundwater to Kingston SE town was identified and an investigation / production bore was drilled to the Dilwyn formation confined aquifer. Pump testing of this bore is planned for November 2012 • Blue Lake research: post-winter water sampling of monitoring and drainage bores was carried out in the capture zone. Data indicates that complex mixing takes place within the aquifer. This dataset also helped to resolve the inapplicability of recharge assessment using chloride mass balance in point recharge dominant catchments.
Bore upgrades	Upgrades to 27 bores across South East and Northern regions to improve source water quality, structural bore integrity and to ensure water security.

Water treatment and distribution

In 2011-12, we commenced or completed a number of projects to improve the quality of water delivered to our customers across the state. These included:

Morgan water treatment plant	Upgrade of coagulation control instrumentation at Morgan water treatment plant to improve removal of suspended solids and natural organic matter.
Upgrade of water treatment plant filters	Upgrade to water treatment plant filters at Happy Valley, Hope Valley and Myponga water treatment plants.
Proactive water quality management strategies	Implementation of a number of additional proactive water quality management strategies including aeration, optimisation of system water age and disinfection residual management across a number of SA Water's drinking water supply systems.
Happy Valley water treatment plant	Extensive infrastructure modifications and control system enhancements at Happy Valley water treatment plant to ensure optimal blending of desalinated water with Happy Valley water.
Iron removal plant upgrades	Iron removal plant (IRP) upgrades to enhance filter performance at Kingston and improvements to IRP sludge management at Beachport, Kalangadoo and Lameroo.

Water quality monitoring and testing

SA Water performs extensive water quality monitoring across metropolitan and country South Australia, from catchment to tap, including field and laboratory tests. Samples are collected by trained field staff to ensure samples are taken correctly and field results have a high degree of integrity. Laboratory analyses are carried out by the Australian Water Quality Centre (AWQC) in accordance with ISO 9001 Quality Systems and the requirements of the National Association of Testing Authorities (NATA).

The following table summarises monitoring and testing activities in our drinking water supply systems during 2011-12:

Number of samples - metropolitan and country drinking water supply systems (2011-12):

	Metropolitan	Country	Total
Drinking water supply systems	6	62	68
Customer taps	190	321	511
Total sample taps	336	958	1 294
Total number of routine samples*	18 065	90 873	108 938
Total number of routine tests	42 921	260 661	303 582

* Includes distribution networks and water treatment plants

Drinking water quality and performance

Despite some challenges posed by the water quality in the River Murray as a result of floodwaters and the effects of blackwater events in the reaches of the upper River Murray in early 2012, SA Water demonstrated robust management of water quality by consistently providing clean, safe drinking water to our customers.



The following tables and graphs provide a summary of our performance for health and aesthetic related parameters of routine samples at customer taps during 2011-12:

Metropolitan and country drinking water supply systems health related performance (2011-12):

Health related parameters	Metropolitan systems	Country systems
% Samples free from *E. coli*	100% (2669)	99.94% (8404)
% Samples compliant with ADWG health parameters *	99.79% (11 609) 2011-12 target: 99.9%	99.54% (35 350) 2011-12 target: 99.8%

* Includes performance against *E. coli* and total / soluble metals. Note that direct exceedances of the *Australian Drinking Water Guidelines* were used to calculate this and not the 95th percentiles for compliance of individual chemical parameters. (number of samples taken)

To determine health related compliance we collected a total of 46 959 routine samples from our drinking water supplies throughout South Australia.

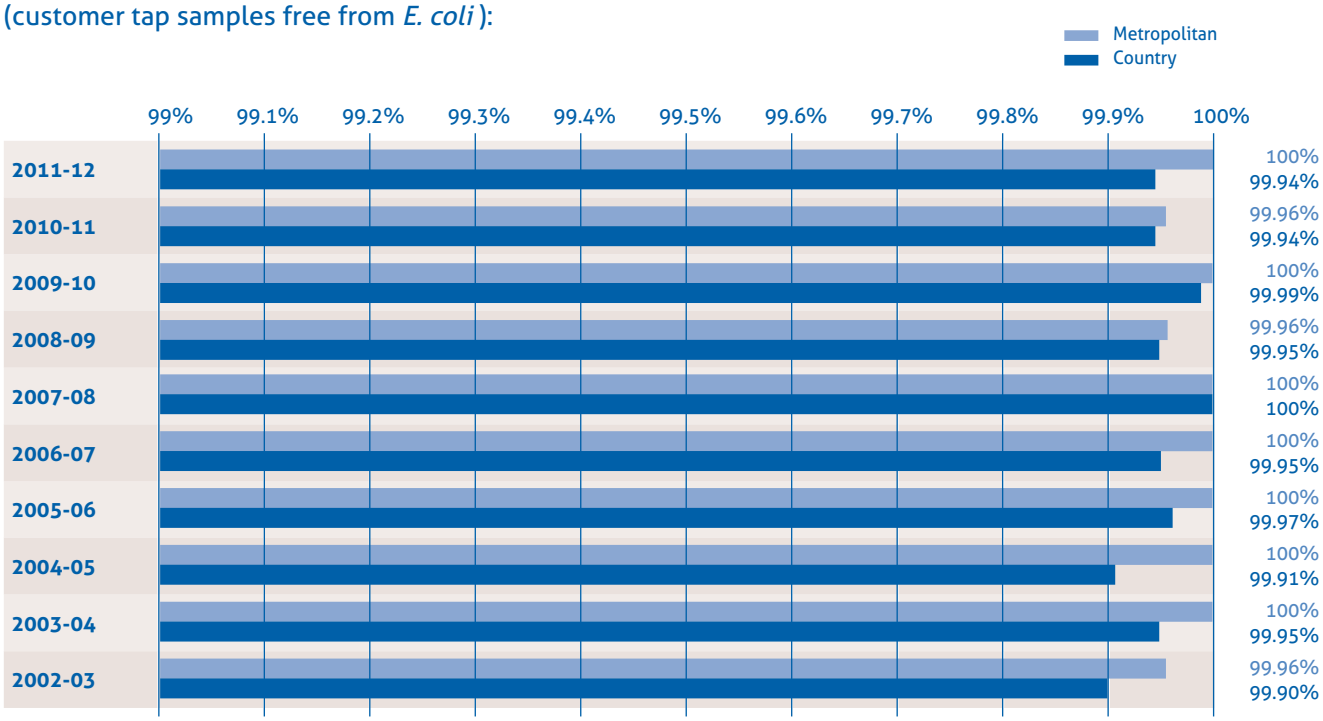
We achieved 100% *E. coli* compliance at all customer taps in metropolitan Adelaide for the 2011-12 financial year across 2669 samples taken from our six metropolitan supply systems.

We achieved 99.94% *E. coli* compliance at all customer taps in regional South Australia for the 2011-12 financial year across 8404 samples taken from our 62 country supply systems (i.e. 8399 samples out of 8404 collected were free of *E. coli*).

The *Australian Drinking Water Guidelines* (ADWG) for health related parameters recognise that occasional exceedances will occur. Compliance with the ADWG was marginally below our target for 2011-12 in both metropolitan and country areas (99.79% and 99.54% respectively). The minimum requirements of the ADWG for health related parameters require an overall result for compliance of 95%. This result was primarily due to the quality of water being sourced from the River Murray, which was carrying a higher than usual level of dissolved organic carbon as a result of the floodwaters and effects of the upstream blackwater events.

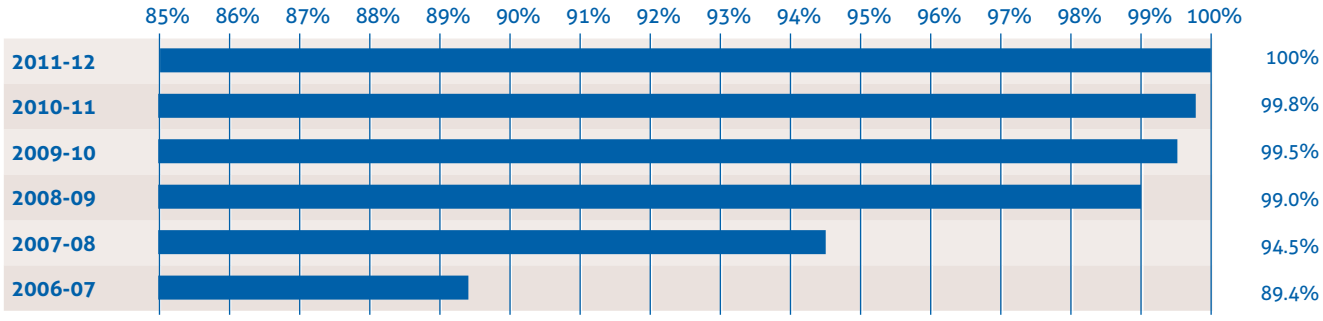
During the year, we identified distribution systems where we were below target and proactively implemented management strategies to address these situations, including working with SA Health. Immediate corrective action was taken to investigate any potential risks to public health. Such measures included flushing of systems, additional disinfection, immediate follow-up sampling and close communication with SA Health.

E. coli compliance at metropolitan and country drinking water supply system customer taps since 2002 (customer tap samples free from *E. coli*):



Implementation of SA Water's Country Water Quality Improvement Program over recent years has led to improvements in the quality of drinking water supplied to country South Australia, with compliance for turbidity in our country drinking water supply systems increasing from 89.4% in 2006-07 to 100% in 2011-12.

Turbidity compliance – country drinking water supply systems:



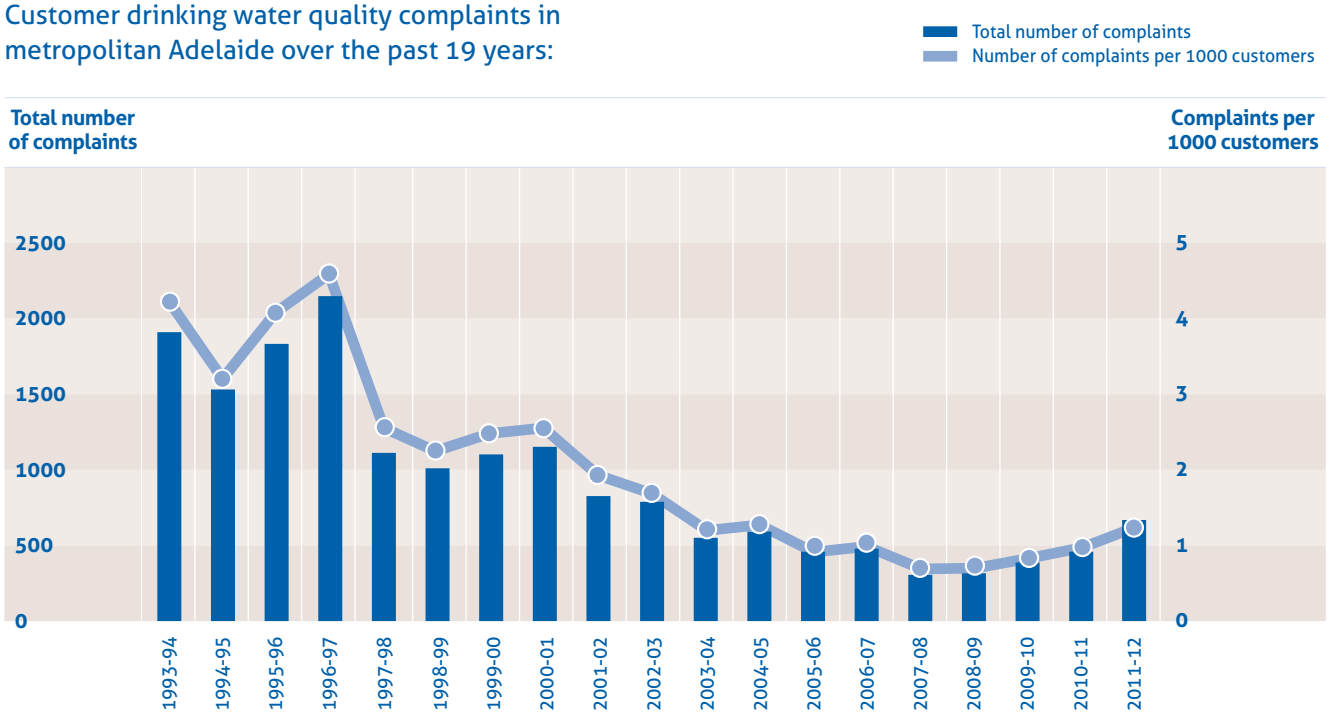
Customer satisfaction

A total of 660 customer complaints relating to drinking water in the metropolitan region were received during 2011-12.

By focusing on water quality impacts in the network and improving our knowledge of system operation and causes of water quality problems we have achieved better water quality outcomes in the distribution system and a dramatic decrease in customer complaints since the mid-1990s (shown in the graph below).

A marginal increase in water quality complaints since 2009 can be attributed to the challenges resulting from flood waters following the drought (for example flushing of dissolved organic carbon into river systems).

Customer drinking water quality complaints in metropolitan Adelaide over the past 19 years:



Incident management

SA Water is committed to the application of the *Australian Drinking Water Guidelines Framework for Management of Drinking Water Quality* (ADWG 2011) which includes two components for the management of incidents and emergencies – communication and incident and emergency response protocols.

SA Water has adopted these principles and has in place a Water Quality Incident and Emergency Management Protocol and an Incident Management System to record and generate notification of water quality incidents. These are in line with the SA Health interagency *Water/Wastewater Incident Notification and Communication Protocol.*

SA Health defines three types of health related incident classifications based upon a precautionary approach:

- Priority Type 1 incident notification – an incident that, without immediate appropriate response or intervention, could cause serious risk to human health and is likely to require immediate interagency meetings to consider responses
- Type 1 incident notification – an incident that, without appropriate response or intervention, could cause serious risk to human health
- Type 2 incident notification – an incident that, without appropriate response or intervention, represents a low risk to human health.

A comparative summary of the Priority Type 1, Type 1 and Type 2 incident notifications reported against the interagency *Water/Wastewater Incident Notification and Communication Protocol:*

Reporting period	Priority Type 1	Type 1	Type 2
2011-12	2	88	121
2010-11	5	111	172
2009-10	9	88	135
2008-09	N/A	92	75
2007-08	N/A	82	59
2006-07	N/A	50	20
2005-06	N/A	42	90

N.B. The Priority Type 1 classification of incidents became effective in July 2009, hence previous financial years are marked "Not Applicable" (N/A).

All Priority Type 1 and Type 1 notifications were immediately reportable to SA Health, while all Type 2 notifications were reportable within 24 hours, in line with the interagency *Water/Wastewater Incident Notification and Communication Protocol.*

In 2011-12 we had a significant decrease in incident notifications, despite River Murray water quality in the first quarter of 2012 being affected by elevated levels of dissolved organic carbon as a result of blackwater events in the upper Murray-Darling Basin. This provided challenges for water treatment plants sourcing raw water from the River Murray, impacting our overall performance against ADWG compliance. However, treatment plant challenges were not of a level as those associated with the blackwater event in 2010-11, thus leading to fewer incident notifications in supply systems sourcing raw water from the River Murray.

The continual review and improvement of our incident management processes has positively impacted on our water quality incident response and overall performance. The proactive water quality management of targeted individual water supply systems and detection and management of risks continued during 2011-12. We are improving our diligence in actively managing these risks, as reflected in the improvement of our Incident Response Index.

During 2011-12 we continued our focus on the early detection, rapid corrective action and prevention of incident notifications and addressing the causes of preventable Type 1 notifications such as disinfection failures or inadequate treatment facilities of groundwater. Strategies employed to achieve this include capital improvements and improving the robust operation of water supply systems.



Incident Response Index (IRI)

The purpose of the Incident Response Index (IRI) is to drive and guide correct response when a Type 1 or Priority Type 1 incident is detected.

The IRI is assessed against a number of criteria, with each component in the IRI designed to assist with the management of water quality incidents, including reporting, initial response and longer term preventive measures. The overall 2011-12 strategic target for the IRI is at least 81% compliance.

Criteria used in the Incident Response Index (based on total reportable SA Health Priority Type 1 and Type 1 incident notifications):

Incident reported to relevant agencies by phone immediately (<1 hour)	Overall strategic 2011-12 target: at least 81%
Incident entered into the Incident Management System (IMS) in <2 hours	
Initial effective response taken within 3 hours	
Written report to Minister for Water within 24 hours	
Root Cause Analysis completed within 10 working days	
Preventive actions implemented within agreed timeframes	

The Incident Response Index achieved in country and metropolitan areas and overall for 2010-11:

System	Incident response index (IRI) 2011-12 financial year	Incident response index (IRI) 2010-11 financial year
Overall (weighted combined country and metropolitan)	93%	81%
Country	95%	81%
Metropolitan	84%	74%

Into 2012-13 we will:

- Increase the Incident Response Index (IRI) target to 82%
- Continue the integration of our water quality incident management process with environmental, wastewater and recycled water incident management requirements to streamline the process for our incident managers
- Conduct incident protocol awareness training to regional and metropolitan incident managers following the release of the new version of the interagency *Water/ Wastewater Incident Notification and Communication Protocol* in 2012-13.

Research and Innovation

SA Water has a national and international reputation for high quality water science and engineering, research and technical innovation.

We continue our work to encourage innovation and communication to strengthen our external collaborations for Research and Innovation (R&I) and deliver better ways to manage our water business. SA Water and the Australian Water Quality Centre (AWQC) are recognised as leaders in the water industry for strategic and operationally-focused research. Approximately 100 people attended the annual R&I Forum in May 2012, with external guests including representatives from the Department for Water, SA Health, Goyder Institute, Water Services Association of Australia (WSAA), CSIRO, Water Quality Research Australia (WQRA), Melbourne Water and Allwater (Suez Environment, Degremont and Transfield Services). This demonstrates the significant interest in our research and innovation portfolio.

Business and customer focus

Through the R&I group, SA Water undertakes research to generate new knowledge and to provide high level technical advice, as appropriate, in the areas of:

- Water quality, public health and risk issues
- Water and wastewater treatment and distribution management
- Water resource and environmental management, sustainability and climate variability
- Asset management, energy efficiency and infrastructure investment.

The research outputs are targeted to improve efficiency and to reduce risk to the business and our customers. This involves developing and facilitating the transfer of new technologies into operational outcomes to improve business performance, efficiency, and to underpin innovation. This will ultimately lead to direct savings in costs for treatment or other business processes or costs related to future investment decisions.

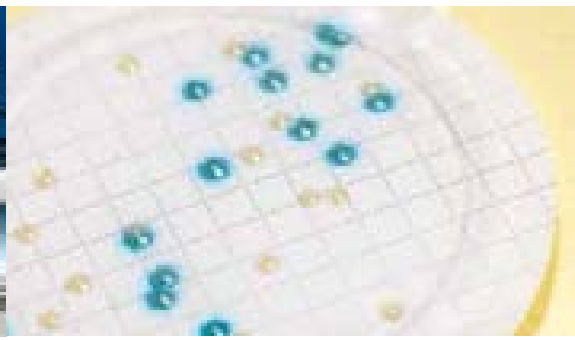
SA Water has a diverse research portfolio in the areas identified above. A high profile project where research investigations have successfully translated to beneficial operational outcomes are water quality investigations associated with the Adelaide Desalination Project (ADP). Water from the ADP supply will be blended with the current treated water from Happy Valley Water Treatment Plant in different proportions depending upon demand. However, the blending of these two supplies with significant differences in underlying water quality can potentially impact upon a range of characteristics that are important to maintain in finished drinking water. It was identified early on that we needed to be aware of the potential issues that could arise from the different chlorine decay characteristics of ADP water blending into the existing system. The research component of this project set out to investigate the risks and develop management systems to avoid water quality changes. A range of investigations into blending the two sources were undertaken to determine the impact on water quality, particularly on chlorine decay and disinfection by-product formation. A key outcome of the project was the development of a practical blended water chlorine decay model that enables prediction of chlorine residuals for informed chlorine dose control at the water treatment plant to achieve the desired water quality in the distribution system. The model was delivered to Allwater in September 2011. The project has now moved into the implementation phase with management tools being integrated in Allwater management of the blended water treatment and supply.

One of the key factors affecting water quality at the customer tap is the water quality that enters the distribution system. While water treatment is implemented by many water utilities, there has not been a focus on identifying the appropriate water quality to minimise water quality deterioration in the distribution system. Water utilities spend considerable resources cleaning and flushing distribution systems to minimise water quality deterioration at the customer tap as the major response to distribution system issues. An important research project undertaken by SA Water involved

determining the extent of treatment necessary to produce water quality that minimises water quality deterioration after passage though the distribution system. This was achieved by comparing the impact of a range of water qualities provided from four different treatment schemes on four parallel Pilot Distribution Systems (PDS) over a monitoring period of 18 months. A range of water quality parameters and analytical tools, including on-line techniques, were utilised to monitor treated water quality and changes within the distribution systems. Significant bacterial, organic and particle removal differences were apparent between the four treatments. The impact of these differences on the PDS is currently being evaluated. The project is nearing completion and an important operational outcome of this project will be to identify water quality parameters and analytical tools that are most suited for monitoring water quality within distribution systems and can be used to predict water quality deterioration.

SA Water has also invested in research assessing and managing risks associated with waterborne contaminants, including *Cryptosporidium* and cyanobacteria ('blue-green algae'), thereby satisfying impending health regulatory requirements. *Cryptosporidium* is a human infectious pathogen that causes diarrhoea. Although it is transferred mainly from person to person, it is also a common contaminant in stormwater and in the run-off from catchments that go into our reservoirs after rainfall. This makes *Cryptosporidium* a risk to water quality and public health. A major initiative in 2011-12 has been the development of innovative tools for measuring *Cryptosporidium* infectivity in our water sources, providing better information on the level of risk posed by rainfall run-off.

Algae and cyanobacteria are recognised as a water quality problem and a hazard with regard to their potential to contaminate water used for drinking water supply, recreational activity and agricultural purposes. The occurrence of cyanobacteria is of most concern as the mass occurrence or blooms of these organisms appears to be increasing in frequency and intensity as a result of nutrient pollution of water sources globally. The two main issues for drinking water supplies are the taste and odour compounds and the range of toxins some of these organisms are known to produce. Water treatment technology is available to remove these algal by-products, but it usually requires advanced oxidation or adsorption techniques, which may not always be available and can be expensive in terms of both capital and operating costs. It is therefore desirable and attractive to treat or remove algae and cyanobacteria in source water where possible. A comprehensive international project led by SA Water has recently been completed which involved evaluation of source water techniques for algal control, with particular focus on finding alternatives to the long-standing method of chemical control with the broad spectrum biocide copper sulphate. Commercial and non-commercial methods from around the world were reviewed, including solar-powered surface mixers, sediment capping agents, alternative algaecides and ultrasound. The greatest success was achieved using a commercially available 'stabilised hydrogen peroxide' (SHP) algaecide. The activity of hydrogen peroxide was found to be comparable to copper sulphate in cost but has the benefit of less impact on the environment due to breakdown into oxygen and water and does not accumulate or give rise itself to undesirable by-products. Further development of SHP by SA Water has an R&I funded project currently underway, entitled 'Development of stabilised hydrogen peroxide as an alternative to copper sulphate'. The work will involve a field trial at a small SA Water wastewater storage to test the effectiveness in a real situation, with the potential of up-scaling to a reservoir, subject to evaluation of practical and environmental considerations.

National and international success

SA Water's R&I group has had significant achievements in the national and international arena. This includes receiving competitive funding grants from a wide range of funding bodies such as the Australian Research Council (ARC) Linkage Grants scheme, WQRA and the Water Research Foundation. Such success has enabled us to forge and enhance alliances with new and existing collaborative partners.

Our impact and influence extends to our relationships with many of our strategic partners, including the Goyder Institute, Allwater, WSAA, the Australian Water Association (AWA), National Health and Medical Research Council (NHMRC), International Centre of Excellence in Water Resource Management (ICEWaRM) and universities (local and international). Members of SA Water's R&I team are well represented on many of the decision-supporting committees of these partners. SA Water also supports the SA Water Centre for Water Management and Reuse (CWMR) at the University of South Australia with an agreement extending until 2014, highlighting our investment in building capacity in the local water education sector. The excellence of SA Water research was recognised in 2011-12 when the Microbiology Research team won the AWA SA Research Merit Award for a research program that developed and applied tools for assessing the risk posed by *Cryptosporidium* in all sources of water. This program developed cell-based assays for measuring *Cryptosporidium* infectivity and DNA-based assays for identifying the key species that cause disease in humans. These tools were used to study *Cryptosporidium* survival in environmental waters, to measure the effect of water treatment processes on *Cryptosporidium* infectivity and to type *Cryptosporidium* detected in stormwater and river water. Current research is applying these innovative tools to measure the effectiveness of wastewater treatment for *Cryptosporidium* inactivation and to assess the risk of infective *Cryptosporidium* in catchment water following rainfall.

SA Water's research into water science, engineering and technology is highly regarded in international circles. Some of the highlights from international collaborations and partnerships in 2011-12 include:

- Three scientists from the Research Centre for Eco-Environmental Sciences (RCEES) in China made separate visits to work at our AWQC. SA Water has, since 2006, undertaken a range of strategic projects with RCEES, which is one of the prestigious Chinese Academy of Sciences Institutes. This collaboration continues to grow in strength with joint science and technology work in the areas of water treatment, environmental science and reservoir management
- A range of international visitors from universities and institutes including: National Cheng Kung University, Taiwan; Virginia Tech, USA; Technical University of Montreal, Canada; the University of Washington, USA; and the University of Florida, USA.

Our reputation is also highlighted in the acceptance of our research papers for platform presentations in national and international conferences, some of which include:

- AWA Ozwater'12 Conference, Sydney
- ISSNIP Conference, Adelaide
- 2011 Singapore International Water Week
- IWA Leading Edge Technologies Conference, Brisbane
- AWWA Water Quality Technology Conference, Arizona, USA
- The 4th International *Giardia* and *Cryptosporidium* Conference, Wellington, New Zealand.

Employee Awareness and Training

During 2011-12, improving the water quality and environmental outcomes skill sets of SA Water employees and alliance partners was a major focus. Some 547 SA Water employees attended either awareness or skills training. All current training courses are reviewed annually for course content and are subject to continual improvement.

The training undertaken during 2011-12 is summarised below:

Overview of water quality awareness	This two-day water quality awareness training course was held over six sessions. The course provides attendees with an understanding of the *Australian Drinking Water Guidelines* (ADWG) hazard analysis process, the risk management principles used to achieve safe drinking water and how to identify potential water quality hazards. Attendees then begin to understand how the implementation of these principles affects water quality from catchment to tap. This training is mandatory for all operators engaged in water supply management. This course is in the process of being mapped to a national accreditation (NWP 279A: *Demonstrate knowledge of the risk management principles of the ADWG*). Eighty six participants attended this course in 2011-12.
Integrated incident management procedures, water quality, environmental, OH&S, operational security management	This incident management training outlines the knowledge required to undertake duties as an incident manager, providing attendees with a thorough knowledge and understanding of SA Water's incident management protocols and procedures. Presentations include demonstrations, case studies, assessments, and there is a written examination. All incident managers, their nominated proxies and support managers are required to attend and achieve competency. Seventy eight participants attended this course in 2011-12.
Water sampling (NWP 218B)	This comprehensive, nationally-accredited training course is delivered as required. The objectives of this one-and-a-half day course are to enable staff to confidently undertake water quality sample collection in accordance with SA Water procedures and AS/NZS 5667.1:1998. Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples are also key components. Training incorporates presentations, active discussions, hands-on practical demonstrations, theory, case studies and on-site practical assessment. All staff who undertake sampling as part of their role are progressively enrolled into this training. Both internal SA Water employees and contractors participate. Fifteen participants attended this course in 2011-12.
Field testing (NWP 210B)	This comprehensive one-day training course is delivered as required. The objective is to enable staff to confidently undertake water quality field testing in accordance with SA Water procedures and AS/NZS 5667.1:1998. Training incorporates presentations, active discussions, hands-on practical exercises and demonstrations, theory and case studies. All staff who undertake field testing as part of their role are progressively attending this training. Both internal SA Water employees and contractors participate.

Disinfection for operators	This comprehensive two-day training course was held on two occasions during 2011-12. This training ensures operators have the required knowledge and skills to operate, maintain and manage the disinfection processes within water supply systems. Training incorporates presentations, active discussions, workshops and practical exercises. Material is focused on SA Water processes and procedures and is currently being mapped to align with NWP 268B: *Monitor, operate and report chlorine disinfection systems* and NWP 366A: *Monitor, operate and control chloramination disinfection systems*. All staff who operate disinfection systems are required to attend, including field maintenance managers, chlorine fitters, district managers and team leaders. Eighteen participants attended this course in 2011-12.
Odours in drinking water supplies	This training is provided to operational staff to assist early detection of offensive / reportable odours in drinking water supply systems. This comprehensive course is presented on a demand basis and incorporates presentations, sensory analysis, practical exercises and case studies to provide operators with the basic skills to identify, assess and respond to odours in drinking water supplies. Both treatment plant operators and distribution system operators are required to attend this training. Sixteen participants attended this course in 2011-12.
Disinfection of mains	This procedural training is scheduled as required by district quality systems officers and water quality coordinators. It is delivered to enhance operator understanding of current procedures and the requirements necessary to undertake supplementary water mains disinfection using mobile chlorine dosing equipment. The training involves presentations, practical exercises, case studies and field work. All staff that plan and / or undertake mains disinfection are targeted to attend and achieve competency.
Chlorine / chloramination for plant operators	The Water Industry Training Centre at Deakin University has been engaged on a demand basis to present a training course over five days. It is designed to upskill newly appointed chlorine fitters in the operation, maintenance and management of chlorine and chloramination plants. This intense competency-based course is provided on-site at appropriate water treatment plants.
Integrated root cause analysis	This training is provided for incident managers and staff who are involved in the response to and management of incidents. Training was developed with co-operation from all groups across SA Water to standardise post-incident review into one generic process. Fourteen participants attended this course in 2011-12.
Introduction to water quality awareness	Developed to supplement *Overview of Water Quality Management* as refresher training and training for administrative office-based staff. Provides staff with a comprehensive understanding of how water is provided under the ADWG and the aspects of SA Water's responsibility. Sixty five participants attended this course in 2011-12.
Introduction to recycled water awareness	Developed as an introduction to recycled water to acquaint employees with a broad awareness of the key factors and issues that influence the supply, use and regulation of recycled water systems. Forty two participants attended this course in 2011-12.
Native vegetation guidelines	Provides an overview of native vegetation standard operating procedures. This training has been developed to give staff an operational understanding of the processes and procedures associated with clearing of native vegetation according to legislative requirements.

Best practice operating procedures	Water quality / environmental procedural training outlining SA Water and legislative requirements associated with operationally controlled discharges of water to the environment.
Environmental management for project managers	An introduction to environmental law and requirements for project managers. This training course covers environmental impact assessment processes and general requirements for project managers in regards to environmental issues related to capital projects. Ten participants attended this course in 2011-12.
Environmental management awareness	A course designed to provide staff with an overview and understanding of strategic environmental law and policy, SA Water's Environmental Management System and responding to environmental incidents.
Disinfection system awareness	An awareness training course developed for operations staff who are required to work on, or adjacent to, chlorine dosing stations. Eighty five participants attended this course in 2011-12.
Incident Management System awareness	An integrated awareness training course developed for all staff, this course outlines responsibilities associated with incident reporting across the five disciplines of water quality, environmental, OH&S, security and operational incidents within SA Water. Eighty five participants attended this course in 2011-12.
Construction and commissioning - water quality considerations	Awareness training course specifically developed for internal SA Water staff and external contractors and delivered as required.
Optimisation of water quality in distribution networks (NWP 317B)	Nationally accredited competency-based training for network operators outlining the responsibilities associated with critical control points and water quality management of reticulation systems. Fifteen participants attended this course in 2011-12.
Understanding drinking water treatment processes	This course aims to identify key water quality issues, describes the major water treatment processes currently used and outlines new approaches for optimising water treatment. Eighteen participants attended this course in 2011-12.

Training courses under development:

Monitor, operate and control granular media filtration processes (NWP 354B)	This course will assist operators to identify, operate, troubleshoot and understand common media filtration processes and compile process reports. This training will be applicable to both drinking water and wastewater reuse.
Monitor, operate and control wastewater treatment processes (NWP 346B)	The course will assist operators to identify, understand, operate and control treatment performance, including the preparation and application of chemicals and compilation of process reports.

Glossary of Water Quality Terminology

Algae
A diverse group of simple photosynthetic organisms with no true roots, stems or leaves. They occur mostly in freshwater and marine environments and range in size from unicellular to multicellular forms.

Algal bloom
A rapid growth of algae in aquatic environments often triggered by an input of high levels of nutrients (particularly nitrogen and phosphorus) and an increase in temperature. Blue-green algae (or cyanobacteria) are of most concern to SA Water. Algal blooms frequently cause environmental problems and can create challenges for water treatment.

Alum
An aluminium sulphate-based chemical used as a coagulant in the water treatment process.

Aluminium (Al)
A naturally occurring element in soils which can enter water from catchments.

Ammonia (NH_3)
A highly soluble compound resulting from the decomposition of organic matter containing nitrogen. Usually only found in small concentrations in surface waters.

Aquifer
A layer or section of earth or rock that contains freshwater (known as groundwater), any water that is stored naturally underground or that flows through rock or soil, supplying springs and wells.

Australian Drinking Water Guidelines (ADWG)
Drinking water guidelines established by a joint committee of the National Health and Medical Research Council (NHMRC) and Agricultural Resource Management Council of Australia and New Zealand (ARMCANZ), published in 2004. These national guidelines provide a framework and benchmark water quality values for best practice in drinking water supply operations.

Australian Water Quality Centre (AWQC)
A business unit of SA Water which provides a comprehensive range of water and wastewater services and undertakes investigations and consultancies on a commercial basis on a wide range of water quality and treatment technology issues. The AWQC has been National Association of Testing Authorities (NATA) accredited since 1974 and obtained quality system certification to ISO 9001 in 1997.

Blue-green algae
See Cyanobacteria.

Blackwater
Blackwater events in rivers are a natural occurrence when extensive areas of floodplains and wetlands with large amounts of organic matter (e.g. a significant build-up of leaf litter and other organic material during prolonged drought) are inundated during floods making its way into the river system. This has a significant effect on source water quality in the river, with the breakdown of the organic matter through microbial activity resulting in water with substantially reduced dissolved oxygen (DO) levels, increased dissolved organic carbon (DOC) levels and a distinctive dark colour (produced by tannins leaching out of the organic matter).

Calcium (Ca)
A naturally occurring element that can enter water from catchments. It may also be added to water in the treatment process to reduce the acidity levels or increase the capacity of water to buffer pH changes.

Catchment
An area of land surrounding a water storage. The runoff water from rain falling over the catchment drains into the storage and collects nutrients, minerals and other contaminants (including microorganisms) from the surface of the land.

Chloramination
The application of chlorine followed by ammonia to create monochloramine (NH_2Cl), a stable disinfectant that is added to drinking water to kill bacteria or to oxidise undesirable compounds. Chloramines persist for a longer time than chlorine and as a result are used in longer water distribution systems.

Chlorination
The disinfection of water, wastewater and industrial waste through the application of chlorine (Cl) as part of the water treatment process. Chlorination kills microorganisms and oxidises undesirable compounds.

Coliforms
Coliform bacteria are used as one of the indicators of the quality of drinking water and the possible presence of disease-causing microorganisms. These bacteria are killed by chlorine.

Colour
See True colour.

Cryptosporidium
A parasitic protozoan (microorganism) which can cause gastroenteritis (stomach upsets) in humans. These organisms occur in the gut of infected warm-blooded animals and can be introduced into source water through faecal contamination.

Customer tap
Strategically placed sampling location in a water distribution system to enable verification of water quality in the distribution system as supplied to customers; typically located near a water meter.

Cyanobacteria (Blue-green algae)
Single-celled, filamentous or colony forming organisms which are widely distributed in freshwater and marine environments. Under favourable conditions of light, temperature and nutrient supply, extensive growth of cyanobacteria may occur, leading to blooms. Cyanobacteria blooms frequently result in environmental problems and can create challenges for water treatment.

Desalination
A water treatment process used to convert highly saline water into water suitable for human consumption. Treatment involves passing saline water through membranes at a high pressure.

Disinfection
Inactivation (killing) of pathogens or organisms capable of causing infectious disease by physical or chemical processes, including chlorination.

Dissolved Organic Carbon (DOC)
DOC is derived from organic materials (such as decomposed plant matter) which may give water a brownish appearance.

Drinking water
Water that is suitable for human consumption.

Drinking Water Quality Management System (DWQMS)
SA Water's DWQMS is used to ensure our drinking water supplies are managed effectively to provide high quality drinking water and to ensure the protection of public health.

Escherichia coli (E. coli)
The most common thermotolerant (heat tolerant) coliform present in faeces, which is regarded as the most specific indicator of recent faecal contamination. *E. coli* can be killed by standard disinfection practices.

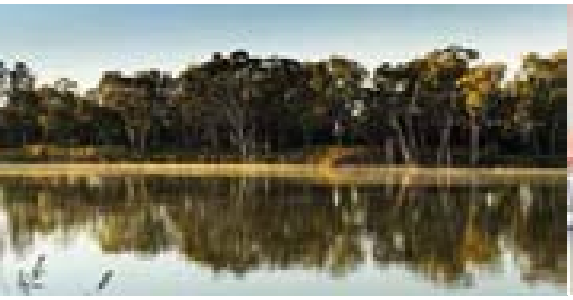
Faecal coliforms
Bacteria which inhabit the intestines of humans and other mammals and are present in faeces. Faecal coliforms are used as an indicator of human and animal waste contamination and can be killed by standard disinfection practices.

Filtration
A process for removing particles by passing water through a porous barrier, such as a screen, membrane, sand or gravel. Often used in conjunction with a coagulant (e.g. alum) to settle contaminants.

Fluoride (F)
Fluoride is regarded as a useful constituent of drinking water, particularly for the prevention of tooth decay. Fluoride has been added to Adelaide's water supply since 1971. Concentration is maintained within the recommended levels set by SA Health.

Geosmin
An organic compound with a distinct earthy / musty smell, produced by certain blue-green algae, which can impart an unpleasant smell and taste to water.

Giardia
A parasitic protozoan (microorganism) found in untreated surface water and removed by filtration. It can cause gastroenteritis (stomach upsets) in humans. These microorganisms occur in the gut of infected warm-blooded animals and can be introduced into source waters through faecal contamination.



Gigalitre (GL)
A metric unit of volume equal to one thousand million (1 000 000 000) litres or 1000 megalitres.

Groundwater
Water beneath the earth's surface (often between saturated soil and rock) that supplies bores, wells or springs.

Heavy metals
Individual metals and metal compounds that negatively affect people's health. These occur naturally in the environment and include arsenic and selenium. In very small amounts, many of these metals are necessary to support life. However, in larger amounts, they become toxic.

Incident Management System (IMS)
The Incident Management System (IMS) is SA Water's web-based incident management tool for the reporting and management of all incidents.

Inflows
Water flowing from catchments into reservoirs through streams, rivers and creeks.

Iron (Fe)
An element which, when found in water, leads to a brownish discolouration. Limits on the amount of iron in water are usually due to taste and appearance factors rather than any detrimental health effects.

Kilolitre (kL)
A metric unit of volume equal to 1000 litres.

Magnetic Ion Exchange (MIEX®)
An ion exchange resin that is designed to remove dissolved organic carbon from water as part of the water treatment process.

Manganese (Mn)
Manganese in a water supply may affect taste, cause staining of clothes, produce deposits in pipes and contribute to turbidity.

Megalitre (ML)
A metric unit of volume equal to one million (1 000 000) litres or 1000 kilolitres.

2-Methyl Isoborneol (MIB)
An earthy / musty smelling organic compound produced by certain blue-green algae, which can impart an unpleasant smell/taste to water.

Microorganisms
Organisms invisible to the unaided eye.

Monitoring
An ongoing observation and testing program to assess potential changes in circumstances.

National Association of Testing Authorities (NATA)
NATA is Australia's national laboratory accreditation authority. NATA accreditation recognises and promotes facilities competent in specific types of testing, measurement, inspection and calibration.

National Health and Medical Research Council (NHMRC)
NHMRC is Australia's peak body for supporting health and medical research for developing health advice for the Australian community, health professionals and governments, and for providing advice on ethical behaviour in health care and in the conduct of health and medical research.

Naturally occurring
Present in the natural environment as minerals, elements, salts and other substances.

Nephelometric Turbidity Unit (NTU)
A measure of turbidity in water.

Nitrate (NO_3)
The most stable form of combined nitrogen in water. Present in surface waters in small amounts, the major sources are from human and animal wastes.

Nitrogen (N)
Nitrogen is an essential nutrient for plant growth. It is used in fertilisers and is present in sewage effluent. High levels of nutrients (including nitrogen) can lead to excessive algal growth in lakes, rivers and reservoirs.

Non-drinking water
Water that is not suitable for human consumption.

Nutrients
Compounds required for growth by plants and other organisms. Major nutrients for plant growth are phosphorus and nitrogen.

Organic
Substances that come from animal or plant sources and always contain carbon.

Parasite
An organism that relies on a host organism to grow.

Pathogens
Disease-causing organisms such as bacteria and viruses.

pH
The pH value indicates if a substance is acidic, neutral or alkaline. It is calculated from the number of hydrogen ions present and is measured on a scale from 0 to 14. A pH greater than 7 is alkaline, less than 7 is acidic and 7 is neutral. The pH of public water supplies should be slightly alkaline to minimise corrosion.

Phosphorus (P)
Phosphorus is an essential nutrient for plant growth. High levels of phosphorus can lead to excessive algal growth in lakes, rivers and reservoirs and can be due to inputs from human activity such as fertiliser runoff and land clearing.

Protozoa
Single-celled organisms that feed on other, smaller microorganisms. A number of these (such as some types of *Giardia* and *Cryptosporidium*) are responsible for waterborne diseases.

Reservoir
A natural or artificial body of water used as a storage for water supply.

SA Health Water/Wastewater Incident Notification and Communication Protocol
An agreement between SA Health and SA Water which covers incident notification and reporting requirements.

Salinity
The concentration of salts in water, mostly sodium chloride. Salinity can affect potability, use for irrigation and industrial purposes as well as aquatic life.

Source water
Water prior to any treatment or disinfection.

Suspended solids
Particles suspended in water that may be removed by sedimentation or filtration.

Total Dissolved Solids (TDS)
A measure of inorganic salts and small amounts of organic matter that are dissolved in water. Usually determined by converting electrical conductivity to TDS values.

Total hardness
Total hardness is the sum of the concentrations of calcium and magnesium ions expressed as calcium carbonate ($CaCO_3$) equivalent. Waters with a high mineral content (a total hardness in excess of 200mg/L) are considered hard.

Treatment (water)
The filtration and disinfection processes employed to produce drinking water.

Trihalomethanes (THMs)
Compounds that may occur in a chlorinated water supply as a by-product of organic materials present in the water reacting with chlorine.

True colour
Colour is mainly due to the presence of dissolved substances from organic matter in water, such as decaying leaves and vegetation. True colour refers to the colour of water after particles of organic matter have been removed through filtration and is the measurement of the extent to which light is absorbed by the water. Measured in Hazen Units (HU).

Turbidity
Refers to the presence of suspended solids in water causing a muddy or discoloured appearance. Turbidity is measured in Nephelometric Turbidity Units (NTU).

Ultraviolet (UV)
Natural UV light from the sun or artificial UV light from low pressure mercury lamps will kill pathogens, depending on contact time and light intensity. The water must be relatively clear, of low turbidity and dissolved compounds.

Water cycle
The water cycle is the simplest natural cycle on earth involving the transfer of water between waterbodies (e.g. oceans and lakes) and the atmosphere. Water evaporates from waterbodies into the atmosphere. The water vapour rises and cools, forming droplets that join together to form clouds (condensation). As the droplets join together and become heavier they fall to earth as rain or other forms of precipitation. The rain can then infiltrate the soil into groundwater aquifers or flow as surface runoff into waterbodies and the cycle begins again.

Water Services Association of Australia (WSAA)
Australia's peak body for the Australian urban water industry. Its members provide water services to over 15 million Australians.

Water supply system
The complete system that provides a water supply to customers. It includes all infrastructure from catchment to tap, including the source water, water storage reservoirs, treatment plants and distribution networks.

Water Treatment Plant (WTP)
A treatment plant that improves water quality by removing impurities through filtration and disinfection.

Country Drinking Water Supply Systems and Towns Supplied

(as at 30 June 2012)

Water Supply System	Towns Supplied
Barmera WTP	Barmera, Cobdogla
Barossa WTP#	Avon, Barabba, Dublin, Hamley Bridge, Kangaroo Flat, Lewiston, Lilith, Lower Light, Mallala, Owen, Port Parham, Redbanks, Roseworthy, Two Wells, Wasley, Wild Horse Plains, Windsor
Beachport IRP	Beachport
Berri WTP	Berri
Blanchetown WTP	Blanchetown
Bordertown	Bordertown
Cadell WTP	Cadell
Coffin Bay	Coffin Bay
Cowirra WTP	Cowirra, Neeta, Pompoota
Elliston	Elliston
Eyre South	Arno Bay, Cleve, Cowell, Cummins, Lipson, Louth Bay, North Shields, Port Neill, Tumby Bay, Ungarra, Yeelanna
Eyre South / Morgan WTP	Ceduna, Cungena, Haslam, Kyancutta, Minnipa, Poochera, Pygery, Smoky Bay, Streaky Bay, Thevenard, Warramboo, Wirrulla, Wudinna, Yaninee, Yantanabie
Geranium	Geranium
Glossop WTP	Glossop, Monash
Happy Valley WTP#	Cherry Gardens, Clarendon
Hawker IRP	Hawker
Kalangadoo IRP	Kalangadoo
Kanmantoo WTP	Callington, Kanmantoo
Kingston SE IRP	Kingston SE
Lameroo IRP	Lameroo
Loxton WTP	Loxton
Lucindale IRP	Lucindale
Mannum WTP	Mannum
Melrose	Melrose
Middle River WTP	Brownlow, Emu Bay, Kingscote, Parndana
Millicent	Millicent
Moorook WTP	Kingston on Murray, Moorook
Morgan WTP	Alford, Appila, Auburn, Blyth, Booborowie, Booleroo Centre, Bower, Brinkworth, Bute, Burra, Caltowie, Clare, Crystal Brook, Drake Peak, Eudunda, Farrell Flat, Georgetown, Gladstone, Gulnare, Iron Knob, Jamestown, Kiepa, Kimba, Koolunga, Konanda, Kybunga, Laura, Leasingham, Lock, Merriton, Mintaro, Morgan, Mount Mary, Mundoora, Napperby, Narridy, Penwortham, Peterborough, Port Augusta, Port Broughton, Port Germein, Point Pass, Port Pirie, Redhill, Robertstown, Rudall, Sevenhill, Snowtown, Spalding, Stirling North, Sutherland, Tickera, Warnertown, Watervale, Wirrabara, Whyalla, Yacka, Yongala
Morgan / Swan Reach WTP	Ardrossan, Arthurton, Balaklava, Bowmans, Clinton, Coobowie, Curramulka, Edithburgh, Halbury, Hoyleton, Kadina, Lochiel, Maitland, Melton, Minlaton, Moonta, Paskeville, Pine Point, Price, Point Pearce, Port Hughes, Port Victoria, Port Vincent, Port Wakefield, South Kilkerra, Stansbury, Wallaroo, Wool Bay, Yorketown

Water Supply System	Towns Supplied
Mount Burr	Mount Burr
Mount Compass	Mount Compass
Mount Gambier	Mount Gambier
Mount Pleasant WTP	Eden Valley, Mount Pleasant, Springton, Tungkillo
Murray Bridge WTP	Monarto, Monteith, Murray Bridge
Mypolonga WTP	Mypolonga, Wall Flat
Myponga WTP#	Carrickalinga, Goolwa, Hindmarsh Island, Middleton, Myponga, Normanville, Port Elliot, Victor Harbor, Yankalilla
Nangwarry	Nangwarry
Naracoorte	Naracoorte
Orroroo	Orroroo
Padthaway	Padthway
Palmer WTP	Caloote, Palmer
Parachilna	Parachilna
Parilla IRP	Parilla
Penneshaw WTP	Penneshaw
Penola IRP	Penola
Pinnaroo IRP	Pinnaroo
Port Lincoln	Port Lincoln
Port MacDonnell	Port MacDonnell
Quorn	Quorn
Renmark WTP	Cooltong, Paringa, Renmark
Robe IRP	Robe
Streaky Bay*	Streaky Bay
Summit WTP	Aldgate, Balhannah, Blakiston, Bridgewater, Birdwood, Brukunga, Charleston, Clayton, Crafers, Crafers West, Dawesley, Forest Range, Gumeracha, Hahndorf, Heathfield, Iron Bank, Kersbrook, Langhorne Creek, Lenswood, Littlehampton, Lobethal, Milang, Mount Barker, Mount Barker Springs, Mount Torrens, Nairne, Oakbank, Piccadilly, Stirling, Strathalbyn, Upper Sturt, Willyaroo, Wistow, Woodside, Verdun
Swan Reach WTP	Angaston, Cambrai, Freeling, Greenock, Kapunda, Keyneton, Lyndoch, Marrabel, Moculta, Nuriootpa, Riverton, Rowland Flat, Rhynie, Saddleworth, Sedan, Seppeltsfield, Shea-oak Log, Stockport, Stockwell, Tanunda, Tarlee, Templers, Towitta, Truro, Williamstown
Swan Reach Town WTP	Swan Reach
Tailem Bend WTP	Coomandook, Coonalpyn, Culburra, Jervois, Karoonda, Keith, Ki Ki, Meningie, Narrung, Salt Creek, Sherlock, Tailem Bend, Tintinara, Wynarka, Yumali
Tarpeena IRP	Tarpeena
Waikerie WTP	Waikerie
Warooka	Port Turton, Warooka
Wilmington	Wilmington
Woolpunda WTP	Mantung, Woolpunda, Wunkar

Supplies both country and metropolitan systems
* Streaky Bay currently supplied by Eyre South / Morgan WTP system

Water Quality Data 2011-12

This report covers the period of 1 July 2011 to 30 June 2012

Table 1

2011-12 Metropolitan Adelaide source water quality (inlets to Water Treatment Plants)

	Anstey Hill WTP					Hope Valley WTP				
	Samples	Min	Max	Ave	Median	Samples	Min	Max	Ave	Median
Colour - True [456nm] [HU]*	12	14	75	31	25	12	16	41	29	30
Dissolved Organic Carbon [mg/L]	29	4.2	12.3	4.7	8.4	25	6.5	9.1	7.8	7.8
Fluoride [mg/L]*	101	<0.10	0.30	0.16	0.14	87	0.25	0.33	0.29	0.29
Hardness - Total [mg/L]	12	38	125	77	61	12	141	170	156	159
Nitrate as Nitrogen [mg/L]	12	0.060	0.270	0.150	0.150	12	0.010	0.160	0.050	0.040
pH Units*	365	6.9	7.9	7.3	7.3	346	7.2	8.9	8.2	8.2
Phosphorus - Total [mg/L]	12	0.020	0.210	0.090	0.080	12	0.020	0.090	0.040	0.040
Total Dissolved Solids [mg/L]	12	100	360	226	185	12	330	410	384	385
Turbidity [NTU]*	365	4.0	144.2	40.9	37.3	346	0.7	6.8	3.0	2.9

	Barossa WTP					Little Para WTP				
	Samples	Min	Max	Ave	Median	Samples	Min	Max	Ave	Median
Colour - True [456nm] [HU]*	12	28	52	40	40	9	16	42	28	25
Dissolved Organic Carbon [mg/L]	12	9.3	12.0	10.7	10.6	19	7.3	11.8	8.5	8.1
Fluoride [mg/L]*	100	0.26	0.29	0.27	0.27	86	0.22	0.36	0.28	0.27
Hardness - Total [mg/L]	12	86	120	100	99	9	124	172	148	148
Nitrate as Nitrogen [mg/L]	12	0.030	0.080	0.060	0.060	9	0.050	0.330	0.160	0.150
pH Units*	365	7.3	7.9	7.6	7.6	91	5.7	8.4	7.8	7.9
Phosphorus - Total [mg/L]	12	0.010	0.040	0.020	0.020	9	0.020	0.060	0.040	0.040
Total Dissolved Solids [mg/L]	12	290	330	315	320	9	310	370	347	350
Turbidity [NTU]*	365	0.2	4.8	0.8	0.5	325	2.3	21.6	9.5	7.8

	Happy Valley WTP					Myponga WTP				
	Samples	Min	Max	Ave	Median	Samples	Min	Max	Ave	Median
Colour - True [456nm] [HU]*	13	21	66	46	51	12	29	47	37	37
Dissolved Organic Carbon [mg/L]	25	6.6	10.3	8.6	8.8	27	9.7	12.6	11.1	10.8
Fluoride [mg/L]*	104	0.20	0.34	0.27	0.27	104	0.19	0.31	0.24	0.24
Hardness - Total [mg/L]	13	94	138	121	125	12	119	142	133	133
Nitrate as Nitrogen [mg/L]	13	0.010	0.240	0.080	0.060	12	0.030	0.150	0.080	0.080
pH Units*	365	7.3	8.0	7.6	7.6	365	6.8	8.2	7.7	7.7
Phosphorus - Total [mg/L]	13	0.020	0.070	0.040	0.050	12	0.020	0.040	0.030	0.030
Total Dissolved Solids [mg/L]	13	270	340	318	320	12	390	440	415	410
Turbidity [NTU]*	365	1.3	16.6	5.2	4.3	365	0.2	7.6	2.1	1.8

* Water Treatment Plant data source: Allwater

Table 2

2011-12 Metropolitan Adelaide distribution system customer tap water quality against 2011 ADWG

	Anstey Hill System							
Parameter	**Health Guideline**	**Aesthetic Guideline**	**Samples**	**Min**	**Max**	**Ave**	**Median**	**% Compliance**
***E. coli* [per 100 mL]**	++	–	584	0	0	0	0	100
Coliforms [per 100 mL]	95% free from coliforms#	–	584	0	200	1	0	95.4
Chlorine Residual - Free [mg/L]	≤ 5 mg/L	–	708	<0.1	2.3	0.6	0.3	100
Chlorine Residual - Free [mg/L]	–	≤ 0.6 mg/L#	708	<0.1	2.3	0.6	0.3	74.8
Colour -True [HU]	–	≤ 15 HU	105	<1	3	1	1	100
Fluoride [mg/L]	≤ 1.5 mg/L	–	14	0.80	1.10	0.91	0.91	100
Hardness - Total [mg/L]	–	≤ 200 mg/L	14	43	128	83	71	100
Iron - Total [mg/L]	–	≤ 0.3 mg/L	52	<0.001	0.162	0.013	0.009	100
Manganese - Total [mg/L]	≤ 0.5 mg/L	–	52	<0.0001	0.003	0.001	0.001	100
Manganese - Total [mg/L]	–	≤ 0.1 mg/L	52	<0.0001	0.003	0.001	0.001	100
pH Units	–	6.5 - 8.5	105	6.9	8.0	7.5	7.5	100
Total Dissolved Solids [mg/L]	–	≤ 600 mg/L	105	130	400	250	240	100
Turbidity [NTU]	–	≤ 5 NTU	106	<0.10	0.43	0.15	0.11	100
Trihalomethanes - Total [µg/L]	≤ 250 µg/L	–	52	54	269	139	138	98.0

	Hope Valley System							
Parameter	**Health Guideline**	**Aesthetic Guideline**	**Samples**	**Min**	**Max**	**Ave**	**Median**	**% Compliance**
***E. coli* [per 100 mL]**	++	–	493	0	0	0	0	100
Coliforms [per 100 mL]	95% free from coliforms#	–	494	0	200	3	0	92.4
Chlorine Residual - Free [mg/L]	≤ 5 mg/L	–	592	<0.1	1.6	0.5	0.2	100
Chlorine Residual - Free [mg/L]	–	≤ 0.6 mg/L#	592	<0.1	1.6	0.5	0.2	80.2
Colour -True [HU]	–	≤ 15 HU	104	1	4	2	2	100
Fluoride [mg/L]	≤ 1.5 mg/L	–	12	0.10	0.92	0.75	0.87	100
Hardness - Total [mg/L]	–	≤ 200 mg/L	12	87	157	135	139	100
Iron - Total [mg/L]	–	≤ 0.3 mg/L	52	0.002	0.131	0.019	0.009	100
Manganese - Total [mg/L]	≤ 0.5 mg/L	–	52	<0.0001	0.004	0.001	0.001	100
Manganese - Total [mg/L]	–	≤ 0.1 mg/L	52	<0.0001	0.004	0.001	0.001	100
pH Units	–	6.5 - 8.5	104	7.0	8.0	7.3	7.3	100
Total Dissolved Solids [mg/L]	–	≤ 600 mg/L	105	190	430	346	350	100
Turbidity [NTU]	–	≤ 5 NTU	104	<0.10	0.49	0.14	0.12	100
Trihalomethanes - Total [µg/L]	≤ 250 µg/L	–	52	81	273	175	169	91.1

	Barossa System							
Parameter	**Health Guideline**	**Aesthetic Guideline**	**Samples**	**Min**	**Max**	**Ave**	**Median**	**% Compliance**
***E. coli* [per 100 mL]**	++	–	195	0	0	0	0	100
Coliforms [per 100 mL]	95% free from coliforms#	–	195	0	36	0	0	96.1
Chlorine Residual - Free [mg/L]	≤ 5 mg/L	–	273	<0.1	2.1	0.4	0.1	100
Chlorine Residual - Free [mg/L]	–	≤ 0.6 mg/L#	273	<0.1	2.1	0.4	0.1	90.1
Colour -True [HU]	–	≤ 15 HU	104	<1	3	1	1	100
Fluoride [mg/L]	≤ 1.5 mg/L	–	12	0.78	0.97	0.90	0.91	100
Hardness - Total [mg/L]	–	≤ 200 mg/L	12	122	164	134	131	100
Iron - Total [mg/L]	–	≤ 0.3 mg/L	52	0.002	0.053	0.014	0.010	100
Manganese - Total [mg/L]	≤ 0.5 mg/L	–	52	0.0019	0.005	0.001	0.001	100
Manganese - Total [mg/L]	–	≤ 0.1 mg/L	52	0.0003	0.005	0.001	0.001	100
pH Units	–	6.5 - 8.5	104	6.8	7.7	7.2	7.2	100
Total Dissolved Solids [mg/L]	–	≤ 600 mg/L	104	330	400	360	360	100
Turbidity [NTU]	–	≤ 5 NTU	104	<0.10	0.85	0.15	0.12	100
Trihalomethanes - Total [µg/L]	≤ 250 µg/L	–	52	69	241	167	167	100

SA Water internal guideline value
Data source: Allwater

++ *E. coli* should not be detected in samples of drinking water. However the ADWG recognise that occasional detections may occur. In accordance with the guidelines any detection is immediately investigated and corrective action implemented as agreed with SA Health.

Table 2

2011-12 Metropolitan Adelaide distribution system customer tap water quality against 2011 ADWG *continued*

	Little Para System							
Parameter	Health Guideline	Aesthetic Guideline	Samples	Min	Max	Ave	Median	% Compliance
***E. coli* [per 100 mL]**	++	–	272	0	0	0	0	100
Coliforms [per 100 mL]	95% free from coliforms#	–	272	0	88	0	0	98.2
Chlorine Residual - Free [mg/L]	≤ 5 mg/L	–	350	<0.1	2.2	0.5	0.1	100
Chlorine Residual - Free [mg/L]	–	≤ 0.6 mg/L#	350	<0.1	2.2	0.5	0.1	83.4
Colour -True [HU]	–	≤ 15 HU	104	<1	4	2	2	100
Fluoride [mg/L]	≤ 1.5 mg/L	–	12	0.82	0.95	0.89	0.89	100
Hardness - Total [mg/L]	–	≤ 200 mg/L	12	120	175	144	150	100
Iron - Total [mg/L]	–	≤ 0.3 mg/L	52	0.001	0.040	0.011	0.010	100
Manganese - Total [mg/L]	≤ 0.5 mg/L	–	52	<0.0001	0.002	0.001	0.001	100
Manganese - Total [mg/L]	–	≤ 0.1 mg/L	52	<0.0001	0.002	0.001	0.001	100
pH Units	–	6.5 - 8.5	108	6.9	7.9	7.3	7.3	100
Total Dissolved Solids [mg/L]	–	≤ 600 mg/L	108	170	410	356	360	100
Turbidity [NTU]	–	≤ 5 NTU	104	<0.10	0.36	0.13	0.10	100
Trihalomethanes - Total [µg/L]	≤ 250 µg/L	–	52	78	234	156	151	100

	Happy Valley System							
Parameter	Health Guideline	Aesthetic Guideline	Samples	Min	Max	Ave	Median	% Compliance
***E. coli* [per 100 mL]**	++	–	1112	0	0	0	0	100
Coliforms [per 100 mL]	95% free from coliforms#	–	1112	0	200	0	0	97.8
Chlorine Residual - Free [mg/L]	≤ 5 mg/L	–	1315	<0.1	2.6	0.6	0.3	100
Chlorine Residual - Free [mg/L]	–	≤ 0.6 mg/L#	1315	<0.1	2.6	0.6	0.3	72.5
Colour -True [HU]	–	≤ 15 HU	203	<1	5	2	1	100
Fluoride [mg/L]	≤ 1.5 mg/L	–	24	0.17	0.97	0.70	0.82	100
Hardness - Total [mg/L]	–	≤ 200 mg/L	24	107	154	133	135	100
Iron - Total [mg/L]	–	≤ 0.3 mg/L	100	0.002	0.130	0.014	0.010	100
Manganese - Total [mg/L]	≤ 0.5 mg/L	–	100	<0.0001	0.005	0.001	0.001	100
Manganese - Total [mg/L]	–	≤ 0.1 mg/L	100	<0.0001	0.005	0.001	0.001	100
pH Units	–	6.5 - 8.5	205	6.9	8.0	7.3	7.3	100
Total Dissolved Solids [mg/L]	–	≤ 600 mg/L	204	230	430	333	340	100
Turbidity [NTU]	–	≤ 5 NTU	202	<0.10	6.70	0.20	0.14	99.5
Trihalomethanes - Total [µg/L]	≤ 250 µg/L	–	106	96	268	184	170	96.9

SA Water internal guideline value
++ *E. coli* should not be detected in samples of drinking water. However the ADWG recognise that occasional detections may occur.
In accordance with the guidelines any detection is immediately investigated and corrective action implemented as agreed with SA Health.
Data source: Allwater

Table 2

2011-12 Metropolitan Adelaide distribution system customer tap water quality against 2011 ADWG *continued*

	Myponga System							
Parameter	**Health Guideline**	**Aesthetic Guideline**	**Samples**	**Min**	**Max**	**Ave**	**Median**	**% Compliance**
***E. coli* [per 100 mL]**	++	–	80	0	0	0	0	100
Coliforms [per 100 mL]	95% free from coliforms#	–	80	0	31	1	0	92.9
Chlorine Residual - Free [mg/L]	≤ 5 mg/L	–	121	<0.1	0.9	0.4	0.2	100
Chlorine Residual - Free [mg/L]	–	≤ 0.6 mg/L#	121	<0.1	0.9	0.4	0.2	94.4
Colour -True [HU]	–	≤ 15 HU	78	<1	3	1	1	100
Fluoride [mg/L]	≤ 1.5 mg/L	–	12	0.81	0.94	0.89	0.90	100
Hardness - Total [mg/L]	–	≤ 200 mg/L	12	128	150	139	139	100
Iron - Total [mg/L]	–	≤ 0.3 mg/L	48	0.001	0.023	0.010	0.009	100
Manganese - Total [mg/L]	≤ 0.5 mg/L	–	48	<0.0001	0.008	0.002	0.001	100
Manganese - Total [mg/L]	–	≤ 0.1 mg/L	48	<0.0001	0.008	0.002	0.001	100
pH Units	–	6.5 - 8.5	80	7.0	7.9	7.5	7.5	100
Total Dissolved Solids [mg/L]	–	≤ 600 mg/L	80	320	480	451	450	100
Turbidity [NTU]	–	≤ 5 NTU	78	<0.10	0.34	0.13	0.12	100
Trihalomethanes - Total [µg/L]	≤ 250 µg/L	–	78	156	289	216	210	89.7

	Metropolitan Adelaide - Total Distribution System							
Parameter	**Health Guideline**	**Aesthetic Guideline**	**Samples**	**Min**	**Max**	**Ave**	**Median**	**% Compliance**
***E. coli* [per 100 mL]**	++	–	2760	0	0	0	0	100
Coliforms [per 100 mL]	95% free from coliforms#	–	2760	0	200	1	0	95.7
Chlorine Residual - Free [mg/L]	≤ 5 mg/L	–	3383	<0.1	2.6	0.6	0.2	100
Chlorine Residual - Free [mg/L]	–	≤ 0.6 mg/L#	3383	<0.1	2.6	0.6	0.2	77.5
Colour -True [HU]	–	≤ 15 HU	709	1	5	1	1	100
Fluoride [mg/L]	≤ 1.5 mg/L	–	86	0.17	1.10	0.83	0.88	100
Hardness - Total [mg/L]	–	≤ 200 mg/L	86	43	175	127	134	100
Iron - Total [mg/L]	–	≤ 0.3 mg/L	363	<0.001	0.162	0.013	0.010	100
Manganese - Total [mg/L]	≤ 0.5 mg/L	–	363	<0.0001	0.008	0.001	0.001	100
Manganese - Total [mg/L]	–	≤ 0.1 mg/L	353	<0.0001	0.008	0.001	0.001	100
pH Units	–	6.5 - 8.5	714	6.8	8.0	7.4	7.3	100
Total Dissolved Solids [mg/L]	–	≤ 600 mg/L	715	130	480	345	340	100
Turbidity [NTU]	–	≤ 5 NTU	708	<0.10	6.70	0.16	0.12	99.8
Trihalomethanes - Total [µg/L]	≤ 250 µg/L	–	392	54	289	174	175	95.6

SA Water internal guideline value
++ *E. coli* should not be detected in samples of drinking water. However the ADWG recognise that occasional detections may occur.
In accordance with the guidelines any detection is immediately investigated and corrective action implemented as agreed with SA Health.
Data source: Allwater

Table 3
2011-12 Country source water quality

Eyre Region	Total Dissolved Solids [mg/L]			Hardness - Total [mg/L]			Dissolved Organic Carbon [mg/L]			pH Units		
System	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
Coffin Bay	340	470	374	212	227	217	0.3	0.6	0.5	7.6	7.8	7.7
Elliston	550	970	763	266	353	307	0.5	0.6	0.6	7.3	7.7	7.5
Eyre South[1]	440	830	595	243	399	306	0.7	1.1	0.9	7.3	7.7	7.5
Eyre South / Morgan WTP[2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Morgan WTP	91	240	160	30	83	57	4.2	14.8	7.8	7.4	8.2	7.8
Port Lincoln[3]	410	1400	678	217	522	299	0.4	0.8	0.6	7.1	7.8	7.4
Streaky Bay[4]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Turbidity [NTU]			Colour - True [HU]			Nitrate as Nitrogen [mg/L]			Phosphorus - Total [mg/L]		
System	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
Coffin Bay	<0.1	2.1	0.2	<1	2	1	0.195	1.200	0.799	0.006	0.016	0.012
Elliston	<0.1	0.3	0.1	<1	1	1	2.780	3.700	3.240	<0.005	0.023	0.014
Eyre South[1]	<0.1	9.1	0.3	<1	1	1	2.620	5.200	3.622	0.005	0.029	0.016
Eyre South / Morgan WTP[2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Morgan WTP	18.0	300.0	75.4	14	82	31	<0.005	0.396	0.063	0.077	0.469	0.187
Port Lincoln[3]	<0.1	30.0	0.4	<1	2	1	0.504	5.740	3.247	<0.005	0.016	0.009
Streaky Bay[4]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[1] Eyre South - supplied by Lincoln Basin, Uley South and Uley Wanilla borefields
[2] Eyre South / Morgan WTP - primarily supplied by Lincoln Basin, Uley South and Uley Wanilla borefields and supplemented by Morgan WTP system
[3] Port Lincoln system supplied by Lincoln Basin, Uley Wanilla and Uley South borefields
[4] Streaky Bay - bores off-line, system currently supplied by Eyre South / Morgan WTP system
N/A - Not applicable

Northern Region	Total Dissolved Solids [mg/L]			Hardness - Total [mg/L]			Dissolved Organic Carbon [mg/L]			pH Units		
System	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
Barmera WTP	92	240	150	35	89	57	4.4	12.8	7.2	7.2	8.4	7.8
Berri WTP	78	210	131	32	79	54	4.2	14.0	7.1	7.1	8.1	7.6
Blanchetown WTP	90	240	162	37	89	58	4.6	13.0	7.4	7.1	8.3	7.6
Cadell WTP	92	240	161	31	88	58	4.4	13.8	7.5	7.2	8.2	7.8
Glossop WTP	78	210	131	32	79	54	4.2	14.0	7.1	7.1	8.1	7.6
Hawker IRP	2200	2700	2454	949	1200	1071	0.5	0.6	0.6	6.9	7.3	7.1
Loxton WTP	86	260	148	31	77	56	4.2	13.9	7.2	7.2	8.3	7.8
Melrose	1200	1700	1423	262	379	323	0.5	0.7	0.6	7.2	7.6	7.4
Moorook WTP	110	240	153	35	81	57	4.5	14.3	7.5	7.3	8.2	7.8
Morgan / Swan Reach WTP[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Morgan WTP	91	240	160	30	83	57	4.2	14.8	7.8	7.4	8.2	7.8
Orroroo	1800	2100	1925	694	707	700	0.4	0.6	0.5	6.9	7.3	7.2
Parachilna	790	830	815	308	316	311	<0.3	0.5	0.4	7.4	7.9	7.7
Quorn	1100	1400	1218	481	539	507	0.6	1.1	0.8	6.7	7.1	7.0
Renmark WTP[2]	75	210	122	31	80	53	4.4	12.4	7.1	7.2	8.1	7.7
Waikerie WTP	89	420	165	31	85	59	4.4	13.2	7.3	7.1	8.2	7.7
Warooka	690	760	734	322	353	337	1.0	1.0	1.0	7.4	7.6	7.5
Wilmington	280	310	293	95	129	115	0.3	1.6	1.2	6.2	6.6	6.4
Woolpunda	90	240	156	30	93	60	4.3	13.4	7.3	7.2	8.8	7.8

[1] Morgan / Swan Reach WTP system supplied from either Morgan WTP or Swan Reach WTP
[2] Renmark WTP - includes supply to Cooltong
N/A - Not applicable

Table 3
2011-12 Country source water quality *continued*

Northern Region *continued*	Turbidity [NTU]			Colour - True [HU]			Nitrate as Nitrogen [mg/L]			Phosphorus - Total [mg/L]		
System	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
Barmera WTP	27.0	290.0	66.5	14	80	32	<0.005	0.143	0.026	0.072	0.560	0.206
Berri WTP	30.0	220.0	70.9	14	87	33	<0.005	0.222	0.053	0.077	0.397	0.172
Blanchetown WTP	26.0	230.0	61.8	15	78	30	<0.005	0.401	0.072	0.082	0.610	0.210
Cadell WTP	24.0	280.0	66.8	13	81	30	<0.005	0.412	0.060	0.079	0.416	0.204
Glossop WTP	30.0	220.0	70.9	14	87	33	<0.005	0.222	0.053	0.077	0.397	0.172
Hawker IRP	8.2	17.0	12.5	<1	1	1	<0.005	0.007	0.006	0.009	0.018	0.014
Loxton WTP	24.0	210.0	68.6	14	86	32	<0.005	0.307	0.076	0.064	0.392	0.172
Melrose	0.2	3.6	1.0	<1	<1	<1	0.314	0.511	0.413	0.009	0.016	0.013
Moorook WTP	24.0	250.0	67.8	14	81	32	<0.005	0.331	0.053	0.091	0.512	0.212
Morgan / Swan Reach WTP[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Morgan WTP	18.0	300.0	75.4	14	82	31	<0.005	0.396	0.063	0.077	0.469	0.187
Orroroo	<0.1	1.3	0.2	<1	2	1	0.032	0.043	0.038	0.012	0.015	0.014
Parachilna	<0.1	0.4	0.1	<1	2	1	1.240	1.410	1.325	0.012	0.012	0.012
Quorn	<0.1	0.7	0.2	<1	1	1	0.104	0.135	0.121	0.012	0.032	0.021
Renmark WTP[2]	41.0	260.0	88.3	15	87	34	<0.005	0.196	0.045	0.094	0.397	0.195
Waikerie WTP	25.0	290.0	70.2	15	84	31	<0.005	0.358	0.061	0.109	0.443	0.191
Warooka	<0.1	1.3	0.2	<1	1	1	2.210	3.360	2.673	0.005	0.009	0.007
Wilmington	<0.1	1.7	0.5	<1	1	1	0.044	0.175	0.087	0.069	0.091	0.084
Woolpunda	26.0	240.0	63.2	14	82	32	<0.005	0.334	0.054	0.107	0.492	0.219

[1] Morgan / Swan Reach WTP system supplied from either Morgan WTP or Swan Reach WTP
[2] Renmark WTP - includes supply to Cooltong
N/A - Not applicable

River Murray System	Total Dissolved Solids [mg/L]			Hardness - Total [mg/L]			Dissolved Organic Carbon [mg/L]			pH Units		
System	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
River Murray[1]	56	450	148	30	93	58	3.7	15.3	7.3	6.1	8.8	7.7

	Turbidity [NTU]			Colour - True [HU]			Nitrate as Nitrogen [mg/L]			Phosphorus - Total [mg/L]		
System	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
River Murray[1]	18.0	380.0	71.3	13	109	31	<0.005	0.467	0.066	0.064	2.320	0.187

[1] River Murray - average data for all systems from Lock 9 to Tailem Bend

Table 3
2011-12 Country source water quality *continued*

Outer Metro Region	Total Dissolved Solids [mg/L]			Hardness - Total [mg/L]			Dissolved Organic Carbon [mg/L]			pH Units		
System	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
Anstey Hill WTP#	290	370	327	101	126	112	8.2	12.2	10.0	7.1	8.6	7.8
Barossa WTP#	300	340	318	85	119	100	9.7	12.3	10.8	7.1	8.4	7.8
Cowirra WTP	90	450	163	38	92	60	4.6	13.2	7.4	6.8	8.2	7.5
Happy Valley WTP#	290	350	321	107	143	123	6.5	11.1	8.9	7.6	9.9	8.0
Kanmantoo WTP	89	250	163	43	82	61	4.4	14.0	7.7	6.9	8.2	7.4
Mannum WTP	93	240	159	39	93	60	4.6	13.2	7.2	6.7	7.8	7.5
Middle River WTP	340	560	480	49	92	75	10.6	18.8	13.4	6.5	8.3	7.1
Morgan / Swan Reach WTP[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Morgan WTP	91	240	160	30	83	57	4.2	14.8	7.8	7.4	8.2	7.8
Mt Compass	170	270	219	63	87	70	<0.3	0.3	0.3	6.2	6.8	6.5
Mt Pleasant WTP	93	240	159	39	93	60	4.6	13.2	7.2	6.7	7.8	7.5
Murray Bridge WTP	89	250	163	43	82	61	4.4	14.0	7.7	6.9	8.2	7.4
Mypolonga WTP	90	240	159	41	87	60	5.1	13.7	7.5	6.8	7.8	7.3
Myponga WTP#	390	430	413	122	145	131	10.2	13.0	11.6	7.2	8.9	7.8
Palmer WTP	93	240	159	39	93	60	4.6	13.2	7.2	6.7	7.8	7.5
Penneshaw WTP	32000	36000	34776	N/A	N/A	N/A	N/A	N/A	N/A	6.5	8.1	6.8
Summit WTP	89	250	163	43	82	61	4.4	14.0	7.7	6.9	8.2	7.4
Swan Reach Town WTP	90	240	158	33	86	56	4.3	13.8	7.2	7.3	8.0	7.7
Swan Reach WTP	90	240	159	33	84	59	4.3	13.8	7.2	7.3	8.0	7.7
Tailem Bend WTP	93	240	162	41	82	60	4.4	14.1	7.3	6.4	7.8	7.3

	Turbidity [NTU]			Colour - True [HU]			Nitrate as Nitrogen [mg/L]			Phosphorus - Total [mg/L]		
System	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
Anstey Hill WTP#	1.6	37.0	11.1	22	64	36	0.018	0.246	0.143	0.017	0.084	0.049
Barossa WTP#	0.3	4.8	1.0	27	52	39	0.019	0.164	0.048	0.007	0.047	0.020
Cowirra WTP	26.0	180.0	54.8	14	78	29	<0.005	0.110	0.038	0.078	0.295	0.153
Happy Valley WTP#	2.0	31.0	6.9	21	72	46	<0.005	0.287	0.088	0.018	0.120	0.051
Kanmantoo WTP	30.0	270.0	65.4	14	76	29	<0.005	0.196	0.075	0.088	0.406	0.178
Mannum WTP	30.0	210.0	60.2	14	77	29	<0.005	0.312	0.074	0.079	2.320	0.337
Middle River WTP	4.3	22.0	8.2	138	283	168	N/A	N/A	N/A	N/A	N/A	N/A
Morgan / Swan Reach WTP[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Morgan WTP	18.0	300.0	75.4	14	82	31	<0.005	0.396	0.063	0.077	0.469	0.187
Mt Compass	<0.1	6.5	1.0	<1	2	1	0.039	0.039	0.039	0.024	0.032	0.028
Mt Pleasant WTP	30.0	210.0	60.2	14	77	29	<0.005	0.312	0.074	0.079	2.320	0.337
Murray Bridge WTP	30.0	270.0	65.4	14	76	29	<0.005	0.196	0.075	0.088	0.406	0.178
Mypolonga WTP	24.0	220.0	56.2	14	76	29	0.005	0.175	0.072	0.074	0.238	0.139
Myponga WTP#	0.4	12.0	1.7	27	82	38	<0.005	0.124	0.055	0.009	0.155	0.032
Palmer WTP	30.0	210.0	60.2	14	77	29	<0.005	0.312	0.074	0.079	2.320	0.337
Penneshaw WTP	<0.1	1.0	0.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Summit WTP	30.0	270.0	65.4	14	76	29	<0.005	0.196	0.075	0.088	0.406	0.178
Swan Reach Town WTP	30.0	240.0	64.0	15	77	30	<0.005	0.394	0.061	0.118	0.385	0.226
Swan Reach WTP	30.0	260.0	72.0	15	76	30	<0.005	0.467	0.083	0.103	0.336	0.196
Tailem Bend WTP	32.0	240.0	76.7	13	75	29	<0.005	0.248	0.100	0.110	0.488	0.209

Supplies both country and metropolitan systems
[1] Morgan / Swan Reach WTP system supplied from either Morgan WTP or Swan Reach WTP
N/A - Not applicable

Table 3
2011-12 Country source water quality *continued*

South East Region	Total Dissolved Solids [mg/L]			Hardness - Total [mg/L]			Dissolved Organic Carbon [mg/L]			pH Units		
System	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
Beachport IRP	620	660	645	245	271	262	0.8	0.8	0.8	7.2	7.3	7.3
Bordertown	390	620	468	211	301	250	0.6	0.8	0.7	6.8	7.5	7.2
Geranium	1300	1500	1440	516	556	534	0.8	1.3	1.1	6.9	7.1	7.0
Kalangadoo IRP	520	630	575	337	399	367	0.9	1.2	1.1	6.9	7.3	7.1
Kingston SE IRP	750	1300	948	215	259	230	0.8	1.0	0.9	7.2	7.6	7.4
Lameroo IRP	900	980	939	222	237	231	0.5	0.5	0.5	7.4	7.6	7.5
Lucindale IRP	780	820	803	303	316	310	2.4	2.6	2.5	7.2	7.4	7.3
Millicent	510	720	601	321	367	344	1.0	1.3	1.2	7.1	7.5	7.4
Mt Burr	390	480	439	271	293	283	0.5	0.7	0.6	7.2	7.4	7.3
Mt Gambier	340	630	519	174	309	207	0.8	1.7	1.0	7.2	8.4	8.0
Nangwarry	530	710	620	300	440	391	1.2	1.2	1.2	6.9	7.3	7.1
Naracoorte	1200	1300	1246	328	389	349	1.6	2.1	1.8	7.6	7.8	7.7
Padthaway	1300	1500	1427	579	606	591	0.8	0.8	0.8	7.0	7.3	7.1
Parilla IRP	610	670	637	175	188	182	0.4	0.4	0.4	7.6	7.8	7.7
Penola IRP	620	770	691	305	356	323	1.2	2.9	1.8	7.1	7.4	7.2
Pinnaroo IRP	660	1400	846	237	419	292	0.5	0.5	0.5	7.1	7.7	7.5
Port MacDonnell	660	720	695	12	17	15	1.2	1.3	1.3	8.1	8.5	8.3
Robe IRP	710	1200	914	68	129	89	1.0	1.2	1.1	7.5	7.9	7.7
Tailem Bend WTP	93	240	162	41	82	60	4.4	14.1	7.3	6.4	7.8	7.3
Tarpeena IRP	620	730	683	388	417	401	1.2	1.2	1.2	7.1	7.2	7.2

	Turbidity [NTU]			Colour - True [HU]			Nitrate as Nitrogen [mg/L]			Phosphorus - Total [mg/L]		
System	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
Beachport IRP	1.6	4.4	3.0	<1	3	1	0.005	0.005	0.005	0.040	0.040	0.040
Bordertown	<0.1	0.5	0.1	<1	2	1	0.026	0.471	0.222	<0.005	0.015	0.010
Geranium	<0.1	2.9	0.4	<1	<1	<1	0.060	0.081	0.071	0.035	0.040	0.038
Kalangadoo IRP	1.8	60.0	10.5	<1	2	1	<0.005	0.011	0.008	0.019	0.020	0.020
Kingston SE IRP	2.2	34.0	15.5	<1	2	1	<0.005	0.007	0.006	<0.005	0.009	0.007
Lameroo IRP	2.1	5.1	3.2	<1	2	1	<0.005	0.006	0.006	0.057	0.058	0.058
Lucindale IRP	1.1	22.0	8.2	<1	3	2	0.005	0.009	0.007	0.037	0.038	0.038
Millicent	0.1	17.0	1.3	<1	4	2	<0.005	0.076	0.038	0.016	0.024	0.020
Mt Burr	<0.1	0.4	0.1	<1	1	1	0.546	3.080	1.813	0.028	0.067	0.048
Mt Gambier	0.1	9.0	1.8	<1	4	1	<0.005	3.700	3.056	<0.005	0.055	0.013
Nangwarry	<0.1	4.1	0.5	<1	8	1	0.728	3.080	1.904	0.007	0.017	0.012
Naracoorte	0.2	0.9	0.4	3	7	5	<0.005	<0.005	<0.005	0.052	0.071	0.063
Padthaway	0.1	1.2	0.5	<1	1	1	0.037	0.081	0.059	0.014	0.026	0.020
Parilla IRP	1.3	3.6	2.2	<1	2	1	<0.005	<0.005	<0.005	0.027	0.034	0.031
Penola IRP	6.3	28.0	16.6	<1	4	2	<0.005	0.006	0.005	0.015	0.038	0.024
Pinnaroo IRP	1.9	18.0	5.6	<1	2	1	<0.005	<0.005	<0.005	0.034	0.075	0.055
Port MacDonnell	<0.1	0.9	0.2	3	6	5	<0.005	0.012	0.009	0.233	0.243	0.238
Robe IRP	0.2	3.5	1.1	<1	4	1	<0.005	0.332	0.087	0.033	0.057	0.045
Tailem Bend WTP	32.0	240.0	76.7	13	75	29	<0.005	0.248	0.100	0.110	0.488	0.209
Tarpeena IRP	0.3	19.0	9.8	<1	2	1	<0.005	<0.005	<0.005	0.029	0.029	0.029

Table 4

2011-12 Country drinking water distribution systems – customer tap water quality against 2011 ADWG

Eyre Region	Coliforms/100 mL		*E. coli*/100 mL		Chlorine Residual - Free [mg/L]*				Chlorine Residual - Total [mg/L]**			
System	Samples	Health Compliance %	Samples	Health Compliance %	Min	Max	Ave	Health Compliance %	Min	Max	Ave	Health Compliance %
ADWG Value Target		> 95% free[x]		0 > 98% free[x]				≤ 5 100%				≤ 4.1 100%
Coffin Bay	53	100	53	100	0.6	1.4	1	100	N/A	N/A	N/A	-
Elliston	53	98	53	100	0.4	1.5	0.9	100	N/A	N/A	N/A	-
Eyre South	255	100	255	100	0.6	2.3	1.1	100	N/A	N/A	N/A	-
Eyre South / Morgan WTP	293	100	293	100	0.4	5.9	1.6	99	N/A	N/A	N/A	-
Morgan WTP	1067	100	1067	100	N/A	N/A	N/A	-	0.5	4.2	2.6	100
Port Lincoln	128	100	128	100	0.6	1.7	1.1	100	N/A	N/A	N/A	-
Streaky Bay	51	96	51	100	0.4	2.1	1.3	100	N/A	N/A	N/A	-

	Total Dissolved Solids [mg/L]				Colour -True [HU]				Turbidity [NTU]			
System	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Aesthetic Compliance %
ADWG Value Target				≤ 600 100%				≤ 15				≤ 5
Coffin Bay	350	420	378	100	<1	<1	<1	100	<0.1	3.4	0.3	100
Elliston	810	850	824	0	<1	1	1	100	<0.1	0.5	0.1	100
Eyre South	510	610	557	94	<1	1	1	100	<0.1	0.2	0.1	100
Eyre South / Morgan WTP	370	530	469	100	<1	2	1	100	<0.1	0.3	0.1	100
Morgan WTP	140	280	212	100	<1	7	2	100	<0.1	4.6	0.2	100
Port Lincoln	530	570	540	100	<1	<1	<1	100	<0.1	0.1	0.1	100
Streaky Bay	430	500	473	100	<1	<1	<1	100	<0.1	0.4	0.2	100

	pH Units				Trihalomethanes - Total [µg/L]				Fluoride [mg/L]			
System	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Health Compliance %	Min	Max	Ave	Health Compliance %
ADWG Value Target				6.5 - 8.5				≤ 250 100%				≤ 1.5 100%
Coffin Bay	7.6	7.9	7.7	100	<4	18	8	100	0.9	1.4	1.2	100
Elliston	7.6	7.9	7.8	100	6	18	10	100	0.6	0.7	0.7	100
Eyre South	7.2	8.0	7.7	100	13	44	28	100	0.4	0.5	0.4	100
Eyre South / Morgan WTP	7.6	8.1	7.9	76	96	250	185	100	0.5	0.6	0.5	100
Morgan WTP	6.8	9.7	8.5	37	13	142	36	100	0.7	0.9	0.8	100
Port Lincoln	7.2	7.7	7.4	100	9	13	11	100	0.4	0.5	0.4	100
Streaky Bay	7.9	8.0	8.0	100	63	207	153	100	0.5	0.6	0.6	100

* Chlorinated systems only
** Chloraminated systems only
[x] SA Water internal guideline value
N/A - Not applicable

Table 4

2011-12 Country drinking water distribution systems – customer tap water quality against 2011 ADWG *continued*

Eyre Region *continued*	Iron -Total [mg/L]				Manganese -Total [mg/L]					Hardness - Total [mg/L]			
System	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Health Compliance %	Aesthetic Compliance %	Min	Max	Ave	Aesthetic Compliance %
ADWG Value Target				≤ 0.3 100%				≤ 0.5 100%	≤ 0.1 100%				≤ 200
Coffin Bay	<0.005	0.011	0.005	100	<0.001	<0.001	<0.001	100	100	212	224	219	0
Elliston	<0.005	<0.005	<0.005	100	<0.001	<0.001	<0.001	100	100	308	314	312	0
Eyre South	<0.005	<0.005	<0.005	100	<0.001	<0.001	<0.001	100	100	257	292	275	0
Eyre South / Morgan WTP	<0.005	0.010	0.005	100	<0.001	0.001	0.001	100	100	207	269	231	0
Morgan WTP	<0.005	0.037	0.005	100	<0.001	0.006	0.002	100	100	40	112	67	100
Port Lincoln	<0.005	<0.005	<0.005	100	<0.001	<0.001	<0.001	100	100	262	283	274	0
Streaky Bay	<0.005	0.022	0.007	100	<0.001	0.003	0.001	100	100	207	242	221	0

Northern Region	Coliforms/100 mL		*E. coli*/100 mL		Chlorine Residual - Free [mg/L]*				Chlorine Residual - Total [mg/L]**			
System	Samples	Health Compliance %	Samples	Health Compliance %	Min	Max	Ave	Health Compliance %	Min	Max	Ave	Health Compliance %
ADWG Value Target		> 95% free[x]		++				≤ 5 100%				≤ 4.1 100%
Barmera WTP	41	98	41	100	0.6	3.3	1.8	100	N/A	N/A	N/A	-
Berri WTP	65	100	65	100	0.1	1.8	1.0	100	N/A	N/A	N/A	-
Blanchetown WTP	51	98	51	98	0.5	1.7	1.0	100	N/A	N/A	N/A	-
Cadell WTP	51	98	51	100	0.6	1.8	1.1	100	N/A	N/A	N/A	-
Glossop WTP	101	99	101	100	<0.1	2.3	1.2	100	N/A	N/A	N/A	-
Hawker IRP	52	100	52	100	0.9	1.6	1.2	100	N/A	N/A	N/A	-
Loxton WTP	102	99	102	99	N/A	N/A	N/A	-	2.3	4.2	3.4	99
Melrose	50	100	50	100	0.1	2.1	1.3	100	N/A	N/A	N/A	-
Moorook WTP	99	97	99	100	<0.1	3.0	1.4	100	N/A	N/A	N/A	-
Morgan / Swan Reach WTP	557	99	557	99	N/A	N/A	N/A	-	<0.1	4.6	2.1	99
Morgan WTP	1067	100	1067	100	N/A	N/A	N/A	-	0.5	4.2	2.6	100
Orroroo	52	100	52	100	0.6	1.7	1.3	100	N/A	N/A	N/A	-
Parachilna	13	100	13	100	<0.1	1.4	0.3	100	N/A	N/A	N/A	-
Quorn	52	100	52	100	0.6	2.2	1.1	100	N/A	N/A	N/A	-
Renmark WTP	142	99	142	100	<0.1	2.8	0.9	100	N/A	N/A	N/A	-
Waikerie WTP	62	98	62	100	<0.1	3.5	0.8	100	N/A	N/A	N/A	-
Warooka	51	98	51	100	0.5	1.5	1.0	100	N/A	N/A	N/A	-
Wilmington	51	100	51	100	0.3	1.7	0.9	100	N/A	N/A	N/A	-
Woolpunda	78	100	78	100	N/A	N/A	N/A	-	<0.1	2.7	1.2	100

* Chlorinated systems only
** Chloraminated systems only
[x] SA Water internal guideline value
N/A - Not applicable
++ *E. coli* should not be detected in samples of drinking water. However the ADWG recognise that occasional detections may occur.
In accordance with the guidelines any detection is immediately investigated and corrective action implemented as agreed with SA Health.

Table 4

2011-12 Country drinking water distribution systems – customer tap water quality against 2011 ADWG *continued*

Northern Region *continued*	Total Dissolved Solids [mg/L]				Colour -True [HU]				Turbidity [NTU]			
System	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Aesthetic Compliance %
ADWG Value Target				≤ 600 100%				≤ 15				≤ 5
Barmera WTP	160	230	202	100	<1	4	1	100	0.1	1.6	0.3	100
Berri WTP	110	220	178	100	<1	2	1	100	0.1	0.4	0.2	100
Blanchetown WTP	180	200	187	100	<1	2	1	100	<0.1	0.2	0.1	100
Cadell WTP	130	200	165	100	<1	2	1	100	<0.1	0.1	0.1	100
Glossop WTP	100	180	143	100	<1	2	1	100	<0.1	2.9	0.2	100
Hawker IRP	2400	2400	2400	0	<1	<1	<1	100	<0.1	0.3	0.2	100
Loxton WTP	110	240	182	100	<1	4	2	100	<0.1	0.2	0.1	100
Melrose	1400	1600	1500	0	<1	<1	<1	100	0.1	0.5	0.3	100
Moorook WTP	130	220	185	100	<1	2	1	100	<0.1	0.2	0.1	100
Morgan / Swan Reach WTP	140	260	208	100	<1	6	2	100	<0.1	1.2	0.2	100
Morgan WTP	140	280	212	100	<1	7	2	100	<0.1	4.6	0.2	100
Orroroo	1900	2000	1925	0	<1	<1	<1	100	<0.1	<0.1	<0.1	100
Parachilna	820	830	825	0	<1	1	1	100	<0.1	0.5	0.1	100
Quorn	1100	1200	1180	0	<1	<1	<1	100	<0.1	<0.1	<0.1	100
Renmark WTP	120	220	178	100	<1	11	1	100	<0.1	0.5	0.2	100
Waikerie WTP	140	240	200	100	<1	3	1	100	0.1	0.3	0.2	100
Warooka	720	750	740	0	<1	1	1	100	<0.1	0.4	0.2	100
Wilmington	300	310	303	100	<1	<1	<1	100	<0.1	0.2	0.1	100
Woolpunda	130	180	163	100	<1	3	2	100	<0.1	2.5	0.3	100

	pH Units				Trihalomethanes - Total [µg/L]				Fluoride [mg/L]			
System	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Health Compliance %	Min	Max	Ave	Health Compliance %
ADWG Value Target				6.5 - 8.5				≤ 250 100%				≤ 1.5 100%
Barmera WTP	7.2	8.4	7.7	100	51	237	122	100	0.8	1.0	0.8	100
Berri WTP	7.7	7.8	7.7	100	63	204	125	100	0.8	0.9	0.8	100
Blanchetown WTP	7.2	7.9	7.6	100	76	200	132	100	<0.1	0.1	0.1	100
Cadell WTP	7.4	8.1	7.7	100	56	189	122	100	<0.1	0.2	0.1	100
Glossop WTP	7.5	8.1	7.8	100	58	214	134	100	<0.1	0.1	0.1	100
Hawker IRP	7.0	7.4	7.2	100	18	54	35	100	0.7	0.7	0.7	100
Loxton WTP	8.5	9.3	9.0	4	20	39	31	100	0.8	0.9	0.8	100
Melrose	7.3	7.4	7.4	100	<4	16	8	100	1.0	1.1	1.0	100
Moorook WTP	7.5	8.5	7.9	100	60	200	122	100	<0.1	0.2	0.1	100
Morgan / Swan Reach WTP	7.7	9.4	8.9	13	12	126	43	100	0.6	0.9	0.8	100
Morgan WTP	6.8	9.7	8.5	37	13	142	36	100	0.7	0.9	0.8	100
Orroroo	7.5	7.6	7.6	100	<4	5	4	100	1.2	1.3	1.3	100
Parachilna	7.7	7.8	7.7	100	N/A	N/A	N/A	-	0.6	0.6	0.6	100
Quorn	7.0	7.3	7.2	100	5	6	5	100	0.5	0.6	0.6	100
Renmark WTP	7.4	9.8	8.1	76	68	430	180	85	0.7	1.0	0.9	100
Waikerie WTP	8.0	8.5	8.2	100	78	206	140	100	0.9	0.9	0.9	100
Warooka	7.3	7.6	7.4	100	28	33	30	100	1.0	1.0	1.0	100
Wilmington	6.2	6.8	6.5	60	5	36	23	100	0.2	0.2	0.2	100
Woolpunda	7.6	8.4	7.9	100	8	85	35	100	0.1	0.1	0.1	100

N/A - Not applicable

Table 4

2011-12 Country drinking water distribution systems – customer tap water quality against 2011 ADWG *continued*

Northern Region *continued*	Iron -Total [mg/L]				Manganese -Total [mg/L]					Hardness - Total [mg/L]			
System	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Health Compliance %	Aesthetic Compliance %	Min	Max	Ave	Aesthetic Compliance %
ADWG Value Target				≤ 0.3 100%				≤ 0.5 100%	≤ 0.1 100%				≤ 200
Barmera WTP	0.009	0.045	0.023	100	0.004	0.005	0.005	100	100	46	85	69	100
Berri WTP	0.013	0.032	0.022	100	0.002	0.003	0.002	100	100	33	75	61	100
Blanchetown WTP	0.006	0.053	0.016	100	<0.001	0.001	0.001	100	100	47	75	60	100
Cadell WTP	<0.005	0.005	0.005	100	0.001	0.001	0.001	100	100	33	75	54	100
Glossop WTP	0.015	0.030	0.020	100	<0.001	0.001	0.001	100	100	31	72	53	100
Hawker IRP	0.006	0.076	0.025	100	<0.001	0.004	0.001	100	100	996	1050	1027	0
Loxton WTP	<0.005	0.005	0.005	100	0.001	0.006	0.003	100	100	31	83	56	100
Melrose	0.008	0.035	0.017	100	<0.001	0.001	0.001	100	100	305	343	327	0
Moorook WTP	<0.005	0.027	0.013	100	0.001	0.003	0.001	100	100	34	71	58	100
Morgan / Swan Reach WTP	<0.005	0.118	0.019	100	0.001	0.011	0.003	100	100	49	85	67	100
Morgan WTP	<0.005	0.037	0.005	100	<0.001	0.006	0.002	100	100	40	112	67	100
Orroroo	<0.005	0.010	0.005	100	<0.001	<0.001	<0.001	100	100	657	775	695	0
Parachilna	<0.005	<0.005	<0.005	100	<0.001	<0.001	<0.001	100	100	307	312	310	0
Quorn	<0.005	<0.005	<0.005	100	<0.001	<0.001	<0.001	100	100	462	634	514	0
Renmark WTP	<0.005	0.036	0.011	100	0.001	0.016	0.005	100	100	38	82	63	100
Waikerie WTP	0.012	0.054	0.039	100	0.003	0.003	0.003	100	100	35	85	64	100
Warooka	<0.005	0.005	0.005	100	<0.001	<0.001	<0.001	100	100	332	350	342	0
Wilmington	0.025	0.110	0.057	100	<0.001	0.001	0.001	100	100	103	130	120	100
Woolpunda	N/A	N/A	N/A	-	N/A	N/A	N/A	-	-	43	61	54	100

Outer Metro Region	Coliforms/100 mL		*E. coli*/100 mL		Chlorine Residual - Free [mg/L]*				Chlorine Residual - Total [mg/L]**			
System	Samples	Health Compliance %	Samples	Health Compliance %	Min	Max	Ave	Health Compliance %	Min	Max	Ave	Health Compliance %
ADWG Value Target		> 95% free[x]		++				≤ 5 100%				≤ 4.1 100%
Barossa WTP[#]	458	97	458	100	<0.1	2.2	0.4	100	N/A	N/A	N/A	-
Cowirra WTP	98	97	98	100	<0.1	1.9	0.8	100	N/A	N/A	N/A	-
Kanmantoo WTP	102	99	102	100	0.3	2.2	1.1	100	N/A	N/A	N/A	-
Mannum WTP	102	99	102	99	0.6	3.1	1.9	100	N/A	N/A	N/A	-
Middle River WTP	101	91	101	100	<0.1	1.8	0.6	100	N/A	N/A	N/A	-
Morgan / Swan Reach WTP	557	99	557	100	N/A	N/A	N/A	-	<0.1	4.6	2.1	99
Morgan WTP	1067	100	1067	100	N/A	N/A	N/A	-	0.5	4.2	2.6	100
Mt Compass	78	100	78	100	0.5	1.7	1.1	100	N/A	N/A	N/A	-
Mt Pleasant WTP	67	97	67	100	<0.1	2.4	0.8	100	N/A	N/A	N/A	-
Murray Bridge WTP	235	100	235	100	<0.1	4.2	1.5	100	N/A	N/A	N/A	-
Mypolonga WTP	144	92	144	100	<0.1	2.1	0.7	100	N/A	N/A	N/A	-
Myponga WTP[#]	355	99	355	99	<0.1	1.3	0.2	100	N/A	N/A	N/A	-
Palmer WTP	150	99	150	100	<0.1	2.5	1.2	100	N/A	N/A	N/A	-
Penneshaw WTP	78	100	78	100	0.7	2.2	1.3	100	N/A	N/A	N/A	-
Summit WTP	715	99	715	100	N/A	N/A	N/A	-	<0.1	3.6	2.1	100
Swan Reach Town WTP	52	100	52	100	<0.1	1.5	0.8	100	N/A	N/A	N/A	-
Swan Reach WTP	443	97	443	100	N/A	N/A	N/A	-	<0.1	3.4	2.0	100
Tailem Bend WTP	438	99	438	100	N/A	N/A	N/A	-	<0.1	4.5	2.2	99

* Chlorinated systems only
** Chloraminated systems only
[x] SA Water internal guideline value
[#] Supplies both country and metropolitan systems
N/A - Not applicable

++ *E. coli* should not be detected in samples of drinking water. However the ADWG recognise that occasional detections may occur. In accordance with the guidelines any detection is immediately investigated and corrective action implemented as agreed with SA Health.

Table 4

2011-12 Country drinking water distribution systems – customer tap water quality against 2011 ADWG *continued*

Outer Metro Region *continued*	Total Dissolved Solids [mg/L]				Colour -True [HU]				Turbidity [NTU]			
System	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Aesthetic Compliance %
ADWG Value Target				≤ 600 100%				≤ 15				≤ 5
Barossa WTP#	330	380	358	100	<1	2	1	100	<0.1	0.3	0.2	100
Cowirra WTP	95	180	134	100	<1	1	1	100	<0.1	0.4	0.1	100
Kanmantoo WTP	140	200	170	100	<1	1	1	100	<0.1	3.5	0.6	100
Mannum WTP	180	260	212	100	<1	1	1	100	<0.1	0.2	0.1	100
Middle River WTP	440	590	518	100	<1	2	1	100	<0.1	0.3	0.2	100
Morgan / Swan Reach WTP	140	260	208	100	<1	6	2	100	<0.1	1.2	0.2	100
Morgan WTP	140	280	212	100	<1	7	2	100	<0.1	4.6	0.2	100
Mt Compass	180	220	208	100	<1	<1	<1	100	<0.1	0.2	0.1	100
Mt Pleasant WTP	200	250	222	100	<1	2	1	100	<0.1	0.4	0.1	100
Murray Bridge WTP	130	240	193	100	<1	1	1	100	<0.1	0.5	0.1	100
Mypolonga WTP	190	240	210	100	<1	2	1	100	<0.1	0.2	0.1	100
Myponga WTP#	370	480	455	100	<1	4	1	100	<0.1	1.3	0.2	100
Palmer WTP	84	260	179	100	<1	4	1	100	<0.1	1.1	0.1	100
Penneshaw WTP	200	270	235	100	<1	<1	<1	100	<0.1	1.7	0.4	100
Summit WTP	150	270	199	100	<1	6	3	100	<0.1	1.1	0.2	100
Swan Reach Town WTP	130	220	175	100	<1	1	1	100	<0.1	0.3	0.1	100
Swan Reach WTP	130	280	201	100	<1	6	2	100	<0.1	0.2	0.1	100
Tailem Bend WTP	130	270	216	100	<1	5	2	100	<0.1	1.5	0.2	100

	pH Units				Trihalomethanes - Total [µg/L]				Fluoride [mg/L]			
System	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Health Compliance %	Min	Max	Ave	Health Compliance %
ADWG Value Target				6.5 - 8.5				≤ 250 100%				≤ 1.5 100%
Barossa WTP#	6.8	8.8	7.5	95	30	329	190	80	0.9	0.9	0.9	100
Cowirra WTP	7.4	8.1	7.8	100	76	203	138	100	<0.1	0.1	0.1	100
Kanmantoo WTP	7.1	8.7	7.7	96	73	242	123	100	<0.1	0.2	0.1	100
Mannum WTP	7.1	8.0	7.7	100	58	194	110	100	1.0	1.0	1.0	100
Middle River WTP	7.5	7.9	7.7	100	49	326	182	85	<0.1	<0.1	<0.1	100
Morgan / Swan Reach WTP	7.7	9.4	8.9	13	12	126	43	100	0.6	0.9	0.8	100
Morgan WTP	6.8	9.7	8.5	37	13	142	36	100	0.7	0.9	0.8	100
Mt Compass	6.4	7.4	6.8	82	4	5	4	100	0.2	0.3	0.3	100
Mt Pleasant WTP	7.0	8.5	7.8	100	53	154	101	100	0.8	1.0	0.9	100
Murray Bridge WTP	7.4	8.4	7.9	100	80	292	163	94	0.8	0.9	0.9	100
Mypolonga WTP	7.2	9.1	7.8	84	91	230	159	100	<0.1	0.1	0.1	100
Myponga WTP#	7.0	7.8	7.4	100	140	357	236	67	0.8	0.9	0.9	100
Palmer WTP	7.0	8.6	7.7	99	85	279	154	97	<0.1	0.1	0.1	100
Penneshaw WTP	7.4	8.4	7.8	100	<4	<4	<4	100	<0.1	<0.1	<0.1	100
Summit WTP	8.3	9.0	8.8	9	7	34	16	100	0.8	1.0	0.9	100
Swan Reach Town WTP	7.6	8.2	7.9	100	97	198	138	100	<0.1	0.2	0.1	100
Swan Reach WTP	8.0	9.2	8.7	18	4	23	15	100	0.7	1.0	0.9	100
Tailem Bend WTP	7.5	9.5	8.6	38	11	60	20	100	0.8	1.0	0.9	100

Supplies both country and metropolitan systems
N/A - Not applicable

Table 4

2011-12 Country drinking water distribution systems – customer tap water quality against 2011 ADWG *continued*

Outer Metro Region *continued*	Iron -Total [mg/L]				Manganese -Total [mg/L]					Hardness - Total [mg/L]			
System	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Health Compliance %	Aesthetic Compliance %	Min	Max	Ave	Aesthetic Compliance %
ADWG Value Target				≤ 0.3 100%				≤ 0.5 100%	≤ 0.1 100%				≤ 200
Barossa WTP#	0.008	0.035	0.016	100	<0.001	0.002	0.001	100	100	122	143	135	100
Cowirra WTP	<0.005	0.018	0.007	100	<0.001	0.001	0.001	100	100	42	69	55	100
Kanmantoo WTP	<0.005	0.111	0.037	100	<0.001	0.001	0.001	100	100	39	75	57	100
Mannum WTP	<0.005	0.007	0.005	100	0.002	0.002	0.002	100	100	49	88	62	100
Middle River WTP	0.048	0.094	0.074	100	0.001	0.009	0.004	100	100	57	84	74	100
Morgan / Swan Reach WTP	<0.005	0.118	0.019	100	0.001	0.011	0.003	100	100	49	85	67	100
Morgan WTP	<0.005	0.037	0.005	100	<0.001	0.006	0.002	100	100	40	112	67	100
Mt Compass	<0.005	0.013	0.008	100	<0.001	0.001	0.001	100	100	57	71	65	100
Mt Pleasant WTP	<0.005	0.005	0.005	100	<0.001	0.063	0.013	100	100	50	71	59	100
Murray Bridge WTP	<0.005	0.043	0.006	100	0.001	0.006	0.002	100	100	40	78	57	100
Mypolonga WTP	0.005	0.034	0.015	100	<0.001	0.002	0.001	100	100	56	80	64	100
Myponga WTP#	0.011	0.183	0.061	100	0.001	0.011	0.003	100	100	124	145	135	100
Palmer WTP	0.007	0.060	0.025	100	0.001	0.002	0.001	100	100	38	82	57	100
Penneshaw WTP	<0.005	0.025	0.006	100	<0.001	0.003	0.001	100	100	55	83	73	100
Summit WTP	<0.005	0.323	0.030	96	0.001	0.018	0.004	100	100	48	90	63	100
Swan Reach Town WTP	0.009	0.158	0.033	100	0.001	0.004	0.003	100	100	36	81	59	100
Swan Reach WTP	<0.005	0.007	0.005	100	0.001	0.007	0.003	100	100	47	94	72	100
Tailem Bend WTP	<0.005	0.056	0.005	100	0.001	0.015	0.006	100	100	39	98	70	100

South East Region	Coliforms/100 mL		*E. coli*/100 mL		Chlorine Residual - Free [mg/L]*				Chlorine Residual - Total [mg/L]**			
System	Samples	Health Compliance %	Samples	Health Compliance %	Min	Max	Ave	Health Compliance %	Min	Max	Ave	Health Compliance %
ADWG Value Target		> 95% free[x]		++				≤ 5 100%				≤ 4.1 100%
Beachport IRP	52	100	52	100	0.7	1.8	1.1	100	N/A	N/A	N/A	-
Bordertown	63	98	63	100	0.7	1.5	1.1	100	N/A	N/A	N/A	-
Geranium	50	100	50	100	0.7	1.8	1.1	100	N/A	N/A	N/A	-
Kalangadoo IRP	52	100	52	100	0.4	1.1	0.8	100	N/A	N/A	N/A	-
Kingston SE IRP	52	100	52	100	0.5	1.8	1.1	100	N/A	N/A	N/A	-
Lameroo IRP	50	100	50	100	0.5	1.4	1.0	100	N/A	N/A	N/A	-
Lucindale IRP	52	100	52	100	0.3	1.3	0.8	100	N/A	N/A	N/A	-
Millicent	78	100	78	100	<0.1	1.3	0.7	100	N/A	N/A	N/A	-
Mt Burr	52	100	52	100	0.1	0.9	0.6	100	N/A	N/A	N/A	-
Mt Gambier	105	100	105	100	0.6	2.2	0.9	100	N/A	N/A	N/A	-
Nangwarry	52	98	52	100	0.1	1.5	0.8	100	N/A	N/A	N/A	-
Naracoorte	66	92	66	100	<0.1	0.4	0.1	100	N/A	N/A	N/A	-
Padthaway	52	100	52	100	0.6	1.6	1.0	100	N/A	N/A	N/A	-
Parilla IRP	26	100	26	100	0.5	1.7	0.9	100	N/A	N/A	N/A	-
Penola IRP	65	100	65	100	<0.1	1.9	0.9	100	N/A	N/A	N/A	-
Pinnaroo IRP	77	100	77	100	0.7	2.6	1.3	100	N/A	N/A	N/A	-
Port MacDonnell	52	98	52	100	N/A	N/A	N/A	-	<0.1	1.3	0.5	100
Robe IRP	65	100	65	100	N/A	N/A	N/A	-	0.8	2.2	1.4	100
Tailem Bend WTP	438	99	438	100	N/A	N/A	N/A	-	<0.1	4.5	2.2	99
Tarpeena IRP	52	100	52	100	0.2	1.4	0.9	100	N/A	N/A	N/A	-

* Chlorinated systems only
** Chloraminated systems only
[x] SA Water internal guideline value
Supplies both country and metropolitan systems
N/A - Not applicable

++ *E. coli* should not be detected in samples of drinking water. However the ADWG recognise that occasional detections may occur. In accordance with the guidelines any detection is immediately investigated and corrective action implemented as agreed with SA Health.

Table 4

2011-12 Country drinking water distribution systems – customer tap water quality against 2011 ADWG *continued*

South East Region *continued*	Total Dissolved Solids [mg/L]				Colour -True [HU]				Turbidity [NTU]			
System	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Aesthetic Compliance %
ADWG Value Target				≤ 600 100%				≤ 15				≤ 5
Beachport IRP	630	660	650	0	<1	1	1	100	<0.1	<0.1	<0.1	100
Bordertown	440	600	503	100	<1	<1	<1	100	<0.1	0.2	0.1	100
Geranium	1400	1400	1400	0	<1	<1	<1	100	<0.1	0.1	0.1	100
Kalangadoo IRP	570	600	588	100	<1	<1	<1	100	<0.1	1.8	0.2	100
Kingston SE IRP	930	1200	1083	0	<1	3	1	100	<0.1	<0.1	<0.1	100
Lameroo IRP	950	980	963	0	<1	<1	<1	100	<0.1	0.1	0.1	100
Lucindale IRP	800	820	808	0	<1	1	1	100	<0.1	0.1	0.1	100
Millicent	500	620	593	52	<1	2	1	100	<0.1	0.6	0.2	100
Mt Burr	420	450	435	100	<1	1	1	100	<0.1	1.5	0.2	100
Mt Gambier	340	620	371	95	<1	1	1	100	<0.1	0.3	0.2	100
Nangwarry	560	640	613	25	<1	<1	<1	100	<0.1	0.1	0.1	100
Naracoorte	1200	1300	1250	0	<1	8	5	100	<0.1	0.9	0.3	100
Padthaway	1400	1500	1450	0	<1	2	1	100	0.1	0.3	0.2	100
Parilla IRP	630	660	648	0	<1	1	1	100	<0.1	0.4	0.1	100
Penola IRP	620	730	687	0	<1	<1	<1	100	<0.1	0.1	0.1	100
Pinnaroo IRP	670	750	718	0	<1	3	1	100	<0.1	0.2	0.1	100
Port MacDonnell	700	720	708	0	3	6	5	100	0.2	2.6	0.8	100
Robe IRP	780	930	827	0	<1	1	1	100	<0.1	0.2	0.1	100
Tailem Bend WTP	130	270	216	100	<1	5	2	100	<0.1	1.5	0.2	100
Tarpeena IRP	640	730	688	0	<1	1	1	100	<0.1	<0.1	<0.1	100

	pH Units				Trihalomethanes - Total [µg/L]				Fluoride [mg/L]			
System	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Health Compliance %	Min	Max	Ave	Health Compliance %
ADWG Value Target				6.5 - 8.5				≤ 250 100%				≤ 1.5 100%
Beachport IRP	7.4	7.8	7.6	100	34	39	37	100	0.2	0.3	0.2	100
Bordertown	7.1	7.7	7.4	100	7	11	10	100	0.3	0.4	0.3	100
Geranium	6.9	7.3	7.1	100	<4	5	5	100	1.0	1.0	1.0	100
Kalangadoo IRP	7.0	7.5	7.3	100	27	59	37	100	0.2	0.2	0.2	100
Kingston SE IRP	7.4	8.0	7.6	100	26	39	33	100	0.3	0.4	0.4	100
Lameroo IRP	7.7	7.8	7.7	100	20	25	22	100	0.6	0.6	0.6	100
Lucindale IRP	7.4	7.5	7.4	100	90	115	103	100	0.3	0.3	0.3	100
Millicent	7.2	7.7	7.4	100	38	120	79	100	0.9	1.2	1.1	100
Mt Burr	7.7	7.9	7.8	100	8	15	10	100	0.2	0.2	0.2	100
Mt Gambier	7.2	8.4	8.1	100	11	41	27	100	0.2	0.9	0.6	100
Nangwarry	7.1	7.7	7.3	100	11	25	18	100	0.1	0.1	0.1	100
Naracoorte	7.6	8.1	7.8	100	<4	81	41	100	0.9	1.3	1.2	100
Padthaway	7.2	7.8	7.5	100	5	6	6	100	0.1	0.1	0.1	100
Parilla IRP	7.5	7.9	7.7	100	14	21	18	100	0.4	0.7	0.5	100
Penola IRP	7.1	7.2	7.2	100	46	136	80	100	0.2	0.3	0.2	100
Pinnaroo IRP	7.4	7.7	7.5	100	9	13	12	100	0.7	0.7	0.7	100
Port MacDonnell	8.0	8.5	8.3	100	N/A	N/A	N/A	-	0.9	1.0	0.9	100
Robe IRP	7.6	8.0	7.7	100	<4	7	5	100	0.3	0.3	0.3	100
Tailem Bend WTP	7.5	9.5	8.6	38	11	60	20	100	0.8	1.0	0.9	100
Tarpeena IRP	7.4	7.6	7.5	100	50	50	50	100	0.2	0.2	0.2	100

[#] Supplies both country and metropolitan systems
N/A - Not applicable

Table 4

2011-12 Country drinking water distribution systems – customer tap water quality against 2011 ADWG *continued*

South East Region *continued*	Iron -Total [mg/L]				Manganese -Total [mg/L]					Hardness - Total [mg/L]			
System	Min	Max	Ave	Aesthetic Compliance %	Min	Max	Ave	Health Compliance %	Aesthetic Compliance %	Min	Max	Ave	Aesthetic Compliance %
ADWG Value Target				≤ 0.3 100%				≤ 0.5 100%	< 0.1 100%				≤ 200
Beachport IRP	<0.005	0.018	0.007	100	<0.001	0.002	0.001	100	100	268	278	274	0
Bordertown	<0.005	0.006	0.005	100	<0.001	<0.001	<0.001	100	100	246	293	265	0
Geranium	<0.005	0.016	0.010	100	<0.001	<0.001	<0.001	100	100	545	562	553	0
Kalangadoo IRP	<0.005	0.052	0.015	100	<0.001	<0.001	<0.001	100	100	364	407	379	0
Kingston SE IRP	<0.005	0.012	0.006	90	<0.001	0.001	0.001	100	100	223	227	225	0
Lameroo IRP	0.017	0.032	0.025	100	0.001	0.001	0.001	100	100	227	242	233	0
Lucindale IRP	<0.005	0.006	0.005	100	<0.001	<0.001	<0.001	100	100	308	319	314	0
Millicent	<0.005	0.233	0.046	100	<0.001	0.005	0.001	100	100	301	373	344	0
Mt Burr	<0.005	0.021	0.007	100	<0.001	<0.001	<0.001	100	100	260	288	276	0
Mt Gambier	<0.005	0.032	0.005	100	<0.001	0.001	0.001	100	100	169	309	190	90
Nangwarry	<0.005	<0.005	<0.005	100	<0.001	<0.001	<0.001	100	100	330	406	381	0
Naracoorte	0.009	0.176	0.070	100	0.001	0.017	0.007	100	100	330	379	357	0
Padthaway	0.025	0.036	0.029	100	N/A	N/A	N/A	-	-	576	581	579	0
Parilla IRP	<0.005	0.014	0.009	100	<0.001	<0.001	<0.001	100	100	179	190	184	100
Penola IRP	0.007	0.073	0.031	100	<0.001	<0.001	<0.001	100	100	268	351	322	0
Pinnaroo IRP	<0.005	0.073	0.019	100	0.001	0.001	0.001	100	100	237	261	252	0
Port MacDonnell	0.052	0.089	0.070	100	0.001	0.001	0.001	100	100	15	21	18	100
Robe IRP	<0.005	0.144	0.010	100	0.001	0.002	0.001	100	100	78	118	103	100
Tailem Bend WTP	<0.005	0.056	0.005	100	0.001	0.015	0.006	100	100	39	98	70	100
Tarpeena IRP	<0.005	0.037	0.020	100	<0.001	0.002	0.001	100	100	390	429	409	0

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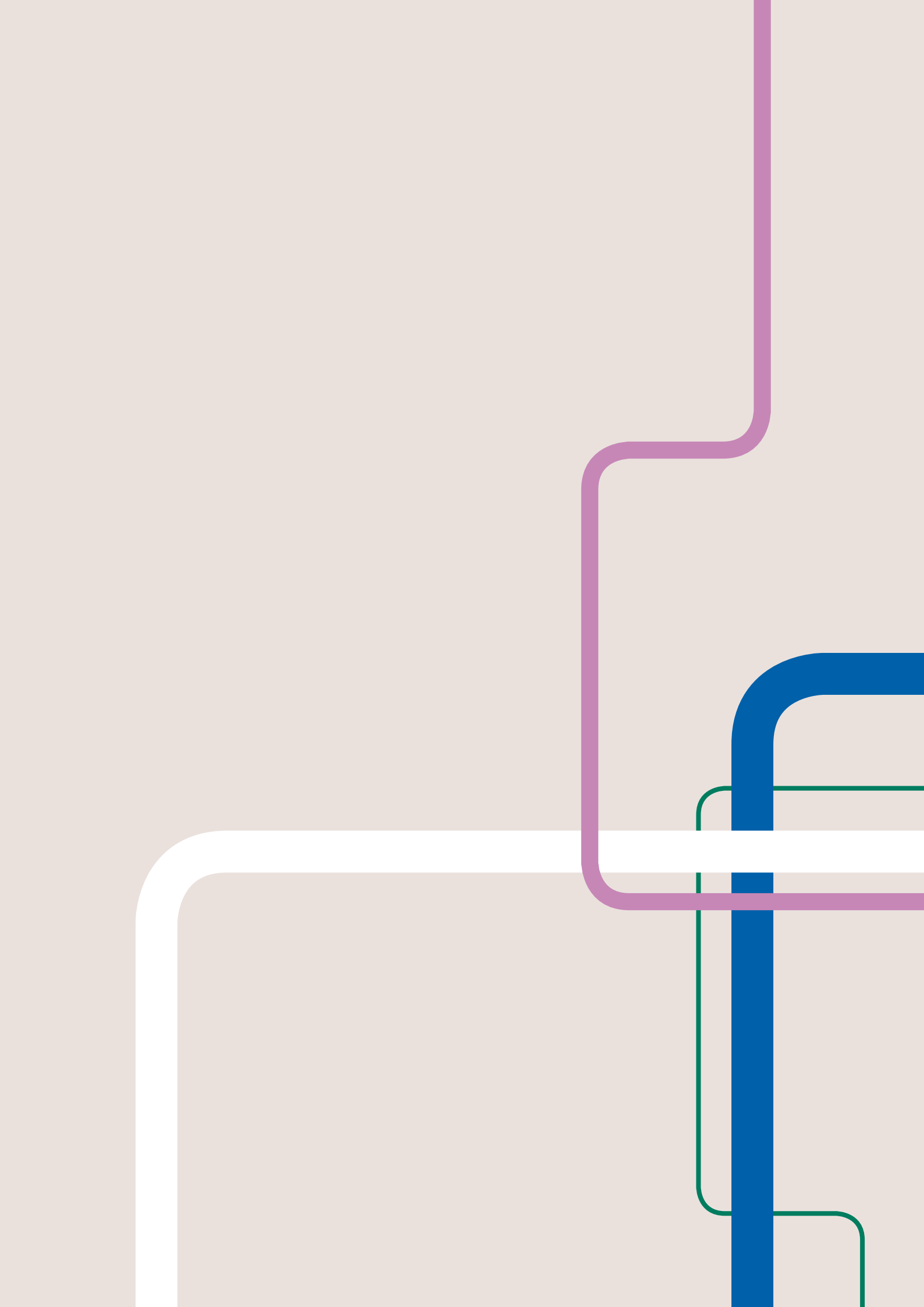

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