



Australian Government
National Water Commission



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Australian Water Resources 2005

Appendix F Theme Report: Information Architecture



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Glossary

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ACL	Access Control List
ACT	Australian Capital Territory
ACT	Australian Capital Territory
AGIMO	Australian Government: Information Management Office
AGLS	Australian Government Locator Standard
ANRA	Australian Natural Resource Atlas
ANRDL	Australian Natural Resources Data Library
ANZLIC	Australian New Zealand Land Information Council
API	Application Program Interface
ARO	Australian Resources Online
ASDI	Australian Spatial Data Infrastructure
AWDIP	Australian Water Data Infrastructure Project
AWRA	Australian Water Resources Audit 2000
BOM	Bureau of Meteorology
BRS	Bureau of Rural Sciences
BWRA	Baseline Water Resource Assessment, 04/05
CANRI	Community Access to Natural Resources Information
CMA	Catchment Management Authority
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEH	Australian Government: Department of the Environment and Heritage
DNR	NSW Government: Department of Natural Resources
DSE	Department of Sustainability and Environment (VIC)
EPA	Environment Protection Authority
ESCAWRI	Executive Steering Committee on Australia's Water Resources Information
ESRI	Environmental Systems Research Institute
GA	Geoscience Australia
GIS	Geographic Information System
GMS	Groundwater Management System
GMU	Groundwater Management Unit
MDBC	Murray Darling Basin Commission
NDN	National Data Network
NHT	Natural Heritage Trust
NLWRA	National Land and Water Resources Audit
NM&EF	Natural Monitoring and Evaluation Framework
NRM	Natural Resource Management
NSW	New South Wales
NWC	National Water Commission



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NWI	National Water Initiative
OGC	Open Geospatial Consortium
SA	South Australia
SKM	Sinclair Knight Merz
SLA	Service Level Agreement
SOA	Service Oriented Architecture
SOAP	Simple Objects Access Protocol
SoE	State of the Environment
SWMA	Surface Water Management Area
VIC	Victoria
VWRDW	Victorian Water Resources Data Warehouse
W3C	World Wide Web Consortium
WFS	Web Feature Service
WMS	Web Map Service
WQDP	Water Quality Data Publishing
WSDL	Web Service Description Language



Executive Summary

The Discovery Phase of the NWI Baseline Water Resource Assessment Project has allowed the Information Architecture Theme to undertake the following tasks:

- 1) Identify high level requirements for the tools required to disseminate and analyse the outputs from the various assessment themes;
- 2) Review a number of initiatives underway in Australia to develop a national data infrastructure for access to water related information
- 3) Review a number of existing and planned tools in Australia for the reporting of water related information; and
- 4) Develop a data management strategy for the BWRA project.

Using the results of these tasks, a set of recommendations and a work plan for Phase 2 of the project have been developed.

The recommendations have been divided into two categories

- Initial Tools - Those things that can and need to be done to ensure that the results of the initial BWRA are publishable in some form by June 30; and
- Enduring Asset - Those things that can and need to be done to ensure that the NWC's vision of an 'interoperable, interactive, real-time national water resources information system' is realised.

With respect to the Initial Tools category it is recommended that:

Recommendation 1: *Initial Reports for the BWRA should be in the form of web-enabled (HTML) assessment theme reports only. This is to be seen as an interim solution only whilst a more sophisticated tool (or set of tools) is defined.*

Recommendation 2: *The NWC should look to deploy the spatial data sets generated by the BWRA on the ANRA Map Maker and provide links to these data sets from within web-enabled theme reports.*

Recommendation 3: *The NWC should look to ensure that the BWRA Project database be placed within the Australian Natural Resources Data Library (ANRDL) at the first delivery milestone. As*



updates to the database are made, a new version should be placed within the data library.

Recommendation 4: *The NWC should also make available to the ANRDL, the ArcReader project file to be delivered with the project database.*

With respect to the Enduring Asset:

Recommendation 5: *The NWC should look to extend the scope of the data infrastructure being developed by ESCAWRI in order to support future assessments. This must be done in collaboration with ESCAWRI and the AWDIP team to ensure that work already undertaken by those groups is taken into account, and, importantly, Australia ends up with a water data infrastructure based upon a single consistent specification.*

Recommendation 6: *The NWC look to participate in the ESCAWRI Technical Working Group (TWG) either through an NWC staff member or through a representative.*

Recommendation 7: *The NWC should continue to define and develop the requirements for a suite of tools to report on future assessments.*

Recommendation 8: *The NWC should continue to engage with the owners of the Water 2010 and ARO projects to determine any synergies between their reporting requirements and the planned functionality of these tools. This can only be done once the requirements of the NWC tool are known.*



1 Introduction

1.1 Project Objectives

The Information Architecture component of the NWI Baseline Water Resources Assessment (BWRA) is responsible for a number of activities. These are:

- coordinate the management of information collected/produced for the project;
- design and develop the various electronic outputs for the project; and
- undertake scoping and specification work required to realise the National Water Commission's vision of an 'interoperable, interactive, real-time National Water Resources Information System' to support future assessments.

Each of these tasks will be discussed briefly.

1.1.1 Data Management

A large amount of data will be collected by the various assessment themes of this project. Similarly, a large of information will be produced. If this information and data is not managed well there is a risk to the project of mistakes being made and delays occurring.

The role of the Information Architecture Theme with respect to data management is to:

- Develop of standards and procedures for data management;
- Develop a single consistent information model and database for all data produced;
- Develop tools for the management of data; and
- Collate, convert and prepare information for analysis through the BWRA reporting tool and other tools.

Data Management Standards and Procedures

Whilst much of the information for the baseline will be collected by other themes, there will be a requirement that the data produced by these themes be collated and used to populate a single data model. In order to ensure this task occurs smoothly, the Information Architecture Theme will define standards for how the data is to be supplied to them. This will include metadata as well as data quality requirements and may include the development of a set of data templates. These standards will be supplied to each of the other project themes for the development of their data products. Each theme will be required to supply information compliant with these standards.



The team will also define and document a set of procedures for processing data provided by each theme and loading the baseline database. These procedures will include quality assurance testing.

The data management guidelines will cover such subjects as metadata requirements, coordinate systems (where applicable), versions of data sets. They are necessary to ensure that all project themes are treating data in the same way. This will ensure that the effort required to prepare data for reporting is kept to a minimum.

Information Model and Database

The model for the information to be collected for the baseline must be capable of supporting the various BWRA outputs. As such, it will be important to develop a model that supports many uses and is flexible to the point that other, currently unforeseen, uses can be readily supported.

The data model for the BWRA outputs will be, primarily, spatial in nature. That is, the core of the model will be spatial features (such as Surface Water Management Areas or River Reaches). As such, the database supporting this model must support the storage of such features.

Data Preparation

The Information Architecture Theme will be responsible for the collation of all data produced for the assessment. From the perspective of theme outputs, this process will include quality checking and loading into the BWRA database.

This theme will also be responsible for the acquisition/development of any data sets required to provide context for the project outputs. In some cases, these data sets may need to be converted to a form suitable for the project.

1.1.2 Baseline Assessment Reporting Tool(s)

The BWRA will produce a number of outputs. The Information Architecture Theme is responsible for development of the tools that will support the delivery of these outputs in an electronic format. This will initially be in the form of a BWRA website.

Development of a tool for reporting the BWRA involves a number of key tasks. These are:

- 1) Determine requirements for the tool through determination of:
 - user profiles – who will use the application.
 - use cases – how will these users interact with the application.



This information will allow for the identification of:

- the set of required outputs.
 - required application functionality – including management tools, searching, mapping etc.
 - Inputs into the information architecture and structural interface components, to inform the design of the application.
- 2) Design application – based on the initial set of requirements, develop an initial design for the application. This will include the development of site storyboards or wire frames to demonstrate site usage, and the development of specifications in order for software developers to develop the application.
 - 3) Develop application – using the design specification for the application, build a first version of the reporting tool.
 - 4) User testing and rapid iteration – based on rapid prototype development techniques, the tool will be tested against the user profiles and workflows (scenarios) to ensure that the site meets business and user needs, and critical usability issues are identified and resolved during the development process.
 - 5) System Testing
 - 6) System Deployment and Ongoing Maintenance.

At the completion of this process the Baseline Assessment Reporting Tool will be complete.

1.1.3 Assessment Data Infrastructure

The NWC has expressed a desire that one of the key outputs of the project be an ‘enduring asset’ in the form of an ‘interoperable, interactive, real-time national water resource information system’. This will support the delivery of future assessments of Australia’s water resources. The role of the Information Architecture Theme in this regard is to ensure that this is possible by documenting the requirements of such a system and describing the context in which this system will exist.

The key to realising this vision is a move away from the centralised database approach used in previous assessments such as the 2000 Australian Water Resources Audit (AWRA). Rather, a distributed data infrastructure approach, where custodians of data make available their data to assessment tools through web services based interoperability standards, is preferred.

The first task in this process is to identify and engage with the water data infrastructure initiatives currently under way in Australia and understand their goals, users, priorities and time frames. This will help identify where synergies can be exploited and, importantly where extra investment is required.



The prime output for this component of this theme will be a document describing the requirements of a data infrastructure supporting future assessments. This will include information schemas and required components. Most importantly it will ensure that this infrastructure is aligned with existing initiatives.

1.2 Discovery Phase Objectives

The Discovery Phase of the BWRA has allowed for the completion of a number of the tasks described above. In particular the following were undertaken:

Data Management

- 1) Development of Data Management Strategy.

Baseline Assessment Reporting Tool(s)

- 1) Review of existing water related reporting tools
- 2) Identification of an initial set of requirements for the Baseline Assessment Reporting tool.
- 3) Development of initial Requirements Document with questions for release to a wider user base.

Assessment Data Infrastructure

- 1) Identification of existing Australian water data infrastructure initiatives.
- 2) Review of a subset of these initiatives.

In order to achieve these tasks, three teams undertook separate work plans designed to be achievable within the allotted timeframe yet capture enough information to allow for recommendations for next steps to be made.

The first of these teams undertook the task of identifying the requirements for the Baseline Assessment Reporting Tool through interviews with NWC staff. The team also undertook a review of the existing Australian Natural Resources Atlas (ANRA) through which the previous audit of Australian water resources is reported.

The second team identified a set of existing data infrastructure projects pertaining to water resources and undertook a review of these. The team also reviewed a set of projects through which water resources information is being reported in order to determine current best practice as well as identify synergies between these and the requirements of the Baseline Assessment Reporting Tool



The third and final team performed a review of the planned outputs from each of the assessment themes within the project team in order to understand the quantum of work to be undertaken in the next phase of the project. This team also developed a data management strategy for the project.

The purpose of this document is to describe the outcomes of these tasks, recommend next steps and approaches and define a work plan to achieve these.

This document is divided into a number of sections. Section 2 describes the requirements for the Baseline Assessment Reporting Tool as captured to date and sets the framework for the next phase of discussions with a wider user base.

Section 3 describes the outcomes of the various reviews of existing water related tools and infrastructures.

Section 4 details the project data management strategy

Sections 6 and 7 give a set of recommendations for the next phase of the project and propose a work plan to achieve them.



2 Requirements for the Baseline Assessment Reporting Tool

2.1 Introduction

The National Water Commission (NWC) has a vision of a tool to report the results of the Baseline Water Resources Assessment and what this tool might be able to achieve. This section contains a high level design specification of the user interface¹ of the proposed Baseline Assessment Reporting Tool. That is, it provides an overview of how the user interface will appear and functions. It also contains a discussion of audiences for the tool. This completes this section of the Information Architecture Discovery Phase.

The information contained in this section has come from a series of one-on-one interviews conducted with NWC staff to capture business and user requirements. It has been presented to Commonwealth, State and Territory stakeholders who endorsed the concepts. This information has been complemented by the results of a review of better practise characteristics of similar Australian Government and spatially based websites as well as the collective experience of members of the Information Architecture Theme. The only assumption made is that the Baseline Assessment Reporting Tool will be in the form of a website or be web based (supplementing hard copy products).

2.2 Overview

2.2.1 Purpose

The purpose of the Baseline Assessment Reporting Tool is:

“To provide an Internet-based, user-focussed snapshot of Australia’s water resources at the beginning of the National Water Initiative (NWI)”

Specifically, the reporting tool will:

- 1) **Focus initially on the current baseline assessment**, but be scalable and designed to accommodate future assessments, and be able to include any future enhancements, additional services, features and subsequent partnerships with other potential content and service providers;
- 2) **Access information within the headline parameters of water quantity, water use, and water health** during the period July 2004 – June 2005, and in the context of longer term patterns of water availability;

¹ For the purpose of this project, the user interface refers to the part of the systems that a user will see and interact with.



- 3) Be able to display and download information from **multiple, distributed sources**;
- 4) **Display the location of** Australia’s water resources;
- 5) **Focus primarily on national issues** that require leadership from Australian Government;
- 6) Provide information on a suitable **baseline against which future comparisons** can be made;
- 7) **Explain the enduring asset** where the NWI is leading the development of an enduring national asset and the role of the NWC bringing together state information through relationships with the teams developing the Australian Water Data Infrastructure (AWDI) and Australian Resources Online (ARO).
- 8) **Provide contextual data**, including demonstrating the ‘connectivity’ of data and water systems across Australia, the concept of integrated water cycle management; and
- 9) Provide definitions and information to **facilitate more precise and deeper understanding** and **better informed public debate**.

2.2.2 Key characteristics

The reporting tool will have the following key characteristics:

- Present data primarily through spatial interfaces and utilise the spatial reporting units defined by the data themes of the BWRA project;
- Support reporting on the Information Model being developed by the Assessment Themes of the project.
- Be visually appealing to all defined audience groups;
- Conforms to all Commonwealth Government policies, guidelines and standards, including W3C Accessibility Standards.
- Bring data together across the themes on a catchment or water management area scale
- Complements existing websites and information including ARO, AWDIP and state databases and websites.
- Provide links and metadata about associated information

2.2.3 Objectives of Website

2.2.3.1 Initial Stages

It is expected that the website will provide basic content and functionality in the initial stages of development, while still meeting the purpose of the site.

In the initial stages of development the website will provide:



- Information focussing on the current baseline assessment;
- Pre-developed detailed information about specific high value environmental assets around Australia;
- Pre-developed detailed reports, maps and information about specific topics and regions;
- Limited dynamically generated content;
- Data pertaining to the baseline assessment for download by the user; and
- Descriptions and contextual information to assist the user interact with the website.

2.2.3.2 Future Stages

It is intended that the website will grow and develop over time. This may be in the form of an extension to the website or through the development of other websites.

In successive iterations, it is intended to provide richer data and services, including:

- The display of a repeatable and an ongoing water data information source;
- The ability to compare similar information across different spatial units, eg compare surface water and groundwater management areas, water catchments, drainage areas and towns.
- Ability to submit detailed queries to datasets as well as view and use the results of these queries;
- The ability for contributors to make metadata available describing their data and information services;
- Ability to save specific queries;
- Compare similar data over the years; and
- Online models that can demonstrate the impact various extractions or management changes will have over time, including environmental, social, and water availability.

2.2.4 Key Usability Requirements

There are seven key usability requirements that should be taken into account in the development of the site:

- Learnability - users can navigate the system successfully without the aid of specific training sessions or training materials; short cuts are provided for expert users;
- Responsiveness - the website will quickly respond and will work well in a variety of office locations e.g. regional and remote offices;



- Discoverability - the website should provide multiple entry points for different audiences from the user community. The website should be discoverable by those using external search engines;
- Error rate - the website should be logical and intuitive, so that users make few mistakes. If a mistake is made, it should be easy for users to recover and start afresh;
- Memorability - the structure and use of the website should be easy to remember; if users return after a lengthy absence, they do not have to re-learn how to use the site;
- Conventional - where possible, the system should align with common practice. This will include common definitions in the industry, conventions for mapping or any similar systems or applications; this will help users feel more familiar and comfortable with the website; and
- Comprehensiveness – the website will include details of all suitable information; the scope of website will be clearly conveyed to the user.

2.3 Discoverability

To aid discoverability:

- The domain name (web address) of the website should be easy and intuitive, and meet relevant guidelines (<http://www.domainname.gov.au/>)
- The website home page should be found using a suite of possible key words and using external search engines.
- The website should be designed so search engine results provide a concise summary of the site.
- The website should be accessible from all similar websites and applications across Australia

2.4 Constraints

The following section lists a set of constraints that could restrain, restrict, or prevent the implementation of the proposed design specification.

General

- The website must be able to support multiple browser types and versions;
- The website must be developed with a minimal requirement for plug-ins or additional coding;
- The website must comply with any and all standards and guidelines applicable to a Commonwealth Government website where appropriate; e.g.:
 - W3C accessibility level A (minimum for Govt sites);

- AGIMO better practise checklists and standards; and
- ANZLIC specifications
- The website must be able to be delivered using the proposed infrastructure/software (yet to be determined).
- Screen resolution – the website must fit into 800x600 viewport and be scalable.

Specific

- Spatial Information (maps) will be delivered using the style and coordinate systems defined by the data management component of the Information Architecture Theme;
- The navigation and information model of the website will be designed to support the outcomes of the BWRA project assessment themes.



2.5 Audience profiles

Knowledge of audience profiles is important in the development of any tool as it is the first pointer towards the identification of individual user types. The following table lists major potential audience groups as defined by the NWC³.

Audience type	Description	Type of tasks/behaviour	Requirements	Ranking
Australian Government	<p>Commonwealth Ministers with responsibility for environment and resources</p> <p>National Water Commissioners</p> <p>Commonwealth Departments and agencies / e.g. NWC, DAFF, DEH BRS, ABS</p> <p>Multi jurisdiction forums - COAG / Murray-Darling Basin Ministerial Council / National Competition Council / ARMCANZ</p> <p>CSIRO / R&D Corporations / CRCs</p> <p>Users – policy users – people in Govt department writing ministerial etc</p>	<p>Assessing sustainability of natural resources, international obligations</p> <p>Priority setting for Commonwealth funding</p> <p>Assisting with program delivery e.g. AGWF, Landcare, NHT 2, NAPSWQ</p> <p>Supporting COAG reforms by States and identifying progress.</p> <p>Use the web when it is going to be the quickest, easiest and most appropriately reliable way to do it...</p> <p>Snapshot on what NWC do and don't know about water.</p> <p>Use this to quote fact and figures</p> <p>Research tool - preliminary resource</p> <p>Provides ability to respond to questions from the public</p>	<p>Readily available data at a range of scales incl., National, State and Regional</p> <p>Statistically accurate information</p> <p>Compliance data</p> <p>Identification of data gaps to inform program funding e.g. RNWS</p> <p>Trends / Benchmarks</p> <p>Data for research. These organisations may also be data providers</p> <p>Managing resources, policy development</p> <p>Larger catchment maps</p> <p>Having a map, with the site, photo, description, database</p>	1
State and Territory Governments	<p>Ministers and ministerial councils (including role in</p>	<p>Sustainability of state resources, benchmarking,</p>	<p>Readily available data at a range of scales</p>	2

³ The audience groups as defined by the NWC. The NWC also expect that the audience groups for this site will be similar to the audience group for the Land and Water Australia site, but these groups are yet to be identified.



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Audience type	Description	Type of tasks/behaviour	Requirements	Ranking
	<p>ARMCANZ, MDBC) State government departments and policy makers Interjurisdictional committees – Murray-Darling Basin, Lake Eyre Basin and Great Artesian Basin Service providers (e.g. Tas hydro, Sydney water, Goulburn-Murray Water) Educational institutions within jurisdictions at all levels.</p>	<p>national obligations, emergency and disaster reporting Determining priorities, program implementation, legislation, water allocation, development opportunities / cross border trading</p>	<p>particularly State and Regional Present visually, using higher level data Links through to existing sites within each state Future – obtain the data Operational data, compliance requirements Data for education Assist with reporting on agreed accountability frameworks e.g. MDBC Cap on Diversions, Salinity Targets, monitored to agreed standard, monitoring data compared against these targets – Ministerial council, release of a report...</p>	
Regional Bodies	<p>Catchment Management Organisations Irrigation Companies Water supply companies Local Governments Indigenous communities</p>	<p>Operational and policy needs, local planning and development, flood and drought response Provide information and support to water user groups, Landcare groups Service providers such as water authorities / irrigation corporations / companies Operational data, compliance</p>	<p>Readily available data at a range of scales particularly Regional Protecting and managing environmental values Managing resources, water sharing (environmental flows) data, data for strategic environmental works</p>	3



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Audience type	Description	Type of tasks/behaviour	Requirements	Ranking
		requirements Consider indigenous water management issues	Assist with other reporting requirements e.g. State of Environment Operational, compliance data, annual water accounts, environmental flows, sustainability Protecting and managing environmental and cultural values Potential sustainable yield Accurate information to serve a range of client needs	
Peak Industry and Environmental Groups	National Farmers Federation (and State FF) Conservation groups e.g. ACF Industry groups e.g. ANCID, WSAA, AWA Local environment groups and NGOs	Determining priorities, program implementation, legislation, water allocation, development opportunities / cross border trading Lobbying	Readily available data at a range of scales incl., National, State and Regional Maps that show at a high level to help inform and start to help inform, and strengthen the argument - provides evidence based assessment. Utilise and improve local knowledge, lobbying Water data for Australia	4
General Public Industry Students / Researchers	Interested members of the public Industry e.g. mining Consultants School students – primary and	Data for business purposes – readily accessible to provide greater efficiency Data for education –	Readily available data at a range of scales incl., National, State and Regional	5



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Audience type	Description	Type of tasks/behaviour	Requirements	Ranking
	secondary University students – undergraduates, interested researchers International queries	information for assignments, studies etc General information on Australian water resources	Must be able to discover the site Readily available data Need an ability to obtain background and contextual information Learn more about the NWC and NWI work Content and visually rich pages to download and use	



2.6 Navigation and Information Architecture

The following provides a high level description of the information architecture and navigation of the website, as initially defined during the consultation process undertaken with NWC staff. Once the information model supporting the baseline assessment is known, and when business and user requirements for this tool are better understood, both the information architecture and website navigation requirements will be able to be further developed and refined.

2.6.1 Navigation

Website navigation refers to the menus, images, cues and controls which assist the user in browsing through the pages of the website, and helps 'navigate' through the information architecture.

The navigation for the website must be easy for the users of the site. This means that:

- Navigating the website is intuitive;
- Multiple navigation methods are provided;
- Category labels and links are meaningful to the user; and
- Category labels and links are labelled consistently throughout the site.

The following table describes the navigation methods to be employed on the website.

Navigation type	Description	Priority
Map based	Users will be provided with a map (assume map of Australia) or series of maps and be able to click through to the required level of detail to access information. Users will be able to access information at a Commonwealth through to specific locations, as well as by basin and management units. Each location will include relevant data presented spatially, as well as charts and records of all other information available.	Primary form of navigation. Will provide main access to spatial component of Information architecture
Topic based	Users will access information according to topics (water use, quantity / health, availability, allocation, management) as well as contextual and links to governance information. Access will be through a left hand side menu.	Secondary form of navigating Will provide main access to topic component of Information architecture
Utility menus	Top level menus will include	Low

Navigation type	Description	Priority
	<ul style="list-style-type: none"> • About the NWC • Contact us • Index – list selection (A to Z) • Help • Contact <p>Footer at the bottom of each page</p> <ul style="list-style-type: none"> • Privacy • Disclaimer • Copyright • Glossary 	

2.6.2 Information Architecture

When discussing a website, the phrase Information Architecture refers to the way information is organised, structure and labelled, so users can complete tasks and find information easily.

The description of the information architecture for the Baseline Assessment Reporting Tool that follows is based on the requirements of the NWC as described during the initial consultation phase. Further development of this information architecture depends heavily upon what is to be reported by the various assessment themes within the project. Once this is known, this information will be integrated into this specification.

The website information architecture is required to:

- Be logical to all the different types of users.
- Support the management, maintenance and any proposed future expansion of the site.

Priority base level information classifications according to the requirements of the NWC are outlined in the following table.

Category	Includes...
Spatial	Jurisdictions – Commonwealth, state, LGA, specific locations River basins Catchments / Surface water management areas Groundwater management units
Topics	Water use Water quantity / health Water availability Water allocation Water management Governance and management issues - licences, allocations, management plans, planning schemes historic records
Contextual information	Role/vision of NWI Information about water systems in Australia. Definitions



2.7 Graphic design

This following section describes the graphic and design requirements that will be laid over the website structure.

Element	Description
Site name	To be resolved through during Phase 2. Working title: Australian Water Resources 2005
Branding/ style guide	The website will be designed according to the NWC Brand Identity System
Font	The preferred font is Arial.
Design theme	The design theme should attempt to communicate the following characteristics: <ul style="list-style-type: none"> • Professional but simple and accessible for all users • Comprehensive – lots of information and detail, and an exhaustive and complete account of water resource information • Authoritative – the primary location for accessing reliable key water information data
Logos	Proposed logos that could be included are: <ul style="list-style-type: none"> • Australian Government logo, with the ‘National Water Commission’ labelling • Logos of associated partners
Links	Links should follow convention and be presented blue and underlined. They should match the title of the page or website they link to.
Site banner	In line with convention the website name in the banner of the inner pages should act as a link back to the home page.
Page size	Page sizes and map loads should be kept to a minimum to allow maximum access to information, and possibly under 50-80K for static pages. Maps should be designed to work as efficiently as possible.
Screen resolution	The website should be designed to display at 800 x 600 screen resolution with no horizontal scrolling. The screen width should be flexible not fixed width. In addition it should degrade gracefully at lower resolutions
Use of space	The proposed page designs maximise screen space for content. Changes have been made in the Map maker specifically to allow more screen space for the map image.

2.8 User Requirements

The following table outlines proposed user requirements of the website. It is important to note that these requirements have not been identified through a process of mapping individual user business processes. Rather these requirements are based upon initial discussions with NWC staff and hence need to be tested against a wider user group in order to ensure they are valid.

The table also indicates whether the requirement should be delivered during the initial development of the website (now) or in future iterations (future). The priority of the requirements is yet to be determined.



FINAL REPORT – INFORMATION ARCHITECTURE

No.	User requirement	Priority	Now	Future
1	Find, view, query and create maps, print maps, view graphs on a particular topic and/or region combining data from different sources	High	x	X
2	View high level predefined maps of fundamental data on specific topics and regions as defined	High	x	X
3	View pre-developed detailed information about specific sites around Australia.	High	x	X
4	Understand the vision of the NWC and projects	Medium	x	X
5	Understand the long term objectives of the site	High	x	X
6	View descriptions, reports and other static contextual information to help the user interact with the website, including cross referencing to the information when appropriate.	High	x	
7	Have the ability to click through a series of maps to find information	High	x	X
8	Search records of data sets to determine the availability of information	Medium	x	X
9	Use predefined searches	Medium	x	X
10	Search for data during a specific time period	Medium		X
11	Search for data on specific locations	High	x	X
12	Search & display metadata (on data, information, data source, people, projects, references), including the facility to preview content without accessing the source information.	High	x	X
13	At each level and jurisdiction to management units, understand the information that is: <ul style="list-style-type: none"> able to be accessed through this website soon to be available through this website (including date) available via other sources (e.g. other sites, agencies etc) reasonably expected, but unavailable 	High	x	x
14	Provide feedback or ask a question to the website administrator	Medium	x	X
15	Access frequently asked questions	High	x	X
16	Find what's been recently added or updated to the site	Medium	x	X
17	Search for information on organisations providing data	High	x	X
18	Review a directory of stakeholders ("who is involved?").	Medium	x	X
19	Understand where data can be obtained offline agencies/catalogues/websites	High	x	X
20	Create dynamic maps	Medium		X
21	Compare similar information sets over time and how they have changed (from 04-05 onwards)	High		X
22	Compare similar information sets or across physical locations (e.g. towns)	High		X
23	Submit more detailed granular queries to datasets as well as view and use the results of these queries.	Medium		X
24	View monthly updates and new data provided where possible	Medium		X
25	Real-time monitoring of activities and measures	Medium		X
26	Save search and query results (summary metadata) & re-	Medium		X

No.	User requirement	Priority	Now	Future
	execute			
27	Update data/information through the website	High		X
28	Access to online advanced data visualisation, modelling & advanced mapping tools	Medium		X
29	Download data on a particular topic and or region for further processing with desktop applications such as GIS software or tools such as Microsoft Word and Excel.	Medium		X
30	Upload metadata describing data and information services	Medium		X
The following requirements have not been identified by the NWC but may be useful...?				
31	Login for increased access and privileges (access to data, ability to publish content) for trusted end-users	Medium		
32	Generate graphs of data	Medium		
33	Access and use collaborative tools – discussion forums etc	Low		
34	E-Commerce functionality	Low		
35	Ad hoc report generation	Low		
36	A directory of people, projects and organisations	Low		
37	A repository of whitepapers, research papers	Low		

The following sections discuss two of these requirements in more detail. These particular requirements are clear in the previous table and common to many similar website. Other requirements will need more clarification and discussion until they can be described further.

2.8.1 Search

Searching will be a fundamental tool for accessing information on the website. A search text box will be located on the top right hand corner of all pages within the site. This will provide a simple key word search function. Advanced search functionality will be available via a link from the search results page.

There are a number of different searching methods that could be implemented to allow the user to search for data by different search parameters. These include searches by:

- Keywords - Search for data by the content of key metadata fields that direct the user to primary entry points for which to access more information
- Spatial - A spatial search would also be required that allows the user to search data by location. This could possibly be subdivided into different location descriptors (management units, states, postcodes etc)

From the search results, users will be able to view information for each result. This may include:

- Weighting / relevance of search return
- Description of the information returned



- Thumbnail of information resource if applicable
- A URL reference

2.8.2 Mapping interface

The mapping interface must be usable for: the novice who is not familiar with mapping and GIS software; users who know how to use maps and have experience with pre-configured layers; through to the technically experienced users. This is particularly important as the maps will be used as a primary navigation tool to access data and information.

The mapping interface should meet the following key criteria:

- Include typical and expected functionality including:
 - Conventional formats, legends and icons;
 - a map scale;
 - Zooming and panning, rotating the view;
 - Printing maps;
 - Measuring distance;
 - Ability to save or export maps;
 - Setting an active layer, adding or deleting layers;
 - Ability to find specific locations; and
 - Access to metadata;
- Novice users can view and interpret basic level maps without the making errors and getting confused, including providing contextual information for first time users.
- Introductory pages should include brief but comprehensive start up that can be easily bypassed by more experienced users.
- When appropriate, access to advanced functionality such as adding layers or querying data is available for those that would like to use it, but should not be required to access basic maps.
- Icons should be conventional, have descriptive alternate text (help bubbles) to help users understand their meaning, and be described in detail in the help file.
- Map behaviour should be organised around the way in which users think about the information and wish to complete tasks
- Where maps are designed to deal with multiple audiences (with different needs), the maps provide clear pathways for each audience, showing the important and useful things available.
- The map window as large as possible, if able 65 percent of the screen, and be resizable.



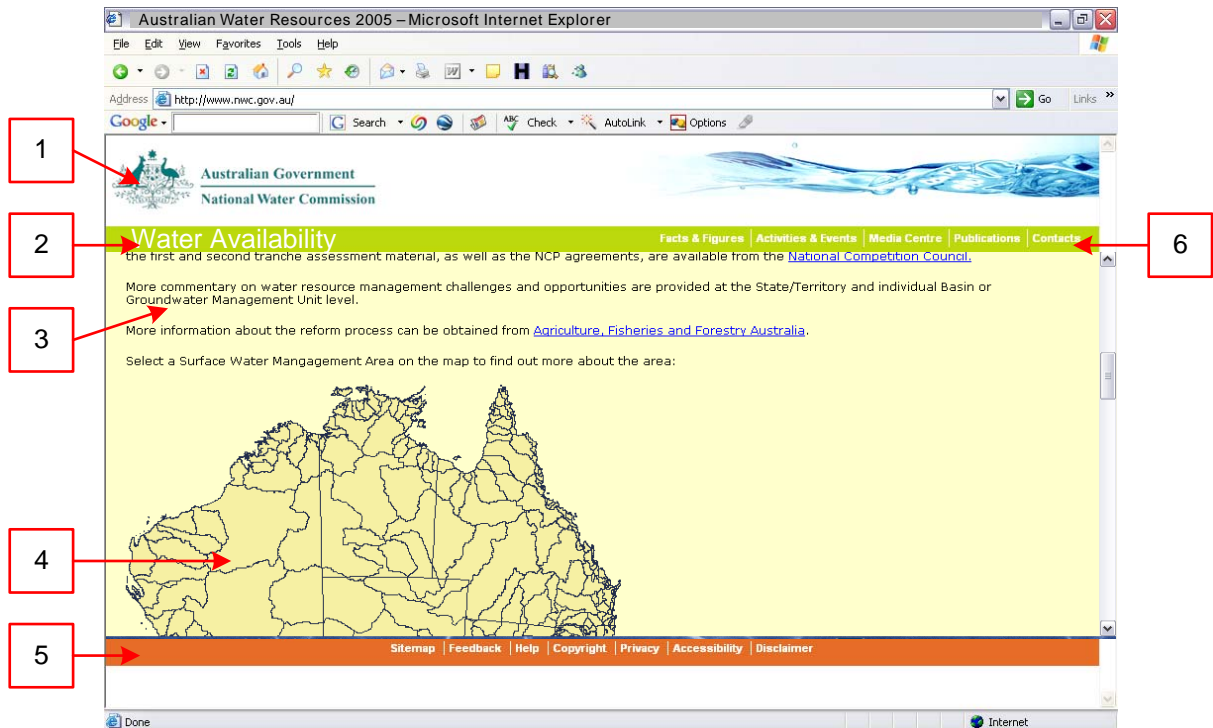
- The system should only allow further zooming, where it results in increased map detail. Zooming should never lead to the message ‘No base map available at this zoom level’.
- Where zooming results in increased map detail but fewer layers, then users must be clearly alerted to the layers that are not available.

2.9 Wireframes

Wireframes are a device used to show required functionality of a user interface. They may be used to show basic layout but are not intended as a guide to the form of the interface. In general, wireframes are a tool to guide the design process. They can also be used to document particular user requirements.

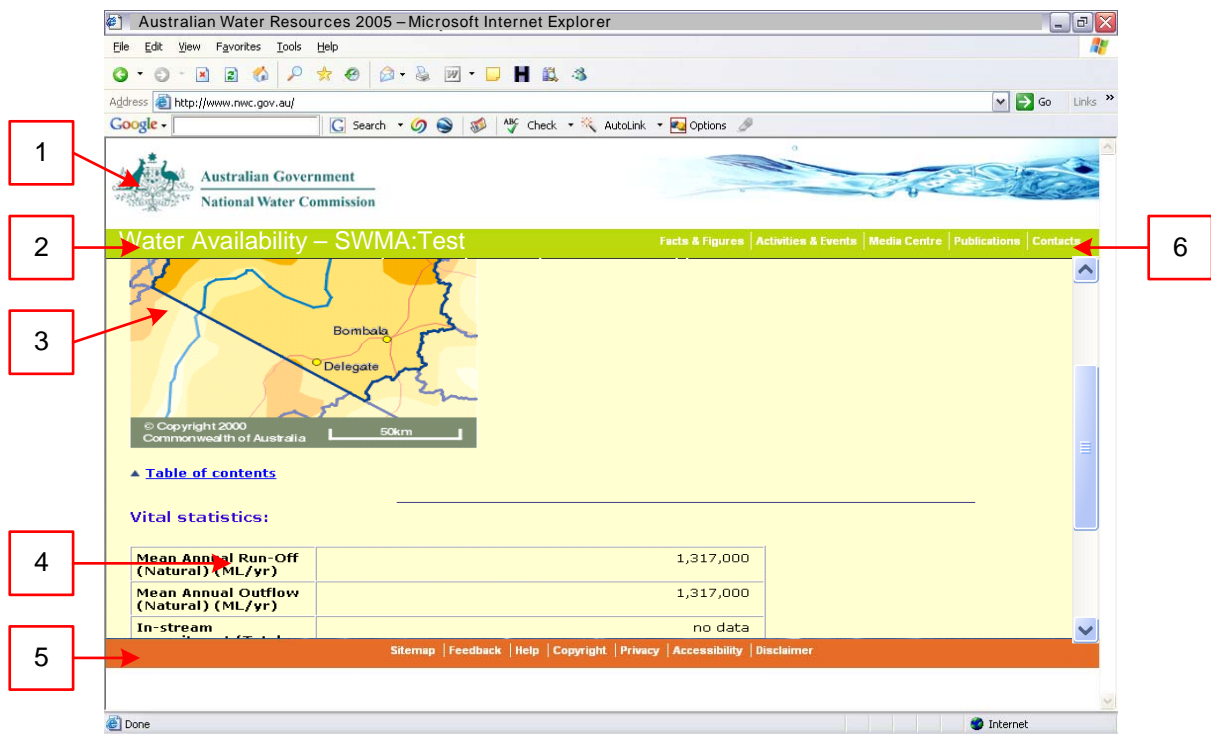
The following pages give indicative wireframes generated from the requirements gathered for the Baseline Assessment Reporting Tool. They are included here to demonstrate a possible implementation of the navigation by map functionality as well as a possible report on a particular NWI indicator for an assessment region.

2.9.1 Theme Report – Navigate by Map



Item	Name	Description
1	Page Header	Standard header for all pages within tool
2	Theme Report Name	The name of the theme report currently being viewed.
3	Theme Report Text	Text of the theme report
4	Navigable Map	Map of regions applicable to the context of the surrounding theme report text (in this case SWMA's). Users select on an individual region and the page links to specific information about that region within the context of the section of the theme report.
5	Page Footer	Standard Page Footer
6	Page Menus	Standard Page Menus

2.9.2 Region Report



Item	Name	Description
1	Page Header	Standard header for all pages within tool
2	Area Report Name	The name of the theme report and region currently being viewed.
3	Region Map	Map showing the boundaries of the region being display along with major roads, rivers and towns for context.
4	Report Data	Table of region specific data within the context of the theme report.
5	Page Footer	Standard Page Footer
6	Page Menus	Standard Page Menus



2.10 Summary

This section has documented the high level requirements for the Baseline Assessment Reporting Tool. The information contained in this section has come from a series of one-on-one interviews conducted with NWC staff in association with the results of a review of better practise characteristics of similar websites as well as the collective experience of members of the Information Architecture Theme.

The Discovery Phase has provided the model upon which more detail can be developed to provide a well documented implementation plan for an enduring asset, and for delivery of an initial set of tools. Details of the next steps are contained in Section 7 of this document.



3 Review of Existing Water Data Infrastructures and Reporting Frameworks

3.1 Introduction

The second team in the Information Architecture Theme was tasked with reviewing a number of Australian web based water data reporting frameworks and water data infrastructures. The purpose here was twofold. Firstly, it was important to understand the current initiatives to develop a water data infrastructure for Australia. It is hoped that one of these initiatives will form the basis of the NWC's vision for an 'interoperable, interactive, real time national water resources information system' to support future assessments.

The second reason for undertaking this review was to understand the current 'state-of-the-art' in water data reporting in Australia. It was also an attempt to discover an existing framework through which the BWRA might be initially be reported. The intention was to match the requirements gathered through the requirements gathering process (described in Section 2) with the capabilities of the reviewed tools.

The following section summarises the results of these reviews and matches the frameworks against the key requirements and objectives identified in Section **Error! Reference source not found.**

3.1.1 Framework Infrastructures

To understand the frameworks and tools reviewed here, and how they fit together, it is important to understand the generic, 3-tiered system infrastructure, and the place each of the reviewed tools and frameworks occupy in that structure. This is illustrated in Figure 1.

In this structure, three basic architectural tiers are distinguished: the data tier where the actual (water-) data is held, a gateway or broker tier that manages access to the data and related resources, and an application services tier where, the reporting tools reside.

Each of these tiers are logically separated (e.g. through a LAN or the Internet), though in practice may be co-located.

As can be seen in the diagram, not all of the tools/frameworks reviewed span all three tiers. AWDIP and NDN for example, do not provide a reporting component. Rather they provide web-service APIs for other reporting applications to utilise.

Another key concept to understand when reading these reviews is the difference between centralised and distributed architectures. In distributed architectures, such as NDN and AWDIP, data is accessed from multiple sources concurrently. In general these data sources are provided by the custodians of the data who provide standards based web-services APIs for access.



As the name suggests, centralised architectures involve a process of collecting data from the custodian and storing it in a central repository in order to serve the application. This type of architecture is currently employed with the ANRA, Water2010 and the VWRDW.

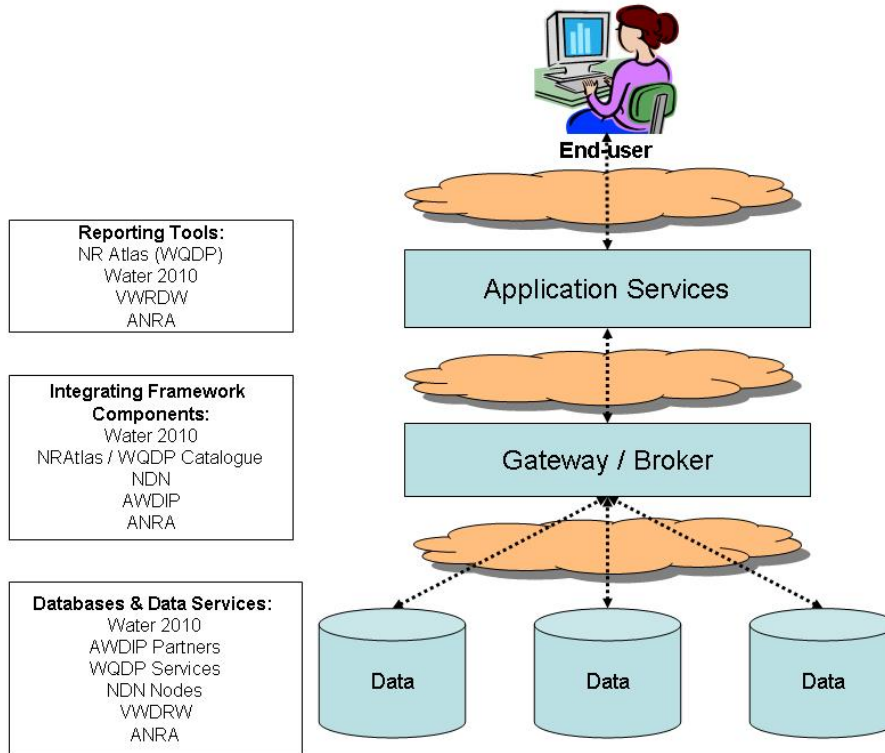


Figure 1 Generic Framework Structure

3.2 Tool/Framework Reviews

3.2.1 Methodology

In order to choose the systems for review, the Information Architecture Theme undertook a scan of currently available water data reporting tools and frameworks and current applicable projects in Australia. This resulted in a list of 10 candidates for review. In consultation with the NWC, this list was cut to six for further review. These were:

- AWDIP - Australian Water Data Infrastructure Project (ESCAWRI/BRS)
- Water 2010 (BRS)
- WQDP – Water Quality Data Publishing (NSW DNR)
- NDN – National Data Network (ABS)
- VWRDW - Victorian Water Resources Data Warehouse (VIC DSE)
- ANRA – Australian Natural Resources Atlas (NLWRA)



Custodians of these tools were sent a questionnaire⁵, followed by a face-to-face interview on site. The questionnaire and compiled results of the questionnaire/interview can be found respectively in Appendix A and Appendix B.

The following sections provide a summary of the reviews of the six candidate tools/frameworks.

3.2.2 Australian Water Data Infrastructure Project (AWDIP) ESCAWRI/BRS

<http://www.affa.gov.au/content/output.cfm?ObjectID=AE19FE00-503A-4BA6-9332BD72598A06E4>

3.2.2.1 Project Description

The Australian Water Data Infrastructure Project (AWDIP) was established under the national component of the Natural Heritage Trust (NHT) to facilitate national assessments of Australia's water resources. This will be achieved through the ongoing development of a comprehensive and accessible national water information framework, to support ongoing water reforms.

The sponsoring organisation for AWDIP is ESCAWRI (Executive Steering Committee for Australia's Water Resources Information).

The AWDIP will provide an Australia-wide infrastructure framework for delivery of water data (at measurement site level). It will be aimed at NRM policy investment planning decision makers at both national and state government levels.

The framework being developed by AWDIP comprises a standards-based Service Oriented Architecture, deploying a range of Open Geospatial Consortium (OGC) interface and encoding standards. This architecture enables access in a consistent and standard manner to water data services from all jurisdictions.

Open API's allow third party applications to connect to the framework.

3.2.2.2 Current Status

- All jurisdictions except the ACT have committed to participating. NSW and SA have live data services available
- Currently supports a limited set of parameters that may be of use to the Surface Water, Groundwater, and River Health assessment themes. The parameters exposed are those recommended by the Monitoring & Evaluation (M&E) framework (where available)
- A working prototype will be available by June 2006
- Ongoing support and investment seems secure until 2007

⁵ The Australian Natural Resources Atlas (ANRA) was not reviewed in the same way as the other systems. This is because members of the Information Architecture Theme were responsible for this systems design and development. These team members understand this tool to the extent needed for this review.

3.2.2.3 Applicability to Baseline Assessment Reporting

- Does not provide a reporting tool, would need to be linked up with e.g. WQPD (with which it already has close links), or, when available, DEH’s “Australian Resource Online” (ARO)
- There seem to little or no licence and access constraints
- Timeframe for the working prototype poses a risk.
- Dependence on advanced, not (yet) universally endorsed standards poses a small risk with regard to backward compatibility with existing off-the-shelf software components.

3.2.3 Water 2010 – BRS

www.brs.gov.au/water2010

3.2.3.1 Project Description

The Bureau of Rural Sciences’ (BRS) Water 2010 project is developing an interactive website and CD-ROM to enable users to explore factors influencing Australia's dynamic water balance.

The Water 2010 project applies a land-use-mapping-based approach to show how and where water is generated and used including run-off, evapotranspiration, irrigation and groundwater.

The website will be integrated with a national water database maintained by State and Commonwealth agencies and dynamically updated to ensure the most current data are available.

The framework being developed by AWDIP will be a key source of data underpinning Water2010.

The audience for Water2010 is similar to that of AWDIP: decision makers in government.

Key differentiators are:

- Strong focus on reporting on the water use theme (balance: supply, demand and dependency),
- Australia-wide 1km landuse grid used for display and modelling purposes
- A centralised data warehouse in addition to distributed web services,
- Reporting through pre-generated PDFs, rather than dynamic report (incl. map) generation, and
- A 1 km grid-based (rather than measurement site-based) spatial reporting model.

3.2.3.2 Current Status

- Working prototype
- Completion expected by July 2007



3.2.3.3 Applicability to Baseline Assessment Reporting

- No dynamic mapping or raw data query facilities
- Could provide water use/balance data into reporting tool
- No licensing constraints

3.2.4 Water Quality Data Publishing (WQDP) – NSW

<http://wqdp.socialchange.net.au/wmc/custom/homepage/home.html>

3.2.4.1 Project Description

DNR NSW is undertaking a project with CANRI funding to serve water quality data online through Web Feature Server (WFS) standard technology. It will support graphing and downloading of water quality data, and will be applicable across all natural resource management datasets for a wide range of business functions and many external partners, including indicator reporting for CMAs, SoE and the NLWRA.

The WQDP audience is defined as: “NRM/Water managers, GIS/NRM professionals, domain specialists, and students.

WQDP is a project that implements a framework consisting of water data services (enabled through Geoserver’s WFS services) and an integration and reporting toolkit (enabled through the NSW Natural Resources Atlas). Implementations of the tool set are currently serving water data ‘live’ from both NSW and SA custodians.

Open API’s allow third party applications to connect to the framework.

WQDP is closely linked with AWDIP and shares the AWDIP architecture and standards framework. In addition it provides a maturing integration and reporting tool including mapping and time-series graphing capability.

3.2.4.2 Current Status

- Working prototype, currently undergoing user acceptance testing before going into production
- Stable release, performance dependency on data services and size of result sets

3.2.4.3 Applicability to Baseline Assessment Reporting

- May require procurement of commercial software licence(s)
- Appropriate and maturing reporting tool
- Compliant with AWDIP standards framework
- Advanced standards dependence poses risk with regard to backward compatibility with existing off-the-shelf software components



3.2.5 National Data Network (NDN) – ABS

www.nationaldatanetwork.org

3.2.5.1 Project Description

The NDN provides functionality for the discovery, viewing, and acquisition of resources that are provided by custodians. Custodians have the ability to make resources that they provide to the NDN publicly available or have restricted access.

The NDN provide functionality for public search and acquisition of publicly available resources. It also provides a 'Rich 'Client that allows NDN Member to access restricted resources as long as the member has ACL rights to the resource

The NDN is aimed at an audience of the general public, researchers and NDN members. It deploys only open source software, and any software developed specifically for the NDN is returned to the public domain.

The NDN does not hold any data. It provides a metadata search facility across, and secure gateway to, member nodes' web services. It is based on a Services Oriented Architecture, deploying mainstream web service standards (WSDL and SOAP) and using AGLS/Dublin Core metadata standards. Open API's allow third party applications to connect to the framework.

The NDN provides a metadata search interface, but no reporting tools.

3.2.5.2 Current Status

- Currently NDN exposes largely statistical (demographic and economic) data, including some water use statistics
- Working prototype with three participating nodes
- Expecting to move into production in late 2006 / early 2007
- Stable release
- Limited support for spatial metadata or spatial web-services (e.g. WMS / WFS)
- Open source: no software licensing constraints. Data access subject to SLA⁶s with providers
- Exploring potential of registration of WQDP as a node

3.2.5.3 Applicability to Baseline Assessment Reporting

- Potential to be data node as well as access point
- Limited compatibility with spatial data and metadata
- Consider for future versions

⁶ Service Level Agreements

3.2.6 Victorian Water Resources data Warehouse (VWRDW) – Vic

www.vicwaterdata.net

3.2.6.1 Project Description

The VWRDW provides access to all water quality/quantity data for the State of Victoria, making it accessible through custom searches. Aside from raw data information products in the form of standard reports are also available. All the data is downloadable.

The data from the Victorian Groundwater Management System (GMS) has also been made available through the VWRDW, making it a valuable resource for surface and groundwater information. Additional information is made available through the VWRDW including Index of Stream Condition and reports relating to water quality/quantity assessment.

An interactive mapping application is also accessible through the VWRDW, providing a spatial context to the data.

The data available is targeted at scientists although the site is used by consultants, water authorities, catchment management authorities, government, EPA and the general public.

The data is centralised in a data warehouse, and has a loose connection to the Victorian government's MapShare public mapping application.

3.2.6.2 Current Status

- Stable Production system
- Limited efficiency
- VWRDW has been established several years ago, and is a mature and well used resource. DSE recognises its architecture is outdated and is embarking on a 1-2 year program to upgrade to a distributed SOA, in line with the principles of the Australian Spatial Data Infrastructure (ASDI)

3.2.6.3 Applicability to Baseline Assessment Reporting

- No data licence constraints
- Potentially valuable data source, would need to explore feasibility of enabling data access within time constraints

3.2.7 Australian Natural Resources Atlas (ANRA) – NLWRA

audit.deh.gov.au/anra

3.2.7.1 Project Description

The Australian Natural Resources Atlas was developed by the National Land and Water Resources Audit (NLWRA) between 1999 and 2003 in order to support reporting of the outcomes of the first national audit of Australia's Natural Resources. A key component of this audit was water, and, as such,



the ANRA contains a component dedicated to water resources and river health.

Content on the ANRA is broken into two distinct sections: a narrative describing a particular resource and giving key facts at varying spatial scales; and the Map Maker which hosts the spatial information produced by the Audit. Users have the ability to displays this spatial data along with relevant contextual information. Where possible, the data produced is available from a sister tool known as the Australian Natural Resources Data Library (ANRDL).

3.2.7.2 Current Status

The ANRA was developed purely to for reporting of the Audit. As such its underlying framework is designed to support this needs. This has resulted in a tool which does not lend itself to other purposes well. In particular:

- all data for the tool is served from a single, custom built, repository (i.e. centralised system).
- Narrative components of the tool are not easily maintained. Although adding spatial data sets to the Map Maker component is relatively simple

The ANRA is a sophisticated tool and reports a considerable amount of information. Unfortunately, this has led to a situation where users new to the site find it difficult to discover the information they seek. This is further evidenced by usage statistics which seem to suggest that the narrative components of the ANRA are not widely used.

3.2.7.3 Applicability to Baseline Assessment Reporting

From a long term perspective, there is to recommend the ANRA as a tool for reporting on future assessments. The tool employs a centralised data management approach and is difficult to maintain.

However, in the short term there is a great deal to recommend use of particular components of the ANRA. In particular adding spatial data sets to the Map Maker (and placing these on the ANRDL) can be achieved relatively quickly. These can then be ‘linked to’ from a simple external tool and will avoid the need to implement a short term mapping engine.

3.3 Summary

Table 1 below summarises the reviewed tools and frameworks against the key requirements and objectives of the reporting tool as identified in Section **Error! Reference source not found.**

Table 1 Capabilities vs. Key Requirements and Objectives

Key Requirements/Objectives	AWDIP	Water 2010	WQDP	NDN	VWRD W	ANRA
General Purpose						
Scalable and future proof	✓	✓	✓	✓		
Within the headline parameters of water quantity, water use, and water health	✓		✓	n/a	✓	✓
Display and download information from multiple, distributed sources	✓	✓	✓	✓		
Display the location of Australia’s water resources	✓	✓	✓		✓	✓
Focus primarily on national issues	✓	✓	✓	✓		✓
Provide information on a suitable baseline	✓	✓	✓		✓	✓
Explain the NWI vision	n/a	n/a	n/a	n/a	n/a	n/a
Provide contextual data, including demonstrating the ‘connectivity’ of data and water systems across Australia	?	✓	?	n/a	?	n/a
Provide definitions and information to facilitate more precise and deeper understanding and better informed public debate	n/a	n/a	n/a	n/a	n/a	n/a
Key website characteristics						
Present data primarily through spatial interfaces	✓	✓	✓			✓
Be visually appealing to all defined audience groups	n/a	✓	✓	n/a		
Present data on a monthly basis where possible and appropriate	✓	✓	✓	n/a	Yes	
Utilise surface and ground water management units developed under the Australian Water Resource Assessment 2000, and be comparable between management units. This will include ground water zones.	?	?	?	n/a	?	✓
Conforms to all Federal Government policies, guidelines and standards, including W3C Accessibility Standards.	n/a			n/a	?	✓
Complements existing websites and information.	✓	✓	✓	✓	?	✓
Provide links and metadata about associated information	✓	✓	✓	✓		✓



Key Requirements/Objectives	AWDIP	Water 2010	WQDP	NDN	VWRD W	ANRA
Initial Objectives						
Information focussing on the current baseline assessment	✓	✓	✓		✓	n/a
Pre-developed detailed information about specific iconic sites around Australia		?			?	n/a
Pre-developed detailed reports, maps and information about specific topics and regions.		✓	✓		✓	✓
Limited dynamically generated content.	✓		✓	✓	✓	
Descriptions and contextual information to assist the user interact with the website	n/a	n/a	n/a	n/a	n/a	
Future Objectives						
The display of a repeatable and an ongoing water data information source	n/a	✓	✓	n/a	✓	n/a
The ability to compare similar information across different spatial units, eg compare towns.	n/a		✓	n/a	✓	n/a
Ability to submit detailed granular queries to datasets as well as view and use the results of these queries.	✓	?	✓	✓		n/a
The ability for contributors to make metadata available describing their data and information services	✓	✓	✓	✓		n/a
Ability to save specific queries	n/a		✓	n/a		n/a
Compare similar data over the years	n/a	✓	✓	n/a	✓	n/a
Online models that can demonstrate the impact various extractions or management changes will have over time, including environmental, social, and water availability		✓		n/a		n/a

As can be seen, no one tool or framework meets all currently identified requirements and objectives. However it seems that a combination of two or more could provide a solid foundation to build upon for the reporting tool.

In summary the tools and framework review has shown that:

- AWDIP could offer a future proofed data infrastructure to support future assessments. It would need to be linked up with a compatible reporting tool, such as the WQDP viewer or (in the future) ARO. Its dependence on



advanced, not (yet) universally endorsed standards poses a small risk with regard to backward compatibility with existing off-the-shelf software components

- Water2010 provides extensive water balance and use information that might be used for inclusion in the reporting tool. This might be looked as a future reporting tool.
- WQPD is closely linked and compatible with AWDIP. Its maturing reporting tool is a candidate for re-use. The same backwards compatibility risks as for AWDIP apply.
- NDN provides an interoperable web-services infrastructure with quite limited spatial capabilities. It could be considered as a potential source or access point after the initial stages of the baseline assessment
- VWRDW is a proven and robust water data reporting framework for the state of Victoria. Its architecture however is outdated and undergoing an upgrade. Its content and reputation warrant exploration of the feasibility of enabling access to VWRDW from the reporting tool in the initial development of the reporting tool.
- The ANRA was developed specifically for the purpose of reporting the previous audit of Australia's Water Resources. Like the VWRDW, however, its architecture is outdated. Furthermore content on the site is difficult to maintain. The Map Maker component does, however, have some attractions in the short term.



4 Data Management Strategy

4.1 Introduction

Effective management of the data acquired or produced as part of the BWRA is essential to the delivery and success of the project. The third and final component of task for the Information Architecture Theme is to ensure that project data (inputs and outputs) are managed appropriately. The initial task for this component is the development of a an overall Data Management Strategy for the project. This strategy provides a data and information framework and set of processes for the BWRA project and for the ongoing requirements of the NWC. The strategy will guide both the Information Architecture Theme and other themes in:

- Development and use of a centralised store of metadata about all source data collected. This will help to avoid duplication of data requests and provide a process to enable the source data to be accessible to all themes;
- Development and maintenance of a BWRA spatial database including core base data sets and data layers required for reporting;
- Collation of all theme data outputs in a common and consistent format, and storage in a central spatial database; and
- Development of data outputs for the reporting tool.

The Data Management Strategy will also define the role of project a Data Manager. This role will be responsible for the administration of the strategy. All assessment themes will be responsible for the adoption and implementation of the strategy as it relates to the data sourced and produced by their theme. These roles and responsibilities are described in more detail in Section 4.2.

The Data Management Strategy described in the following section is for the use of project team members. It is contained here to demonstrate that there is an intention that data will be managed appropriately.

4.2 Managing BWRA Project Data

The flow of data into and within the BWRA project is shown in Figure 2. The key components of this data flow are::

- data acquisition (Source Data),
- data cataloguing (Project Data Catalogue)
- data storage (Theme or Project Data Store) and
- data delivery and distribution (Reporting Tools).



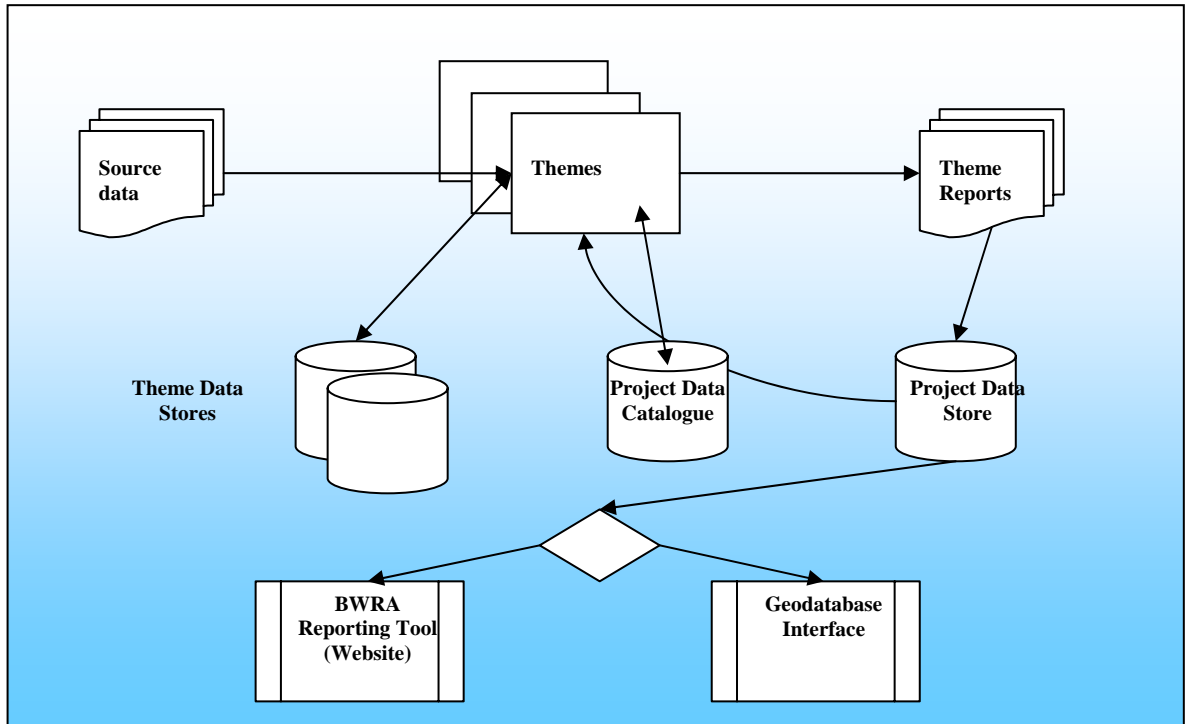


Figure 2 Data management strategy – data flow diagram

4.2.1 Data Acquisition

- Individual assessment themes will make data requests and arrangements for the delivery of the data sets they need to undertake their assessment.
- Data sets should only be acquired from an external source when it has been determined that the data set has not been previously requested or acquired by another Theme.
- A whole of project approach should be taken when acquiring the data, and where possible, **data licenses agreements should be negotiated to cover use by all themes in the project and the provision of the data to NWC on completion of the project.**
- Data licensing will be the responsibility of the themes and issues relating to data licensing should be brought to the attention of the Project Manager as soon as they arise.

4.2.2 Data Cataloguing

A data catalogue will be created and maintained on the project extranet/web site.

- A catalogue record should be completed for each data set either upon ordering or receipt. This is the responsibility of the theme.
- The data catalogue record will include:
 - 1) Data set name



- 2) Source agency
- 3) Custodian contact name and details
- 4) Jurisdiction of the agency
- 5) Requesting theme /"owner" theme – the theme that made the initial request and contact
- 6) Description of data set
- 7) Data set format
- 8) Metadata – indicate if a standards based metadata document is available, and has been received. These documents will be stored centrally
- 9) Data license agreement – note any restrictions to access / use by other themes and NWC
- 10) Status – Requested and/or Received

4.2.3 Data storage

Data produced by individual assessment themes as part of the project will be lodged and stored centrally by the Data Manager. The data store will have two components.

4.2.3.1 Central Metadata Store

The Central Metadata Data Store will include all metadata documents alongside the project data catalogue. Metadata documents within the central data store will be available to all themes in the format that it was received and provided to the Data Manager. It is important to note that it is not the role of the Data Manager to develop metadata for source data sets.

4.2.3.2 BWRA Project Database

The project database will be a spatially enabled database containing all outputs from the individual assessment themes along with core spatial data sets to be used by the assessment themes for reporting. This database will also include base data sets to ensure that all mapping and spatial analysis undertaken by the themes will be done so according to a common base.

Spatial data acquired by individual assessment themes that are not core data sets will not be stored in the Project Database. Each core data layer will have an "owner" theme which will be responsible for providing the Data Manager with this data.

Base data will include 1:250,000 Geodata topographic data layers (roads, watercourses, coastline etc.) for state and regional mapping and 1:1,500,000 for national scale mapping.

Core data layers required for reporting and identified by the themes as part of the discovery phase include:

- Surface Water Management Areas (SWMA) – this data set is to be ‘owned’ by the Surface Water Assessment theme.
- Groundwater Management Units (GMU) – ‘owned’ by the Groundwater Assessment theme.
- River reaches – ‘owned’ by the River Health Theme.
- State and Territory boundaries – potential core reporting unit for the Water Use Theme.
- Water Authority jurisdiction boundaries – may be required / provided by the Water Use Theme (ABS).

Copies of the Project Database will be provided to individual themes on a regular basis or as updates and outputs are received.

The Data Manager will maintain and control the versions of the core spatial data. Updates to these layers must be informed by the Themes and be provided in spatial data formats.

The spatial data will be compiled and maintained in ESRI shapefile/geodatabase format. The data will be stored using the GDA94 geographics (Longitude, Latitude) coordinate system.

As part of the data assessment process, a database may be developed and maintained by each theme listing the core reporting units for each theme and the availability of data. This will provide a consistent overview to the Project Manager and the NWC as to the completeness of the results and where the main data gaps are.

4.2.4 Data Distribution

4.2.4.1 Data Produced by Assessment Themes

All data outputs from the assessment themes (spatial information, databases, tables etc.) will be provided to the Data Manager along with metadata prepared to NWC standard (ANZLIC compatible). The preferred data format will be Access database tables. Results should be reported for all spatial reporting units as defined in the core spatial data sets. This data will be collated and integrated into the project database.

4.2.4.2 Project Database

The Project Database will be available to all assessment themes. Updated versions of the core spatial layers will be provided to all themes (through the theme leader or a single nominated contact) as these are produced to ensure that all themes have access to common spatial data.

The Project Database, including all spatial and related data and documents produced by each theme will be provided to the NWC. It is intended to deliver the database with a tool to analyse the data. For the database delivered in June 2006, an ArcReader^{††} interface will be included. This will

^{††} ArcReader is an easy to use GIS interface suitable for users with no previous GIS experience through to experienced users. The software can be freely distributed does not require a license



enable users to access the database, perform simple queries and produce maps.

Later deliveries of the Project database will include additional content provided by the assessment themes. At this point, the interface provided will undergo a review based upon the additional content, the potential for combining and analysing the data from the different themes and the use and experiences of the ArcReader interface by the NWC. This review will contribute to the development of a customised user interface that will enable more advance analysis of the data.



5 Summary

The Discovery Phase of the NWI Baseline Water Resource Assessment Project has allowed the Information Architecture Theme to undertake the following tasks:

- 1) Identify high level requirements for the tools requirement to disseminate and analyse the outputs from the various assessment themes;
- 2) Review a number of initiatives underway in Australia to develop a national data infrastructure for access to water related information
- 3) Review a number of existing and planned tools in Australia for the reporting of water related information; and
- 4) Develop a data management strategy for the BWRA project.

5.1 User Requirements (Section 2)

The requirements gathering task undertaken in the Discovery has defined and documented a set of high level requirements. It is clear from these that any application developed to report on the NWI Baseline Water Resource Assessment project will be based upon spatially oriented tools and that spatial information will play a key role in the user experience. It is also clear that it is intended that this tool be useful to a wide range of users.

The next step in defining the requirements of this tool (or set of tools) will be to assimilate the information model developed by the assessment themes of this project. It will then be necessary to identify and engage with a set of users of the proposed tool to understand how these users might wish to interact with the tool and the information they would wish to discover using it.

5.2 Water Data Infrastructure Initiatives (Section 3)

Two key data infrastructure initiatives were reviewed. These are:

- Australian Water Data Infrastructure Project (AWDIP); and
- National Data Network (NDN)

The key findings of this review were that both initiatives were well advanced although neither would be complete to meet the June 30 timeframe of this project.

AWDIP could offer a future proofed data infrastructure to support future assessments. However, it would need to be linked with a compatible reporting tool as it currently has no such tools. Possible candidates for this tool are the WQDP viewer, the Water2010 user interface or (in the future) the Australian Resources Online (ARO).

NDN provides an interoperable web-services infrastructure with limited spatial capabilities. It could be considered as a potential source or access



point for data in future assessments however its suitability as an infrastructure to support an entire assessment is doubtful.

5.3 Water Data Reporting Tools (Section 3)

A number of existing tools as well as tools under development were reviewed with a view to using one as the framework for reporting the results of the BWRA. These tools are:

- Water2010 – BRS;
- Water Quality Data Publishing (WQDP) Project – NSW;
- Victorian Water Resources Data Warehouse; and
- Australian Natural Resources Atlas

Water2010 provides extensive water balance and use information that might be useful for inclusion in the BWRA reporting tool. It is certainly a candidate as a future reporting tool, however, it is not due for completion until July 2007.

WQPD is closely linked and compatible with the infrastructure being developed by AWDIP. Its maturing reporting tool is a candidate for re-use in the future. However, its reliance on a data infrastructure and third party software licences will limit its viability as a short term solution.

VWRDW is a proven and robust water data reporting framework for the state of Victoria. Its architecture however is outdated and undergoing an upgrade. Its content and reputation warrant exploration of the feasibility of enabling access to VWRDW from the reporting tool in the initial development of the reporting tool.

The ANRA was developed specifically for the purpose of reporting the previous audit of Australia's Water Resources. Like the VWRDW, however, its architecture is outdated. Furthermore content on the site is difficult to maintain. The Map Maker component along with the associated Australian Natural Resources Data Library do, however, have some attractions in the short term.

5.4 Data Management (Section 4)

A data management strategy for the project team has been developed and will be implemented and used during Phase 2 of the project.

A key element of the output from the Data Management team within Phase 2 will be a spatially enabled database of all project results accompanied by a tool for analysing this data.



6 Recommendations

The following section outlines a set of recommendations for the NWC with respect to implementation of the Information Architecture components of Phase 2. These recommendations have been developed from the findings of the Discovery Phase and the collective experience of team members.

The most important feature of these recommendations is that they are divided into two distinct categories:

- Initial Tools - Those things that can and need to be done to ensure that the results of the initial BWRA are publishable in some form by June 30; and
- Enduring Asset - Those things that can and need to be done to ensure that the NWC's vision of an 'interoperable, interactive, real-time national water resources information system' can be realised.

The recommendations to achieve each of these goals are described below.

6.1 Initial Tools

For the purposes of the BWRA project, a centralised database of the data produced by the assessment themes will be developed. For logistical reasons, this database will only contain data and will not contain contextual text similar to that stored within the database supporting the Australian Natural Resources Atlas (ANRA).

This textual content will however, be contained in the final assessment reports. Thus, there is the possibility to use this text as content within the initial reporting website.

In order to achieve the June 30 delivery timeframe there is little possibility to implement a sophisticated tool capable of managing this text, nor can the expense for such a tool be justified for, what is hoped to be, a temporary solution.

The only existing tool that could be considered to support delivery of reports in the timeframe is the Australian Natural Resources Atlas (ANRA). However, as pointed in Section 3, this tool does not readily support the inclusion of new products.

A simple solution is required.

Recommendation 1: *Initial Reports for the BWRA should be in the form of web-enabled (HTML) assessment reports only. This is to be seen as an interim solution only whilst a more sophisticated tool (or set of tools) is defined and implemented.*

Elements of the ANRA can be used to display the spatial information produced for the assessment reports. This would be in the form of maps displayed on the Map-Maker. It is relatively simple to add content this tool.



Furthermore, it is possible to structure this content such that external applications can request that the Map-Maker start in such a way that it displays a particular data set, sets of data sets or zoomed into a particular feature within a data set.

Recommendation 2: *The NWC should look to deploy the spatial data sets generated by the BWRA on the ANRA Map Maker and provide links to these data sets from within web-enabled theme reports. This is to be seen as an interim solution only whilst a more sophisticated tool (or set of tools) is defined and implemented.*

It is important to be able to analyse the information contained within the BWRA Project Database. As the project database will be in the form of an ESRI Geodatabase, the most appropriate tool in the short term will be an ESRI ArcReader based solution. In the longer term it will be necessary to determine whether the NWC should invest in the development of a more sophisticated tool.

It is important that access to the information generated by the project is available to all.

Recommendation 3: *The NWC should look to ensure that the BWRA Project database be placed within the Australian Natural Resources Data Library (ANRDL) at the first delivery milestone. As updates to the database are made, a new version should be placed within the data library.*

Recommendation 4: *The NWC should also make available to the ANRDL, the ArcReader project file to be delivered with the project database.*

Figure 3 gives a proposed site map for the initial release of the BWRA Reporting Tool. It is important to note that this structure can be delivered by June 30 for reporting of initial outputs of the BWRA project. It is not envisaged that this become the final reporting tool. Rather, this is an interim solution until a more useful tool can be developed.



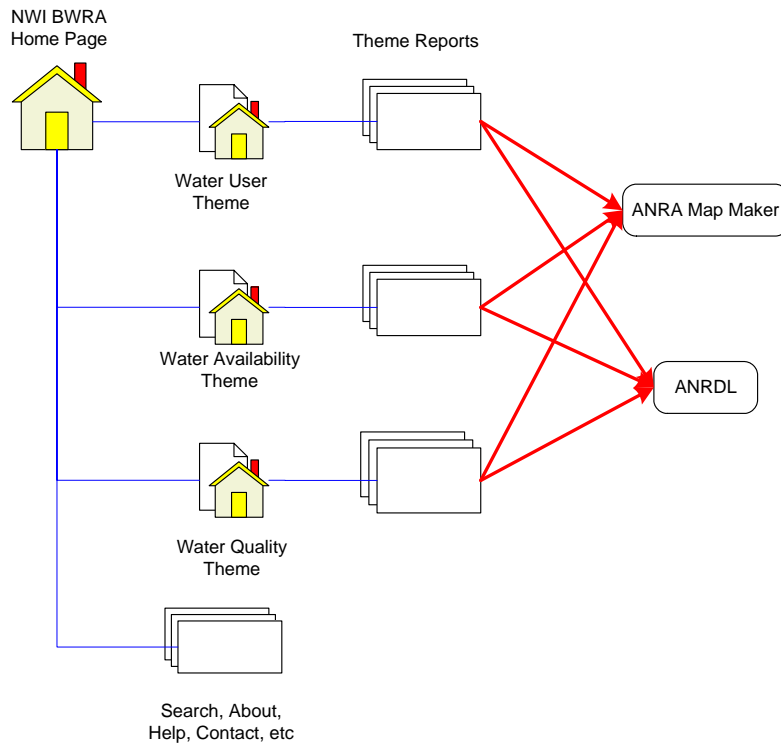


Figure 3 Initial BWRA Reporting Tool Site Map

6.2 Enduring Asset

The NWC’s ‘Enduring Asset’ consists of two components. These are:

- 1) A distributed data infrastructure capable of supplying the information required to support future assessments; and
- 2) A tool (or set of tools) for reporting on future assessments

6.2.1 Data Infrastructure

The infrastructure being developed by the AWDIP under the direction of ESCAWRI is the first step towards the infrastructure component required to support the ‘enduring asset’. At present this infrastructure supports a subset of the parameters required to for future resource assessments. However, the structure of the AWDI it is such that, with adequate investment, it can be extended to include the parameters required. Importantly, the development of this infrastructure has the support of the states and territories and, in most cases, is their preferred framework for such data access.

Recommendation 5: *The NWC should look to extend the scope of the data infrastructure being developed by ESCAWRI in order to support future assessments. This must be done in collaboration with ESCAWRI and the AWDIP team to ensure that work already undertaken by those groups is taken into account, and,*



importantly, Australia ends up with a water data infrastructure based upon a single consistent specification.

Recommendation 6: *The NWC look to participate in the ESCAWRI Technical Working Group (TWG) either through an NWC staff member or through a representative.*

6.2.2 Reporting Tool(s)

High level requirements for a tool (or set of tools) to report on the BWRA and future assessments have been captured. It is now necessary to test these requirements with potential users of these tools and define them to a point where design and development can begin.

Recommendation 7: *The NWC should continue to define and develop the requirements for a suite of tools to report on future assessments.*

As for the data infrastructure component, it is important not to ‘reinvent wheels’ and therefore projects such as Water2010 (reviewed in Section 3) and the National Land and Water Resources Audit’s Australian Resources Online (ARO) (not reviewed in this study) should be looked to as potential candidates for reporting in the future.

Recommendation 8: *The NWC should continue to engage with the owners of the Water 2010 and ARO projects to determine any synergies between their reporting requirements and the planned functionality of these tools. This can only be done once the requirements of the NWC tool are known.*

7 Work Plan: Phase 2

7.1 Introduction

The Information Architecture theme objectives that were completed during Phase One (Discovery Phase) were:

- 1) Development of a Data Management Strategy.
- 2) Review of existing water related reporting tools
- 3) Identification of an initial set of requirements for the Baseline Assessment Reporting tool.
- 4) Development of initial Requirements Document with a framework for engaging with a wider user base.
- 5) Identification of existing Australian water data infrastructure initiatives.
- 6) Review of a subset of these initiatives.

The results of the Discovery Phase indicated that the tool used to report on the NWI Baseline Water Resources Assessment project will be based upon spatially oriented tools, and that spatial information will play a key role in the user experience. It is also clear that it is intended that this tool be useful to a wide range of users.

The next step in defining the requirements of this tool (or set of tools) will be to assimilate the information model developed by the data themes of this project into this specification. From there, an initial set of tools can be built and an implementation strategy for the implementation of an ‘enduring asset’ can be developed.

The Phase Two Work Plan of the Information Architecture theme describes the process for developing an implementation plan, and the process for building initial tools to promulgate the NWI Baseline Water Resources Assessment information.

7.2 Objective of Phase Two

The objectives of Phase Two of the Information Architecture theme are to:

- 1) Build a set of tools for the initial promulgation of NWI Baseline Water Resources Assessment information.
- 2) Determine the requirements, scope, architecture, and implementation plan for an Interoperable Water Information Infrastructure that can deliver future water resource assessments. This infrastructure will be an “enduring asset”, and will form the one of the most important outputs from the BWRA project.

7.3 Key Outcomes

Key outcomes of Phase Two will be:

- 1) Development of the initial reporting tools (online and desktop) to promulgate NWI Baseline Water Resources Assessment information.
- 2) Validation and detailed definition of the key operational requirements for the enduring asset including Information Architecture tools, data, and institutional/governance requirements, using the discovery phase outcomes from all themes as a start point for further iteration.
- 3) Analysis of the key operational requirements against the existing frameworks and available resources, and analysis of the investment required and approaches to deliver the enduring asset.
- 4) Implementation Strategy to deliver the enduring asset.

7.4 Constraints, Dependencies and Opportunities

There are a number of constraints and dependencies that must be considered and addressed during Phase Two. The main constraints and dependencies include:

- **Outcomes from Theme Reports (Discovery Phase).** In order to provide an implementation plan that is achievable and realistic, the outcomes from the discovery phase provide a guide to the types of constraints and dependencies that will exist for an enduring asset. This will include the Information Architecture Water Reporting Frameworks review.
- **Related Activities and Groups.** There are a number of related activities, including the Water Accounting, Performance Indicators, Benchmarking, AWDIP, Reporting and Metering and Measuring projects. These projects have links to this project and with each other. All will require information from similar agencies. Communication with jurisdictions must align with information sessions and activities of other projects.
- Similarly there are a number of groups working in similar areas on similar problems. These include: ESCAWRI, NLWRA, eWater CRC and the WRON Alliance. There is an opportunity to ensure these groups are working towards a common goal through development of a liaison plan and under the leadership of ESCAWRI.
- **Sufficient and appropriate stakeholder involvement.** This includes the ability to identify, educate and engage the stakeholders in a short amount of time, and the ability for stakeholders and users to articulate their requirements of the tools to be delivered. This can be managed by ensuring that the stakeholders are able to represent priority user groups, have some technical capacity to convert requirements to specifications, and have an understanding of what the NWC and the project is aiming to

achieve. It is assumed that the NWC will be active in ensuring that the right stakeholders are identified and engaged.

- **Completion date.** The build of the initial tools is to be complete by 30 June 2006. This is an ambitious timeframe for this type of project. This is further constrained by the requirement to coordinate with other projects especially in regards to communication with jurisdictions. The depth of development, assessment and detail will be dependant on this constraint.
- **Related process and framework issues.** In some cases, important requirements of a solution can only be met if related business processes and frameworks are improved first. For example, a map that is required by users could be delivered only if an agency agrees to update internal policies on providing data. If issues with processes and frameworks cannot be improved or resolved, this may constrain what the tool is able to deliver. Addressing these issues could also lead to an increase in time, cost and the scope of the project.

7.5 Methodology

Work for the Information Architecture Theme in Phase Two will be divided into two project streams. These are:

- 1) An 'Initial Tools' Stream; and
- 2) an 'Enduring Asset' Stream.

The Information Architecture Theme leader will have overall responsibility for both streams. Streams will run concurrently and be project managed as discrete projects. The Theme Leader will be responsible for ensuring linkages between the two streams are identified and exploited. This role will also coordinate with other activities (e.g. Water Accounting project) to ensure no duplications occur and to leverage of existing work.

Figure 4 attempts to depict the work plan for each Stream and the tasks involved. The following sections outline the methodology for both streams in more detail.

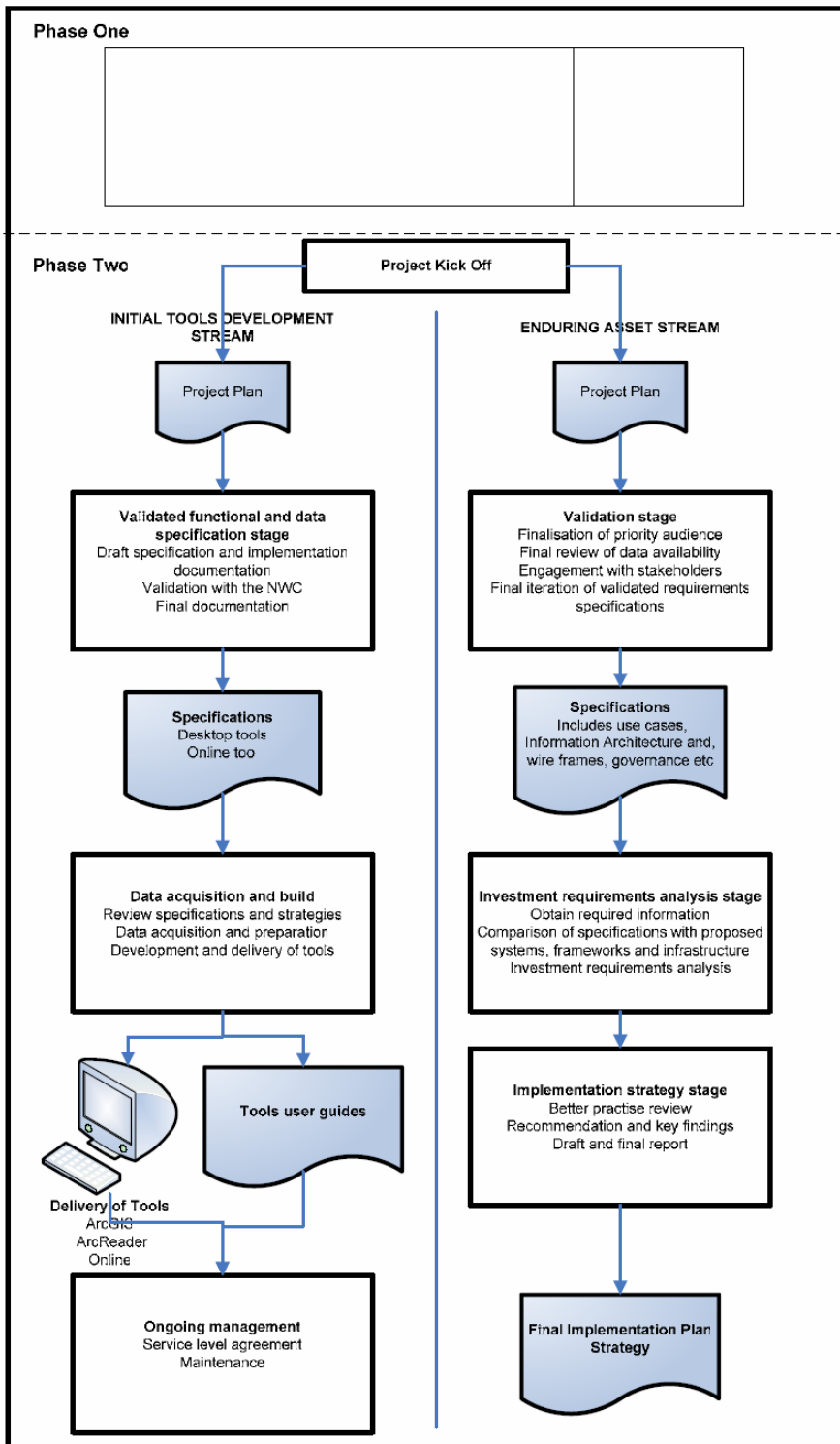


Figure 4 Methodology for Information Architecture Theme Phase Two Work plan

7.5.1 Project kick off (both streams)

The project will commence with a meeting with the Information Architecture Theme Leader, Project Managers, and NWC staff. The meeting will focus on providing clarity and understanding on what is to be delivered in the timeframes provided.

7.5.1.1 Process

Activities to be undertaken during the project kick off are to review, discuss and confirm for both streams:

- The proposed methodology including resources, project plan and timelines against the objectives of the project.
- The timetable for milestones and meetings, project management activities and reporting schedules.
- A common understanding and agreement of what outcomes, what tasks will be completed, timelines for completion, and the project deliverables.

7.5.1.2 Outcomes

The outcomes from the start-up meeting will be an agreed project plan, methodology and timelines document for review and sign-off against those activities of the project that can be monitored.

7.6 Initial Tools Development Stream

The major outputs of this stream are the implementation of an online (public internet) tool and a desktop tool (for NWC use). This stream will also have responsibility for developing and managing the catalogue of all data acquired for the project as well as providing the store for core spatial data sets.

A centralised database of outputs will be developed containing data only. In order to achieve the June 30 timeframe for delivery, text for the website will be extracted from the final reports delivered by individual assessment themes and delivered in HTML web based format. Elements of the ANRA will be used to display the spatial information produced by the assessment themes in the forms of maps on the Map-Maker tool. It is proposed to provide links to these data sets from within the web-enabled theme reports. The BWRA Project database will also be placed within the ANRDL on completion of the project.

The NWC have also expressed a desire for a tool for analysing the information within the BWRA Project Database. As the project database will be in the form of an ESRI Geodatabase, the most appropriate tool in the short term will be an ESRI Arc Reader based solution.

There are three main stages to the Initial Tools Development stream that are described in more detail below.

- 1) Validated functional and data specification stage
- 2) Data acquisition and tools build
- 3) Ongoing data management

7.6.1 Validated Functional and Data Specification Stage

As with the Enduring Asset Stream validation stage, understanding the objectives and expectations of the tools and validating this with the NWC before building is a *critical* stage in the process, and will be fundamental to the success of the tool.

It is expected that this stage of the project will be completed as quickly and early as possible, to ensure the maximum time is spent on the data acquisition and building stages.

7.6.1.1 Process

The following activities are to be completed in the validation stage.

- 1) **Detailed specifications and implementation documentation.** A high level description of the initial tools was provided in the Discovery Phase. This description will be built upon with the assistance of the NWC to describe in detail what will be implemented. This will include identifying the data that will be used during implementation.
- 2) **Validation with the NWC.** This documentation will be presented to the NWC for comment. It is not anticipated that there will be wider consultation due to the short time frames that are involved.
- 3) **Final iteration** of validated specifications. Following engagement with the NWC, the final specification documents will be provided for final validation prior to proceeding with the next stages.

7.6.1.2 Outputs

The outputs for this stage will be separate validated specification documents for both the desktop and online tools. It will contain all functional and non functional specifications and any other information that will be required in order to complete the build of the tools. It is anticipated that where existing tools are to be used, some specification information will already exist or will not be required in order to build.

7.6.2 Data Acquisition and Build

At this stage of the project, the initial tools will be specified and described, strategies finalised, and available data identified. Using all this information as a blueprint, the data can be acquired and the tools built, tested and delivered.

7.6.2.1 Process

The following activities are to be included in the data acquisition and build stage.

- 1) **Review specifications and strategies.** Prior to building, it is important that the project managers and developers review the specifications and



strategies and ensure that all the information is provided to deliver all tools. This task should be able to be completed quickly and will essentially be a safeguard against delays during the project.

- 2) **Data acquisition and preparation.** In order to build the tools, the data needs to be acquired and prepared. This will include the following:
 - **Sourcing data.** This will include sourcing and preparation of base data sets - Geodata 1:1M - Themes (Roads, BUA, Localities, Water Courses, State and Nat. Boundaries), Core Mapping Data (SWMA, GMU, River Reaches and Water Authority Boundaries).
 - **Developing data storage structures.** Includes establishing the Data Catalogue and Project Geodatabase, creating a directory structure and central repository for the core datasets, collation of all base data and providing access to this for all project themes.
- 3) **Development and delivery of tools.** Once specifications are developed and data is available, the initial tools can be developed and delivered to the NWC. This will include the following:
 - Develop and test database and presentation of information for all tools.
 - Prepare maps for reports & reporting tool
 - Develop required interfaces for online tool, and ArcReader. These will be based on specifications provided.
 - Pre-test presentation of products for review and comment from the NWC
 - User acceptance testing to ensure that tools operate effectively and as planned and specific.
 - On completion of testing, launching of online tool to hosted environment and production of ArcReader product.
 - Provide a copy of all collated data and the Project Geodatabase to the NWC
 - Provide all application documentation including a user guide for the desktop tools.

7.6.2.2 Outputs

The outputs for the data acquisition and build stage will be the initial online tool and desktop tools (Arc Reader) and related documentation and user guides.

7.6.3 Ongoing Management

Once the initial tools have been delivered they will also require ongoing management including the ongoing management of data.

7.6.3.1 Process

The ongoing management of the tools and the data will be finalised with the NWC during the project, and will include the following types of activities.



- 1) **Service level agreement.** Development of an agreed level of service and ongoing management tasks

- 2) **Maintenance.** This includes:
 - Maintenance of central data store & catalogue including ensuring the data catalogue is up to date and duplicates of source data are being received and stored
 - Ongoing monitoring of data entries in the catalogue and receipt and storage of incoming source data. Checking data for logical consistency, metadata etc.,
 - Maintaining the core GIS data layers. If any changes or additions are required, the themes will provide a GIS data set. The data manager will update core GIS data layers when and provide versioned updates
 - Maintenance of the online tool
 - Reporting updates. This includes the preparation of maps for reports and reporting tools.

7.6.3.2 Outputs

- Service and management documentation
- Ongoing management of initial tools and data

7.7 Enduring Asset Stream

The major output of the Enduring Asset Stream is an investment and implementation strategy describing what is required, how it could be implemented, and the investment that will be required to build the 'enduring asset'.

As with any systematic development of an application or technical tool, the Enduring Asset Stream will take the first iteration of the high level requirements and model, developed in the Discovery Phase, and builds upon these to produce the next level of detailed required. Once this is has been achieved, the investment required to do so can be analysed and the process of how to implement can be defined.

There are three main stages to the enduring asset stream that are described in more detail below.

- Validation stage
- Investment requirements analysis stage
- Implementation strategy stage

7.7.1 Validation Stage

The Discovery Phase has indicated a requirement for spatially oriented tools and described, at a high level, the requirements of these tools. The Enduring Asset Stream will begin to build on these requirements by validating them with jurisdictions and developing more detailed, final specifications of the enduring asset.

Understanding and describing in detail the enduring asset, validating this with stakeholders and users is a *critical* stage in the process before finalising and documenting the tool. It will be fundamental to the success of the tool as an 'enduring asset'. The Validation Stage will:

- Manage and clarify the expectations of what will be developed.
- Allow the jurisdictions the opportunity to understand and be clear about what the enduring asset will look like and what requirements will be met, and to provide feedback on what is to be implemented.
- Provide the opportunity to further identify who the users are and how they will interact with the product, and what is going to be useful. For the product to be an enduring asset this must be as clear as possible as it defines functions the tool must be able to deliver and how the tool will deliver them.
- Provide direction for those developing and building the asset, including management of scope, costs and risks.
- Ensure that the tool (or tools) is implemented to meet the specific requirements of users and against defined use cases, rather than trying to fit the tool into existing systems or frameworks that may not meet requirements (therefore reduce the ability for the tool to be an enduring asset).
- Highlight any areas of inconsistency, ambiguity and incompleteness early, rather than during the build phase. Finding problems during the build can be expensive and time consuming and usually results in a product that does not meet requirements.

7.7.1.1 Process

The validation stage includes the following activities

- 1) **Finalisation of priority audience groups with the NWC.** In order to be an 'enduring asset', the tool will be built so it is useful and usable for the actual users. Tools that do not take into consideration the intended and actual user are typically short lived.

A high level description of the audience groups for the enduring asset was developed during the Discovery Phase. This description needs to be built upon during the validation stage through a series of research activities with the NWC. These activities will form the bedrock of this stage as it will identify who the tool will be built for, what will be useful, and who will test the usefulness of the tool.



- 2) **Final review of data availability.** Data was identified in the discovery phase reports from all assessment themes. This data will provide the Information Architecture theme with more details on what the enduring assets information model will look like and, hence, will be reviewed to inform the validation stage.
- 3) **Engagement with stakeholders.** Validation of the proposed specifications and requirements must occur before finalising the tool. This will involve the following activities
 - Identification of appropriate contacts to assist with validation of the requirements. Stakeholders should be a mix of priority users and represent priority user groups. They should also have some technical capacity to convert requirements into specifications and have an understanding of what the NWC and the project is aiming to achieve. It is assumed that the NWC will be active in ensuring that the right stakeholders are identified and engaged.
 - Workshop preparation. In order to engage with the stakeholders and users certain preparatory work is required. This includes gathering of: information about the project and its requirements; what information is required; questions to be answered in order to validate requirements; pre-workshop activities participants will be asked to undertake. This will also include liaison with other projects and other themes to introduce the issue and ensure that linkages and efficiencies in consultation and interviews.
 - Conduct Workshops. Workshops have an advantage over interviews and individual consultation as they enable several groups to be consulted at once, promote consensus and prioritisation of requirements, and allow conflicting issues amongst stakeholders to be highlighted and resolved. The main outcome of the workshops will be to review, provide more detail, prioritise and finalise requirements. These workshops will also explore the relationships between the specification, the proposed tools, and other existing sites and tools.
 - Follow up interviews. It is anticipated that up to sixteen follow up interviews and discussions will occur in order to finalise and complete more detailed issues that will be initially raised during the workshops.
 - Consolidation of the information collected during workshops/interviews.
- 4) **Final iteration of validated requirements specifications.** Following engagement with stakeholders, the final activities involve developing the final iteration of validated requirements. Documentation will include:
 - User profiles. Priority users and their requirements of the enduring asset. Users can also refer to other specific users of a tool, such as administrators, custodians, owners, data providers.

- Use cases. Development of scenarios that show the activities of the users, written in the user language. Each use case involves the description of a single task, without specific reference to the actual features of a tool. These are used to inform the information architecture and structural design, and to test whether the final tool is useful and meets user requirements.
- Information Architecture. In this instance, information architecture refers to the design, structure, grouping and presentation of the information on the site. This will include the labels and topic groupings, the behaviour of menus and navigation, and how the structure of the tool will aid in the discovery of information.
- Graphic design. The graphic elements of the site including colours, branding, buttons and icons, look and feel.
- Wire frames. A wire frame is a conceptual representation of what a tool will look like and how it will behave. The use cases, Information Architecture, and graphic design will influence how the wire frames will be developed.
- Data requirements. Describes the type of data and its characteristics that will be required to support use cases and meet user requirements.
- Functional requirements. Describes the behaviour of the system/tool in order to support the Information Architecture, use cases and user requirements. Functional requirements are typically described from a technical perspective, include a rationale for inclusion, and are measurable.
- Non functional requirements. Describes the characteristics or constraints of the tool in order to support the Information Architecture, use cases and user requirements. Non functional requirements typically describe external constraints or non-measurable characteristics.
- Institutional and Governance issues. Depending on the requirements, specific institutional and governance issues that will impact on the implementation of the enduring asset will be identified and addressed. As specification documents are typically iterative and adaptive, this will also include the change management process for any evolution of the specifications after sign off.

In order to ensure that the Information Architecture design and wire frames will be usable and useful, a round of user testing will occur at this point, followed by refinement of the specifications where required. User testing will involve one-on-one testing with up to five defined priority users of the tool. Participants will attempt to complete different scenarios or activities, and will provide feedback on how to improve the specifications to ensure the tool will be both usable and useful.

Draft reports of all specifications will be made available to the NWC prior to development of final reports and presentation and sign off of the specifications.



7.7.1.2 Outputs

The outputs for this stage will be the validated requirements document including the following:

- User profiles and requirements
- Description of use cases and scenarios the tool must support
- Information Architecture and graphic design, including wire frames
- Institutional and Governance
- Data Requirements
- Functional Requirements
- Non Functional Requirements

7.7.2 Investment Requirements Analysis Stage

During the discovery phase, a number of existing and ‘in-development’ systems were reviewed against the high level requirements of the NWC. It is expected that a combination of two or more of these systems could be used for the enduring asset.

The investment requirements analysis stage involves reviewing the ‘ideal’ requirements and specifications against the systems, frameworks and infrastructure that will be used to deliver the enduring asset. It involves understanding where specific delivery gaps exist, and determining the type and level of investment required in order to meet these gaps and provide the ‘ideal’ enduring asset.

7.7.2.1 Process

The investment requirements stage can begin once the requirements documentation has been reviewed and signed off by the NWC. This stage includes the following activities:

- 1) **Obtain required information.** The first task is to review the requirements and specifications against information collected during the Discovery Phase. This will identify the additional information or detail needed in order to conduct an analysis. This information will then be obtained from the appropriate sources.
- 2) **Comparison of the ideal against the existing.** Information will be collated and organised so that the ideal requirements and specifications can be compared with the systems, frameworks and infrastructure that will be used to deliver the asset. This will highlight existing gaps.
- 3) **Investment requirement analysis.** The final activity of this stage is to determine the type and level of investment to best meet the requirements and specifications. This will include a review of any better practise examples and a discussion with the NWC on possible investment types. It is anticipated that in some cases there will be a number of investment



options. In these cases the risks and benefits of each investment option will be reviewed.

7.7.2.2 Output

The output for this stage will be a breakdown of what investment is required to meet the specifications and specifications identified during this stream. This will be used to inform the implementation strategy.

7.7.3 Implementation Strategy Stage

The final stage of the 'Enduring Asset' Stream will bring together all information and analysis from the previous stages, and provide a strategy for the implementation of the tool/s. This strategy will provide the NWC with a series of recommendations and an implementation plan.

7.7.3.1 Process

The following activities are to be included in the implementation strategy stage.

- 1) **Better practice review.** A review of relevant Australian and international examples of similar initiatives or tools, including examples of similar initiatives in other disciplines or industries. Such a review provides the opportunity for this project to learn from previous examples,
- 2) **Recommendations and key findings.** Analysis of the type and level of investment required to implement a tool as an 'enduring asset' and development of recommendations and key findings. Recommendations will include the rationale, benefits, risks, constraints and cost, and a breakdown of the tasks to achieve the recommendations, how they might be achieved, and resources and timelines required to achieve them.
- 3) **Meeting with NWC.** A meeting with the NWC will be convened to discuss to review the findings and the recommendations / tasks, including an assessment and discussion of the impact of the recommendations. This meeting will also include a final validation of the structure and content of the strategy.
- 4) **Draft and final report.** Following the meeting with the NWC, update the final recommendations and complete a draft report for review. Using this information from the review, edit and provide a final strategy for sign off and project stream close.

7.7.3.2 Output

The output for this stage will be a Final Implementation Plan Strategy. The contents of this report can be discussed and finalised during the project, but it is anticipated that it will contain the following type of information:

- Final validated vision, objectives and characteristics of the enduring asset.
- A summary of the more detailed specification documentation including description of key audience groups and requirements specifications, mock ups, and examples of the structure and design of the tool.
- Prioritised list of tasks to be completed in order to meet the requirements
- Description of how existing investments to be used to implement the enduring asset and the type and estimated level of additional investment required.
- Investment and Implementation options on how to move from the initial tools to the enduring asset tool/s, including indicative costs, constraints, benefits and risks.
- Identification of 'quick wins'.

Recommended investment and implementation option, including a practical and detailed road map for implementing this option.



Appendix A Questionnaire

Introduction

This questionnaire provides the structure for the tool reviews to be carried out with custodians of online water data reporting tools in Australia.

Tools currently under review are:

- AWDIP -Australian Water Data Infrastructure Project / Water 2010 (BRS)
- WQDP –Water Quality Data Publishing (NSW DNR)
- NDN – National Data Network (ABS)
- VWRDW - Victorian Water Resources Data Warehouse (VIC DSE)

The purpose of the questionnaire and interview is to:

- Obtain an overview of the current state-of-the art of water data reporting in Australia
- Help define the requirements for the NWC Baseline Assessment Reporting Tool
- Assess the possibilities of re-using (parts of) existing tools and/or infrastructures as a basis for the NWC Baseline Assessment Reporting Tool.

The interview is intended to follow the structure of this questionnaire. It would be very helpful if you could review this questionnaire, and complete as much information as possible in advance.

On behalf of the National Water Commission, and the Baseline Assessment Consortium, we thank you very much for your cooperation.

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General Description

Name of the tool: _____

URL: _____

Purpose and audience

- What is its purpose, and what is its target audience?

Description

- Can you provide a general (2-3 paragraph) description of the tool?

Custodian / custodial organisation

Name:

URL:

Custodian contact details

Name:

Title:

Phone:

Email:

Interviewed person(s) contact details

Name:

Title:



Phone:

Email:

Functionality

These questions refer to the general functional capabilities of the tool. Primarily focussing on end-user (=reporting) functionality, but may include e.g. key publishing or administrative functionalities

Query Capabilities

Datasets

- What datasets are queryable using this tool?
 - _____
 - _____
 - _____
 - _____
 - _____
 - _____

Themes

- Which of the following content themes –if any- are included in the tool and/or the data?
 - Surface Water (how much do we have and store, what are the variability factors, what are the connections?)
 - Groundwater (how much do we have and store, what are the variability factors, what are the connections?)
 - Water Quality and River Health (what is the condition, are the systems healthy, what are the key environmental assets?)
 - Water Use (how much do we use, what water is used, what is it used for)?
 - Other: _____

Detail and complexity

- Does the tool allow querying of attributes per ‘site’ (show me data for these attributes in this timeframe)?

- Does the tool allow selecting sites by attribute value (selects sites with attribute value over certain threshold)?

- Does the tool allow selecting sites by location (e.g. draw on a rectangle and select all sites in that area)?



-
- What parameters/attributes are queryable?
 - _____
 - _____
 - _____
 - _____
 - _____
 - _____
 - What level of detail/complexity is available in query building (logical AND/OR combinations, value ranges, 'Like' queries, etc.)?
-

Configurability

- Is the list of queryable datasets configurable? If yes: how?

- Are query-definitions (parameters, field names, etc.) configurable? If yes: how?

Navigation & Functional Architecture

Area of Interest

- What methods are available for navigating to an Area of Interest?
 - Zoom & Pan
 - Select from predefined list of named features
 - Free text geographic names
 - Other: _____

Topic of Interest

- What methods are available for selecting a topic (or theme) of interest (e.g. basemap, surface water, water use, etc.)?
 - Catalogue Search
 - Select from predefined list
 - Other: _____

Display options

Data output

- What type of data output formats are available?
 - Tables
 - Maps
 - Graphs (time series)

- Graphs (other)
- Other: _____

Selection

- What –if any- methods of selecting features (sites, rivers, etc.) are available?

Aggregation

- What –if any- methods of aggregating data (e.g. sum/average) before display are available?

Standard reports

- What –if any- capability exists for end-users to run/generate preconfigured queries and reports? (e.g. Annual rainfall over the last 5 years for CMA x)

Downloads

- What –if any- facilities exist for the user to download query results?
 - None
 - Text (e.g. CSV)
 - Spreadsheet/database: _____
 - Spatial data format (shapefiles, GML, other): _____
 - HTML
 - PDF
 - Other: _____.

Other

- What –if any- other key functionalities does the tool provide?

- _____
- _____
- _____
- _____



Spatial Coverage

Extent

- What is the spatial extent of the tool and/or data exposed through the tool?
 - World
 - Australia
 - One or more states: _____
 - Other: _____

Reporting Units

- What is the spatial resolution (lowest level of detail) of the units for which data is exposed through the tool (e.g. rivers, lakes, monitoring sites, etc.)?

Architecture

Centralised/Distributed

- Is the tool based on a centralised (e.g. datawarehouse) or distributed (e.g. web-services) architecture?

Standards

- What standards –if any- is the architecture based on? (e.g. web-services, user interfaces, data access, data exchange, metadata, security, etc.)
 - _____
 - _____
 - _____
 - _____
 - _____

Hard- and software

- What –if any- existing off-the-shelf software components are included in the architecture (e.g. ArcIMS)?
 - _____
 - _____
 - _____
 - _____
- What –if any- hard and software restrictions exist for the tool (intel/unix server, databases, browser versions, etc.)
 - _____



- _____
- _____
- _____

Maturity

Status of Completion

- What is the status of completion of the tool?
 - Conceptual
 - Proof-of-concept
 - Working prototype
 - Production

Performance

- What can you say about the performance (speed, usability) and robustness (stability) of the tool in its current form?
- _____

Maintenance and Development

- What –if any- plans for further development exist, and in what timeframe?
- _____

- What –if any- maintenance arrangements are in place?
- _____

- What –if any- ongoing funding arrangements are in place?
- _____

Licensing and access constraints

- Are there any licensing or other access constraints to consider for this tool to potentially be used for the NWC baseline assessment reporting?
- _____
- _____
- _____



Appendix B Questionnaire / Interview results

	AWDIP	Water 2010	WQDP	NDN	VWRDW
1 General Description					
Name of the tool:	Australian Water Data Infrastructure Project	Water 2010	Water Quality Data Publishing (Project) NSW Natural resource Atlas WebMap Composer (Application) GeoServer (WFS Server)	National Data Network	Victorian Water Resources Data Warehouse
URL	http://www.affa.gov.au/content/output.cfm?ObjectID=AE19FE00-503A-4BA6-9332BD72598A06E4	www.brs.gov.au/water2010	http://wqdp.socialchange.net.au/wmc/custom/homepage/home.html www.nratlas.nsw.gov.au http://webmap.socialchange.net.au/support/ http://geoserver.sourceforge.net/	www.nationaldatanetwork.org	www.vicwaterdata.net
1.1 Purpose and audience	Purpose: Infrastructure framework for delivery (Geoserver WFS based) Audience: Aus Govt	Purpose: Deliver client-oriented water balance information for policy development and	Two components: Server infrastructure (Geoserver WFS) and user front-end (NRAtlas/WMC). Audience:	Audience: General public, researchers and NDN Members	To deliver all water quality/quantity data for the State of Victoria The data available is targeted at



	AWDIP	Water 2010	WQDP	NDN	VWRDW
	& State Govt NRM policy investment planning decision makers	strategic planning Audience: -Australian and state govt water policy development areas - NWC - MDBC - NLWRA - Ministers (state & c'wlth) for Environment and Primary industries - CMAs	NRM/Water managers GIS/NRM professionals Domain specialists, students		scientists although the site is used by consultants, water authorities, catchment management authorities, government, EPA and general public
1.2 Description	The Australian Water Data Infrastructure Project (AWDIP) was established under the national component of the Natural Heritage Trust to facilitate national assessments of Australia's water resources. This will be achieved through the ongoing development of a comprehensive and	The Bureau of Rural Sciences' (BRS) Water 2010 project is developing an interactive website and CD-ROM to enable users to explore factors influencing Australia's dynamic water balance. The Water 2010 project applies a land-use-mapping-based approach to	DNR NSW is undertaking a project with CANRI funding to serve water quality data online through Web Feature Server standard technology. It will support graphing and downloading of water quality data, but will also be applicable across all natural resource management datasets for a wide	The NDN provides functionality for the discovery, viewing, and acquisition of resources that are provided by custodians. Custodians have the ability to make resources that they provide to the NDN publicly available or have restricted access. The NDN provide functionality for	The VWRDW provides access to all water quality/quantity data for the State of Victoria, making it accessible through custom searches. Aside from raw data information products in the form of standard reports are also available. All the data is downloadable. The data from the



AWDIP

accessible national water information framework, to support ongoing water reforms.

Water 2010

show how and where water is generated and used including run-off, transpiration, irrigation and groundwater.

The website will be integrated with a national water database maintained by State and Commonwealth agencies and dynamically updated to ensure the most current data are available. The AWDIP is a key source of data underpinning Water2010

WQDP

range of business functions and many external partners, including indicator reporting for CMAs, SoE and the NLWRA

NDN

public search and acquisition of publicly available resources. As well as the a Rich Client that allows NDN Member to access restricted resources as long as the member has ACL rights to the resource

VWRDW

Groundwater Management System (GMS) has also been made available through the VWRDW, making it a valuable resource for surface and groundwater information. Additional information is made available through the VWRDW including Index of Stream Condition and reports relating to water quality/quantity assessment. An interactive mapping application is also accessible through the VWRDW, providing a spatial context to the data.

1.3 Custodian / custodial organisation

Name:

ESCAWRI (DAFF = Sponsoring organisation)

BRS

NSW DNR

ABS

VIC DSE



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	AWDIP	Water 2010	WQDP	NDN	VWRDW
URL:	http://www.daff.gov.au/corporate_docs/publications/word/ural_science/water/final_escawri_tor_membership.doc	www.brs.gov.au	www.dnr.nsw.gov.au	www.abs.gov.au	www.dse.vic.gov.au
1.3.1 Custodian contact details					
Name:	Karina Budd		Jonathan Doig (+ SCO, + Geoserver project)	Mark Lound	Craig Feuerherdt
Title:				Business Contact	GIS Analyst & MapShare
Phone:					
Email					
1.3.2 Interviewed person(s) contact details					
Name:	Evert Bleys	David Barratt	Jonathan Doig	Steve Matheson	Adrian Spall
Title:	BRS Information Officer	Senior scientst (a/g)		Assistant Statistician	Director Water Assessment & Research
Phone:					
Email					
2 Functionality					
2.1 Query Capabilities					



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		AWDIP	Water 2010	WQDP	NDN	VWRDW
2.1. Datasets 1		All jurisdictional water databases: - on board --> All but ACT - online --> SA, NSW; more by June 06	Underpinning databases: 1. AWDIP 2. Australian Water Availability Project (NHT: http://www.affa.gov.au/corporate_docs/publications/word/rural_science/aboutbrs/nht_awa.doc)	Any spatio-temporal datasets, e.g. NSW, SA water quality and quantity	Datasets from ABS (statistics), AIHW (health), OEBRy (statistics)	Water quality Water quantity Index of Stream Condition
2.1. Themes 2		Surface Water Groundwater Water Quality and River Health	Surface Water Groundwater Water Use	Surface Water Groundwater (coming soon) Water Quality and River Health	Water Use Currently no other relevant datasets available in demo - eventually any node can participate (e.g. CANRI)	Surface Water. All monitoring sites currently being monitored under the partnerships agreement including historic sites and data. Some sites, external to the partnerships are also available. Groundwater. All Groundwater data relating to resource information is stored in the GMS. Water Authorities use the GMS to register and approve the drilling of bores. Water



AWDIP

Water 2010

WQDP

NDN

VWRDW

level and some quality data is only collected for the bores in the State Observation Bore Network (SOBN), approximately 2500 bores. This data is replicated into the VWRDW on a weekly basis.

In addition, Primary Industries Research Victoria (PIRVic), Department of Primary Industries, monitors 2500+ shallow bores, monitoring the risk of dryland salinity. This data is currently stored and maintained in a separate database.

Water Quality and River Health. A wide range of water quality parameters are measured, but it is dependant on the requirements of the partners in the cost share of a specific



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	AWDIP	Water 2010	WQDP	NDN	VWRDW site. River Health information is available, predominately in
2.1.3					
Detail and Complexity					
Query attributes per site	Yes	Canned (by river basic)	Yes	Yes, if such service is available	Yes
Select sites by value	Yes	No	Yes (Geoserver), No (WMC)	Yes, if such service is available	No
Select sites by locations	Yes	No	Yes	Yes, if such service is available	Yes, rudimentary searches by CMA or Basin. Spatial searches can be done through the interactive map although the returned list is not connected to the VWRDW



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		AWDIP	Water 2010	WQDP	NDN	VWRDW
	Queryable parameters/attributes	<u>M&E recommended parameters:</u> Surface: -Total N -Total P -Flow -Turbidity -Salinity (EC) Ground: -Salinity (EC) -Depth to groundwater	See list of pre-canned queries in questionnaire	Flow (min, max, mean) Height/level (measured) Temperature Turbidity Total P Salinity (EC)	AGLS Metadata (Dublin Core searchable by metadata)	Select by measurement type Select by site code/site name Select all sites within a CMA or basin Select by site type i.e. surface water, groundwater etc Select by site status i.e. active, inactive Select by date
	Complexity in query building	As per OGC "filter" spec	None	Geoserver: As per OGC "filter" spec WMC: none	No complexity, but individual nodes/services (WSDL) metadata can be queried	None
2.1.4	Configurability					
	list of queryable datasets configurable?	n/a	No	Yes	Nodes can publish GALS metadata	No
	query-definitions configurable?	No, set by community schema	No	Yes	n/a Reporting tools out of scope	No
2.2	Navigation & Functional Architecture					
2.2.1	Area of Interest	n/a	Zoom & Pan	Zoom & Pan	n/a Reporting tools	Zoom & Pan



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		AWDIP	Water 2010	WQDP	NDN	VWRDW
1			Select from list of names	Select from list of names By parameterised URL	out of scope	Select from list of names Free text entry
2.2.2	Topic of Interest	n/a	Select from list	Catalogue Search Select from list	n/a Reporting tools out of scope	Select from list
2.3	Display Options					
2.3.1	Data output	WFS/GML	Tables Maps Time Series Graphs Other Graphs Reports (PDF)	Maps Time series graphs	AGLS/Dublin Core metadata and available resource for download	Tables Maps Time series graphs Other graphs CSV files
2.3.2	Selection	n/a	None	Single site by clicking on map All sites in current view	n/a Reporting tools out of scope	SITES, REACHES
2.3.3	Aggregation	None (client or value add service responsibility)	Canned	Through built-in predefined queries	n/a Reporting tools out of scope	SUM, MEAN, AVERAGE
2.3.4	Standard reports	n/a	Canned river basin PDF reports	Through built-in predefined queries	n/a Reporting tools out of scope	There are a range of standard reports, depending on the site type i.e. groundwater vs surface water
2.3.5	Downloads	WFS/GML	HTML PDF	Text (CSV) GML	Downloads can be any disk file format as well as WSDL.	CSV HTML Spatial data format(s) by request



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		AWDIP	Water 2010	WQDP	NDN	VWRDW
2.3.6	Other	Extensible: easily increase parameters and query types supported	Water resource reliability tool under development	Bookmark sites return later	Protected web services Lite node publishing Search/Discovery	Measure by measure analysis
3	Spatial Coverage					
3.1	Extent	Australia	Australia	Australia (currently NSW and SA)	World	VIC
3.2	Reporting Units	Monitoring Sites (aiming for catchment "outflow" points - measured or modelled)	River basis (245), ultimately sub-catchments (approx 10,000)	Monitoring Sites	Data dependent	Monitoring sites, river reaches
4	Architecture					
4.1	Centralised/distributed	Distributed web-services	Both	Distributed web-services	Distributed network of web-services No central data repository Secure gateway to nodes	Currently a data warehouse, moving towards web-services (aligned with AWDIP)
4.2	Standards	OGC WFS + Filter OGC GML OGC O&M ISO19139 metadata	Subset of ANZLIC metadata	OGC WFS + Filter OGC GML OGC O&M ANZLIC Metadata	WSDL HTTP/HTTPS AGLS Dublin Core SSL	UI-ASP VWRDW was developed in the late 90's therefore architecture is out of date and



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	AWDIP	Water 2010	WQDP	NDN	VWRDW currently being reviewed	
4.3	Hard- and software					
	Off-the shelf components	Recommend Geoserver (SeeGRID 'branch') for provider nodes	Adobe MapServer	GeoServer WebMap Composer (WMC) Oracle (not compulsory)	Apache (open source) ABS written software MySQL Hibernate	ArcIMS/moxi media IMF is used for mapping application (separate from VWRDW)
	Hard- and software restrictions	n/a	None	Geoserver & WMC server & Browser restrictions	none	INGRES database Windows 2000 server
5	Maturity					
5.1	Status of completion	Proof of concept - prototype by June 06	Proof of concept / Working Prototype	Production (in UAT)	Working prototype with three nodes. Expect to go into production late 06/early 07	Production
5.2	Performance Speed & robustness	Too early to tell, needs tuning in DB-WFS (geoserver) connection to optimise performance	Fast and user-friendly Appears to be stable	Depends on 3rd party service performance (e.g. Topoweb) & size of result set	Stable release	The VWRDW is useable however it is not efficient in providing access to the data. The speed of queries is acceptable but depends on the



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	AWDIP	Water 2010	WQDP	NDN	VWRDW request from the client. The VWRDW is very stable	
5.3	Maintenance and Development					
	Plans for further development	Expect working prototype by June 06	Completion expected by July 2007	National: Link in with BRS/AWDIP NSW: Broaden beyond water & develop specific "indicator reporting" front-end	ongoing development in 3 month 'blocks'	A review of the VWRDW is currently being done with a view to re-develop it. The review and re-development will take place in the next 12 months
	Ongoing maintenance arrangements	Establish contractual arrangements with jurisdictions NLWRA will likely take this responsibility for ARO (Australian Resources Online)	Nominally maintained by BRS, given DAFF/MDBC/NWC support	COTS maintenance arrangements		The VWRDW (both infrastructure and data) are currently maintained by an external provider
	Ongoing funding arrangements	NHT investment from June 07	nothing concrete	provisional DNR budget 06-07		State funded...not sure about commitment
6	Licensing and access constraints	None, other than data is not allowed to be stored offsite (agreement with jurisdictions)	None	WMC - commercial licence (Social Change Online) Geoserver: GPL	GPL for software MOU NDN-board <- -> NWC required to participate	All data on the VWRDW is freely available



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AWDIP

Some doubt about whether services should be publicly available. NWC would need to (1) enter into agreement with jurisdictions or (b) enter into joint SLA with NLWRA/ARO

Water 2010

WQDP

NDN

VWRDW

