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BATHURST INTEGRATED WATER CYCLE MANAGEMENT STRATEGY

IWCM STRATEGY REPORT

FEBRUARY 2009

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REVISION SCHEDULE

REV. NO.	DATE	DESCRIPTION	PREPARED BY	REVIEWED BY	APPROVED BY
0	28.11.08	Draft IWCM Strategy for client review	Emma Hawkins	Emma Pryor	Mary Watt
1	11.02.09	Final IWCM Strategy	Emma Hawkins	Emma Pryor	Mary Watt

SYDNEY
Level 2, 39-41 Chandos Street, St Leonards, Sydney, NSW 2065
p + 61-2-9493 9700, f + 61-2-9493 9799

EXECUTIVE SUMMARY

Bathurst Regional Council (BRC) has embarked on the development of this Integrated Water Cycle Management (IWCM) Strategy to explore options for the sustainable management of the provision of water supply, sewerage and stormwater services. This report documents the IWCM study undertaken and the recommended IWCM Strategy for BRC.

IWCM STRATEGY FOR BATHURST REGIONAL COUNCIL

(See section 9)

Scenario 2 is to be adopted by BRC for implementation. Key features of this Strategy are:

Water Supply and Demand - water demand management and source substitution measures including planning controls, pricing review, retrofit and rebate programs, monitoring, regulation and education. Many water supply and demand management activities and programs are currently in place. Some of the options included represent an extension to these programs. These activities would be funded from the Water Fund.

Wastewater Treatment – increased investment in infiltration and inflow rehabilitation, introduction of 'smart sewers' for new development areas and reduction of wastewater production through reduced water consumption (see above). These activities would be funded from the Sewer Fund.

Stormwater - increased requirements for new developments to meet stormwater volume and quality improvement targets. Increased monitoring of stormwater quality to better identify stormwater pollution hot spots, and prioritise management activities. These activities would be funded from the General Fund.

Waterway health/ Catchment management - increased Council control of riparian corridors and buffers on public and private land. Increased investment in rehabilitation programs and in school-based waterway program to improve the condition of waterways. Increased monitoring of river water quality to better inform land, river and riparian zone management, and prioritise rehabilitation activities. These activities would be funded from the General Fund.

IWCM Process

(See section 1)

IWCM is a way of integrating the three (3) urban water services of water supply, sewerage and stormwater to ensure water is utilised optimally, now and in the future. IWCM also looks at integrating the provision of urban water services with the management of the water supply catchment and water resources.

The IWCM Study for BRC IWCM has been undertaken in two major stages:

1. The **BRC IWCM Concept Study** (the Concept Study) identified water cycle management issues and set goals for the BRC IWCM Strategy.

2. The preparation of this **BRC IWCM Strategy,** built upon the findings of the Concept Study, has involved a comprehensive assessment of the costs and benefits of IWCM Options and the recommendation of a preferred IWCM Scenario (group of IWCM Options). This Bathurst IWCM Strategy Report contains:
   - A summary of the water cycle management issues facing Bathurst;
   - A description of the range of IWCM Options investigated;
   - A description of the four (4) alternative IWCM scenarios, illustrating the possible future approaches to BRC's delivery of urban water services;
   - An economic, environmental and social assessment of the costs and benefits of each IWCM scenario;
   - A capital works plan and annual operating cost estimate for implementing the selected scenario; and
   - Modelling and assessment outputs utilised in developing and assessing the IWCM Options and scenarios.

IWCM Issues and Goals

(See section 2)

The following section outlines the IWCM Issues and Goals identified by the Project Reference Group (PRG) in relation to water cycle management in Bathurst.

IWCM Issues identified through the IWCM Study are summarised in Table E-1. These issues are referred to in later parts of this report by way of the reference (Ref) nominated in Table E-1.

Table E-1. IWCM Issues

#	Issue	Description/ PRG Comments	Ref
1.	Control of Water Resources	• Lack of control of water resources, particularly between Ben Chifley Dam and the Water Filtration Plant.	*Water Control*
2.	Stormwater (low-flow capture – for irrigation and increased infiltration)	• Capture of low-flow stormwater to increase infiltration, which will provide more water for vegetation. • Storage tanks for stormwater runoff. • There is an opportunity to retain water for irrigation of vegetation. • Storage of water on residential sites.	*Stormw. capture*
3.	Incentives for the use of Recycled Water	• Provide incentives for using recycled water. Use of treated effluent from the Wastewater Treatment Works (WWTW) to provide irrigation for bigger users (effluent reuse). • Use of treated greywater from residential homes.	*Recycled Water*
4.	Stormwater Management	• Poor stormwater quality causing increased pollutant loadings at discharge points. • Gross Pollutant Traps are not regularly monitored. • Lack of data relating to stormwater quality and flows, particularly at discharge points into the Macquarie River.	*Stormw. mgt*
5.	Soil Erosion	• Many creeks and rivers in the Bathurst region exhibit signs of soil erosion as a result of historic clearing, poor land management practices, road construction and new developments.	*Soil erosion*
6.	On-site Sewage Treatment Systems	• Poor management of on-site sewage treatment systems and little or poor quality data on the location, number and conditions. Consequently, there is a lack of understanding of the impact of these systems on the environment.	*Septic*
7.	Groundwater Extractions	• A lack of, or inaccurate, data (quantity, quality and reliability) on groundwater bores and availability of water for extraction. • There is a lack of understanding of the impact of over-extraction on groundwater dependent ecosystems.	*Groundw.*

#	Issue	Description/ PRG Comments	Ref
8.	Salinity	• Salinity hotspots have been identified in Campbell's River and Evan's Creek sub catchments. • The risk of severe salinity in these areas is predicted to increase over the next 50 years.	*Salinity*
9.	River Monitoring	• Lack of a coordinated, integrated approach to water quality and river flow data collection, storage and reporting.	*River Monitor*
10.	Land Management/ Soil Acidity	• Historic clearing to make way for grazing and cropping. Clearing has had a dramatic affect on groundwater levels, water runoff and levels of nutrients. • Illegal land clearing contributes to salinity problems, poor water quality and elevated nutrient loads. • Soil acidity is a problem within the Macquarie River Catchment (DECC, 2006).	*Land Mgt/* *Soil Acidity*
11.	Expansion of Community Involvement.	• Education / involvement of schools to manage and protect waterways. • Current scheme managed by Bathurst High School has been extremely successful and should be expanded.	*Comm. Involve't*
12.	Wastewater Treatment Works and Network	• WWTW does not meet DECC licence requirements for Suspended Solids, Nitrogen and Phosphorous discharge. • High infiltration of stormwater into the sewerage system.	*WWTW + network*
13.	Trade Waste Management	• Reasonable control over trade waste released to the wastewater network. • Work is required, however, to ensure all discharges comply with guidelines.	*Trade Waste*
14.	Riparian Zone Management/ Biodiversity Loss	• Need for stream bank rehabilitation and protection through better riparian management and buffer plantings. • Significant biodiversity loss has occurred, largely related to European settlement, introduced species, land use change and clearing.	*Riparian Zone / Biodivers.*
15.	Funding Constraints	• Financial needs. Suggestions: Environmental lottery, Establishment of a Grant's Officer Position.	*Funding constraints*
16.	Biosolids Treatment and Disposal	• Biosolids from the wastewater treatment process contain only 14% solids which results in higher disposal costs.	*Biosolids*
17.	Bulk Water Supply/ Drought Management/ Network Leakage – Unaccounted for Water	• Current bulk water storages may not meet future demand in the case of high growth. • Treated effluent is not being utilised to its fullest potential (current WWTW onsite reuse is 24% of inflow).	*Bulk Water/ Drought/ Leakage/ UFW*
18.	Allowing for Population and Industry Growth	• This issue overlaps with the issues of 'Dam Safety' and 'Bulk Water Supply'.	*Pop'n Growth*
19.	Water Transfer	• Potential for water transfers, particularly in regard to selling water to Cadia mines.	*Water Transfer*

#	Issue	Description/ PRG Comments	Ref
20.	Environmental Flows	• Environmental flows should be managed through a whole of catchment approach.	*Env. Flow*
21.	Chemical Contamination	• The former Bathurst Gasworks Site was declared a Remediation Site in 2001[1]. • Runoff from agricultural sprays is also an issue.	*Chem. Cont.*
22.	River Water Quality	• Water quality in the Macquarie River does not comply with Central West Catchment Management Authority guidelines.	*River Water Quality*
23.	Greenhouse Gas Emissions	• There is the potential for climate change to affect the availability of water supply and water quality by altering rainfall patterns and evaporation rates.	*GGE*
24.	Water Stress (River)	• Water stress resulting from increasing irrigation extraction and the increasing number of groundwater bores.	*Water Stress*
25.	Strategic Plan	• The Strategic Plan for Water & Wastewater has not been updated since the Local Government amalgamation.	*Strategic Plan*
26.	Flooding/ Flood Damage to Inlet Works	• The Bathurst region has a history of flood events which have damaged local infrastructure and industries. • There is a need to mitigate damage to inlet works caused by flood events.	*Flooding*
27.	Algal Blooms	• Particularly in Ben Chifley Dam (BCD) due to high nutrient levels.	*Algal Blooms*
28.	Emergency Plans	• The emergency plans for the WWTW and water infrastructure are not fully documented and detailed regarding power failure, mains failure, plant failure, terrorism and earthquakes.	*Emerg. Plans*
29.	Potable Water Network Quality	• Dirty water incidents have occurred in the potable water system due to sediments entering the pipes during times of high flows.	*Water Network Quality*
30.	Odour Complaints	• In urban areas near the WWTW.	*Odour*
31.	Dam Safety	• Winburndale Dam requires upgrade to comply with NSW Dam Safety standards.	*Dam Safety*

[1] Remediation works have been carried out by Council.

IWCM Goals for the IWCM Strategy were developed in line with the triple bottom line (TBL) assessment approach, which involves assessment based on environmental, social and economic performance. The IWCM Goals identified for the IWCM Strategy are as follows:

Water Supply Reliability

- To secure a sustainable water supply *(Environmental)*

Water Supply/ Use Efficiency

- To maintain public ownership of water infrastructure *(Economic)*
- To become more efficient in the use of water resources, and encourage uptake of new technologies for efficient water cycle management *(Environmental/ Social)*
- To make more efficient use of potable water, i.e. better match the quality of water supplied to the quality of water required by particular uses (i.e. it is not necessary to provide potable water to all water uses) *(Environmental/ Economic)*

Improve Water Quality

- Improve/ maintain sustainable environmental flows, river and riparian ecology - without compromising human usage requirements *(Environmental)*
- To maintain or improve water quality, particularly relating to discharge to waterways from urban development, stormwater and sewage treatment facilities *(Environmental)*

Affordability of IWCM Outcomes

- Adopt best technology to keep costs low. On-going commitment to research and development *(Economic)*

Community Awareness and Education

- Raise awareness and educate community on water issues and their responsibilities *(Environmental/ Social)*

Water Cycle Baseline Assessment

(See section 3)

A major component of Integrated Water Cycle Management is the development of an understanding of Bathurst's current water cycle. This is undertaken through and the assessment of the current and historical influences and demands on the water, wastewater and stormwater networks. The key findings of the water cycle baseline assessment are as follows:

- Total water consumption in BRC is expected to increase by approximately 34%. However, with the continuation of the NSW Government Building Sustainability Index (BASIX) and the Federal Government Water Efficiency Labelling Scheme (WELS), total water consumption is expected to increase by approximately 25%.
- The greatest risk to the security of Bathurst's water supply is the lack of understanding of the levels and patterns of extraction of water downstream of Ben Chifley Dam, for agricultural and industrial uses.
- Total wastewater production levels are expected to increase by approximately 20% with projected population growth. However, with the continuation of the NSW Government Building Sustainability Index (BASIX) and the Federal Government Water Efficiency Labelling Scheme (WELS), total water consumption is expected to increase by approximately 16%.
- Increased development is expected to increase stormwater runoff volumes and pollutant loads.

Figure E-1 and E-2 illustrate the baseline projection of potable water demand, and wastewater production in BRC, respectively. The Adopted Supply Curve is based on the current supply capacity or BRC.

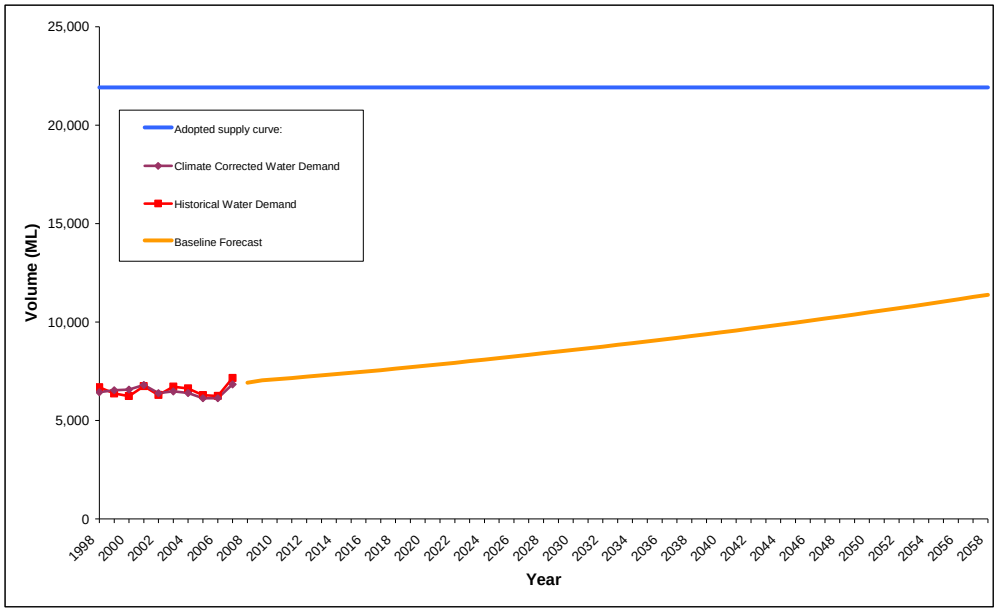

Figure E-1. Baseline Water Demand Projection

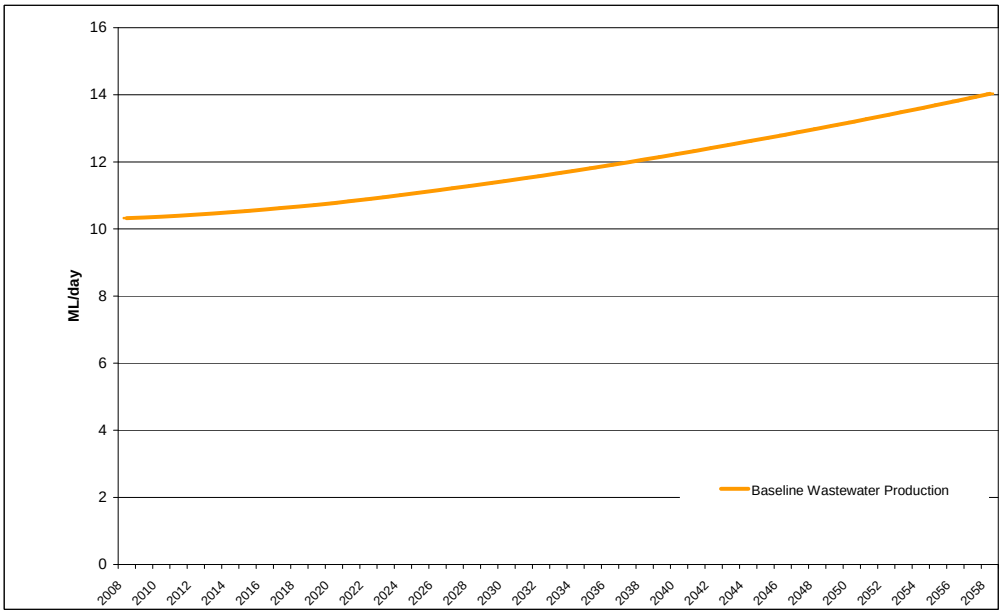

Figure E-2. Baseline Wastewater Production Projection

IWCM Options and Scenarios

(See sections 4, 5 and 6)

The following table lists each of the IWCM Options, and their inclusion in the IWCM Scenarios: Business As Usual (BAU), IWCM 1, IWCM 2 and IWCM 3.

Table E-2. IWCM Options and Scenarios

		IWCM Options	BAU	IWCM 1	IWCM 2	IWCM 3
1.	W	Community IWCM education (irrigation, land management, erosion control, water use, energy use)*	✓	✓	✓	✓
2.	W	Rainwater tank rebate program*	✓	✓	✓	✓
3.	W	*Pipeline from BCD to the Water Filtration Plant**	✗	✗	✗	✗
4.	W	Dam Safety Upgrade in line with NSW Dam Safety Standards*	✓	✓	✓	✓
5.	W	BASIX: Mandatory use of rainwater tanks connected to toilets, cold laundry and external uses. Efficient showerheads, taps and toilets*	✓	✓	✓	✓
6.	W	WELS scheme*	✓	✓	✓	✓
7.	WW	Planned WWTW upgrades*	✓	✓	✓	✓
8.	WW	Infiltration and Inflow - assessment and repair*	✓	✓	✓	✓
9.	W	Urban water system energy audit, improved technology and operation		✓	✓	✓
10.	W	On-site greywater recycling promotion		✓	✓	✓
11.	W	Active water supply system leak assessment, detection and repair		✓	✓	✓
12.	W	Washing machine rebate program		✓	✓	✓
13.	W	On-site greywater recycling retrofit		✓	✓	✓
14.	W	Residential conservation retrofit (pamphlet, leaks and low flow fixtures)*		✓	✓	✓
15.	W	High water user site audits A) residential B) non-residential		✓	✓	✓
16.	W	Pricing reform (increased variable charges)		✓	✓	✓
17.	W	Groundwater monitoring and extraction regulation [#]		✓	✓	✓
18.	WW	"Smart" sewers (e.g. low inflow and infiltration, pressurised sewer systems)		✓	✓	✓

		IWCM Options	BAU	IWCM 1	IWCM 2	IWCM 3
19.	S	Stormwater quality monitoring		✓	✓	✓
20.		River water quality monitoring*		✓	✓	✓
21.		Reduce stormwater litter/organics A) infrastructure B) Street Cleaning		✓	✓	✓
22.		Water Sensitive Urban Design Development Control Plans (according to best practice targets)		✓	✓	✓
23.		Upgrade and fence waterway buffers on farmland to reduce erosion		✓	✓	✓
24.		Rehabilitate existing degraded watercourses/ riparian zones		✓	✓	✓
25.		Review Development Guidelines/ LEP to include erosion control buffer and prescribed buffer management practices.		✓	✓	✓
26.		School waterway protection scheme*		✓	✓	✓
27.		Improve trade waste monitoring and audits		✓	✓	✓
28.	W	Encouragement of sustainable building beyond BASIX requirements**			✓	✓
29.		Increase safety margins in system design and management (due to climate change)			✓	✓
30.		Commercial property toilet retrofit			✓	✓
31.		Mains water quality monitoring and flushing			✓	✓
32.	WW	Establish on-site treatment (septic) system monitoring program			✓	✓
33.	S	Establish buffer zones on public land alongside significant streams/ with passive recreation			✓	✓
34.		Develop salinity monitoring program to guide land management planning#			✓	✓
35.	W	Dual reticulation in new development areas via raw water network				✓
36.	S	Water sensitive urban design retrofit in key areas (opportunistic)				✓

✘	Option/ Program excluded
W	Water
WW	Wastewater
S	Stormwater
*	Expansion of existing BRC program
**	Incentives only
#	Dependant on collaboration with the DWE/ DECC

Scenario Assessment

(See section 8)

The triple bottom line (TBL) based scenario assessment was undertaken by the PRG at a facilitated workshop. The PRG was provided with information on each of the scenarios, and in small groups, was asked to assess each of the scenarios against the IWCM Goals. It was also noted that a number of the goals (such as asset ownership) had a null impact on the assessment of scenarios.

Following the scenario assessment process, the PRG was asked to identify any changes to the selected Scenario: **IWCM 2.** It was agreed that the scenario should remain as suggested.

Preferred Scenario: IWCM 2

After reviewing the input of the PRG and the content of the selected scenario, BRC adopted **IWCM 2** as the preferred scenario for implementation.

Next Steps

(See section 9)

The BRC IWCM Strategy will be implemented through incorporation into planning programs and budgets.

To ensure that this IWCM Strategy resolves the identified IWCM issues, and contributes to improved water cycle management in the BRC area, ongoing monitoring and review is required. The IWCM Strategy requires integrated implementation to be successful. Early implementation of the components is required to achieve the outcomes projected through this study. Failure to implement one component of the Strategy will require a review of the recommendations provided in this report.

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GLOSSARY OF TERMS

Term	Definition
Aquifer	An underground layer of soil, rock or gravel able to hold and transmit water. Bores, spear-points, springs and wells are used to obtain water from aquifers.
Average Dry Weather Flow	The average flow at a point in the sewerage system calculated or measured over a 24-hour period.
BASIX	A planning tool developed by the NSW Government used by development applicants to measure their compliance with environmental guidelines covering water and greenhouse gas efficiency and other related building aspects. Required for building (and renovation) approval.
Best-practice	An industry standard recognising the most effective management methods of the time.
Capital works program	A schedule of planned capital expenditure, normally over a period of thirty years for water supply and sewerage businesses.
Catchment	The area of land drained by a river and its tributaries.
Conductivity	A measure of the ability of water to conduct an electric current between electrodes placed in the water. The value obtained relates to the nature and amount of salts present.
Demand management	Measures, programs or strategies aimed at reducing the consumption of water by reducing the demand for it.
DSS	Demand Side Management Decision Support System. Model used to project water consumption and wastewater production patterns, and the impact of water consumption demand management options.
Dissolved oxygen	The concentration of oxygen, which is dissolved in environmental waters and compared with oxygen 'saturation' at a particular temperature.
Effluent	The out-flow water or wastewater from a water processing system or device.
Environmental flows	River flows, or characteristics of the river flow pattern that are either protected or created for an environmental purpose, usually the protection of habitat or an ecological process.
Equivalent Persons	Equivalent person is defined as "water supply demand or the quantity and/or quality of sewage discharge for a person resident in a detached house". The term equivalent person is also applied to: • The number of persons who would have a water demand equivalent to the establishment being considered; and • The number of persons who would contribute the same quantity and/or quality of domestic sewage as the establishment being considered.
Embedded greenhouse gas emissions	Greenhouse gas emissions include carbon dioxide, methane, nitrous oxide, perfluorocarbon and sulphur hexafluoride. Embedded greenhouse gas emissions are those that are emitted in the production and transport of a product prior to its use.
Faecal coliform	A type of bacteria found in the faecal material of humans and other mammals that is an indicator of faecal pollution. Faecal coliforms themselves generally do not make people ill.
Floodplain	Flat land beside a river that is inundated when the river overflows its banks during a flood.
FINMOD	DWE Financial Modelling tool used to project changes to Council costs and residential bill based on changes to capital, operations, maintenance and assessment costs.
Greenfield Development	New development that occurs in areas that have not previously been developed (e.g. recently cleared land).

Term	Definition
Greywater	Wastewater from the hand basin, shower, bath, spa bath, washing machine, laundry tub, and dishwasher.
Gross Pollutants	Any debris or pollutant material that would be retained by a five millimetre mesh screen. Gross pollutants typically include litter (mainly paper and plastics) and vegetation (leaves and twigs), which are transported by stormwater runoff into receiving waters (urban creeks, rivers and estuaries).
Groundwater	Underground water filling the voids in rocks; water in the zone of saturation in the earth's crust. See also aquifer.
High Water User	Customer accounts that use more than 5 kL of water per day.
Hydrology	The study of the distribution and movement of water.
Infill Development	Infill development refers to new residential development in developed areas. This is often also referred to as brownfield development.
Infiltration (sewer)	“Infiltration’ in IWCM refers to the infiltration of stormwater into sewerage pipes. This occurs through cracks and faults within the pipe material.
Inflow (sewer)	“Inflow’ refers to the inflow of stormwater into sewerage pipes through illegal or accidental connection of the two networks.
Integrated Water Cycle Management (IWCM)	Planning approach that aims to optimise water, sewer and stormwater management through assessing the urban water system components as interrelated parts of a cycle. IWCM approach was developed for Local Governments in NSW by the Department of Water and Energy.
Model for Urban Stormwater Improvement Conceptualisation (MUSIC)	Model used to simulate the impacts of stormwater management programs on the production of stormwater flow and generation of pollutant loads.
Nutrients	A source of nourishment. Increased levels of nutrients can degrade waterways through disturbing the natural balance of aquatic ecosystems.
On-site detention	A structure or system designed to capture and temporarily store stormwater so that it can either be released to the drainage system at a controlled rate or reused on-site.
Potable water	Water of a standard fit to drink.
Project Reference Group (PRG)	Government, industry and community representatives involved in developing the Integrated Water Cycle Management (IWCM) Strategy.
Rainwater tank	Storage tank for collecting rainwater from the roofs of buildings.
Recharge	Water that infiltrates through the soil surface to the watertable.
Recycled/ reclaimed water	Sewage effluent or treated stormwater that has been treated to a level where it can be reused.
Reuse	The use of treated sewage effluent or treated stormwater to replace the use of potable water.
Scenarios	Complementary bundles of water cycle management initiatives.
Sewer catchment	An area of land where sewage is collected.
Sewage	The used water supply of a community including water-carried waste matter from homes and businesses.
Sewage Overflow	Discharge of sewage or odour from the sewerage system in the event of wet weather surcharge, mechanical failure, chokes or leakage.

Term	Definition
Sewage treatment plant	A facility to treat sewage to produce treated effluent and biosolids.
Sewerage	Drainage system for taking sewage away from the community to a sewage treatment plant.
Source substitution	The use of treated sewage effluent or treated stormwater to replace the use of potable water.
Soil acidity	Soil acidification means an addition of acidity to the soil. Acidification occurs naturally, but agricultural practices increase the rate of acid inputs to the soil. Agricultural soils are usually in the range pH 4 to 8. Soils with a Ph less than 5.5 are considered to be affected by soil acidity. (More information: Department of Primary Industries, www.dpi.nsw.gov.au)
Stakeholder	A person or organisation with an interest in the issue/activity being addressed
Stormwater	Rainfall that flows over hard surfaces in urban areas and is collected in drainage systems for disposal.
Surface water	Water on the surface of the land, for example in rivers, creeks, lakes and dams.
TN (Total Nitrogen)	Total Nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), organic nitrogen and ammonia (all expressed as N). Total Nitrogen is measured as an indicator of stormwater runoff quality. High concentrations of total nitrogen are, in conjunction with other factors, often associated with algal blooms (including toxic blue-green algal blooms), as well as dense aquatic plant growth. This process of high nutrient input and algal growth is known as eutrophication, which can lead to water which does not support aquatic life (www.npi.gov.au).
TSS (Total Suspended Solids)	The smaller, lighter material such as clay, silt and fine sand carried in suspension in water.
TP (Total Phosphorous)	Total phosphorus is the sum of the phosphorus present in all phosphorus-containing components in the water column. High total phosphorus levels together with high total nitrogen levels, in conjunction with other necessary nutrients and favourable physical characteristics of aquatic environments, can result in plant and algal blooms. After assimilation in plant and algal growth, microbial breakdown and other processes such as mineralisation may transform organic and complex phosphate forms through various steps into the readily available inorganic phosphate form (www.npi.gov.au)
Waters	All natural terrestrial water bodies, including lakes, rivers, wetlands and groundwater.
Water demand	The water needs of a town including homes, commercial and industrial enterprises or businesses and public organisations.
Water quality	The biological, chemical and physical properties of water.
Water supply	The available water sources, water extraction, storage, transfer and treatment systems to supply town water.
Water recycling plant	A facility to treat raw sewage or stormwater to a level where it can be reused.
Water sensitive urban design	Urban design and land use planning that seeks to ensure that development is designed, constructed and maintained so as to minimise impacts on the natural water cycle.
Water treatment plant	A facility to treat raw water to a potable water quality.
WATHNET	Bulk water supply model used to estimate bulk supply levels and security, based on changes in climate and water consumption.

Term	Definition
Wastewater	See sewage.
WELS	Australian Government Water Efficiency Labelling and Standards Scheme

LIST OF ACRONYMS

Acronym	Term
ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environmental Conservation Council
ASL	Above Sea level
ASS	Acid Sulphate Soil
BASIX	Building Sustainability Index
BAU	Business As Usual
BCC	Bathurst City Council
BCD	Ben Chifley Dam
BOD	Biological Oxygen Demand
BOM	Bureau of Meteorology
BRC	Bathurst Regional Council
CI	Confidence Interval
CMA	Catchment Management Authority
CWCMA	Central West Catchment Management Authority
DCP	Development Control Plan
DECC	Department of Environment and Climate Change
DoP	Department of Planning
DWE	Department of Water and Energy
EPA	Environmental Protection Agency (NSW)
ESC	Evans Shire Council
GGE	Greenhouse Gas Emissions
GIS	Geographic Information System
GL	Gigalitres
GPT	Gross Pollutant Trap
IWCM	Integrated Water Cycle Management
LAP	Local Approvals Policy
LEP	Local Environment Plan
LGA	Local Government Authority
LOS	Levels of Service
LWU	Local Water Utility
ML	Megalitres
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
NHMRC	National Health and Medical Research Council
OMA	Operations, Maintenance and Administration
RWT	Rainwater Tanks

Acronym	Term
RO	Reverse Osmosis
TBL	Triple Bottom Line
TN	Total Nitrogen
TP	Total Phosphorous
TSS	Total Suspended Solids
TRB	Typical Residential Bill
UFW	Unaccounted for Water
VMP	Vegetation Management Plan
WATHNET	Model for simulating water supply systems
WELS	Water Efficiency Labelling Scheme
WFP	Water Filtration Plant
WSUD	Water Sensitive Urban Design
WWTW	Wastewater Treatment Works

1. INTRODUCTION

Bathurst Regional Council (BRC) has embarked on the development of this Integrated Water Cycle Management (IWCM) Strategy to explore options for the sustainable management of the provision of water supply, sewerage and stormwater services. This report documents the IWCM Study undertaken and the recommended IWCM Strategy for BRC.

1.1 WHAT IS INTEGRATED WATER CYCLE MANAGEMENT?

IWCM is recognised as best practice for the management of water supply, sewerage and stormwater services

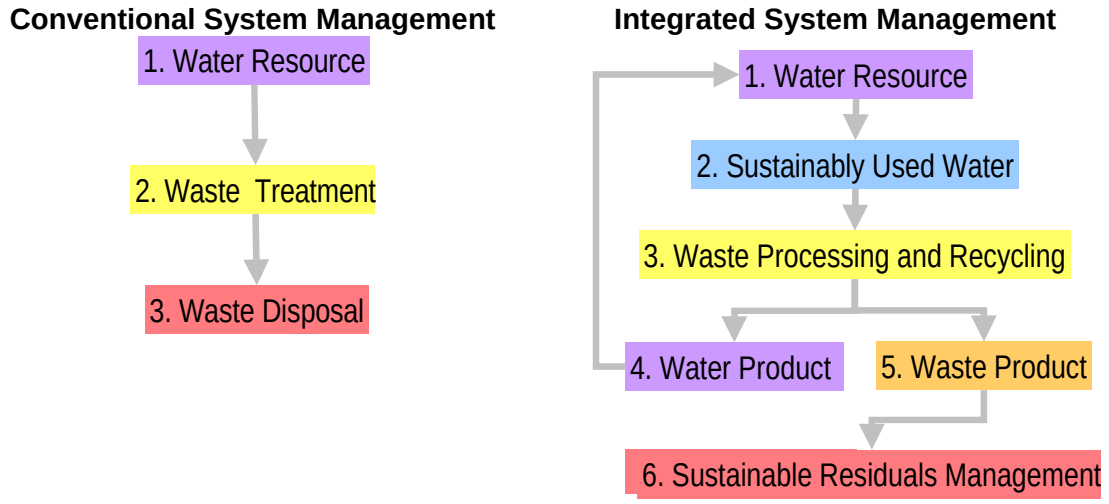
IWCM is a best practice approach to local water utility (LWU) strategic planning. It is a requirement of the Department of Water and Energy (DWE), as defined in the *Best Practice Management of Water Supply and Sewerage Guidelines 2007* (IWCM Guidelines) and forms part of a range of initiatives by the NSW Government to improve water management by LWUs. BRC has committed to this best practice initiative.

IWCM is a way of integrating the three urban water services of water supply, sewerage and stormwater to ensure water is utilised optimally, now and in the future. IWCM also looks at integrating the provision of urban water services with the management of the water supply catchment and water resources.

Conventional water system management, where each element of the water cycle is treated sequentially, has provided us with many important benefits. By examining integrated options for management of the water cycle, however, we maximise the opportunity to discover new ways of doing things, as well as making ourselves aware of efficiencies and synergies within the water cycle (Figure 1-1).

IWCM adopts the following 5 principles:

1. Consideration of all water sources (including wastewater) in water planning;
2. The sustainable and equitable use of all water sources;
3. Consideration of all water users;
4. Integration of water use and natural water processes; and
5. A whole of catchment integration of natural resource use and management.



- Sequential management of individual water system components
- Limited consideration of 'big picture' and resource utilisation impacts

Leads to unsustainable outcomes

- Integrated management of all water system components
- Full consideration of 'big picture' and resource management impacts (including triple bottom line)

Leads to more sustainable outcomes

Figure 1-1: Traditional and Integrated Water System Management (Source: DWE, 2004)

1.2 WHY IS IT IMPORTANT?

IWCM is important as it helps to:

- Balance the needs of water users, including towns and the environment (a whole of water cycle approach);
- Reduce the pressure on water resources by ensuring a wide range of water sources, including rainwater, stormwater and treated effluent, are considered as alternative sources;
- Ensure that the measures for supplying urban water services into the future are put in place;
- Integrate catchment management and urban water service provision; and
- Ensure local community participation in the planning and delivery of urban water services.

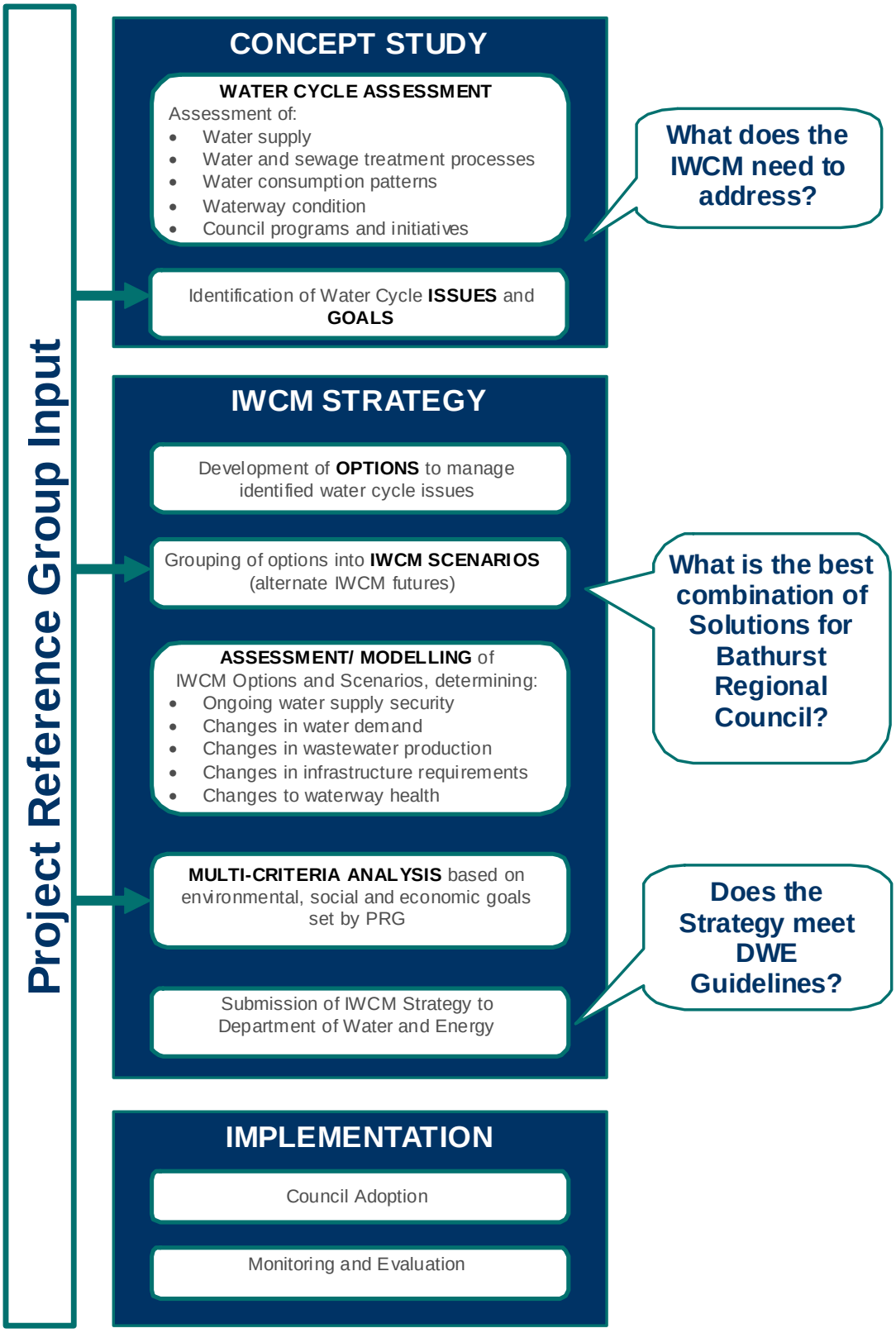


Figure 1-2. The Integrated Water Cycle Management Planning Process

1.3 WHAT IS INVOLVED?

The IWCM framework involves the identification of water cycle management issues and development of appropriate solutions (options) to meet agreed environmental, economic and social objectives. Figure 1-2 provides an explanation of the Concept Study, the IWCM Strategy development and the Monitoring and Review phases of the IWCM Planning Process.

The IWCM Study for BRC has been undertaken in two major stages:

1. The **BRC IWCM Concept Study** (the Concept Study) identified water cycle management issues and set goals for BRC.

2. The preparation of this **BRC IWCM Strategy,** built upon the findings of the Concept Study, has involved a comprehensive assessment of the costs and benefits of IWCM Options and the recommendation of a preferred IWCM scenario (group of IWCM Options). This Bathurst IWCM Strategy Report contains:
   - A summary of the water cycle management issues facing Bathurst;
   - A description of the range of IWCM Options investigated;
   - A description of the four (4) alternative IWCM scenarios, illustrating possible future approaches to BRC's delivery of urban water services;
   - An economic, environmental and social assessment of the costs and benefits of each IWCM scenario;
   - A capital works plan and annual operating cost estimate for implementing the selected scenario; and
   - Modelling and assessment outputs utilised in developing and assessing the IWCM Options and Scenarios.

The objective of this project is to develop an IWCM Strategy addressing the immediate urban water challenges in Bathurst and to assist in the planning for the sustainable delivery of urban water services in the future.

1.4 WHO IS INVOLVED?

Stakeholder involvement is essential to the success of the development and implementation of IWCM Strategies. To assist in the development of the Bathurst IWCM Strategy, BRC invited community and government agency representatives to join a Project Reference Group (PRG). The PRG was involved at three key milestones as follows (see also Figure 1-2):

The Project Reference Group included community & government agency representatives.

PRG WORKSHOP 1

PRG Workshop 1 was held at BRC on the 18th of January 2008. The PRG undertook the following tasks:

- Identification of the key water cycle issues within BRC LGA;
- Ranking of the IWCM issues in terms of importance to BRC; and
- Formulation of social, environmental and economic goals for the IWCM Strategy.

SCENARIO DEVELOPMENT

Potential IWCM Options were identified and assessed against the IWCM Goals. The IWCM Options were then grouped into draft scenarios (groups of Options). A Scenario Discussion Paper was provided to the PRG. Members were asked to review, and provide comments on the scenarios, and the options within these scenarios. The draft scenarios were approved, with the exception of the removal of the Reverse Osmosis Treatment Plant option from Scenario IWCM 3.

PRG WORKSHOP 2

PRG Workshop 2 was held at BRC on the 6th of November 2008. During this workshop, the PRG was asked to discuss the results of the investigation undertaken and provide Council with their recommendations on the preferred scenario. The PRG was provided with the following information:

- A recap on the IWCM Issues identified within the PRG IWCM Workshop 1;
- Details of the options included within each scenario;
- Quantitative information on performance of each scenario (see section 6);
- Qualitative information on options that were not modelled; and
- Relative costs of each IWCM Scenario

Based on this information, the PRG recommended a preferred scenario for BRC to consider for adoption.

Minutes of the two PRG Workshops are provided in Appendix C.

2. IWCM IN BATHURST REGIONAL COUNCIL

2.1 BACKGROUND

Bathurst is located approximately 200 km west of Sydney by road. The City of Bathurst is the oldest inland settlement in Australia. It was proclaimed a town in 1815 and, with the discovery of gold, experienced rapid growth in the 1850s and 60s. In 2006, there were an estimated 35,844 persons residing in the Bathurst region (ABS, 2006). Population projections to the year 2031 indicate that the population is expected to increase by 0.8% per annum, to approximately 46,300 persons (BRC, 2007).

The BRC local government area (LGA) has a highly variable climate, with a large temperature range. Generally, the area experiences cool to cold winters with irregular snow falls at higher elevations and warm to hot summers. Land use in the BRC LGA is dominated by residential, rural residential and agricultural uses. Recent expansion of urban and rural residential development is beginning to compete with agricultural land use.

BRC was formed through the amalgamation of Bathurst City Council and approximately 80% of Evans Shire Council in 2004. Following the amalgamation, a process of reviewing and consolidating the Councils plans and programs commenced.

Key processes undertaken by Council following the amalgamation included:

- The preparation of the Draft Interim Local Environmental Plan; and
- The preparation of the Draft Bathurst Region Urban Strategy, the draft Bathurst Region Rural Strategy and the draft Bathurst Region Urban Strategy.

The development of a Bathurst Regional Council Strategic Business Plan for Water and Sewer Services is underway.

2.2 LOCAL GOVERNMENT AND LOCAL WATER UTILITY RESPONSIBILITIES

Bathurst Regional Council is both the Local Government Authority and the Local Water Utility for the Bathurst region.

Bathurst Regional Council exercises water supply functions under Division 2 Part 3 Chapter 6 *Local Government Act 1993*, which states that:

1. A council is the owner of all works of water supply, sewerage and stormwater drainage installed in or on land by the council (whether or not the land is owned by the council);

2. A council may operate, repair, replace, maintain, remove, extend, expand, connect, disconnect, improve or do any other things that are necessary or appropriate to any of its works to ensure that, in the opinion of the council, the works are used in an efficient manner for the purposes for which the works were installed.

In its LWU capacity, BRC is regulated primarily by DWE, DECC and NSW Health. The Act also states that a council must not, except in accordance with the approval of the Minister for Land and Water Conservation (now Minister for Local Government), do any of the following:

a as to works of water supply-construct or extend a dam for the impounding or diversion of water for public use or any associated works;

b as to water treatment works-construct or extend any such works;

c as to sewage-provide for sewage from its area to be discharged, treated or supplied to any person; and,

d as to flood retarding basins prescribed by the regulations-construct or extend any such basins.

In its LWU capacity, BRC administers the water and sewer fund which are legally ring-fenced from each other and from the general purpose fund of council, which is the main source of funds for the other non-LWU functions of Council. Pursuant to section 409 (5) of the Local Government Act (1993), a dividend may be paid after the end of each financial year commencing in 2003/04 from either or both of the water and sewer funds to the general fund, following an independent review of a utility's best-practice performance (which must be determined to be 'substantially compliant') and obtaining the permission of the DWE

The general fund of council has a number of principal reporting activities which represent its key functions. These are set out in the annual BRC Management Plan. In relation to the water cycle, in general, stormwater and catchment management activities, unless directly impacting on water and sewerage services, are funded from the general fund.

2.3 BATHURST IWCM ISSUES

The identification of the IWCM Issues for BRC involved the following steps:

1. Preliminary identification of issues by BRC;
2. Presentation of these Issues to the IWCM PRG; and
3. IWCM PRG confirmation and ranking of the identified issues and additional issues raised by the group.

Table 2-1 provides a list of the water cycle management issues identified throughout the IWCM Study. The issues are listed in order of importance as ranked by the PRG.

Table 2-1. IWCM Issues

#	Issue	Description/ PRG Comments	Ref
1.	Control of Water Resources	• Lack of control of water resources, particularly between Ben Chifley Dam and the Water Filtration Plant.	Water Control
2.	Stormwater (low-flow capture – for irrigation and increased infiltration)	• Capture of low-flow stormwater to increase infiltration, which will provide more water for vegetation. Storage tanks for stormwater runoff. There is an opportunity to retain water for irrigation of vegetation. Storage of water on residential sites.	Stormw. capture
3.	Incentives for the use of Recycled Water	• Provide incentives for using recycled water. Use of treated effluent from the Wastewater Treatment Works (WWTW) to provide irrigation for bigger users (effluent reuse). Use of treated greywater from residential homes.	Recycled Water
4.	Stormwater Management	• Poor stormwater quality causing increased pollutant loadings at discharge points. • Gross Pollutant Traps are not regularly monitored. • Lack of data relating to stormwater quality and flows, particularly at discharge points into the Macquarie River.	Stormw. mgt
5.	Soil Erosion	• Many creeks and rivers in the Bathurst Region exhibit signs of soil erosion as a result of historic clearing, poor land management practices, road construction and new developments.	Soil erosion
6.	On-site Sewage Treatment Systems	• Poor management of on-site sewage treatment systems and little or poor quality data on the location, number and conditions. Consequently, there is a lack of understanding of the impact of these systems on the environment.	Septic
7.	Groundwater Extractions	• A lack of, or inaccurate, data (quantity, quality and reliability) on groundwater bores and availability of water for extraction. • There is a lack of understanding of the impact of over-extraction on groundwater dependent ecosystems.	Groundw.
8.	Salinity	• Salinity hotspots have been identified in Campbell's River and Evan's Creek sub catchments. • The risk of severe salinity in these areas is predicted to increase over the next 50 years.	Salinity

#	Issue	Description/ PRG Comments	Ref
9.	River Monitoring	• Lack of a coordinated, integrated approach to water quality and river flow data collection, storage and reporting.	River Monitor
10.	Land Management/ Soil Acidity	• Historic clearing to make way for grazing and cropping. Clearing has had a dramatic affect on groundwater levels, water runoff and levels of nutrients. • Illegal land clearing contributes to salinity problems, poor water quality and elevated nutrient loads. • Soil acidity is a problem within the Macquarie River Catchment (DECC, 2006).	Land Mgt/ Soil Acidity
11.	Expansion of Community Involvement.	• Education / involvement of schools to manage and protect waterways. • Current scheme managed by Bathurst High School has been extremely successful and should be expanded.	Comm. Involve't
12.	Wastewater Treatment Works and Network	• WWTW does not meet DECC licence requirements for Suspended Solids, Nitrogen and Phosphorous discharge. • High infiltration of stormwater into the sewerage system.	WWTW + network
13.	Trade Waste Management	• Reasonable control over trade waste released to the wastewater network. • Work is required, however, to ensure all discharges comply with guidelines.	Trade Waste
14.	Riparian Zone Management/ Biodiversity Loss	• Need for stream bank rehabilitation and protection through better riparian management and buffer plantings. • Significant biodiversity loss has occurred, largely related to European settlement, introduced species, land use change and clearing.	Riparian Zone / Biodivers.
15.	Funding Constraints	• Financial needs. Suggestions: Environmental lottery, Establishment of a Grant's Officer Position.	Funding constraints
16.	Biosolids Treatment and Disposal	• Biosolids from the wastewater treatment process contain only 14% solids which results in higher disposal costs.	Biosolids
17.	Bulk Water Supply/ Drought Management/ Network Leakage – Unaccounted for Water	• Current bulk water storages may not meet future demand in the case of high growth. • Treated effluent is not being utilised to its fullest potential (current WWTW onsite reuse is 24% of inflow).	Bulk Water/ Drought/ Leakage/ UFW
18.	Allowing for Population and Industry Growth	• This issue overlaps with the issues of 'Dam Safety' and 'Bulk Water Supply'.	Pop'n Growth

#	Issue	Description/ PRG Comments	Ref
19.	Water Transfer	• Potential for water transfers, particularly in regard to selling water to Cadia mines.	Water Trans
20.	Environmental Flows	• Environmental flows should be managed through a whole of catchment approach.	Env Flow
21.	Chemical Contamination	• The former Bathurst Gasworks Site was declared a Remediation Site in 2001[2]. • Runoff from agricultural sprays is also an issue.	Chem Cont
22.	River Water Quality	• Water quality in the Macquarie River does not comply with Central West Catchment Management Authority guidelines.	River Water Quality
23.	Greenhouse Gas Emissions	• There is the potential for climate change to affect the availability of water supply and water quality by altering rainfall patterns and evaporation rates.	GGE
24.	Water Stress (River)	• Water stress resulting from increasing irrigation extraction and the increasing number of groundwater bores.	Water Stress
25.	Strategic Plan	• The Strategic Plan for Water & Wastewater has not been updated since the Local Government amalgamation.	Strategic Plan
26.	Flooding/ Flood Damage to Inlet Works	• The Bathurst Region has a history of flood events which have damaged local infrastructure and industries. • There is a need to mitigate damage to inlet works caused by flood events.	Flooding
27.	Algal Blooms	• Particularly in Ben Chifley Dam (BCD) due to high nutrient levels.	Algal Blooms
28.	Emergency Plans	• The emergency plans for WWTW and water infrastructure are not fully documented and detailed regarding power failure, mains failure, plant failure, terrorism and earthquake.	Emerg. Plans
29.	Potable Water Network Quality	• Dirty water incidents have occurred in the potable water system due to sediments entering the pipes during times of high flows.	Pot Water Qual.
30.	Odour Complaints	• In urban areas near the WWTW.	Odour

[2] Remediation works have been carried out by Council.

#	Issue	Description/ PRG Comments	Ref
31.	Dam Safety	• Winburndale Dam requires upgrade to comply with NSW Dam Safety standards.	Dam Safety

2.4 RECENT PROGRESS ON IWCM ISSUES

As the IWCM Strategy was being developed, Council continued to progress on a number of the issues included in Table 2-1. Recent progress on these issues is summarised below. Where possible, the progress on these issues was taken into account in the scenario assessment process.

ISSUE 12: WASTEWATER TREATMENT WORKS AND NETWORKS OVERFLOW

- *WWTW does not meet DECC licence requirements for Suspended Solids, Nitrogen and Phosphorous discharge.*
- *High infiltration of stormwater into the sewerage system.*

On 31 October 2008, BRC was issued a licence from the NSW DECC for the operation of the Bathurst Wastewater Treatment System. The licence, covering the Waste Water Treatment Plant and the associated sewer network, is to be reviewed on 23 August 2010.

At the end of the 2008 licence period, the areas of non-compliance were as follows:

- Total Suspended Solids (TSS) pollutant load;
- Total Suspended Solids 90 percentile and 100 percentile limits;
- Biochemical Oxygen Demand 100 percentile limit; and
- Total Nitrogen 100 percentile limit.

Actions underway

- Increased monitoring and testing and other enhancements at the WWTW are underway in an effort to minimise the areas and extent of non-compliance;
- Comprehensive data and reports have been provided to Council, including a separate report for the PRP100 condition requirement (AWT, 2008); and,
- The sewer network was fitted with 30 gauges to allow calibration and validation of a comprehensive network model of the sewer system, and to check the monitor daily performance. Projected growth was incorporated into the model, along with a chosen wet weather event to determine the location, volume and frequency of any wet weather overflows. Work required to minimise any overflows has been identified and prioritized. Four underground storage tanks have been constructed at priority pump stations, with another under construction, to eliminate dry weather overflows from those stations.

Planned Actions

- Investigations into the WWTW processes or other major changes are to be completed in 2009.
- Further work on reducing wet weather overflow is to be tendered and constructed in 2009. Additional work may be undertaken in the future as resources permit.

- A review of the model and re-gauging will occur following the next census to confirm the modelling that has been completed, and to evaluate the effectiveness of identified solutions to minimise overflows.

Outcomes

- The Sewer Overflow Investigations Report (prepared in relation to Pollution Reduction Program (PRP100) was completed, submitted and accepted by the EPA.

ISSUE 13: TRADE WASTE MANAGEMENT

- *Reasonable control over trade waste released to the wastewater network.*
- *Work is required, however, to ensure all discharges comply with guidelines.*

Council adopted the Trade Waste Policy in November 2005, which was based on the Department of Energy, Utilities and Sustainability (now Department of Water and Energy) Liquid Trade Waste Management Guidelines. All businesses with potential for trade waste concerns were identified, visited and recorded. There are approximately 300 active trade waste customers now on the database. Seven hundred inspections carried out, with many repeat visits to food-based industry premises.

There are 12 industries identified as classification C trade waste dischargers. Of these, the largest dischargers are 3 customers operating over 4 sites. Council has ensured that each of these customers:

- Have official approvals;
- Undertake appropriate sampling and testing at a NATA laboratory; and
- Contribute excess mass charges or non-compliance excess mass charges as appropriate in accordance with the BRC Trade Waste Policy and the State Government Guidelines.

The customer discharging the largest volume and strength of waste has also put in place additional measures to monitor performance, allow for improvement and identify triggers for mitigation/ response.

ISSUE 32: BULK WATER SUPPLY/ DROUGHT MANAGEMENT/ NETWORK LEAKAGE – UNACCOUNTED FOR WATER

In order to quantify and monitor the level of Unaccounted for Water (UFW) in Bathurst, Council has been working with the Water Directorate Water Loss Management Team to identify appropriate zones and metering requirements.

Actions underway

The following has been undertaken:

- Appropriate zones have been identified;
- A review of available metering has highlighted where additional bulk water meters are needed;
- Additional meters have been purchased; and,
- Council is in the process of installing these additional bulk water meters.

Results to date:

- Eglinton (500 houses): Flows dropped to zero over night, indicating no losses.
- Ashworth Estate (100 houses): Flows dropped to zero over night, indicating no losses.

2.5 BATHURST IWCM GOALS AND CRITERIA

Goals set for the IWCM Strategy are developed in line with the triple bottom line (TBL assessment approach, which involves assessment based on environmental, social and economic performance. The IWCM Goals identified for the IWCM Strategy are as follows:

Water Supply Reliability

- To secure a sustainable water supply *(Environmental)*

Water Supply/ Use Efficiency

- To maintain public ownership of water infrastructure *(Economic)*
- To become more efficient in the use of water resources, and encourage uptake of new technologies for efficient water cycle management *(Environmental/ Social)*
- To make more efficient use of potable water, i.e. better match the quality of water supplied to the quality of water required by particular uses (i.e. it is not necessary to provide potable water to all water uses) *(Environmental/ Economic)*

Improve Water Quality

- Improve/ maintain sustainable environmental flows, river and riparian ecology - without compromising human usage requirements *(Environmental)*
- To maintain or improve water quality, particularly relating to discharge to waterways from urban development, stormwater and sewage treatment facilities *(Environmental)*

Affordability of IWCM Outcomes

- Adopt best technology to keep costs low. On-going commitment to research and development *(Economic)*

Community Awareness and Education

- Raise awareness and educate community on water issues and their responsibilities *(Environmental/ Social)*

These goals were then used to develop a suite of criteria for assessing the IWCM Options and Scenarios. The criteria developed are as follows:

Environmental Assessment Criteria

- Improved waterway health
- Environmental flows to rivers/ waterways maintained or improved
- Efficient water usage/ reduced consumption
- Energy use/ Greenhouse Gas Emission reduction

Social Assessment Criteria

- Improved public awareness
- WWTW safe discharge (meeting licence conditions)
- Public Health and Safety

Economic Assessment Criteria

- Affordable services (Cost to customer)
- Affordability (Cost to Council)
- Fit for purpose water[3]
- Public ownership of water assets

[3] This criteria is used as an indicator of how much potable quality water is being substituted for fit for purpose lower water quality product

3. BASELINE ASSESSMENT

A major component of Integrated Water Cycle Management is the development of an understanding of Bathurst's current water cycle. This is undertaken through an assessment of the current and historical influences and demands on the water, wastewater and stormwater networks. The baseline demand analysis found that per capita consumption in Bathurst of 700 litres/ person/ day. A decline in per capita demand was noted between the mid 1990s and 2006. An unexplained increase in demand since 2006 has been recorded. The outcomes of the Baseline Demand Analysis are included within the BRC IWCM Concept Study (2008). The Demand Side Management Decision Support System (DSS) was used to generate forecasts of future water demand and wastewater flows. The DSS takes account of population growth and changes in household size and the impact of demand management programs. More information on the DSS is provided in Section 5.1 and Appendix F.

3.1 WATER SUPPLY AND CONSUMPTION

Total water consumption is expected to increase significantly due to population growth.

Preliminary potable water demand forecasts have been developed. Table 3-1 indicates the baseline forecasts without the influence of the NSW Government Building Sustainability Index (BASIX) and the Water Efficiency Labelling Scheme (WELS). As both of these programs are now active and are planned to continue into the future, Table 3-2 indicates the baseline including the impacts of BASIX and WELS.

BASIX and WELS programs are expected to reduce the water consumed per person.

It can be seen that without BASIX and WELS, the total and per capita potable water consumption is expected to increase over the next 30 years. The implementation of BASIX and WELS, however, result in a reduced per capita consumption level, and a less significant increase in total water consumption. The baseline forecast is illustrated in Figure 3-1.

Table 3-1 Water Demand Forecast without BASIX / WELS

Demand Parameter	2008	2013	2018	2023	2028	2033	2038
Per capita water demand (L/c/day)	700	705	706	709	713	719	725
Annual water demand (ML/annum)	6,919	7,289	7,630	8,009	8,417	8,840	9,291
Peak day water demand (ML/day)	44	47	51	54	58	62	66

Table 3-2 Water Demand Forecast with BASIX / WELS

Demand Parameter	2008	2013	2018	2023	2028	2033	2038
Per capita water demand (L/c/day)	700	694	685	680	677	675	675
Annual water demand (ML/annum)	6,919	7,169	7,402	7,677	7,982	8,302	8,647
Peak day water demand (ML/day)	44	47	50	54	58	62	66

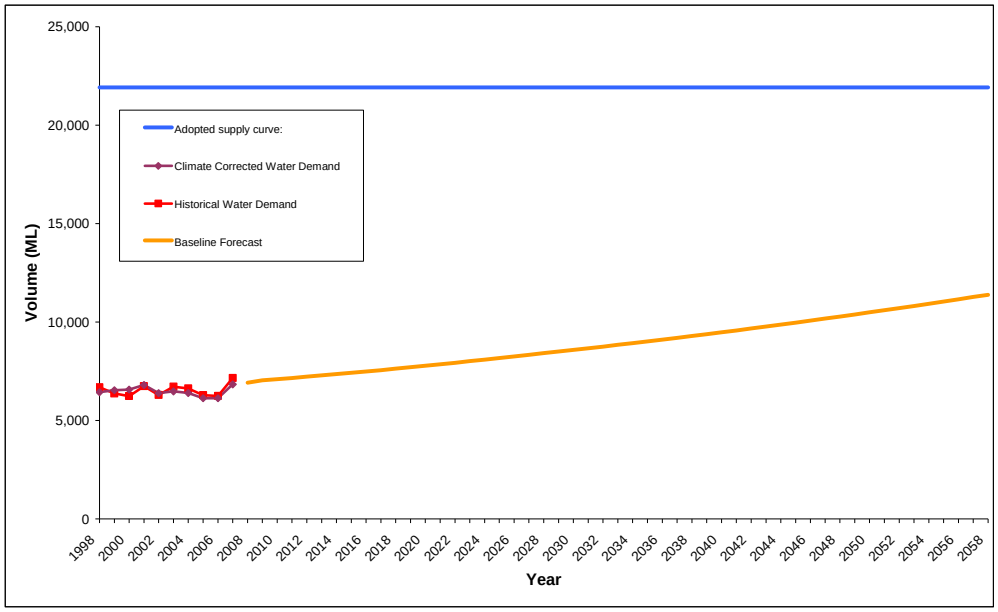


Figure 3-1. Baseline Water Demand Projection

More information on the Demand Side Management Decision Support System (DSS) is provided in Section 5.2 and Appendix F.

3.2 WATER SUPPLY RELIABILITY AND SECURITY

Over-extraction of surface and groundwater potentially presents the greatest risk to water supply security.

The principal water storage for Bathurst is the Ben Chifley Dam (BCD), which is fed by the Campbell River. Water is released from BCD into the Campbell River, which joins the Fish River and becomes the Macquarie River. Water is extracted along the river by irrigators, industry and at the BRC Water Filtration Plant.

While no options were developed within the IWCM to control water resources downstream of BCD, the security of the supply was modelled to determine the limiting factors. The modelling found that the security of the supply of BCD is reliant on the following factors:

- **INFLOW -** Inflows to the dam are sufficient and do not pose a risk to the security of Bathurst's water supply. Significant changes to rainfall patterns as a result of global climate change may increase the risk of reduced reliability of BCD.
- **STORAGE CAPACITY -** Due to recent upgrades to BCD, the storage capacity is capable of providing a reliable water supply to Bathurst. This is highly dependant on extraction levels, see below.
- **DAM RELEASE / CONSUMPTION**
  - The greatest risk to the security of Bathurst's water supply is over extraction of water from the Macquarie River for agricultural or industrial purpose downstream of BCD and upstream of the Water Filtration Plant.

- Groundwater extraction for these purposes also poses a risk to the security of the water supply, presumably as a result of the consequent drawdown on the Macquarie River; however, this has not been quantified.
- In periods of high irrigation, releases from BCD must be much higher than town water demand if in-stream flows are to be maintained.

Table 3-3 outlines the predicted dam levels, and water restriction parameters for varying levels of irrigation extraction. The total of the current surface extraction entitlements (4.72 GL/ year), and an estimate of possible extraction levels based on recorded BCD releases and demands (11 GL/year) were modelled. It can be seen that extraction levels of 11 GL/ year trigger external water use restrictions[4].

Table 3-3. Water Supply Security Assessment

Irrigation/ Industrial Extraction (GL/ year)	Reservoir Storage % full	Reliability of Supply	Need for Restrictions to secure supply	Restriction outcome required
0	95-100%	100%	NO	na
2	85-100%	100%	NO	na
4.72	**50-100%**	100%	**NO**	**na**
11	2-100%	> 99.5%	YES	100% restriction on external use

[4] Water restrictions are triggered when BCD reaches less than 30%.

3.3 WASTEWATER

Preliminary total wastewater inflow forecasts have been developed. Table 3-4 indicates the baseline forecasts without the influence of BASIX and WELS. As both of these programs are now active and are planned to continue into the future, Table 3-5 indicates the baseline including the impacts of BASIX and WELS.

Wastewater production is expected to increase due to population growth.

Table 3-4 Wastewater Production Forecast without BASIX/ WELS

Forecast - No BASIX/WELS	2008	2013	2018	2023	2028	2033	2038
WWTW annual inflow (ML/annum)	3,557	3,676	3,755	3,860	3,984	4,116	4,263
WWTW Average Dry Weather Flow (ML/day)	8.0	8.3	8.4	8.6	8.9	9.2	9.5

Table 3-5 Wastewater Production Forecast with BASIX/ WELS

Forecast with BASIX/WELS	2008	2013	2018	2023	2028	2033	2038
WWTW annual inflow (ML/annum)	3,556	3,634	3,685	3,770	3,878	3,998	4,133
WWTW Average Dry Weather Flow (ML/day)	8.0	8.2	8.2	8.4	8.6	8.9	9.2

Total wastewater production is expected to increase due to population growth (Figure 3-2). WELS and BASIX programs will; however, reduce the impact of this growth through the encouragement of the installation of fixtures and fittings with improved water efficiency. WELS and BASIX are expected to impact upon the total wastewater received by the WWTW, not the pollutant loads (concentration of pollutants within the wastewater).

BASIX and WELS programs are expected to reduce the wastewater produced per person.

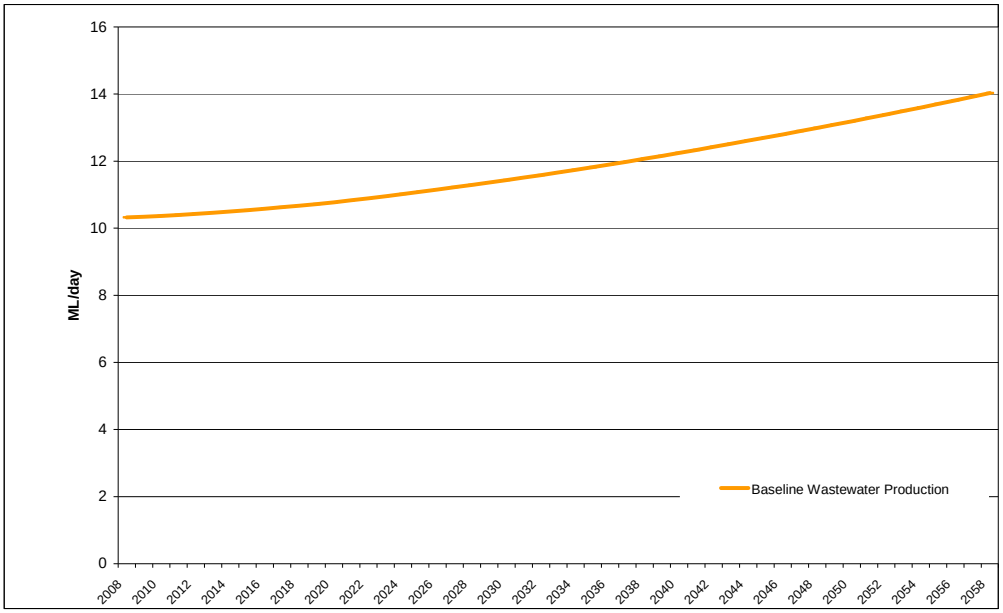


Figure 3-2. Baseline Wastewater Production Projection

More information on the Demand Side Management Decision Support System (DSS) is provided in 5.1 and Appendix F.

3.4 STORMWATER

Increased development is expected to increase stormwater runoff volumes and pollutant generation.

Stormwater quality monitoring results for the BRC LGA were not available for use in the IWCM assessment. A stormwater pollutant generation modelling package (MUSIC) was used to estimate the stormwater flow and pollutant levels based on current land use zoning. As this information has not been calibrated with monitoring data, this baseline should be used for comparative purposes only (refer to section 5.6).

The modelling indicated a significant increase in flow generation and pollutants as compared with pre-development conditions. More information on the MUSIC modelling undertaken is provided in Appendix D.

4. IWCM OPTIONS

A 'long list' of IWCM options was developed in response to the issues identified by the PRG. From this list, a suite of IWCM Options for further investigation was selected (Table 4-1). A TBL assessment was then undertaken on the short list of options to inform the development of the IWCM Scenarios. Appendix B provides a summary of the TBL assessment that was undertaken. More information on each of the IWCM Options is provided in Appendix A.

Table 4-1. IWCM Options

		IWCM Options
1.	W	Community IWCM education (irrigation, land management, erosion control, water use, energy use)*
2.		Rainwater tank rebate program (continuation)*
3.		*Pipeline from BCD to the Water Filtration Plant**
4.		Dam Safety Upgrade in line with NSW Dam Safety Standards*
5.		BASIX: Mandatory use of rainwater tanks connected to toilets, cold laundry and external uses. Efficient showerheads, taps and toilets*
6.		WELS scheme*
7.	WW	Planned WWTW upgrades*
8.		Infiltration and Inflow - assessment and repair*
9.	W	Urban water system energy audit, improved technology and operation
10.		On-site greywater recycling promotion
11.		Active water supply system leak assessment, detection and repair
12.		Washing machine rebate program
13.		On-site greywater recycling retrofit
14.		Residential conservation retrofit (pamphlet, leaks and low flow fixtures)*
15.		High water user site audits A) residential B) non-residential
16.		Pricing reform (increased variable charges)
17.		Groundwater monitoring and extraction regulation [#]
18.	WW	"Smart" sewers (e.g. low inflow and infiltration, pressurised sewer systems)

		IWCM Options
19.	ST	Stormwater quality monitoring
20.		River water quality monitoring*
21.		Reduce stormwater litter/organics A) infrastructure B) Street Cleaning
22.		Water Sensitive Urban Design Development Control Plans (according to best practice targets)
23.		Upgrade and fence waterway buffers on farmland to reduce erosion
24.		Rehabilitate existing degraded watercourses/ riparian zones
25.		Review Development Guidelines/ LEP to include erosion control buffer and prescribed buffer management practices.
26.		School waterway protection scheme*
27.		Improve trade waste monitoring and audits
28.	W	Encouragement of sustainable building beyond BASIX requirements**
29.		Increase safety margins in system design and management (due to climate change)
30.		Commercial property toilet retrofit
31.		Mains water quality monitoring and flushing
32.	WW	Establish on-site treatment (septic) system monitoring program
33.	ST	Establish buffer zones on public land alongside significant streams/ with passive recreation
34.		Develop salinity monitoring program to guide land management planning[#]
35.	W	Dual reticulation in new development areas via raw water network
36.	ST	Water sensitive urban design retrofit in key areas (opportunistic)

✘	Option/ Program excluded, or included in other BRC budgets
W	Water
WW	Wastewater
S	Stormwater
*	Expansion of existing BRC program
**	Incentives only
#	Dependant on collaboration with the DWE / DECC.

5. IWCM OPTION ASSESSMENT

The objective of the IWCM assessment was to determine the most appropriate scenario for Bathurst. The following sections provide an outline of the models used to undertake this assessment, and the assessment outcomes.

While the following graphs project outcomes to 2058, it should be noted that the timeframe for the BRC IWCM is 30 years.

5.1 IWCM MODELLING TASKS

The modelling tasks undertaken as part of the IWCM Study are summarised below.

Demand Side Management Decision Support System (DSS)

- Used primarily to model water demand management and wastewater management options.
- Uses historical water consumption records and climate information to estimate consumption patterns.
- Provides projections of consumption into the future, and potential changes resulting from the implementation of measures over time.
- Provides an assessment of:
    - Water consumption;
    - Energy consumption;
    - Infrastructure renewal replacement; and
    - Capital and operating costs.

Bulk Water Network Simulation (WATHNET)

- Used to simulate water supply catchment characteristics (rainfall, inflow, storage etc) under varying conditions.
- Compares water supply capacity with consumption patterns.
- Provides an assessment of:
    - Supply catchment inflow and storage characteristics;
    - Security of supply; and
    - Likelihood of need for, and severity of, restrictions.

Model for Urban Stormwater Improvement Conceptualisation (MUSIC)

- Used to model stormwater management options.
- Models the stormwater flow and pollutants generated from different land uses.
- Provides an assessment of:
    - Stormwater flow production (FLOW);
    - Gross pollutants (GP);
    - Total phosphorous (TP);
    - Total nitrogen (TN);
    - Total suspended solids (TSS).

Financial Model (FINMOD)

- Models the impact of changes in Council's capital and operating costs for water and sewer on Typical Residential Bills (TRB – a key social affordability indicator).
- Uses projections of capital and operating costs of proposed options over time.
- Water supply and sewerage funds are separately modelled.

5.2 WATER DEMAND MANAGEMENT

5.2.1 POTABLE WATER DEMANDS

By 2038, 10% of projected water consumption could be saved through demand management measures.

Reduced water demand can be achieved through structural, regulatory, economic and awareness raising mechanisms. Section 4 and Appendix A provide a more detailed explanation of each of the IWCM Options.

Figure 5-1 and Table 5-1 illustrate the impacts of each of the demand management options. In examining this information, it should be noted that:

- Program durations vary based on the nature of the program and its links to Council planning horizons; and
- Some programs take into account the likelihood of reduced effectiveness. An example of this may be that a proportion of residents will not be satisfied with the performance of low flow showerheads and will return to using a traditional high flow showerhead[5]. The impacts of some programs may, however, be sustained with additional investment over time.

[5] Including "clawback" which refers to refers to the replacement of efficient fittings with inefficient fittings after retrofitting has occurred.

Table 5-1. Demand Management Options - Water savings summary

#	Water Demand Management Option	Average Water Savings (ML/a) 2008-2038	Cost * $ / kL 2008-2038
14	Residential Leakage Repairs	1.1	*$ 0.16*[6]
30	Commercial Toilet Retrofit	1.3	$ 7.42
15B	Non-Residential - high water user audit	4.5	$ 0.50
14	Residential tap retrofit	5.8	*$ 0.16*
15A	Residential high water user audit	12.4	$ 0.35
1	Community IWCM education	14.2	$ 0.21
14	Residential shower retrofit	30.5	*$ 0.16*
5	BASIX Program	6.5	$ 2.87
6	WELS Program	36.4	$ 0.49
28	Encouragement of sustainable building beyond BASIX requirements	114.1	$ 0.58
16	Increased variable charge	284.3	$ 0.01
11	Water supply leak assessment and repair	321.8	$ 0.30

* Total cost – includes costs to Council and the community.

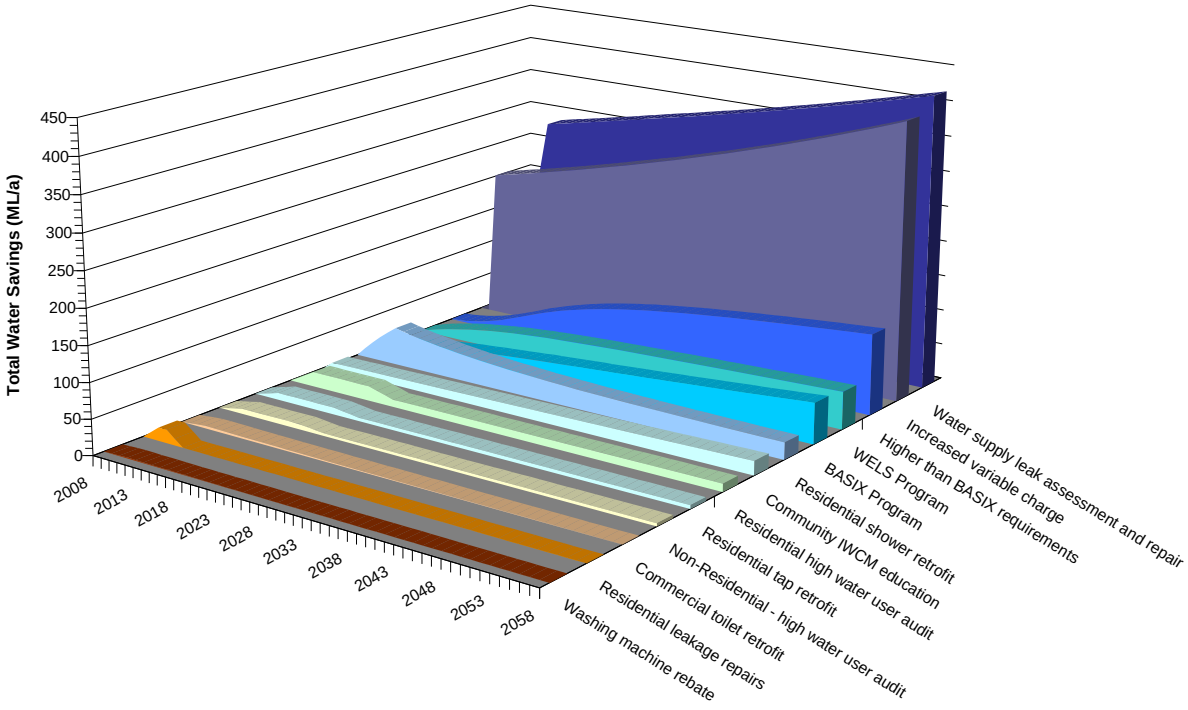


Figure 5-1. Projected impact of water demand management options

More information on each of the IWCM Options is provided in Appendix A.

[6] Residential Retrofit Program (showers, taps and leakage repairs) in total has a value of $0.48/kL water saved.

5.2.2 RAW WATER DEMANDS

The raw water system in Bathurst currently supplies water for irrigation and industrial uses. The IWCM has not focused on these demands as they are low compared with potable demands, and do not pose a risk to the security of Bathurst's water supply (Table 5-2). While the raw water demand has not been dealt with, the raw water network was considered as a potential distribution network for the Dual Reticulation Option (Option 35). Section 5.3 and Appendix A provide more information on the Dual Reticulation Option.

It should be noted that records indicate that release patterns from Winburndale Dam vary significantly between years.

Table 5-2. Winburndale Dam – Yearly Release Volumes

Financial year ending	ML to town (yearly total)
June 2005	827
June 2006	674

5.3 SOURCE SUBSTITUTION

By 2038, 9 % of projected water consumption could be saved through source substitution measures.

Reduced pressure on potable water supplies can be achieved through the introduction of alternative water sources, often referred to as source substitution. The source substitution options assessed as part of this study are listed below. It can be seen that the implementation of a dual reticulation system provides the greatest level of water savings through source substitution. Table 5-3 and Figure 5-2 illustrate the impacts of each of the source substitution options. In examining this information, it should be noted that:

- BASIX Rainwater Tank requirements for infill and greenfield development and the NSW Government rainwater tank rebate program are in place and are expected to continue; and,
- The implementation of the dual reticulation option will require significant changes to infrastructure, in addition to education programs and management systems to ensure safe use of recycled water.

Table 5-3. Source Substitution Options - Water savings summary

#	Source Substitution Option	Average Water Savings (ML/a) 2008-2038	Cost* $ / kL 2008-2038
2	Rainwater Tank Rebate (NSW)#	1.1	$ 0.00**
13	Greywater reuse system retrofit	15.9	$ 2.00
5	BASIX Rainwater Tank- Infill development#	19.9	$ 2.66
5	BASIX Rainwater Tanks - Greenfield development#	231.4	$ 1.70
35	Dual Reticulation system	424.3	$ 2.04

* Total cost – includes costs to Council and the community.

** NSW Government Rainwater Tank Rebate Program – no cost to Council.

The cost-effectiveness of rainwater tanks should be taken as a preliminary estimate, that does not take account of their impact on the full supply system reliability.

More information on each of the IWCM Options is provided in section 4 and Appendix A.

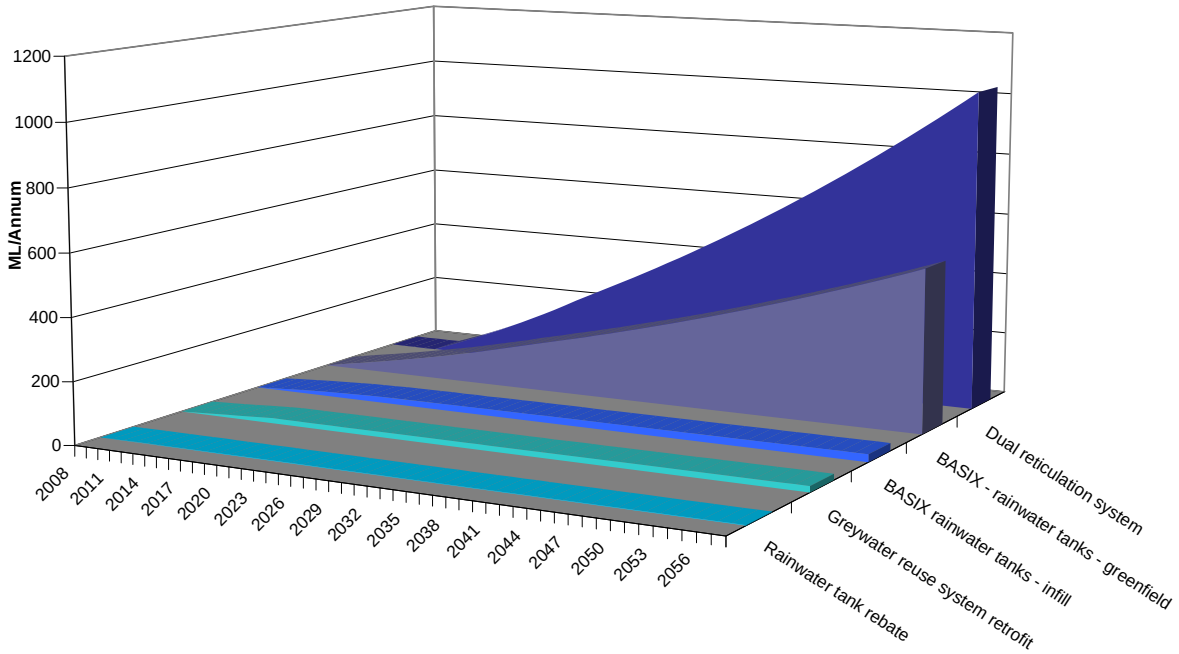


Figure 5-2. Projected impact of source substitution options

It should be noted that BRC does not currently utilise reclaimed (recycled) water. The Bathurst Effluent Reuse Scheme Pre-Feasibility Report completed in May 2006 identified a number of potential zones for irrigation with reclaimed water. Due to the current security of water supply, this scheme has not yet been endorsed by Council.

5.4 WASTEWATER PRODUCTION

By 2038, 19 % of projected wastewater production could be saved

The amount of water treated by wastewater treatment plants is influenced by water consumption (internal) and the level of inflow and infiltration of stormwater into the sewerage pipes.

A comprehensive review of the system with current and future loading during both dry weather and wet weather, as documented in the Sewer Network Model Report (AWT, 2008), concluded that there are areas with extreme and moderate inflow and infiltration into the Bathurst sewer network, with a significant proportion of catchments showing no indication of inflow or infiltration.

Reduced wastewater production reduces operating costs, energy consumption and effluent discharge. In addition to reducing wastewater production through reducing internal consumption, the IWCM has modelled the expansion of the stormwater infiltration and inflow reduction program and the introduction of ‘smart sewers’ in all new developments.

Table 5-4 and Figure 5-3 illustrate the impacts of each of the IWCM Options that impact wastewater production levels over a 50 year period. In examining this information, it should be noted that some programs take into account the likelihood of reduced effectiveness over time. An example of this may be that a proportion of households installing water efficient fixtures under BASIX will return to less efficient fixtures in the medium to long term[7]. The impacts of some programs may, however, be sustained with additional investment over time.

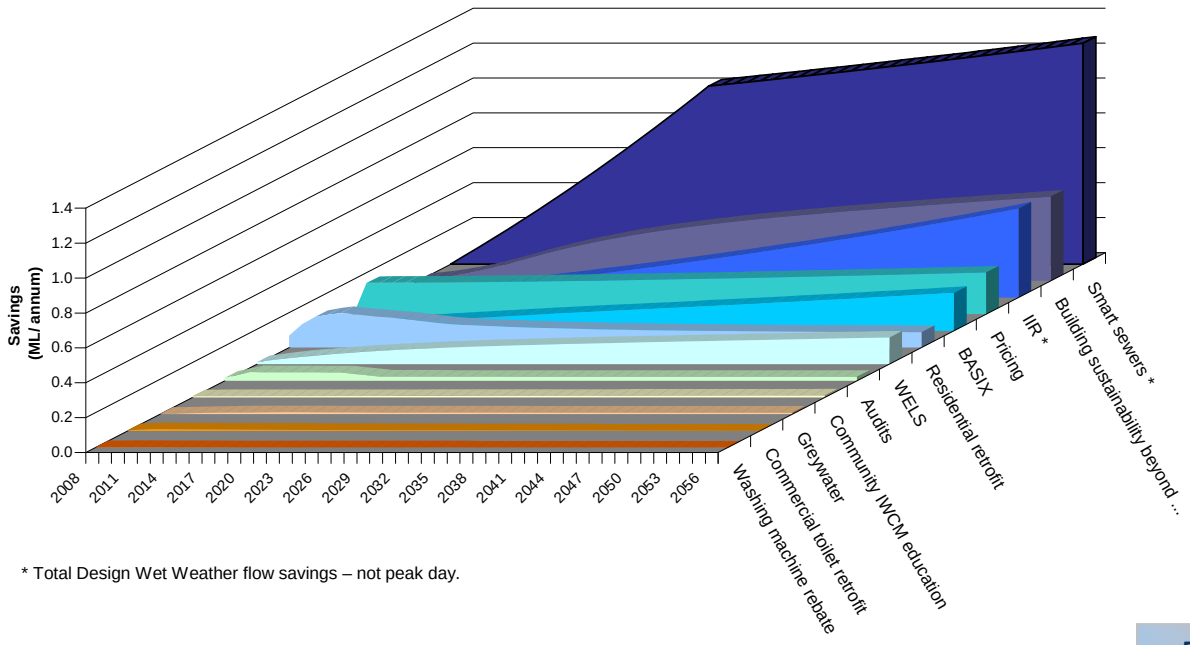
Table 5-4. Wastewater Reduction Options

	Wastewater Reduction Option	Average Wastewater saved (ML/a)
12	Washing machine rebate	0.00
30	Commercial Toilet Retrofit	0.01
13	Greywater Reuse Retrofit	0.01
1	Community IWCM Education	0.01
15	High Water User Audits	0.03
6	Water Efficiency Labelling Scheme (WELS)	0.08
14	Residential Retrofit	0.12
5	Building Sustainability Index (BASIX)	0.08
16	Increased Variable Charges, Decreased Fixed Charges for water services	0.18
8	Inflow and Infiltration Reduction *	0.12
28	Encouragement of sustainable building beyond BASIX requirements	0.2
18	Smart sewers *	0.64

* Total Design Wet Weather – not Peak Day

More information on each of the IWCM Options is provided in Appendix A.

[7] Including “clawback” which refers to refers to the replacement of efficient fittings within inefficient fittings after retrofitting has occurred.



* Total Design Wet Weather flow savings – not peak day.

Figure 5-3. Peak Day Wastewater Savings (ML/annum)

Based on projections, the planned WWTW upgrade should not be required before 2058

Projections of Equivalent Persons (EP) of wastewater production based on expected population growth suggest that the WWTW upgrade should not be required before 2058 (Figure 5-4). Based on these projections, it is recommended that the need for the WWTW upgrade be reassessed in 2018. A review prior to this date should be conducted if any major commercial or industrial development is planned.

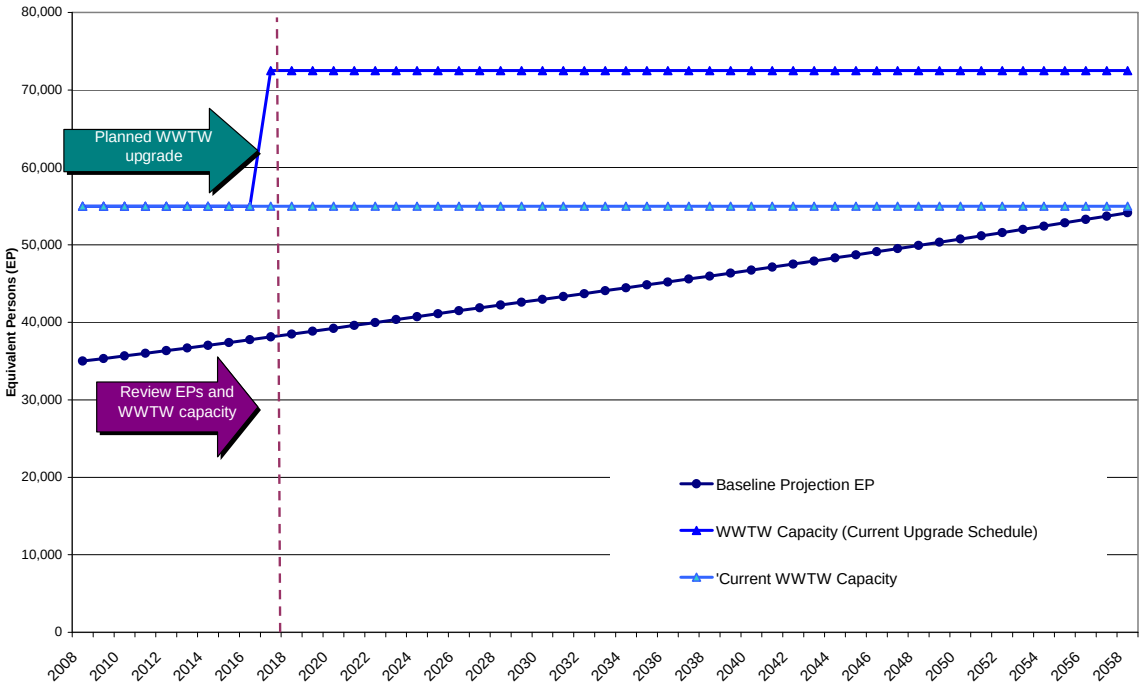


Figure 5-4. Wastewater EP Projections and WWTW Capacity (2008-2058)

5.5 ENVIRONMENTAL WATER / FLOWS

Environmental water as defined in the *Water Management Act 2000* comprises "water that is committed by management plans for fundamental ecosystem health or other specified environmental purposes .. that cannot.. be taken or used for any other purpose, and that is committed … for specified environmental purposes".

Environmental Flow management options are under investigation through a separate process.

Council's operating licence requires the minimum release of environmental waters of 4.53 ML/day at times where inflow exceeds this amount. Reduced flows are to be released at times where inflow is less than 4.53 ML/day. The maintenance of environmental flows within the Macquarie River has been identified as an issue. The feasibility of a pipeline from BCD to the Water Filtration Plant, as a means of reducing in-stream losses, has been assessed separate to the IWCM process. A decision on the proposed pipeline had not been made by Council at the time of writing.

The potential for alteration to BCD releases to improve the condition of the Macquarie River may also be investigated in the future.

5.6 STORMWATER MANAGEMENT

Improved stormwater management could have significant impacts on stormwater runoff, particularly in new development areas.

The majority of stormwater runoff in urban catchments is generated from impervious surfaces (e.g. concrete/ asphalt). Stormwater travels across impervious surfaces at a higher rate than pervious surfaces (e.g. vegetated land), resulting in a higher capacity to carry nutrients to natural waterways and more intense flow patterns during storm events. Stormwater management measures are generally designed to slow the stormwater flow, increase infiltration into soils, and collect litter and pollutants before reaching natural waterways. Figure 5-5 illustrates the relative effectiveness (% reduction from Business as Usual) of each of the stormwater management options modelled within MUSIC. The model reflects the impact at ultimate projected development.

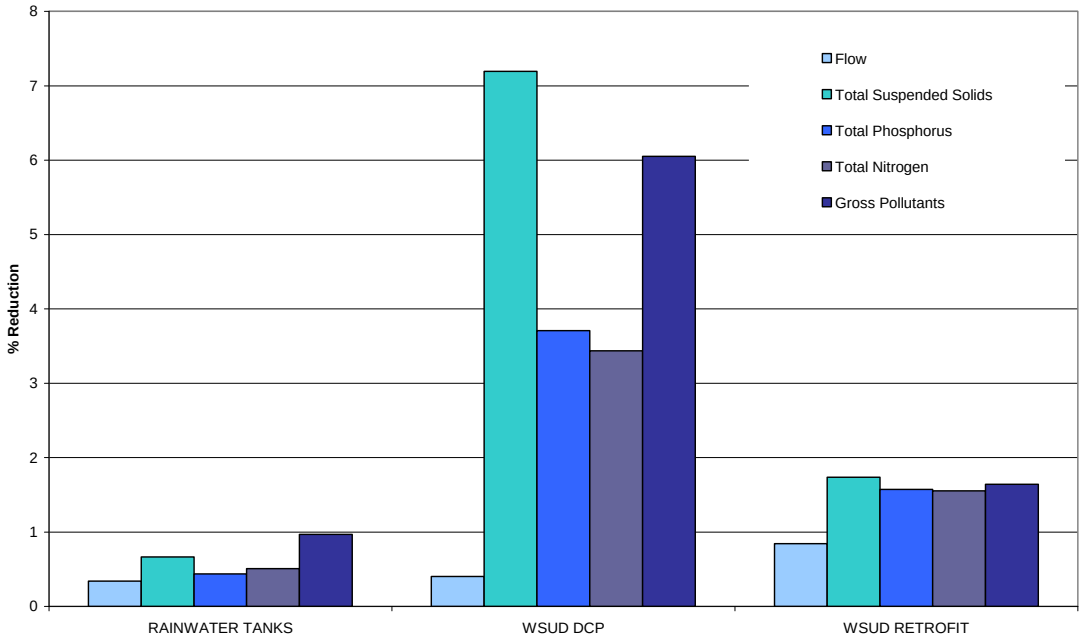


Figure 5-5. Stormwater Management Option Comparison

More information on the MUSIC modelling undertaken is provided in Appendix D.

5.7 WATERWAY HEALTH

Waterway health refers to the condition and ecological function of waterways, creeks and other water bodies. Factors that may affect waterway health include:

- Reduced flows (water stress) through over extraction of surface and ground water;
- Diffuse pollutants and stormwater runoff (see section 5.6);
- Point source pollution e.g. waste discharge, sewer overflow and contaminated land leaching;
- Riparian corridor condition e.g. waterway vegetation;
- Soil condition e.g. soil acidity and acid sulphate soils; and
- Bed and bank stability, which could be affected by:
  - Human activities e.g. litter, power-boating, walking along banks, and
  - Agriculture e.g. cattle grazing along banks.

Waterway health management options included in the IWCM Study are as follows:

- Groundwater monitoring and extraction regulation; #
- Stormwater quality monitoring;
- River water quality monitoring*;
- Rehabilitation of existing degraded watercourses and riparian zones;

- Review of Development Guidelines/ LEP to include erosion control buffers and prescribed buffer management practices;
- School waterway protection scheme*;
- Improved trade waste monitoring;
- Establishment of on-site treatment (septic) system monitoring program;
- Establishment of buffer zones on public land alongside significant streams used for passive recreation; and
- Development of a salinity monitoring program to guide land management planning #

Due to the complexity of the waterway network and the lack of historical waterway quality data, the effectiveness of these programs is unable to be quantified.

It should be noted that Council made significant progress in regard to the STP non-compliances and trade waste management in 2008 (during the IWCM Strategy development period). More information is provided in section 2.4.

Dependant on collaboration with DECC AND DWE
* Expansion on current program

6. IWCM SCENARIO DEVELOPMENT AND ANALYSIS

The following chapter outlines the steps taken to develop the four IWCM Scenarios for BRC, and the results of their assessment.

6.1 SCENARIO DEVELOPMENT

Following the analysis of each of the IWCM Options, the MWH team ranked each in relation to their performance against the BRC IWCM Criteria, with equal weighting given to each criterion (Appendix B). The IWCM Options were then grouped into scenarios based on the level of investment required and their TBL ranking. This TBL ranking and the four draft scenarios were presented to the PRG for review and comment.

6.1.1 BATHURST IWCM SCENARIOS

Four "Scenarios", representing four alternative futures for Bathurst, have been prepared and assessed.

In order to allow comparison between the proposed approaches and those that are currently in place, the first scenario represents Business as Usual (BAU) for BRC. The three IWCM Scenarios then represent varying levels of integration: from low to medium and high. It is presumed that IWCM 3 'High Integration' represents the greatest degree of change and highest level of investment from BRC. The nature of each of the scenarios can be summarised as:

Business As Usual (BAU)

- Programs currently in place in BRC.
- Programs planned/ commissioned/ currently being investigated.

Low integration (IWCM 1)

- Programs currently in place in BRC.
- Programs planned/ commissioned/ currently being investigated.
- Inclusion of additional IWCM Options, with a low level of integration across the water cycle.
- Implementation of IWCM Options will include limited change to current practices

Moderate Integration (IWCM 2)

- Programs currently in place in BRC.
- Programs planned/ commissioned/ currently being investigated.
- Inclusion of additional IWCM Options, with a moderate level of integration across the water cycle.
- Implementation of IWCM Options will include a moderate change to current practices

High Integration (IWCM 3)

- Programs currently in place in BRC.
- Programs planned/ commissioned/ currently being investigated.
- Inclusion of additional IWCM Options, with a high level of integration across the water cycle.
- Implementation of IWCM Options will include significant change to current practices and high level of additional investment.

Table 6-1 shows the IWCM Options included in each of the four IWCM Scenarios; Business As Usual (BAU), IWCM 1, IWCM 2 and IWCM 3. More information on each of the IWCM Options within these Scenarios is provided in Appendix A.

Table 6-1. IWCM Options and Scenarios

		IWCM Options	BAU	IWCM 1	IWCM 2	IWCM 3
37.	W	Community IWCM education (irrigation, land management, erosion control, water use, energy use)*	✓	✓	✓	✓
38.	W	Rainwater tank rebate program (continuation)*	✓	✓	✓	✓
39.	W	*Pipeline from BCD to the Water Filtration Plant**	✗	✗	✗	✗
40.	W	Dam Safety Upgrade in line with NSW Dam Safety Standards*	✓	✓	✓	✓
41.	W	BASIX: Mandatory use of rainwater tanks connected to toilets, cold laundry and external uses. Efficient showerheads, taps and toilets*	✓	✓	✓	✓
42.	W	WELS scheme*	✓	✓	✓	✓
43.	WW	Planned WWTW upgrades*	✓	✓	✓	✓
44.	WW	Infiltration and Inflow - assessment and repair*	✓	✓	✓	✓
45.	W	Urban water system energy audit, improved technology and operation		✓	✓	✓
46.	W	On-site greywater recycling promotion		✓	✓	✓
47.	W	Active water supply system leak assessment, detection and repair		✓	✓	✓
48.	W	Washing machine rebate program		✓	✓	✓
49.	W	On-site greywater recycling retrofit		✓	✓	✓
50.	W	Residential conservation retrofit (pamphlet, leaks and low flow fixtures)*		✓	✓	✓
51.	W	High water user site audits A) residential B) non-residential		✓	✓	✓
52.	W	Pricing reform (increased variable charges)		✓	✓	✓
53.	W	Groundwater monitoring and extraction regulation [#]		✓	✓	✓
54.	WW	"Smart" sewers (e.g. low inflow and infiltration, pressurised sewer systems)		✓	✓	✓
55.	S	Stormwater quality monitoring		✓	✓	✓
56.	S	River water quality monitoring*		✓	✓	✓
57.	S	Reduce stormwater litter/organics A) infrastructure B) Street Cleaning		✓	✓	✓
58.	S	Water Sensitive Urban Design Development Control Plans (according to best practice targets)		✓	✓	✓
59.	S	Upgrade and fence waterway buffers on farmland to reduce erosion		✓	✓	✓

		IWCM Options	BAU	IWCM 1	IWCM 2	IWCM 3
60.		Rehabilitate existing degraded watercourses/ riparian zones		✓	✓	✓
61.		Review Development Guidelines/ LEP to include erosion control buffer and prescribed buffer management practices.		✓	✓	✓
62.		School waterway protection scheme*		✓	✓	✓
63.		Improve trade waste monitoring and audits		✓	✓	✓
64.	W	Encouragement of sustainable building beyond BASIX requirements**			✓	✓
65.		Increase safety margins in system design and management (due to climate change)			✓	✓
66.		Commercial property toilet retrofit			✓	✓
67.		Mains water quality monitoring and flushing			✓	✓
68.	WW	Establish on-site treatment (septic) system monitoring program			✓	✓
69.	S	Establish buffer zones on public land alongside significant streams/ with passive recreation			✓	✓
70.		Develop salinity monitoring program to guide land management planning#			✓	✓
71.	W	Dual reticulation in new development areas via raw water network				✓
72.	S	Water sensitive urban design retrofit in key areas (opportunistic)				✓

✘	Option/ Program excluded, or included in other BRC budgets
W	Water
WW	Wastewater
S	Stormwater
*	Expansion of existing BRC program
**	Incentives only
#	Dependant on collaboration with the DWE/ DECC.

6.2 SCENARIO COMPARISON

The following section provides a comparison of the four Scenarios in relation to their projected impacts on components of the water cycle, including:

- Potable water demand;
- Wastewater flows;
- Recycled water and source substitution;
- Greenhouse gas emissions; and
- Urban pollutant loads.

6.2.1 POTABLE WATER DEMANDS

Projected growth within Bathurst will result in higher demands on potable water supply. The baseline forecast suggests that the annual volume of water consumed will increase from 6,920 ML/a in 2008 to 11,120 ML/a in 2058.

The projections indicate that:

- Water supply system leakage and repair, pricing reform, high water user site audits and residential conservation retrofit produce the most significant reduction in the overall and per capita water demand as compared to BAU;
- The implementation of dual reticulation in new development also has a noticeable impact on reducing the overall and per capita demand for IWCM 3; and
- Some programs take into account the likelihood of reduced effectiveness over time[8], which can be seen in the reduced savings around 2020 in IWCM 1, 2 and 3. The impacts of some programs may, however, be sustained with additional investment over time.

IWCM 1, 2 and 3 produce progressively greater water savings, compared to BAU

Figure 6-1 illustrates the impact of each of the Scenarios on mitigating the increase in total potable water demand. Figure 6-2 illustrates the impact of the Scenarios on reducing the potable water consumption per person. Both graphs illustrate the historical consumption pattern and the projected impact over the period 2008-2058. IWCM 1, 2 and 3 produce progressively greater water savings. The greatest difference between scenarios is between BAU and IWCM 1.

It should be noted that the timeframe for the BRC IWCM is 30 years.

[8] Including “clawback” which refers to the replacement of efficient fittings within inefficient fittings after retrofitting has occurred.

More information on the IWCM Options and their timeframes for implementation is provided in Appendix A. More information on the Demand Side Management Decision Support Tool used to model these projections is provided in Appendix F.

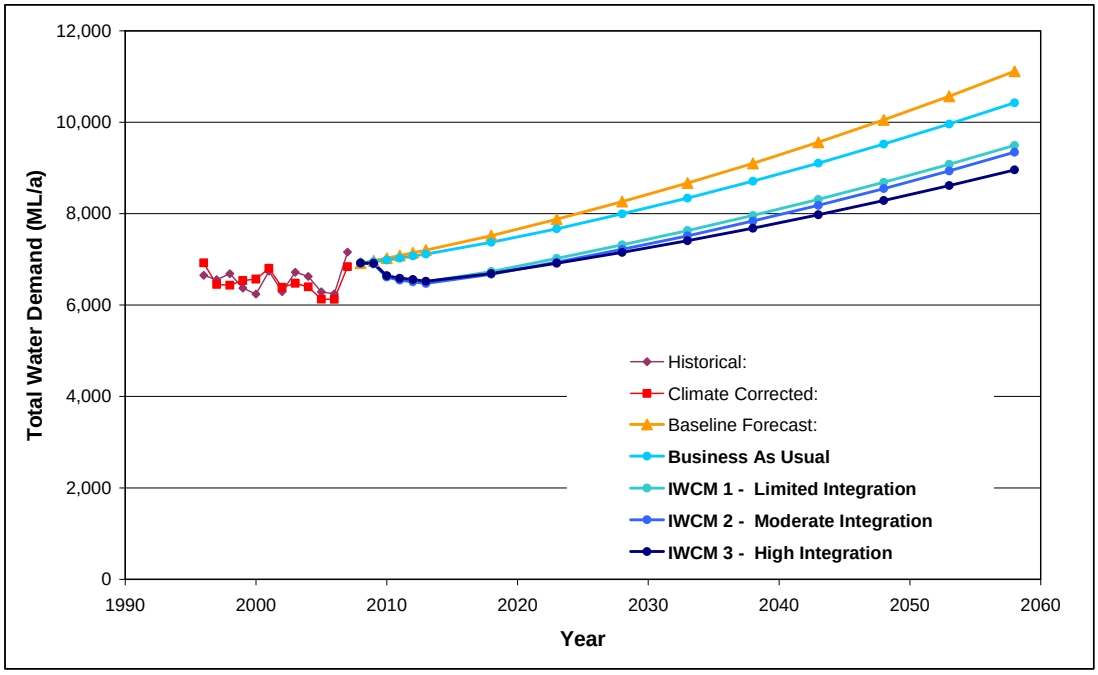


Figure 6-1. Annual Potable Water Demand Projections (ML/a) (2008-2058)

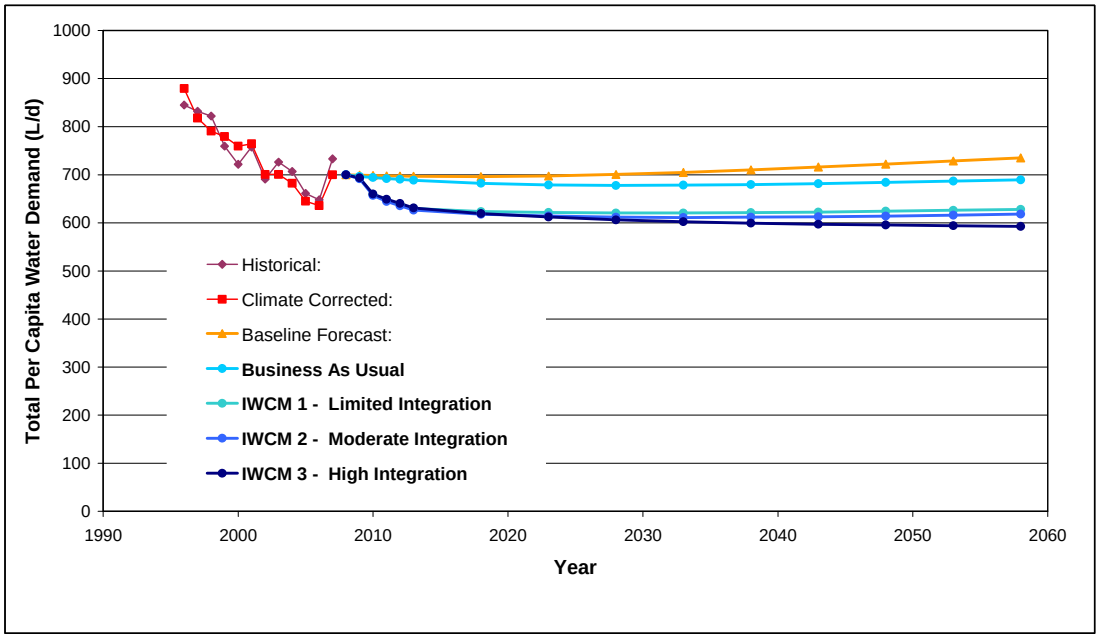


Figure 6-2. Daily Per Capita Water Demand Projections (L/person/ day) (2008-2058)

6.2.2 WASTEWATER FLOWS

Projected growth within Bathurst will result in higher levels of wastewater production. The baseline forecast suggests that the average day wastewater production will increase from 10.3 ML/day in 2008 to 14 ML/day in 2058.

IWCM 1, 2 and 3 produce progressively greater wastewater production savings, compared to BAU

Figure 6-3 illustrates the projected wastewater production levels from 2008 to 2058. Figure 6-4 illustrates the level of saving between the scenarios.

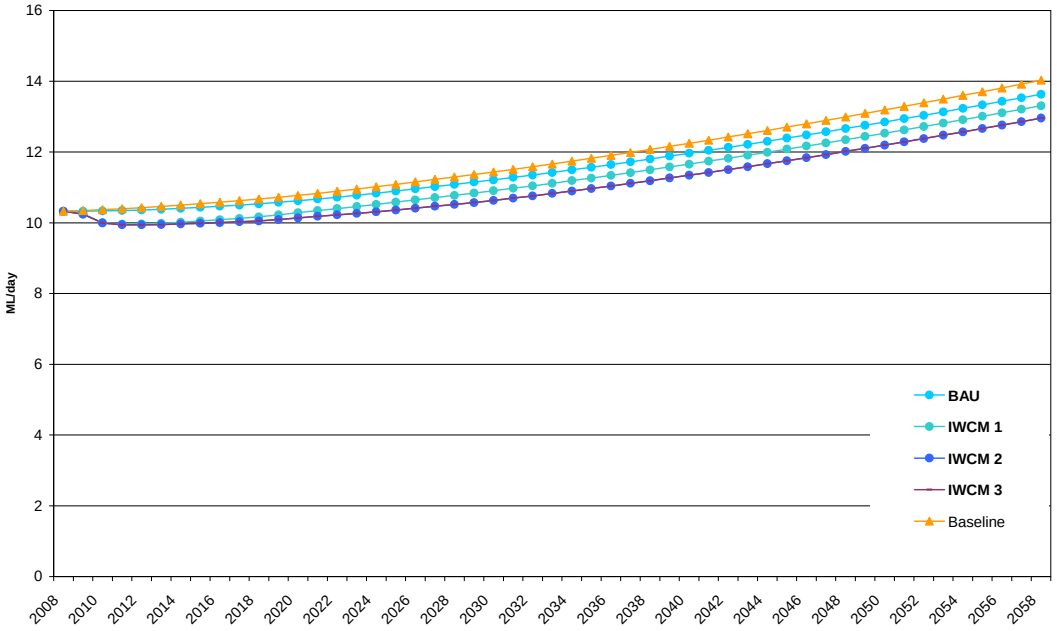


Figure 6-3. Daily Wastewater Production (ML/day) (2008-2058)

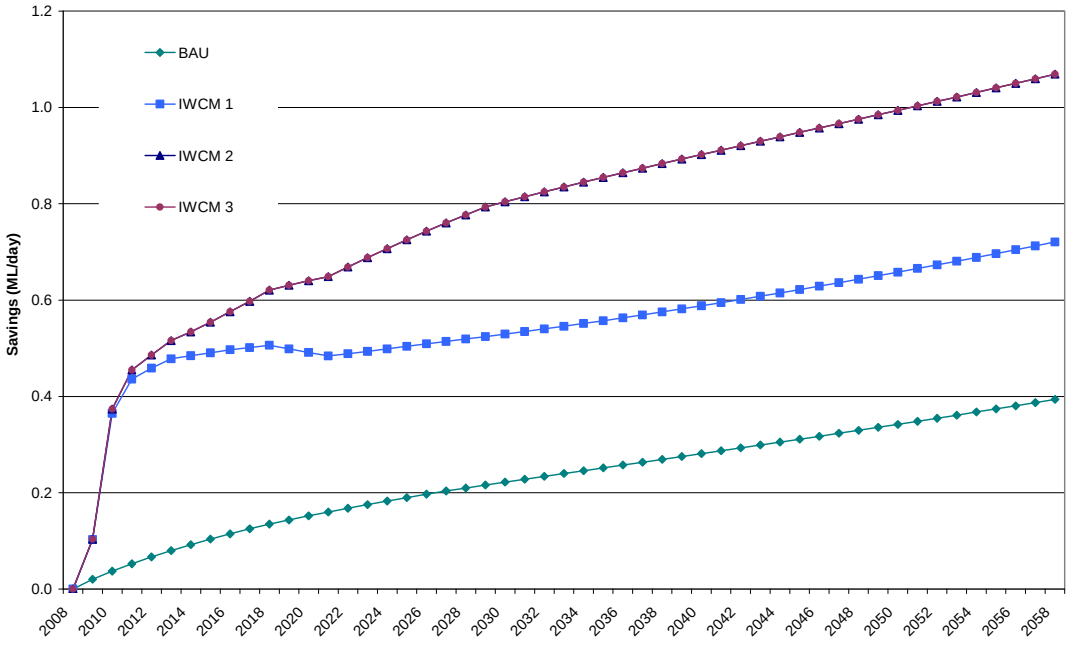


Figure 6-4. Daily Wastewater Production Savings (ML/day) (2008-2058)

In examining this information, it should be noted that:

- Smart sewers, infiltration and inflow reduction program and encouragement of building sustainability beyond BASIX requirements have the most significant impact on reducing wastewater production;
- Wastewater production savings are the same for both IWCM 2 and 3 as no additional wastewater reduction options are included in IWCM 3; and
- Some programs take into account the likelihood of reduced effectiveness over time[9], which can be seen in the reduced savings around 2020 in IWCM 1, 2 and 3. The impacts do some programs may, however, be sustained with additional investment over time.

More information on the IWCM Options and their timeframes for implementation is provided in Appendix A. More information on the Demand Side Management Decision Support Tool used to model these projections is provided in Appendix F.

[9] Including “clawback” which refers to the replacement of efficient fittings within inefficient fittings after retrofitting has occurred.

6.2.3 RECYCLED WATER AND SOURCE SUBSTITUTION

Due to the relative security of the water supply in BRC, large scale water recycling was included solely in IWCM 3. Greywater reuse and rainwater tanks are however included as local scale reuse options.

Dual Reticulation (in IWCM 3) represents the greatest saving related to source substitution

Figure 6-5 illustrates the level of water recycling in each of the scenarios. The significant increase in recycled water in IWCM 3 is a result of the implementation of a dual reticulation system servicing new development areas.

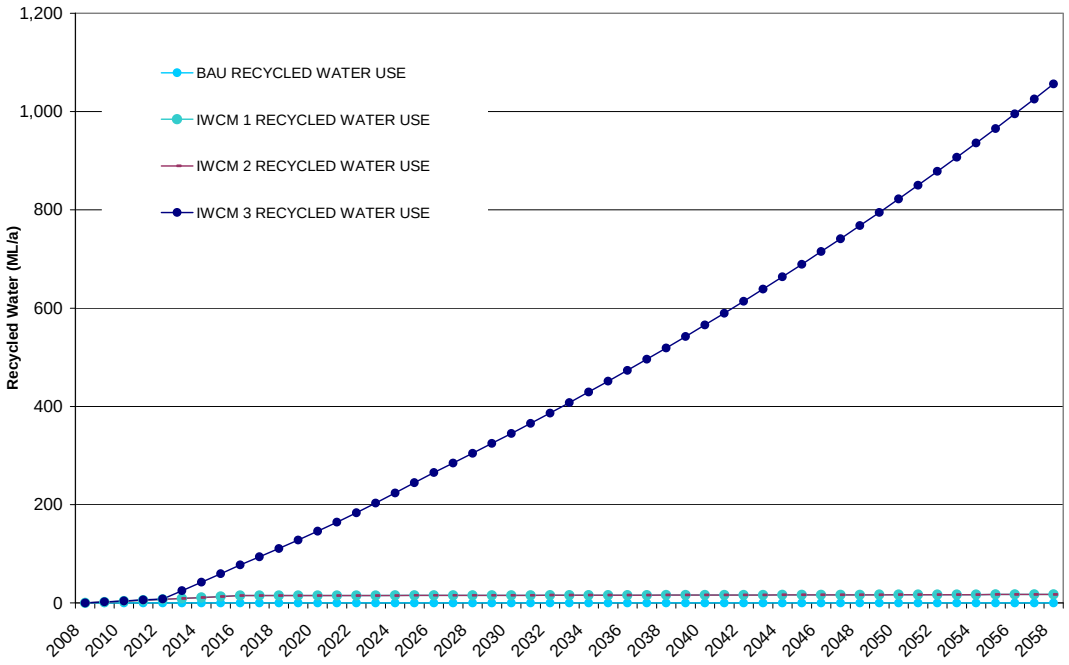


Figure 6-5. Recycled Water Use Projection (2008-2058)

More information on the Demand Side Management Decision Support Tool used to model these projections is provided in Appendix F.

6.2.4 GREENHOUSE GAS EMISSION

Reduced water treatment and transfer requirements, and reduced heated water needs can reduce the overall level of water consumption related greenhouse gas emissions. Scenario IWCM 3 has a lower rate of reduction, which is the result of the increased energy requirement of the dual reticulation system. It should be noted here that not all direct and embedded greenhouse gas emissions have been accounted for.

Reduced hot water consumption reduces greenhouse gas emissions.

More information on the Demand Side Management Decision Support Tool used to model these projections is provided in Appendix F.

Figure 6-6 illustrates the relative impact each of the scenarios on greenhouse gas emissions.

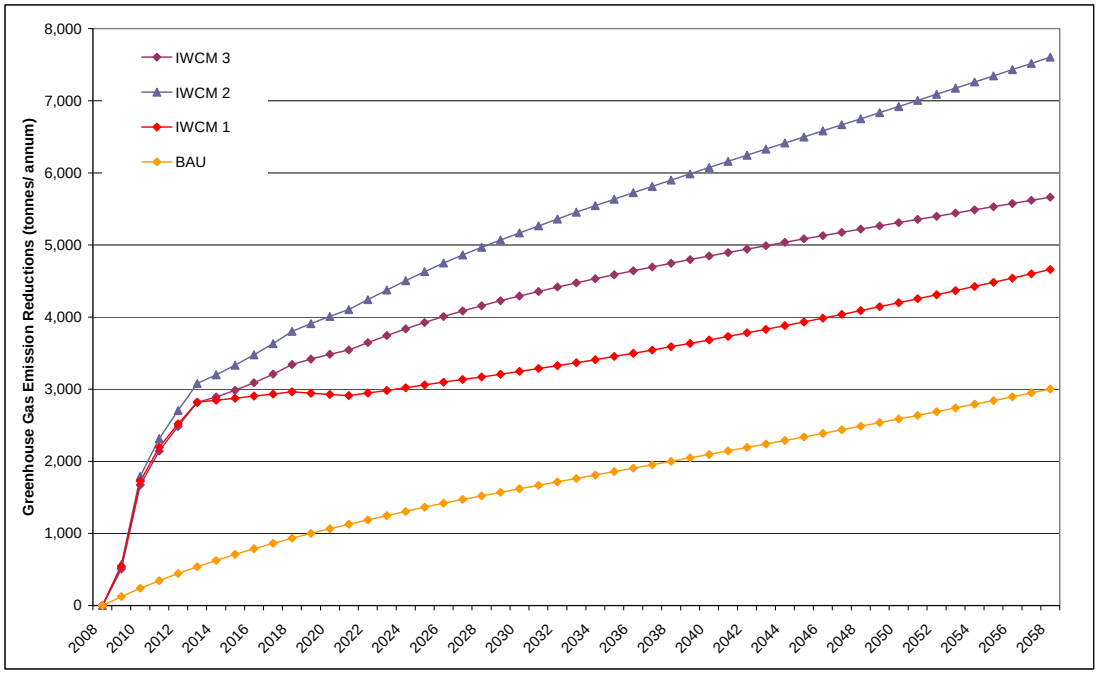


Figure 6-6. Greenhouse Gas Emission Reductions (2008 – 2058)

6.2.5 URBAN POLLUTANT LOADS

Projected growth in Bathurst is likely to increase the proportion of impervious area and the production of pollutants. This in turn will increase the stormwater flows during rain events, and increase the levels of pollutants carried into waterways.

IWCM 1, 2 and 3 represent progressively more effective stormwater management.

Figure 6-7 illustrates the level of impact of the scenarios on pollutant loads. In examining this graph it should be noted that:

- BAU shows the expected increase from current flow and pollutant loads resulting from the need to accommodate an increase in development of around 60%;
- IWCM 1, 2 and 3 progressively mitigate this increase through stormwater management; and
- As this modelling exercise has utilised generic land use nodes, and has not been calibrated with stormwater quality data, the results are to be considered only for comparative purposes.

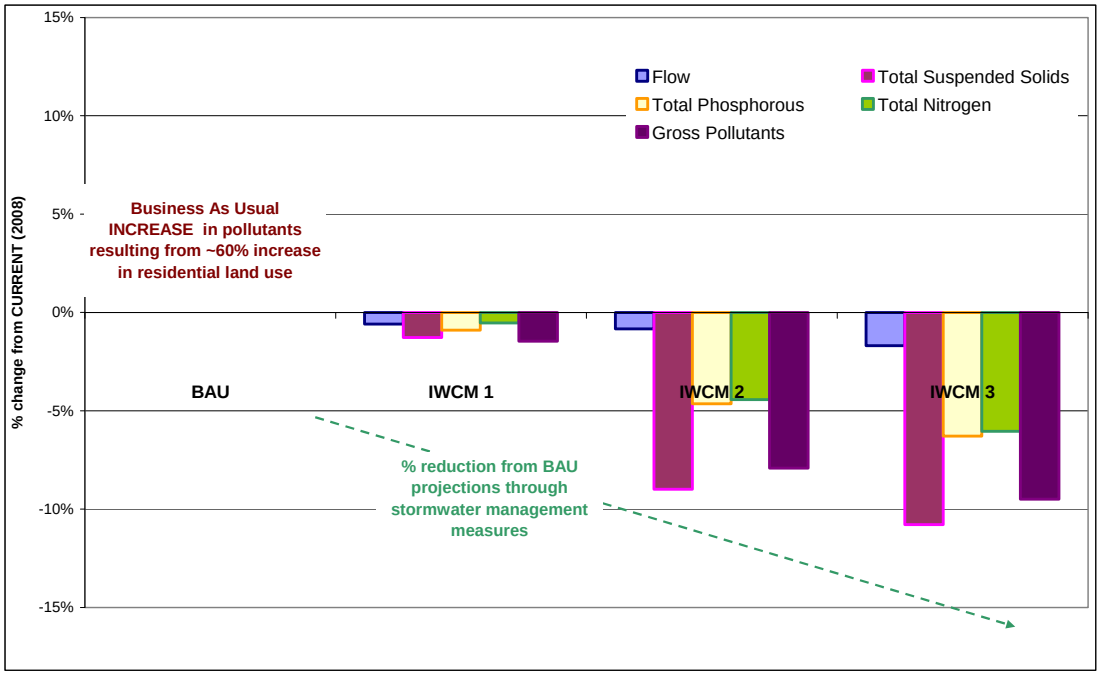


Figure 6-7. Stormwater Flow and Pollutant Load generation comparison

More information on the MUSIC modelling undertaken is provided in Appendix A.

6.3 ECONOMIC IMPLICATIONS

The following section provides a comparison of the four Scenarios in relation to their projected economic impacts, including:

- Net present value of the capital and operating cost of each scenario; and
- The typical residential bill (a key indicator of affordability).

Further details on the financial modelling can be found in Appendix H, which shows components of the combined TRB presented here in relation to the separate funds (water, sewer and general) to which monies collected would flow. The results of the economic assessment are set out in Table 6-2. The results are for the whole scenario including water supply, sewerage and stormwater.

Table 6-2. Scenario Economic Comparison

SCENARIO	Typical Residential Bill ($/ASSESSMENT)	Present Value (Cost to Council)*
Business as Usual	$ 925	$ 216,194,479
IWCM 1	$ 950	$ 224,046,370
IWCM 2	$ 965	$ 227,236,223
IWCM 3	$ 995	$ 233,999,307

***** Includes Capital and Operating costs for all options

7. ADDRESSING THE ISSUES

The following table indicates the options that were developed to address each of the IWCM issues identified throughout the IWCM Study. The table also indicates which of the four IWCM Scenarios include these options, and hence address the issues. Issues that were resolved independent of scenarios include:

• Control of Water Resources	Not investigated as a feasibility assessment of a pipeline from BCD to the WFP has been undertaken separately.
• Environmental Flows	As above.
• Funding Constraints	BRC has the authority to levy full cost recovery for water supply and sewerage services. An assessment of the typical residential bill (an indicator of affordability, derived separately for the water fund and the sewer fund) has been made for each scenario (section 6.3). BRC has the authority to levy $ 30/ assessment for stormwater. Works have been planned within this constraint for each scenario.
• Allowing for Population and Industry Growth	All modelling and planning considered projected growth.
• Water Transfer to Cadia Mines	Council publicly considered and rejected this option during the course of this study.
• Chemical Contamination	Council has addressed the remediation of the Gasworks site during the course of this study.
• Strategic Planning	Council has indicated that the Strategic Business Plan for Water and Sewer is to be updated. It is expected that the outcomes of the IWCM Strategy will inform this planning process.

Table 7-1. IWCM Issues, Options and Scenarios

#	Issue		#	IWCM OPTION	BAU	IWCM 1	IWCM 2	IWCM 3
1.	Water Control	W	3	Pipeline from BCD to the WFP	✘	✘	✘	✘
2.	Stormw. capture	ST	22	Water Sensitive Urban Design built into Development Controls Plans			✓	✓
3.	Recycled Water	W	1	Community IWCM Education	✓	✓	✓	✓
		W	2	Rainwater tank rebate program (continuation)	✓	✓	✓	✓
		W	5	Mandatory use of rainwater tanks in new developments (BASIX)	✓	✓	✓	✓
		W	10	On-site greywater recycling promotion		✓	✓	✓
		W	13	On-site greywater recycling retrofit		✓	✓	✓
4.	Stormw. mgt	ST	19	Stormwater quality monitoring		✓	✓	✓
		ST	22	Water Sensitive Urban Design built into Development Controls Plans			✓	✓
5.	Soil erosion	ST	23	Upgrade and fence waterway buffers on farmland to reduce erosion			✓	✓
		ST	24	Rehabilitate existing degraded watercourses/ riparian zones			✓	✓
		ST	25	Review Development Guidelines to include erosion control			✓	✓
		ST	33	Establish buffer zones on public land alongside significant streams			✓	✓
6.	Septic	WW	32	Establish on-site treatment (septic) system monitoring program			✓	✓
7.	Groundw	W	17	Groundwater monitoring and extraction regulation		✓	✓	✓
8.	Salinity	ST	34	Develop salinity monitoring program to guide land management planning			✓	✓
9.	River Monitor	ST	20	River water quality monitoring			✓	✓

#	Issue		#	IWCM OPTION	BAU	IWCM 1	IWCM 2	IWCM 3
10.	Land Mgt/ Soil Acidity	ST	19	Stormwater quality monitoring			✓	✓
		ST	20	River water quality monitoring			✓	✓
		ST	22	Water Sensitive Urban Design built into Development Controls Plans			✓	✓
11.	Comm. involve't	W	26	School waterway protection scheme (increased support			✓	✓
12.	WWTW + network	WW	7	Planned WWTW Upgrades	✓	✓	✓	✓
		WW	8	Infiltration and Inflow – assessment and repair	✓	✓	✓	✓
		WW	18	Smart sewers		✓	✓	✓
13.	Trade Waste	ST	27	Improve trade waste monitoring and audits			✓	✓
14.	Riparian Zone / Biodivers.	ST	23	Upgrade and fence waterway buffers on farmland to reduce erosion			✓	✓
		ST	24	Rehabilitate existing degraded watercourses/ riparian zones			✓	✓
		ST	25	Review Development Guidelines to include erosion control			✓	✓
		ST	26	School Waterway Protection Scheme			✓	✓
15.	Biosolids	WW	7	Planned WWTW Upgrades	✓	✓	✓	✓
16.	Fund Constraints		X	NA	✘	✘	✘	✘
17.	Bulk Water/ Drought/ Leakage/ UFW	W	2	Rainwater tank rebate program (continuation)	✓	✓	✓	✓
		W	5	Mandatory use of rainwater tanks in new developments (BASIX)	✓	✓	✓	✓
		W	6	WELS Scheme	✓	✓	✓	✓

#	Issue		#	IWCM OPTION	BAU	IWCM 1	IWCM 2	IWCM 3
		W	10	On-site greywater recycling promotion		✓	✓	✓
		W	11	Active water supply system leak assessment detection and repair		✓	✓	✓
		W	12	Washing machine rebate program		✓	✓	✓
		W	13	On-site greywater recycling retrofit		✓	✓	✓
		W	14	Residential Conservation Retrofit		✓	✓	✓
		W	15A	High user audit (res)		✓	✓	✓
		W	15B	High user audit (non-res)		✓	✓	✓
		W	16	Pricing Reform		✓	✓	✓
		W	17	Groundwater monitoring and extraction regulation		✓	✓	✓
		W	28	Adopt higher than BASIX standards			✓	✓
18.		W	30	Commercial toilet retrofit			✓	✓
19.	Popn Growth	W	29	Climate change planning			✓	✓
20.	Water Trans		X	NA	✘	✘	✘	✘
21.	Env Flow	ST	3	Pipeline from BCD to the WFP	✘	✘	✘	✘
22.	Chem Cont	ST	23	Upgrade and fence waterway buffers on farmland to reduce erosion			✓	✓
23.	River Water Quality	ST	20	River water quality monitoring			✓	✓
		ST	21	Reduce stormwater litter/organics A) infrastructure B) Street Cleaning		✓	✓	✓
		ST	23	Upgrade and fence waterway buffers on farmland to reduce erosion			✓	✓

#	Issue		#	IWCM OPTION	BAU	IWCM 1	IWCM 2	IWCM 3
		ST	24	Rehabilitate existing degraded watercourses/ riparian zones			✓	✓
		ST	25	Review Development Guidelines to include erosion control			✓	✓
		ST	33	Establish buffer zones on public land alongside significant streams			✓	✓
		ST	19	Stormwater quality monitoring		✓	✓	✓
		ST	22	Water Sensitive Urban Design built into Development Controls Plans		✓	✓	✓
24.	GGE	W	29	Increase safety margins in system design and management -due to climate change			✓	✓
		W	2	Rainwater tank rebate program (continuation)	✓	✓	✓	✓
		W	5	Mandatory use of rainwater tanks in new developments (BASIX)	✓	✓	✓	✓
		W	9	Urban Water system energy audit, improved technology and operation		✓	✓	✓
		W	10	On-site greywater recycling promotion		✓	✓	✓
		W	13	On-site greywater recycling retrofit		✓	✓	✓
25.	Water Stress	W	17	Groundwater monitoring and extraction regulation		✓	✓	✓
		ST	3	Pipeline from BCD to the WFP	✘	✘	✘	✘
26.	Strategic Plan		x		✘	✘	✘	✘
27.	Flooding	ST	29	Increase safety margins in system design and management -due to climate change			✓	✓
28.	Algal Blooms	ST	22	Water Sensitive Urban Design built into Development Controls Plans		✓	✓	✓
		ST	23	Upgrade and fence waterway buffers on farmland to reduce erosion			✓	✓
29.	Emerg. Plans	W	29	Increase safety margins in system design and management -due to climate change			✓	✓

#	Issue		#	IWCM OPTION	BAU	IWCM 1	IWCM 2	IWCM 3
30.	Pot Water Qual.	W	31	Mains water quality monitoring and flushing			✓	✓
31.	Odour	WW	7	Planned WWTW Upgrades	✘	✘	✘	✘
32.	Dam Safety	W	4	Winburndale Dam upgrade	✘	✘	✘	✘

✘	Option/ Program excluded, or included in other BRC budgets
W	Water
WW	Wastewater
S	Stormwater
*	Expansion of existing BRC program
**	Incentives only
#	Dependant on collaboration with the DWE/ DECC.

8. SCENARIO ASSESSMENT

The following section summarises the scenario assessment process undertaken as part of the IWCM study.

8.1 SCENARIO COMPARISON

The process of determining the preferred Scenario for Bathurst involved a TBL assessment approach. This process used the same defined IWCM Goals and Criteria (see Section 2.5) as were used to rank the IWCM Options. The scenario assessment was undertaken by the PRG in Workshop 2. The PRG was divided into small groups and was asked to rank each of the scenarios against the IWCM Criteria. Information provided to the PRG to inform this process included:

- A recap on the IWCM Issues identified during Workshop 1;
- Details of the options included within each scenario;
- Quantitative information on the performance of each scenario (see Section 6); and
- Qualitative information on options that were not modelled.

Minutes from the PRG Workshops are provided in Appendix C.

Table 8-2 provides the cumulative results of the scenario assessment undertaken by the PRG. It can be seen that with each criteria group (environmental, social and economic) given equal weighting, that Scenario 2 was preferred by the PRG. It was noted by the PRG however, that some of the criteria, such as asset ownership, had a null impact on the assessment.

The respective weightings of the criteria were altered during the workshop to test whether the outcomes would change if one criteria group (environmental, social or economic) was weighted higher than others (i.e. was considered more important). This analysis highlighted that Scenario 2 was preferred in all cases, except where environmental criteria were considered twice as important as the others. It should be noted that in this instance, IWCM 2 and IWCM 3 achieved very similar results[10].

[10] Assessment Scores: BAU = 5.1, IWCM = 14.5, IWCM 2 = 18.5, IWCM 3 = 18.2.

Table 8-1. Assessment Criteria Weighting Trials

Trial Criteria Weighting	Preferred Scenario
All areas equal	IWCM 2
Environmental Criteria twice as important as others	IWCM 3*
Social Criteria twice as important as others	IWCM 2
Economic Criteria twice as important as others	IWCM 2

* IWCM 2 and IWCM 3 achieved very similar scores.

Table 8-2. Scenario Assessment Results

SCENARIO ASSESSMENT RESULTS															
IWCM Scenario	**Environmental Criteria**					**Social Criteria**				**Economic Criteria**					**Overall Score**
	Improved waterway health	Environmental flows to rivers/ waterways maintained or improved	Efficient water usage/ reduced consumption	Energy use/ GGE reduction	Total Environment Score	Improved public awareness	WWTW safe discharge (meeting licence conditions)*	Public health and safety*	Total Social Score	Affordable services (Cost to customer)	Affordability (Cost to Council)	Fit for purpose water	Public ownership of water assets*	Total Economic Score	
Weighting	1	1	1	1	**1**	1	1	1	**1**	1	1	1	1	**2**	
BAU	-1.5	**0.0**	0.6	1.0	**0.1**	1.0	1.7	1.5	**4.2**	-1.0	-0.8	1.8	0.3	**0.3**	**4.6**
IWCM 1	0.8	**0.0**	1.8	2.0	**4.5**	1.7	1.7	2.2	**5.5**	-1.4	-1.4	2.3	0.5	**0.0**	**10.0**
IWCM 2	1.8	**0.0**	1.8	3.0	**6.5**	1.7	1.7	2.2	**5.5**	-1.4	-1.4	2.3	0.5	**0.0**	**12.0**
IWCM 3	2.8	**0.0**	2.1	2.9	**7.8**	2.2	1.3	0.2	**3.7**	-1.8	-2.0	2.8	0.5	**-0.5**	**10.9**

8.2 SCENARIO ASSESSMENT NOTES

All scenarios are expected to meet the following objectives:

- WWTW safe discharge (meeting licence conditions);
- Public health and safety; and,
- Public ownership of water assets.

Scenarios IWCM 1, 2 and 3 contain actions that provide for levels of service, and associated expenses, that exceed the minimum requirements of the Best Practice Management approach (DEUS, 2007). These service levels were agreed in consultation with the community through the function of the PRG.

8.3 PRG RECOMMENDATIONS

Following the scenario assessment process, the IWCM PRG was asked to identify any recommended changes to the preferred Scenario. It was agreed that IWCM 2 did not require alteration.

9. STEPS FROM HERE

The following section outlines recommended steps in the implementation of the IWCM Strategy.

IWCM STRATEGY FOR BATHURST REGIONAL COUNCIL

(See section 9)

Scenario 2 is to be adopted by BRC for implementation. Key features of this Strategy are:

Water Supply and Demand - water demand management and source substitution measures including planning controls, pricing review, retrofit and rebate programs, monitoring, regulation and education. Many water supply and demand management activities and programs are currently in place. Some of the options included represent an extension to these programs. These activities would be funded from the Water Fund.

Wastewater Treatment – increased investment in infiltration and inflow rehabilitation, introduction of 'smart sewers' for new development areas and reduction of wastewater production through reduced water consumption (see above). These activities would be funded from the Sewer Fund.

Stormwater - increased requirements for new developments to meet stormwater volume and quality improvement targets. Increased monitoring of stormwater quality to better identify stormwater pollution hot spots, and prioritise management activities. These activities would be funded from the General Fund.

Waterway health/ Catchment management - increased Council control of riparian corridors and buffers on public and private land. Increased investment in rehabilitation programs and in school- based waterway program to improve the condition of waterways. Increased monitoring of river water quality to better inform land, river and riparian zone management, and prioritise rehabilitation activities. These activities would be funded from the General Fund.

9.1 IMPLEMENTATION

The Bathurst Regional Council Integrated Water Cycle Management Strategy will be implemented by Council through the following steps:

- Budgeting and funding allocation through incorporation of IWCM Capital and Operating Expenditure Plans into management plans (Strategic Business Plans for Water and Sewer and BRC's annual Management Plan for the catchment and stormwater activities).

- Undertake risk assessment and detailed project design for each of the components of the Strategy.
- Allocation of staff and resources to initiate IWCM programs.
- Review of the Bathurst Regional Council Strategic Business Plan, incorporating the water and sewer components of this IWCM Plan.
- Incorporation of relevant components of this IWCM Plan into BRC stormwater, river and catchment management plans.
- Incorporation of Water Sensitive Urban Design requirements (see Appendix A) into Residential Housing and Residential Sub-Division Development Control Plans.
- Communication with external parties (Department of Natural Resources, Central West Catchment Management Authority, and Bathurst High School) to initiate collaborative programs.
- It is assumed that the planned Winburndale Dam safety upgrade will go ahead as planned.
- While it has been recommended that the WWTW capacity upgrade be delayed, it has been assumed that the rehabilitation and minor new works will go ahead as planned, and will improve effluent release to meet DECC requirements.

The 30 year water supply and sewerage fund financial plans for the implementation of the BRC IWCM Strategy are presented in Appendix H.

9.2 IWCM STRATEGY IMPLEMENTATION RISKS

The IWCM Strategy requires integrated implementation to be successful. Early implementation of the components is required to achieve the outcomes projected through this Study. Failure to implement one component of the Strategy will require a review of the recommendations provided in this report. Failure to implement groundwater extraction monitoring and regulation, for example, may require a review of the bulk water supply security assessment.

In addition to the implementation risks associated with each of the components of the IWCM Strategy, the following risks may require specific attention:

- Increased residential bills and increased variable charges for water services may benefit from consultation with stakeholders.
- Lack of collaboration/ cooperation with external stakeholders may hinder the effectiveness of some components.

- This IWCM Strategy has been developed in collaboration with BRC, in response to the issues identified both by Council and the IWCM Project Reference Group. To ensure that this IWCM Strategy resolves these issues, and contributes to improved water cycle management in BRC LGA, ongoing monitoring and review is required. Ongoing monitoring will ensure that new issues are identified, and will allow Council to be flexible and adaptive in planning and decision making in the future. In BRC, specific attention should also be given to:
    - Major commercial / industrial development. Should any major new commercial or industrial developments occur within BRC in the future, the projected water consumption and wastewater production for BRC will be altered. At this time, water supply security projections should be reviewed, as should the timeline for upgrading the WWTW.
    - Changes to irrigation practices or extraction licences, which would increase or decrease the level of water extracted from the Macquarie River and groundwater reservoirs.

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APPENDICES

APPENDIX A: IWCM OPTIONS

The following table provides details of the parameters and assumptions assigned to each of the IWCM Options. The table also indicates whether the option represents an existing program, an expansion of an existing program or a new program.

Table C-1. IWCM Options – Parameters and Assumptions

		IWCM Options	Description	Continuation (C), Expansion (E), OR New (N)	Timeframe	Assumed % uptake/ area affected	Assumed savings/ improvement	External parties involved
1.		Community IWCM education	Current community education programs including the provision of information materials, community events. Program to include irrigation, land mgt, erosion control, water use and energy use	E	Ongoing	25% accounts influenced	2% reduction in residential leakage and outdoor use 1% reduction in commercial and industrial leakage and outdoor use	
2.		Rainwater tank rebate program (continuation)	Continuation of the NSW Government rainwater tank rebate program. This option is not delivered by BRC.	C	2008 - 2012	0.09% existing residents 2008-2012. 50 households (existing) to take up rebate over 2008-2012.	Modelling indicated that 43% household consumption could be saved through the installation of a rainwater tank, with a proportion connected internally. The following indicate the expected savings to be gained by the 50 households. Toilets 21.5% Baths, showers, taps/ sink 2.2 % Washer 10.75 % External 21.5 %	Department of Environment and Climate Change
3.		*Pipeline from BCD to the WFP*	*The BCD to WFP pipeline is being investigated through a separate study*					
4.	W	Dam Safety Upgrade in line with NSW Dam Safety Standards	Upgrade of Winburndale Dam in order to align with NSW Dam Safety Standards.	C	-	-	-	-
5.		BASIX	Continuation of the NSW Government BASIX program for new developments. • Mandatory use of rainwater tanks (toilets, cold laundry, external) • Efficient showerheads, taps and toilets This option is not to be delivered by BRC.	C	2008 - ongoing	90% new development	• Increase in uptake of low-flow showerheads from 29% to 90%. 50% customers retain low flow showerheads on replacement • 10% reduction in tap flow levels. 50% retain flow regulators after 10 years. Rainwater Tank impacts: Toilets 39% Baths 3.4% Showers 3.4% Taps/sink 3.4% Dishwasher 3.4% Washer 24% Intern Leaks 32.3% External 40.7% Ext. other 40.7% Extern Leaks 40.7% Based on modelling indicating that 43% household consumption could be saved through the installation of a rainwater tank, with a proportion connected internally (BASIX Implementation Report, 2005)	NSW Department of Planning

		IWCM Options	Description	Continuation (C), Expansion (E), OR New (N)	Timeframe	Assumed % uptake/ area affected	Assumed savings/ improvement	External parties involved
6.		WELS scheme	Continuation of the Federal Government Water Efficiency Labelling Scheme (WELS). This option is not delivered by BRC.	C	2008 - ongoing	Increase in the market share of efficient washing machines and showerheads by 5% 5% increase in the uptake of efficient tapware. Other appliances 0.5% existing households and 10% new households appliance purchase influenced by scheme	Taps/ sinks 20% water savings. Washing machine savings based on increased uptake of efficient machines (90litres/ wash) in place of inefficient machines (140 litres/ wash). Shower savings based on increased uptake of efficient showers (45 litres / shower) in place of inefficient showers (80 litres/ shower).	The WELS Scheme is a joint initiative of the Australian, State, and Territory governments.
7.	WW	Planned WWTW upgrades	WWTW Capacity augmentation/ mechanical and electrical refurbishment. Pump station upgrades and odour control. Reticulation system upgrade and rehabilitation.	C	Proposed to occur after 2058.	-	-	-
8.	WW	Sewer infiltration and inflow assessment, and reduction/rehabilitation program	Assessment of infiltration and inflow of stormwater into sewer mains to identify key problem areas. Reduction of infiltration through repairs and rehabilitation is then to be carried out focused on identified hotspots.	E	2009 - ongoing	1.17% system targeted each year	30% reduction in Infiltration and Inflow achievable in targeted areas	-
9.	W	Urban water system energy audit, improved technology and operation	An audit of the water supply and wastewater systems in regard to energy consumption associated with treatment and distribution. The options will include the identification of opportunities to implement improved technology and operational procedures to increase the energy efficiency of Bathurst water supply and wastewater treatment.	N	2009 - ongoing		-	
10.	W	On-site greywater recycling promotion	On-site advice and promotional materials explaining the benefits of greywater recycling and providing advice on greywater treatment techniques and systems.	N	2008 - ongoing	95 residential accounts and 1 commercial account participating after 8 years (2009-2016)	80% reduction in targeted water uses (external water use and toilet flushing).	-
11.	W	Active water supply system leak assessment, detection and repair	Assessment of the whole of the water supply system to identify and repair leakages. This differs from a reactive approach to repairs following major leakages/ pipe bursts.	N	2009 - 2012	25% system covered in each year	50% losses are avoidable 75% of avoidable losses repaired 29% reduction in leakage flows	-
12.	W	Washing machine rebate program	Provision of a monetary rebate to offset the cost of purchasing a water efficient washing machine.	N	2009 - 2011	2% owners of inefficient washing machines to participate. 50% of participants are freeriders[11]	Washing machine savings based on increased uptake of efficient machines (90litres/ wash) in place of inefficient machines (140 litres/ wash).	-

[11] Freeriders = participants that would have acted (e.g. purchased efficient washing machine) outside of the rebate program

		IWCM Options	Description	Continuation (C), Expansion (E), OR New (N)	Timeframe	Assumed % uptake/ area affected	Assumed savings/ improvement	External parties involved
13.		On-site greywater recycling retrofit	Implementation of simple greywater reuse systems at selected properties (model assumes ~ 300 properties including residential, commercial and industrial).	N	2009 - 2016	0.1%	80% reduction in targeted water uses (external water use and toilet flushing).	-
14.		Residential conservation retrofit (pamphlet, leaks & low flow fixtures)	Household based education including retrofit with low- flow fixtures and leak repair.	C	2009 - 2013	20% households participate. 50% participants retain efficient fixtures in the medium term.	Water savings: Showers - replace high flow showerheads (80 litres/ shower) with low flow showerheads (45 litres/ shower). 15% reduction water consumption via taps Temporary reduction in household leakage by 50% effective for 2 years.	-
15.		High water user site audits	Conduction of site audits for high users to identify opportunities for improving water efficiency.	N	2009 - 2011	50 residential customers and 20 commercial participating over 2009 – 2011.	High water users = users with 4 times the demand of the average user. 10% reduction is achieved 50% customers retain savings in the long term (> 10 years)	Industry, residents
16.		Pricing Reform (increased variable charges)	Alteration to the current water tariff structure to decrease the proportion of fixed charges and increase the proportion of variable charges to increase the incentive for reduced consumption. This change is not envisaged to change the annual water bill for average customers. Potential increased bill for high water users.	E	2010 - ongoing	100% customers	Increase in volumetric charges from 50% of total bill to 75%. Reduction in fixed charges from 50% to 25% of total bill. Price elasticities -0.05% for internal use, -0.20 for external uses. Applies to all customer groups	
17.		Groundwater monitoring and extraction regulation	Implementation of a program to monitor groundwater resources, including increased monitoring and regulation of groundwater extraction. It is noted that groundwater licences are controlled by the State Government and that this option may be delivered through collaboration with DNR.	N	2009 - ongoing	-	-	Department of Natural Resources, Landholders
18.	WW	"Smart" sewers (e.g. low inflow and infiltration, pressurised sewer systems)	Installation of “Smart” sewer in all new developments.	N	2009 - ongoing	5% system covered each year	-	
19.	ST	Stormwater quality monitoring	Implementation of a stormwater quality monitoring program to establish baseline stormwater quality data and monitor trends. This option includes in-situ monitoring devices and regular testing exercises carried out by Council personnel.	N	2009- ongoing	-	-	
20.		River water quality monitoring*	Implementation of a river quality monitoring program to establish baseline stormwater quality data and monitor trends. This option may include in situ monitoring devices and regular testing exercises carried out by Council personnel.	E	2009- ongoing	-	-	Department of Natural Resources

		IWCM Options	Description	Continuation (C), Expansion (E), OR New (N)	Timeframe	Assumed % uptake/ area affected	Assumed savings/ improvement	External parties involved
21.		Reduce stormwater litter/organics (e.g. extra bins & street cleaning, replace plastic bags)	This program has a number of components, including the provision of sufficient litter disposal infrastructure, review of street cleaning practices, and collaboration with the retail sector to eliminate plastic bags. The level of investment into these components will depend on current infrastructure, and the success of current litter reduction programs.	N	2009-ongoing	Urban area	-	
22.		Water Sensitive Urban Design Development Control Plans (according to guidelines/ MUSIC guidelines)	Development of Water Sensitive Urban Design Development Control Plans to maintain or improve the quality of stormwater flow in the future (including flow patterns and pollutants). New Developments are to achieve the following reduction compared with traditional residential runoff: ▪ 70% reduction of TSS; ▪ 45% reduction of TN; ▪ 45% reduction of TP; and, ▪ 5-10% reduction in peak flows. This should be proven through MUSIC modelling, or other similar programs	N	2009-ongoing	100% new development	▪ 70% reduction of TSS; ▪ 45% reduction of TN; ▪ 45% reduction of TP; and, ▪ 5-10% reduction in peak flows.	
23.		Upgrade and fence waterway buffers on farmland to reduce erosion	Program of rehabilitating and fencing off waterway buffers on farmland to reduce cattle intrusion and associated erosion of the river bank.	N	2009-ongoing	-	-	Landholders
24.		Rehabilitate existing degraded watercourses/ riparian zones	Rehabilitation of existing watercourses and riparian zones.	E	2009-ongoing	100% degraded areas	-	Central West Catchment Management Authority
25.		Review Development Guidelines/ LEP to include erosion control buffer and prescribed buffer management practices.	Review of the Local Environment Plan to recognise the need for erosion control and buffer management practices. LEP to include minimum buffer widths and acceptable practices for buffer management. Monitoring and regulation of buffers should also be implemented as part of the LEP monitoring and review process.	N	2009 - 2013		-	Landholders
26.		School waterway protection scheme	Increased support of school waterway protection scheme. Potential for increased training and/or additional -monitoring equipment.	E	2009 - ongoing		-	Participating schools
27.		Improve trade waste	Increased support of trade waste monitoring program. Increased audits of	E	2009 – ongoing		-	Industry

		IWCM Options	Description	Continuation (C), Expansion (E), OR New (N)	Timeframe	Assumed % uptake/ area affected	Assumed savings/ improvement	External parties involved
		monitoring and audits	trade waste management practices and associated equipment.					
28.	W	Encouragement of sustainable building beyond BASIX requirements**	Incorporate standards for new developments in regard to water and energy efficiency, higher than in the current BASIX program, into plans and policies.	N	2009-2011	93% new and infill customers participating	Increase in uptake of: 1. low-flow showers from 27% to 93% 2. 4.5/3 dual flush toilets from 60% to 90% 3. Tap flow regulators to 90%	State Government
29.		Increase safety margins in system design and management (due to climate change)	Review plans in regard to increased risks associated with global warming and climate change. This process may require assessments of the potential localised impacts on the Bathurst region.	N	2009 - ongoing	-	-	-
30.		Commercial toilet retrofit	Replacement of inefficient toilets with more efficient dual flush toilets in commercial properties. The program will include supporting the private sector in replacing fixtures and fittings.	N	2009 - 2013	5% commercial accounts with high flush toilets convert to 6/3 Dual flush	Savings based on replacement of high flush toilets (12 litres/ flush) to Dual flush toilets (4 litres/ flush).	-
31.		Mains water quality monitoring and flushing	Water quality monitoring and flushing program to improve reliability of town water supply quality.	E	ongoing	-	-	-
32.	WW	Establish on-site treatment (septic) system monitoring program	Development of a program of on-site septic system monitoring. The program should include the provision of information to maintain septic systems and improve failing systems.	N	2009 - ongoing	-	-	
33.	ST	Establish buffer zones on public land alongside significant streams/ w passive recreation	Re-zoning of public land alongside waterways to establish buffer zones. Buffer zones should be designed to preserve the bed and bank stability while allowing low-impact passive recreation.	N	2009 – ongoing	-	-	
34.		Develop salinity monitoring program to guide land management planning	Implementation of a program to monitor salinity levels within the region to allow assessment of trends and inform agricultural land management practices and land use planning exercises. This will require collaboration with DNR.	N	2010 - ongoing	-	-	Department of Natural Resources

		IWCM Options	Description	Continuation (C), Expansion (E), OR New (N)	Timeframe	Assumed % uptake/ area affected	Assumed savings/ improvement	External parties involved
35.	W	Dual reticulation in new development areas via raw water network	Construction of a dual reticulation network to service the two major development areas. The existing Winburndale Dam raw water network would be used to transfer recycled water from the WWTW to the development areas.	N	2013-2028	New Greenfield Development Areas	100% savings on toilets, washing machines, internal leakage and external water demands	Developers
36.	ST	Water sensitive urban design retrofit in key areas (opportunistic)	Opportunistic retrofit of neighbourhood scale Water Sensitive Urban Design measures in existing development areas. The most appropriate WSUD measure(s) are to be identified on a case by case basis. In existing areas, swales and buffers are likely to be the most feasible options.	N	2009-ongoing	25% existing residential development	Reductions based on model of existing neighbourhood (pilot), as follows: **Parameter** **% reduction** Flow 14.1 Total Suspended Solids 7.6 Total Phosphorus 16.3 Total Nitrogen 15.1 Gross Pollutants 14.3	Developers

✘	Option/ Program excluded, or included in other BRC budgets
W	Water
WW	Wastewater
S	Stormwater
*	Expansion of existing BRC program
**	Incentives only
#	Dependant on collaboration with the DWE/ DECC.

APPENDIX B: IWCM OPTION TBL ASSESSMENT SUMMARY

The table below includes the TBL assessment that was undertaken on the preliminary long list of IWCM Options. Selected options from this list were used to develop the three IWCM Scenarios.

Table B-1. IWCM Option TBL Summary

IWCM Option	Rank	Total Score	Total Env. Score	Total Soc. Score	Total Econ. Score
Urban water system energy audit, improved technology and operation	1	**15.0**	8.0	5.0	2.0
Increase filtration and treatment along treatment train from STP outlets	2	**13.0**	10.0	6.0	-3.0
Rehabilitation of Gasworks site	3	**12.0**	2.0	10.0	0.0
School waterway protection scheme	**4**	**11.0**	2.0	3.0	6.0
Residential conservation retrofit (pamphlet, leaks & low flow fixtures)	**4**	**11.0**	5.0	3.0	3.0
Pipe BCD to WFP	**4**	**11.0**	13.0	0.0	-2.0
Dam Safety Upgrade in line with NSW Dam Safety Standards	**7**	**10.0**	1.0	11.0	-2.0
Community IWCM education (irrigation, land mgt, erosion control, water use, energy use)	**8**	**9.0**	3.0	4.0	2.0
Increase safety margins in system design and management (due to climate change)	**8**	**9.0**	4.0	2.0	3.0
Rainwater tank rebate program (continuation)	**10**	**8.0**	4.0	2.0	2.0
Potable reuse of reclaimed water (RO)	**10**	**8.0**	5.0	3.0	0.0
Upgrade sewage treatment plants to meet receiving water quality standards	**10**	**8.0**	4.0	5.0	-1.0
Upgrade WFP	**10**	**8.0**	0.0	10.0	-2.0
Encouragement of sustainable building beyond BASIX requirements**	**14**	**7.0**	5.0	2.0	0.0
High water user site audits	**14**	**7.0**	4.0	2.0	1.0

IWCM Option	Rank	Total Score	Total Env. Score	Total Soc. Score	Total Econ. Score
Reclaimed water use through a "third pipe" system (replaces portion of potable supply)	**14**	**7.0**	4.0	2.0	1.0
"Smart" sewers (e.g. low inflow and infiltration, pressurised sewer systems)	**14**	**7.0**	4.0	3.0	0.0
Improve trade waste monitoring and audits	**14**	**7.0**	4.0	5.0	-2.0
Stormwater quality monitoring	**14**	**7.0**	4.0	3.0	0.0
River water quality monitoring	**14**	**7.0**	4.0	4.0	-1.0
Pricing Reform (Increased variable charges)	**21**	**6.0**	4.0	2.0	0.0
Reclaimed water use through a "third pipe" system (replaces portion of potable supply)	**21**	**6.0**	4.0	2.0	0.0
Mandatory use of rainwater tanks (toilets, cold laundry, external) (BASIX)	**21**	**6.0**	3.0	2.0	1.0
Rehabilitate existing degraded watercourses/ riparian zones	**21**	**6.0**	5.0	2.0	-1.0
Establish on-site treatment (septic) system monitoring program	**21**	**6.0**	1.0	3.0	2.0
Commercial toilet retrofit	**26**	**5.0**	2.0	2.0	1.0
On-site greywater recycling promotion	**26**	**5.0**	2.0	1.0	2.0
Sewer infiltration and inflow assessment, and reduction/rehabilitation program	**26**	**5.0**	3.0	4.0	-2.0
WSUD DCPs (according to guidelines/ MUSIC guidelines)	**26**	**5.0**	5.0	1.0	-1.0
Enhance soil erosion controls	**26**	**5.0**	4.0	2.0	-1.0
Establish buffer zones on public land alongside significant streams/ w passive recreation	**26**	**5.0**	5.0	1.0	-1.0

IWCM Option	Rank	Total Score	Total Env. Score	Total Soc. Score	Total Econ. Score
Upgrade and fence waterway buffers on farmland to reduce erosion	**26**	**5.0**	2.0	3.0	0.0
Active water supply system leak assessment, detection and repair	**33**	**4.0**	5.0	0.0	-1.0
Reduce stormwater litter/organics (e.g. extra bins & street cleaning, replace plastic bags)	**33**	**4.0**	2.0	3.0	-1.0
Review Development Guidelines/ LEP to include erosion control buffer and prescribed buffer management practices.	**33**	**4.0**	3.0	1.0	0.0
Opportunistic WSUD retrofit in new areas	**33**	**4.0**	4.0	1.0	-1.0
Water sensitive urban design retrofit in key areas (opportunistic)	**37**	**3.0**	4.0	1.0	-2.0
Develop salinity monitoring program to guide land management planning	**37**	**3.0**	3.0	1.0	-1.0
Washing machine rebate program	**39**	**2.0**	3.0	1.0	-2.0
Upgrade biosolid treatment and disposal process	**39**	**2.0**	1.0	3.0	-2.0
Groundwater monitoring and extraction regulation	**39**	**2.0**	3.0	1.0	-2.0
Mains water quality monitoring and flushing	**39**	**2.0**	0.0	2.0	0.0
Reduce river extraction (increase monitoring and regulation)	**43**	**1.0**	4.0	0.0	-3.0
Replace/ supplement raw water system with recycled water	**43**	**1.0**	0.0	1.0	0.0
On-site greywater recycling retrofit	**45**	**0.0**	2.0	1.0	-3.0
Extend sewerage services to non-backlog villages	**45**	**0.0**	1.0	1.0	-2.0
Residential toilet retrofit	**45**	**0.0**	1.0	1.0	-2.0

IWCM Option	Rank	Total Score	Total Env. Score	Total Soc. Score	Total Econ. Score
Expansion of centralised reticulated wastewater network (incl. plant expansion)	**48**	**-3.0**	-3.0	0.0	0.0
Expansion of centralised water supply network (include plant expansion)	**48**	**-3.0**	-4.0	1.0	0.0
Expansion of traditional (piped) stormwater network	**48**	**-3.0**	-5.0	0.0	2.0
Increase off-stream storage	**51**	**-4.0**	-3.0	0.0	-1.0
River extraction for irrigation	**52**	**-8.0**	-8.0	0.0	0.0
New on-stream dam*	**53**	**-10.0**	-6.0	0.0	-4.0

* This option was later removed based on PRG feedback

APPENDIX C: COMMUNITY CONSULTATION

The following section includes the key discussion points from the two Project Reference Group workshops. Background information and introductory sections have been removed to avoid repetition.

Workshop 1 Minutes (18 January 2008)

This paper summarises the outcomes of the first workshop of the BRC IWCM Strategy Project Reference Group (PRG). The PRG's role is to provide Council with input and feedback on the options being considered and their environmental, social and financial implications. The first PRG Workshop was held at BRC Offices on the 18th of January 2008. The objectives of this workshop were to:

- Understand the IWCM guidelines and the IWCM process;
- Confirm the outcomes of the Concept Study process, namely the IWCM issues;
- Agree on measurable goals for the strategy which will be used to assess the scenarios developed.

Workshop Participants

A cross-section of community and local government representatives were invited to participate in the workshop. This group is collectively known as the PRG for the BRC IWCM Strategy project. Participants are listed in Table C-1.

Table C-1. PRG Workshop 1, Participants

Representative	Organisation
Geoff Hush	Devro
David Scott	Charles Sturt University
Jeff McSpedden	Bathurst Irrigators
Brad Constable	Bathurst Golf Club
Guy Cassidy	NSW Department of Corrective Services
Gillian Baldwin	Boundary Rd Reserve Landcare
John Fry	Conservation Volunteers
Kerryn Murray	Devro
Diana Kureen	Central West Catchment Management Authority
David Swan	Bathurst Regional Council
Russell Deans	Bathurst Regional Council
Dearne Murray	Bathurst Regional Council
Nick Lavoipierre	Bathurst Regional Council
Sharon Lord	Bathurst Regional Council
Damien Tom	Bathurst Regional Council
Anna Stapleton	Bathurst Regional Council
Richard Denyer	Bathurst Regional Council
Tony Burgoyne	Bathurst Regional Council
Bob Banning	Bathurst Regional Council
Garry Hawkins	Bathurst Regional Council
Toby Gray	MWH (Facilitator)
Russell Beatty	MWH (Chairperson)
Shiva Ghahreman	MWH (Project Manager)
Anthony Weinberg	MWH (Environmental Planner)

Background

The PRG were provided with a briefing paper prior to the workshop setting out the background for the project. A short presentation of the IWCM approach to urban water planning and the Department of Water and Energy (DWE) requirements for IWCM projects was made by the workshop facilitator.

It was noted during the meeting that additional details on the DWE IWCM process are available from www.dwe.nsw.gov.au.

Verifying IWCM Issues

As a precursor to the development of the IWCM Strategy, BRC completed a draft IWCM Concept Study. The purpose of this study was to identify the water cycle management issues present in the Local Government Area (LGA). A summary of these issues were included in the briefing paper for the workshop. A key part of this workshop was the review and verification of the IWCM issues identified in the draft Concept Report. The PRG was asked to split into sub-groups to discuss and then rank each of the issues using a simple voting process. The PRG was also given the opportunity to identify other issues that were not documented in the draft Concept Study. The outcomes of this process are set out in **Table 2**. Issues are listed in order of importance, from the highest 'Score' (corresponding to the greatest number of votes), to the lowest 'Score', (corresponding to the fewest votes)

A number of key words are used in the description of issues. A glossary of terms is included in **Attachment 1**.

In summary, MWH proposes the following key themes for the IWCM Strategy drawing on the issues verified by the PRG:

1. Ensuring adequate supply of water to the Region;
2. Providing a diverse water supply that makes best use of available water resources;
3. Sharing water between urban areas, other water users and the environment;
4. Improving the quality of waterways for revegetation and habitat;
5. Raising awareness of water issues through community education to create a sense of value and responsibility for water resources.

Table C-2. PRG Verified IWCM Issues for the Bathurst Region

No	IWCM Issue	Description	PRG Outputs	Score
1	Stormwater Management	• High infiltration of stormwater into the sewerage system • Poor stormwater quality is causing increased pollutant loadings at discharge points • GPTs not regularly monitored • Lack of data relating to stormwater flows, particularly at discharge points into the Macquarie River	- Promote Water Sensitive Urban Design (WSUD) features - Capture low-flow stormwater to provide more water for vegetation - Encourage storage tanks on residential sites for stormwater run-off to be used for irrigation (greywater).	26
2	Control of Water Resources	There is a lack of control of water resources, particularly between Ben Chifley Dam and Bathurst Water Treatment Plant. As well as providing potable water for Bathurst City, this supply is used by irrigators.	- Develop a water sharing plan – allow for potable water supply, irrigation, recreational use at Ben Chifley Dam - Also need to ensure environmental flows are adequate	20
3	Not utilising treated effluent	Treated effluent is not being utilised to its fullest.	- Identify potential major users for recycled water - Provide incentives for users - Use treated effluent from WWTP - Utilise greywater from residential homes.	13
4	Soil Erosion	Many creeks and rivers in the Bathurst Region exhibit signs of soil erosion as a result of historic clearing, poor land management practices, road construction and new developments.	- Increase education on ways to minimise erosion as well as its impact on water quality - Provide incentives to encourage erosion control.	12
5	Bulk Water Supply	Current bulk water storages may not meet future demand	- IWCM to investigate this issue. - Need to clarify ownership rights of the water in dams.	11
6	On-site Sewage Treatment Systems	Throughout the catchment, there is poor management of on-site sewage treatment systems and little or poor quality data on the location, number and condition of these systems. Consequently, there is a lack of understanding as to the impact of these systems on the environment.	- Identify and monitor the condition of on-site sewage treatment systems.	10

No	IWCM Issue	Description	PRG Outputs	Score
7	Groundwater Extractions	A lack of, or inaccurate, data (quantity, quality and reliability) on groundwater bores and availability of water for extraction. There is a lack of understanding of the impact of over-extraction on groundwater dependent ecosystems	- Monitor and regulate groundwater supplies and bores. (Responsibility: DNR)	10
8	Salinity	Salinity is an issue, particularly in Campbell's River and Evan's Creek sub-catchments, where the risks of severe salinity are predicted to increase over the next 50 years.	- Monitor areas where salinity is a problem or is likely to be a problem in the future. (Responsibility: BRC, DECC)	9
9	Water quality and flow data	There is a lack of a coordinated and integrated approach to water quality and river flow data collection, storage and reporting.	- BRC to develop an initiative to monitor river flows and water quality within the LGA.	9
10	Land Management	Historic clearing to make way for grazing and cropping. Clearing has had a dramatic affect on groundwater levels, water runoff and levels of nutrients. Illegal land clearing contributes to salinity problems, poor water quality and elevated nutrient loads.	- Incentives to be provided at a catchment scale for landholders to stop land clearing and encourage sustainable land management. - CMA monitoring of illegal land clearing.	8
11	Wastewater Treatment Plant	The wastewater treatment plant (WWTP) does not meet EPA license requirements for SS, N and P discharge. To address this issue additional treatment tanks were provided, however the EPA license became more stringent.	- IWCM Strategy to address this issue	8
12	Expansion of community involvement.	Educational / Involvement of school to manage and protect waterways.	Current scheme managed by Bathurst High School has been extremely successful and should be expanded.	8
13	Trade Waste Management	There is reasonable control over trade waste released to the wastewater network, however work is required to ensure all discharges comply with guidelines.	- Need to ensure all trade waste discharges comply with national standards.	7
14	Riparian Management	Stream bank rehabilitation and protection through better riparian management and buffer plantings.	- Undertake riparian management and buffer planting. - Regulate new development to ensure it does not affect riparian areas.	7

No	IWCM Issue	Description	PRG Outputs	Score
15	Biosolids Treatment and Disposal	The biosolids from the waste water treatment process contain only 14% solids which results in higher disposal costs.		6
16	Greater funding for capital works.	To provide the necessary funding for capital works and water conservation schemes.	Establish an environmental lottery.	6
17	Water Transfer	Investigate the possibility of transferring water between catchments, in response to supply and demand	There may be a number of customers for recycled water e.g. Cadia Mines	5
18	Environmental Flows	Assessing environmental flows using a whole of catchment approach.		5
19	Chemical Contamination	There is the possibility of onsite and offsite soil and groundwater contamination at the former Bathurst Gasworks Site. In 2004, this area was declared a Remediation Site by the EPA (now DECC). Runoff from agricultural sprays is also an issue.		5
20	River Water Quality	Water quality for the Macquarie River does not comply with CMA guidelines.	(See stormwater management issue 1)	4
21	Greenhouse Gases	There is the potential for climate change to affect the availability of water supply and water quality by altering rainfall patterns and evaporation rates.	- Investigate solutions implemented in other regions to address climate change impacts. - Ensure efficient use of resources to minimise greenhouse gas emissions.	4
22	Water Stress	Water stress across the Bathurst Region due to increasing irrigation extractions and the increasing number of groundwater bores.	- Seek best management practices for irrigating and control. - Monitor and regulate ground water supplies. (Responsibility: DNR)	3
23	Strategic Plan	The Strategic Plan for Water & Wastewater has not been updated.	- The Strategic Plan is currently being revised by BRC.	3
24	Flooding	The Bathurst Region has a history of flood events which have damaged local infrastructure and industries.	- This issue has been dealt with by BRC a number of flood prevention initiatives have been considered.	2

No	IWCM Issue	Description	PRG Outputs	Score
25	Algal Blooms	Particularly in Ben Chifley Dam due to high nutrient levels.	- This issue is currently being dealt with by the Central West CMA and BRC through education of landowners and river monitoring.	2
26	Emergency Plans	The emergency plans for WWTW and water infrastructure are not fully documented and detailed. This includes power failure, mains failure, plant failure, terrorism, and earthquake.	- Emergency plans have been developed, but require periodical review.	2
27	Potable Water Network Quality	There have been some dirty water incidents in the filtered water reticulation system due to sediments entering the pipes during times of high flows.	- (IWCM Strategy to further investigate system leaks.) - Provide water saving incentives	2
28	Odour Complaints	Particularly at Bathurst WWTP	- Monitor and investigate infrastructure options further	1
29	Dam Safety	Winburndale Dam requires upgrade to comply with NSW Dam Safety standards.		1

Setting IWCM Goals

Following the verification of IWCM issues, the PRG was asked to formulate goals for the IWCM Strategy. The purpose of this exercise was to develop measurable criteria which can be used to assess the scenarios developed as part of the IWCM Strategy process. The PRG was asked to split into sub-groups and develop nine (9) goals, covering social, environmental and economic criteria. Each of the goals, developed by the sub-groups, were presented to the PRG for discussion. The PRG were then asked to rank all of these goals in terms of their importance, with the highest Score corresponding to the greatest number of votes.

As agreed with the PRG, following the workshop, MWH has summarised these goals and suggested potential measures for each of these goals. The set of summarised goals and potential measures are shown in Table C-3.

Table C-3. IWCM Goals and Measures

Goal	Performance Measure
To secure a sustainable and economically viable water supply.	To ensure all Local Water Utility obligations (requirements and service level agreements) as stated in the BRC Strategic Business Plan will be incorporated in the IWCM strategy.
To become more efficient in the use of water resources, and encourage uptake of new technologies for efficient water cycle management.	Per capita water consumption will be reduced.
To make more efficient use of potable water, i.e. better match the quality of water supplied to the quality of water required by particular uses (i.e. it is not necessary to provide potable water to all water uses).	Percentage of non-potable water demand being met by non-potable water sources will increase.
Improve / maintain sustainable environmental flows, river and riparian ecology – without compromising human usage requirements.	Environmental flows to major rivers and waterways will be maintained or improved.
To maintain or improve water quality, particularly relating to discharge to waterways from urban development, stormwater and sewage treatment facilities.	Discharge water quality will meet license conditions.
To provide adequate supply for all water users and encourage water sharing between users.	The viability and appropriateness of a Water Sharing Plan will be considered.
Raise awareness and educate community on water issues and their responsibilities.	Community awareness and education programs will be expanded. The uptake of water saving technologies will be encouraged.
To maintain public ownership of water infrastructure.	*IWCM Strategy outcomes do not affect asset ownership status.*

Next Steps

The Bathurst IWCM Concept Study is currently in final-draft stage. Once the draft is finalised it will be reviewed by both BRC and DWE with feedback to be incorporated. The issues as set out in the final document will aid in the development of a scope of work for the next stage of the IWCM, the Strategy phase. This phase will involve identifying solutions to improve the management of these issues and undertaking feasibility assessments of the IWCM options identified.

A second workshop is planned for the Strategy phase to facilitate PRG input into the assessment of water cycle management scenarios. It can be expected that the next PRG workshop will occur between April-May 2008.

Workshop 2 Minutes (6 November 2008)

Assessment Results

Respective weightings of the criteria were altered during the workshop to test whether the outcomes would change if one area (environmental, social or economic) was weighted higher than others (i.e. was considered more important). This task revealed the following:

Table C-4. Assessment Criteria Weighting Trials

Trial Criteria Weighting	Preferred Scenario
All areas equal	IWCM 2
Environmental Criteria twice as important as others	IWCM 3*
Social Criteria twice as important as others	IWCM 2
Economic Criteria twice as important as others	IWCM 2

* IWCM 2 and IWCM 3 achieved very similar scores.

Assessment Discussion

It was noted that:

- IWCM Option 2 included options 1- 35.
- This process does not guarantee that each of the options will be implemented by Council
- Recommended programs are to be scheduled, altered and prioritised to fit in with Council planning and budgets

Scenario Selection

Based on the scenario assessment process and the subsequent discussion, the PRG recommended scenario IWCM 2. The PRG was asked whether any changes to the options within the scenario were required. It was agreed that the options within the scenario IWCM 2 should remain as presented by the MWH Team.

Issues and Questions

A number of issues and questions were raised during the presentation of the IWCM Process and the IWCM Study investigations. The following section outlines these queries and concludes their resolution.

Greywater Reuse System Costs

The cost of greywater reuse systems were inquired about. The costs included in the model are provided below.

Table C-5. Greywater Reuse System Costs

Component	TOTAL COST	*Council contribution*	*Property owner contribution*
Program set up	**$20,000**	*$20,000*	*$0*
Administration costs	**$ 3,000**	*$ 3,000*	*$0*
	$20/ customer*	*$20/ customer*	*$0*
Capital Costs	**$ 3,000** Residential properties	*$ 150 (5%)*	*$ 2,850 (95%)*
	$ 7,810 Commercial premises	*$390 (5%)*	*$ 7,420 (95%)*
	$ 20,000 Industrial premises	*$ 1,000*	*$ 19,000*
Operating and Maintenance Costs	**$120/ year** Residential premises	*$0*	*$120/ year*
	$ 312/ year Commercial premises	*$0*	*$ 312/ year*
	$ 823/ year Industrial premises	*$0*	*$ 823/ year*

* Estimated approximately 12 per year for 8 years

Effectiveness of Community Education Programs

- Some participants expressed the view that consumers in Bathurst are generally complacent about reducing water consumption. This was based on anecdotal evidence of garden watering behaviour etc.
- It was noted by David Swan that current Water Saving Education programs include extensive program that incorporated radio, newspaper and television education campaigns supported by rebate programs for rainwater tanks, water efficient retrofitting and the WELS program.

- It was also noted that per capita water use is significantly higher in the Bathurst Region than in metropolitan areas. It was noted that this may be due to the residents understanding that water supply is secure and abundant. It was also noted that other factors should be considered in comparing consumption patterns in Bathurst with metropolitan areas, including higher density living providing less area of garden/ lawn per resident.
- It was generally agreed that continued extensive education programs where needed.

CONCLUSION

- Council is undertaking a number of education programs, and has noted a positive response from the community.
- It is understood that education and rebate programs are unable to achieve behavioural change in all community members.
- Ongoing investment in education and rebate programs has been included in the IWCM Strategy.
- Land use and lifestyle in Bathurst should be considered when comparing per capita consumption with that in metropolitan areas.

Commercial Toilet Retrofit

- It was questioned whether the commercial retrofit program included retrofitting of basins.

CONCLUSION

Retrofitting of basin taps in commercial premises was not included in the commercial retrofit option due to the high costs and relatively low impact on water conservation.

Environmental Flow and Pipeline Feasibility Study

- It was questioned whether the impact of river extractions (e.g. irrigators) on environmental flows were included in the IWCM process.
- It was noted that a feasibility assessment of pipeline from BCD to the Water Filtration Plant is in progress, and is likely to answer some of these questions. As this study is in progress, it was not explicitly dealt with through the IWCM Process.
- David Swan acknowledged that there was general lack of data and understanding of the timing and volume of environmental flows, and that current dam releases produces a pattern that opposite to the natural pattern (i.e. higher releases in Summer and lower in Winter contradicts natural pattern of low river flows in Summer and high flows in Winter). David Swan proposed the possibility

of undertaking a study to understand the regions required environmental flows in conjunction with a yield and climate change impact assessment.

- It was noted that in order to manage environmental flows, the following information was needed:
    - Timing and volume of flows
    - Factors that impact environmental flows along the Macquarie River
- David Swan did suggest that PRG comments on the issue were welcome.

CONCLUSION

An assessment of the feasibility of a pipeline from Ben Chifley Dam to the Water Filtration Plant to address environmental flow concerns is underway. PRG comments on this issue will be considered by Council.

Water Transfer to Cadia Mines

It was noted that the question of transferring water to Cadia Mines had previously been raised in the first PRG, but had not been considered further. David Swan noted that Council had decided that selling water to Cadia Mines was not an option.

CONCLUSION

BRC resolved not to sell water to Cadia Mines

Water Sensitive Urban Design

The results of the MUSIC (Stormwater improvement) modelling were questioned, specifically in relation to level of impact of Scenario IWCM 3. The modelling results have been reviewed and altered where necessary. It was found that the stormwater flow and pollutant generation attributable to the current residential development was omitted from the scenario IWCM 3 calculations, which led to the over-estimation of the level of reduction achieved through this scenario.

The reviewed results are provided in Section 6.2.5 and Appendix D. It can be seen that to continue with current development and stormwater management (BAU) would result in greatest increase on flows and pollutants (column 3). IWCM 1, 2 and 3 progressively provide a reduced increase in flow and pollutant generation (Columns 4, 5 and 6).

Assuming Current Land Use is the base case, the results below show the % increase in flow and pollutant generation from this point. Increased development incorporating current practices (BAU) is expected to result in 12-14% increases from current levels. IWCM 1, 2 and 3 progressively result in lower increases in stormwater flow and pollutant generation.

Table C-6. Increase (%) in Stormwater Flow and Pollutant Loads – comparison with BAU

	BAU	IWCM 1	IWCM 2	IWCM 3
Flow	0%	-1%	-1%	-2%
TSS	0%	-1%	-9%	-11%
TP	0%	-1%	-5%	-6%
TN	0%	-1%	-4%	-6%
GP	0%	-1%	-8%	-9%

The presentation of the above results has been amended since the distribution of the PRG Workshop minutes. The results have not changed.

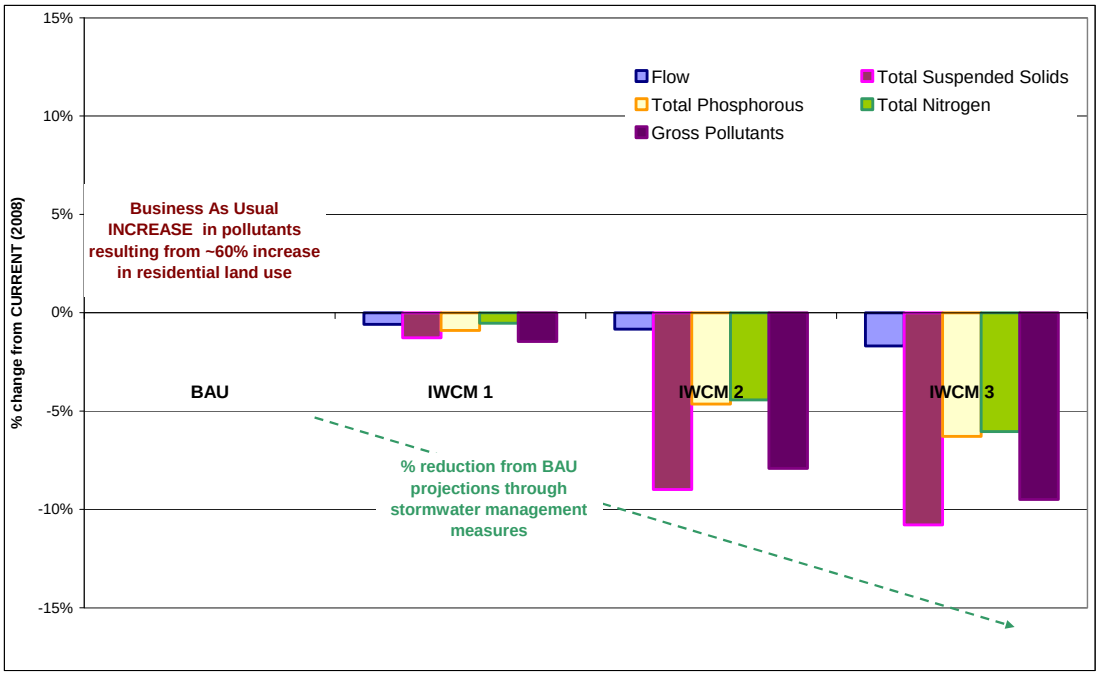


Figure C-1. Stormwater Flow and Pollutant Load generation comparison (AMENDED – see note above)

The majority of stormwater runoff in urban catchments is generated from the impervious surfaces. Stormwater travels across impervious surfaces (concrete/ asphalt) at a higher rate than pervious surfaces (e.g. vegetated land). This results in a higher capacity to carry nutrients into natural waterways and produces more intense flow patterns during storm events. Stormwater Management measures generally tend to slow the flow and treat the pollutants within this runoff before it reaches natural waterways.

The following section defines the stormwater management measures that have been included in each of the IWCM Scenarios.

Table C-7. Stormwater Management/ WSUD measures

Stormwater Management/ WSUD measure	BAU	IWCM 1	IWCM 2	IWCM 3
Buffer Strips Buffer strips are vegetated strips adjacent to drainage lines. Buffer strips are often implemented between the residential property boundary and the stormwater gutter. The vegetated strip aids in the collection of suspended solids (and associated nutrients) and from runoff. Buffer strips also encourage seepage of stormwater (and nutrients) into the underlying soil.				✓ (~8% upstream area buffered)
Water Quality Objectives In order to estimate the improvement of stormwater management in large scale new development areas, it is assumed that all new developments will be developed in a way that achieves the following Water Quality Objectives: ▪ 70% reduction of TSS; ▪ 45% reduction of TN; ▪ 45% reduction of TP; and, ▪ 5-10% reduction in peak flows.			✓	✓
Rainwater Tanks While rainwater tanks are primarily installed to provide an alternative source of water, they aid in the slowing of flows during high rainfall events.		✓ (1%)	✓ (5% new development, 1% existing)	✓ (5% in new, ~4.5 % % existing)

CONCLUSION

- Stormwater flow and pollutant loads were reviewed and have been adjusted.
- The additional impact of retrofitting WSUD in developed areas is less than that presented during the workshop.
- Additional graphs provided in Attachment D.

Summary of Comments and Discussion

In regard to the general IWCM Process, it was noted that:

- A complete glossary of terms was required. It was agreed that this will be incorporated into the final report.
- The workshop process was considered confusing by some people. It was acknowledged that some people had not been involved in the first workshop and

were therefore not familiar with the process and the details of the options being assessed. It was noted that more supporting data may have assisted with providing more clarity.

- Drought was not identified as a significant issue. It was noted that this should not be ignored despite the security of the water supply. It was acknowledged that changing weather patterns had been incorporated in the water system modelling process.
- Environmental flows have not been investigated in detail through this process due to the pipeline feasibility assessment. It was noted that further investigation into the impacts of better aligning BCD releases with the natural flow regime of the Macquarie River may be investigated in the future.

Next Steps

The workshop concluded with a brief discussion of the steps from here, as follows:

- Council to consider PRG recommendations and comments made during the workshop;
- MWH Team and Council to finalise details of the preferred scenario;
- Financial modelling to be finalised based on the preferred scenario;
- IWCM Action Plan to be developed based on the preferred scenario, including capital and operating costs;
- A draft IWCM Strategy Report will be prepared and will include:
    - IWCM Process Summary;
    - Background Information on Bathurst's water cycle;
    - IWCM Study (modelling and assessment results);
    - PRG Recommendations and comments from Workshop 1 and 2;
    - Outline of how IWCM Issues are resolved through the preferred IWCM Scenario; and
    - Details of the IWCM Preferred scenario and recommendations for implementation.
- Submission of the draft IWCM Strategy Report to the Department of Water and Energy (DWE);
- A final IWCM Strategy Report will be prepared, incorporating the comments provided by DWE. The Final IWCM Strategy Report will then be submitted to Council;
- Council will then accept all or a selection of the components of the IWCM Strategy, in line with current strategic plans and budgeting processes.

APPENDIX D: URBAN POLLUTANT RUNOFF ESTIMATES

Stormwater Modelling with 'MUSIC'

MUSIC is the Model for Urban Stormwater Improvement Conceptualisation developed by the MUSIC Development Team of the CRC for Catchment Hydrology. The model provides the ability to simulate both quantity and quality of runoff from catchments ranging from a single house block up to many square kilometres, and the effect of a wide range of treatment facilities on the quantity and quality of runoff downstream (MUSIC User Manual, 2003).

MUSIC is designed to operate at a range of temporal and spatial scales suitable for catchment areas from 0.01 km^2 to 100 km^2. MUSIC is not a detailed design tool; it does not contain the algorithms necessary for detailed sizing of structural stormwater quantity and/or quality facilities. The MUSIC modelling undertaken has been used as one source of information in the decision making process for the BRC IWCM Strategy.

Stormwater Management in BRC

The MUSIC model for BRC was developed to allow the estimation of the flow and pollutant loads being produced by each land use within the catchment both at current development levels and with projected development. It should be noted that due to the size of BRC LGA, it was not possible to accurately model the whole of the stormwater catchment as a whole. To allow comparison of the stormwater management options, each of the land uses were modelled as separate nodes. The stormwater flow and pollutants generated by these nodes were then added. Where stormwater management measures were in place, these were applied only to the relevant land use nodes e.g. the 'WSUD DCP measure' was only applied to the new residential development node.

Scenario Development Process

The Current Situation Scenario has been modelled to show flow and pollutant loads at the present time, and does not account for projected growth. This scenario was prepared to provide a comparative baseline for the other scenarios.

The section below outlines which options have been modelled in each of the scenarios. Due to limitations of the modelling process, additional stormwater, catchment and land management options included in the IWCM Scenarios have not been modelled. These options have the potential for further impact on stormwater flow and pollutant loads.

'Current' Scenario

- Represents the runoff and loads generated by current development.

'Business as usual' Scenario

- Represents the runoff and loads generated by both the current and projected development, assuming no change to Council policy or programs.

IWCM 1: Low Integration

- Represents the runoff and loads generated by both the current and projected development, assuming that demand management measures, including pricing reform will encourage increased uptake of rainwater tanks. 1% uptake is assumed.

IWCM 2: Moderate Integration Scenario

- Represents the runoff and loads generated by both the current and projected development assuming that all new development will achieve the load reductions expected from Best Practice Water Sensitive Urban Design. The reduction assumptions incorporated into the model are as follows:
  - 70% reduction of Total Suspended Solids;
  - 45% reduction of Total Nitrogen;
  - 45% reduction of Total Phosphorous; and,
  - 5-10% reduction in peak flows.

It is assumed that these reductions will be achieved through the implementation of a suite of WSUD measures.

IWCM 3: High Integration

- Represents the runoff and loads generated by both the current and projected development assuming that all new development will achieve the load reductions expected from Best Practice Water Sensitive Urban Design, and the 25% existing residential areas will undergo Water Sensitive Urban Design retrofitting.
- To determine the likely level of effectiveness of WSUD in developed areas, a small area (~5 ha) was chosen as a case study. Following examination of aerial photographs and GIS layers, it was decided that the area could support the construction of buffers along some of the streets, and that some houses would have the space available to install a rainwater tank. This neighbourhood was modelled with these measures in place. The effectiveness of this treatment measure was then applied to 25% of all current and infill development area nodes.

The comparative performance of each of the scenarios in respect to the above parameters is represented provided in Figures H-1 to H-5. As this modelling exercise has utilised generic land use nodes, and has not been calibrated with stormwater quality data, the results are to be considered as comparative only.

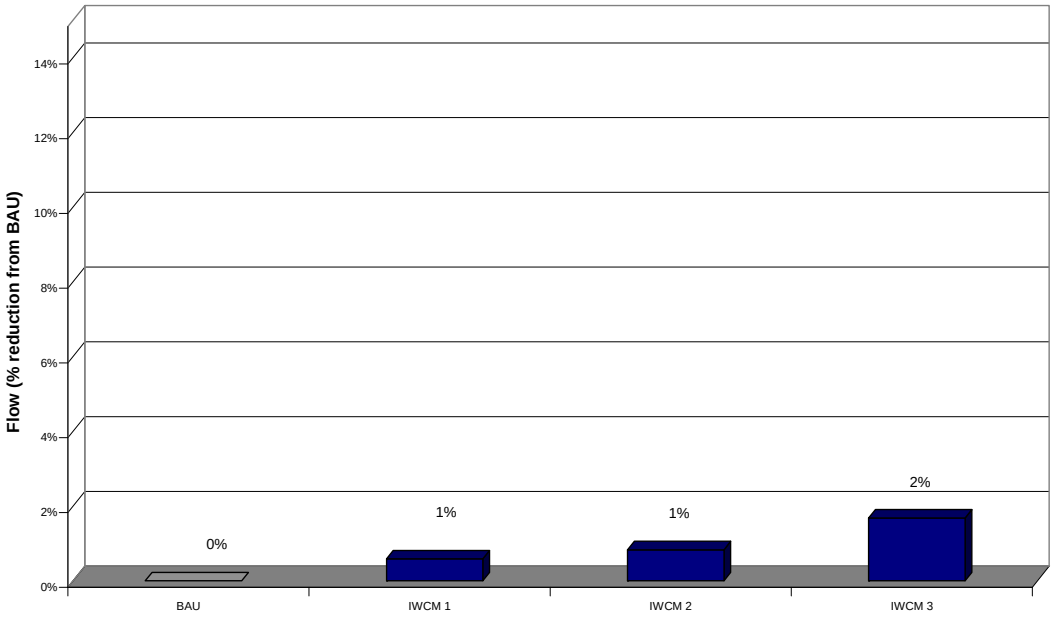


Figure H-1. Stormwater Flow Generation Comparison (% reduction from BAU)

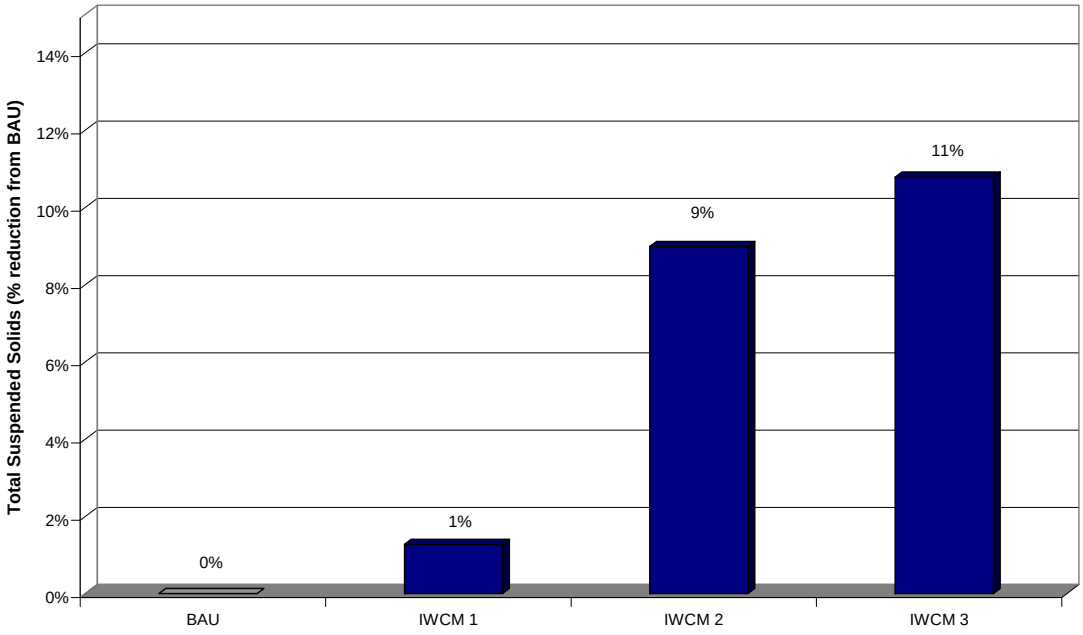


Figure H-2. Total Suspended Solids Comparison (% reduction from BAU)

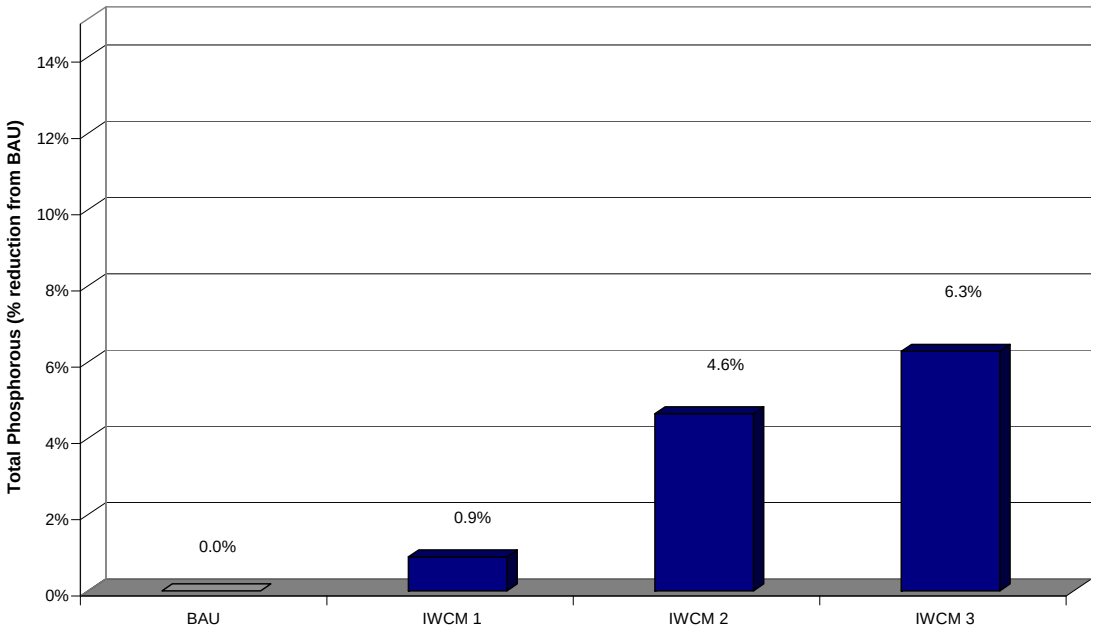


Figure H-3. Total Phosphorous Comparison (% reduction from BAU)

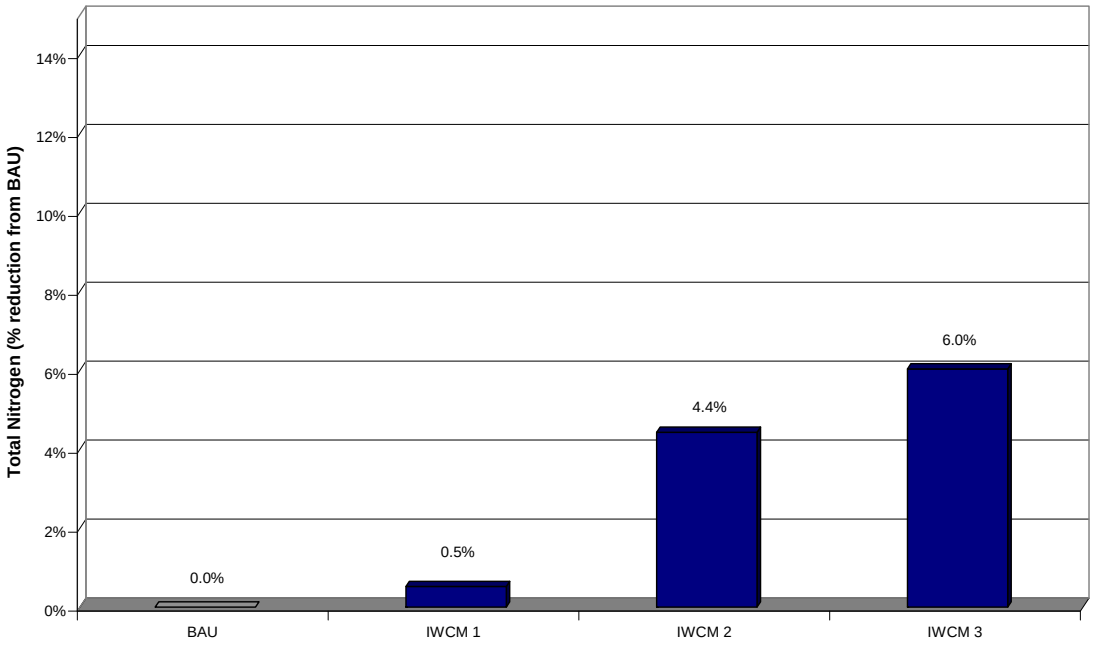


Figure H-4. Total Nitrogen Comparison (% reduction from BAU)

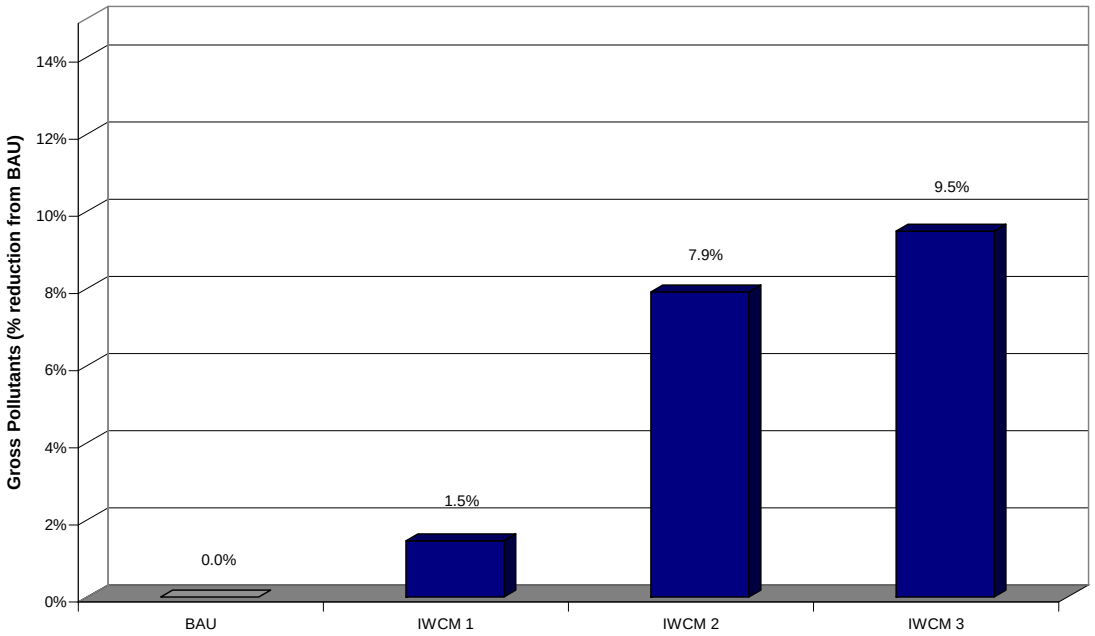


Figure H-5. Gross Pollutant Comparison (% reduction from BAU)

APPENDIX E: SCENARIO ASSESSMENT RESULTS

+ 3	Significant positive contribution	0	No influence	-1	Minimal negative contribution
+ 2	Moderate positive contribution			-2	Moderate positive contribution
+ 1	Minimal positive contribution			- 3	Significant negative contribution

IWCM Scenario	Environmental Criteria					Social Criteria				Economic Criteria					Overall Score
	Improved waterway health	Environmental flows to rivers/ waterways maintained or improved	Efficient water usage/ reduced consumption	Energy use/ GGE reduction	Total Environmental Score	Improved public awareness	WWTW safe discharge (meeting licence conditions)	Public Health and Safety	Total Social Score	Affordable services (Cost to customer)	Affordability (Cost to Council)	Fit for purpose water	Public ownership of water assets	Total Economic Score	
PRG GROUP 1															
Criteria Weighting	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Business As Usual	-2.0	-3.0	0.5	1.0	**-3.5**	1.0	2.0	1.5	**4.5**	-1.0	-1.0	2.0	1.0	**1.0**	**2.0**
IWCM 1	1.0	**0.0**	1.0	2.0	**4.0**	2.0	2.0	2.0	**6.0**	-1.5	-1.5	2.5	1.5	**1.0**	**11.0**
IWCM 2	2.0	**0.0**	1.0	3.0	**6.0**	2.0	2.0	2.0	**6.0**	-1.5	-1.5	2.5	1.5	**1.0**	**13.0**
IWCM 3	3.0	**0.0**	1.5	3.0	**7.5**	2.5	2.0	-1.0	**3.5**	-2.0	-2.0	3.0	1.5	**0.5**	**11.5**
PRG GROUP 2															
Business As Usual	-2.0	**0.0**	0.5	1.0	**-0.5**	1.0	1.0	1.0	**3.0**	-1.0	-1.0	1.0	**0.0**	**-1.0**	**1.5**
IWCM 1	**0.0**	1.5	2.0	2.0	**5.5**	1.0	1.0	1.5	**3.5**	-1.0	-1.0	1.5	**0.0**	**-0.5**	**8.5**
IWCM 2	1.0	1.5	2.0	3.0	**7.5**	1.0	1.0	1.5	**3.5**	-1.0	-1.0	1.5	**0.0**	**-0.5**	**10.5**
IWCM 3	2.0	1.5	2.0	2.5	**8.0**	1.0	1.0	0.5	**2.5**	-1.0	-1.0	2.0	**0.0**	**0.0**	**10.5**
PRG GROUP 3															
Business As Usual	**0.0**	**0.0**	1.0	1.0	**2.0**	1.0	2.0	2.0	**5.0**	-1.0	**0.0**	2.0	**0.0**	**1.0**	**8.0**
IWCM 1	1.0	-1.0	2.0	2.0	**4.0**	2.0	2.0	3.0	**7.0**	-2.0	-1.0	2.5	**0.0**	**-0.5**	**10.5**

IWCM 2	2.0	-1.0	2.0	3.0	**6.0**	2.0	2.0	3.0	**7.0**	-2.0	-1.0	2.5	**0.0**	**-0.5**	**12.5**
IWCM 3	3.0	-2.0	2.0	3.0	**6.0**	3.0	1.0	1.0	**5.0**	-3.0	-2.0	3.0	**0.0**	**-2.0**	**9.0**

APPENDIX F: DEMAND SIDE MANAGEMENT DECISION SUPPORT SYSTEM MODEL

The Demand Side Management Decision Support System (DSS) has a set architecture for generating demand forecasts and assessing the impact of demand management and source substitution initiatives.

The model starts with the generation of a baseline or “business as usual” forecast, which is the reference case for the demands to follow. The baseline forecast represents the demand that would occur in the event that there was no demand management or source substitution intervention.

The DSM DSS has a formal structure for the economic assessment of different options. A key component of these assessments is the avoided costs. Avoided costs occur when demand management or source substitution options result in:

- Reductions in water and wastewater treatment and transfer costs;
- Delays to and downsizing of capital expenditure; and
- Reductions in customer water heating.

The avoided costs module also has the capability to identify reductions in greenhouse gas emissions and to assign economic benefits associated with water and/or emissions trading.

The DSM DSS has a number of modules that are used to assess the impact of different types of demand management and source substitution measures (see Figure F-1). These include:

- The water pricing module which provides a framework for the assessment of changes in water prices;
- The fixture and appliance market intervention model where the impact of retrofit and rebate programs relative to the natural market trends can be estimated;
- The general conservation/source substitution module which estimates the impact of measures that include recycled and rainwater use; and,
- The Water Loss and Infiltration/Inflow Reduction modules where the impact on reducing system water losses and wet weather wastewater system inflows can be estimated.

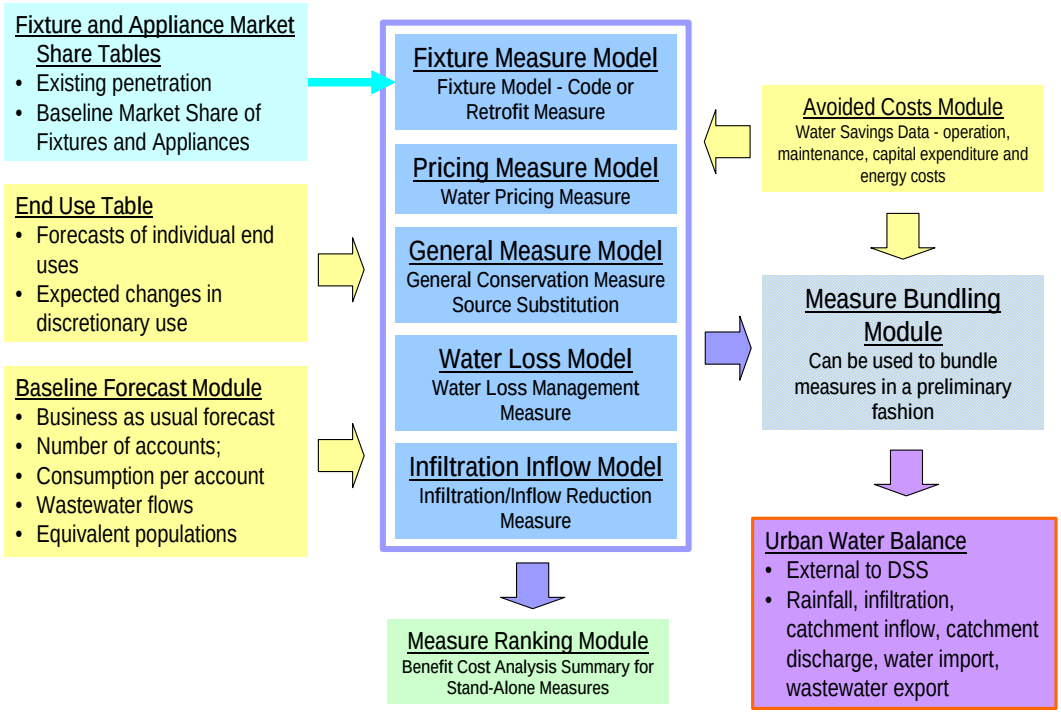


Figure F-1: Evaluation of Demand Management Options Using the DSM DSS Model

APPENDIX G: WATHNET MODELLING

Traditional approaches for defining the reliability of a water supply system were based on water balance analysis of historical streamflows and projected demands. These approaches assumed that historical streamflow records and sequences would be representative of streamflow into the future.

In line with the NSW Department of Energy, Utilities and Sustainability (DEUS) *Integrated Water Cycle Management Guidelines for NSW Local Water Utilities*, this investigation applies a stochastic approach using WATHNET software to simulate the water supply headworks system. It overcomes the limitation of dependence on historical streamflow sequences through the generation of many synthetic sequences with statistical properties similar to the available historical data. This approach allows a definition of the system's reliability at any point of time within the planning horizon. The generated sequences contain periods with more severe droughts than historical records, allowing for better understanding of the reliability and security of the water supply system. WATHNET also utilises network linear programming to allocate water from multiple sources to competing demands making allowance for capacity and operational constraints. Three types of models were used in this study:

1. Synthetic streamflow/climate generator.
2. Overall demand model.
3. Water balance model.

The schematic representation of the approach and the models used is shown on Figure G-1.

Historical climate, streamflow and demand data were used to:

- Establish and fit a multi-site stochastic model to historical streamflow and climate data;
- Generate 1000 30 year long sequences of daily streamflow and climate data. Note that streamflows and climate data are correlated and this correlation is preserved in the synthetic data;
- Establish and calibrate a demand water tracking model (by MWH);
- Develop an end-use forecasting model known as the DSS[12] based on historical data and various demand management and system improvement options (by MWH);
- Establish an integrated demand model based on water tracking model and DSS, providing daily demand forecast for various options as per DSS using synthetic climate data;
- Generate 1000, 30 years long sequences of daily demand forecasts corresponding to the synthetic climate data and demand scenarios as per DSS;

[12] The Decision Support System (DSS) is a combined end use and financial impact model.

- Establish water balance models representative of the demand scenarios as per DSS;
- Determine the reliability of the water supply system.

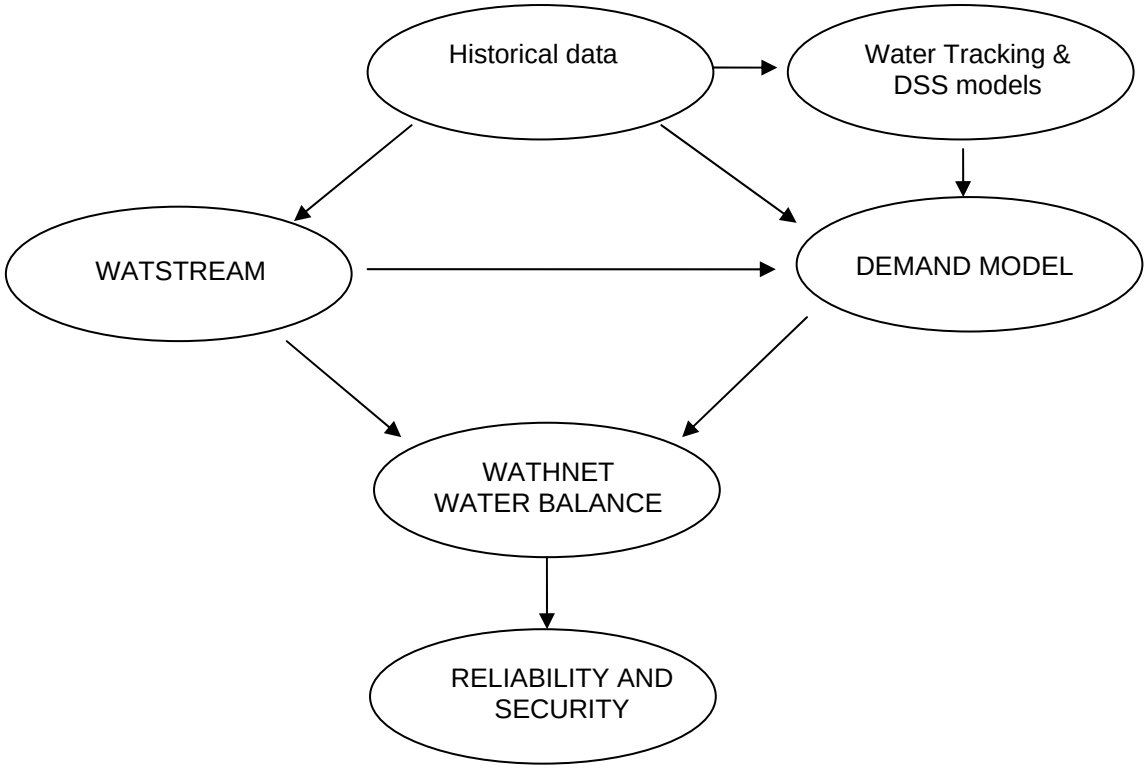


Figure G-1. Schematic diagram of models used in Water Balance Study

Reliability of supply is defined as a percentage of time with an un-interrupted water supply due to system failure and/or demand restrictions. It can be expressed as an annual reliability or as a daily reliability. Security of supply is the ability of the supply system to meet demands at any time and represents the chance of running out of water.

WATHNET Modelling for Bathurst Regional Council

A conceptual storage hydrological model was established and calibrated against the recorded streamflows at gauging station 421101. The flow duration curves of the recorded and the simulated streamflows are shown in Figure 1.

A water balance simulation was prepared within WATHNET to demonstrate the flows within the water supply system. The simulation of the water supply system includes the following inflows:

- Campbells River flows upstream of Ben Chifley Dam
- Residual flow downstream of Ben Chifley Dam, including Fish River. The catchment draining to Oberon Dam is excluded from the Fish River flows;

- 5 ML/day[13] are released as environmental flows when the inflow to the reservoir are higher than 5 ML/day
- Where inflow is lower than 5ML/day, released environmental flows are equal to inflows

Historical climate data was used to generate 1000 replicates of 30 year synthetic climate sequences. The Monash model was then used to produce synthetic streamflows in response to the synthetic climate sequences. 1000 replicates of 30 year projections of synthetic sequences of streamflows and corresponding water demand sequences.
The following scenarios were modelled:

- Business As Usual
- Restrictions, applied to external demand only, as follows:
  - 30% of external demand when Ben Chiefly Dam storage drops to 30%;
  - 60% of external demand when the storage drops to 20% and
  - 100% of external demand when storage drops to 10%.
- Irrigation extractions/ losses from the system, as follows:
  - 0 GL / year
  - 2 GL / year
  - 4.72 GL / year (based on current licensed extraction limits)
  - 11 GL / year (Calculated from BRC records of releases from BCD and coinciding extraction from Macquarie River).

Model Results

The following table indicates the predicted reservoir level and the requirement for water restrictions for four irrigation extraction scenarios.

Table G-1. Water Supply Security Assessment

Irrigation/ Industrial Extraction (GL/ year)	Reservoir Storage % full	Reliability of Supply	Need for Restrictions to secure supply	Restriction outcome required
0	95-100%	100%	NO	na
2	85-100%	100%	NO	na
4.72	**50-100%**	100%	**NO**	**na**
11	2-100%	> 99.5%	YES	100% restriction on external use

[13] (5 ML/day was used instead of 4.53 ML/day as WATHNET uses integer arithmetic).

The key conclusions of the WATHNET modelling undertaken are as follows:

- The operating regime of Ben Chifley Dam releases much higher flows than required for town water supply.
- The recorded releases are 150% higher than the recorded extraction of water for Bathurst's town water supply (including deductions for environmental flows).
- The reliability of the water supply is high, greater than 99.5%. (The system was depleted of water in only 2 of 1000 replicates).
- The reservoir volume is 4.75 times larger than the annual demand of 8 GL/ annum.

Assuming that extractions from the river for irrigation/ individual water use are controlled, the current system is capable of supplying Bathurst with water for the next 30 years. The most significant risk to the system is the potential for extractions exceeding the current licensed extraction limits (4.72 GL/year).

It should be noted that there remains uncertainty regarding the impact of groundwater extraction. Information on the linkage of groundwater aquifers to the river was not available. The contribution of groundwater extraction to channel losses is therefore unknown. Significant extractions from groundwater sources connected to Ben Chifley Dam may reduce the reliability of the system

APPENDIX H: FINANCIAL MODELLING

Overview

The objective of financial planning is to recognise the full life cycle costs of service provision and to determine appropriate funding strategies to ensure that services remain affordable in the long-term. A key output of financial modelling is an estimation of the Typical Residential Bill (TRB) for any given water supply or sewerage capital works program and its associated schedule of operation, maintenance and administration costs. In strategic planning for water supply or sewerage services, the TRB is often used as a parameter in multi-criteria assessments (including triple bottom line – economic, social and environmental) to assist decision makers determine between a number of potential strategic directions. This financial assessment has been undertaken to assist Bathurst Regional Council determine the likely impact of a series of integrated water cycle management strategies (scenarios) on the water supply and sewerage TRBs to be faced by their customers. This assessment forms an input into the decision-making process to determine a preferred scenario. Following identification of the preferred scenario, the financial model for this scenario was further refined, a sensitivity analysis completed and a medium-term price path set.

Taking a long-term view highlights the current impact of future actions (a 30 year planning horizon has been adopted for the modelling of water supply, sewerage and stormwater businesses) and allows financial peaks and troughs to be smoothed out to give a consistent pricing policy. The NSW Financial Model (FINMOD) has been used to assist in Council's financial planning for water supply and sewerage businesses. As the stormwater business is a part of Council's General Fund, which covers all services excluding water supply, sewerage and waste, a typical residential bill cannot be calculated for stormwater alone. As such, a simple estimate, driven by the capital works program and on-going costs identified in this IWCM plan only, has been used to estimate the likely impact of this part of the water cycle on customer bills.

The aim of financial modelling is to:

- Meet the funding requirements of the capital works program and other life-cycle costs associated with each system's (separately water supply, sewerage and stormwater/catchment) assets,
- Ensure a minimum level of cash and liquidity, and
- Provide forecast estimates of a sustainable residential bill over the long term.

It is recognised that the capital works programs provide a guide for estimating long term operation and maintenance costs. It is accepted that the level of confidence in capital works projections decreases with time from the present, but it is important to identify future commitments as accurately as possible. It is necessary to regularly review capital and operating programs and update financial assessments with respect to any changes.

Approach

As part of the IWCM plan, four different scenarios for water supply, sewerage and stormwater were developed. Each scenario is supported by separate water supply, sewerage and stormwater capital works plans and associated operating cost schedules. To undertake the initial assessment of all four scenarios, for which the incremental difference in TRB for the scenario was used as an input to the selection of the preferred scenario, the capital works plan and associated operation, maintenance, and administration was varied between each scenario for each fund.

The TRB for each scenario was developed by finding the combination of funding from internal and external sources (i.e. loans) that gives a constant TRB. All other measurements of financial performance have been kept as uniform as possible. In particular, the following constraints were adopted in each case to achieve uniformity:

- Borrowing has only been undertaken when there is a requirement for further funds to maintain constant, average residential bills.
- The difference between cash and investments and borrowing outstanding at the final year of the model is in a similar range for all models.

The data, assumptions results of this assessment are included in the following sections.
A preferred IWCM scenario was developed based on the outcomes of a triple bottom line (social, environmental, economic) assessment of the scenarios by the project reference group, including the consideration of the TRB. This scenario was adopted for implementation as part of the IWCM process. As a result, it was necessary to determine a proposed medium-term price path for the water supply and sewerage components of the scenario, taking into account the impact of a number of variables which may influence the TRB.

Financial Plans

This section sets out the inputs and outcomes of the financial modelling.

Base Input Data

Base data (Table H-1) was sourced from the financial statements for 2005/06 and 2006/07

Table H-1. Input Data

Item	Data Used	
Historical Data	Historical Financial Statements from 2005/06 and 2006/07 supplied by Bathurst Regional Council	
Financial Data	• Inflation Rate General: 2.50 % p.a. • Borrowing Interest Rate: 6.50 % p.a. • Investment Interest Rate: 5.50 % p.a. • Model Forecast Years: 30 years • Term of New Loan: 20 years • Average Life of System Assets: 70 years	
Balance sheet key data (30 June 2007)	**Water Supply**	**Sewerage**
Cash	$ 10.22 M	$ 12.26 M
Debt	$ 1.03 M	$ 0.39 M
System assets		
Replacement costs	$186.7 M	$123.2 M
Written down cost	$121.2 M	$67.2 M
Assessments/Bills		
Residential growth rate (30 year shire-wide average)	0.95 %/a	0.95 %/a
Number of residential assessments	12,342	11,582
Number of vacant assessments	929	541
Current TRB	$360	$351
Proportion TRB for vacant assessments	25%	100%
Proportion of pensioners	16%	17%
Expenditure		
Existing loan payments ($'000)	Principal: $1,026 Interest: $1,377	Principal:$385 Interest:$492
Capital works programs	Varies by scenario (see Table H-8)	
Capital works grants ($'000)	$9,891	$0
Operation, maintenance and administration (OMA) costs	Varies by scenario (see Table H-8)	

Costs to the customer (other than TRBs and charges levied by Council), such as the cost of installing a rainwater tank, are generally not accounted for in the financial modelling. Social outcomes (including other costs payable by the customers) are analysed separately in the triple bottom line assessment of scenarios documented as part of the IWCM workshop processes.

Variables

The water supply and sewerage options/cases modelled differ by the following input variables:

- Capital works expenditure; and
- OMA costs.

Outcomes

A summary of the major outcomes of the financial comparison are given in Table H-2 and Table H-3. These results are illustrated in Figure H-1 and Figure H-2.

Table H-2. Water Supply Modelling Results

Scenario	30 Year Capital Works ($M)	30 Year Total OMA ($M)	TRB ($/assessment)
Business as Usual	78.8	220.46	505
IWCM 1	90.7	220.88	530
IWCM 2	88.3	229.88	545
IWCM 3	106.8	230.33	575

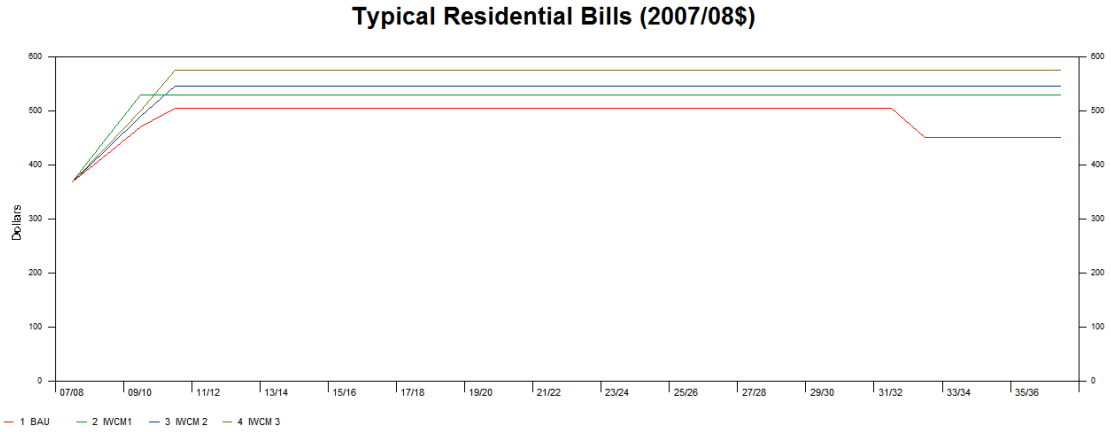
Table H-3. Sewerage Modelling Results

Scenario	30 Year Capital Works ($M)	30 Year Total OMA ($M)	TRB ($/assessment)
Business as Usual	53.1	170.3	390
IWCM 1	54.5	170.0	390
IWCM 2	55.2	169.9	390
IWCM 3	55.2	169.9	390

The following notes apply to both of the tables above:

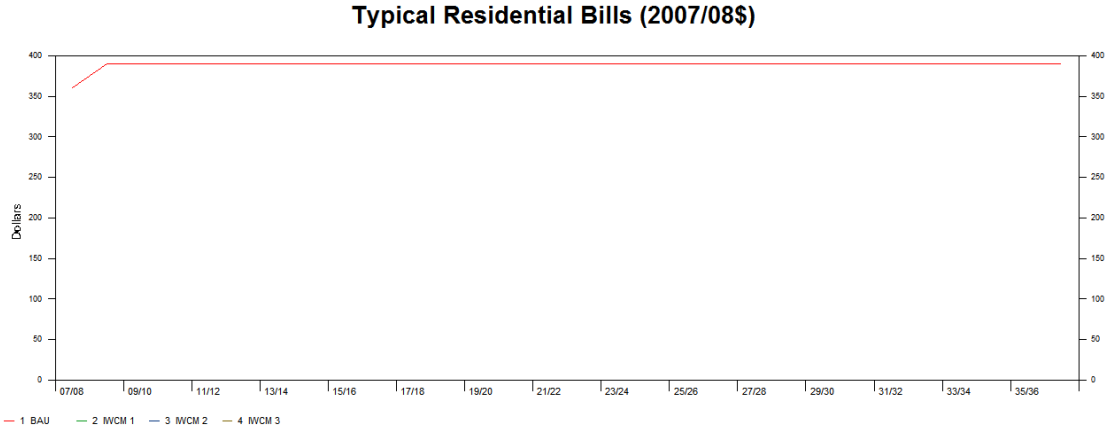
1. Capital works includes works for improved level of service (LOS), renewals and growth.
2. All figures are in 2007/08 dollars (i.e. not inflated). They will need to be adjusted for inflation.
3. Net cash in the final year for all of the options is similar.

The financial plan provides an indication of the relative cost to the customer i.e. the TRB for the different options.



	Case 1	Case 2	Case 3	Case 4
Average Growth Rate (%)	1.0	1.0	1.0	1.0
Inflation Rate (%)	2.5	2.5	2.5	2.5
Borrowing Interest Rate (%)	6.5	6.5	6.5	6.5
Investment Interest Rate (%)	5.5	5.5	5.5	5.5
Typical Developer Charges ($)	2716	2716	2716	2716
Total Capital Works (2007/08 $M)	78.8	90.7	88.3	106.8
Grants for Capital Works (2007/08 $M)	9.8	0.1	0.1	0.1
Minimum Cash and Investment (2007/08 $M)	2.6	2.1	5.0	4.3
Cash and Investments at Final Year (2007/08 $M)	24.4	23.9	22.2	19.7
Borrowings Outstanding at Final Year (2007/08 $M)	1.6	2.9	2.9	2.6

Figure H-1. TRB for Water Supply Scenarios (2007/08$)



	Case 1	Case 2	Case 3	Case 4
Average Growth Rate (%)	1.0	1.0	1.0	1.0
Inflation Rate (%)	2.5	2.5	2.5	2.5
Borrowing Interest Rate (%)	6.5	6.5	6.5	6.5
Investment Interest Rate (%)	5.5	5.5	5.5	5.5
Typical Developer Charges ($)	2101	2101	2101	2101
Total Capital Works (2007/08 $M)	53.1	54.5	55.2	55.2
Grants for Capital Works (2007/08 $M)	0.0	0.0	0.0	0.0
Minimum Cash and Investment (2007/08 $M)	12.7	12.3	12.1	12.1
Cash and Investments at Final Year (2007/08 $M)	35.8	34.8	33.8	33.9
Borrowings Outstanding at Final Year (2007/08 $M)	0.0	0.0	0.0	0.0

Figure H-2. TRB for Sewerage Scenarios (2007/08$)

Detailed outputs from the FINMOD model are set out at the back of this appendix.

Financing of New Works

Where possible, the capital works program and recurrent expenditure is funded through existing cash levels which is largely determined by the income from bills. Where planned expenditure exceeds the available cash levels, loans are required. A minimum cash level (approximately 20% of annual turnover) is maintained for each fund. Loans are required to fund the water scenarios as shown in Table H-4. No loans are required to fund sewerage.

Table H-4. Load Schedule ($,000)

Fund	14/15	15/16	16/17	23/24
Business as Usual	4999	10359	0	5,000
IWCM 1	6,853	6,852	1,852	8,971
IWCM 2	8,761	8,687	3,687	9,032
IWCM 3	5,985	10,910	5,911	8,139

Stormwater

As stormwater is a component of general fund, it cannot be modelled in isolation in FINMOD. Stormwater modelling was undertaken based only on the levelisation of capital and operating expenditure for the preferred scenario and the projected growth in residential assessments. This is not a financial model, nor do the results take into account the impact of a borrowing strategy for financing. The results are indicative only and suggest that the actions contained within this plan can be provided within the $30 per assessment, which Bathurst Regional Council is entitled to charge for stormwater services. However, with the uncertainties associated with modelling of the general fund, this could vary significantly.

Preferred Scenario

Following the financial modelling of the four scenarios, a triple bottom line (TBL) examination of the scenarios was undertaken as part of the Bathurst Regional Council IWCM process. The TRBs were utilised as part of the assessment of the social impact of each of the scenarios. The overall capital and operating costs were used as part of the economic assessment of each of the scenarios.

The preferred scenario was IWCM 2 for water supply, sewerage and stormwater unaltered from that modelled earlier.

The combined TRB for the preferred scenario (water supply, sewerage and stormwater) would be $965 per assessment. This combined TRB is only used for comparison of scenarios. The actual TRB derived for each separate service is what would be collected and deposited into the appropriate fund.

A sensitivity analysis was undertaken prior to setting a medium-term price path.

Sensitivity Analysis

Sensitivity analysis helps to determine the impact of various parameters on the outcomes, with particular emphasis on the typical residential bill. The sensitivity analyses cover the following variations:

- Higher interest rates (only relevant for water as there is no borrowing in sewer);
- Lower growth rates; and,

- Higher capital acquisition costs.

Subsidy was not modelled as there is very little subsidy incorporated in the scenarios. One parameter is varied between the base case of the adopted scenario and the sensitivity cases.

Higher Interest Rates

A sensitivity analysis was undertaken of the borrowing interest rate and the effect that this would have on the TRB of the adopted scenarios. The initial financial modelling was undertaken with a borrowing interest rate of 6.5%. Remodelling of the preferred scenario was undertaken with a borrowing interest rate of 7%. The table below shows the interest rate sensitivity analysis.

Table H-5. Impact of Higher Interest Rates on TRB

Scenario	Borrowing Interest Rate (%)	Combined TRB ($ Per Assessment
Preferred scenario current rate	6.5	965
Preferred scenario higher rate	7.5	975

Lower Growth Rates

A sensitivity analysis was undertaken of the growth projections and the effect that this would have on the TRB of the adopted scenarios for both water supply and sewerage. Annual growth rates were reduced by 50% as part of the remodelling of the preferred scenario to examine the effect of a reduced number of assessments on the TRB. The table below shows the growth sensitivity analysis.

Table H-6. Impact of Lower Growth Rates on TRB

Scenario	Growth Rate (% per year)	Combined TRB ($ Per Assessment
Preferred scenario current rate	0.95	965
Preferred scenario lower rate	0.45	1,070

Higher Capital Acquisition Costs

A sensitivity analysis was undertaken on the cost of capital acquisition. It was assumed that the cost of capital may increase by 10% over the life of the capital works plan. The table below shows the capital acquisition costs sensitivity analysis.

Table H-7. Impact of Higher Capital Costs on TRB

Scenario	Increase in Capital (%)	Combined TRB ($ Per Assessment
Preferred scenario current capital	0	965
Preferred scenario increased capital cost	10	990

Price Path

Bathurst Regional Council should set medium-term price paths that allow for some of the uncertainty demonstrated in the sensitivity analysis. This will enable Council to reduce the need to change the bills every year. The proposed price paths are:

- Water Supply Medium-Term Price Path for Preferred Scenario (2007/08$): $590
- Water Supply Medium-Term Price Path for Preferred Scenario (2007/08$): $430

The TRBs set under the medium-term price path will need to be:

- Adjusted annually in accordance with changes to the CPI.
- Checked annually, with a view not to vary the bills for the next 4- 5 years.

As illustrated in the sensitivity analysis, the TRBs are very sensitive to growth. Should the expected growth levels not be realised, it may be necessary to delay items of work on the capital works programs for water supply and sewerage. Growth forecasts should be reviewed at least twice a year.

Under recent legislation Council may elect to pay dividends and tax equivalents from the water supply and/or sewerage businesses to the General Fund. If Council wishes to make such payments, the price path will need to be increased by up to $30 per assessment for dividends (or the amount of the dividend) and $3 per assessment for tax equivalents, to create a surplus that will enable these payments.

Future changes due to uncontrollable variables such as interest rates, growth rates, energy costs etc may be significant. Thus, the financial models must be revisited regularly and the data updated to avoid potential problems.

Table H-8. BRC IWCM Strategy – 30 Year Plan

The following tables provide the projected spend to 2038 linking the activities planned to the key IWCM issue that the activity addresses. Items currently included in Councils budgets are included (rows with white background), as well as additional programs recommended as part of the IWCM (rows with blue background). Current budget costs have been taken from the BRC Capital Works Strategic Plan and the BRC 08/09-11/12 Draft Management Plan, updated through conversations with Council during 2008.

The fund from which each of the items will be funded has been identified; being the General Fund, Water Fund or Sewer Fund.

Historical Operating Costs for Stormwater management have not been provided as these costs have not previously been documented separately in the past.

Options 5, 9, 10, 14, 15, 16, 17, 28 and 29 are included in the Scenario IWCM 2 Operating Costs and hence are not identified separately in the following table. Option 3 was rejected during the process.

Water Capital and OMA Expenditure – Water Fund																														
Iss #	Capital Element ($'000)	Opt #	Fund	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
	Ben Chifley Dam																																
17	Management Plan Works		Water	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
20	Pipeline Dam to Town		Water						10,000	10,000	5,000																						
14	Recreation/env/catchment		Water	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
18	Roads		Water	68																													
14	Caravan park		Water																														
20	Pipeline Feasibility		Water	150								250										250											
	Winburndale Dam																																
31	Dam safety	4	Water																														
17	Pipeline		Water		1,000	4,000	4,000																										
17	Scour Valve refurb		Water	100	100	100	100	100	100	100	100	100	100	100	100	100																	
	Water Filtration Plant																																
29	Capacity augmentation		Water															9,450															
29	Capacity augmentation		Water																														
29	Install GAC filters		Water																														
29	Electrical refurbishment		Water	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
29	Mechanical refurbishment		Water	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
29	Raw water pumping station		Water															250															
29	Clear water pumping station		Water															500															
29	Model Review		Water				150					150					150					150					150					150	
29	Model implementation		Water					150					150					150					150					150					150
	Infrastructure - Distribution																																
29	Mechanical Refurbishment		Water	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
29	Electrical Refurbishment		Water	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
29	Additional No 6 Res Cap ML		Water											1,350																			
29	New meter installation		Water	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
29	Leak Detection + Repair	11		40	13	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Water Capital and OMA Expenditure – Water Fund

Iss #	Capital Element ($'000)	Opt #	Fund	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
29	Mains flushing	31		**30**																													
	New works/renewals																																
18	Minor new works		Water	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
18	Unmetered properties		Water	20	20	20	20																										
18	CBD renewal program		Water	250	250	250	250	250	250	250	250	250	250																				
18	New Water Services		Water	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
17	Demand Management		Water																														
17	WELS	6		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	IWCM Education	1		23	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
17	RWT Rebate	2		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	Greywater Recyc. Retrofit	13		25	6	6	6	6	7	7	7	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
17	W machine rebate	12		62	53	53	0	0																									
17	Commercial Toilet Retrofit	30		81	23	23	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Planning																																
17	IWCM Review		Water					75				125					75				125					75				125			
25	Strategic Business Plan		Water	75					75					75					75				75					75				
Total				**2,054**	**2,596**	**5,597**	**5,678**	**1,733**	**11,563**	**11,489**	**6,489**	**2,009**	**1,634**	**2,659**	**1,234**	**1,234**	**1,359**	**11,484**	**1,209**	**1,134**	**1,259**	**1,534**	**1,284**	**1,209**	**1,134**	**1,209**	**1,284**	**1,284**	**1,209**	**1,259**	**1,134**	**1,284**	**1,284**

Iss #	Operating Costs ($'000)		09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
29	*Historical Operating Costs*	Water	6,181	6,181	6,244	6,307	6,370	6,433	6,496	6,559	6,622	6,684	6,746	6,807	6,870	6,932	6,994	7,056	7,119	7,182	7,245	7,308	7,368	7,427	7,486	7,545	7,604	7,663	7,724	7,786	7,849	7,912
	Scenario IWCM 2 Operating Costs	Water	6,458	6,508	6,994	7,138	7,119	7,108	7,168	7,141	7,206	7,272	7,332	7,397	7,464	7,530	7,596	7,662	7,729	7,796	7,863	7,930	7,994	8,057	8,120	8,183	8,246	8,310	8,375	8,441	8,508	8,575

Wastewater Capital and OMA Expenditure – Sewer Fund

Iss #	Capital Element ($'000)	Opt #	Fund	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
	Major Headworks STP																																
12	Capacity		Sewer																														
12	Model Review	7	Sewer				150					150					150					150					150					150	
12	Mechanical Refurbishment	7	Sewer	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
12	Electrical Refurbishment	7	Sewer	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
12	Model implementation		Sewer					150					150					150					150					150					150
	Gilmour St PS																																
12	Sewage pumping stations		Sewer																														
12	Dry weather flows PS upgrade	7	Sewer	200	1,200																												

Wastewater Capital and OMA Expenditure – Sewer Fund

Iss #	Capital Element ($'000)	Opt #	Fund	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
	Pump Stations																																
31	Pump station odour control	7	Sewer	105																													
	Sewerage Reticulation System																																
12	General Sewerage System Rehabilitation		Sewer	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
12	Minor New Works		Sewer	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
12	Seymour St main upgrade		Sewer	155																													
12	Rankin St main upgrade		Sewer	481																													
12	Stanley St main upgrade		Sewer			634																											
12	Durham St main upgrade		Sewer			213																											
12	Northern Gilmour St main upgrades		Sewer				473																										
12	Southern Gilmour St main upgrades		Sewer				992																										
12	Remove constructed overflows		Sewer					36																									
12	Year 5 Performance assessment		Sewer					58																									
12	Mechanical Refurbishment		Sewer	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
12	Electrical Refurbishment		Sewer	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
12	New Wastewater Services		Sewer	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
12	Smart Sewers	18	Sewer	324	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	40	40
12	Infiltration/Inflow assessment	8	Sewer	87	301	303	306	309	312	314	317	320	323	326	329	332	335	338	341	344	347	350	353	355	358	361	364	367	370	374	377	383	386
	Monitoring																																
12	Septic Monitoring Program	32	Sewer	30	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
	Planning																																
12	IWCM Review		Sewer					75				125					75				125					75				125			
26	Strategic Business Plan		Sewer	75					75					75					75					75				75				
12	Development Servicing Plan		Sewer	75					75					75					75					75				75				
Total				**2,711**	**2,744**	**2,393**	**3,164**	**1,871**	**1,705**	**1,557**	**1,560**	**1,838**	**1,716**	**1,719**	**1,572**	**1,575**	**1,803**	**1,731**	**1,734**	**1,587**	**1,715**	**1,743**	**1,746**	**1,749**	**1,602**	**1,680**	**1,758**	**1,761**	**1,764**	**1,742**	**1,620**	**1,777**	**1,780**

	Operating Costs ($'000)		09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
12	*Historical Operating Costs*	Sewer	*4,884*	*4,958*	*5,013*	*5,068*	*5,122*	*5,176*	*5,230*	*5,283*	*5,336*	*5,389*	*5,442*	*5,495*	*5,548*	*5,601*	*5,654*	*5,707*	*5,760*	*5,814*	*5,868*	*5,922*	*5,975*	*6,026*	*6,076*	*6,127*	*6,178*	*6,231*	*6,284*	*6,337*	*6,390*	*6,441*
	Scenario IWCM 2 Operating Costs	Sewer	4,884	4,958	5,011	5,058	5,110	5,164	5,217	5,269	5,322	5,374	5,427	5,479	5,532	5,585	5,638	5,690	5,742	5,796	5,849	5,903	5,955	6,006	6,055	6,106	6,157	6,209	6,262	6,315	6,367	6,418

Stormwater Capital and OMA Expenditure – General Fund

Iss #	Capital Element ($'000)	Opt #	Fund	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
4	Catchment Management Expenditure		Gen	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Catchment Management Grant Income		Gen	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160

Iss #	Operating Costs ($'000)	Opt #	Fund	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
	Planning																																
2	WSUD DCPs	22	Gen	18	8	9	10	11	12	13	14	15	16	16	17	18	19	20	20	21	22	23	24	24	25	26	27	28	28	29	30	31	32
10	Review LEP	25	Gen	36	2	2	2	2																									
	Monitoring																																
4	Stormwater	19	Gen	28	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
9	River	20	Gen	28	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
8	Salinity monitoring	34	Gen	**0**	50	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
13	Trade waste monitoring	27	Gen	23	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	Litter																																
22	Litter	21	Gen	69	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
22	Litter	21	Gen	19	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
	Rehabilitation																																
10	Soil Erosion (ag)	23	Gen	43	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
10	Soil Erosion (public)	33	Gen	43	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
22	Waterway / riparian	26	Gen	21	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
22	Waterway / riparian	24	Gen	27	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
	TOTAL Operating Costs (IWCM 2)		Gen	**356**	**256**	**249**	**250**	**251**	**249**	**250**	**251**	**252**	**253**	**253**	**254**	**255**	**256**	**257**	**257**	**258**	**259**	**260**	**261**	**261**	**262**	**263**	**264**	**265**	**265**	**266**	**267**	**268**	**269**

Legend

IWCM Option
Current BRC Budget item
Total costs (sum of all costs for that section)

FINMOD Outputs (Water)

Bathurst IWCM Financial Model : IWCM 2

Operating Statement

FINMOD
MWH Pty Ltd

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32
EXPENSES																									
Management Expenses	*2173*	*2173*	*2195*	*2217*	*2240*	*2261*	*2283*	*2305*	*2327*	*2349*	*2371*	*2393*	*2415*	*2437*	*2459*	*2481*	*2503*	*2526*	*2547*	*2569*	*2590*	*2611*	*2632*	*2653*	*2674*
Administration	1475	1475	1490	1505	1520	1535	1550	1565	1580	1595	1610	1625	1640	1655	1670	1685	1700	1715	1730	1745	1759	1773	1787	1801	1815
Engineering and Supervision	698	698	705	712	719	726	733	740	747	754	761	768	775	782	789	796	803	810	817	824	831	838	845	852	859
Operation and Maintenance Expenses	*4049*	*4158*	*4584*	*4693*	*4651*	*4615*	*4628*	*4610*	*4653*	*4695*	*4731*	*4772*	*4815*	*4857*	*4899*	*4942*	*4984*	*5028*	*5070*	*5114*	*5155*	*5194*	*5234*	*5275*	*5315*
Operation Expenses	1862	1971	2379	2495	2440	2390	2388	2349	2369	2390	2405	2426	2446	2467	2488	2509	2530	2551	2572	2593	2614	2634	2654	2674	2694
Maintenance Expenses	1548	1548	1564	1580	1596	1612	1628	1644	1660	1675	1690	1705	1721	1736	1751	1766	1782	1798	1814	1830	1845	1860	1875	1890	1905
Energy Costs	89	89	89	86	86	86	85	86	87	88	89	90	91	91	92	93	94	95	96	97	98	98	99	100	101
Chemical Costs	550	550	552	532	529	528	527	532	537	542	547	551	557	563	568	573	578	583	588	594	598	602	606	611	615
Purchase of Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation	*2108*	*2121*	*2138*	*2164*	*2232*	*2302*	*2315*	*2469*	*2621*	*2702*	*2719*	*2732*	*2762*	*2772*	*2781*	*2794*	*2952*	*2963*	*2973*	*2984*	*2999*	*3011*	*3022*	*3032*	*3043*
System Assets	2108	2121	2138	2164	2232	2302	2315	2469	2621	2702	2719	2732	2762	2772	2781	2794	2952	2963	2973	2984	2999	3011	3022	3032	3043
Plant & Equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest Expenses	69	66	64	61	60	57	54	617	1149	1330	1259	1190	1118	1049	981	911	1424	1326	1227	1128	1028	926	826	724	624
Other Expenses	236	236	238	240	242	244	246	248	250	252	254	256	258	260	262	264	266	268	270	272	274	276	278	280	282
TOTAL EXPENSES	**8635**	**8754**	**9218**	**9375**	**9425**	**9479**	**9527**	**10250**	**11000**	**11330**	**11334**	**11342**	**11369**	**11374**	**11382**	**11391**	**12129**	**12111**	**12086**	**12068**	**12047**	**12019**	**11992**	**11964**	**11938**
REVENUES																									
Rates & Service Availability Charges	*3145*	*3757*	*4351*	*4910*	*4971*	*5028*	*5082*	*5140*	*5195*	*5254*	*5311*	*5363*	*5421*	*5475*	*5533*	*5590*	*5649*	*5705*	*5766*	*5821*	*5879*	*5932*	*5988*	*6047*	*6102*
Residential	2421	2886	3344	3776	3824	3869	3912	3959	4002	4048	4093	4134	4180	4222	4267	4311	4358	4401	4448	4492	4537	4577	4621	4666	4710
Non-Residential	724	871	1007	1135	1147	1160	1169	1181	1193	1205	1219	1229	1241	1254	1266	1279	1291	1304	1318	1329	1342	1355	1367	1380	1392
User Charges	*3059*	*3660*	*4237*	*4780*	*4837*	*4891*	*4939*	*4996*	*5048*	*5105*	*5159*	*5212*	*5264*	*5318*	*5374*	*5427*	*5483*	*5538*	*5595*	*5648*	*5705*	*5757*	*5809*	*5868*	*5921*
Sales of Water : Residential	1767	2106	2440	2756	2791	2825	2854	2889	2921	2955	2987	3019	3050	3082	3115	3147	3181	3213	3246	3278	3311	3341	3373	3407	3438
Sales of Water : Non-Residential	1292	1554	1796	2023	2046	2066	2085	2107	2127	2150	2172	2193	2214	2236	2258	2280	2302	2325	2349	2369	2393	2415	2436	2461	2483
Extra Charges	25	30	35	40	41	40	41	40	41	42	42	43	43	44	44	44	44	45	46	46	46	47	48	48	48
Interest Income	528	498	494	505	447	323	313	338	309	259	231	231	212	221	253	282	261	257	272	286	294	310	332	358	385
Other Revenues	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grants	*96*	*145*	*126*	*95*	*93*	*92*	*91*	*90*	*89*	*86*	*86*	*85*	*83*	*83*	*81*	*80*	*79*	*78*	*76*	*75*	*74*	*73*	*71*	*71*	*70*
Grants for Acquisition of Assets	0	50	31	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Pensioner Rebate Subsidy	96	96	94	93	92	90	89	88	87	85	84	82	81	81	79	78	77	76	74	73	72	71	70	69	67
Other Grants	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contributions	*483*	*554*	*418*	*416*	*410*	*407*	*402*	*399*	*402*	*399*	*399*	*399*	*399*	*399*	*399*	*402*	*402*	*405*	*405*	*407*	*394*	*386*	*383*	*388*	*391*
Developer Charges	483	554	418	416	410	407	402	399	402	399	399	399	399	399	399	402	402	405	405	407	394	386	383	388	391
Developer Provided Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Contributions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL REVENUES	**7336**	**8645**	**9660**	**10746**	**10799**	**10780**	**10867**	**11004**	**11083**	**11145**	**11229**	**11332**	**11423**	**11540**	**11684**	**11826**	**11918**	**12028**	**12160**	**12283**	**12392**	**12504**	**12630**	**12779**	**12916**
OPERATING RESULT	**-1299**	**-109**	**442**	**1371**	**1374**	**1301**	**1340**	**754**	**83**	**-185**	**-105**	**-10**	**54**	**166**	**301**	**434**	**-211**	**-83**	**74**	**215**	**345**	**485**	**638**	**815**	**978**
OPERATING RESULT (less Grants for Acq of Assets)	**-1299**	**-159**	**410**	**1369**	**1373**	**1299**	**1338**	**752**	**81**	**-187**	**-108**	**-12**	**52**	**164**	**299**	**432**	**-213**	**-85**	**72**	**213**	**344**	**483**	**637**	**813**	**976**

Bathurst IWCM Financial Model : IWCM 2

Cashflow Statement

FINMOD
MWH Pty Ltd

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32
Cashflow From Operating Activities																									
Receipts																									
Rates and Charges	6229	7448	8622	9730	9849	9959	10061	10177	10284	10400	10513	10617	10729	10837	10951	11061	11177	11289	11406	11515	11630	11736	11844	11962	12071
Interest Income	528	498	494	505	447	323	313	338	309	259	231	231	212	221	253	282	261	257	272	286	294	310	332	358	385
Other Revenues	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grants	96	145	126	95	93	92	91	90	89	86	86	85	83	83	81	80	79	78	76	75	74	73	71	71	70
Contributions	483	554	418	416	410	407	402	399	402	399	399	399	399	399	399	402	402	405	405	407	394	386	383	388	391
Total Receipts from Operations	**7336**	**8645**	**9660**	**10746**	**10799**	**10780**	**10867**	**11004**	**11083**	**11145**	**11229**	**11332**	**11423**	**11540**	**11684**	**11826**	**11918**	**12028**	**12160**	**12283**	**12392**	**12504**	**12630**	**12779**	**12916**
Payments																									
Management	2173	2173	2195	2217	2240	2261	2283	2305	2327	2349	2371	2393	2415	2437	2459	2481	2503	2526	2547	2569	2590	2611	2632	2653	2674
Operations (plus WC Inc)	4081	4192	4614	4724	4683	4646	4659	4642	4685	4728	4763	4805	4848	4889	4933	4975	5018	5062	5104	5149	5189	5229	5268	5309	5351
Interest Expenses	69	66	64	61	60	57	54	617	1149	1330	1259	1190	1118	1049	981	911	1424	1326	1227	1128	1028	926	826	724	624
Other Expenses	236	236	238	240	242	244	246	248	250	252	254	256	258	260	262	264	266	268	270	272	274	276	278	280	282
Total Payments from Operations	**6559**	**6667**	**7111**	**7242**	**7224**	**7208**	**7242**	**7813**	**8411**	**8659**	**8647**	**8643**	**8639**	**8635**	**8635**	**8630**	**9211**	**9182**	**9147**	**9118**	**9081**	**9042**	**9005**	**8966**	**8931**
Net Cash from Operations	**777**	**1978**	**2549**	**3504**	**3575**	**3573**	**3624**	**3191**	**2672**	**2485**	**2582**	**2689**	**2784**	**2905**	**3049**	**3195**	**2707**	**2846**	**3013**	**3165**	**3311**	**3462**	**3626**	**3813**	**3986**
Cashflow from Capital Activities																									
Receipts																									
Proceeds from Disposal of Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Payments																									
Acquisition of Assets	1530	1849	2024	2596	5597	5678	1733	11563	11489	6488	2009	1634	2659	1233	1234	1360	11484	1209	1134	1259	1534	1284	1209	1134	1209
Net Cash from Capital Activities	**-1530**	**-1849**	**-2024**	**-2596**	**-5597**	**-5678**	**-1733**	**-11563**	**-11489**	**-6488**	**-2009**	**-1634**	**-2659**	**-1233**	**-1234**	**-1360**	**-11484**	**-1209**	**-1134**	**-1259**	**-1534**	**-1284**	**-1209**	**-1134**	**-1209**
CashFlow from Financing Activities																									
Receipts																									
New Loans Required	0	1	0	0	0	0	0	8761	8687	3687	2	2	1	1	2	2	9032	2	2	3	2	2	2	2	2
Payments																									
Principal Loan Payments	12	13	13	14	14	15	16	239	470	583	605	632	655	683	709	737	996	1036	1078	1122	1166	1212	1262	1311	1364
Net Cash from Financing Activities	**-12**	**-12**	**-13**	**-14**	**-14**	**-15**	**-16**	**8522**	**8216**	**3104**	**-604**	**-630**	**-654**	**-681**	**-707**	**-735**	**8036**	**-1034**	**-1077**	**-1119**	**-1164**	**-1210**	**-1260**	**-1310**	**-1363**
TOTAL NET CASH	**-765**	**117**	**512**	**893**	**-2037**	**-2120**	**1875**	**150**	**-600**	**-899**	**-31**	**425**	**-529**	**991**	**1108**	**1101**	**-741**	**603**	**802**	**786**	**613**	**968**	**1157**	**1369**	**1414**
Current Year Cash	-765	117	511	893	-2037	-2120	1875	151	-600	-899	-31	425	-529	991	1108	1101	-741	603	802	786	613	968	1157	1369	1414
Cash & Investments @Year Start	10223	9227	9116	9393	10035	7804	5545	7239	7209	6448	5414	5251	5537	4886	5734	6675	7586	6678	7103	7713	8292	8687	9420	10318	11403
Cash & Investments @Year End	9458	9344	9628	10286	7999	5683	7420	7390	6609	5549	5382	5676	5009	5877	6842	7775	6845	7281	7906	8499	8904	9655	10576	11688	12816
Capital Works Funding:																									
Internal Funding for New Works ($'000)	730	885	1125	1794	4795	4876	931	2000	2000	2000	1205	830	2105	680	680	905	2000	755	680	805	1080	830	755	680	755
Internal Funding for Renewals	800	913	868	800	800	800	800	800	800	800	800	800	550	550	550	450	450	450	450	450	450	450	450	450	450
New Loans	0	1	0	0	0	0	0	8761	8687	3687	2	2	1	1	2	2	9032	2	2	3	2	2	2	2	2
Grants	0	50	31	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Total Capital Works	**1530**	**1849**	**2025**	**2596**	**5597**	**5678**	**1733**	**11562**	**11489**	**6488**	**2009**	**1634**	**2659**	**1233**	**1234**	**1360**	**11484**	**1209**	**1134**	**1259**	**1534**	**1284**	**1209**	**1134**	**1209**

Bathurst IWCM Financial Model : IWCM 2

Statement of Financial Position

FINMOD
MWH Pty Ltd

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32
Cash and Investments	9458	9360	9812	10553	8350	6066	7835	7815	7044	5993	5836	6138	5479	6357	7329	8270	7346	7790	8421	9022	9433	10189	11116	12231	13364
Receivables	1356	1377	1392	1407	1422	1437	1452	1467	1482	1497	1512	1527	1542	1557	1572	1587	1602	1617	1632	1647	1662	1676	1690	1705	1719
Inventories	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Property, Plant & Equipment	*137895*	*137275*	*136821*	*136923*	*139965*	*143026*	*142138*	*150932*	*159507*	*163007*	*162019*	*160650*	*160282*	*158485*	*156687*	*155006*	*163299*	*161311*	*159244*	*157296*	*155613*	*153674*	*151654*	*149555*	*147524*
System Assets (1)	123659	123386	123271	123703	127068	130444	129862	138956	147823	151608	150898	149800	149697	148158	146611	145177	153709	151955	150116	148391	146925	145198	143385	141487	139654
Plant & Equipment	14236	13889	13550	13220	12897	12583	12276	11976	11684	11399	11121	10850	10585	10327	10075	9829	9590	9356	9128	8905	8688	8476	8269	8068	7871
Other Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ASSETS	**148709**	**148012**	**148025**	**148882**	**149737**	**150529**	**151425**	**160214**	**168033**	**170497**	**169367**	**168315**	**167304**	**166399**	**165587**	**164862**	**172247**	**170718**	**169297**	**167965**	**166708**	**165539**	**164461**	**163490**	**162607**
LIABILITIES																									
Bank Overdraft	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Creditors	206	209	211	214	216	218	221	223	225	227	230	232	234	236	239	241	243	245	247	250	252	254	256	258	260
Borrowings	1014	978	940	904	867	831	795	9298	17287	19969	18878	17788	16700	15612	14524	13434	21142	19593	18039	16480	14913	13340	11754	10158	8547
Provisions	300	304	307	311	314	317	321	324	327	331	334	338	341	344	347	350	354	357	360	363	367	370	373	376	379
TOTAL LIABILITIES	**1520**	**1491**	**1459**	**1428**	**1397**	**1366**	**1337**	**9844**	**17840**	**20527**	**19442**	**18357**	**17275**	**16192**	**15109**	**14025**	**21739**	**20195**	**18646**	**17093**	**15532**	**13964**	**12383**	**10793**	**9187**
NET ASSETS COMMITTED	**147189**	**146521**	**146566**	**147454**	**148340**	**149163**	**150088**	**150369**	**150193**	**149970**	**149924**	**149958**	**150029**	**150207**	**150478**	**150837**	**150507**	**150523**	**150650**	**150873**	**151176**	**151575**	**152077**	**152698**	**153420**
EQUITY																									
Accumulated Operating Result	114147	111254	108982	107694	106442	105147	103922	102141	99733	97116	94641	92323	90126	88094	86246	84577	82303	80213	78331	76635	75112	73765	72604	71649	70879
Asset Revaluation Reserve	33042	36133	39294	42531	45861	49368	53058	56823	60952	65454	70187	75016	79930	84963	90069	95248	100505	106210	111990	117844	123774	129793	135890	142061	148303
TOTAL EQUITY	**147189**	**146505**	**146382**	**147189**	**147990**	**148781**	**149674**	**149945**	**149759**	**149526**	**149471**	**149496**	**149558**	**149727**	**149991**	**150343**	**150006**	**150014**	**150135**	**150350**	**150647**	**151042**	**151538**	**152154**	**152872**
(1) Notes to System Assets																									
Current Replacement Cost	192098	193033	194188	195984	200780	205659	206592	217355	228044	233732	234941	235775	237884	238567	239251	240160	251195	251954	252638	253448	254531	255365	256125	256808	257567
Less: Accumulated Depreciation	68439	69647	70917	72280	73713	75215	76730	78399	80221	82124	84043	85975	88186	90408	92640	94984	97486	99999	102522	105056	107606	110167	112739	115321	117914
Written Down Current Cost	123659	123386	123271	123703	127068	130444	129862	138956	147823	151608	150898	149800	149697	148158	146611	145177	153709	151955	150116	148391	146925	145198	143385	141487	139654

Bathurst IWCM Financial Model : IWCM 2

Performance Indicators

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32
Typical Residential Bills	369	430	490	545	545	545	545	545	545	545	545	545	545	545	545	545	545	545	545	545	545	545	545	545	545
Average Residential Bills (2007/08$)	335	393	450	503	504	505	504	506	506	507	507	508	508	509	509	509	510	510	511	511	511	512	512	513	514
Mgmnt Cost / Assessment (2007/08$)	161	158	158	158	158	158	158	157	158	158	158	157	158	157	157	157	157	157	157	157	157	157	156	156	156
OMA Cost per Assessment (2007/08$)	461	461	489	493	486	480	478	473	473	472	472	471	471	471	470	470	470	469	469	469	468	468	468	468	467
Operating Sales Margin (%)	-25.82	-7.29	-0.22	9.03	9.52	9.88	10.23	9.67	8.56	8.12	8.37	8.53	8.55	8.76	8.99	9.19	8.15	8.36	8.64	8.80	8.91	9.02	9.20	9.50	9.69
Economic Real Rate of Return (%)	-1.27	-0.43	-0.01	0.68	0.70	0.72	0.76	0.68	0.58	0.54	0.57	0.59	0.60	0.63	0.66	0.68	0.58	0.61	0.64	0.67	0.69	0.72	0.75	0.79	0.82
Debt Service Ratio	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08	0.15	0.17	0.17	0.16	0.16	0.15	0.14	0.14	0.20	0.20	0.19	0.18	0.18	0.17	0.17	0.16	0.15
Debt/Equity Ratio	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.12	0.13	0.13	0.12	0.11	0.10	0.10	0.09	0.14	0.13	0.12	0.11	0.10	0.09	0.08	0.07	0.06
Interest Cover	-17.83	-1.40	7.43	23.33	23.95	23.97	25.63	2.22	1.07	0.86	0.91	0.99	1.05	1.16	1.31	1.47	0.85	0.94	1.06	1.19	1.33	1.52	1.77	2.12	2.56
Return on capital (%)	-0.83	-0.06	0.32	0.96	0.96	0.90	0.92	0.85	0.73	0.67	0.68	0.70	0.70	0.73	0.77	0.82	0.70	0.73	0.77	0.80	0.82	0.85	0.89	0.94	0.98
Cash and Investments (2007/08$'000)	9458	9344	9629	10287	8000	5684	7421	7390	6609	5549	5382	5676	5009	5877	6842	7775	6845	7281	7906	8499	8904	9655	10576	11688	12816
Debt outstanding (2007/08$'000)	1014	978	940	904	867	831	795	9298	17287	19969	18878	17788	16700	15612	14524	13434	21142	19593	18039	16480	14913	13340	11754	10158	8547
Net Debt (2007/08$'000)	0	0	0	0	0	0	0	1908	10678	14420	13496	12112	11691	9735	7682	5659	14297	12312	10133	7981	6009	3685	1178	0	0

FINMOD Outputs (Sewer)

Bathurst IWCM Plan : IWCM 2

Operating Statement

FINMOD
MWH Pty Ltd

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32
EXPENSES																									
Management Expenses	*2060*	*2092*	*2114*	*2138*	*2160*	*2183*	*2206*	*2229*	*2250*	*2272*	*2294*	*2315*	*2338*	*2360*	*2382*	*2404*	*2426*	*2449*	*2472*	*2495*	*2517*	*2539*	*2561*	*2583*	*2605*
Administration	1326	1346	1361	1376	1391	1406	1421	1435	1449	1463	1477	1491	1505	1519	1533	1547	1561	1576	1591	1606	1620	1634	1648	1662	1676
Engineering and Supervision	734	745	753	761	769	777	785	793	801	809	817	825	833	841	849	857	865	873	881	889	897	905	913	921	929
Operation and Maintenance Expenses	*2652*	*2692*	*2720*	*2741*	*2770*	*2797*	*2826*	*2854*	*2882*	*2912*	*2940*	*2969*	*2997*	*3026*	*3054*	*3083*	*3110*	*3140*	*3168*	*3196*	*3226*	*3252*	*3277*	*3304*	*3331*
Operation Expenses	993	1008	1019	1030	1041	1052	1063	1074	1085	1096	1107	1118	1129	1140	1151	1162	1173	1184	1195	1206	1217	1227	1237	1247	1257
Maintenance Expenses	1208	1226	1240	1254	1267	1280	1293	1306	1319	1332	1345	1358	1371	1384	1397	1410	1423	1436	1449	1462	1475	1488	1500	1513	1526
Energy Costs	322	327	329	328	331	334	338	341	345	349	352	356	359	363	367	371	374	378	381	385	389	391	394	397	399
Chemical Costs	129	131	131	130	131	132	132	133	134	135	136	137	138	139	139	140	141	142	143	144	145	146	146	147	148
Depreciation	*1839*	*1856*	*1881*	*1906*	*1927*	*1960*	*1973*	*1984*	*1993*	*2002*	*2014*	*2025*	*2036*	*2045*	*2054*	*2067*	*2077*	*2089*	*2098*	*2109*	*2120*	*2131*	*2143*	*2152*	*2162*
System Assets	1839	1856	1881	1906	1927	1960	1973	1984	1993	2002	2014	2025	2036	2045	2054	2067	2077	2089	2098	2109	2120	2131	2143	2152	2162
Plant & Equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest Expenses	25	23	23	22	21	20	20	19	18	17	16	15	15	14	13	12	11	11	10	9	9	8	7	6	5
Other Expenses	172	175	177	179	181	183	185	187	189	191	193	195	197	199	201	203	205	207	209	211	213	215	217	219	221
TOTAL EXPENSES	**6748**	**6837**	**6915**	**6987**	**7059**	**7143**	**7210**	**7271**	**7332**	**7394**	**7458**	**7520**	**7583**	**7644**	**7704**	**7769**	**7830**	**7895**	**7956**	**8020**	**8085**	**8145**	**8205**	**8263**	**8324**
REVENUES																									
Rates & Service Availability Charges	*5559*	*6153*	*6225*	*6293*	*6357*	*6431*	*6502*	*6581*	*6643*	*6715*	*6781*	*6859*	*6930*	*6999*	*7063*	*7138*	*7206*	*7271*	*7344*	*7413*	*7489*	*7557*	*7621*	*7690*	*7757*
Residential	4058	4481	4536	4588	4638	4694	4748	4807	4854	4908	4957	5015	5069	5120	5168	5223	5274	5321	5376	5428	5483	5534	5581	5632	5681
Non-Residential	1501	1672	1689	1705	1719	1737	1754	1774	1789	1807	1823	1844	1861	1879	1895	1915	1933	1949	1968	1985	2005	2023	2040	2058	2076
Trade Waste Charges	385	425	430	436	439	445	450	456	460	465	470	476	481	486	490	495	500	505	510	514	520	525	529	534	539
Other Sales and Charges	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Extra Charges	27	30	30	31	32	32	32	33	33	33	34	34	34	35	35	35	36	36	37	37	36	36	37	37	38
Interest Income	682	709	694	660	636	599	583	599	622	647	664	680	697	717	740	755	769	783	800	814	826	837	846	860	871
Other Revenues	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grants	*95*	*94*	*92*	*91*	*90*	*88*	*87*	*86*	*85*	*83*	*82*	*81*	*80*	*78*	*77*	*77*	*75*	*74*	*72*	*71*	*71*	*70*	*69*	*67*	*66*
Grants for Acquisition of Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pensioner Rebate Subsidy	95	94	92	91	90	88	87	86	85	83	82	81	80	78	77	77	75	74	72	71	71	70	69	67	66
Other Grants	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contributions	*351*	*405*	*305*	*303*	*298*	*296*	*296*	*294*	*294*	*290*	*290*	*290*	*290*	*290*	*290*	*292*	*292*	*296*	*296*	*298*	*288*	*282*	*279*	*282*	*284*
Developer Charges	351	405	305	303	298	296	296	294	294	290	290	290	290	290	290	292	292	296	296	298	288	282	279	282	284
Developer Provided Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Contributions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL REVENUES	**7099**	**7817**	**7776**	**7813**	**7852**	**7891**	**7950**	**8048**	**8137**	**8233**	**8320**	**8419**	**8511**	**8606**	**8695**	**8792**	**8877**	**8963**	**9058**	**9148**	**9230**	**9306**	**9380**	**9470**	**9554**
OPERATING RESULT	**351**	**980**	**861**	**826**	**793**	**748**	**740**	**777**	**805**	**839**	**862**	**899**	**929**	**962**	**992**	**1023**	**1047**	**1069**	**1102**	**1128**	**1145**	**1161**	**1175**	**1207**	**1231**
OPERATING RESULT (less Grants for Acq of Assets)	**351**	**980**	**861**	**826**	**793**	**748**	**740**	**777**	**805**	**839**	**862**	**899**	**929**	**962**	**992**	**1023**	**1047**	**1069**	**1102**	**1128**	**1145**	**1161**	**1175**	**1207**	**1231**

Bathurst IWCM Plan : IWCM 2

Cashflow Statement

FINMOD
MWH Pty Ltd

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32
Cashflow From Operating Activities																									
Receipts																									
Rates and Charges	5971	6609	6686	6759	6828	6907	6984	7070	7136	7213	7284	7368	7445	7520	7588	7668	7742	7811	7890	7964	8045	8117	8186	8261	8333
Interest Income	682	709	694	660	636	599	583	599	622	647	664	680	697	717	740	755	769	783	800	814	826	837	846	860	871
Other Revenues	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grants	95	94	92	91	90	88	87	86	85	83	82	81	80	78	77	77	75	74	72	71	71	70	69	67	66
Contributions	351	405	305	303	298	296	296	294	294	290	290	290	290	290	290	292	292	296	296	298	288	282	279	282	284
Total Receipts from Operations	**7099**	**7817**	**7776**	**7813**	**7852**	**7891**	**7950**	**8048**	**8137**	**8233**	**8320**	**8419**	**8511**	**8606**	**8695**	**8792**	**8877**	**8963**	**9058**	**9148**	**9230**	**9306**	**9380**	**9470**	**9554**
Payments																									
Management	2060	2092	2114	2138	2160	2183	2206	2229	2250	2272	2294	2315	2338	2360	2382	2404	2426	2449	2472	2495	2517	2539	2561	2583	2605
Operations (plus WC Inc)	2661	2701	2730	2751	2779	2807	2835	2863	2892	2921	2950	2979	3007	3036	3064	3093	3120	3150	3178	3207	3236	3262	3287	3315	3341
Interest Expenses	25	23	23	22	21	20	20	19	18	17	16	15	15	14	13	12	11	11	10	9	9	8	7	6	5
Other Expenses	172	175	177	179	181	183	185	187	189	191	193	195	197	199	201	203	205	207	209	211	213	215	217	219	221
Total Payments from Operations	**4918**	**4991**	**5044**	**5090**	**5141**	**5194**	**5246**	**5297**	**5349**	**5401**	**5454**	**5505**	**5557**	**5608**	**5660**	**5712**	**5762**	**5816**	**5868**	**5922**	**5975**	**6024**	**6072**	**6122**	**6172**
Net Cash from Operations	**2181**	**2825**	**2733**	**2724**	**2711**	**2698**	**2703**	**2752**	**2788**	**2832**	**2866**	**2914**	**2955**	**2997**	**3035**	**3079**	**3115**	**3147**	**3190**	**3226**	**3255**	**3282**	**3308**	**3348**	**3382**
Cashflow from Capital Activities																									
Receipts																									
Proceeds from Disposal of Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Payments																									
Acquisition of Assets	1230	2111	2711	2744	2394	3164	1871	1704	1558	1560	1838	1716	1719	1573	1575	1803	1731	1734	1588	1715	1744	1746	1748	1602	1680
Net Cash from Capital Activities	**-1230**	**-2111**	**-2711**	**-2744**	**-2394**	**-3164**	**-1871**	**-1704**	**-1558**	**-1560**	**-1838**	**-1716**	**-1719**	**-1573**	**-1575**	**-1803**	**-1731**	**-1734**	**-1588**	**-1715**	**-1744**	**-1746**	**-1748**	**-1602**	**-1680**
CashFlow from Financing Activities																									
Receipts																									
New Loans Required	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0
Payments																									
Principal Loan Payments	4	5	5	5	5	5	5	6	6	6	6	7	7	7	8	8	8	9	9	9	10	10	10	11	11
Net Cash from Financing Activities	**-4**	**-4**	**-5**	**-5**	**-5**	**-5**	**-5**	**-6**	**-6**	**-6**	**-6**	**-7**	**-7**	**-7**	**-8**	**-8**	**-7**	**-9**	**-9**	**-9**	**-9**	**-10**	**-10**	**-11**	**-11**
TOTAL NET CASH	**947**	**710**	**17**	**-25**	**311**	**-472**	**827**	**1041**	**1225**	**1266**	**1022**	**1192**	**1229**	**1418**	**1453**	**1269**	**1376**	**1404**	**1594**	**1501**	**1502**	**1526**	**1549**	**1735**	**1691**
Current Year Cash	947	710	17	-25	311	-472	827	1041	1225	1266	1022	1192	1229	1418	1453	1269	1376	1404	1594	1501	1502	1526	1549	1735	1692
Cash & Investments @Year Start	12262	12887	13265	12959	12618	12613	11845	12363	13078	13953	14848	15483	16268	17071	18038	19015	19790	20650	21516	22547	23461	24355	25250	26145	27200
Cash & Investments @Year End	**13209**	**13597**	**13283**	**12934**	**12929**	**12142**	**12672**	**13405**	**14302**	**15219**	**15870**	**16675**	**17497**	**18489**	**19491**	**20284**	**21166**	**22054**	**23110**	**24048**	**24964**	**25881**	**26798**	**27880**	**28892**
Capital Works Funding:																									
Internal Funding for New Works ($'000)	280	1160	1761	1794	1444	2214	921	755	608	610	888	766	769	622	625	853	781	784	637	765	793	796	799	652	730
Internal Funding for Renewals	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950
New Loans	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0
Grants	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Capital Works	**1230**	**2111**	**2711**	**2744**	**2394**	**3164**	**1871**	**1704**	**1558**	**1560**	**1838**	**1716**	**1719**	**1573**	**1575**	**1803**	**1731**	**1734**	**1588**	**1715**	**1744**	**1746**	**1749**	**1602**	**1680**

Bathurst IWCM Plan : IWCM 2

Statement of Financial Position

FINMOD
MWH Pty Ltd

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32
Cash and Investments	13209	13597	13283	12934	12929	12142	12672	13405	14302	15219	15870	16675	17497	18489	19491	20284	21166	22054	23110	24048	24964	25881	26798	27880	28892
Receivables	814	826	836	845	854	864	873	882	891	899	908	917	926	934	943	952	961	970	979	988	997	1006	1014	1023	1032
Inventories	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Property, Plant & Equipment	*69367*	*69597*	*70402*	*71215*	*71659*	*72840*	*72716*	*72414*	*71958*	*71495*	*71298*	*70969*	*70632*	*70141*	*69643*	*69361*	*68997*	*68625*	*68098*	*67687*	*67295*	*66894*	*66485*	*65920*	*65423*
System Assets (1)	68309	68565	69395	70233	70700	71905	71803	71524	71090	70648	70472	70162	69845	69373	68894	68630	68284	67930	67419	67025	66649	66264	65870	65320	64838
Plant & Equipment	1058	1032	1007	982	958	935	912	890	868	847	827	806	787	767	749	731	713	695	678	662	646	630	615	600	585
Other Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ASSETS	**83390**	**84020**	**84520**	**84994**	**85442**	**85845**	**86261**	**86701**	**87151**	**87614**	**88076**	**88560**	**89055**	**89564**	**90077**	**90597**	**91124**	**91649**	**92187**	**92723**	**93256**	**93780**	**94297**	**94823**	**95347**
LIABILITIES																									
Bank Overdraft	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Creditors	268	272	275	278	281	284	286	289	292	295	298	301	304	307	310	313	316	319	322	325	328	330	333	336	339
Borrowings	381	368	354	341	327	314	301	288	275	262	249	236	224	212	199	186	174	162	149	136	123	110	97	84	71
Provisions	296	300	304	307	311	314	317	321	323	327	330	333	336	339	343	346	349	352	356	359	363	366	369	372	375
TOTAL LIABILITIES	**945**	**940**	**933**	**926**	**919**	**911**	**905**	**898**	**891**	**884**	**877**	**870**	**864**	**858**	**851**	**845**	**839**	**833**	**826**	**819**	**813**	**806**	**799**	**792**	**785**
NET ASSETS COMMITTED	**82445**	**83080**	**83587**	**84068**	**84523**	**84934**	**85356**	**85803**	**86260**	**86730**	**87199**	**87690**	**88191**	**88706**	**89226**	**89752**	**90285**	**90816**	**91360**	**91904**	**92442**	**92974**	**93498**	**94031**	**94562**
EQUITY																									
Accumulated Operating Result	65585	64965	64242	63501	62745	61963	61191	60476	59806	59187	58605	58075	57587	57144	56742	56381	56053	55754	55497	55271	55068	54886	54722	54594	54494
Asset Revaluation Reserve	16860	18115	19346	20567	21778	22971	24165	25327	26454	27543	28594	29615	30604	31562	32484	33372	34232	35062	35864	36633	37374	38089	38776	39437	40069
TOTAL EQUITY	**82445**	**83080**	**83587**	**84068**	**84523**	**84934**	**85356**	**85803**	**86260**	**86730**	**87199**	**87690**	**88191**	**88706**	**89226**	**89752**	**90285**	**90816**	**91360**	**91904**	**92442**	**92974**	**93498**	**94032**	**94562**
(1) Notes to System Assets																									
Current Replacement Cost	126561	127722	129483	131277	132721	134934	135856	136611	137219	137829	138717	139483	140252	140874	141499	142352	143133	143917	144555	145319	146113	146909	147708	148360	149091
Less: Accumulated Depreciation	58252	59157	60088	61044	62020	63029	64052	65086	66129	67181	68245	69321	70407	71501	72605	73722	74849	75988	77135	78294	79464	80645	81838	83040	84252
Written Down Current Cost	68309	68565	69395	70233	70700	71905	71803	71524	71090	70648	70472	70162	69845	69373	68894	68630	68284	67930	67419	67025	66649	66264	65870	65320	64838

Bathurst IWCM Plan : IWCM 2

Performance Indicators

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32
Typical Residential Bills	360	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390
Average Residential Bills (2007/08$)	345	376	376	376	376	377	378	378	378	378	378	379	379	379	379	380	380	380	380	380	381	381	381	381	381
Mgmnt Cost / Assessment (2007/08$)	161	162	162	162	161	162	161	162	162	161	162	162	161	161	161	161	161	161	161	161	161	161	161	162	161
OMA Cost per Assessment (2007/08$)	369	370	369	369	369	369	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368
Operating Sales Margin (%)	-4.77	4.13	2.69	2.64	2.46	2.32	2.40	2.64	2.68	2.75	2.80	3.03	3.16	3.27	3.33	3.49	3.58	3.62	3.78	3.87	3.89	3.92	3.93	4.10	4.20
Economic Real Rate of Return (%)	-0.44	0.42	0.27	0.26	0.25	0.23	0.24	0.27	0.28	0.29	0.30	0.33	0.35	0.37	0.38	0.40	0.42	0.43	0.46	0.48	0.49	0.50	0.50	0.54	0.56
Debt Service Ratio	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Debt/Equity Ratio	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest Cover	15.04	42.83	38.71	38.08	39.04	37.78	38.30	43.00	45.59	50.90	53.52	60.00	63.45	70.79	78.83	83.28	92.47	102.63	115.60	121.20	135.00	151.00	169.58	214.00	248.33
Return on capital (%)	0.45	1.19	1.05	1.00	0.95	0.89	0.88	0.92	0.94	0.98	1.00	1.03	1.06	1.09	1.11	1.14	1.16	1.18	1.21	1.23	1.24	1.25	1.25	1.28	1.30
Cash and Investments (2007/08$'000)	13209	13597	13283	12934	12929	12142	12672	13405	14302	15219	15870	16675	17497	18489	19491	20284	21166	22054	23110	24048	24964	25881	26799	27880	28892
Debt outstanding (2007/08$'000)	381	368	354	341	327	314	301	288	275	262	249	236	224	212	199	186	174	162	149	136	123	110	97	84	71
Net Debt (2007/08$'000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Bathurst Regional Council
IWCM 2
Sewerage **Capital Works Program**

2,009 Financial Year of Program Commencement
2,009 Financial Year of Capital Estimates, All Estimates in $'000

Issue	Capital Element	IWCM Opt #	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
	Major Headworks STP																															
12	Capacity																															
12	Model Review					150					150					150					150					150				150		
12	Mechanical Refurbishment		250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
12	Electrical Refurbishment		250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
12	Model implementation						150					150					150					150					150					150
	Gilmour St PS																															
12	Sewage pumping stations																															
12	Dry weather flows PS upgrade		200	1,200																												
	Pump Stations																															
31	Pump station odour control		105																													
	Sewerage Reticulation System																															
12	General Sewerage System Rehabilitation		150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
12	Minor New Works		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
12	Seymour St main upgrade		155																													
12	Rankin St main upgrade		481																													
12	Stanley St main upgrade				634																											
12	Durham St main upgrade				213																											
12	Northern Gilmour St main upgrades					473																										
12	Southern Gilmour St main upgrades					992																										
12	Remove constructed overflows						36																									
12	Year 5 Performance assessment						58																									
12	Mechanical Refurbishment		150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
12	Electrical Refurbishment		150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
12	New Wastewater Services		180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
	Smart Sewers	18	324	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	40	40
12	Infiltration/ Inflow assessment	8	87	301	303	306	309	312	314	317	320	323	326	329	332	335	338	341	344	347	350	353	355	358	361	364	367	370	374	377	383	386
	Monitoring																															
	Septic Monitoring Program	32	30	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
	Planning																															
12	IWCM Review						75				125					75				125					75				125			
26	Strategic Business Plan		75					75					75					75					75					75				
12	Development Servicing Plan		75					75					75					75					75					75				
			2,711	2,744	2,393	3,164	1,871	1,705	1,557	1,560	1,838	1,716	1,719	1,572	1,575	1,803	1,731	1,734	1,587	1,715	1,743	1,746	1,749	1,602	1,680	1,758	1,761	1,764	1,742	1,620	1,777	1,780

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
	2,711	**2,744**	**2,393**	**3,164**	**1,871**	**1,705**	**1,557**	**1,560**	**1,838**	**1,716**	**1,719**	**1,572**	**1,575**	**1,803**	**1,731**	**1,734**	**1,587**	**1,715**	**1,743**	**1,746**	**1,749**	**1,602**	**1,680**	**1,758**	**1,761**	**1,764**	**1,742**	**1,620**	**1,777**	**1,780**
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	602	555	558	710	882	716	569	571	849	727	730	583	586	814	742	745	598	726	754	757	760	613	691	769	772	775	753	631	787	790
	1,159	1,239	886	1,504	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	40	40
	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950	950

Bathurst Regional Council

Sewerage OMA IWCM 2 Scenario

2009 Financial Year of Schedule Commencement

2009 Financial Year of OMA Estimates, All Estimates in $'000

% Multiplier		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
	% Var DSS		0.0%	-0.9%	-3.4%	-4.1%	-4.3%	-4.5%	-4.6%	-4.7%	-4.9%	-5.0%	-5.2%	-5.2%	-5.2%	-5.3%	-5.4%	-5.5%	-5.6%	-5.7%	-5.9%	-6.0%	-6.1%	-6.2%	-6.2%	-6.3%	-6.3%	-6.3%	-6.4%	-6.4%	-6.4%
	Historical Administration (M)	1,326	1,346	1,361	1,376	1,391	1,406	1,421	1,435	1,449	1,463	1,477	1,491	1,505	1,519	1,533	1,547	1,561	1,576	1,591	1,606	1,620	1,634	1,648	1,662	1,676	1,690	1,704	1,718	1,732	1,746
0	Scenario Administration	1,326	1,346	1,361	1,376	1,391	1,406	1,421	1,435	1,449	1,463	1,477	1,491	1,505	1,519	1,533	1,547	1,561	1,576	1,591	1,606	1,620	1,634	1,648	1,662	1,676	1,690	1,704	1,718	1,732	1,746
	Historical Engineering & Supervision (M)	734	745	753	761	769	777	785	793	801	809	817	825	833	841	849	857	865	873	881	889	897	905	913	921	929	937	945	953	961	969
0	Scenario Engineering & Supervision	734	745	753	761	769	777	785	793	801	809	817	825	833	841	849	857	865	873	881	889	897	905	913	921	929	937	945	953	961	969
	Historical Operation Expenses (M)	993	1,008	1,019	1,030	1,041	1,052	1,063	1,074	1,085	1,096	1,107	1,118	1,129	1,140	1,151	1,162	1,173	1,184	1,195	1,206	1,217	1,227	1,237	1,247	1,257	1,268	1,279	1,290	1,301	1,311
0	Scenario Operation Expenses	993	1,008	1,019	1,030	1,041	1,052	1,063	1,074	1,085	1,096	1,107	1,118	1,129	1,140	1,151	1,162	1,173	1,184	1,195	1,206	1,217	1,227	1,237	1,247	1,257	1,268	1,279	1,290	1,301	1,311
	Historical Maintenance Expenses (M)	1,208	1,226	1,240	1,254	1,267	1,280	1,293	1,306	1,319	1,332	1,345	1,358	1,371	1,384	1,397	1,410	1,423	1,436	1,449	1,462	1,475	1,488	1,500	1,513	1,526	1,539	1,552	1,565	1,578	1,591
0	Scenario Maintenance Expenses	1,208	1,226	1,240	1,254	1,267	1,280	1,293	1,306	1,319	1,332	1,345	1,358	1,371	1,384	1,397	1,410	1,423	1,436	1,449	1,462	1,475	1,488	1,500	1,513	1,526	1,539	1,552	1,565	1,578	1,591
	Historical Energy Costs (M)	322	327	331	335	339	343	347	351	355	359	363	367	371	375	379	383	387	391	395	399	403	406	409	412	415	419	423	427	431	434
0.6	Scenario Energy Costs	322	327	329	328	331	334	338	341	345	349	352	356	359	363	367	371	374	378	381	385	389	391	394	397	399	403	407	411	414	417
	Historical Chemical Costs (M)	129	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
0.6	Scenario Chemical Costs	129	131	131	130	131	132	132	133	134	135	136	137	138	139	139	140	141	142	143	144	145	146	146	147	148	149	150	151	152	153
	Historical Other Expenses (M)	172	175	177	179	181	183	185	187	189	191	193	195	197	199	201	203	205	207	209	211	213	215	217	219	221	223	225	227	229	231
0	Scenario Other Expenses	172	175	177	179	181	183	185	187	189	191	193	195	197	199	201	203	205	207	209	211	213	215	217	219	221	223	225	227	229	231
	SCENARIO TOTAL	**4,884**	**4,958**	**5,011**	**5,058**	**5,110**	**5,164**	**5,217**	**5,269**	**5,322**	**5,374**	**5,427**	**5,479**	**5,532**	**5,585**	**5,638**	**5,690**	**5,742**	**5,796**	**5,849**	**5,903**	**5,955**	**6,006**	**6,055**	**6,106**	**6,157**	**6,209**	**6,262**	**6,315**	**6,367**	**6,418**
	Historical Total	4,884	4,958	5,013	5,068	5,122	5,176	5,230	5,283	5,336	5,389	5,442	5,495	5,548	5,601	5,654	5,707	5,760	5,814	5,868	5,922	5,975	6,026	6,076	6,127	6,178	6,231	6,284	6,337	6,390	6,441

Bathurst Regional Council

Water Supply **Capital Works Program**

2,009 Financial Year of Program Commencement

2,009 Financial Year of Capital Estimates, All Estimates in $'000

Data Sources	Capital Element	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
BCC Capital Works Strategic Plan*	Catchment Management Expendit	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
BCC Capital Works Strategic Plan*	Catchment Management Grant Inc	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160
		40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
		40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Data Sources	Capital Element	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
BCC Capital Works Strategic Plan*	Catchment Management Expendit	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
BCC Capital Works Strategic Plan*	Catchment Management Grant Inc	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160	-160
		40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
		40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Bathurst Regional Council

Stormwater **OMA**

2009 Financial Year of Schedule Commencement

2009 Financial Year of OMA Estimates, All Estimates in $'000

Issue	Capital Element	IWCM Opt #	Description	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
	Planning																																
2	WSUD DCPs	22	Development Control Plans to include WSUD requirements	18	8	9	10	11	12	13	14	15	16	16	17	18	19	20	20	21	22	23	24	24	25	26	27	28	28	29	30	31	32
10	Review LEP	**25**		36	2	2	2	2																									
	Monitoring																																
4	Stormwater	19	Stormwater Quality Monitoring	28	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
9	River	20	River Quality Monitoring	28	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
8	Salinity monitoring	34		0	50	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
13	Trade waste monitoring	27	Improve trade waste monitoring	23	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	Litter																																
22	Litter	21	Increase waste management infrastructure (street)	69	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
22	Litter	21	Increased Street Cleaning	19	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
	Rehabilitation																																
10	Soil Erosion	23	Upgrade and fence waterway buffers in agricultural areas	43	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
10	Soil Erosion	33	Upgrade and fence waterway buffers on PUBLIC land	43	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
22	Waterway / riparian	26	School Waterway protection/ rehabilitation program	21	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
22	Waterway / riparian	24	Rehabilitate existing degraded water courses/ riparian zones	27	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
	TOTAL			**356**	**256**	**249**	**250**	**251**	**249**	**250**	**251**	**252**	**253**	**253**	**254**	**255**	**256**	**257**	**257**	**258**	**259**	**260**	**261**	**261**	**262**	**263**	**264**	**265**	**265**	**266**	**267**	**268**	**269**
	Operations			167	158	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151
	Maintenance			114	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Administration			75	33	33	34	35	34	34	35	36	37	38	38	39	40	41	42	42	43	44	45	46	46	47	48	49	50	50	51	52	53
	Chemical/Energy			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Bathurst Regional Council
IWCM 2
Water Supply

Capital Works Program
2,009 Financial Year of Program Commencement
0 Financial Year of Capital Estimates, All Estimates in $'000

Data Sources	Area	Issue	Capital Element	IWCM Opt #	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
			Ben Chifley Dam																															
BCC Capital Works Strategic Plan*	BCD	17	Management Plan Works		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
BCC Capital Works Strategic Plan*		20	Pipeline Dam to Town							10,000	10,000	5,000																					
BRC 08/09 -11/12 Draft Management Plan		14	Recreation/env/catchment		150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
BRC 08/09 -11/12 Draft Management Plan		18	Roads		68																											
BRC 08/09 -11/12 Draft Management Plan		14	Caravan park																													
BRC 08/09 -11/12 Draft Management Plan		20	Pipeline Feasibility		150								250										250										
			Winburndale Dam																															
BCC Capital Works Strategic Plan*	WIN Dam	31	Dam safety			1,000	4,000	4,000																									
BCC Capital Works Strategic Plan*		17	Pipeline		100	100	100	100	100	100	100	100	100	100	100	100	100																
BRC 08/09 -11/12 Draft Management Plan		17	Scour Valve refurb																														
			Water Filtration Plant																															
BCC Capital Works Strategic Plan*	WFP	29	Capacity augmentation																9,450															
BCC Capital Works Strategic Plan*		29	Capacity augmentation																															
BCC Capital Works Strategic Plan*		29	Install GAC filters							0	0	0	0	0																			
BCC Capital Works Strategic Plan*		29	Electrical refurbishment		150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
BCC Capital Works Strategic Plan*		29	Mechanical refurbishment		150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
BCC Capital Works Strategic Plan*		29	Raw water pumping station							0	0	0	0	0					250														
BCC Capital Works Strategic Plan*		29	Clear water pumping station							0	0	0	0	0					500														
BCC Capital Works Strategic Plan*		29	Model Review					150		0	0	0	150					150					150					150				150	
BCC Capital Works Strategic Plan*		29	Model implementation						150					150					150					150					150				150
			Infrastructure - Distribution																															
Pers Comms (R.Deans BRC July 08)	Network	29	Mechanical Refurbishment		150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Pers Comms (R.Deans BRC July 08)		29	Electrical Refurbishment		150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
BCC Capital Works Strategic Plan*		29	Additional No 6 Res Cap ML												1,350																		
Pers Comms (R.Deans BRC July 08)		29	New meter installation		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
BRC IWCM		29	Leak Detection + Repair	11	40	13	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRC IWCM		29	Mains flushing	31	**30**																												
			New works/ renewals																															
BCC Capital Works Strategic Plan*	All	18	Minor new works		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
BCC Capital Works Strategic Plan*		18	Unmetered properties		20	20	20	20																									
BCC Capital Works Strategic Plan*		18	CBD renewal program		250	250	250	250	250	250	250	250	250	250																			
Pers Comms (R.Deans BRC July 08)		18	New Water Services		200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
		17	Demand Management																														
BRC IWCM	All	17	WELS	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRC IWCM	All	17	IWCM Education	1	23	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
BRC IWCM	All	17	RWT Rebate	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRC IWCM	All	17	Greywater Recyc. Retrofit	13	25	6	6	6	6	7	7	7	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
BRC IWCM	All	17	W machine rebate	12	62	53	53	0	0																								
BRC IWCM		17	Commercial Toilet Retrofit	30	81	23	23	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Planning																															
Pers Comms (R.Deans BRC July 08)	All	17	IWCM Review						75				125					75				125					75				125		
Pers Comms (R.Deans BRC July 08)		25	Strategic Business Plan		75					75					75					75				75					75			

2,054	**2,596**	**5,597**	**5,678**	**1,733**	**11,563**	**11,489**	**6,489**	**2,009**	**1,634**	**2,659**	**1,234**	**1,234**	**1,359**	**11,484**	**1,209**	**1,134**	**1,259**	**1,534**	**1,284**	**1,209**	**1,134**	**1,209**	**1,284**	**1,284**	**1,209**	**1,259**	**1,134**	**1,284**	**1,284**
2,054	**2,596**	**5,597**	**5,678**	**1,733**	**11,563**	**11,489**	**6,489**	**2,009**	**1,634**	**2,659**	**1,234**	**1,234**	**1,359**	**11,484**	**1,209**	**1,134**	**1,259**	**1,534**	**1,284**	**1,209**	**1,134**	**1,209**	**1,284**	**1,284**	**1,209**	**1,259**	**1,134**	**1,284**	**1,284**
686	446	447	528	583	413	339	339	609	484	409	334	334	559	1,234	409	334	459	484	484	409	334	409	484	484	409	459	334	484	484
500	1,350	4,350	4,350	350	10,350	10,350	5,350	600	350	1,700	350	350	350	9,800	350	350	350	600	350	350	350	350	350	350	350	350	350	350	350	350
868	800	800	800	800	800	800	800	800	800	550	550	550	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450
196	**78**	**78**	**22**	**22**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

Bathurst Regional Council

Water **OMA** **IWCM 2**

2009 Financial Year of Schedule Commencement

2009 Financial Year of OMA Estimates, All Estimates in $'000

% Multiplier	% Var	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Historical Administration (M)	1,475	1,475	1,490	1,505	1,520	1,535	1,550	1,565	1,580	1,595	1,610	1,625	1,640	1,655	1,670	1,685	1,700	1,715	1,730	1,745	1,759	1,773	1,787	1,801	1,815	1,829	1,844	1,859	1,874	1,889
0	Scenario Administration	1,475	1,475	1,490	1,505	1,520	1,535	1,550	1,565	1,580	1,595	1,610	1,625	1,640	1,655	1,670	1,685	1,700	1,715	1,730	1,745	1,759	1,773	1,787	1,801	1,815	1,829	1,844	1,859	1,874	1,889
	Historical Engineering & Supervision (M)	698	698	705	712	719	726	733	740	747	754	761	768	775	782	789	796	803	810	817	824	831	838	845	852	859	866	873	880	887	894
0	Scenario Engineering & Supervision	698	698	705	712	719	726	733	740	747	754	761	768	775	782	789	796	803	810	817	824	831	838	845	852	859	866	873	880	887	894
	Historical Operation Expenses (M)	1,585	1,585	1,601	1,617	1,633	1,649	1,665	1,681	1,697	1,713	1,729	1,745	1,761	1,777	1,793	1,809	1,825	1,841	1,857	1,873	1,889	1,904	1,919	1,934	1,949	1,964	1,980	1,996	2,012	2,028
0	Scenario Operation Expenses	1,585	1,585	1,601	1,617	1,633	1,649	1,665	1,681	1,697	1,713	1,729	1,745	1,761	1,777	1,793	1,809	1,825	1,841	1,857	1,873	1,889	1,904	1,919	1,934	1,949	1,964	1,980	1,996	2,012	2,028
	Sceanrio Operation Expenses	1,862	1,912	2,355	2,483	2,428	2,377	2,398	2,325	2,345	2,365	2,381	2,401	2,422	2,443	2,464	2,485	2,506	2,527	2,548	2,569	2,590	2,610	2,630	2,650	2,669	2,689	2,710	2,731	2,753	2,774
	Historical Maintenance Expenses (M)	1,548	1,548	1,564	1,580	1,596	1,612	1,628	1,644	1,660	1,675	1,690	1,705	1,721	1,736	1,751	1,766	1,782	1,798	1,814	1,830	1,845	1,860	1,875	1,890	1,905	1,920	1,935	1,950	1,966	1,982
0	Scenario Maintenance Expenses	1,548	1,548	1,564	1,580	1,596	1,612	1,628	1,644	1,660	1,675	1,690	1,705	1,721	1,736	1,751	1,766	1,782	1,798	1,814	1,830	1,845	1,860	1,875	1,890	1,905	1,920	1,935	1,950	1,966	1,982
	Historical Energy Costs (M)	89	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117
1	Scenario Energy Costs	89	89	89	86	86	86	85	86	87	88	89	90	91	91	92	93	94	95	96	97	98	98	99	100	101	102	103	104	104	105
	Historical Chemical Costs (M)	550	550	556	562	568	574	580	586	592	598	604	609	615	621	627	633	639	645	651	657	662	667	672	677	682	687	692	698	704	710
1	Scenario Chemical Costs	550	550	552	532	529	528	527	532	537	542	547	551	557	563	568	573	578	583	588	594	598	602	606	611	615	619	624	629	634	639
	Historical Purchase of Water (M)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	Scenario Purchase of Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Historical Other Expenses (M)	236	236	238	240	242	244	246	248	250	252	254	256	258	260	262	264	266	268	270	272	274	276	278	280	282	284	286	288	290	292
0	Scenario Other Expenses	236	236	238	240	242	244	246	248	250	252	254	256	258	260	262	264	266	268	270	272	274	276	278	280	282	284	286	288	290	292
	SCENAIRO TOTAL	6,458	6,508	6,994	7,138	7,119	7,108	7,168	7,141	7,206	7,272	7,332	7,397	7,464	7,530	7,596	7,662	7,729	7,796	7,863	7,930	7,994	8,057	8,120	8,183	8,246	8,310	8,375	8,441	8,508	8,575
	Historical TOTAL	6,181	6,181	6,244	6,307	6,370	6,433	6,496	6,559	6,622	6,684	6,746	6,807	6,870	6,932	6,994	7,056	7,119	7,182	7,245	7,308	7,368	7,427	7,486	7,545	7,604	7,663	7,724	7,786	7,849	7,912