The purpose of this document

Science and research have played a critical role in helping manage some of the difficult water resource issues facing Western Australia, such as salinity, climate change, eutrophication of rivers and estuaries, and water recycling.

This plan sets out a vision for managing and conducting the Department of Water’s science, research and innovation over the next five years.

This science, research and innovation plan will provide the Department of Water with an understanding of:

- our current knowledge and our science and research activities
- our science, research and knowledge needs over the period 2008–2012
- the organisational capacity required for undertaking science activities and utilising the knowledge generated
- the operational context through which we will achieve the activities proposed
- the opportunities to work with the Premier’s Science and Innovation Council (PSIC) and other stakeholders to develop broader water science programs.

This plan for the coming five years covers:

- the business of water – background information relating to the business objectives of the Department of Water
- the knowledge for management – why scientific and research activities are important to the department’s business processes
- this science, research and innovation plan – detail on the science and research needs over the coming five years. This information is provided in detail under three strategic headings: Strategy 1: Investment for knowledge; Strategy 2: Collaborative partnerships; and Strategy 3: Use of knowledge
- the operational framework – how the science, research and innovation plan will be implemented by the Department of Water.
The business of water

The Department of Water ensures that the state’s water resources are planned and managed to meet community and environmental requirements, now and into the future. The department achieves this by providing a strong foundation of knowledge to enable well-informed management decisions, and to improve water-management practices across the state.

These responsibilities are achieved through four organisational roles and objectives.

Water governance

To improve and facilitate the governance of water resources and the water industry so that all Western Australians have access to the water services they need.

Our role

- Develop a vision for the water industry in Western Australia.
- Establish a policy and planning framework for managing water resources and the water industry.
- Put in place effective management mechanisms (i.e. education, legislation, consultation, influencing change).
- Encourage sound and transparent decision-making (i.e. consistent, fair, defensible).

Water knowledge

To increase our knowledge of Western Australia’s water resources and set values that govern their management.

Our role

- Increase our knowledge of groundwater and surface-water resources.
- Increase our knowledge of water available for recycling and water use efficiency and develop innovative techniques that support this.
- Increase our knowledge of the social, economic and environmental dependencies associated with these resources.
- Set environmental, economic and social values for water.
- Increase our knowledge of the risks and threats to these water resources and their availability.
- Investigate new and innovative ways to address threats to resources.
- Increase our knowledge of supply and demand trends.
- Provide water information.
Water use and impact management
To manage people’s use of and impact on water resources.

Our role
• Manage the availability of water.
• Ensure that water is used wisely for its specific purposes.
• Undertake water-resource and water-service planning for the state.
• Facilitate the balance between local, regional and state development needs.
• Protect against undesired impacts and consequences.
• Restore resources to agreed values.
• Bring certainty for water users, and allow them greater scope to plan agricultural and other activities.

Capacity building
To increase our knowledge and that of the community, leading to appropriate corporate, community and individual actions.

Our role
• Be responsive to stakeholder needs.
• Work collaboratively with stakeholders in raising awareness of water-resource management issues.
• Develop structures/frameworks to improve stakeholders’ management of water resources.
• Transfer knowledge and information to stakeholders to enable good decision-making in water-resource management.
• Develop and support integrated programs between the public, private and academic sectors to build knowledge and skills.
• Develop and enhance internal capacity within the Department of Water.

As set out above, a large part of the Department of Water’s core business is underpinned by its scientific knowledge base and its investigative activities.
Knowledge for management

Accountability for our water resources and their sustainable use needs to be underpinned by sound knowledge. An understanding of social, environmental and economic values is an essential part of this knowledge base. The identification of knowledge gaps, and the improvement of existing knowledge, can be addressed through scientific investigations to understand water resource management issues. High-quality knowledge arises from strong collaborative partnerships that also result in the delivery of knowledge outputs that are easily taken up by decision-makers and managers.

The need for science and research

It is important to understand the distinction between ‘science’ and ‘research’ and how they are both important to water resource management.

In this plan, we define research as the systematic inquiry or investigation into a subject in order to discover or revise the facts, theories or applications that have been previously accepted. For example, research into climate change can assist us in understanding how groundwater aquifers will behave over time in response to such changes.

Science is the application of knowledge gained from research in the resource-management process. For example, the knowledge gained from research into the interaction of landuse and groundwater can lead to improved decision making on setting water management conditions on wetlands and on setting water allocations to water users. The term ‘science’ encompasses both environmental and socioeconomic disciplines in this plan.

Figure 1  Science and research as part of the decision-making management process
There is a third technical aspect in which the department also has a vested interest: innovation. Innovation is the process of implementing new ideas or enacting technology, novel to a given situation.

Collectively, science and research activities generate and refine knowledge that is used by the Department of Water to manage Western Australia’s water resources with greater confidence. The need for knowledge in competent water-resource management is recognised in Strategy 1: Investment for knowledge.

As the science, research and innovation plan for the Department of Water, this plan covers the department’s knowledge, needs, partnerships and operational frameworks.

During 2008 a more wide-ranging plan that will cover science, research and innovation issues for the state as a whole will be developed. The water science plan for Western Australia will cover knowledge, needs, partnerships and operational frameworks for the state. Its development will be in collaboration with the Premier’s Science and Innovation Council.

The evaluation of the Premier’s Water Foundation showed a continuing need for a funding body that supports water research, development and education in the state. The review confirmed that water remains a key concern to the community, with the topic increasing in prominence in the political and media arenas during 2007. This interest has been precipitated largely by the extensive drought that has gripped most of the country and the continued pressure on water supply brought about by the reduction and variability of rainfall and by population growth.
A government priority area, and a key objective of the State Water Plan 2007 (a whole of government strategic framework to plan and manage our water resources in Western Australia), is investment in science, innovation and education, with a focus on adaptation to climate change and sustainable and efficient water management.

Through the work of the Premier’s Science and Innovation Council it has become clear that there is no overall plan for water science in this state. It is therefore important to determine the goal and capabilities and infrastructure required to ensure sustainable and efficient water management.

The water science plan will link with the State Water Plan 2007, the National Water Initiative and the Indian Ocean Climate Initiative. It will be far-reaching and comprehensive, and send a clear signal to water and innovation stakeholders that the Government of Western Australia is committed to the development of water science and innovation across the state.

The need for collaborative partnerships

Refinement of knowledge based on research will be required to achieve our water management commitments into the future. Collaborative research partnerships will be very important for the Department of Water in achieving this, as they will leverage knowledge generated in other jurisdictions into the organisation’s business.

Integral to the Department of Water’s function and direction is the continuing development of cooperative alliances with universities, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), cooperative research centres, other state and national agencies and regional natural resource management bodies.

The importance of collaborative partnerships has been identified as a priority for the Department of Water in this science, research and innovation plan. Specifically, the importance of partnerships is recognised in Strategy 2: Collaborative partnerships.
Use of knowledge
There needs to be credible high-quality knowledge and understanding of what are increasingly complex water resource management issues. In order for this knowledge and understanding to be translated into management and policy improvements, we require better ways of communication, engagement and presentation.

Successful resource management depends on having high-quality knowledge available and the capacity to utilise it once it is available. Achieving both the provision of knowledge and its uptake within our business operations relies on organisational capacity in the context of there being both knowledge consumers and knowledge suppliers.

| 1 Identify the need for knowledge |
| 2 Define the knowledge required |
| 3 Design the scientific investigation needed to generate knowledge |
| 4 Deliver the knowledge in a tangible format |
| 5 Take up the new knowledge in the decision-making and management process |

Knowledge consumer

Knowledge provider

Knowledge consumer

Figure 3 Organisational capacity for generating and using knowledge

The importance of making knowledge available to decision-makers and resource managers, and streamlining the uptake of knowledge by these knowledge-users, is recognised in Strategy 3: Use of knowledge.

This science, research and innovation plan

The Department of Water has four programs through which the organisation’s business is arranged: value from water; water availability; water allocation; and capability and delivery. The four programs develop business plans every five years. Currently the program plans give particular focus to organisational commitments outlined in three strategic documents:

- State Water Plan 2007
- Western Australia’s Implementation Plan for the National Water Initiative
- Government Response to ‘A Blueprint for Water Reform in Western Australia’.

In alignment with the business-planning process, the Department of Water’s science, research and innovation plan recognises the actions identified within the five-year program plans and the science and research needs required to meet those commitments.
Additionally, some of the overarching questions raised and addressed by this science, research and innovation plan include the following:

- How can we manage sustainable provision of water supplies to all users (e.g. humans, environment, industry)?
- How can we best maintain and improve water resources and waterways?
- How can we recycle water safely and efficiently?

To ensure science and knowledge are available to achieve business commitments, this plan has been developed with the following objectives:

- Generate knowledge and understanding relevant to the sustainable management and use of the water resources of Western Australia.
- Develop collaborative partnerships to support improved research in water-resource management.
- Enhance the application of science and research knowledge in water-management processes across government, industry and the community.

Responding to these items, the plan is framed around three key strategies:

- **Strategy 1: Investment for knowledge**
- **Strategy 2: Collaborative partnerships**
- **Strategy 3: Use of knowledge.**

Each strategy is discussed below along with the action items identified to progress under each of these strategies within the lifetime of this plan (2008–2012).

**Strategy 1: Investment for knowledge**

The objective of Strategy 1 is to invest directly in science and research activities, either within the department or with external research groups, industry or consultants. The science and research activities are important as they generate a knowledge base that supports new management approaches and leads to better water outcomes.
To provide focus on our science and research direction over the coming five years, five key themes have been identified for this strategy as priority areas:

- Understanding water resources
- Economic and social value of water
- Land-use impacts on water
- Climate uncertainty
- Water recycling and efficiency.

In Table 1 (on page 18) is a summary matrix of how the action items for each theme relate to the steps of the resource-management process outlined earlier. For each action item, a category has been given, indicating how and when the department will tackle it. Greater detail outlining the origin of each action item is provided under each theme below.

**Theme 1: Understanding water resources**

Water availability and quality will continue to be major issues for Western Australia in the coming years.

Although Western Australia has extensive water resources, the lack of rainfall and the increasing demand for water have led to water scarcity and water restrictions in some areas of the state. In addition, reduced catchment inflows and groundwater recharge are affecting the quality of water resources and the viability of the ecological communities that rely on them. Western Australia’s challenge is to satisfy escalating demands for finite quantities of water while preserving our environment.

To supply the projected water demands while preserving environmental needs, we can develop new, more expensive supplies (e.g. desalination) or develop alternative sources that in the past were considered to be of marginal quality (e.g. stormwater). The need for new water-source developments could be postponed through fit-for-purpose recycling and greater water-use efficiency.

To assist decision-makers in selecting from water-source options for supply to the community, understanding water resources through measurement and investigation of groundwater and surface water are critical activities for the Department of Water.

**Key recommended actions**

- Ensure adequate resources are allocated to maintain existing science and research activities currently supporting the conduct of the department’s business.
- Continue with the groundwater investigation program and shallow groundwater studies.
- Increase capacity to undertake groundwater modelling for use as a decision-support tool, including both water quantity and water quality modelling.
- Develop the capacity to undertake groundwater quality investigations.
- Investigate surface water – groundwater interactions (including saltwater intrusion).
- Improve catchment-modelling coordination across the organisation.
- Investigate a state-wide integrated waterways initiative (including rivers, wetlands, estuaries) leading to the delivery of resource-condition targets and environmental values.
- Complete the review of the department’s surface-water and groundwater monitoring programs.
- Develop the organisational capacity to allow review and assessment of potential yields for existing and new water-supply sources.
Theme 2: Economic and social value of water

Taking into account social and economic factors is essential when it comes to making sound decisions about land and water management. In particular, water-allocation plans, regional water plans, drainage plans and water-management plans need to incorporate social and economic considerations in addition to environmental and resource aspects.

The department considers there are two key areas that need further understanding to support sustainable water use:

- Combining economic and social-resource-assessment techniques to understand and address the psychological and social factors affecting sustainable water use and water protection in Western Australia.
- Understanding and incorporating Indigenous cultural, social, spiritual and economic values into water-resource planning processes.

Key recommended actions

- Improve methodologies for determining social (including Indigenous) and economic values of water to facilitate sustainable water-resource management, including risk-assessment techniques, to ensure community and environmental values of water resources are met.
- Develop decision-support tools and models that integrate social, economic and environmental values, and surface water – groundwater interactions to assist water-resource planning.
- Develop, apply and review methods for environmental water-requirement studies, considering both quality and quantity of water resources.
- Evaluate environmental, social and economic values of drainage-water resources to optimise the quantity and ensure the quality for potential community and environmental users.
Theme 3: Land-use impacts on water

In managing water it is important to understand how resources are currently influenced by environmental and social factors, and how this influence may change in future scenarios. Key social and environmental factors that influence water resources include:

- land use (e.g. forestry plantations, market gardening, urban development)
- acid sulphate soils
- catchment condition
- abstraction activities
- climate change.

Factors such as these may change either the amount of water available or its quality, although both are often affected.

In an effort to minimise or mitigate impacts on water resources, management measures can be used. Where such measures have been identified in other localities (interstate or overseas) it is necessary to trial how effective a measure is in a Western Australian context using monitoring and evaluation activities. Some measures that may be useful in managing Western Australia’s water resources are:

- changing current land-use activities in order to improve the quality of water resources through reducing contaminant loads or by increasing the efficiency of water use (e.g. replacing high-water-use crops with crops that have lower irrigation needs)
- managing environmental factors to reduce the impact of water resource development (e.g. implementing fish ladders at water-storage facilities to ensure fish passage can be maintained)
- develop decision-support tools for water-resource managers (e.g. a tool that allows comparison of future water-use scenarios before change is implemented).

Key recommended actions are:

- Improve coordination of science in water-sensitive urban design and waterway restoration, enabling the broad application of management options.
- Develop tools to assess impacts of land-use change on water quality and quantity.
- Assess impacts of interceptions (e.g. forestry plantations, farm dams) on water resources, and the likely effects of changing such land use.
- Evaluation of best-management-practice options for remediation and restoration of waterways (e.g. provision of bio-retention systems, bubble curtains, fish ladders).
- Determine the possible impacts of salt accumulation on the viability of riparian revegetation and associated fauna.
Theme 4: Climate uncertainty

Over the last two decades, annual rainfall in south-west Western Australia has been below the long-term annual mean. With reduced rainfall have come associated reductions in streamflow and groundwater recharge. This has repercussions for both the environment and the community as end users of water.

Reduced streamflows and groundwater recharge are likely to have major implications for the structure of rivers, in-stream ecological function (particularly for groundwater-dependent ecosystems), riparian vegetation and water quality in waterways.

Surface-water resources available for consumptive use have been considerably reduced for Perth and also for many country towns across south-west Western Australia. This can be seen in the reduced total inflow to the reservoirs supplying Perth and integrated schemes.

Over the last century, groundwater levels on the Gnangara Mound have reflected the long-term rainfall trends, rising in response to years of above-average rainfall and falling in response to lower-than-average rainfall.

Groundwater levels in major aquifers have also declined in response to pumping for water supply and the effects of increased water use by tree plantations. This makes it difficult to discriminate between the changes that are specifically due to variations in rainfall and the effects of other parameters, such as land use.

The drying climate is not consistent across Western Australia or even the south-west of the state. The Kimberley region in particular has experienced above-average rainfall and streamflow for the last few years, in contrast to the water-supply catchments for Perth.

Figure 4  Declining streamflows and watertables have been experienced over many parts of the south-west of Western Australia (courtesy: Mark Pearcey)
Key recommended actions

- Research the impacts of a drying climate on water resources and related ecologies (e.g. estuarine–marine influence; salt leaching of cleared catchments).
- Continue involvement in the Indian Ocean Climate Initiative.
- Foster stronger links with state and federal governments with respect to climate impacts on water resources.
- Develop climate scenarios and integrate them into water-resource assessments and water-allocation planning.

**Theme 5: Water recycling and efficiency**

Water recycling and efficient use of water has the potential to reduce or delay the demand for new water sources. In order for recycling schemes to be sustainable, issues that require consideration include:

- health and environmental risk assessment
- protection of existing groundwater quality
- social acceptability
- costs and pricing of recycled water
- waste discharge and management
- regulation of water service providers
- interface with land use planning.

A number of water-recycling trials and projects are currently under way in Western Australia. These include recycling of both stormwater and municipal wastewater.

Stormwater recycling projects include the Town of Cottesloe’s ‘Restoration of groundwater aquifer on the Cottesloe Peninsula’, involving the removal of ten stormwater ocean outfalls and installation of underground stormwater treatment, storage and recharge tanks. A number of other local governments are currently investigating managed recharge of confined aquifers with treated stormwater.

Wastewater recycling may be pursued through direct application or through managed aquifer recharge. Projects currently underway include:

- the Water Corporation’s groundwater replenishment trial, investigating the use of reverse-osmosis-treated wastewater as a future drinking-water source for Perth
- the Premier’s Water Foundation project ‘Determining requirements for managed aquifer recharge in Western Australia’, investigating water-quality improvements following recharge by infiltration
- the Raising National Water Standards project ‘Development of an ecotoxicity toolbox to evaluate water quality for recycling’.

Through these projects and collaboration with proponents, the government is working to develop strategies and policy to guide and support recycling in Western Australia.
Key recommended actions

- Investigations of treatment options for stormwater and wastewater permitting multi-purpose reuse.
- Application of environmental risk assessment and management process of fit-for-purpose recycling, including managed aquifer recharge and irrigation.
- Studies on the economics and marketing of water recycling (e.g. renaming ‘wastewater’) and dissemination of the information to internal and external stakeholders.
- Understanding treatment options that will advance the science of water recycling and increase the proportion of reuse.
- Researching developments in water use efficiency nationally and internationally.
### Table 1  
Summary matrix of theme action items against steps of the resource-management process

<table>
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<th>Theme</th>
<th>Resource</th>
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| **Understanding water resources** | • Continue with existing science and research activities.  
• Develop the capacity to undertake groundwater quality investigations.  
• Investigate surface water – groundwater interactions.  
• Complete the review of the department’s measurement network.  |
| **Economic and social value of water** | • Improve methods for social and economic evaluation of water values.  
• Develop, apply and review methods for environmental water-requirement studies.  |
| **Land-use impacts on water**     |                                                                                                                                                                                                          |
| **Climate uncertainty**          | • Research the impacts of a drying climate on water resources and related ecologies.  
• Continue link with IOCI.  |
| **Water reuse**                  | • Understand treatment options that will advance the science of water recycling and increase the proportion of reuse.  
• Determine environmental risk assessment and management of fit-for-purpose recycling, including managed aquifer recharge, to ensure long-term public health and environmental safety. |

**Categories:**  
A – Currently part of the Department of Water science activities.  
B – To be part of the Department of Water science activities within the next 1 to 2 years.  
C – To be part of the Department of Water science activities within the next 3 to 5 years.  
D – The Department of Water to access science skills externally.  
E – The Department of Water to foster capacity-building with external collaborators.
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<th>Pressure</th>
<th>Management</th>
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| • Develop the organisational capacity to allow review and assessment of potential yields for supply sources.\(^C\)  
  • Increase the capacity to undertake groundwater and (eco-)hydraulic modelling.\(^{A,B,D}\)  
  • Improve integration of catchment modelling across the agency.\(^A\) | • Investigate a state-wide integrated waterways initiative leading to improved waterway condition.\(^{A,D,E}\) |
| • Develop decision-support tools and models that integrate social, economic and environmental values to assist resource planning.\(^{B,D,E}\) | • Evaluate environmental, social and economic values of drainage-water resources to optimise quantity and ensure quality for potential community and environmental users.\(^{B,E}\) |
| • Develop and refine tools to assess impacts of land-use change on water quality and quantity.\(^{A,B}\)  
  • Assess impacts of interceptions (such as plantations and farm dams) and changing land use on water resources.\(^{A,B}\)  
  • Determine the possible impacts of salt accumulation on the viability of riparian revegetation and associated fauna.\(^{B,D,E}\) | • Improve coordination of science in water-sensitive urban design and waterway restoration.\(^B\)  
  • Develop policy that takes into account the implications for water allocation from plantations and land-use change.\(^B\)  
  • Evaluate best-management-practice options for remediation and restoration of waterways.\(^{A,C,D}\) |
| • Develop and integrate climate scenarios into water-resource assessments and water-allocation plans.\(^C\) | • Foster greater links with state and federal governments with respect to climate impacts on water resources.\(^E\) |
| • Undertake investigations of stormwater and wastewater quality that will facilitate public acceptance through demonstration of the safety of treated water.\(^{B,E}\) | • Study the economics and marketing of water recycling and disseminate information.\(^D\) |
Strategy 2: Collaborative partnerships
The objective of Strategy 2 is to build on existing research partnerships and develop new ones to improve the knowledge base for water-resource science and research.

Two key themes have been identified as priority areas under this strategy:

- Excellence in science delivery
- External partnerships.

Theme 1: Excellence in science delivery
The department will maintain and enhance its research capacity and culture of innovation in the delivery of improvements in water-resource management and knowledge-based solutions to assist industry and enhance public policy.

There is a need to ensure the return to the state on investment in research. Enhancements to internal systems, processes and communication pathways will be implemented to maximise the efficiency and effectiveness of research efforts and new/improved knowledge.

Key recommended actions

- Establish a science and research coordination committee for the Department of Water.
- Set key performance indicators to measure success with strategic outcomes.

Stakeholder engagement at Baigup Reserve, Bayswater (courtesy: Dr Helen Astill)
Theme 2: External partnerships

Universities, the CSIRO, consultants, industry, local and state government and catchment groups are undertaking research into water-related issues.

There are concerns with the current approach to water-resources research in Western Australia, including the lack of critical mass in key areas required for research activities; critical research areas not covered at all; ad hoc postgraduate teaching in water-resource-management areas; lack of capacity or experience in local academic institutions; and overall lack of investment in water research.

The review of the Premier’s Water Foundation found that both stakeholder feedback and the current water-management environment demonstrated a continuing need for a funding body that promotes and supports water research, development and education in Western Australia.

Key recommended actions

- Coordinate the development of a state water science plan in collaboration with PSIC.
- Develop new and foster existing partnerships with key research groups, including CSIRO and relevant universities in targeted areas, at state, national and international levels.
- Facilitate the development of a postgraduate teaching program in water-resource management relevant to Western Australia.
- Provide the opportunity for vacation employment for postgraduates.
- Support the establishment of a state coordinating body for water science and research.
- Develop an approach to establishing collaborative research agreements.
- Influence water-research directions across external institutions and provide tangible support to water researchers (e.g. a water-research fund for scholarships).
Strategy 3: Use of knowledge
The objective of Strategy 3 is to ensure that there are within the department the skills to allow the creation and use of scientific information, along with efficient communication pathways and information systems that will make the information accessible and usable.

Three key themes have been identified as priority areas under this strategy:

- Workforce planning
- Communications
- Information systems.

Theme 1: Workforce planning
The key threat of failure for this plan is the department’s ability to retain and attract employees. With respect to retainment, some of the key issues for an employer of technically skilled staff are:

- providing a clear message as to the organisation’s direction
- offering technical career pathways
- providing in-house development opportunities.

In attracting new employees, some of the key points for consideration are:

- developing competitive retention packages
- making known any unique opportunities to be found in the organisation
- having efficient, friendly and informative recruitment processes.

Key recommended actions

- Make sure that staff with science skills are adequately represented across the departmental structure to ensure organisational science and research directions are considerate of management needs and can be utilised by the decision-makers and managers.
- Determine the skill sets required to deliver the plan.
- Employ knowledge brokers for the department (multiple brokers distributed across the organisational structure).
- Establish the capability to attract and retain senior scientists in their technical capacity.
Theme 2: Communication
There needs to be credible, high-quality knowledge and understanding of what are increasingly complex water-resource-management issues. The translation of this knowledge and understanding into improved management and policy requires better ways of communicating, engagement and presentation.

Key recommended actions

- Provide new knowledge, and translate existing knowledge, into forms suitable for uptake by policy, management and practitioners.
- Facilitate knowledge transfer with forums, seminars and workshops for internal and external audiences.
- Minimise the impact of staff leaving by better approaches to storing knowledge in the business (through dissemination, mentoring, brokering).
- Institute training on science communication within the department, primarily for science providers.
- Develop new communication formats aimed at influencing community and external stakeholders.

Theme 3: Information systems
With the advancement of technology have come many new software and hardware systems for managing and communicating information. In many cases new systems reduce the time required to access information, and accordingly the number of people and therefore resources required to provide the same amount of information. This has the potential to lead to improved business efficiency.

Within the Department of Water a broad variety of information is, or could be, used in daily business operations:

- Data: surface and groundwater measurement networks; water-quality data; land-use maps; spectral imagery; output of numerical models.
- Documents: published and unpublished reports; correspondence; flyers; library acquisitions; project-reporting outputs.
- Knowledge held by people: there are more than 600 staff within the Department of Water, located in many offices across the state with particular skill sets associated with projects or activities; external stakeholder contacts.

Key recommended actions

- Complete the review of the organisational information systems.
- Construct databases that assist decision-makers (e.g. DWAID), i.e. make decision-support tools available to all staff regardless of experience and technical skill.
- Set up an interactive spatial map of measurement and monitoring activities.
- Develop methods to allow estimates of current water use at multiple spatial scales (e.g. remote sensing information and water-use estimates).
- Provide real-time access to data on water use and availability (e.g. a state-wide telemetered measurement network).
To achieve the action items identified in this science, research and innovation plan within the timeframe 2008–2012, an operational framework for implementation is required, as outlined below.

The roles of the various elements of the operational framework are:

- **Department of Water corporate executive**: to ensure that the proposed science and research directions as defined by the plan are aligned with the business of the department, and to approve resource requests made by the science and research coordination committee.

- **Director of water resource management**: to serve as chair of the science and research coordination committee and to present resource-planning cases to corporate executive for approval.

- **Science and research coordination committee**: to prepare resource plans that will ensure that adequate skills, people and money are available to deliver the action items of the current plan, to review new research proposals and to negotiate scheduling of science and research activities across the department.

- **Science network**: to provide within the department a communication pathway that will enable knowledge users and providers to freely and efficiently access one another.

- **Science and research coordinator**: to coordinate the use and generation of scientific knowledge across the organisation; to facilitate dissemination of science and research outcomes; to develop and implement a knowledge framework for the organisation; to ensure research leads to management and policy outcomes; to engage with external stakeholders in regard to the organisation’s science and research directions.
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