

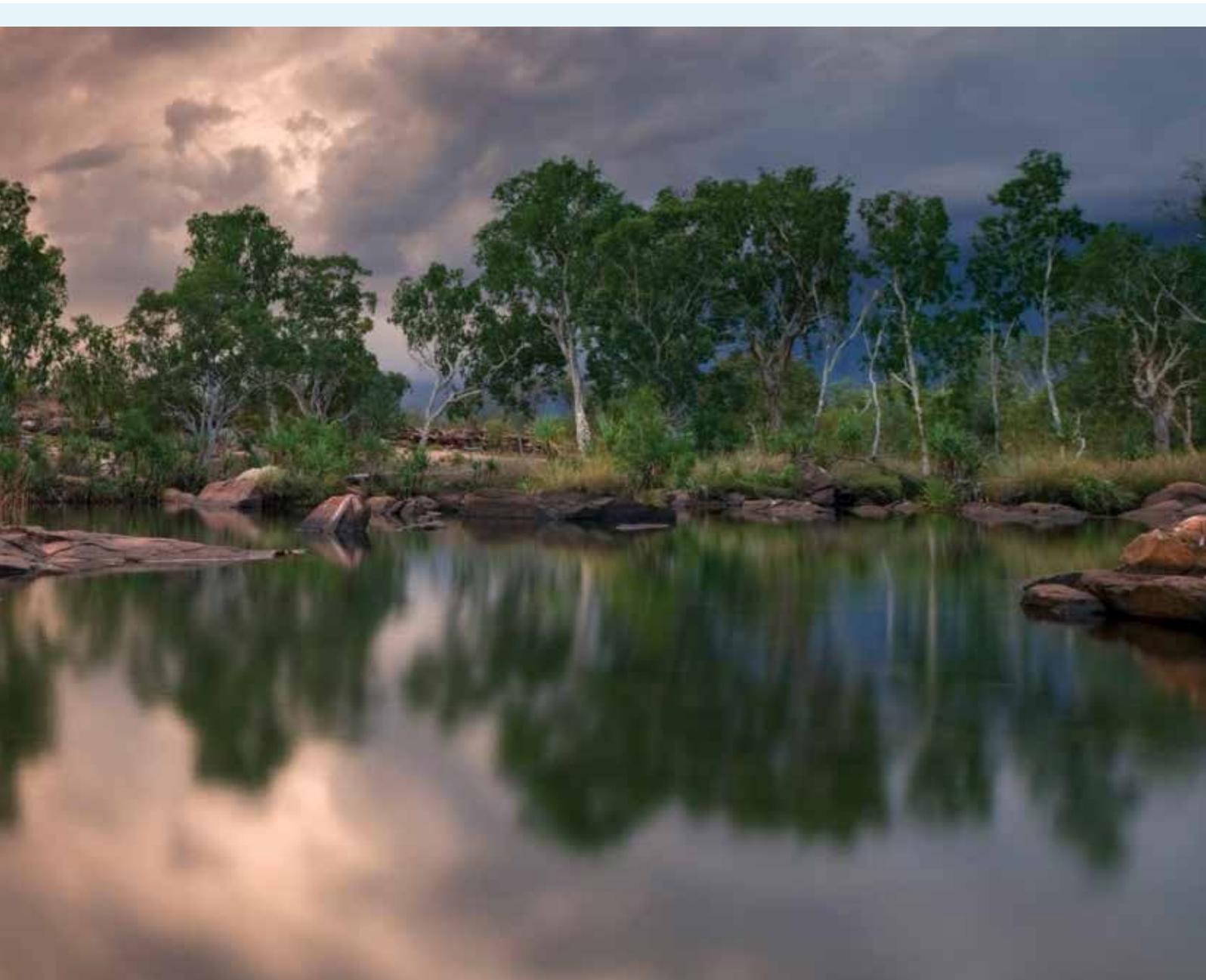


Australian Government
Bureau of Meteorology

Improving Water Information Programme

Progress Report

Advances in water information made by the Bureau of Meteorology in 2013



Improving Water Information Programme Progress Report:
Advances in water information made by the Bureau of Meteorology in 2013

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Cover: Approaching storm clouds and thunderheads at Manning Gorge, along the Gibb River Road,
Western Australia | Photograph by Sara Winter (iStockPhoto).

Page 7: Wingecarribee Dam near Bowral, New South Wales | Photograph by Phillip Minnis (iStockphoto).

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Introduction

In a country that can swing abruptly from extended droughts to flooding rains and back again, the Bureau of Meteorology (the Bureau) plays an important role in helping Australians understand the changing status of our water resources.



This report details the Bureau's progress in implementing the ten-year *Improving Water Information Programme*, which began in 2007. It highlights our key achievements and challenges encountered this year and outlines the important work that will follow in the coming years.

Over the past six and a half years, the Bureau's water information services have helped policymakers and water managers throughout the country make more informed decisions.

Coverage of the Seasonal Streamflow Forecast Service increased this year from 50 to 70 sites, extending its national reach. This has enabled improved forecasting of inflows into reservoirs and management of environmental water reserves and provided valuable preparation for flood forecasting.

Data providers are now efficiently delivering four million files of water observations to the Bureau each year. More than 80 per cent of data supplied to the Bureau is in the Water Data Transfer Format which enhances the consistency and quality of the information we receive, process and analyse. We thank our water data providers for adopting this standardised format and for their continuing support of the programme.

This year, we published the second Australian Water Resources Assessment, building on and extending the coverage of the first assessment that we published two years ago. The assessment is now underpinned by a nationally-consistent landscape water balance model that provides estimates for water flow, streamflow salinity, land use, population, soil types, physiographic regions, rainfall zones, and rainfall deficits. It is also supported by a very significant set of hydrologic observations, gathered by the States and Territories and collated and analysed by the Bureau.

Improvements to internal processes and systems and the ongoing support of our reporting partners led to the earlier publication of the annual National Water Account this year: the third published by the Bureau so far. The Daly region in the Northern Territory was added to this year's account, bringing the number of reported significant water use regions up to nine. The reporting regions included in the National Water Account are home to more than 70 per cent of Australia's population and are where more than two-thirds of Australia's total annual water consumption occurs.

This year the Bureau published revised estimates of design rainfalls that are used by engineers in the design of hydraulic structures such as dams, bridges, culverts and drains. This product is used to estimate relationships between rainfall intensity, frequency and duration across the nation, updating the current data set, which has been in use for almost 30 years.

As in all major programmes, not everything has proceeded as planned. We have faced major challenges in building the data warehousing component of the Australian Water Resources Information System. This has proven to be a complex undertaking beyond our initial estimation, necessitating some redesign and rebuilding. Whilst this has set back our work programme we are confident that we will soon be able to commission a system that provides a robust, enduring source of valuable water data and a reliable platform for several new water information products and services.

As the programme heads into its final years, the Bureau is working closely with our stakeholders to finalise planning for future products and services. The process of national water reform is both long term and multi-faceted, so we need to remain attentive to changes in stakeholder needs.

Our accomplishments have only been possible with the support of our many partners and supporters, including more than 200 organisations across Australia that provide water data to the Bureau.

I also acknowledge the ongoing passion and expertise of our employees who are committed to making the programme's vision a reality.

Since joining the Bureau earlier this year, I have continually been impressed by the breadth and depth of the programme, resulting from our compilation, analysis and delivery of comprehensive national water information.

It is my pleasure to report on the programme's progress and oversee the development and expansion of our suite of freely available water information products and services to help Australia manage its vital water resources.

Graham Hawke
Deputy Director (Environment and Research)

Improving water information

The *Improving Water Information Programme* is a key component of the nation's water reform agenda. Led by the Bureau of Meteorology, and supported by water agencies across Australia, it complements other key elements of the *Water for the Future Programme*, such as infrastructure investments, water market reforms and the purchase of water rights for the environment.

A comprehensive, reliable and up-to-date picture of Australia's water resources is emerging as the programme enters its seventh year. The Bureau continues to develop its product to ensure Australia is better equipped to manage water scarcity, water quality and flood risk through ready access to high-quality water information at the national level.

The journey so far

The *Improving Water Information Programme* is contributing to improved:

- availability and understanding of the water information that underpins water policies and management decisions;
- public disclosure of water entitlements, allocations, trades and use;
- water availability forecasts, leading to greater certainty in water resources management and operations;
- design flood estimation, enabling safer and more cost efficient infrastructure design; and
- community understanding of water resources management.



Sunset on the River Murray, South Australia | Photograph by Clearviewstock (Dreamstime.com)

Key achievements

The *Improving Water Information Programme* has achieved many Australian firsts over the past six and a half years, some of which are listed below.

Standards

- The world's first water accounting standard based on the financial accounting model.
- Common national data licensing arrangements.
- National industry guidelines for hydrometric monitoring.
- An Australian Water Information Dictionary.
- National and international standards for water data transfer.
- A National Aquifer Framework for naming and grouping sedimentary rocks with similar hydraulic characteristics.

Data

- An Australian Water Resources Information System that collates most of the nation's water information on an ongoing basis.
- A consistent geospatial framework representing Australia's hydrological features.
- Updated Intensity–Frequency–Duration Design Rainfalls product for the first time in almost 30 years.
- The National Groundwater Information System, a spatial database that contains information about more than 800 000 bores across Australia.
- Nationally consistent tracking of water storage levels.
- Nationally consistent tracking of water market activity.
- National view of current water restrictions.

Monitoring

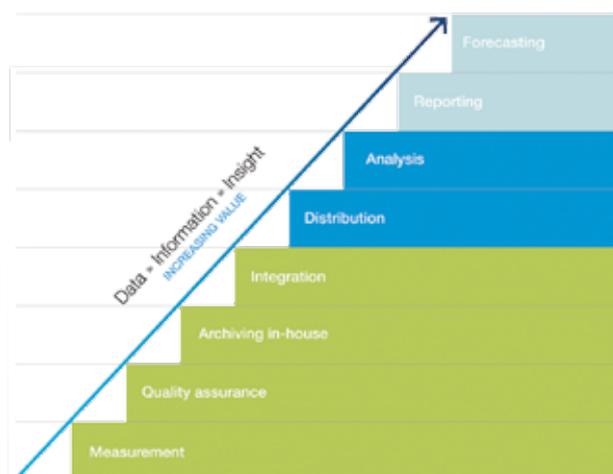
- Completion of the five year Modernisation and Extension of Hydrological Monitoring Systems Programme which was allocated \$80 million and funded 463 projects across the country.

Reports

- A comprehensive Australian Water Resources Assessment, published every two years.
- A National Water Account, published annually.
- A national water balance model that underpins the Assessment and Account.
- Ongoing assessments of trends in streamflow at 221 hydrologic reference sites, updated every two years.

Forecasts

- A Seasonal Streamflow Forecast Service, which issues monthly forecasts for 70 sites around the country and looks three months ahead.



The *Improving Water Information Programme* is providing insight by moving up the water information value ladder.

Programme objectives

The *Improving Water Information Programme* began in July 2007, funded initially for a ten-year period. In the early days the focus was on recruiting expert staff, commissioning IT hardware and software and establishing new offices and stakeholder relationships. More recently the focus has been on building and delivering quality products that meet user needs and inform decision-making across the country.

The *Improving Water Information Programme* is working to achieve the following ten objectives:

1. Establish enduring national water data sharing and licensing arrangements.
2. Develop and disseminate national water information standards.
3. Build and maintain the Australian Water Resources Information System to underpin all of the Bureau's water information products and services.
4. Collate, standardise and archive water data collected by more than 200 organisations named in the schedules to the Water Regulations 2008.
5. Support water data collecting organisations to improve the coverage, currency and accuracy of water data collected around Australia and to enable its ready transmission to the Bureau.
6. Provide the Australian public with free online access to reliable water information.
7. Analyse trends in water availability and quality across the nation, and convey this information to the public through Australian Water Resources Assessments.
8. Publicly disclose water entitlements, allocations, trades and take for all major urban and rural water supply systems in an annual National Water Account.
9. Provide effective and reliable streamflow forecasting services for high-priority water supply systems.
10. Enhance the science and technology base of the Bureau's water information products and services by supporting strategic research and development.

Answering water information questions

The wide range of water information products and services developed by the Bureau has national reach. They are freely and readily available to the public and are helping answer the following:

- How much water is available today, and how does that compare with the past?
- Who is entitled to use water, how much can they use and under what constraints?
- How much water is being traded?
- How much water is being allocated to the environment?
- How is the rate and pattern of water use changing?
- How is the quantity and quality of water in our rivers and aquifers changing?
- How much water is being lost to evaporation and leakage?
- What are the hydrologic impacts of land management changes and climate change?



1. Sharing data

Objective: Establish enduring national water data sharing and licensing arrangements.

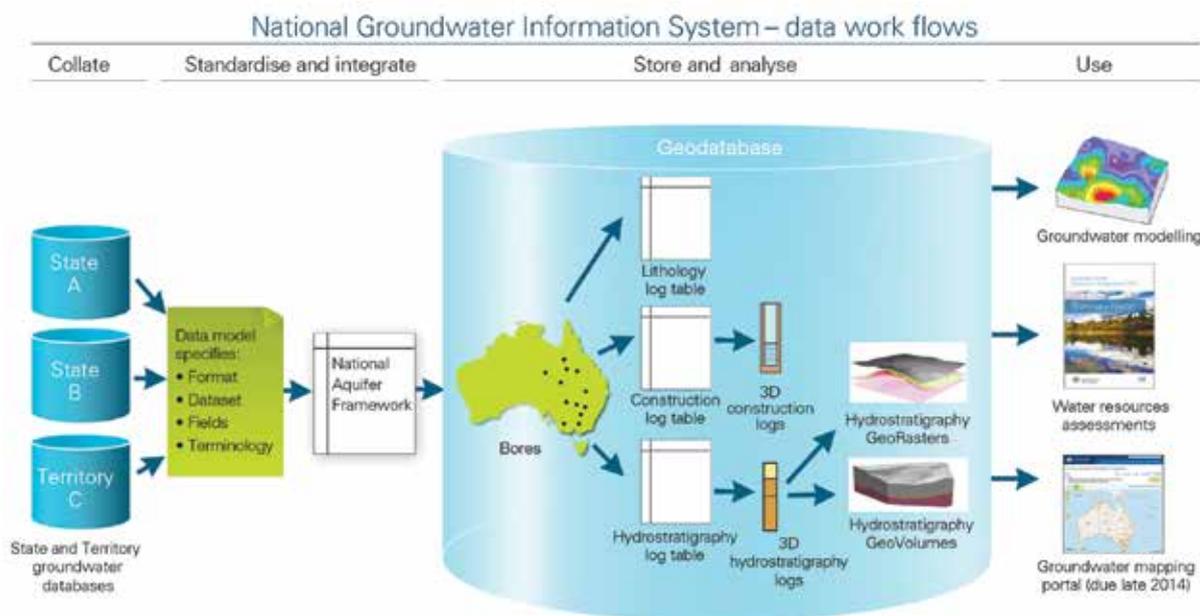
About this objective: For a national water information service to succeed, it is vital to first establish national data sharing and licensing arrangements. With more than 200 organisations collecting a piece of the national water information puzzle, coordination and cooperation are critical. For these to be robust and enduring, a national leader with a legislative mandate is required.

The *Water Act 2007* came into effect in March 2008. Part 7 of the Act empowers the Bureau to collect and publish water information. This legislation mandates that water information is shared freely as a public resource.

The Water Regulations 2008 define which organisations must give specified water information to the Bureau, and the time and format in which it must be supplied. The Regulations name more than 200 organisations that are required to give the Bureau specific water information that is in their possession, custody or control.

Progress summary

The Bureau is well advanced in achieving this objective. More than 80 per cent of data supplied to the Bureau is now in the standard Water Data Transfer Format. This allows data providers to deliver four million files of water observations to the Bureau each year. Data delivered in this format is more efficiently interpreted, ingested, and standardised within the national database.



'The Victorian Government strongly supports the Bureau's National Groundwater Information System. As the only national dataset, it is an important one-stop shop for bore information and bore log data across all borders.'

CHRIS McAULEY, ACTING DIRECTOR, GROUNDWATER AND LICENSING BRANCH,
DEPARTMENT OF ENVIRONMENT AND PRIMARY INDUSTRIES, VICTORIA

Additionally, 82 per cent of organisations providing water data to the Bureau have agreed to make this information more freely available for use under a Creative Commons Australia Attribution Licence.

In 2014, the Bureau will carry out a comprehensive review of organisations listed in the Water Regulations 2008 to ensure the list is accurate and has good coverage. The focus will be on ensuring organisations are listed in the correct categories and those with no data to provide are identified. The Bureau will continue to encourage providers to use the Creative Commons licence to ensure that data can be re-used, within certain conditions.

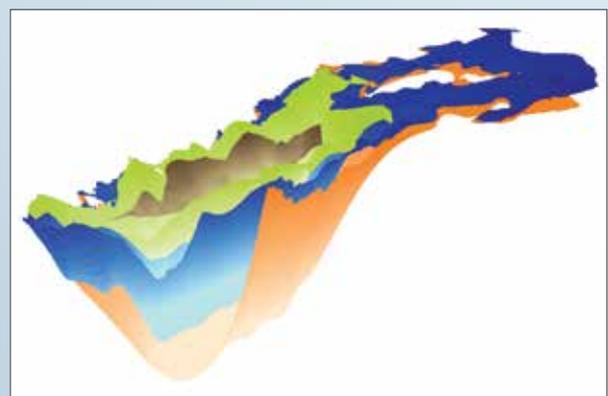
2013 achievements

- Eighty-two per cent of organisations providing data to the Bureau are doing so under a Creative Commons licence. This has simplified licencing arrangements, reduced restrictions, and significantly enhanced the usefulness of the data, which when shared by the Bureau can be used for any purpose with acknowledgment of the supplying organisation.
- Amendments made in late 2013 to the Water Regulations 2008 will result in specified organisations providing water information in 2014 to the Bureau in a form approved by the Director of Meteorology and published in an Administrative Instrument on the Bureau's website.
- The National Groundwater Information System has full national coverage with all States and Territories submitting information. It contains more than 800 000 bore sites around Australia and holds detailed information about each site, including its purpose, lithology logs, bore construction logs and hydro-stratigraphy logs. 2D and 3D aquifer geometries are available for some areas.
- Hydrogeological units within the National Groundwater Information System have been standardised using the National Aquifer Framework. This first nationally agreed system for naming and grouping sediments and rocks with similar hydraulic characteristics in Australia addresses jurisdictional differences.

- Metadata and background information requirements associated with the Water Regulations 2008 were developed in 2013. A list of metadata associated with category 2 (groundwater resource information) was shared for external review.

3D view of Daly Basin water resources

Hydrologists in the Daly Basin in the Northern Territory have a 3D picture of groundwater resources in the region thanks to a pilot study that uses the National Groundwater Information System and ArcHydro tools. More than 2000 bores in the Daly Roper Water Control District were interpreted using existing bore completion reports, technical reports, field data, and other information. The data were then used to populate the borehole log table in the National Groundwater Information System. ArcHydro tools were used to generate 3D bore lines and rasters of the interpreted hydrogeological logs and were then converted into 3D products using ArcScene. This work will build a better understanding of the existing groundwater resource and assist in the allocation of groundwater.



ArcHydro tools have been used to generate a 3D Map of hydrogeological units in the Daly Basin, Northern Territory.

2. Setting standards

Objective: Develop and disseminate national water information standards.

About this objective: Australia's water information will be improved by standardising data collection and reporting regimes. The Bureau is working closely with water agencies, researchers and expert panels to develop a range of national standards that will harmonise water data collection, analysis and reporting across the nation. Under the *Water Act 2007*, a function of the Bureau is to issue water information standards, including water accounting standards. To date, the standards released by the Bureau have been achieved by voluntary adoption.

Progress summary

Work against this objective has progressed well. The Water Information Standards Business Forum established in December 2010 is proving to be an effective platform for collaborating on producing guidelines and standards on data collection, metadata, and data quality.

The Water Data Transfer Format will continue to be developed to ensure all feasible Water Regulations 2008 data sub-categories will be able to be exchanged using the standardised format by 2017. Version 2.0 of the Water Data Transfer Format is expected to be released in 2015 and will be compatible with WaterML 2.0, the international standard for exchanging water data.

2013 achievements

- The Water Information Standards Business Forum brought 25 member organisations together in May and November 2013 to collaborate on developing consistent and national water information standards.
- The Bureau published a series of ten National Industry Guidelines, endorsed by the Forum, for hydrometric monitoring.
- Forum members agreed to a set of principles, policies and procedures for guidelines and standards development. They include a three tiered model for standards terminology which defines legislated standards (tier 1), non-mandatory standards (including national industry guidelines) (tier 2), and work practices and procedures (tier 3).
- Version 1.2 of the Water Data Transfer Format was released in late 2013 and includes the ability to encode and transmit water markets information.
- Data export tools for many types of water data management systems are available to organisations named in the Water Regulations 2008. They simplify delivery of standardised format data to the Bureau.
- The Bureau invited public comment on its draft Australian Water Accounting Standard 2 (Assurance Engagements on General Purpose Water Accounting Reports). The feedback supported the fundamental core concepts in the exposure draft and only minor changes were required. The Bureau expects to release the new standard in early 2014.

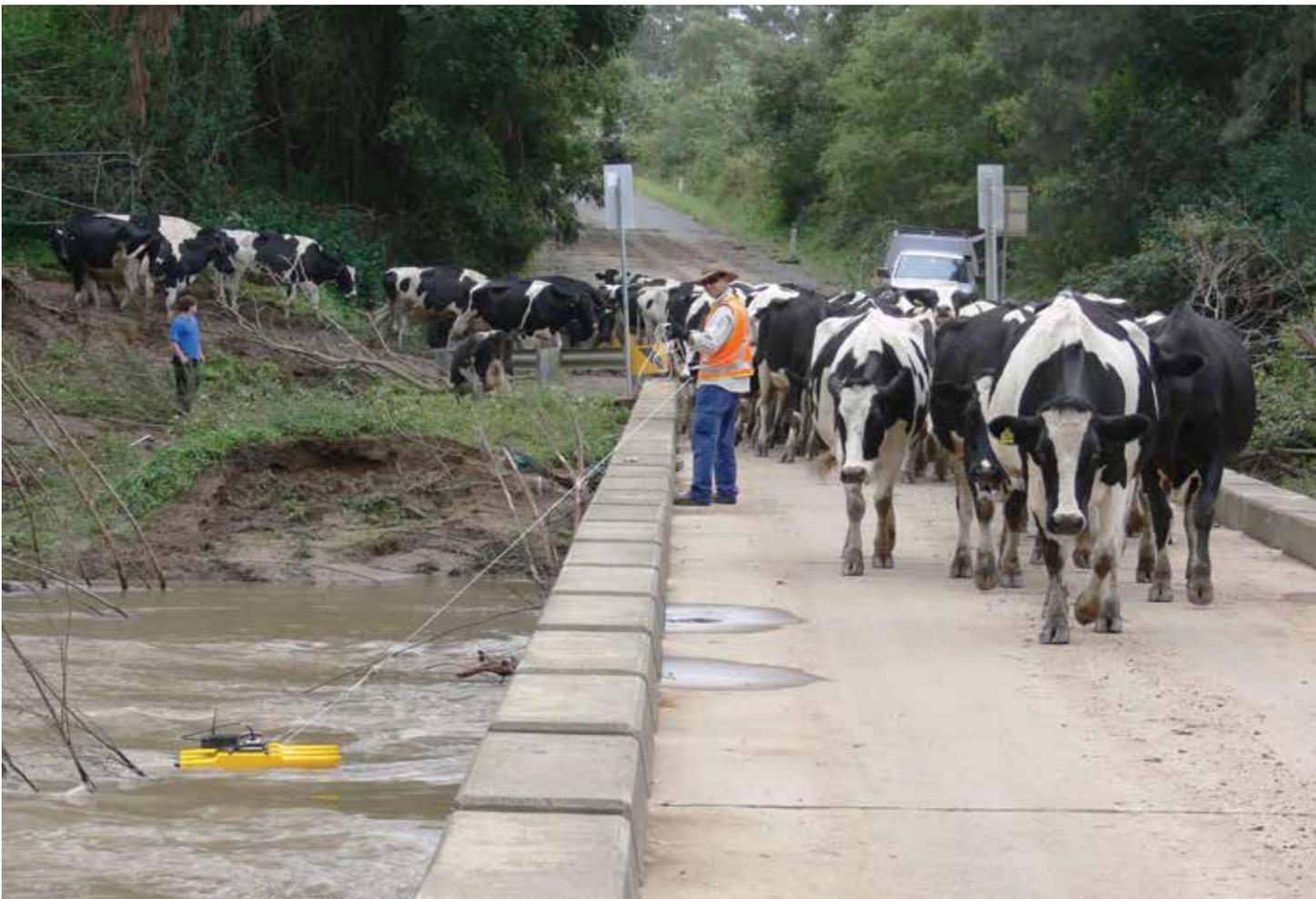
‘The Australian Hydrographers Association is proud to be involved with the Water Information Standards Business Forum and to be part of the process of developing the new National Industry Guidelines for Hydrometric Monitoring.’

WILLIAM STEEN, CHAIRMAN, AUSTRALIAN HYDROGRAPHERS ASSOCIATION

New National Industry Guidelines for Hydrometric Monitoring

The Water Information Standards Business Forum endorsed ten new hydrometric monitoring guidelines in May 2013. These guidelines, published online, can be applied to surface water level, discharge and water quality monitoring, groundwater level and water quality monitoring, and rainfall monitoring. They are aligned with Australian industry practice and provide wide-ranging practical guidance—from site establishment, instrument systems, data management and training, through to specific recommendations for applying acoustic Doppler instrumentation in a single series.

These new hydrometric monitoring guidelines could not have been produced without extensive industry input and consultation. They will improve data consistency and enable data to be more easily compared between the collecting organisations, and to be integrated by the Bureau.



Use of new acoustic Doppler current meters funded by the Modernisation and Extension of Hydrological Monitoring Systems Programme by the New South Wales Office of Water for flow measurement at Hastings River, upstream of Grafton.

3. Building systems

Objective: Build and maintain the Australian Water Resources Information System (AWRIS) to underpin all of the Bureau's water information products and services.

About this objective: The Bureau is building AWRIS to receive, ingest and standardise water data gathered from around the nation, and to deliver a range of water information products and services.

Progress summary

Work on AWRIS has been more complex than initially estimated. The Bureau is currently redeveloping AWRIS to address complexities and increase its efficiency, flexibility, scalability and improve its ability to be effectively maintained. The Bureau is confident that AWRIS will become Australia's most powerful and essential water information system.

The Bureau's immediate focus is the development of the new Water Data Online product, which will provide access to streamflow and water level data for more than 2000 monitoring sites across Australia. Water Data Online is expected to be available in mid 2014.

2013 achievements

- The Bureau coupled a time-series data management system (WISKI) to AWRIS this year to standardise and combine time-series observational data.
- Web services were developed and introduced this year for the Australian Hydrological Geospatial Fabric (Geofabric) and online mapping tools were introduced.
- The Bureau produced a pilot Geofabric (Version 3) for the Namoi and Murrumbidgee water catchments. This pilot uses high-resolution hydrology data maintained by Geoscience Australia. The data, sourced from the New South Wales State mapping agency, are combined with a national one-second (30 metre) digital elevation model developed by CSIRO under the Water Information Research and Development Alliance (WIRADA). This will provide improved river and catchment information for supporting environmental modelling activities and retaining national consistency in product scale.
- Key process improvements resulted in improved project management. A business-as-usual team established in 2011 took on responsibility for maintaining a growing number of water information systems in a co-ordinated manner. Additionally the Bureau improved its project definition and approval, monitoring and reporting processes.

'The development of the Australian Water Resources Information System in stages will allow the Bureau to release more comprehensive water information types and functions in the coming decade. This will provide high-quality information for users and decision makers.'

LAWRENCE LINGAM, DIRECTOR, OPERATIONS SERVICE, RIVER MANAGEMENT DIVISION, MURRAY-DARLING BASIN AUTHORITY

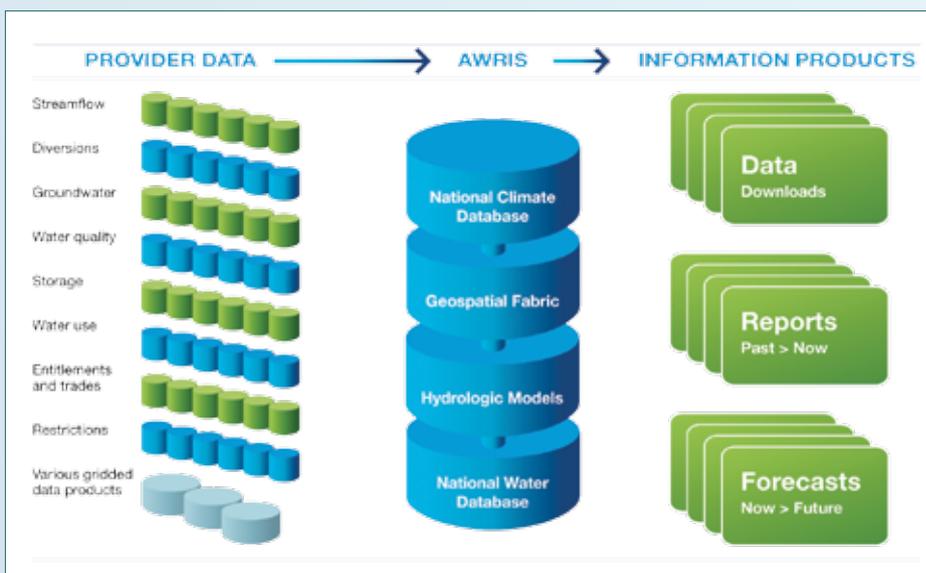
AWRIS redevelopment will improve seasonal streamflow forecasts

The redevelopment of AWRIS will deliver significant benefits for the Bureau's Seasonal Streamflow Forecast Service by giving forecasters the ability to use historical water data records alongside current observations. By spatially referencing this data, forecasters will be able to query and report streamflow data in many different ways. In particular, forecasters will be able to rapidly extract daily surface water observations to produce dynamical forecasts of seasonal streamflow. At the moment, they are restricted to using monthly total streamflow volumes with a statistical modelling framework.

Stakeholders who use the seasonal streamflow forecasts will ultimately benefit from better quality forecasts for more locations across Australia. This will help water managers and policymakers make decisions about environmental water releases, water supply operations, water restrictions, water allocation outlooks, water trading, cropping planning, hydropower operations, and recreational water availability.

AWRIS is underpinning a range of developments that will deliver significant benefits:

- integration of real-time flood monitoring network and other sources with forecasting models;
- an operational water balance model with landscape, groundwater and surface transport processes;



AWRIS is set to become Australia's most important water information system.

- an online portal with water balances of metropolitan and urban water utilities in Victoria;
- an online portal for exploring climate resilient water sources (recycled and desalination plants) and characteristics;
- an online tool for operational monitoring and reporting of key performance indicators on the AWRIS system;
- integration of groundwater (level and quality) observations received through the Water Regulations 2008 with geographic data from the National Groundwater Information System;
- web-based mapping portal with groundwater bores, including bore construction and lithology logs;
- end-to-end streamflow forecasting capability up to ten days ahead at hourly time steps; and
- end-to-end national Seasonal Streamflow Forecast Service and web products.

4. Data warehousing

Objective: Collate, standardise and archive water data collected by more than 200 organisations named in the schedules of the Water Regulations 2008.

About this objective: The *Water Act 2007* empowers the Bureau to collect water data from around the nation and to make this information freely available to the public. To ensure data flows freely to the public, the Bureau must negotiate and monitor data supply agreements, develop data management procedures and assemble teams to curate the information it stores.

Progress summary

The Bureau's data warehouse holds more than 4 billion time series observations collected and archived since the Water Regulations 2008 came into effect. Since 2008, the Bureau has received more than 23 million files from more than 200 organisations, encompassing ten data categories and 105 water parameters. More than 10 000 new water data files are added to the system each day.

The ongoing redevelopment of AWRIS has already significantly improved data ingestion. Data ingestion times have been reduced by a factor of 60.

The Bureau regularly publishes data regarding Australia's water storages, the volume and value of trading in water entitlements and allocations, water restrictions information and seasonal streamflow forecasts.



Lake Argyle on the Ord River, Western Australia | Photograph by John Carnemolla (iStockphoto).

‘The staged development of AWRIS will provide the most comprehensive source of Australian water data in one integrated platform. This will enable the Bureau to continue to release new features and functions in the coming decades for different types of its high-quality water data. This can only be of benefit to decision makers and the public alike.’

JOHN HAYES, WATER DATA SYSTEMS MANAGER, NSW OFFICE OF WATER

Over the next four years, the Bureau will continue to use AWRIS to develop new products and product-specific ‘datamarts’, while extending data ingestion to cover new versions of the Water Data Transfer Format. This information will be integrated with other Bureau datasets, such as climate and environment information.

2013 achievements

- More than 20 information technology vendors have implemented systems to transfer data to the Bureau in the Water Data Transfer Format. Five major commercial water data management systems use this national standard.
- Historical data, in some cases going back more than 100 years, has been received in the Water Data Transfer Format from all lead water agencies across Australia. The data are being updated automatically each day as new files are provided to the Bureau.
- Almost 20 new water storage sites (up from 285 to 303 this year) were added to the Water Storage webpage and iPhone application, which received between 20 000 and 60 000 unique page views each month.
- Water data was used to create a quality-controlled geospatial reference system to link monitoring point locations registered in the Geofabric with time series data from AWRIS.



The Bureau’s Water Storage product displays data from 303 sites across the country.

5. Improving observations

Objective: Support water data collecting organisations to improve the coverage, currency and accuracy of water data collected around Australia and to enable its ready transmission to the Bureau.

About this objective: Under the Water Regulations 2008, more than 200 water data providers are required to provide specified water information to the Bureau. The Australian Government's \$80 million Modernisation and Extension of Hydrologic Monitoring Systems Programme, administered by the Bureau, has equipped data providers with resources to update monitoring systems and improve data quality and delivery to the Bureau.

Progress summary

The five-year Modernisation and Extension Programme is complete, with the final round finishing in 2012. This substantial investment to modernise and upgrade water resource monitoring networks across the country enabled the completion of 463 projects and assisted many organisations to provide data to the Bureau.

Organisations were funded to set up systems and processes so that they can export data to the Bureau using the Water Data Transfer Format.

The Bureau will continue to benefit from this investment in the years to come. The Modernisation and Extension Programme has enabled the Bureau to efficiently receive and process large volumes of water data each day for important water information products such as the National Water Account and the Australian Hydrological Geospatial Fabric.

2013 achievement

All financial acquittals for each project funded under the Modernisation and Extension Programme were completed in 2013.

Streamflow network upgrade in Tasmania delivers ongoing benefits

Extremely reliable, accurate and timely streamflow data across Tasmania was made possible with Modernisation and Extension Programme funding and the Bureau's assistance. A \$2.3 million investment over the past five years has enabled the Tasmanian Department of Primary Industries, Parks, Water and Environment (the Department) to update its entire network of 87 streamflow stations throughout the State.

Since the installation of the new monitoring systems, there have been no data logger failures. Telemetered data is returned reliably to the Tasmanian

Government's database and all sensors are returning accurate data with minimal failure rates. This rationalisation means the Department does not have to carry a large number of spare instruments.

All of the Department's high stage-flow measurement facilities (travellerways and cableways) were upgraded to new assemblies. This has resulted in much more user-friendly, efficient and reliable infrastructure at each site throughout Tasmania.

The Modernisation and Extension Programme set-up new crosslines across the network to enable the use of new technology acoustic Doppler instruments

‘The Department is extremely grateful for the Bureau’s investment in our stream gauging network. We believe we are returning more accurate, reliable and timely data. This will allow water industry entities and individuals to make important decisions about water-related matters with confidence when using our data.’

JEFFREY CHAMBERLAIN, SECTION HEAD, WATER MONITORING,
DEPARTMENT OF PRIMARY INDUSTRIES, PARKS, WATER AND ENVIRONMENT, TASMANIA

Overview of Modernisation and Extension Programme funding from 2007–2012

Type of funding	Total funding (millions)	Percentage of total funding	Number of projects
Equipment and networks. This includes all investment in improving coverage, currency and accuracy. It includes upgrades and new equipment and projects focused on improving bathymetry and flow ratings.	\$39.69	50.8%	228
Data management systems. This includes investment related to Water Data Transfer Format	\$15.17	19.4%	109
Data (quality assurance/quality control)	\$1.34	1.7%	6
Data rescue	\$2.22	2.8%	12
Australian Hydrological Geospatial Fabric and the National Groundwater Information System. This includes investment in improving site position information, survey benchmarks and other spatial data projects.	\$10.15	13.0%	43
Water accounting	\$3.30	4.2%	18
Coordination	\$4.54	5.8%	29
Standards	\$1.52	1.9%	14
Hydrographic training	\$0.17	0.2%	4
	\$78.10		463

General notes

All \$ are excluding GST and based on funds allocated in funding deeds.

for measuring streamflow. This new equipment has allowed the Department to capture more accurate flow measurements in significantly less time compared with traditional meter methods. This has allowed field hydrographers to capture flow information at many more sites than previously possible during flood events.

Significant safety upgrades to site platforms and staircase infrastructure have reduced potential risk and injury to staff carrying out field work, often in steep and slippery locations and all types of weather.

Travellerway upgrade in Prosser River, upstream of Lower Dam, Tasmania, funded through the Modernisation and Extension Programme.



6. Publishing information

Objective: Provide the Australian public with free online access to reliable water information that is readily understood.

About this objective: The Bureau is striving to ensure that most of Australia's water information is freely and publicly accessible, and to package it in a way that maximises its value. This will not only assist water managers and policymakers to do their jobs more effectively, it will help to satisfy the needs of water-dependent businesses, farmers, industry, educators and the general community.

Progress summary

The Bureau has successfully increased its suite of freely available water information far beyond flood forecasting, which was the only Bureau water information service prior to the inception of the *Improving Water Information Programme* in 2007.

The water information website has been successfully developed to house a thorough suite of data, reports, forecasts, products and services. It receives over a million unique visits each year.

While some progress in publishing slowed this year due to the redevelopment of the Australian Water Resources Information System, we expect to accelerate publishing in the year ahead.

The Bureau will continue to improve and expand its suite of water information products and services over the next four years with a particular focus on accessibility and meeting user needs. For example, following this year's release of the updated Intensity–Frequency–Duration Design Rainfalls product in strong partnership with Engineers Australia, work has already begun working on the next phase of this five-year revision project. In the next two years, the Bureau will further extend the product, including sub-annual Intensity–Frequency–Duration Design Rainfalls, which are used in stormwater designs.

2013 achievements

- The Bureau published new Water Restrictions information on its website to give users access to current water restrictions for the whole of Australia. Water restrictions can be searched by State or Territory, water agency, and restriction name.
- A secure portal was developed for urban water agencies to report their current water restrictions, as they are required, under Category 8 of the Water Regulations 2008, to alert the Bureau of any changes. The changes submitted are then reflected on the Water Restrictions website.
- Users can visit a new groundwater webpage which clearly details the Bureau's important work in this area and explains our suite of groundwater products and various reports which include groundwater information.
- Phase 1 of the new Water Data Online product has begun, with lead water agencies reviewing the representation of their water data prior to the planned public release in 2014. This product will publish a wide range of current and historical streamflow and water level data collected under the Water Regulations 2008. Over time this will be expanded to other water data categories.
- The Bureau signed an agreement with the Murray–Darling Basin Authority to provide it with Water Regulations 2008 data in 2014 for use in the Murray–Darling Basin Plan reporting and assessment processes.

‘The Intensity–Frequency–Duration Design Rainfalls product team has done a great job on this product—we are getting pressure to use it for mitigation projects for major floods worth about \$200 million.’

MARTIN FIDGE, SENIOR HYDROLOGIST, DEPARTMENT OF PLANNING, TRANSPORT AND INFRASTRUCTURE, SOUTH AUSTRALIA

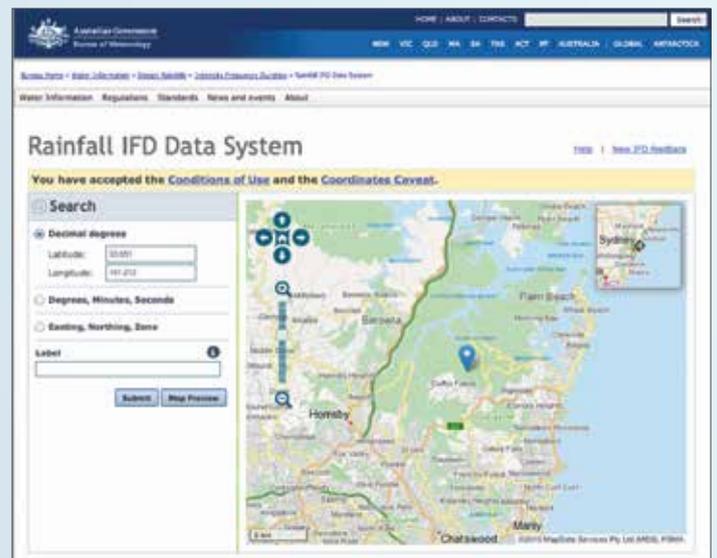
New rainfall estimates

The new Intensity–Frequency–Duration Design Rainfall product was released on the Bureau’s website on 1 July 2013. These new estimates are based on a more extensive database, with at least 30 years of additional rainfall data and data from 2300 extra rainfall stations. Most of the new data used was provided to the Bureau by water agencies under the Water Regulations 2008.

Contemporary statistical analyses and techniques are combined with the expanded rainfall database to provide more accurate design rainfall estimates for Australia. This update forms part of the revision to the Engineers Australia Australian Rainfall and Runoff guidelines on design flood estimation.

Until other design flood inputs have been revised, the new estimates can only be used for sensitivity analyses in new design flood studies and for revised regional flood frequency analysis.

The previous estimates can still be used for existing design flood studies and probabilistic rational methodology.



The updated Intensity–Frequency–Duration Design Rainfall website.



Confluence of Murray and Darling rivers at Wentworth, New South Wales | Photograph by Ashley Whitworth.

7. Assessing water resources

Objective: Analyse trends in water availability and quality across the nation and convey this information to the public through Australian Water Resources Assessments.

About this objective: The Bureau will publish Australian Water Resources Assessments periodically to describe changes in the availability, condition and use of Australia's water resources. The assessments require detailed climatologic and hydrologic analyses to be undertaken on 13 hydrologic regions spanning the whole continent.

Progress summary

The Australian Water Resources Assessment 2012 was published this year and covers the period from July 2011–June 2012.

The 2012 Assessment extended the content presented in the 2010 Assessment by including additional background information and more about surface water, groundwater, urban and agricultural water systems throughout Australia, as well as streamflow salinity analyses.

This follows the 2010 Assessment which covered July 2009–June 2010 and built upon earlier assessments undertaken by various Australian Government agencies and partners at irregular intervals over the past 50 years. Those prior assessments varied greatly in terms of method and quality, and generally suffered from discontinuities at jurisdictional borders.

Further improvements are planned for the 2014 Assessment and future assessments, including improved data processing and better online publishing. The Bureau is investigating more frequent reporting.

2013 achievements

The *Australian Water Resources Assessment 2012*, enhanced and published this year, delivers a nationally consistent:

- landscape water balance model that provides estimates for landscape water flow, evapotranspiration, and streamflow;
- assessment and analysis that provides trend and anomalies for streamflow salinity, groundwater, surface water, urban water supply and use, agricultural water use, and wetlands flow; and
- more background information that provides a single textbook (point of access) for regional information on land use, population, soil types, physiographic regions, rainfall zones, and rainfall deficits.

The 2012 Assessment also delivers:

- more than 400 maps; and
- improved and more consistent content for 13 regional chapters which provide snapshots of the state of water availability and use.

The Assessment, as well as all water data and model outputs used in the maps, graphs and tables are freely available on the Bureau's website.

'The Australian Water Resources Assessment 2012 report is used daily by government staff to build their knowledge of water resource availability in Australia.'

PETER BAKER, PRINCIPAL SCIENCE ADVISOR, THE AUSTRALIAN GOVERNMENT DEPARTMENT OF THE ENVIRONMENT

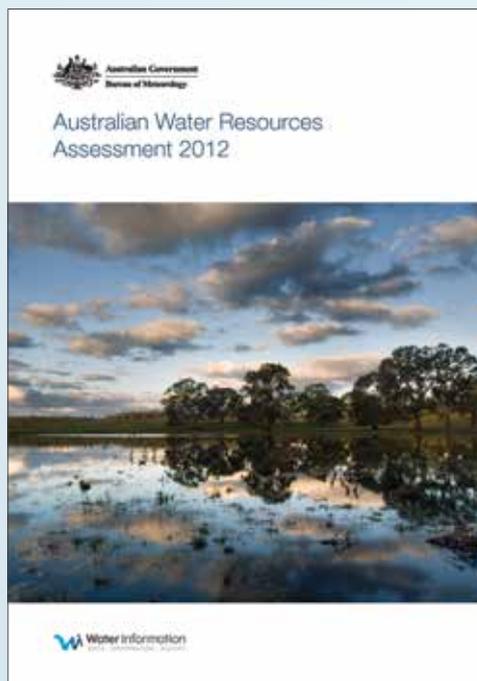
‘The Assessments have been used, and are proving to be a valuable resource, in Australian sustainable water management courses covering irrigation, urban water and climate themes.’

TREVOR PILLAR, NATIONAL PARTNERSHIPS MANAGER,
INTERNATIONAL CENTRE OF EXCELLENCE IN WATER RESOURCES MANAGEMENT (ICE WARM), AUSTRALIA

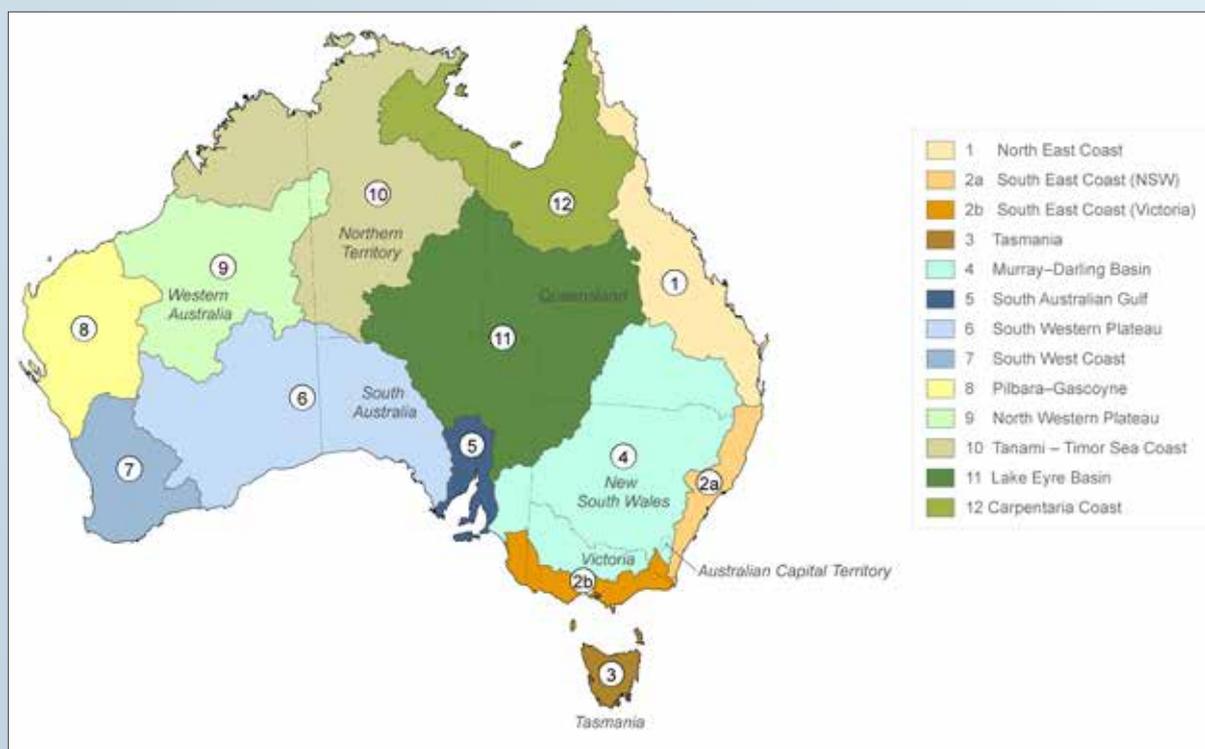
Water assessments saving client time and money

Targeted information provided by the Australian Water Resources Assessments is saving Melbourne consultancy HydroNumerics considerable time and resources. They are using evaporative loss estimates from the Assessments for its hydrodynamic and water quality modelling projects. In particular, HydroNumerics has been able to redress water balance problems in the Nagambie Lakes system in Victoria by adding estimated losses back to inflows in the model. This resulted in significant performance improvements, evidenced by improved accuracy when compared with the measured height of water at Nagambie Weir.

The consultancy plans to continue to use evaporative loss estimates provided by the Australian Water Resources Assessments to support their clients.



The *Australian Water Resources Assessment 2012* report.



Australian Water Resources Assessment 2012 reporting regions.

8. Accounting for water

Objective: Publicly disclose water entitlements, allocations, trades and take for all major urban and rural water supply systems in an annual National Water Account.

About this objective: As competition for water resources intensifies, it is more important than ever to account for how water is managed across Australia in a transparent and rigorous way. Water accounting is the systematic process of identifying, recognising, quantifying, reporting and assuring information about water, the rights or other claims to water, and obligations against that water.

The *Water Act 2007* requires the Director of Meteorology to annually publish a National Water Account. The account provides information for water resources planning, water market design and regulation, investment decisions, environmental management, and community dialogue about the management of water. Over time, it is expected that the National Water Account will form the knowledge base for building policies and management decisions that enhance the integrity of the water entitlement system.

Progress summary

The Bureau's annual National Water Account has developed into Australia's most comprehensive water information report, covering nine significant water use areas that are home to more than 70 per cent of the population.

The scope and format of the report has expanded since the first account was released in 2010. Improvements have been made in response to user feedback and extensive stakeholder consultation.

The National Water Account discloses information about water stores and flows, water rights and water use. It reports on the volumes of water traded, extracted, and managed for economic, social, cultural and environmental purposes.

Over the next few years, the Bureau will continue to further enhance the report by expanding geographic coverage, improving the timeliness of publication, and addressing information gaps to ensure stakeholder and user needs continue to be met.

2013 achievements

- The *National Water Account 2012*, which covers June 2011–July 2012, was published earlier than previous years due to improved Bureau processes and systems. This was made possible by highly productive relationships with reporting partners.
- The Daly region in the Northern Territory was added to the 2012 Account. This important tropical area is under considerable development pressure and has significant environmental and cultural water value. The Daly region report includes background information and summarises how documented Indigenous cultural values and needs are addressed in the water sharing process. This reporting approach will provide a basis for future reporting on Indigenous cultural values in other regional reports.
- The 2012 Account published a range of new information, including regional overviews, a national summary, and a companion guide.

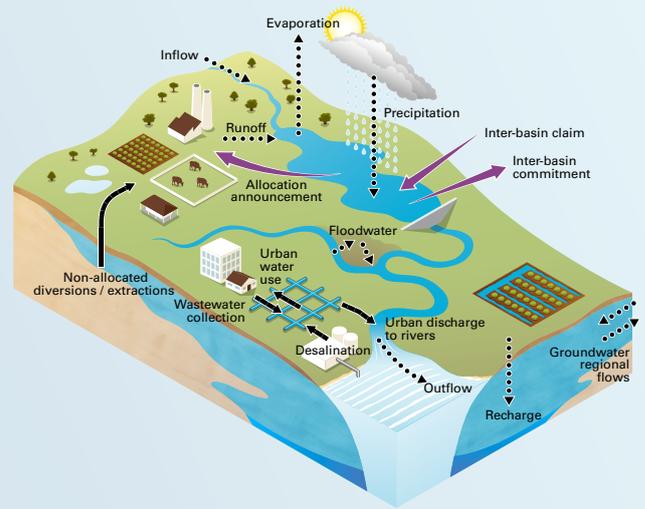
‘We need something like Australia’s National Water Account which quantifies the state of the water system each year in critical regions and how it’s changing over time. Australia integrates and standardises information on water across the country. We need this in Texas which has been experiencing drought conditions in most regions for the past three years.’

DR DAVID MAIDMENT, PROFESSOR OF CIVIL ENGINEERING, CENTER FOR RESEARCH IN WATER RESOURCES, UNIVERSITY OF TEXAS

Focusing on stakeholder and user needs

Feedback from stakeholders and users guided a range of improvements to the 2012 Account. This resulted in the following new information which has improved the product’s useability:

1. Understanding – a new companion guide provides a written and schematic overview of the concepts which shape the National Water Account. It describes how the physical environment is conceptualised, the way water accounting regions are defined, and what makes up the water assets and water liabilities of the region.
2. Overview – new regional overviews highlight the climate, surface water storage, urban water supply and irrigation supply for each region. The overviews provide links to different sections of the region report for users interested in more detailed data.
3. Summary and comparison – for the first time, a national summary highlights broad trends and findings across the nine reporting regions. It summarises the major water initiatives, water access and entitlements, and water trade across the country.



Legend

Physical water assets	Water users	Water not counted as a water asset of the region
Surface water	Agriculture	Sea
Extractable groundwater	Industry	Off-channel water storage
Urban water system water	Stock and domestic	Flood water out of channel
Irrigation scheme water	Business and household	Soil moisture
Water transactions		
Water abstraction, transfer, return after use		
Natural water flow		
Accrual transactions (non-physical water)		
		Non-extractable groundwater

A graphic representation of the National Water Account’s *Statement of Changes in Water Assets and Water Liabilities* from the new National Water Account Companion Guide.



Gulpa Creek in the Murray–Darling Basin, New South Wales | Photograph by David Kleinert.

9. Forecasting flows

Objective: Provide effective and reliable streamflow forecasting services for high priority water supply systems.

About this objective: Greater demand for timely and accurate water availability forecasts has prompted the Bureau to expand its services to include continuous short-term streamflow forecasts (up to ten days ahead) and seasonal streamflow forecasts (up to three months ahead). The Bureau's seasonal and short-term streamflow forecasting services are expected to be valuable tools for managing water. This timely information will be used for managing water allocations, meeting water demand, providing environmental water, and managing scarce water resources during droughts.

Progress summary

The Seasonal Streamflow Forecast Service, which issues monthly forecasts and looks three months ahead, has expanded from 21 locations in 2010 to 70 locations in 2013.

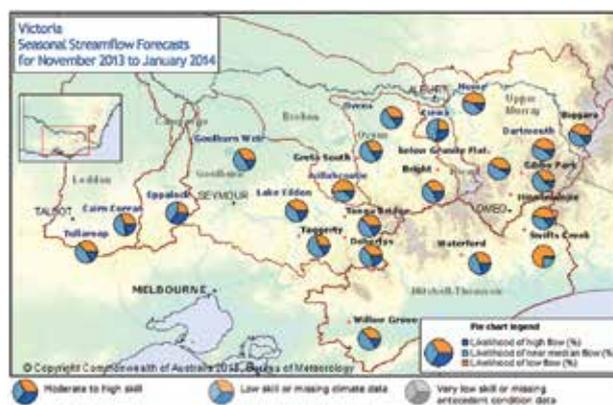
According to a stakeholder survey completed in late 2013, the forecasts are helping users make important decisions around water restriction levels, water markets, water allocation outlooks, scheduled environmental watering, scheduled irrigation and the management of river operations.

The short-term Streamflow Forecast Service website was made available to registered users in late 2011. It is the first service of its kind in Australia that delivers streamflow forecasts at hourly time steps out to ten days ahead. An additional ten catchments were added in November 2013 and the Bureau expects to start publishing forecasts for a further 50 catchments in 2014.

The Bureau is investigating up to 221 new streamflow locations across Australia to track climate-driven long-term streamflow changes. It is working on long-term water availability impacts at these stations using climate change projections in the recently released *Intergovernmental Panel on Climate Change Fifth Assessment Report*.

2013 achievements

- The expanded Seasonal Streamflow Forecast Service now provides three-month forecasts of total streamflow volumes in Queensland, New South Wales, Victoria, the Australian Capital Territory, and the Northern Territory.
- The Bureau has confirmed its approach to deliver new short-term streamflow services by developing hydrological models for 11 catchments throughout Australia, including the Ord River in Western Australia, the Onkaparinga River in South Australia, the South Esk River in Tasmania, the Cotter River in the Australian Capital Territory, the Stanley River in



The Bureau's Seasonal Streamflow Forecasts website.

‘It’s very impressive what you’ve achieved. Hopefully the Hydrologic Reference Stations will still be standing long after we all retire, because they’re one of those projects with the potential to create a genuine enduring legacy.’

BRAD NEAL, PRACTICE LEADER – WATER RESOURCE PLANNING, SINCLAIR KNIGHT MERZ

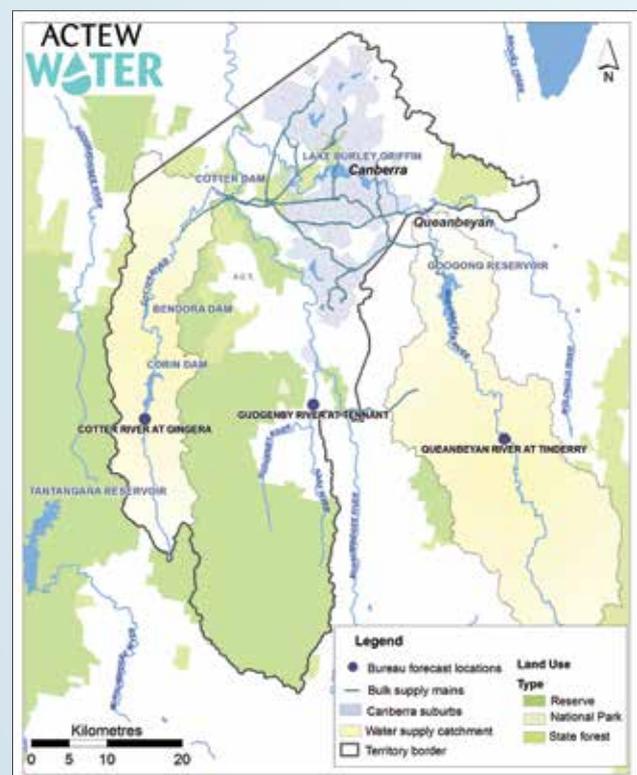
- Queensland, the Ovens and Watts rivers in Victoria and Goobarragandra, Macleay, Upper Murray, and Wollondilly rivers in New South Wales. These new services were released to registered users on 15 November 2013.
- The Hydrologic Reference Stations website portal was formally launched in June 2013 following its release in December 2012. This product publishes streamflow reference stations status information and trends, as well as about 13 000 graphical products and daily streamflow data. Researchers use data from these stations to test new hypotheses and develop and test new models and tools.

- The Bureau has begun producing experimental forecasts for monthly and three-monthly streamflows at 50 locations using a dynamical modelling approach. This new approach will be applied to up to 150 locations in 2014 and 250 locations in 2015. The dynamical forecasts will be merged with the current statistical forecasts. The upgraded forecast products are scheduled for release in late 2014.

Seasonal forecasts helped remove water restrictions

In spring 2010, ACTEW Water was considering whether water storage levels had increased enough to remove temporary water restrictions before summer. However, due to the large variability in historical climate data, a small but significant number of scenarios indicated that water storages would remain below the level needed to keep restrictions in place during the summer of 2010–11.

To assist ACTEW Water, the Bureau converted some experimental seasonal streamflow forecasts into water storage forecasts and overlaid them onto the historic reference period. The new forecast was less variable than the historical reference period. Importantly, the forecast storage outcomes did not indicate that water storage would decline below the level needed to keep restrictions in place. In fact, the forecast showed a high chance of increased water storage which provided ACTEW with the confidence to remove temporary water restrictions in October 2010.



This shows the ACT reservoir catchment areas (yellow), urban supply system for Canberra/Queanbeyan (pale blue) and ACTEW Water reticulation (aqua). The Bureau provides seasonal streamflow forecasts upstream of the Cotter Dam and Googong Reservoir (gauges shown in dark blue).

10. Research and development

Objective: Enhance the science and technology base of the Bureau's water information products and services by supporting strategic research and development.

About this objective: The Bureau invests in research and development to ensure that its new water information role is supported by the best available science and technology. We invest primarily through our water information alliance with CSIRO, the Water Information Research and Development Alliance (WIRADA). Other important research and development collaborations exist with eWater, the Centre for Australian Weather and Climate Research, the University of Melbourne, University of Adelaide and the University of Newcastle.

Progress summary

Since its establishment in 2008, WIRADA has delivered much of the high-quality science needed to assist the Bureau to fulfil its national water information mandate.

WIRADA has overcome the challenges of a new business and operational environment and is helping the Bureau develop new national datasets, standards, analysis methods, and information management tools.

Since the programme's inception WIRADA has supported the delivery of the following products:

- Water Data Transfer Format;
- Australia's first Seasonal Streamflow Forecast Service;
- continuous, more accurate and reliable flood and short-term streamflow forecasts;
- an integrated system for water balance assessments;
- a high resolution, Australia-wide digital elevation model; and
- a sophisticated information model that underpins the Australian Hydrological Geospatial Fabric (Geofabric).

Over the next four years, the Bureau will focus on business priorities that address water data management and quality, the ability of systems to work together so they can exchange data, integrated surface water and groundwater assessment, and seamless water forecasting across different outlook periods.

2013 achievements

- WIRADA has enabled the Bureau to combine statistical and dynamical modelling methods to produce merged seasonal streamflow forecasts. This provided end-users with a single set of forecasts.
- Remotely-sensed soil-moisture data were included into the rainfall-runoff probability distributed model, which provides input into improved short-term streamflow predictions.
- Gridded sub-daily rainfall forecasts are being produced for sub-regions of Queensland and south eastern Australia, which provide key input to future flood and short-term streamflow forecasting. These forecasts are supported by blended high-resolution regional forecast model outputs and lower-resolution global model outputs. They comprise 50 model outputs with hourly output at 2 km resolution and a forecast period out to seven days.

‘The Water Information Research and Development Alliance [is] a great success and has been pivotal to underpinning and enabling a fundamental leap in water information provision across the nation.’

WIRADA EXTERNAL REVIEW PANEL, 2013

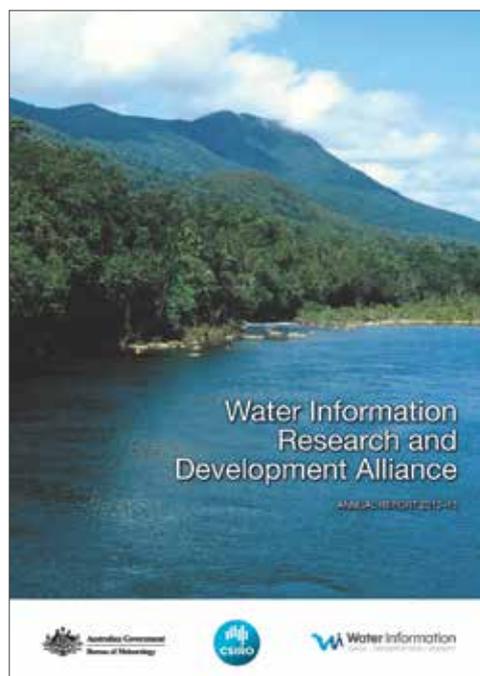
- WIRADA developed and transferred a new version of the integrated Australian Water Resources Assessment modelling system to the Bureau, which enables faster run times and lower maintenance overheads.
- The Bureau began standardising the exchange of ratings, gaugings and river cross-section information through WIRADA. An Open Geospatial Consortium discussion paper was released and an Interoperability Experiment to test the developing standard began. This work should lead to release of an Open Geospatial Consortium WaterML 2.0: Part 2 standard in 2015.
- Research teams at the University of Newcastle and the University of Adelaide have developed an advanced model calibration method known as Bayesian Total Error Analysis. The Bureau uses this method as a key component in a fully automated system for the Seasonal Streamflow Forecast Service.

Digital elevation model: mapping the continent in fine detail

A new digital elevation model provides unprecedented detail of Australia’s continent and is supporting the Bureau’s hydrological applications. Produced by WIRADA researchers, the high-resolution Australia-wide digital elevation model is based on one-second (~30 m resolution) shuttle radar topographic mission data. The model is helping increase the understanding of how the shape of Australia’s land surface influences the volume and distribution of water resources. It is helping the Bureau provide more accurate and credible assessments of national water resources and annual water accounts. Three-dimensional visualisations of the landscape will help improve the understanding of potential flood extents and impacts.



Groundwater monitoring point on the Queanbeyan River, Australian Capital Territory | Photograph by Lynton Crabb.



WIRADA 2012–13 Annual Report.

Stakeholder consultation

Jurisdictional Reference Group on Water Information

The Jurisdictional Reference Group on Water Information is the primary vehicle for coordinating the Bureau's water information activities with those of the States and Territories. It comprises representatives of the lead water agencies in each jurisdiction and delegates from some major water utilities. It provides a forum for members to articulate water information priorities in their jurisdictions and provide feedback to the Bureau on its various water information products and services.

Membership in 2013:

- **Graham Hawke**, Bureau of Meteorology (Chair)
- **Goran Alibegovic**, Department of Water, Western Australia
- **Ray Boyton**, Office of Water, New South Wales
- **Ben Bruce**, Department of Environment, Water and Natural Resources, South Australia
- **Greg Carson**, Hydro Tasmania
- **Stewart Chapman**, Department of Territory and Municipal Services, Australian Capital Territory
- **Matt Darcey**, Department of Land Resource Management, Northern Territory
- **Tino Galati**, Water Corporation, Western Australia
- **Lawrence Lingam**, Murray–Darling Basin Authority
- **Greg Long**, Department of Natural Resources and Mines, Queensland
- **Paul Pendlebury**, Office of Water, New South Wales
- **Martin Read**, Department of Primary Industry, Parks, Water and Environment, Tasmania
- **Bruce Rhodes**, Melbourne Water
- **Adrian Spall**, Department of Environment and Primary Industries, Victoria
- **Damien Venema**, SA Water Corporation
- **Brent Williams** (replaced Fraser MacLeod), Murray–Darling Basin Authority

Meetings held in 2013:

- 23–24 May 2013
- 28–29 November 2013

National Water Account Committee

National Water Account Committee provides strategic advice on all aspects of the National Water Account, guides the collaborative development of the account, and provides advice on alignment to user needs.

Membership in 2013:

- **Louise Minty/Grace Mitchell** (Chair), Bureau of Meteorology
- **Bill Allen**, Australian Bureau of Statistics
- **Clarke Ballard**, Irrigation Australia (resigned mid 2013)
- **Stewart Chapman**, Environment and Sustainable Development Directorate, Australian Capital Territory
- **Tanja Cvijanovic/Tim Fisher**, Department of the Environment
- **Matt Darcey**, Department of Land Resource Management, Northern Territory
- **Peter Gee**, Water Services Association of Australia
- **Karin Geraghty**, Department for Environment, Water and Natural Resources, South Australia
- **Fraser MacLeod**, Murray–Darling Basin Authority
- **David Nicholls**, Department of Primary Industries, Parks, Water and Environment, Tasmania
- **Paul Pendlebury**, Office of Water, New South Wales
- **Lindsay Preece**, Department of Water, Western Australia
- **Murray Radcliffe**, National Water Commission
- **Adrian Spall**, Department of Environment and Primary Industries, Victoria
- **Lloyd Taylor**, Department of Natural Resources and Mines, Queensland

Meetings held in 2013:

- 20 February 2013
- 26 June 2013
- 13 November 2013

Standards Business Forum

The Standards Business Forum brings key water industry representatives together with the Bureau to inform the development of water information standards.

Membership in 2013:

- Bureau of Meteorology (Chair)
- Australian Hydrographers Association
- CSIRO
- Department of Environment and Primary Industries, Victoria
- Department of Environment, Water and Natural Resources, South Australia
- Department of Finance and Services, Manly Hydraulics Laboratory, New South Wales
- Department of Land Resource Management, Northern Territory
- Department of Natural Resources and Mines, Queensland
- Department of Primary Industries, New South Wales
- Department of Primary Industries, Parks, Water and Environment, Tasmania
- Department of Resources, Energy and Tourism
- Department of Science, Information Technology, Innovation and the Arts, Queensland
- Department of Water, Western Australia
- Environment and Sustainable Development Directorate, Australian Capital Territory
- Hutchinson Software
- Hydro Tasmania/Entura
- Kisters Pty Ltd Australia
- Melbourne Water
- Murray–Darling Basin Authority
- Office of Environment and Heritage, New South Wales
- Office of Water, New South Wales
- Queensland Water
- Snowy Hydro Ltd
- Standards Australia
- Sydney Water
- Water Corporation, Western Australia

Meetings held in 2013:

- 30 May 2013
- 14 November 2013

Flood warning consultative committees

In each State and the Northern Territory, flood warning consultative committees meet regularly on a three to six-month time frame. These committees comprise representatives of key stakeholders such as emergency managers, water authorities, local government and catchment management authorities. Meetings cover a broad spectrum of items ranging from network issues to service needs. In the Northern Territory, a similar group is called the Flood Warning Working Group.

Meetings held in 2013

- New South Wales: 23 August 2013
- Northern Territory: 13 February and 17 September 2013
- Queensland: 25 June, 21 July and 6 December 2013
- South Australia: 27 November 2013
- Tasmania: 19 July 2013
- Victoria: 20 December 2013
- Western Australia: 12 September 2013

National Flood Risk Advisory Group

The need for a national forum on flood risk management was first formally identified in 2004 following a national flood risk management workshop in Victoria. The inaugural meeting of the National Flood Risk Advisory Group was held at Geoscience Australia in Canberra in November 2005. The group was made a sub-committee of the then Australian Emergency Management Committee when it became clear that there should be a conduit to that committee. The Secretariat role for the National Flood Risk Advisory Group is provided by the Australian Government, through Geoscience Australia and the Bureau.

The group works to strengthen the nation's resilience to floods by providing strategic leadership and advice on best practice for flood risk management. It brings together representatives from each jurisdiction who are actively involved in flood risk management.

> STAKEHOLDER CONSULTATION

Together they progress issues to improve the resilience of the Australian community to flooding. They became a reference group of the National Emergency Management Committee in 2010 when the Australian Emergency Management Committee ceased to exist.

Membership in 2013:

- **Miriam Middelman-Fernandes**, Geoscience Australia (Secretariat)
- **Soori Sooriyakumaran**, Bureau of Meteorology (Secretariat)
- **Chrissie Bloss**, Department of Environment, Water and Natural Resources, South Australia
- **Rick Bretnall**, Department of Water, Western Australia
- **Belinda Davies**, Australian Fire and Emergency Service Authorities Council
- **Ian Dinham**, Australian Local Government Association
- **Mike Edwards**, Department of Environment and Primary Industries, Victoria
- **Tony Graham**, ACT Emergency Services
- **John Handmer**, RMIT University
- **Andrew Lea**, Tasmanian State Emergency Service
- **Duncan McLuckie**, Office of Environment and Heritage, New South Wales
- **Jeff Perkins**, Bureau of Meteorology
- **Ed Pikusa**, National Emergency Management Committee Risk Assessment Measurement and Mitigation Sub-committee
- **Lakshman Rajaratnam**, Department of Land Resource Management, Northern Territory
- **Mark Saunders**, Department of State Development, Infrastructure and Planning, Queensland
- **Jane Sexton**, Geoscience Australia
- **Karl Sullivan**, Insurance Council of Australia
- **Ron de Veer**, Australian Building Codes Board
- **Caroline Walker**, The Treasury
- **Samantha Ward**, Attorney-General's Department

Meetings held in 2013:

- 8 February 2013
- 27 May 2013

National Groundwater Information System Steering Committee

The National Groundwater Information System Steering Committee provides advice on developing and implementing the national groundwater information initiative. This includes endorsing the National Groundwater Information System work plan and budget, and periodically evaluating the project. The Steering Committee is supported by a Technical Reference Group (TRG).

Membership in 2013:

- **Tony Boston** (co-Chair), Bureau of Meteorology
- **Matt Kendall** (co-Chair) (alternative: Kerry Olsson), National Water Commission
- **Peter Baker**, Department of the Environment
- **Barry Croke**, Australian National University
- **Neal Evans**, Geoscience Australia
- **Chris McAuley** (TRG representative), Department of Environment and Primary Industries, Victoria
- **Murray Radcliffe** (alternative Lexie Johnson), National Water Commission

Meetings held in 2013:

- 14 May 2013
- 22 November 2013

Expert panels

The Water Accounting Standards Board

The Water Accounting Standards Board is an independent advisory board to the Bureau. It works with the water industry to develop consistent standards for water accounting.

- **Members 1 January 2013–30 June 2013:** Mike Smith (Chair), W Peter Day, Denis Flett, Professor Jayne Godfrey
- **Members 1 July 2013–31 December 2013:** W Peter Day (Chair), Professor Jayne Godfrey, Garry Smith, Simon Taylor (three year appointments)

The Board has an agreement with the Auditing and Assurance Standards Board to develop an assurance standard for general purpose water accounting.

Meetings held in 2013:

- 20 May 2013
- 9 August 2013
- 11 October 2013
- 23 December 2013

Australian Hydrological Geospatial Fabric (Geofabric) Steering Committee

The Geofabric Steering Committee provides strategic guidance on technical direction, adoption and government policy with the aim of making the Geofabric the authoritative register and source of information about Australia's surface and sub-surface water features.

Members:

- **Tony Boston** (Chair), Bureau of Meteorology
- **Simon Costello**, Geoscience Australia
- **Michael Hutchinson**, Australian National University
- **David Lemon**, CSIRO
- **Paul Sheahan**, Bureau of Meteorology
- **Andrew Woolf**, Bureau of Meteorology

Meetings held in 2013:

- 3 June 2013
- 15 September 2013

The Geofabric Project Management Group

The Geofabric Project Management Group is the main forum for the project partners, the Bureau (Chair), CSIRO, the Australian National University and Geoscience Australia. The group provides scientific and expert knowledge, monitors progress and resolves issues.

Members: Matthew Brooks (Chair), representatives of the Bureau, and Geofabric partner organisations.

Meetings were held every month in 2013.

Conferences

The Water Information Programme actively participated in the significant conferences listed below. The Bureau submitted technical papers, staffed trade stands and provided financial support via event sponsorship.

- Ozwater13, Perth, 7–9 May 2013
- Floodplain Management Association National Conference, Tweed Heads, 29–31 May 2013
- Stormwater Industry Association of Queensland Conference, Townsville, 14–15 August 2013
- The International Association of Hydrogeologists Congress, Perth, 15–20 September 2013
- International River Symposium, Brisbane, 23–26 September 2013
- Greenhouse 2013, Adelaide, 8–11 October 2013
- ModSim2013, Adelaide, 1–6 December 2013

Communication

Product launches and information sessions

- 21 February 2013: the Bureau held an information session simultaneously across seven of its offices via video-conference to discuss and seek feedback on the exposure draft for the proposed Standard-Assurance Engagements on General Purpose Water Accounting Reports.
- 20 June 2013: the Bureau launched its Hydrologic Reference Stations website portal at its Canberra office. The launch was simultaneously broadcast to two Bureau offices in Melbourne and Sydney where stakeholders participated in a product demonstration following the launch.

Meeting our stakeholder needs

The Bureau held a workshop in Melbourne on 26 June 2013 to explore ways that its weather, water, and climate services could improve drought information used by other agencies and the public. Agencies represented at the workshop expressed a desire for a common access point for 'drought information. Representatives at the workshop included the Department of Agriculture, Murray–Darling Basin Authority, Melbourne Water, and the Murrumbidgee Irrigation Authority. Attendees also expressed a need for:

- accurate, more targeted and timely forecasts across a range of timeframes;
- different drought indices that take other factors into account at varying spatial and time scales;
- improved communication of approaching dry periods, and water products and how they can be used; and
- stakeholder research to find out what products are needed.

The Bureau is using the information from the workshop to develop a road map to improve its drought services and to further engage with stakeholders to explore their needs.

- In June 2013, the Bureau released its revised Intensity–Frequency–Duration Design Rainfalls product in collaboration with Engineers Australia. Targeted communication and technical support was provided to key users, particularly hydrologists and civil engineers.

Stakeholder communication

- The Bureau continued to distribute water information programme updates throughout the year with five issues of the external newsletter *enGauge*.
- More than 3700 people received specific product updates and special announcements and subscription to the e-newsletter increased by 48 per cent from last year.
- The monthly Seasonal Streamflow Forecast Service subscriptions grew in popularity to approximately 1400 subscribers this year. Subscription to the monthly email increased by 60 per cent from 2012. An online survey completed by product users showed high levels of satisfaction, with over 87 per cent of respondents indicating that they are satisfied with the service.
- In addition to regular communications, the Bureau sent email notifications to water information subscribers and stakeholders to update them on the Australian Water Resources Assessment 2012, Intensity–Frequency–Duration Design Rainfalls, Australian Hydrological Geospatial Fabric, and the Water Regulations 2008.



Website

- During 2013, the Bureau maintained an active water information website at www.bom.gov.au/water. The site was visited by 1 024 792 (815 342 in 2012) unique visitors this year, resulting in 1 242 982 (978 229 in 2012) page views.

National Climate and Water Briefings

Since its inception in August 2011, the monthly National Climate and Water Briefings continue to attract strong interest, with around 50 people attending each briefing. Attendees represent more than 40 government departments and agencies and stakeholder organisations.

Each briefing presents a summary of recent climate and water conditions and then investigates the outlook for coming months. Climate, water and landscape factors contributing to that outlook are presented.

Special topics that were featured throughout the year include seasonal pre and post-severe weather briefings, the introduction of a dynamical model for the Seasonal Climate Outlook, and a summary of the Working Group I contribution to the Intergovernmental Panel on Climate Change Fifth Assessment Report.

The information presented at the briefings is used by briefing attendees to directly and indirectly inform decision-making, to brief senior colleagues, and as background for other work.



Bureau hydrologist Trudy Wilson presenting at the official launch event for the Hydrologic Reference Stations website portal.



Bureau hydrologist Andrew Schepen presenting at the August 2013 National Climate Water Briefing.

Notes

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Australian Government
Bureau of Meteorology

