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Richmond Valley Council

Integrated Water Cycle Management Strategy Plan

April 2008

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Executive Summary

This report documents the development of the Richmond Valley Council (RVC) Integrated Water Cycle Management (IWCM) Strategy. This report has been developed in accordance with the NSW Department of Water and Energy (DWE) *IWCM Guidelines* (2004). It identifies the process in which the preferred scenario for the future management of urban water services in RVC was chosen and provides guidance for its implementation.

IWCM is a planning process developed by the NSW Department of Water and Energy (DWE), with defined steps to effectively integrate water supply, sewerage and stormwater to achieve sustainable management of these services.

IWCM is a way of managing water in which all components of the water system are integrated so that water is used optimally. For a local water utility such as RVC, this means that the three main urban services – water supply, sewerage and stormwater – should be planned and managed in an integrated way to ensure that the maximum value is obtained from the resources and that benefits to the environment and community are realised.

IWCM deals with the complex linkages between the different elements of the water cycle. It addresses issues facing local water utilities as well as the more general issues facing the environment. An IWCM Strategy Plan considers issues such as:

- The future urban water service needs and customer expectations;
- The availability of water including water sources such as rainwater, effluent and stormwater; and
- The impact of town water use on other water users including the environment and future generations.

The IWCM process

The DWE guidelines set out a three step process for developing an IWCM plan:

- A concept study: What are the issues?
- A strategy: How do we fix the problems?
- An implementation phase: How do we know the problems are fixed?

RVC has prepared the IWCM Concept Study and this IWCM Strategy Plan. Throughout the IWCM process, stakeholder consultation was undertaken to ensure that stakeholders contributed to the definition of water cycle management issues and the identification of potential solutions. This was achieved through the formation of a Project Reference Group (PRG) which included representatives from RVC, government agencies, local organisations and the community.

The RVC IWCM Concept Study identified catchment, water resource and urban water cycle management issues relevant to the management and operation of RVC water supply and sewerage businesses. These issues and potential solutions were identified through a stakeholder consultation program and the review of background information.

The IWCM Strategy was developed through the building and assessment of a series of management strategies (scenarios) to address the issues defined in the Concept Study.

Based on the outcomes of the Concept Study and a series of desktop analyses, a number of different management options were developed for each of the water cycle issues identified. Each option is supported by a different asset management plan depending on the type of infrastructure required to deliver the services. This in turn means that each option will have different environmental, social and economic outcomes (both positive and negative).

Each of the scenarios was assessed to identify a preferred scenario for implementation. The different scenarios are assessed on their economic, social and environmental outcomes. The preferred scenario sets out a list of strategic actions to improve the management of the identified water cycle issues over a 30 year planning horizon.

Current Urban, Catchment and Water Resources Situation

RVC is responsible for the extraction, treatment and reticulation of water to the town of Casino. Other towns and villages within the Richmond Valley local government area (LGA) with reticulated water supplies (Coraki, Broadwater/Rileys Hill, Evans Head and Woodburn) are serviced by the Mid and Lower Richmond River (MLRR) bulk water supply scheme operated by Rous Water.

The population of Casino is expected to increase from 10,504 people identified in the 2006 Census to over 12,000 people in 10-15 years time. Population growth is expected to be the most important driver of demand over the next 30 years. Baseline water forecasts predict that annual average demand in the Casino water supply scheme will rise from 7.2 ML/d in 2006 to 9.8 ML/d in 2036 (a 36% increase in water use).

The vast majority of the Richmond Valley area is rural land and the water supply catchments generally have poor vegetation coverage. Agricultural land uses, including beef cattle, dairying, sugar cane, tea tree oil, poultry and timber, account for almost half of the land. These practices may exert pressures on the quality of water resources through the impacts of vegetation clearing and subsequent erosion, the application of treatments to improve soils or eliminate pests, ploughing and the trampling of soils and destabilisation of stream banks by stock.

Increasing urbanisation of some sub-catchments of the Richmond River is resulting in alterations to the natural flow regime and subsequently increasing the erosive potential of discharges and pollution loads to waterways.

The main rivers of the Richmond Valley LGA are the Richmond River and Evans River. Casino town water is extracted from Jabour Weir in the Kyogle Area sub-catchment of the Richmond River. This sub-catchment is under high environmental and extraction stress due to loss of riparian vegetation, stream bank erosion, bed instability, high usage, in-stream structures, water quality and lack of tree cover.

Jabour Weir is an on-stream storage and has a capacity of 1,623 ML. The reliability of Casino bulk water supply has been investigated for a range of future demand scenarios as part of the IWCM Strategy planning. The reliability of the water supply system is relatively low and level 1 to level 4 restrictions could be expected almost every year. The probability of running out of water in any year is high and a back up source is required.

RVC provides reticulated sewerage services to Casino, Evans Head, Woodburn, Rileys Hill and Coraki. The town of Broadwater and villages of Rappville and Fairy Hill utilise on-site systems for treatment of wastewater. Sewering of Broadwater is expected to be completed by 2009, with sewage transferred to the recently upgraded Evans Head Sewage Treatment Plant (STP).

Approximately one third of Casino STP effluent is reused (at the Casino Golf Course and for agricultural irrigation). The remaining effluent from Casino, Coraki and Rileys Hill STP is discharged to tributaries of the Richmond River.

The upgrade of the Evans Head STP, completed in 2007, will accommodate the growth in the area, allow treatment of Broadwater sewerage and meet the stringent licence requirements for future reuse schemes or effluent disposal. The Casino STP will be augmented in 2009/10 to allow for future population growth.

There are over 2,800 licensed on-site sewage systems in the RVC area. RVC has prepared and is implementing an On-Site Sewage Management Strategy for the area focusing on existing and new systems. Random audits of the existing systems to assess compliance with legislation and pre-purchase inspections of conditions are undertaken.

A stormwater drainage network consisting of kerb and guttering, pipes, gross pollutant traps, detention basins and natural drainage lines service the urban areas. The system discharges urban stormwater to local creeks, lagoons and the Richmond River and ultimately the ocean.

Urban Water Issues facing RVC

The IWCM Concept Study provides a basis to understand the issues faced by RVC in the provision of water, sewerage and stormwater services. These catchment, water resource and urban issues were identified through the review of existing background information as well as discussions with RVC staff and regulatory authorities and stakeholder consultation.

Following on from the Concept Study, a set of IWCM issues which define the urban water cycle management problems faced by RVC was developed. The IWCM issues were confirmed during the stakeholder consultation program.

IWCM Issues

- Poor town water supply security.
- Lack of ground and surface water sharing plans. RVC must be involved in the water sharing process to ensure town water supplies are adequate.
- RVC must implement sustainable effluent reuse with end user requirements considered.
- Existing land use practices and urban impacts are affecting surface water quality.
- High operating and management costs for water and sewerage systems lead to relatively high typical residential bills.
- RVC must comply with current and future potable water standards.
- Hydrologic stress in catchments contributes to unsustainable extraction particularly during low flows.
- There is a need for sustainable management of onsite sewage systems.
- Stormwater infiltration into sewerage system increases wet weather flows.
- There is a need for sustainable stormwater / rainwater reuse.
- Climate change may adversely alter the rainfall and temperature patterns of the study area.
- Non-conformances at Coraki and Rileys Hill sewage treatment plants.
- Poor demand management in terms of consumption and unaccounted for water.
- ASS soils in RVC urban areas potentially impact on sewer infrastructure.

Objectives for IWCM

A series of draft objectives to set the direction of RVC's IWCM Strategy were formulated as part of the stakeholder consultation process and documented in the IWCM Concept Study. These objectives set goals for the future management of the identified water cycle issues.

IWCM Objectives

- Improve land use management through education and demonstration.
- Coordinated approach to sharing of surface and ground waters.
- Maximise high value (priority to substitution of potable water) reuse.
- Increase number of alternative water sources.
- Improved security of urban water supply.
- Provide highest level of service relative to users' willingness to pay.

Options considered

In developing the IWCM Strategy, options to manage water supply, sewerage and stormwater services in the future were assessed in a two part process:

- Identification and assessment of individual management options; and
- Assessment of scenarios (bundles of complementary management options).

The options investigated were:

IWCM Options

- Regional institutional arrangements
- Demand management
- Treatment capacity
- Security of supply
- Emergency backup
- Effluent management
- Stormwater harvesting
- UFW reduction
- Water Sharing Plan (WSP)
- Effluent reuse education
- On-site sewage management
- Environmental flows provision
- Stormwater quality improvement and management
- Salt water intrusion reduction
- Catchment management initiatives
- Flood management
- Blue-green algae management
- STP point source contamination control
- Other point source contamination control
- Education on sustainable land management practice
- Financial management
- Asset renewals
- Water treatment process upgrade
- Drinking water quality improvement
- Rainwater tanks

- Risk management
- Alternative water sources
- Sewage treatment process upgrade
- Unaccounted-for-water reduction
- Acid sulphate soil management

Preferred IWCM Scenario

Having identified and evaluated a range of opportunities to manage each of the IWCM issues, five draft scenarios were established. The scenarios were:

- A "base" case (B) also known as "business as usual", which does not include any solutions beyond what RVC is already doing to improve or maintain the water supply and sewerage businesses;
- A "traditional" case (T) based on traditional solutions that solve issues in an isolated, non-integrated way; and
- Three "integrated" solutions (IN 1, IN 2 and IN 3) that incorporate combinations of various build and non-build options and integration of water supply, sewerage and stormwater management by including recycled water use and stormwater harvesting, among other options.

Tailoring the IWCM process in this way ensured that that a high number of potential options were investigated and assessed at the preliminary stage without compromising the ability of the final outcome to provide effective management solutions.

Each of the five draft scenarios combines complementary management options to provide RVC with solutions to the water cycle management issues. The main features of the draft scenarios are listed below.

Scenario	Demand Management	Security of Supply	Effluent Recycling
Base Case (B)	None	Not secure.	Golf course and agricultural irrigation (Blue Dog)
Traditional (T)	Low level	Source Investigation	B + sporting fields, industry
Integrated 1	High level	Source Investigation	B + sporting fields, industry
Integrated 2	High level	T + Increase of security through dual reticulation	T + Dual reticulation for new development
Integrated 3	High level	T + Increase of security through Indirect Potable Reuse	T + Indirect potable reuse

The scenarios developed were ranked based on their performance against a series of economic, social and environmental measures (a Triple Bottom Line assessment). The preferred scenario was determined through consultation with the PRG, steering committee and the TBL assessment.

Based on the results of the consultation program and the scenario ranking, Integrated 3 was identified as the preferred scenario for implementation. However, the PRG found that the implementation of this scenario will require a relatively long lead time due to the investigations, risk assessment and consultation required for the indirect potable reuse component. The PRG considered that the scenario "Integrated 1" should be adopted as a short term solution. Also, the PRG agreed that it was worth considering dual reticulation for new development (from Integrated scenario 2) if feasible.

Therefore, a hybrid of Integrated Scenarios 1, 2 and 3 has been identified by RVC as the preferred scenario. The preferred scenario is summarised below.

IWCM Issues		Strategies	Preferred Scenario
1	Poor town water supply security	Regional institutional arrangements	Conduct feasibility study into regional water supply arrangements including connection of Casino system to Rous Water and RVC management of Lower Richmond River supply
		Demand management	High level demand management (BASIX, pricing, education (as in Rous Demand Management Plan), UFW reduction, showerhead retrofit, business audit and water conservation order)
		Regional demand management	Regional Demand Management Strategy
		Treatment capacity	Present WTP capacity 23 ML/d. No augmentation required.
		Security of supply	SBP cost allocation for augmentation. Alternate Source Investigation. Increase of security of supply through indirect potable reuse and/or dual reticulation (if feasible in future).
		Emergency backup	Include consideration of alternative emergency supplies in Alternate Source Investigation
		Effluent management - Casino	Reuse at Golf Course and agricultural irrigation (Blue Dog), Blue Circle cement, sporting fields. In future, dual reticulation for new development and indirect potable reuse to be considered.
		Effluent management - MLRR	Coraki golf course, irrigation of sporting fields and open space areas. In future, dual reticulation for new development and recharge Woodburn aquifer to be considered.
		Stormwater harvesting	Encourage individual development / industry to harvest stormwater.
		UFW reduction (metering)	Metering in distribution system.
		UFW reduction (renewal)	Condition based asset renewal.
		UFW reduction (leak detection)	UFW reduction as in Demand Management above.
2	Lack of ground and surface water sharing plans. RVC must be involved in the water sharing process to ensure town water supplies are adequate.	Macro Water Sharing Plan (WSP)	Contribute to DNR Macro WSP development process.

IWCM Issues		Strategies	Preferred Scenario
3	RVC must implement sustainable effluent reuse with end user requirements considered.	Effluent management	As in 1.
		Education	Education on effluent reuse when and if dual reticulation and/or indirect potable reuse are implemented.
4	Existing landuse practices and urban impacts are affecting surface water quality	On-site sewage management (design regulation)	Regulated on-site system design approval.
		On-site sewage management (monitoring)	Implement existing program (RVC On-site Sewage Management Strategy).
		On-site sewage management (improvement)	Incentives for better on site technologies.
		Environmental flows	Water sharing process as in 2, indirect potable reuse to increase base flows if implemented in future.
		Stormwater quality improvement and management	Full implementation of Stormwater Management Plan (2007).
		Salt water intrusion reduction	Water sharing process as in 2
		Catchment management initiatives	Liaison with CMA to implement Northern Rivers CMA Catchment Action Plan.
		Water Sharing Plan	Water sharing process as in 2
		Flood management	Full implementation of Flood Management Plan (2002).
		Blue-green algae management	As per Emergency backup as in 1, environmental flows as in 4, addition of PAC treatment as in 6, and regional institutional arrangement (via alternate source) as in 1.
		STP point source contamination control	Augment Casino, Coraki, Evans Head STPs, targeted renewals at Rileys Hill STP.
		Point source contamination control	Liaison with DEC to enforce POEO licence requirements.
		Education	Education on sustainable land management practices.
5	High operating and management costs for water and sewerage systems lead to relatively high typical residential bills	Financial management	Update DSP and Financial Plan, apply full cost recovery pricing (Demand Management as in 1) and Designed to be self funding and less costly. Greater access to funds through diversified services and product delivery.
		Water and sewerage asset renewals	Condition based asset renewal.
6	RVC must comply with current and future potable water standards.	Treatment plant process upgrade - Casino	Current process includes sedimentation and filtration. Addition of PAC and KMnO4, review and adjust current operational procedure.
		Drinking water quality	As per Rous water supply with quality compliance clause in Service Level Agreement.

IWCM Issues		Strategies	Preferred Scenario
7	Hydrologic stress in catchments contributes to unsustainable extraction particularly during low flows.	Regional institutional arrangements	As in 1.
		Emergency backup	As in 1.
		Demand management	As in 1.
		Catchment management initiatives	As in 4.
		Environmental flows	As in 4.
8	There is a need for sustainable management of onsite sewage systems.	On-site sewage management systems (design regulation, monitoring and incentives)	As in 4.
9	Stormwater infiltration into sewerage system increases wet weather flows	Sewerage asset renewals	Infiltration / inflow reduction program and asset renewal as in 5.
10	There is a need for sustainable stormwater / rainwater reuse	Rainwater tanks	As in demand management of 1 (BASIX).
		Stormwater harvesting	As in 1
11	Climate change may adversely alter the rainfall and temperature patterns of the study area	Risk management	Sensitivity analysis on yield with reduced rainfall.
		Alternative water sources	As in 1 (Regional institutional arrangements, emergency back up, demand management, effluent management, stormwater harvesting, UFW reduction).
12	Non-conformances at Coraki and Rileys Hill sewage treatment plants	Treatment plant process upgrades	As in 4 (STP point source contamination control) and 5 (asset renewals)
13	Poor demand management in terms of consumption and unaccounted for water	Demand management	As in 1
		UFW reduction	As in 1
14	ASS soils in RVC urban areas potentially impact on sewer infrastructure	New infrastructure to consider ASS impacts	Implement DCP5 - Acid Sulphate Soils: identification, assessment and management.
		Renewal program to consider ASS impacts	Renewals to consider ASS impacts.

Implementation Process

The implementation of the preferred scenario is reliant on RVC's commitment to the capital works program developed as part of this Strategy, as well as its ability to maintain financial stability over the next 30 years.

A summary of the financial implications of the preferred scenario is given in the following table. These costs do not include dual reticulation and indirect potable reuse options (components of integrated scenarios 2 and 3).

Component	30 year Capital Works Program ($'000)	30 year OMA Expenditure ($'000)	Typical Residential Bill ($/assessment)
Water Supply	26,800	80,300	445
Sewerage	172,000	250,000	770
Total	198,800	330,300	1,215

The current water bill may be reduced slightly and the sewerage bill may need to increase if the preferred scenario is implemented. A financial plan is required to determine the most appropriate medium-term price paths and funding scenarios.

Monitoring

Monitoring is an essential part of the IWCM process to ensure that the implementation of strategies which have been identified as part of this study have been successful at addressing the water cycle issues. It is important that any new or changes in severity of individual issues are reviewed after 6 years, and appropriate changes are made to the Strategy document, capital works program and financial plan.

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Glossary

BASIX	A web-based design tool that ensures each new residential dwelling design meets the NSW Government's targets of up to 40% reduction in water consumption and a 25% reduction in greenhouse gas emissions, compared with the average home (Department of Planning, 2006).
Best-practice	An industry standard recognising the most effective management methods of the time.
Capital expenditure	The initial cost of constructing infrastructure assets.
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.
FINMOD	NSW Financial Modelling software package developed by the NSW Government for local water utilities.
Groundwater	Underground water filling the voids in rocks; water in the zone of saturation in the earth's crust. See also aquifer.
Local water utility (LWU)	The water supply and sewerage businesses of a local council.
Nutrients	A source of nourishment. However, for water quality, it indicates nitrogen and phosphorous.
Potable water	Water that based on current knowledge is safe to drink over a lifetime; that is, it constitutes no significant risk to health.
Rainwater tank (RWT)	Storage tank for collecting rainwater from the roofs of buildings.
Reuse	The use of treated sewage effluent or treated stormwater to replace the use of potable water. Taking water from a waste (effluent) stream or stormwater captured and purified to a level suitable for further use.
Sewage	The used water supply of a community including water-carried waste matter from homes and businesses.
Sewage treatment plant (STP)	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.
Stormwater	Rain 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.
Strategic Business Plan (SBP)	The LWU principle planning tool for water supply and sewerage businesses.

Typical residential bill (TRB)	The annual bill paid by a residential customer that is not a pensioner or the owner of a vacant block.
Wastewater	See sewage.
Water demand	The water needs of a town including homes, 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 treatment plant (WTP)	A facility to treat raw water to a potable water quality.

List of Abbreviations

AD	Average day (demand)
ADWG	Australian Drinking Water Guidelines
ASS	Acid Sulphate Soils
BIN	Binalong
BOW	Bowning
BPM	Best-Practice Management
CAP	Catchment Action Plan
CMA	Catchment Management Authority
DECC	Department of Environment and Climate Change, NSW
DEUS	Department of Energy, Utilities and Sustainability, NSW
DNR	Department of Natural Resources, NSW
DPI	Department of Primary Industries, NSW
DSS	Decision Support System – DWE computer modelling software for forecasting water demand
DWE	Department of Water and Energy, NSW
EP	Equivalent Person
EPA	Environment Protection Authority, NSW (now part of DECC)
FINMOD	Financial Modelling software, see also Glossary
GUN	Gundaroo
ILOS	Improved Levels of Service
IWCM	Integrated Water Cycle Management
kL	Kilolitre
L	Litre
LGA	Local Government Area
LWU	Local Water Utility
LOS	Level of Service
mg	milligrams
mm	millimetre
ML	megalitre
MLRR	Mid and Lower Richmond River (supply area)
MBU	Murrumbateman
OMA	Operation, Maintenance and Administration (cost)

OSS	Off-stream storage
PD	Peak day (demand)
POEO	*Protection of the Environment Operations Act 1997*, NSW
PRG	Project Reference Group
RVC	Richmond Valley Council
SBP	Strategic Business Plan
SWM Plan	Stormwater Management Plan
STP	Sewage Treatment Plant
SoE	State of the Environment (Report)
TBL	Triple Bottom Line
TDS	Total Dissolved Solids
UFW	Unaccounted for Water
WQO	Water Quality Objectives
WSP	Water Sharing Plan
WTP	Water Treatment Plant

1 Introduction

This report documents the development of the Richmond Valley Council (RVC) Integrated Water Cycle Management (IWCM) Strategy by RVC in line with the NSW Department of Water and Energy (DWE, formerly Department of Energy, Utilities and Sustainability, DEUS) *IWCM Guidelines* (2004). This report identifies the process in which the preferred scenario for the future management of urban water services was chosen and provides guidance for its implementation.

1.1 The IWCM Process

RVC is continually planning its water, sewerage and stormwater business activities. RVC is committed to developing an IWCM plan for Richmond Valley.

IWCM aims to maximise the benefit derived from available water resources through the efficient and appropriate management of urban water services (water supply, sewerage and stormwater). It also encourages the evaluation of opportunities to minimise the impact of the urban water services on the available water resources through the identification and assessment of potential management solutions (scenarios) to address a range of catchment, water resource and urban issues.

An IWCM plan considers issues such as:

- The future urban water service needs and customer expectations;
- The availability of water including water sources such as rainwater, effluent and stormwater; and
- The impact of town water use on other water users including the environment and future generations.

In 2004, DWE published guidelines to assist LWUs in implementing IWCM, as part of their best-practice approach to LWU strategic planning. These guidelines set out a three step process for developing an IWCM plan:

- **A Concept Study**: an initial scoping study from which a project brief for a strategy can be developed. During this study, urban, water resource and catchment related water cycle management issues are identified by the study team and the community;
- **A Strategy**: options to address the issues identified in the Concept Study are bundled and assessed against economic, social and environmental criteria to determine the most beneficial scenario;
- **An implementation phase:** to put the strategy plan into place, monitor actions and assess the success of the plan in relation to managing the identified issues over time and revise the plan accordingly.

The IWCM process followed by RVC is illustrated in the following figure and each of these steps is discussed in further detail in the following sections.

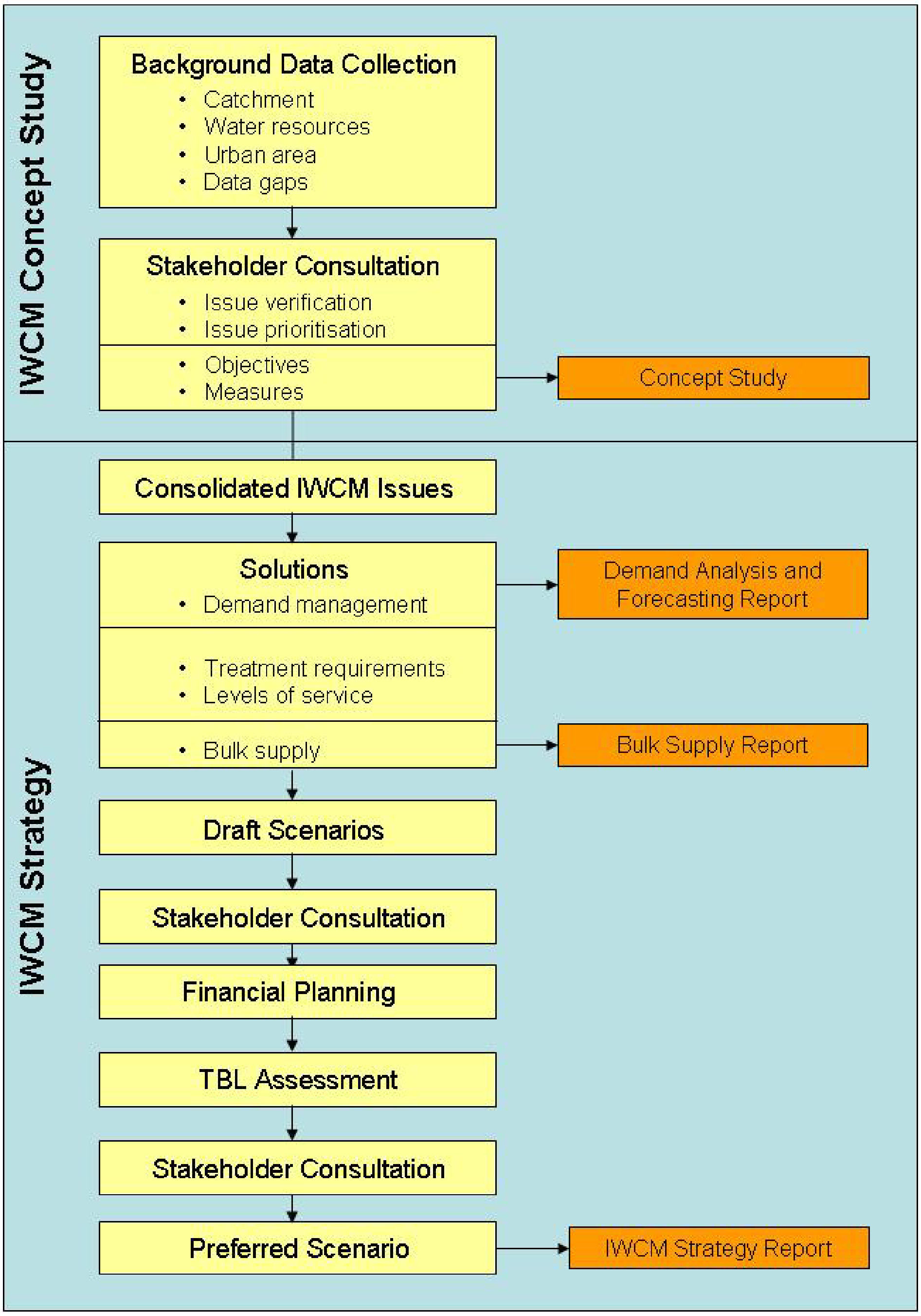

Figure 1-1: IWCM Process for RVC

1.1.1 IWCM Concept Study

The RVC IWCM Concept Study is attached in Appendix A. This study identified catchment, water resource and urban water cycle management issues relevant to the management and operation of RVC water supply and sewerage businesses. These issues and potential solutions were identified through a stakeholder consultation program and the review of background information.

1.1.2 IWCM Strategy

The IWCM Strategy was developed through the building and assessment of a scenarios (bundles of options) to address the issues defined in the Concept Study.

Based on the outcomes of the Concept Study and a series of desktop analyses, a number of different management options were developed for each of the water cycle issues identified. Each of the options represents a different level of integration of urban water services, therefore different impacts on the environment and customers. Similarly, each option is supported by a different asset management plan depending on the type of infrastructure required to deliver services. This in turn means that each option will have different environmental, social and economic outcomes (both positive and negative).

As the number of options can be large, DWE recommends that compatible options covering water supply, sewerage and stormwater services are bundled together as a scenario.

Each of the scenarios must be assessed to identify a preferred scenario for implementation. The different scenarios are assessed on their economic, social and environmental outcomes. The preferred scenario sets out a list of strategic actions to improve the management of the identified water cycle issues over a 30 year planning horizon.

The aim of this Strategy report is to detail the development of these scenarios and to document the outcomes of the scenario assessment process as it applies to the issues facing RVC.

1.1.3 Implementation Phase

Once a preferred scenario is identified it must be implemented appropriately to ensure that the management of the water cycle issues identified in the IWCM Concept Study is improved.

Key planning tools for implementation of the IWCM preferred scenario are:

- Strategic Business Planning;
- Financial Planning;
- Best Practice Pricing;
- Development Servicing Plans;
- Demand Management; and
- Drought Management.

This Strategy report documents the process of implementation of the preferred scenario for RVC.

2 Developing the IWCM Strategy

This section sets out the approach taken to develop the RVC IWCM Strategy and includes a summary of the input data utilised (including the outcomes of the IWCM Concept Study), stakeholder consultation process, desktop analyses of some of the potential options to manage the water cycle issues and the scenario building process.

2.1 Identifying the Issues

The Concept Study is an essential part of the IWCM process providing a basis to understand the issues faced by RVC in the provision of water, sewerage and stormwater services. These catchment, water resource and urban issues were identified through the review of existing background information as well as discussions with RVC staff and regulatory authorities and stakeholder consultation.

Following on from the Concept Study, the issues identified through the information review and those identified during the consultation phase were combined into a set of IWCM issues which define the urban water cycle management problems faced by RVC. The IWCM issues were confirmed during the consultation program (refer Section 2.2).

The IWCM issues are listed in Table 2-1. In developing solutions to each of the identified issues, a range of strategies were investigated. These are summarised in Table 2-1 and discussed throughout this report. The scenarios developed for RVC incorporate these strategies (refer Table 10-3).

Table 2-1: IWCM Issues and Strategies

IWCM Issues		Location	Strategies
1	Poor town water supply security	Shire-wide	Regional institutional arrangements
		Casino	Demand management
		Lower Richmond	Regional demand management
		Casino	WTP Treatment capacity
		Casino	Security of supply
		Casino	Emergency backup
		Casino	Effluent management
		Lower Richmond	Effluent management
		Casino	Stormwater harvesting
		Lower Richmond	Stormwater harvesting
		Shire-wide	UFW reduction (metering)
		Shire-wide	UFW reduction (renewal)
		Shire-wide	UFW reduction (leak detection)
2	Lack of ground and surface water sharing plans. RVC must be involved in the water sharing process to ensure town water supplies are adequate.	Shire-wide	Macro Water Sharing Plan (WSP)

IWCM Issues		Location	Strategies
3	RVC must implement sustainable effluent reuse with end user requirements considered.	Casino	Effluent management
		Lower Richmond	Effluent management
		Shire-wide	Education
4	Existing landuse practices and urban impacts are affecting surface water quality	Shire-wide	On-site sewage management (design regulation)
		Shire-wide	On-site sewage management (monitoring)
		Shire-wide	On-site sewage management (improvement)
		Shire-wide	Environmental flows
		Shire-wide	Stormwater quality improvement and management
		Shire-wide	Salt water intrusion reduction
		Shire-wide	Catchment management initiatives
		Shire-wide	Water Sharing Plan
		Shire-wide	Flood management
		Casino	Blue-green algae management
		Casino	STP point source contamination control
		Coraki	STP point source contamination control
		Rileys Hill	STP point source contamination control
		Evans Head	STP point source contamination control
		Shire-wide	Point source contamination control
		Shire-wide	Education on sustainable land practice management
5	High operating and management costs for water and sewerage systems lead to relatively high typical residential bills	Shire-wide	Financial management
		Shire-wide	Water and sewerage asset renewals
6	RVC must comply with current and future potable water standards.	Casino	WTP process upgrade
		Lower Richmond	Drinking water quality
7	Hydrologic stress in catchments contributes to unsustainable extraction particularly during low flows.	Shire-wide	Regional institutional arrangements
		Shire-wide	Emergency backup
		Shire-wide	Demand management
		Shire-wide	Catchment management initiatives
		Shire-wide	Environmental flows
8	There is a need for sustainable management of onsite sewage systems.	Shire-wide	On-site sewage management systems (design regulation, monitoring and incentives)
9	Stormwater infiltration into sewerage system increases wet weather flows	Shire-wide	Sewerage asset renewals
10	There is a need for sustainable stormwater / rainwater reuse	Shire-wide	Rainwater tanks
		Shire-wide	Stormwater harvesting

IWCM Issues		Location	Strategies
11	Climate change may adversely alter the rainfall and temperature patterns of the study area	Shire-wide	Risk management
		Shire-wide	Alternative water sources
12	Non-conformances at Coraki and Rileys Hill sewage treatment plants	Coraki	STP process upgrade
		Rileys Hill	STP process upgrade
13	Poor demand management in terms of consumption and unaccounted for water	Shire-wide	Demand management
		Shire-wide	UFW reduction
14	ASS soils in RVC urban areas potentially impact on sewer infrastructure	Lower Richmond	New infrastructure to consider ASS impacts
		Lower Richmond	Renewal program to consider ASS impacts

2.2 Stakeholder Consultation Program

Stakeholder consultation was undertaken to ensure that stakeholders contributed to the definition of water cycle management issues and the identification of potential solutions. This was achieved through the formation of a Project Reference Group (PRG) which included representatives from RVC, government agencies, local organisations and the community.

Following the drafting of the Concept Study, the PRG assisted in the process of finalising the study. The first meeting of the PRG during the Strategy phase was held at Richmond Valley Council on 29 March 2007. The objectives of this workshop were to:

- Review the IWCM issues;
- Review the options (project elements); and,
- Review the draft scenarios.

Another PRG workshop was held on 21 June 2007. The objectives of this workshop were to:

- Review the preliminary TBL assessment criteria;
- Rank the five IWCM scenarios considering the social, economic and environmental costs and benefits of each scenario; and
- Identify a preferred scenario or preferred scenario components for implementation.

The PRG Workshop Briefing and Summary Papers are attached in Appendix B.

2.3 Objectives for the Strategy

A series of draft objectives to set the direction of RVC's IWCM Strategy were formulated as part of the stakeholder consultation process and documented as part of the Concept Study. These objectives set goals for the future management of the identified water cycle issues. The objectives and criteria developed to measure progress and the scenario assessment process are discussed in Section 10.4 and Appendix H.

2.4 Developing Solutions

The purpose of scenario building is to analyse the combinations of options available to RVC to sustainably provide urban water services into the future. This is done by:

- Identification and assessment of individual management options; and
- TBL assessment of scenarios (bundles of options).

The general process applied to RVC is summarised below:

- The process began with the identification of the demand for water. Potable and non-potable end-uses of water were identified as part of the demand analysis (see Section 3). This analysis also examined cost-effective demand management measures that could be put in place in order to minimise urban water demands. In total, five sets of demand projections, incorporating an increasing investment in demand management, were developed;
- Having established water demands, a process of matching demand with the available water sources was undertaken (see Section 4). This included an analysis of the reliability of Casino bulk water supply for a range of future demand scenarios;
- In matching demands to sources, (in addition to the maintenance of existing effluent activities) priority was given to the identification of the potential for treated effluent or stormwater/rainwater to augment the urban water demands identified. Consideration was then given to the use of these alternative water sources to meet other, lower value, uses;
- Opportunities for extension of the water supply and sewerage services were identified (see Section 5);
- For each of these scenarios, the level of treatment required to ensure the water source would meet the requirements of the water use it had been matched with was assessed (see Section 6);
- The capacity of water and sewage treatment facilities was determined in relation to the water demand and effluent generation forecasts developed, which took into account savings as a result of demand management activities; and
- Lastly, where treated effluent and stormwater could not be utilised as a water source, options for effluent disposal were identified.

To support the process described above, a series of analyses were undertaken. The results of these analyses are set out in the following sections.

3 Demand Analysis

The demand analysis focuses on the current and future water demands and effluent volumes of the Casino water supply system. Demand management for the MLRR water supply systems is subject to Rous Water demand initiatives.

The demand forecasting study is attached in Appendix C.

The historical demand analysis involved:

- Data collection and review: to establish the adequacy of available water production, consumption, restriction and demand management information held by RVC;
- A water demand analysis: to climate-correct Casino's historical water demand records, establish the level of unaccounted for water (UFW), and establish the categories of existing Casino consumers and the breakdown of their water use activities;
- Water demand effluent forecasts: to identify the drivers of future demand in Casino in order to establish a baseline forecast of the water demands and effluent flows that would be expected in the service area over the next 30 years; and
- A water efficiency analysis: to determine a preliminary cost-benefit assessment of potential water efficiency measures, and assess the impact of a set of potential water efficiency programs (demand-side management programs) for Casino.

Overall, the analysis identified:

- The climate-corrected production for Casino scheme is 2,638 ML/annum (Climate correction is carried out using the DWE model to eliminate the impact of unusual climate years on future demand projections. Details are provided in Appendix C);
- Average metered potable consumption within Casino service area was 2,017 ML/a between 2004/05 and 2005/06;
- The climate corrected UFW was calculated to be 24% of production. The NSW LWU target for UFW is currently 10%. The UFW value may not only represent actual water loss and leakage, but also inaccurate and/or incomplete metering of production and consumption volumes. It is also likely that ageing infrastructure is causing some leakage;
- Residential demand accounts for approximately 46% of the total metered consumption volume in the Casino water supply system. Hence, the adopted demand management program should also consider business water use to ensure its effectiveness;
- Population growth of 1.2% from 2005-2030 is predicted and is expected to be the most important driver of demand over the next 30 years; and
- Baseline water forecasts predict that annual average demand in the Casino water supply scheme will rise from 7.2 ML/d in 2006 to 9.8 ML/d in 2036 (a 36% increase in water use). Peak demand will become 20.5 ML/d from 15.2 ML/d over the next 30 years which is an increase of approximately 35%.

By applying a number of individual demand management measures to the baseline forecast and examining the costs and benefits (in terms of both dollars and water saved) the relative merit of each measure was determined. The best performing individual measures were progressively bundled together as a number of water savings programs. The most cost-effective measures for reducing demands in the Casino system, in addition to the mandatory requirements of BASIX and best-practice pricing, is to implement a UFW reduction program in conjunction with a complementary outdoor water use education program.

As part of the demand analysis, four water savings programs were developed. Each program contains progressively more water efficiency measures based on a benefit-cost analysis of the individual measures as illustrated in Table 3-1. Further information is provided in Appendix C.

Table 3-1: Potential water saving programs for RVC.

Water Savings Program	Pricing	BASIX	Education	UFW	Showerhead Retrofit	Business Audit	Water Conservation	RWT Rebate	Residential Audit	Toilet Retrofit
1 (regulatory / minimum compliance)	✓	✓								
2	✓	✓	✓	✓						
3	✓	✓	✓	✓	✓	✓	✓			
4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

The demand management measures apply to both urban and non-urban customers. Most parts of the education program can successfully capture both the rural and urban audiences.

The estimated impact of each of these programs on the average day water demand, the peak day water demand and dry weather effluent flows for the Casino system are set out in the following figures.

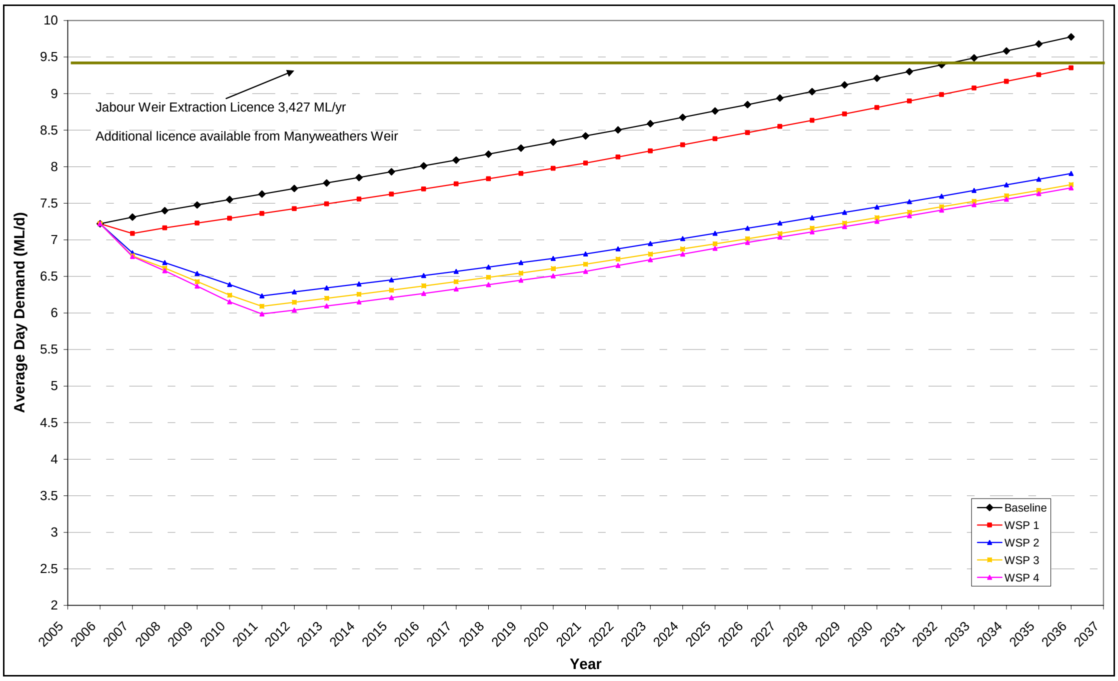

Figure 3-1: Water Savings Program influenced average day demand forecast (ML/d).

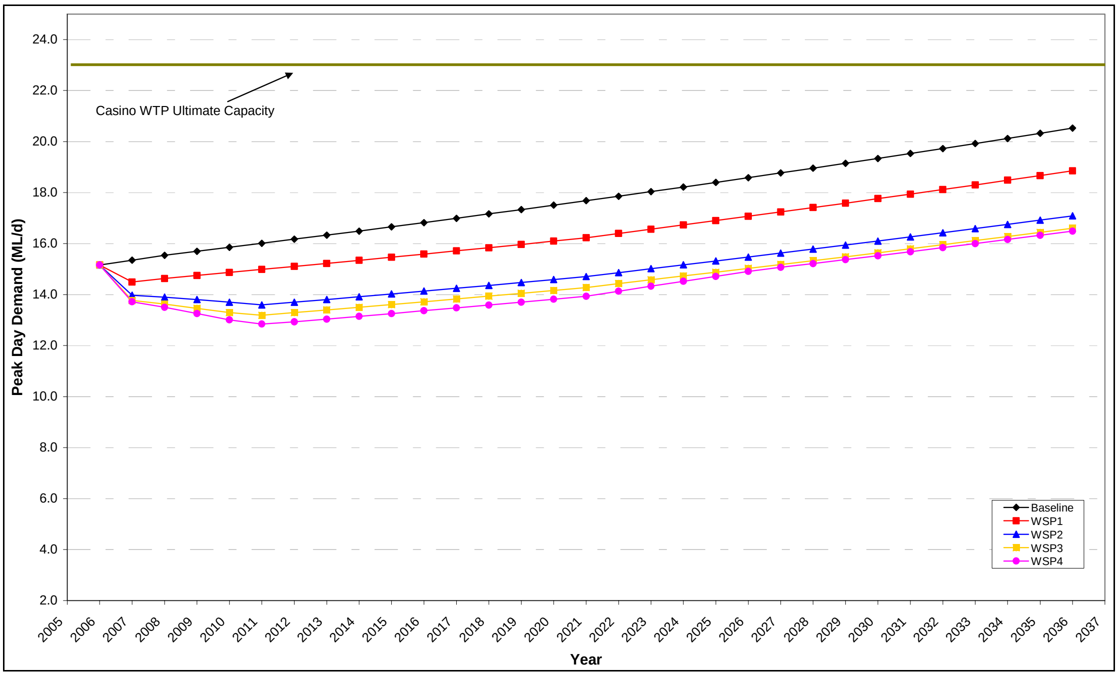

Figure 3-2: Water Savings Program influenced peak day demand forecast (ML/d).

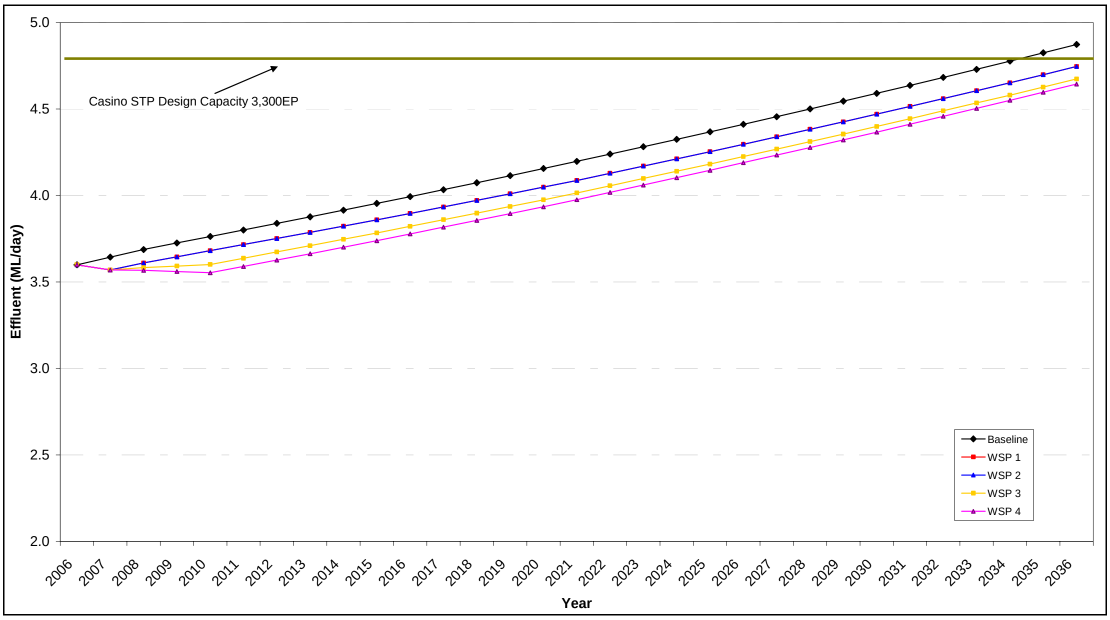

Figure 3-3: Water Savings Program influenced dry weather effluent forecast (ML/d).

Figure 3-1 shows that the baseline average demand forecast would not be able to be met by the Jabour Weir extraction licence. This will not be the case under other Water Savings Programs. However, the consistency of water availability from Jabour Weir is a major concern (refer Section 4.3).

The capacity of Casino WTP (23 ML/d) is sufficient for projected demand as shown in Figure 3-2.

Based on current water demand trends, the current treatment capacity of the Casino STP is sufficient to meet future treatment demands until the end of the planning horizon (refer Figure 3-3).

Water Savings Program 2 is expected to reduce the predicted baseline annual average demand by up to 19% by 2036 based on current demand trends. Further review of costing for each water efficiency measure is required to finalise the cost benefit analysis used to develop these water saving programs. This will be undertaken during the ongoing review and update of the RVC Demand Management Plan.

4 Water Availability Analysis

The water availability analysis aims to identify water sources currently utilised in the provision of water to each of the main towns within RVC and to also assess the ability for these resources to meet future demands. Once this is established, alternative water sources such as stormwater harvesting and effluent reuse were considered to supplement or replace non-potable demands on the town water supplies.

4.1 Existing Water Supply

RVC is responsible for the extraction, treatment and reticulation of water to the town of Casino. Other towns and villages within Richmond Valley local government area (LGA) with reticulated water supplies, Coraki, Broadwater/Rileys Hill, Evans Head and Woodburn are serviced by the Mid and Lower Richmond River (MLRR) bulk water supply scheme operated by Rous Water. Locations of the towns are shown in Figure 4-1.

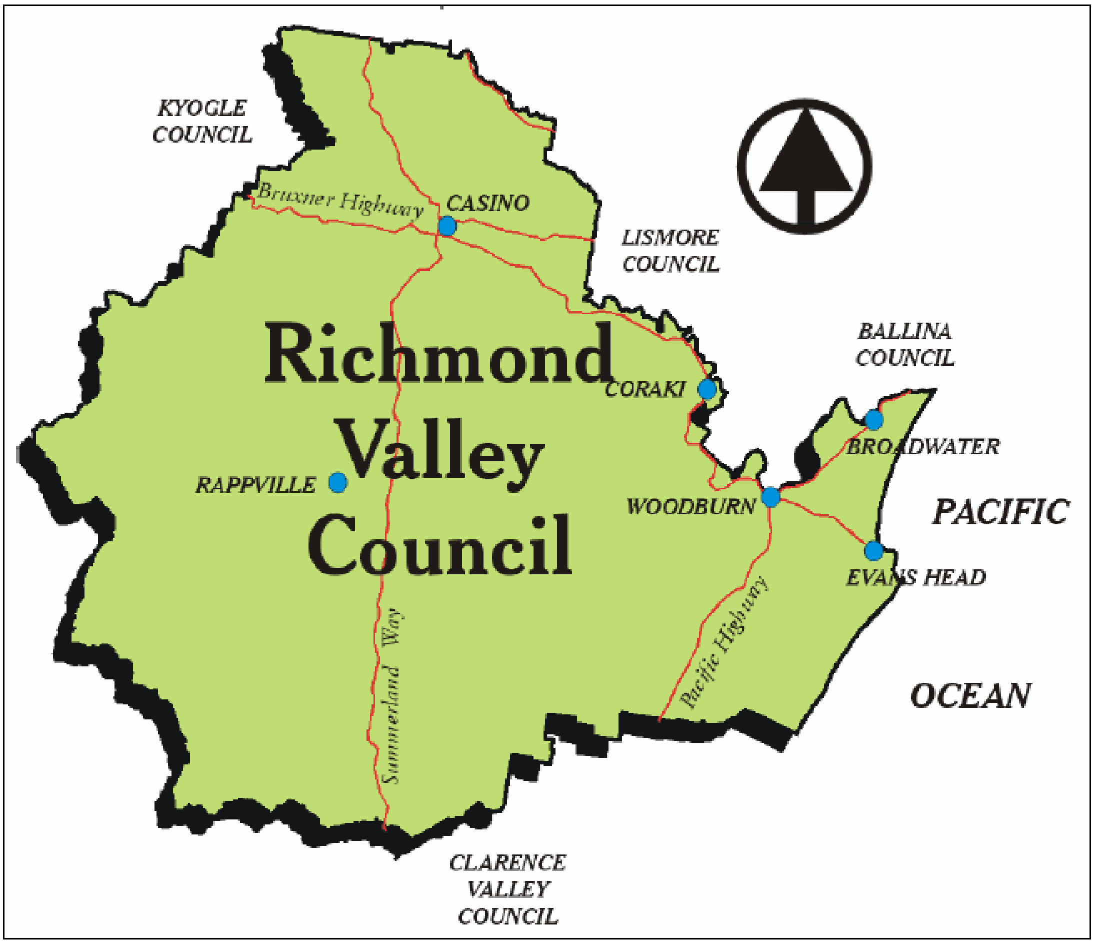

Figure 4-1: Major Towns in RVC

Table 4-1 sets out the capacity and demands in the Richmond Valley service area as planned in the RVC Development Servicing Plan (DSP).

Table 4-1: Capacity of Water Supply Systems

<table>
<tr><th rowspan="2">Service Area</th><th colspan="2">Ultimate Treatment Works Capacity</th><th>Ultimate Transfer Works Capacity</th></tr>
<tr><th>ML/d</th><th>ET</th><th>ET</th></tr>
<tr><td>Casino</td><td>23</td><td>7,667</td><td>6,655</td></tr>
<tr><td>Coraki</td><td colspan="2" rowspan="4">Water treated and supplied by Rous</td><td>606</td></tr>
<tr><td>Broadwater/Rileys Hill</td><td>246</td></tr>
<tr><td>Evans Head</td><td>2,428</td></tr>
<tr><td>Woodburn</td><td>275</td></tr>
</table>

Source: JWP (2006b)

The Casino system extracts raw water from the Jabour Weir. The weir is an on-stream storage and has a capacity of 1,623 ML. The demand for 2004/05 was 2,437ML. The storage could be supplemented by Toonumbar Dam. However there is no existing agreement with DNR for the use of this supply.

A verbal commitment from DNR exists to use Cookes Weir to supplement Jabour Weir when level 5 restrictions are in place. At other times, the Cookes Weir spillway is drowned out by normal Jabour Weir water levels. It is assumed that the Cookes Weir will not be drowned when level 5 restrictions are in place. Cookes Weir has a capacity of 500 to 1000 ML.

The storage could be supplemented by Toonumbar Dam (operated by DNR) for emergency provisions. However, a formal agreement with DNR for the use of this supply would be required as it has not been used before. As part of IWCM strategy planning, a workshop was conducted with DNR on water use from Toonumbar Dam, among other issues. DNR explained that in order to use the water from Toonumbar Dam, RVC should either apply for water extraction licences or acquire rights from irrigators.

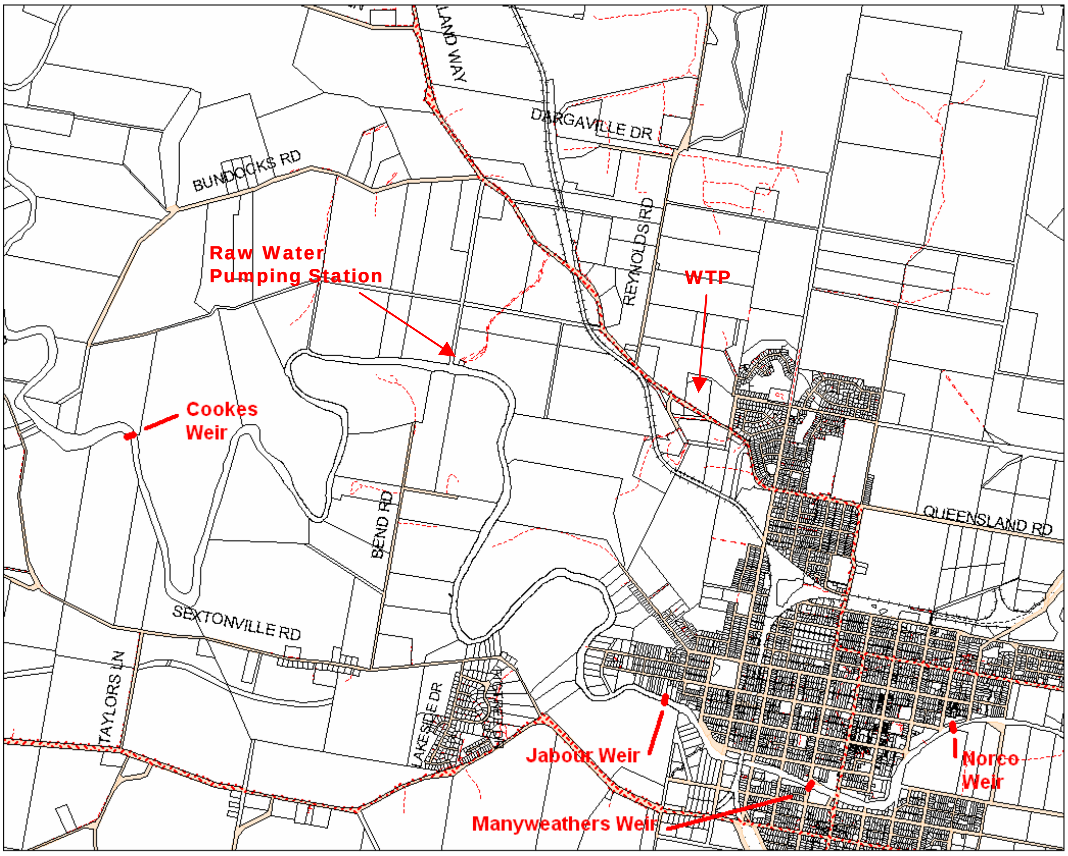

Figure 4-2: Location of Jabour, Cookes and Manyweathers weirs.

Bulk water is supplied by Rous Water to the MLRR from Rocky Creek Dam via three trunk mains. One trunk main runs from Lismore city with a branch off to Coraki, Woodburn, Broadwater, Rileys Hill and ultimately Evans Head in RVC's service area. The other two mains supply Lismore City Council, Byron Bay and Ballina Shires. A small reticulation system which pumps groundwater from the Alstonville Aquifer is located between Woodburn and Evans Head and is used to supplement the Rocky Creek supply.

Rocky Creek Dam is an on-stream dam with a secure yield of 9,600 ML. Rous Water also operates Emigrant Creek Dam, bringing the combined system safe yield to 11,200 ML. Rous Water also has access to limited supplies of the Alstonville aquifer.

4.2 Existing Sewerage Systems

Existing sewerage services include four sewage treatment plants (STP) located at Casino, Evans Head (which also receives raw effluent from Woodburn), Coraki and Rileys Hill. The four plants and their treatment capacity are presented in Table 4-2.

Table 4-2: Richmond Valley STP Treatment Type and Design Capacity.

STP	Treatment type	Design Capacity - Equivalent Population (EP)	Average Dry Weather Flow (ML/day)
Casino STP	Combined trickling filter/activated sludge - tertiary treatment	13,300	NA
Evans Head STP	Trickling filter - secondary treatment	3,700	1.8-2.6
Coraki STP	Trickling filter - tertiary treatment	1,200	NA
Rileys Hill STP	Activated sludge - tertiary treatment	200	NA

Source: JWP (2006b)

Casino STP was originally built in 1932 and augmented in 1955, 1976 and 1990. The plant comprises three trickling filters and an extended aeration tank (EAT) which operates in parallel under higher flows. The treated effluent is discharged into a tertiary pond and then into a constructed wetland area within the STP site. One third of Casino STP effluent is reused (refer Section 4.5.1) and the remainder of the effluent (which was 1073 ML in 2004/05) is discharged to Barlings Creek, which eventually discharges to the Richmond River, via a series of wetlands on site at the STP.

Recent developments in the Casino area mean that Casino STP will reach its capacity within 2 years. An augmentation is now planned to be completed sooner than originally scheduled (which was 2009/10).

Evans Head STP was constructed in 1942 and augmented in 1970. Secondary treated effluent is discharged via an open drain to Salty Lagoon (a designated SEPP 14 wetland located in Broadwater National Park). A recent augmentation, completed in 2007, was required to accommodate the growth in the area, treat additional sewage from Broadwater, meet stringent licence requirements and allow for future effluent reuse opportunities.

Coraki STP was constructed in 1966 and comprises a trickling filter and two tertiary ponds. Effluent is discharged onto adjacent swampland which drains to the Richmond River. Augmentations have included odour control at the Coraki Golf Club.

Rileys Hill STP is a package plant installed in 1998. Effluent is discharged to the Richmond River.

In terms of POEO licensing, minor non-conformances have occurred at the sewage treatment works at Evans Head, Rileys Hill and Coraki in the last five years. An augmentation at Evans Head aims to address some of these issues.

4.3 Water Supply Yield Analysis

The reliability of Casino bulk water supply has been investigated for a range of future demand scenarios as part of the IWCM Strategy planning. Reliability of supply is defined as a percent 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.

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.

This investigation applies a stochastic approach using WATHNET software (a generic water balance model developed by Dr. George Kuzcera from University of Newcastle) to simulate the water supply headworks system. It overcomes the limitation of dependence on historical streamflow sequences through the generation of many synthetic sequences (in this case, 30 years long 1000 sequences of daily streamflow and climate data) 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; and
3. Water balance model.

Details of the investigation can be found in Appendix D.

The maximum amount of supply which can be extracted from a given system using historical data without running out of water is referred to as a "safe yield". The maximum average annual demand which can be supplied from the Jabour Weir, assuming that the historical sequence will repeat, is 4.8 GL/a without running out of water, corresponding to 13.1 ML/d. However, restrictions level 1 to level 6 would be experienced. It was found that at least Level 1 restriction has to be placed for 83% of total time. Details of the daily and annual restriction frequency are given in Table 9 of Appendix D (Bulk Supply Modelling).

The "yield" without any restriction is 2.8 GL/a (7.7 ML/d), assuming that the historical sequence will repeat. This is slightly lower than the projected demand with low level of demand management (7.9 ML/d) and with high level of demand management (7.8 ML/d).

However, it is un-realistic to expect that the climate and the resulting streamflows from the last 30 years will repeat in the next 30 years. The historical data were produced by a natural process, and the aim of the Monte Carlo analysis utilised by the WATHNET software is to identify and fit a mathematical model capable of producing synthetic sequences which have similar statistical parameters to historical, produce many synthetic sequences (replicates) and then simulate the performance of the system and define the reliability and security by analysing a much larger sample (in our case 1000 replicates compared to one historical sequence).

As a conclusion of the Monte Carlo simulation, it can be noted that the annual reliability of RVC's water supply system of 17% is relatively low, it means that level 1 to level 4 restrictions could be expected almost every year. Further, the probability of running out of water is high (0.5%) in any year and a back up source would be required. Acceptable reliability depends on the scale of the system, financial capacity, economic impact and other factors. As a comparison, the probability of running out of water in Sydney is 0.01%.

4.4 Source Augmentation Strategies

4.4.1 Regional Arrangements

The Casino water supply system operates in parallel to the MLRR system with Rous Water as the bulk water supply service provider. Rous Water also provides bulk water to three other councils in the region (Lismore, Byron Bay and Ballina). In each case, the Councils also have the responsibility for reticulation of water to other parts of the LGA.

With increasing water resource scarcity coupled with the increasing projected demand, there is a need to investigate options for a regional water supply in order to improve efficiency and security of supply. This strategy should cover the water and sewerage services of Rous Water and all four councils and should investigate all potential new sources including sea water desalination, groundwater and stormwater harvesting in addition to augmentation of the current water sources and identification of new water sources. Recycling of water should also be investigated including utilisation of rainwater and treated effluent. Reuse options can include value-added reuse such as dual reticulation and indirect potable reuse as well as agricultural and industrial reuse options that replace extractions.

The study should also investigate the provision of sewerage services to currently unsewered areas to optimise service provision in the region.

Institutional and management options for the regional water supply may include Rous Water taking control of some or all of the independent water supply systems in the region or Rous Water handing back some or all of the bulk water supply operations to the respective councils. Other related scenarios may include interstate transfer of water or other federal water management initiatives.

The study would need to be undertaken in association with the relevant State Government departments including DWE, DECC and DNR.

The scope of the investigation may include the following:

- Description and evaluation of current systems;
- Baseline studies (demand analysis, surveying, water resources, preliminary geotechnical, environmental, etc);
- Identification of options;
- Provision of an indicative assessment of the costs, benefits and risks of each identified option;
- Identification of the issues (political, economical, social, environmental) that need to be resolved in more detailed studies; and
- Identification of the tasks required to progress from pre-feasibility to an implementation stage.

The cost of the study is estimated at $500,000 and 20% of the cost is attributed to RVC. Preliminary discussions on the Study have commenced and Rous Water has indicated that it can lead the project if all Councils and state government departments agree.

4.4.2 Alternate Source Investigation

Although the regional arrangements discussed above would provide a more holistic approach to water supply management, it would take time to implement the outcome of any regional arrangement. The timeframes involved present a risk to RVC as it is unlikely to have control over the process and RVC's water supply is currently not secure. It is recommended that RVC commence a separate alternate source investigation which can be incorporated in the broader Regional Strategy when appropriate. This study would also serve as an emergency drought management study since RVC currently has no water supply back up system.

All possible options should be investigated including raising of Jabour weir, groundwater sources, off-stream storage, Cookes weir, and Toonumbar dam.

DNR has advised that it is possible to obtain a licence for Toonumbar Dam either directly or by converting the existing irrigation licences into town water licences. Preliminary investigations undertaken by DNR also confirmed the possibility of groundwater extraction pending further quality and yield investigations.

The alternate source investigation should also include rainwater use, stormwater harvesting and effluent reuse. It should also consider purchasing water in emergencies from Rous Water or other nearby service provider either by a pipeline or by trucks. However, it is considered that under a severe drought situation nearby providers including Rous Water would also face severe water shortages and therefore the risk of failure may still be unacceptably high.

The scope of the investigation should include the following:

- Analysis of existing scheme (demands, climate, land use, regulation, etc);
- Projections (demand, availability);
- Capacity of existing system (streamflow analysis, secure yield analysis);
- Options identification;
- Indicative assessment of the costs, benefits and risks of each identified option; and
- Analysis of results and recommendations.

The cost of the study is estimated at $130,000.

4.4.3 Capital allocation for source augmentation

Anticipating the need for a possible source augmentation, RVC has allocated a lump sum of $4 million in its current capital works program (JWP, 2006a). The required amount has not been verified through any detailed investigations to date. The possibilities of source augmentation options are numerous and there are a wide range of costs associated with the options. Evaluation of the suitability of the $4 million figure will need to be made when the results of the above investigations are known.

To understand the impact of the investment on the typical residential bill (TRB), indicative costs of the required off-stream storage have been determined. Capacities of the required off-stream storage have been estimated from the WAHTNET model for various demand management options (refer Table 13 of Appendix D). Indicative costs are included in Table 4-3.

Table 4-3: Cost Estimates of Source Augmentation Options.

Demand Management Level	Required Capacity (GL)	Indicative Cost ($m)
None	3.5	18
Low	3.0	15.3
High	2.8	14.3

The OMA cost is estimated at between $400,000 and $450,000 per year.

The effect on the TRB is discussed in Section 11.2.

4.4.4 Climate Change Analysis of Casino System Yield

The safe yield of the Casino system has been estimated using a 30 year historic stream flow and the system reliability has been estimated using a stochastic 30 year stream flow derived from 100 year historic rainfall. However, due to the impacts of climate change, it is likely that the future rainfall pattern will not follow the historic pattern. To understand the impact of global climate shift, a climate change analysis of Casino system yield is required. This study can help understand the need for source augmentation.

It is proposed that a sensitivity analysis be undertaken using the Integrated Quantity and Quality Model (IQQM) and a range of climate change scenarios similar to a recent CSIRO study (Kirono, et al, 2007). The scope of the investigation should include the following:

- Literature review;
- Overview of Casino system yield and reliability;
- Overview of climate change in the Northern Rivers;
- Climate change scenarios;
- Supply estimation under different scenarios;
- Risk assessment; and
- Analysis of results and recommendations.

The cost of the study is estimated at $135,000.

In the reliability study under for the IWCM Strategy (refer Section 4.3), a stochastic 30 year stream flow derived from 100 year historic rainfall was used. The result can be improved by using a simulated 100 year stream flow from the same 100 year historic rain flow. However, this investigation does not eliminate the need for an alternate source investigation.

4.5 Alternative Water Sources

4.5.1 Recycled Water

On average, three percent of Casino STP effluent is reused at the Casino Golf Course and 36% for agricultural irrigation by Blue Dog. Effluent from Coraki STP will be reused on the golf course from 2008, which will assist with resolving historical non-conformances with the EPA licence.

There have been significant investigations into effluent reuse for the Evans Head STP and the sewering of Broadwater. The following reclaimed water options were considered in combination with STP options (GeoLINK, 2006):

- Agricultural reuse;
- Industrial reuse;
- Irrigation of sporting fields and open space areas;
- Direct potable reuse;
- Indirect potable reuse; and
- Residential urban reuse.

The effluent reuse opportunities and the estimate of capital, operational and lifecycle costs are presented in Table 4-4. These estimates do not include treatment requirements which are discussed in Section 6.

Table 4-4: Cost Estimates of Effluent Management Options.

Type	Option	Capital ($'000)	Operating ($'000/a)	NPV ($'000 @ 7% discount)
Dual Reticulation	New development area west Casino (Bruxner Hwy)	3,700	600	10,500
	New development area North Casino (Summerland Way)	3,100	500	8,200
	Reynolds Road	600	50	1,200
	New development area South west of Coraki STP	500	10	600
	New development area North east of Coraki STP	3,000	100	4,100
	Broadwater - urban residential reuse (including cogeneration plant) (145 ML/y)	6,300	200	8,700
	Broadwater - urban residential reuse (excluding cogeneration plant) (72 ML/y)	3,400	80	4,100
	Evans Head & Woodburn - urban residential reuse (370 ML/y)	14,900	200	16,500
	Evans Head - urban residential reuse (300 ML/y)	11,500	200	12,900
	Woodburn - urban residential reuse (70 ML/y)	4,600	80	5,200
Indirect Potable Reuse	Casino indirect potable reuse - Route 1 (via street)	3,300	2,700	34,200
	Casino indirect potable reuse - Route 2 (via agricultural land)	1,300	1,400	17,400

Type	Option	Capital ($'000)	Operating ($'000/a)	NPV ($'000 @ 7% discount)
	Recharging Woodburn aquifer	3,900	600	10,800
Irrigation	Casino - Golf Course	1,200	100	2,500
	Casino - Albert Park	400	20	600
	Casino – Queen Elizabeth Park	400	50	900
	Casino – Crawford Square	800	30	1,000
	Present reuse regime at lower Richmond (Coraki golf course)	600	60*	1,300
	Broadwater agricultural reuse (incl. Woodburn) (256 ML/y)	2,000	30	2,100
	Evans Head irrigation open spaces	2,100	70	2,700
	Woodburn irrigation open spaces	6,700	90	7,400
Industrial	Casino - Abbatoir	50	40	600
	Casino - Blue Circle Cement Ltd (Dyraaba St)	900	100	2,100
	Broadwater industrial reuse (73 ML/y)	2,900	200	4,700

* Estimate only – based on 10% of the capital expenditure.

It is recommended that RVC undertake an effluent management study to determine the most beneficial uses of recycled water while considering the water needs of all water users. This would require analysis of the requirements of the potential end users including reuse volumes, treatment level, irrigation conditions and transfer systems.

Existing users of recycled water (Casino and Coraki golf courses and Blue Dog agricultural irrigation) will require a continuing source of water for their operations.

For effluent reuse programs to be successful, it is important to provide information on sustainable effluent management practices and measures to protect public health and the environment. Education programs will be included with all effluent management strategies.

4.5.2 BASIX Rainwater Tank Analysis

Analysis (undertaken for the Concept Study, refer Appendix A) of the potential opportunity for stormwater harvesting via rainwater tanks in Casino town involved a simple spreadsheet model (adapted from a daily water balance model developed by DWE for the Kempsey IWCM). The analysis indicated that:

- Harvesting of the rainwater that falls on the roof for outdoor and toilet flushing uses would result in preventing 58k L/y of stormwater flowing from this house, which equates to a 42% reduction in rainfall runoff from a typical roof area;

- Up to 43% of the total outdoor and toilet flushing water needs (which are currently supplied from the reticulation) could be supplied by a 3,000 L rainwater tank; and
- Rainwater tanks larger than 3,000 L have less impact on water savings as they are oversized for areas of low average annual rainfall.

The contribution of a 3,000 L rainwater tank into water savings on a dwelling at Casino Town is significant. This analysis highlights the need to include rainwater tanks in new developments as a complementary way to save water (as part of the BASIX scheme).

4.5.3 Stormwater Harvesting

Harvesting of stormwater for new development areas in Casino (Bruxner Highway and Summerland Way) was considered for the IWCM Strategy where the areas could rely on rainwater and stormwater harvesting and not need to connect to the town water supply. It is considered that costs for such water sensitive urban design components of new developments will be borne by developers.

A preliminary desktop water balance investigation shows that it is not possible to satisfy total water needs of these new development areas solely from stormwater harvesting supported by grey water reuse and BASIX water savings based on a typical building size and impermeable surfaces. The principal reason is the unfavourable rainfall pattern (amount and distribution) prevailing in Casino.

Principal assumptions used for the analysis includes average plot size of 1,250m^2, 40% demand reduction under BASIX, typical roof area of 150m^2, maximum 40% grey water reuse, 1% of harvestable hard surface and communal use. These are based on current typical trends.

However, it is possible to make stormwater harvesting feasible by enforcing design regulations such as a minimum roof size and ratio of hard surfaces to permeable area. It may also be beneficial to encourage individual developers or industry to implement stormwater harvesting.

There are potential benefits of implementing WSUD at the design stage for both individual lots and whole subdivisions. This can reduce the impacts of stormwater as well as reduce potable water use. The IWCM Strategy proposes to encourage the developers to consider WSUD. This can be undertaken in the form of a DCP.

5 Service Extension

The options to extend RVC's water and sewerage service areas to address the issues in Table 2-1 are discussed below.

5.1 Water Supply

RVC provides reticulated water services to:

- Casino System - Casino
- Lower Richmond River - Evans Head, Broadwater, Woodburn, Rileys Hill and Coraki.

RVC is responsible for both the bulk water supply and reticulation of water to Casino.

Rous Water is the bulk water supplier to each of the towns in RVC except Casino. Bulk water is treated and supplied to reservoirs and is reticulated by RVC to customers.

Rappville and Fairy Hill are not supplied with reticulated water but rely on rainwater tanks.

Augmentation of the water supply systems will be required to service new growth. The estimates of capital, operational and lifecycle costs for main water supply extensions are presented in Table 5-1.

5.2 Sewerage

RVC provides reticulated water and sewerage services to Casino, Evans Head, Woodburn, Rileys Hill and Coraki.

The town of Broadwater and villages of Rappville and Fairy Hill utilise on-site systems for treatment of their wastewater. Sewering of Broadwater village is expected to be completed by 2009, with sewage transferred to Evans Head STP for treatment.

There are a total of 2,840 licensed on-site sewage systems in the RVC area (2004/05), with an increasing number of new septic approvals per year. RVC has prepared and is implementing an *On-Site Sewage Management Strategy* (OSMS) for the area focusing on existing and new systems. Random audits of the existing systems to assess compliance with legislation and pre-purchase inspections of conditions are made by RVC.

Sewer extensions are planned to service growth.

Main options to extend the sewerage service and the estimate of capital, operational and lifecycle costs are presented in Table 5-1.

Table 5-1: Cost Estimate of Main Service Extension Options

Location	Option	Capital ($'000)	Operating ($'000/a)	NPV* ($'000 @ 7% discount)
Water Supply				
Casino (cost allocated in SBP and RVC budget)	New Gays Hill Reservoir	1,000	-	1,000
	Works to service growth	1,500 (over 30 years)	-	630
	South Reservoir upgrades	150	-	150
	Low pressure area improvements	250	-	250
	Minor Works	780 (over 30 years)	-	320
MLRR (cost allocated in SBP)	Mains upgrades	630 (over 30 years)	-	260
	Reservoir upgrades	300	-	300
	Works to service growth	1,000 (over 30 years)	-	430
Sewerage				
Casino (cost allocated in SBP and RVC budget)	Mains upgrades	2,300 (over 30 years)	-	1,200
	Pump Station upgrades	2,000	-	1,700
Evans Head/Woodburn (cost allocated in SBP and RVC budget)	Mains upgrades	1,100 (over 30 years)	-	600
	Pump Station upgrades	3,000	-	2,500
Coraki (cost allocated in SBP and RVC budget)	Mains upgrades	350 (over 30 years)	-	160
	Pump Station upgrades	200	-	180
Broadwater (cost allocated in RVC budget)	Broadwater sewerage augmentation (including treatment)	6,000	600 [1]	10,500

1. Approximate value for OMA (10% of capital cost). Recurrent costs were included in the OMA schedule used in RVC's DSP (RVC, 2006).

6 Asset Management

An Asset Management Plan contains information that Council will use to manage its assets throughout their whole life cycle including asset creation, operation, maintenance, replacement and disposal. The Plan identifies current and projected capital works to satisfy future demands in terms of growth, improved level of service and replacement of existing assets.

The 2006 Strategic Business Plans (JWP, 2006a) and 2007/08 Management Plan (RVC, 2007) identify projected renewals investment of $23 million for water supply and $26 million for sewerage over 30 years. This includes a significant investment in mains relining to address inflow and infiltration reduction.

The IWCM Strategy considers the development of a condition based asset management plan and renewals expenditure based on asset condition, remaining asset life and depreciation and considering the written down current cost and current replacement cost.

Information from the RVC asset register was used to determine the depreciation of each asset. Assets included water and sewerage mains, fire hydrants, water meters, valves, bulk meters, WTPs, STPs, manholes, fittings and vent stacks. No renewal cost is considered until an asset reaches 50% of its design life.

The 30 year NPV of the proposed renewal expenditure is detailed in Table 6-1. This is lower than the investment originally proposed by RVC but is considered to be sufficient over the long term.

Table 6-1: Renewals Expenditure.

System	30 year Expenditure ($'000)	NPV ($'000 @ 7% discount)
Water Supply	9,900	4,600
Sewerage	10,200	4,300
Total	20,100	8,900

Capital works programs for each IWCM scenario are attached in Appendix E. Appropriate operation, maintenance and administration (OMA) expenditure has also been identified to deliver each scenario.

7 Treatment Analysis

The treatment analysis aims to match the type of treatment required for the water sources identified in Section 4 with the potential needs of the various customers to be supplied with each source. This considered not only the required quality and treatment of potable water supplies, but also of potential recycled effluent and stormwater harvesting opportunities.

7.1 Water Supply Treatment

Casino's water supply is fully treated with sedimentation and filtration at a treatment plant adjacent to the Summerland Way, north west of Casino. The present capacity of the WTP is 23 ML/d which is sufficient to serve the projected demand. To address taste and odour issues, the treatment process will be upgraded to include powdered activated carbon (PAC) and soda ash ($KMNO_4$) dosing. An operational review is also required to optimise the treatment process with the aim of achieving full compliance with drinking water guidelines. The cost estimates for water treatment options are listed in Table 7-1.

Table 7-1: Cost Estimates of Water Treatment Options.

Location	Option	Issue Addressed	Capital ($'000)	Operating ($'000/a)	NPV ($'000 @ 7% disc.)
Casino WTP	Inclusion of PAC and soda ash dosing (cost allocated in budget).	Taste and odour	500	400	5,300

In the MLRR system, water taken from Rocky Creek Dam is treated at Nightcap WTP by Rous Water before being distributed to the storage reservoirs in Richmond LGA. The Service Level Agreement (SLA) with Rous Water (refer Section 8.3) includes a clause specifying that the water to be supplied by Rous Water will meet the latest standard of drinking water guidelines (ADWG).

7.2 Sewage Treatment

The existing sewage treatment systems are summarised in Table 4-2.

Each of the potential sewage treatment and reuse options are listed in Table 7-2 along with estimates of their capital, operational and lifecycle costs.

Table 7-2: Cost Estimates of Sewage Treatment Options

Location	Option	Issue Addressed	Capital ($'000)	Operating ($'000/a)	NPV ($'000 @ 7% disc.)
Casino	Augmentation to 19,000 EP secondary treatment (cost allocated in budget).	Capacity increase.	5,500	500	10,400
	Augmentation to 19,000 EP secondary treatment.	Capacity increase, (revised cost estimate).	6,200	500	11,100
	Augmentation to 19,000 EP tertiary treatment.	Capacity and treatment level increase for indirect potable reuse.	13,700	700	21,100
Coraki	Augmentation to 1,800 EP secondary treatment (cost allocated in budget).	Capacity increase.	4,000	100	8,400
	Augmentation to 1,800 EP secondary treatment.	Capacity increase, (reviewed cost estimate). [1]	1,100	100	2,300
	Augmentation to 1,800 EP tertiary treatment.	Capacity and treatment level increase for effluent reuse.	1,800	100	3,300
Evans Head	Augmentation to 11,000 EP secondary treatment (cost allocated in budget).	Capacity increase.	14,100	400	17,800
	Augmentation to 11,000 EP secondary treatment.	Capacity increase, (reviewed cost estimate). [1]	7,900	400	12,000
	Augmentation to 11,000 EP tertiary treatment.	Capacity and treatment level increase for aquifer recharge.	15,800	500	21,100
Rileys Hill	Addition of tertiary treatment.	Process upgrade for effluent reuse.	500	80	1,500

1. RVC cost estimate was checked and found to be conservative. RVC budget estimate was used (RVC, 2007).

7.3 Stormwater

The Richmond Valley LGA has a drainage network servicing urban areas consisting of kerb and guttering, pipes, gross pollutant traps, detention basins and natural drainage lines. The system discharges urban stormwater to local creeks, lagoons, the Richmond River and ultimately the ocean. Some catchments discharge in the vicinity of SEPP 14 wetlands in Evans Head.

RVC prepared a *Revised Stormwater Management Plan* (SMP) in 2005 (updated in 2007) to meet the requirements set out by the DEC to minimise the ecological and economical effect of urban stormwater on the receiving environment and community. The SMP covered the ten urbanised sub-catchments, documenting the drainage paths, catchment areas, potential hot-spots and opportunities for implementing stormwater management practices. It also explored community-identified issues for stormwater management such as litter, water quality, weeds, funding and infrastructure maintenance.

The SMP also assessed catchment conditions and stormwater issues in the LGA. It found that erosion was not a major problem for the area, although steeper areas of the upper catchments of Rocky Mouth Creek and the Evans River demonstrate higher erosion potential, particularly during flood events. Other potential pollutants identified in the SMP were sewage effluent discharges, acid sulphate soils, some industrial discharges and runoff from urban and agricultural land usage, including landfills.

Measures to improve the situation in the associated action plan included the construction of wetlands and sediment basins at Evans Head, maintenance of gross pollutant traps (GPTs) and other stormwater control devices, litter control, acid sulphate soil identification and exploring rainwater tanks.

Additionally, *DCP 9 – Water Sensitive Urban Design* was prepared and adopted in 2005, outlining principles such as water conservation, water quality control, management of stormwater generation (quality and quantity), management of riparian areas, habitat corridors, vegetation and landform and the management of construction, erosion and sediment control. The requirements outlined by this DCP are included in development application approvals.

Currently, there are limited measures to treat stormwater in RVC as the stormwater management plan has not been fully implemented due to a lack of financial resources.

Cost estimates in the SWM Plan were used to develop the stormwater capital works programs (Appendix G).

8 Other IWCM Initiatives

An integrated approach to water supply and sewerage services includes consideration of stormwater quantity and quality, catchment health, water sharing and the resulting interactions with the town water supply and sewerage systems. For some issues, water supply and sewerage solutions do not completely solve the identified problem and a total catchment management approach is required. The resulting solutions are not traditionally part of the water and sewerage businesses of NSW LWUs and funding for these initiatives must come from other areas (e.g. Council's General Fund, stormwater and catchment levies, the Catchment Management Authority (CMA) or other State Government departments).

As discussed in Table 2-1, the strategies investigated to solve some of the IWCM issues include the initiatives discussed in the following sections.

8.1 Regional Water Supply Strategy

To improve town water security in Richmond Valley, an important consideration is the regional institutional arrangements. RVC proposes to conduct a feasibility study into regional water supply arrangements including connection of Casino to Rous water supply system and RVC management of the MLRR supply. This would be undertaken as part of a Regional Water Plan in conjunction with Rous Water, other regional water utilities and State Government departments and in accordance with actions from the Far North Coast Regional Strategy (NSW Department of Planning, 2006). The aim is to review future supply options to ensure long term regional water efficiencies and improved drought security.

8.2 Regional Demand Management

As well as the demand management initiatives for the Casino water supply (refer Section 3), RVC implements the demand management strategies in the Rous Water Demand Management Plan for the MLRR water supply systems.

RVC will also participate in the development of a Regional Demand Management Strategy with Rous Water and other regional water utilities to develop consistent and complementary demand management initiatives for the region.

8.3 Service Level Agreement with Rous Water

The arrangements between RVC (and other constituent councils) and its bulk water supplier Rous Water have historically been relatively informal. This can lead to circumstances where, for instance, the demand management strategies developed by the bulk supplier and implemented by the constituent Councils have not undergone comprehensive review and analysis for effectiveness as there are no clear lines of responsibility or mechanisms through which to bring the respective organisations to account. Similar issues can occur when it comes to ultimate responsibility for customer water quality and the security of supply.

These existing conditions may be further complicated if RVC achieves significant reductions in potable demand through replacement of treated effluent and stormwater and hence looks for appropriate discounting of the developer contributions and other charges levied by Rous Water.

A key issue identified by the PRG in the IWCM Concept Study phase was to define responsibilities and formalise a service agreement between Rous Water and RVC. As a supplementary initiative of the IWCM strategy planning, the process of developing a Service Level Agreement (SLA) between the parties was commenced. The purpose of this Agreement is to define roles and responsibilities for the management of water supply within the area of operations of the parties.

A half-day workshop to broadly delineate each utility's responsibilities with respect to management, operations, funding and service provision, especially in relation to specific IWCM options for Richmond Valley was conducted on 28 November, 2006. Representatives from the other constituent Councils (Lismore, Byron Shire and Ballina) also attended the workshop. A summary of the workshop outcomes, which formed the basis for the SLA preparation between the parties can be found in Appendix I.

The SLA is an agreement between Rous Water, Ballina, Byron, Lismore and Richmond Valley Councils and was finalised in March 2008. The final SLA is attached in Appendix L.

8.4 Water Sharing Plans

At present there is no water sharing plan for either Richmond River or surrounding groundwater resources. A water sharing plan is important for RVC not only for ensuring continuing supply but for diversification of water sources, and general water quality and catchment management.

A key issue identified by the PRG in the IWCM Concept Study phase was to ensure that urban water service planning and the macro water sharing and catchment planning processes were better integrated. This would ensure a coordinated approach to the sharing of surface water and groundwater in the region.

To achieve this outcome, a meeting was held on 28 November, 2006 between RVC and representatives from the Northern Rivers CMA and DNR to discuss the expected outcomes of the macro water sharing plan process and the potential impacts of this process on urban and rural water users. The objective of the meeting was to define the opportunities for the IWCM process to assist in the delivery of an integrated approach to water management across the Richmond Valley.

A summary of the meeting outcomes are included in Appendix J.

8.5 Other Initiatives

Other initiatives which complement the IWCM process are listed below:

- Stormwater quality control to address poor water quality in rivers and improve the quality of raw water for drinking water supplies through implementation of the stormwater management plan (refer Section 7.3);
- Liaison with the Northern Rivers CMA to implement the Catchment Action Plan (CAP) to address poor water quality in rivers and improve the quality of raw water for drinking water;
- Update, implementation and review of the 2002 Flood Management Plan;

- Regulation and approval of new on-site systems, implementation of the On-Site Sewage Management Strategy and provision of incentives for improved on-site system technologies;
- Liaison with the DECC to enforce POEO Licence requirements and reduce point source contamination by others;
- Education programs on sustainable land management practices to improve the quality of raw water for drinking water supplies; and
- Implementation of development controls for the identification, assessment and management of acid sulphate soils (DCP 5).

These initiatives will be implemented by Council in consultation with the relevant regulatory authorities.

Stormwater and catchment management capital works programs and OMA schedules are included in Appendix G. Approximate stormwater and catchment levies required to fund the related initiatives are listed in Table 8-1.

Table 8-1: Cost Estimates for Stormwater and Catchment Management Initiatives.

30 year Capital ($'000)	30 year Operating ($'000)	Average Cost ($'000 p.a.)	Levy (per assessment) [1]
Stormwater			
800	13,000	500	42 [2]
Catchment Management			
-	3,000	100	9

1. Based on average ultimate (year 2036) number of water and sewer residential assessments (11,118 assessments) not total rateable assessments.
2. The maximum allowable levy is $25 per rateable assessment. RVC may elect to cross-subsidise the expenditure or modify the capital works program.

8.5.1 Initiatives to be implemented as part of the General Fund

Some of the initiatives proposed to address the IWCM issues which would be funded from Council's general fund. These are listed as follows:

1. Incentives for better on site technologies: This initiative is to address the need for improvements in on-site sewerage management. It is assumed that from the 2,840 on-site systems, about 25% (about 700) will be replaced/upgraded using this incentive. The cost of an improved domestic on-site sewerage system is quoted as about $10,000 (BioMAX). It is also assumed that Council will contribute 25% ($2,500) of the cost. The incentive is assumed to be applied over 10 years for existing systems only. New systems have to comply with best-practice on-site effluent management as part of the development approval conditions. It has also been assumed that the audit program will be carried out every 3 years. The total cost including audit is $2.8 million over 30 years.

2. Education on sustainable land management practices: This initiative aims to improve existing land use practices that impact on surface water quality. It is assumed that a 5-year education program targeting farmers will be developed and implemented. The total cost is 150,000 over a 5 year period.

3. Stormwater and catchment management actions as discussed above (refer Appendix G).

9 Identified Data Gaps

As part of the IWCM Concept Study a data audit involving the collection of background data and the identification of data gaps was undertaken. In order to progress the IWCM Strategy, measures were identified to address these gaps that would be undertaken concurrently with the completion of Strategy and during the implementation phase.

A review of the status of these data gaps has been undertaken. A summary of this review and the original recommendations for addressing these gaps are presented in Table 9-1. Where the data gap has been resolved in the IWCM Strategy, this is discussed in Section 11.

Table 9-1: Data gap review and summary.

Data Gap	Measures to Remedy Gap	Status of data gap
Secure yield of Jabour weir.	Undertake yield assessment of Jabour Weir. This analysis should take into account the 1990 investigation completed by NSW Department of Public Works and Services on behalf of Rous Water.	Completed (refer Section 4.3).
Data on the nature and extent of stormwater infiltration to the sewerage system.	Condition assessment, sewer system modelling.	RVC is currently undertaking an inflow/infiltration reduction program with targeted relining for high risk catchments (high flow pump stations). Modelling will commence in 2008. Asset renewal expenditure will be utilised to reduce infiltration.
Limited data on on-site sewage management systems (location, condition, pump out etc).	Expand the current rolling audit program to be based on a risk assessment and management approach.	The RVC On-site Sewage Management Strategy will be implemented as part of this IWCM Strategy. Random audits of the existing systems are made to assess compliance with legislation and pre-purchase inspections of condition. The risk-based approach is yet to be implemented.
Quality and quantity of stormwater runoff.	Review of SMP, with focus on quantity management opportunities in line with the assessment of urban stormwater systems in Evans Head and Casino which RVC plans to undertake in 2006/07.	Some actions from the SMP have been completed and the remaining actions will be undertaken progressively (refer Section 7.3).

Data Gap	Measures to Remedy Gap	Status of data gap
Flooding impact on specific water and sewerage infrastructure.	Review outcomes of floodplain mapping to identify at risk assets for systems other than Casino (which has already been assessed for the 1 in 100 year event).	No IWCM activities have been allocated to specifically address flooding impact apart from update, implementation and review of the 2002 Flood Management Plan (refer Section 8.5).
Limited data on rainwater tanks.	Audit all existing urban systems.	Rainwater tanks will be considered as part of the Regional Water Supply Strategy (refer Section 8.1)
Raw data for water quality in Richmond River and Rocky Creek dam catchments.	Develop and implement program to facilitate assessment of urban (stormwater and effluent) discharges.	No IWCM activities have been allocated to specifically establish a river water quality monitoring program. Available water quality data in terms of limited parameters will continue to be sourced from external organisations such as DNR. Strategies to reduce the impact of urban discharges include on-site sewage management, stormwater management, flood management, catchment management, STP upgrades and the reduction of point source pollution.
Licensed surface and ground water extraction information	DNR to collect and compile data.	Available data will continue to be sourced from external organisations such as DNR.
Comprehensive documentation of soil erosion and erosion prone areas.	Map catchment land use and practices.	No IWCM activities have been allocated to document soil erosion apart from education on sustainable land management practices (refer Section 8.5).
Implementation status of effectiveness of floodplain risk management strategy.	Review and document strategy, with focus on impact on water and sewerage infrastructure.	No IWCM activities have been allocated to specifically address flooding impact apart from update, implementation and review of the 2002 Flood Management Plan (refer Section 8.5).

10 IWCM Scenarios

10.1 Draft Scenarios

Having identified and evaluated a range of opportunities to manage each of the verified issues (Table 2-1) developed as part of the Concept Study, five draft scenarios were established.

These scenarios include:

- A "base" case (B) also known as "business as usual", which does not include any solutions beyond what RVC is already doing to improve or maintain the water supply and sewerage businesses;
- A "traditional" case (T) based on traditional solutions that solve issues in an isolated, non-integrated way; and
- Three "integrated" solutions (IN 1, IN 2 and IN 3) that incorporate combinations of various build and non-build options and integration of water supply, sewerage and stormwater management by including recycled water use and stormwater harvesting, among other options.

Tailoring the IWCM process in this way ensured that that a high number of potential options were investigated and assessed at the preliminary stage without compromising the ability of the final outcome to provide effective management solutions.

The previous chapters present various potential options to solve the issues. The potential options are summarised in Table 10-1. The options showing poor cost benefit ratio were not included in the draft scenarios.

The draft scenarios developed are listed in Table 10-3.

Table 10-1: Potential Options

Category	Options	Included in Scenarios	Note
Regional institutional arrangement	Feasibility study on regional water supply arrangements	T, 1, 2, 3	20% capital cost to RVC
Demand Management	No demand management	B	
	DWE best practice two part pricing	T, 1, 2, 3	
	Rainwater tanks under BASIX (for new development)	T, 1, 2, 3	
	Educational program for external water uses (as in Rous Water Demand Management Plan)	T, 1, 2, 3	
	Reduction for unaccounted for water	T, 1, 2, 3	
	Shower head retrofit	1, 2, 3	
	Permanent restriction	1, 2, 3	

Category	Options	Included in Scenarios	Note
	Business audit	1, 2, 3	
	Rainwater tank retrofit (for existing development)	No	Poor cost benefit
	Residential audit	No	Poor cost benefit
	Dual flush toilet retrofit	No	Poor cost benefit
	Rous demand management strategies for lower Richmond	All	
	Regional demand management strategy	1, 2, 3	20% capital cost to RVC
Water sharing	Contribute to DNR Macro Water Sharing Plan	T, 1, 2, 3	
Climate change	Sensitivity analysis on yield with reduced rainfall	1, 2, 3	
Source augmentation	Augmentation planned as in SBP	All	Can not solve issue
	Alternate source investigation	T, 1, 2, 3	
	Off stream storage of 3.5 GL as a pool money	NO	Design Alternative
	Off stream storage of 3.0 GL as a pool money	NO	Design Alternative
	Off stream storage of 2.8 GL as a pool money	1A	Special investigation
Emergency backup	No back up planned	B	Can not solve issue
	Emergency backup supplies in alternate source investigation	T, 1, 2, 3	Included in the alternate source investigation scope
Dual reticulation	Dual reticulation new development area west Casino (Bruxner Hwy)	2	
	Dual reticulation new development area North Casino (Summerland Way)	2	
	New development area South west of Coraki STP	2, 3	50% capital cost to RVC
	New development area North east of Coraki STP	No	Poor cost benefit

Category	Options	Included in Scenarios	Note
	Broadwater dual reticulation - urban residential reuse (incl. Cogeneration plant) (145 ML/y)	2, 3	50% capital cost to RVC
	Broadwater dual reticulation - urban residential reuse (excl. Cogeneration plant) (72 ML/y)	No	Lower environmental outcomes
	Evans Head & Woodburn dual reticulation - urban residential reuse (370 ML/y)	2	50% capital cost to RVC
	Evans Head dual reticulation - urban residential reuse (300 ML/y)	No	Combined option is more effective
	Woodburn dual reticulation - urban residential reuse (70 ML/y)	No	Combined option is more effective
	New development area at Rileys Hill	No	Too small scale to justify
Indirect potable use	Casino indirect potable reuse - Route 1 (via street)	No	Less cost-effective option
	Casino indirect potable reuse - Route 2 (via agric land)	3	
	Recharging Woodburn aquifer	3	
Effluent management	Casino - Golf Course	All	
	Casino - Abbatoir	No	Abbatoir declined offer
	Casino - Blue Circle Cement Ltd (Dyraaba St)	T, 1, 2, 3	
	Present reuse regime at lower Richmond (Coraki golf course)	B	
	Broadwater agricultural reuse (incl. Woodburn) (256 ML/y)	T, 1, 2, 3	
	Broadwater industrial reuse (73 ML/y)	No	Geolink report
	Evans Head irrigation open spaces	T, 1, 2, 3	
	Woodburn irrigation open spaces	No	Combined option is more effective
Stormwater harvesting	Stormwater harvesting for Casino new development (Bruxner)	No	Can not solve issue
	Stormwater harvesting for Casino new development (Summerland)	No	Can not solve issue

Category	Options	Included in Scenarios	Note
	Encourage individual developer / industry to implement stormwater harvesting	1, 2, 3	
Asset renewal	Renewal as in SBP and budget	B	
	Condition based asset renewal including pumps, reservoirs and bores	T, 1, 2, 3	
	Consideration of ASS impacts for lower Richmond	1, 2, 3	
	Lower Richmond - Metering in distribution system	T, 1, 2, 3	
Stormwater Management	On going implementation	All	
	Update stormwater management plan	All	
Catchment initiatives	Liaison with CMA to implement CAP	All	
	Implement CAP	1, 2, 3	
Flood Management	On going implementation	All	
	Update flood management plan	All	
STP	Casino: RVC budget estimate	B	
	Casino: JWP cost review for conventional treatment	T, 1, 2	
	Casino: Tertiary treatment	3	
	Coraki: RVC budget estimate	All	
	Coraki: JWP cost review for conventional treatment	No	RVC cost is conservative
	Coraki: Tertiary treatment	No	Design Alternative
	Evans Head: RVC budget estimate	All	
	Evans Head: JWP cost review for conventional treatment	No	RVC cost is conservative
	Evans Head: Tertiary treatment	3	
	Rileys Hill : Tertiary	No	Design Alternative
WTP	Casino: Review and adjust operational procedure	T, 1, 2, 3	
	Casino: Add PAC - RVC budget estimate	All	

Category	Options	Included in Scenarios	Note
	Casino: Add PAC: JWP cost review	No	RVC cost is conservative
	Lower: Include a quality compliance clause in SLA	T, 1, 2, 3	
OMA cost	SBP / budget OMA cost	B	
	OMA cost modified by JWP	T, 1, 2, 3	
	Regulated on-site system design approval	All	
	On-site sewage management strategy	All	
	Incentives for better on site technologies	1, 2, 3	
	Liaison with DEC to enforce POEO license	T, 1, 2, 3	
	Education on effluent reuse	2, 3	
	Education on sustainable land management practice	1, 2, 3	
	Update DSP and financial plan	All	Cost is included in the SBP OMA cost
	Apply full cost recovery pricing	T, 1, 2, 3	
	Implement DCP 5: for ASS	All	
	Infiltration / inflow reduction program	ALL	Cost is included in the SBP OMA cost
Additional projects requested by RVC	Effluent management - Casino sporting fields (Albert park, Queens Elizabeth Park, Crawford square)	T, 1, 2, 3	
	Dual Reticulation - Reynolds Road	2	

The basis of the draft scenarios is listed in Table 10-2.

Table 10-2: Main components of Draft Scenarios

Scenario	Demand Management	Security of Supply	Effluent Recycling
Base Case (B)	None	Not secure.	Golf course and agricultural irrigation (Blue Dog)
Traditional (T)	Low level	Source Investigation	B + sporting fields, industry
Integrated 1	High level	Source Investigation	B + sporting fields, industry
Integrated 2	High level	T + Increase of security through dual reticulation	T + Dual reticulation for new development
Integrated 3	High level	T + Increase of security through Indirect Potable Reuse	T + Indirect potable reuse

Each of these five draft scenarios combines complementary management options to provide RVC with solutions to their water cycle management issues. The draft scenarios developed are summarised in Table 10-3.

A capital works program, OMA (Operation, maintenance, administration) schedule and financial model was set up for each IWCM scenario in order to compare levels of expenditure and typical residential bills (TRB) to be paid by water and sewerage customers under each IWCM scenario. This enabled the IWCM scenarios to be compared in terms of TRB, a key social criteria identified by the PRG.

Table 10-3: RVC Draft Scenarios.

No.	IWCM Issues	Location	Option	Base Case (B)	Traditional (T)	Integrated 1 (IN 1)	Integrated 2 (IN 2)	Integrated 3 (IN 3)
Water supply security								
1	Poor town water supply security.	Shire-wide	Regional institutional arrangements	No change	Conduct feasibility study into regional water supply arrangements including connection of Casino system to Rous Water and RVC management of Lower Richmond River supply	Same as T	Same as T	Same as T
		Casino	Demand management	None. Projected peak demand 20.6 ML/d (in 2036). Projected average demand 9.8 ML/d (in 2036)	Demand management including BASIX, pricing, education (as in Rous Demand Management Plan) and UFW reduction. Projected peak demand 17.1 ML/d (in 2036). Projected average demand 7.9 ML/d (in 2036).	High level demand management (T + showerhead retrofit, business audit and water conservation order). Projected peak demand 16.6 ML/d (in 2036). Projected average demand 7.8 ML/d (in 2036)..	Same as IN 1	Same as IN 1
		Lower Richmond	Regional demand management	As per Rous Demand Management Plan.	Same as B	Regional Demand Management Strategy (partial cost added).	Same as IN 1	Same as IN 1
		Casino	Treatment capacity	Present WTP capacity 23 ML/d. No augmentation required.	Same as B	Same as B	Same as B	Same as B
		Casino	Security of supply	Lack of security. Present unrestricted average demand is 7.2 ML/d. Present restricted safe yield is about 13.1 ML/d. Present unrestricted safe yield is 7.7 ML/d. Casino would run out of water during more severe droughts. SBP cost allocation for augmentation.	B + Alternate Source Investigation including raising of Jabour Weir / off-stream storage / groundwater / Cookes weir / stormwater harvesting / Toonumbar dam / regional water supply arrangements.	Same as T	T + Increase of security of supply through dual reticulation for new development.	T + Increase of security of supply through indirect potable reuse.
		Casino	Emergency backup	No emergency backup.	Include consideration of alternative emergency supplies in Alternate Source Investigation (alternate source will also act as emergency back-up).	Same as T	Same as T	Same as T
		Casino	Effluent management	Reuse at Golf Course and agricultural irrigation (Blue Dog) = 597 ML in 04/05.	B + Blue circle cement, sporting fields (Albert park, Queens Elizabeth Park, Crawford square).	Same as T	T + dual reticulation for new development of Bruxner, Summerland and Reynolds Road.	T + indirect potable reuse (and return flow credits).
		Lower Richmond	Effluent management	Coraki golf course	B + Irrigation of sporting fields and open space areas (Evans Head effluent reuse scheme, Broadwater agriculture including Woodburn).	Same as T	T+ transfer of effluent to Rous for dual reticulation (50% cost added), Southwest Coraki, Broadwater including cogeneration, Evans Head and Woodburn combined.	T + recharge Woodburn aquifer + transfer of effluent to Rous for dual reticulation (50% cost added) for Southwest Coraki and Broadwater including cogeneration.
		Casino	Stormwater harvesting	None	Same as B	Encourage individual development / industry to harvest stormwater.	Same as IN 1	Same as IN 1
		Lower Richmond	Stormwater harvesting	None	Same as B	Encourage individual development / industry to harvest stormwater.	Same as IN 1	Same as IN 1
		Shire-wide	UFW reduction (metering)	None	Metering in distribution system.	Same as T	Same as T	Same as T

No.	IWCM Issues	Location	Option	Base Case (B)	Traditional (T)	Integrated 1 (IN 1)	Integrated 2 (IN 2)	Integrated 3 (IN 3)
			UFW reduction (renewal)	Renewal program as in SBP.	Condition based asset renewal.	Same as T	Same as T	Same as T
			UFW reduction (leak detection)	As in demand management of 1 (UFW reduction).				
Ground and surface water sharing								
2	Lack of ground and surface water sharing plans. RVC must be involved in the water sharing process to ensure town water supplies are adequate.	Shire-wide	Macro Water Sharing Plan (WSP)	None	Contribute to DNR Macro WSP development process.	Same as T	Same as T	Same as T
Effluent reuse								
3	RVC must implement sustainable effluent reuse with end user requirements considered.	Casino	Effluent management	As in 1				
		Lower Richmond	Effluent management	As in 1				
		Shire-wide	Education	None	Same as B	Education on effluent reuse.	Same as IN 1	Same as IN 1
Surface water quality								
4	Existing land use practices and urban impacts are affecting surface water quality.	Shire-wide	On-site sewage management (design regulation)	Regulated on-site system design approval.	Same as B	Same as B	Same as B	Same as B
		Shire-wide	On-site sewage management (monitoring)	Implement existing program (RVC On-site Sewage Management Strategy).	Same as B	Same as B	Same as B	Same as B
		Shire-wide	On-site sewage management (improvement)	None	Same as B	Incentives for better on site technologies.	Same as IN 1	Same as IN 1
		Shire-wide	Environmental flows	None	As in 2	As in 2	As in 2	T + indirect potable reuse to increase base flows
		Shire-wide	Stormwater quality improvement and management	Stormwater Management Plan (2007) - on going implementation and periodic update.	Same as B	Full implementation of SMP	Same as IN 1	Same as IN 1
		Shire-wide	Salt water intrusion reduction	As in 2				
		Shire-wide	Catchment management initiatives	None	Same as B	Liaison with CMA to implement Northern Rivers CMA Catchment Action Plan.	Same as IN 1	Same as IN 1
		Shire-wide	Water Sharing Plan	As in 2				
		Shire-wide	Flood management	Flood Management Plan (2002) - on going implementation and periodic update.	Same as B	Full implementation of FMP.	Same as IN 1	Same as IN 1
		Casino	Blue-green algae	As per Emergency backup in 1, environmental flows in 4, PAC in 6, and regional institutional arrangement (via alternate source) in 1				
		Casino	STP point source contamination control	Current capacity 13,300 EP Augmentation to 19,000 as in SBP.	Revised cost estimate.	Same as T	Same as T	Tertiary treatment
		Coraki	STP point source contamination control	Current capacity 1,200 EP, licensed discharge = 400kL/d Upgrade to 1,800 EP as in SBP.	Same as B	Same as B	Same as B	Same as B

No.	IWCM Issues	Location	Option	Base Case (B)	Traditional (T)	Integrated 1 (IN 1)	Integrated 2 (IN 2)	Integrated 3 (IN 3)
		Rileys Hill	STP point source contamination control	Current capacity 200EP, licensed discharge = 216kL/day Renewals only as in SBP.	Same as B	Same as B	Same as B	Same as B
		Evans Head	STP point source contamination control	Current capacity 3,700 EP, licensed discharge = 650 kL/d Augmentation to 11,000 as in SBP.	Same as B	Same as B	Same as B	Tertiary treatment
		Shire-wide	Point source contamination control	None	Liaison with DEC to enforce POEO licence requirements.	Same as T	Same as T	Same as T
		Shire-wide	Education	None	None	Education on sustainable land management practices.	Same as IN 1	Same as IN 1
Typical residential bills								
5	High operating and management costs for water and sewerage systems lead to relatively high typical residential bills.	Shire-wide	Financial management	Update DSP and Financial Plan.	B + Apply full cost recovery pricing (Demand Management as in 1).	T + Designed to be self funding and less costly. Greater access to funds through diversified services and product delivery.	Same as IN 1	Same as IN 1
		Shire-wide	Water and sewerage asset renewals	Renewal program as in SBP and budget.	Condition based asset renewal.	Same as T	Same as T	Same as T
Potable water quality								
6	RVC must comply with current and future potable water standards.	Casino	Treatment plant process upgrade	Current process includes sedimentation and filtration. Addition of PAC and KMnO4 as in SBP. 2004/05 compliance was total coliform 79% and Chemical 96%.	B + Review and adjust current operational procedure.	Same as T	Same as T	Same as T
		Lower Richmond	Drinking water quality	As per Rous water supply.	B + Include a quality compliance clause in Service Level Agreement.	Same as T	Same as T	Same as T
Hydrologic stress								
7	Hydrologic stress in catchments contributes to unsustainable extraction particularly during low flows.	Shire-wide	Regional institutional arrangements	As in 1				
			Emergency backup	As in 1				
			Demand management	As in 1				
		Shire-wide	Catchment management initiatives	As in 4				
		Shire-wide	Environmental flows	As in 4				
On-site systems								
8	There is a need for sustainable management of onsite sewage systems.	Shire-wide	On-site sewage management systems (design regulation, monitoring and incentives)	As in 4				
Sewerage assets								
9	Stormwater infiltration into the sewerage system increases wet weather flows.	Shire-wide	Sewerage asset renewals	Infiltration / inflow reduction program.	B + asset renewal as in 5.	Same as T	Same as T	Same as T

No.	IWCM Issues	Location	Option	Base Case (B)	Traditional (T)	Integrated 1 (IN 1)	Integrated 2 (IN 2)	Integrated 3 (IN 3)
Stormwater / rainwater reuse								
10	There is a need for sustainable stormwater / rainwater reuse.	Shire-wide	Rainwater tanks	As in demand management of 1 (BASIX)				
		Shire-wide	Stormwater harvesting	As in 1				
Climate change								
11	Climate change may adversely alter the rainfall and temperature patterns of the study area.	Shire-wide	Risk management	None	Same as B	Sensitivity analysis on yield with reduced rainfall.	Same as IN 1	Same as IN 1
		Shire-wide	Alternative water sources	As in 1 (Regional institutional arrangements, emergency back up, demand management, effluent management, stormwater harvesting, UFW reduction)				
Sewerage systems								
12	Non-conformances at Coraki and Rileys Hill sewage treatment plants.	Coraki	Treatment plant process upgrade	As in 4 (STP point source contamination control) and 5 (asset renewals)				
		Rileys Hill	Treatment plant process upgrade	As in 4 (STP point source contamination control) and 5 (asset renewals)				
Demand management								
13	Poor demand management in terms of consumption and unaccounted for water.	Shire-wide	Demand management	As in 1				
			UFW	As in 1				
ASS soils								
14	ASS soils in RVC urban areas potentially impact on sewer infrastructure.	Lower Richmond	New infrastructure to consider ASS impacts	Implement DCP5 - Acid Sulphate Soils: identification, assessment and management	Same as B	Same as B	Same as B	Same as B
		Lower Richmond	Renewal program to consider ASS impacts	None	None	Renewals to consider ASS impacts.	Same as IN 1	Same as IN 1

10.2 Financial Analysis

A capital works program, OMA schedule (Appendix E) and financial model (Appendix F) was set up for each IWCM scenario in order to compare levels of expenditure and typical residential bills (TRB) to be paid by water and sewerage customers under each IWCM scenario. This enabled the IWCM scenarios to be compared in terms of TRB, a key social criteria identified by the PRG.

In order to conduct the financial analysis, preliminary design and cost estimates were determined for each project/capital works item. These design and cost estimates are provided at a planning level and costs may vary by up to 50%. This achieves the purpose of draft scenario evaluation since similar assumptions, procedures and origins are used for all of the cost estimates.

Cost estimates are based on NSW Reference Rates, information from similar projects and suppliers quote. The costs are adjusted for CPI and construction industry trends as applicable. In most cases, the cost includes engineering, training, manuals, site establishment, project management, land acquisition and contingency.

10.3 Stakeholder Review

As they will be critical to the successful implementation of the IWCM Strategy, stakeholders were invited to participate in the process of reviewing and selecting a scenario for implementation. As discussed in Section 2.2, PRG workshops were held to:

- Review the solutions proposed to address the identified issues;
- Discuss the developed draft scenarios;
- Evaluate the draft scenarios considering the social, economic and environmental costs and benefits of each scenario; and
- Identify a preferred scenario or preferred scenario components.

Participants were issued with a project briefing paper prior to the workshops and a summary paper of the workshop outcomes (refer Appendix B).

10.4 Triple Bottom Line Assessment

Consistent with the DWE IWCM framework, the scenarios developed were ranked based on their performance against a series of economic, social and environmental measures (a Triple Bottom Line assessment). The methodology and outcomes of this assessment for RVC is detailed in Appendix H and summarised in the following sections.

Triple Bottom Line (TBL) assessment is an approach of assessing individual or bundled management options against a set of social, environment and economic measures. It is possible to develop many environmental and social measures upon which to measure the appropriateness of the management options. However, for practical purposes, it is necessary to identify key criteria which best represent local values.

The inputs of the PRG, government agencies and RVC staff, as part of the community consultation process were utilised to determine a set of triple bottom line assessment measures for RVC (refer Appendix B, Appendix H and Section 2.2).

Each of the three scenarios was ranked using the TBL measures, to assess the relative desirability of the outcomes from implementing the different scenarios.

Based on the measures set, each option was assigned an environmental score and a social score and weightings for each measure were assigned by the PRG members. In order to rank the relative TBL performance of each option, the environmental and social scores for each option were summed and then divided by the net present value of the option. Ranking each option in this manner provides a measure of how many positive social and environmental outcomes every dollar invested would buy. Hence, this process provides an opportunity to assess the relative desirability of the outcomes of implementing different scenarios.

Ranking of the draft scenarios was determined by the PRG in the second PRG workshop (refer Appendix B and Appendix H).

11 Preferred Scenario

The preferred scenario for RVC's water, sewerage and stormwater businesses was determined through consultation with the PRG, steering committee meeting and TBL assessment. The PRG and steering committee discussed the project elements within each scenario, the methodology used to build the scenarios and the TBL assessment of scenarios, including assigning weightings to each assessment measure.

Based on the results of the consultation program and the scenario ranking, Integrated 3 was identified as the preferred scenario for implementation. However, the PRG found that the implementation of this scenario will require a relatively long lead time due to the investigations, risk assessment and consultation required for the indirect potable reuse component. The PRG considered that the scenario "Integrated 1" should be adopted as a short term solution. Also, the PRG agreed that it was worth considering dual reticulation for new development (from Integrated scenario 2) if feasible.

Therefore, a hybrid of Integrated Scenarios 1, 2 and 3 will be adopted by RVC as the preferred scenario.

RVC considers that it is important to undertake planning for the indirect potable reuse component in conjunction with a regional water supply strategy, alternate source investigation and emergency supply strategy.

11.1 Components of the Preferred Scenario

This section summarises the preferred scenario and the method for its implementation.

Table 11-1: Finalised Preferred Scenario

IWCM Issues		Strategies	Preferred Scenario
1	Poor town water supply security	Regional institutional arrangements	Conduct feasibility study into regional water supply arrangements including connection of Casino system to Rous Water and RVC management of Lower Richmond River supply
		Demand management	High level demand management (BASIX, pricing, education (as in Rous Water Demand Management Plan), UFW reduction, showerhead retrofit, business audit and water conservation order)
		Regional demand management	Regional Demand Management Strategy
		Treatment capacity	Present WTP capacity 23 ML/d. No augmentation required.
		Security of supply	SBP cost allocation for augmentation Alternate Source Investigation. Also, increase of security of supply through indirect potable reuse and/or dual reticulation (if feasible in future).
		Emergency backup	Include consideration of alternative emergency supplies in Alternate Source Investigation

IWCM Issues		Strategies	Preferred Scenario
		Effluent management - Casino	Reuse at Golf Course and agricultural irrigation (Blue Dog), Blue Circle cement, sporting fields. In future, dual reticulation for new development and indirect potable reuse to be considered.
		Effluent management - MLRR	Coraki golf course, irrigation of sporting fields and open space areas. In future, dual reticulation for new development and recharge Woodburn aquifer to be considered.
		Stormwater harvesting	Encourage individual development / industry to harvest stormwater.
		UFW reduction (metering)	Metering in distribution system.
		UFW reduction (renewal)	Condition based asset renewal.
		UFW reduction (leak detection)	UFW reduction as in Demand Management above.
2	Lack of ground and surface water sharing plans. RVC must be involved in the water sharing process to ensure town water supplies are adequate.	Macro Water Sharing Plan (WSP)	Contribute to DNR Macro WSP development process.
3	RVC must implement sustainable effluent reuse with end user requirements considered.	Effluent management	As in 1.
		Education	Education on effluent reuse when and if dual reticulation and/or indirect potable reuse implemented.
4	Existing landuse practices and urban impacts are affecting surface water quality	On-site sewage management (design regulation)	Regulated on-site system design approval.
		On-site sewage management (monitoring)	Implement existing program (RVC On-site Sewage Management Strategy).
		On-site sewage management (improvement)	Incentives for better on site technologies.
		Environmental flows	Water sharing process as in 2, indirect potable reuse to increase base flows if implemented in future.
		Stormwater quality improvement and management	Full implementation of Stormwater Management Plan (2007).
		Salt water intrusion reduction	Water sharing process as in 2
		Catchment management initiatives	Liaison with CMA to implement Northern Rivers CMA Catchment Action Plan.
		Water Sharing Plan	Water sharing process as in 2
		Flood management	Full implementation of Flood Management Plan (2002).

IWCM Issues		Strategies	Preferred Scenario
		Blue-green algae management	As per Emergency backup as in 1, environmental flows as in 4, addition of PAC treatment as in 6, and regional institutional arrangement (via alternate source) as in 1.
		STP point source contamination control	Augment Casino, Coraki, Evans Head STPs, targeted renewals at Rileys Hill STP.
		Point source contamination control	Liaison with DEC to enforce POEO licence requirements.
		Education	Education on sustainable land management practices.
5	High operating and management costs for water and sewerage systems lead to relatively high typical residential bills	Financial management	Update DSP and Financial Plan, apply full cost recovery pricing (Demand Management as in 1) and Designed to be self funding and less costly. Greater access to funds through diversified services and product delivery.
		Water and sewerage asset renewals	Condition based asset renewal.
6	RVC must comply with current and future potable water standards.	Treatment plant process upgrade - Casino	Current process includes sedimentation and filtration. Addition of PAC and KMnO4, review and adjust current operational procedure.
		Drinking water quality	As per Rous water supply with quality compliance clause in Service Level Agreement.
7	Hydrologic stress in catchments contributes to unsustainable extraction particularly during low flows.	Regional institutional arrangements	As in 1.
		Emergency backup	As in 1.
		Demand management	As in 1.
		Catchment management initiatives	As in 4.
		Environmental flows	As in 4.
8	There is a need for sustainable management of onsite sewage systems.	On-site sewage management systems (design regulation, monitoring and incentives)	As in 4.
9	Stormwater infiltration into sewerage system increases wet weather flows	Sewerage asset renewals	Infiltration / inflow reduction program and asset renewal as in 5.
10	There is a need for sustainable stormwater / rainwater reuse	Rainwater tanks	As in demand management of 1 (BASIX).
		Stormwater harvesting	As in 1
11	Climate change may adversely alter the rainfall and temperature patterns of the study area	Risk management	Sensitivity analysis on yield with reduced rainfall.
		Alternative water sources	As in 1 (Regional institutional arrangements, emergency back up, demand management, effluent management, stormwater harvesting, UFW reduction).

IWCM Issues		Strategies	Preferred Scenario
12	Non-conformances at Coraki and Rileys Hill sewage treatment plants	Treatment plant process upgrades	As in 4 (STP point source contamination control) and 5 (asset renewals)
13	Poor demand management in terms of consumption and unaccounted for water	Demand management	As in 1
		UFW reduction	As in 1
14	ASS soils in RVC urban areas potentially impact on sewer infrastructure	New infrastructure to consider ASS impacts	Implement DCP5 - Acid Sulphate Soils: identification, assessment and management.
		Renewal program to consider ASS impacts	Renewals to consider ASS impacts.

The key financial parameters associated with the preferred scenario are as follows:

- Total capital cost (water): $26.8 million
- Total capital cost (sewerage): $80.3 million
- 30 year OMA cost (water): $172 million
- 30 year OMA cost (sewerage): $250 million
- Typical residential bill (water): $445 per assessment
- Typical residential bill (sewerage): $770 per assessment

11.2 Impact of Increased Expenditure for Source Augmentation

One of the critical components in the preferred scenario is the security of supply. As it is apparent that a new source has to be identified (Section 4.3), the cost for an alternate source investigation is included in the scenario. The study (Section 4.4.2) should look into all possible options including raising of Jabour weir, groundwater sources, off-stream storage, Cookes weir and Toonumbar dam. Anticipating the need for a possible source augmentation, RVC has allocated a lump sum of $4 million in its current capital works program (JWP, 2006a). However, to understand the impact of the investment on the typical residential bill (TRB), indicative costs of the required off-stream storage have been determined (Section 4.4.3).

An alternate preferred scenario (Integrated IN 1a) was established by replacing the arbitrary SBP allocation for source augmentation with the cost of the required off stream storage (OSS). The preferred integrated scenario (IN 1) corresponds with the high level demand management which set the OSS capacity at 2.8 GL (based on the WATHNET model, see Table 4-3).

The capital and OMA cost for the alternate preferred scenario IN 1a (with OSS) is (Appendix K).

- Total capital cost (water): $37.0 million
- 30 year OMA cost (water): $174 million

The TRB is $1,280 per assessment (compared to $1,215 per assessment for Integrated 1).

11.3 Implementation

This IWCM Strategy has set the future direction for RVC by addressing a number of priority issues identified by RVC staff, government agencies and the local community.

The implementation of the preferred scenario is reliant on RVC's commitment to the capital works program developed as part of this Strategy, as well as its ability to maintain financial stability over the next thirty years. Hence, the capital works program and financial model, attached in Appendices D and F, will set the direction for RVC's Strategic Business Plan (SBP). RVC will need to continuously develop, implement and review the components of this Strategy to ensure it is successful.

A summary of the financial implications of the preferred scenario is given in the following table. These costs do not include dual reticulation and indirect potable reuse options (components of integrated scenarios 2 and 3).

Table 11-2: Capital and Recurrent (OMA) Expenditure and Typical Residential Bills (TRB).

Component	30 year Capital Works Program ($'000)	30 year OMA Expenditure ($'000)	TRB ($/assessment)
Water Supply	26,800	80,300	445
Sewerage	172,000	250,000	770
Total	198,800	330,300	1,215

The following figures provide a summary of the capital expenditure (works divided into ILOS – improved levels of service, growth and renewals) and recurrent (OMA) expenditure for water supply and sewerage.

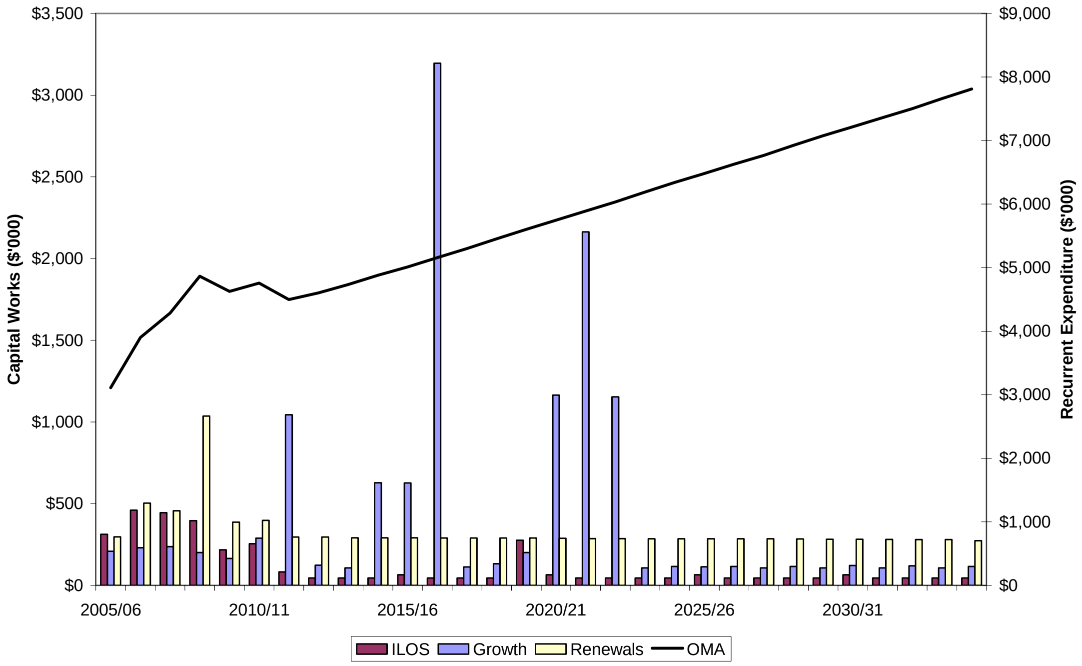

Figure 11-1: Water Supply Capital and Recurrent (OMA) Expenditure – Preferred Scenario.

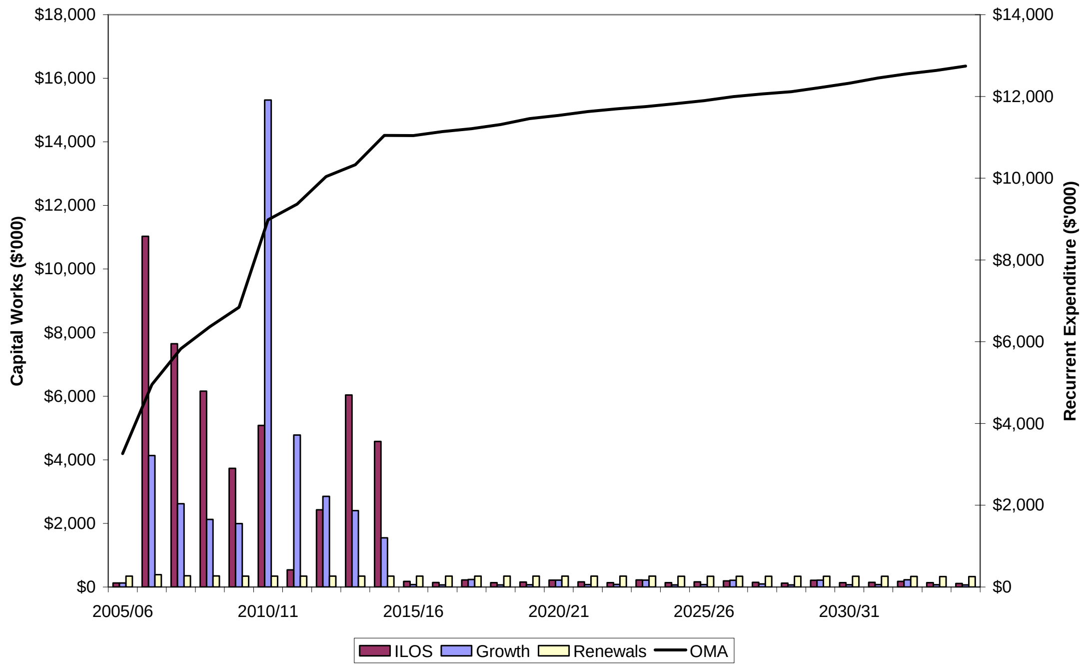

Figure 11-2: Sewerage Capital and Recurrent (OMA) Expenditure – Preferred Scenario.

Where possible, the capital works program and recurrent expenditure is funded through existing cash levels which is determined by the amount of income generated from bills (TRB). Where planned expenditure exceeds the available cash levels, loans will be required.

The sewerage TRB needs to increase to meet the operation and maintenance costs of the proposed new works. The current water TRB can be reduced slightly. A financial plan is required to determine the most appropriate medium term price paths and funding scenarios.

11.4 Best-Practice Management

IWCM is one of the eight Best-Practice criteria set by DWE which aims to promote the long-term sustainability of LWU's and their water, sewerage and stormwater businesses. The progress of RVC in meeting each of these criteria and their relationship with this IWCM Strategy is set out in Table 11-3.

Some of these reports will require updating now that the IWCM Strategy has been completed to incorporate relevant changes.

Table 11-3: RVC's Best Practice Management Progress

DWE Best Practice Management Criteria	Relationship to this IWCM Strategy	Action
Strategic Business Plan	The preferred scenario and capital works programs developed in the IWCM Strategy will be used to set the direction of RVC and form the basis of RVC's strategic business plan.	To be updated by 2009.

DWE Best Practice Management Criteria	Relationship to this IWCM Strategy	Action
Financial Plan	The preferred scenario and capital works programs developed in the IWCM Strategy were used as inputs into RVC's FINMOD analysis and financial plan.	Attached in Appendix F. To be updated as part of the Strategic Business Planning process.
Best-Practice Pricing	Included as a demand management measure in demand analysis. Requires updating to reflect the IWCM Strategy capital works program and financial plan.	To be updated.
Demand Management Plan	Results from the demand analysis as mentioned in Section 3 were used in developing RVC's demand management plan.	Currently being prepared.
Drought Management Plan	Demand analysis and results of IWCM Concept Study will be used in the development of RVC's drought management plan.	To be reviewed following changes to water supply security or emergency water sources.
Development Servicing Plan	The capital works programs and financial plan developed in the IWCM Strategy will be used as inputs into RVC's development servicing plans.	To be updated in 2011.
IWCM	This IWCM Strategy document completes the second phase of the IWCM process. Results from the Concept Study were used in the development of this document.	Refer to RVC's IWCM Concept Study (Appendix A) and this document. To be updated in 2014.
Reporting	RVC must provide reporting information annually to DWE, in order to assess RVC's progress at achieving a sustainable business.	Ongoing.

11.5 Monitoring and Review

Monitoring is an essential part of the IWCM process to ensure that the implementation of strategies which have been identified as part of this study have been successful at addressing the water cycle issues. In addition to this, it is important that any new or changes in severity of individual issues are reviewed after 6 years and appropriate changes are made to the Strategy document, capital works program and financial plan.

However, annual reviews should take place in the form of DWE Reporting which should provide an indication of the success of RVC's IWCM Strategy and the other Best-Practice planning documents in achieving sustainability and progress in meeting RVC's business goals and social and environmental responsibilities.

12 Qualification

1. In preparing the report and estimate of costs JWP has exercised the degree of skill and care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering design principles.
2. JWP has used all reasonable endeavours to inform itself of the parameters and requirements of the project and has taken all reasonable steps to ensure that the report and costs estimate is as accurate and comprehensive as possible given the information upon which it is based.
3. It is not intended that this report and costs estimate represent a final assessment of the feasibility of the project.
4. JWP reserves the right to review and amend all calculations, cost estimates and/or opinions included or referred to in the report if:
   (a) additional sources of information not presently available (for whatever reason) are provided or become known to JWP; or
   (b) JWP considers it prudent to revise the estimate in light of any information which becomes known to it after the date of submission.
5. The report and cost estimate are preliminary only and restricted in that certain information is obtained from external sources and has not been independently verified.
6. JWP does not give any warranty nor accept any liability in relation to the completeness or accuracy of the report and cost estimate.
7. If any warranty would be implied whether by law, custom or otherwise, that warranty is to the full extent permitted by law excluded.
8. All limitations of liability shall apply for the benefit of the employees, agents and representatives of JWP to the same extent that they apply for the benefit of JWP.
9. This report and cost estimate is for the use of the party to whom it is addressed and for no other persons. No responsibility is accepted to any third party for the whole or part of the contents of this report and cost estimate.
10. If any claim or demand is made by any person against JWP on the basis of detriment sustained or alleged to have been sustained as a result of reliance upon the report and cost estimate or information therein, JWP will rely upon this provision as a defence to any such claim or demand.

13 References

DEUS, 2004: Department of Energy, Utilities and Sustainability, *Integrated Water Cycle Management Guidelines for NSW Local Water Utilities*.

DEUS, 2004b: Department of Energy, Utilities and Sustainability, *Best-Practice Management Guidelines for NSW Local Water Utilities.*

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JWP 2006b: *Richmond Valley Council*, *Integrated Water Cycle Management Concept Study.*

JWP 2006c: *Richmond Valley Council*, *Development Servicing Plans for Sewerage.*

JWP 2006d: *Richmond Valley Council*, *Development Servicing Plans for Water Supply.*

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Kirono, et al, 2007: *Climate Change Impact on Rous Water Supply,* D Kirono, G Podger, W Franklin and R Siebert, Water, March 2007, AWA.

RVC 2007: *Management Plan 2007/08-2009/10 - Capital and Operating Expenditure Summary.*

Appendix A

IWCM Concept Study

Success through
Partnership

JWP

Richmond Valley Council

Integrated Water Cycle Management Concept Study

FINAL

July 2006

RICHMOND VALLEY COUNCIL

Richmond Valley Council

Integrated Water Cycle Management Concept Study

Final

July 2006

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2	E. Pryor	E. Pryor	E. Pryor		26/07/06

Executive Summary

The Works Directorate of Richmond Valley Council (RVC) is responsible for water supply (the whole scheme for Casino and reticulation elsewhere), sewerage and stormwater management services within the Richmond Valley local government area (LGA). Bulk water supply services to towns other than Casino are provided to RVC by Rous Water.

RVC continually plans for the on-going provision of these urban water services and implements industry best-practice management practices. RVC is furthering its best-practice commitment by preparing an Integrated Water Cycle Management (IWCM) Strategy in accordance with the NSW Department of Energy, Utilities and Sustainability (DEUS) guidelines.

This Concept Study, part one of the IWCM process, has four main goals:

1. To collate and review the available data on the urban water cycle in order to identify and prioritise the filling of data gaps;
2. To document the current condition of the water cycle in the study area in order to establish and prioritise the water cycle management issues that will need to be managed as part of the IWCM Strategy (part two of the IWCM process);
3. To set a framework for defining the future of water cycle management in the study area by setting objectives for the IWCM Strategy; and
4. To set a scope of works for developing the IWCM Strategy based on a preliminary analysis of management options.

A Project Reference Group (PRG) was set up to assist in the identification of management issues. The PRG consisted of council and local water utility staff as well as representatives from the NSW state government agencies and the community. The PRG's role included identifying and prioritizing water cycle management issues (some not necessarily evident through data analysis).

The findings of the Concept Study are set out in this document in the following way:

Section 2: Where are we now? A review of all the available information regarding the catchment, the water resource and urban water service demands.

The available data was generally very comprehensive. Gaps in the data included:

- Recent water quality data for Richmond River and Rocky Creek catchments;
- A lack of information about the security of the main water source for Casino (Jabour Weir); and
- Limited data for on-site sewage management systems.

A detailed audit of data and the gaps identified is presented in **Appendix A**, with a short summary in **Table 18: Data Gap Analysis.** This table can be found on page 34.

Section 3: What are the issues? RVC has a history of successfully identifying and managing water cycle management issues as evidenced in the on-going revision of their Strategic Business Plans and Development Servicing Plans for water supply and sewerage. The issues arising from an audit of the available data included:

- The security (both existing and future) of the town water supplies.
- Town water extractions are a major factor in surface water stress;
- The lack of a clearly defined relationship between RVC and Rous Water;
- Poor floodplain drainage practices leading to increased erosion and sedimentation; and
- Missed opportunities for water reuse.

All identified issues are summarised in **Table 26: Summary of Catchment, Water Resource and Urban Area Audit Issues.** This can be found on page 46. Key issues identified by PRG members are summarised in **Table 27: PRG Identified Issues and Proposed Solutions.** This can be found on page 48.

Section 4: Where do we want to be? Objectives to guide the development of an effective IWCM Strategy and improve water cycle management were developed based on high priority issues. The objectives which are to guide the assessment of options and scenarios in the IWCM Strategy phase are summarised in **Table 28: Priority Issues, Objectives and Measures.** This can be found on page 51.

Section 5: How will we get there? A proposed scope of works for the IWCM Strategy is presented in this section, based on the findings of the Concept Study. The scope of works is specifically designed to address the issues raised in this Concept Study as well as to satisfactorily meet the objectives set in **Section 4**. The recommended scope is set out on page 54.

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Glossary

Acid sulphate (sulfate) soils	Includes *acid sulphate soils* and *potential acid sulphate soils*. Acid sulphate soils contain highly acidic layers resulting from the aeration of materials that are rich in iron sulphides. This oxidation produces hydrogen ions in excess of the capacity of the sediment to neutralise the acidity resulting in soils of pH of 4 or less when measured in dry season conditions. Potential acid sulphate soils contain iron sulphides or sulphidic material which have not been exposed to air and have not oxidised. However, they pose a considerable environmental risk when disturbed.
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.
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.[1]
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.
Dissolved oxygen	The concentration of oxygen which is dissolved in environmental waters and compared with oxygen 'saturation' at a particular temperature.[1]
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.
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.
FINMOD	Financial Modelling software package developed by the NSW Government for local water utilities.
Floodplain	Flat land beside a river that is inundated when the river overflows its banks during a flood.
Groundwater	Underground water filling the voids in rocks; water in the zone of saturation in the earth's crust. See also *aquifer*.
Hydrology	The study of the distribution and movement of water.

[1] Definitions provided by DEUS (Pers. comm. G. Freeman, DEUS, 2005).

Local water utility	The water supply and sewerage businesses of a local council.
Nutrients	A source of nourishment.
Potable water	Water of a standard fit to drink.
Rainwater tank	Storage tank for collecting rainwater from the roofs of buildings.
Recharge	Water that infiltrates through the soil surface to the watertable.
Reuse	The use of treated sewage effluent or treated stormwater to replace the use of potable water.
Sewage	The used water supply of a community including water-carried waste matter from homes and businesses.
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.
Stormwater	Rain 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.
Suspended solids	The smaller, lighter material such as clay, silt and fine sand carried in suspension in water.
Typical residential bill	The annual bill paid by a residential customer that is not a pensioner or the owner of a vacant block.
Water demand	The water needs of a town including homes, 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 treatment plant	A facility to treat raw water to a potable water quality.
Wastewater	See *sewage*.

List of Abbreviations

ABS	Australian Bureau of Statistics
ADWG	Australian Drinking Water Guidelines
ANZECC	Australia and New Zealand Environment and Conservation Council
ASS	Acid Sulphate Soils
BOD	Biological Oxygen Demand
CBD	Central Business District
CMA	Catchment Management Authority
DCP	Development Control Plan
DEC	Department of Environment and Conservation, NSW
DEUS	Department of Energy, Utilities and Sustainability, NSW
DNR	Department of Natural Resources, NSW
DSS	Decision Support System – DUES computer modelling software for forecasting water demand.
EP	Equivalent Population
EPA	Environment Protection Authority, NSW (now part of DEC)
IWCM	Integrated Water Cycle Management
kL	Kilolitre
kg	Kilogram
L	Litre
LEP	Local Environmental Plan
LGA	Local Government Area
LWU	Local Water Utility
MOU	Memorandum of Understanding
mg	Milligrams
ML	Megalitre
NPWS	National Parks and Wildlife Service, NSW (Now part of DEC)
OSMS	On-site Sewage Management Strategy

POEO	*Protection of the Environment Operations Act 1997*, NSW
PRG	Project Reference Group
RVC	Richmond Valley Council
SBP	Strategic Business Plan
SEPP	State Environmental Planning Policy
SMP	Stormwater Management Plan
SoE	State of the Environment Report
STP	Sewage Treatment Plant
TBL	Triple Bottom Line
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
UFW	Unaccounted for Water
WTP	Water Treatment Plant

1 Introduction

The Works Directorate of Richmond Valley Council (RVC) is responsible for water supply (the whole scheme for Casino and reticulation elsewhere), sewerage and stormwater management services within the RVC local government area (LGA). As such, RVC is the local water utility (LWU) for the LGA. Bulk water supply services to towns other than Casino are provided to RVC by Rous Water.

RVC continually plans for the on-going provision of these services and implements industry best-practice management practices.

In 2004, the NSW Department of Energy, Utilities and Sustainability (DEUS) introduced a new best-practice management criterion for LWUs: Integrated Water Cycle Management (IWCM). IWCM involves the integration of urban water services – water supply, sewerage and stormwater – so that water is used optimally. The DEUS IWCM criterion requires LWUs to develop and implement a long-term IWCM Strategy for the provision of urban water services.

In 2006, RVC committed to implementing this new best-practice requirement into the organisation's business planning activities. This document sets out the results of an initial scoping study (known as a Concept Study) for the development of RVC's IWCM Strategy.

1.1 What is Integrated Water Cycle Management?

Increasingly water utilities need to consider all aspects of the water cycle and catchment in relation to their business activities – the provision of safe, reliable, environmentally sound and affordable urban water services. In recognition of the impact of increasing demands on river and groundwater resources, attention has turned towards looking at ways to maximise the benefits of water use in the urban sector.

Broadly, IWCM is the process of balancing water needs with the sustainable use of available water resources. In an urban context, IWCM is characterised as the process of bringing together water supply, sewerage and stormwater management to achieve a more efficient use of water resources.

However, urban water use is also about the provision of essential services to customers, both now and into the future.

Therefore, IWCM is the process of identifying appropriate water cycle management options that meet the demand for services while sustainably managing the available water resource.

The DEUS IWCM Guidelines define the principles of IWCM as:

- Consideration of all water sources (including wastewater) in water planning;
- The sustainable and equitable use and reuse of all water sources;
- Consideration of all water users;

- Integration of water use and natural water processes; and
- A whole of catchment integration of natural resource use and management.

1.2 The Integrated Water Cycle Management Process

The DEUS IWCM documentation sets out a three part process for developing an IWCM Strategy:

- Part 1: Preliminary components (often referred to as a Concept Study) – designed to scope the work required to develop a strategy;
- Part 2: An IWCM Strategy – to set out the actions the LWU will undertake to implement an integrated approach to the management and operation of their businesses; and
- Part 3: Strategy implementation and review – the ongoing monitoring, evaluation and adaptation of the strategy.

The IWCM process is one of adaptive management and planning. In each phase (including the on-going process of strategy review), the following questions should be used to guide strategy development:

- What are the issues?;
- How do we fix the issues?; and
- How do we know the issues have been fixed?

The development of a Concept Study is summarised in the following steps:

1. Assess the current situation. This involves:
   - Defining the boundaries of the water system;
   - Collecting the available data on the water system; and
   - Reviewing the data to understand current system performance.
2. Identify problems in the water system. This involves:
   - Auditing the available data against recognised frameworks to identify current and potential future water cycle management issues; and
   - Prioritising the identified issues.
3. Identify goals for improving the system. This involves setting water cycle management objectives based on the issues identified.
4. Identify preliminary options to manage the system issues. This involves:
   - Identifying areas where existing management options can be improved;
   - Examining options for integration; and
   - Undertaking preliminary feasibility analysis of selected options.

1.3 Objectives of Richmond Valley Council's Concept Study

The objectives of the RVC Concept Study are:

- To identify the key water cycle issues related to the provision of urban water services in the Richmond Valley local government area;
- To identify potential actions for managing identified water cycle issues;
- To define a tailored process for developing an IWCM Strategy for RVC;
- To provide stakeholders with the opportunity to participate in the strategic planning process; and
- To continue to implement best-practice management practices in the planning and operation of RVC.

2 Where Are We Now?

The purpose of this section is to assess the current situation within which urban water services are provided. This involves:

- Defining the boundaries of the water system;
- Collecting the available data on the water system; and
- Reviewing the available data to understand current system performance.

Three different perspectives were considered in reaching an understanding of the current situation: the catchment context, the water resource context and the urban context.

2.1 Boundaries of the Water System

There are a number of aspects to defining the boundaries of the water system (the study area) for RVC:

- Service boundaries;
- Administrative boundaries; and
- Physical boundaries.

Given the nature of IWCM (in that stakeholders other than the town are to be considered) and the boundaries being considered, it is not possible to draw a single 'study area boundary' on a map as is common in traditional water supply and sewerage studies.

2.1.1 Service Boundaries

Within the Richmond Valley LGA, the Works directorate of the Council provides reticulated water and sewerage services to:

Water Services	Sewerage Services
Casino System • Casino Lower Richmond River • Evans Head • Broadwater; • Woodburn; • Rileys Hill; and • Coraki.	• Casino; • Evans Head; • Woodburn; • Coraki; and • Rileys Hill.

Rappville or Fairy Hill are not supplied with reticulated water, rather are served by individual rainwater tanks only. The town of Broadwater and villages of Rappville and Fairy Hill utilise on-site systems for treatment of their wastewater. Investigations and planning to supply Broadwater with sewerage services are underway.

Stormwater services (in the form of trunk mains, detention basins, stormwater treatment devices, kerb and guttering, etc.) are provided to Gay's Hill, Casino, Coraki, Woodburn, Broadwater and Evans Head. Other towns rely on natural drainage channels to convey stormwater.

2.1.2 Administrative Boundaries

Rous Water is a single purpose County Council, with its primary responsibility being the provision of bulk water to the lower river part of RVC, Byron and Ballina Councils and Lismore Water (the constituent councils). Reticulation of the water is the responsibility of the constituent member councils. Two Councillors from each of the four LGAs are nominated as Councillors to Rous County Council.

IWCM issue: *Need to formalise service agreement between Rous Water and RVC*

Rous Water is the bulk water supplier to each of the towns in RVC except Casino. Bulk water is treated and supplied to reservoirs. From here, the water is reticulated by RVC to customers. RVC is responsible for both the bulk water supply and reticulation of water to Casino. Some of the reservoir assets are owned by RVC, whilst others are owned by Rous Water. Rous Water was involved in the development of this Concept Study (refer **Section 3.2** for details of the input from the bulk supplier).

There is no formal service agreement between Rous Water and RVC regarding the length of the contract for supply, specifications of the quality of water provided or responsibilities of each party.

RVC is responsible for the operation, maintenance and development of centralised sewerage treatment and has a role in auditing the management of on-site sewage services within the LGA.

The provision of water supply and sewerage services is regulated by a number of NSW government departments, primarily DEUS, NSW Health, NSW Department of Natural Resources (DNR) and the NSW Department of Environment and Conservation (DEC). Lismore and Grafton are the main administrative centres for the local representation of each of these departments.

Stormwater services are managed by RVC. In so far as its discharge may constitute pollution, the NSW Department of Environment and Conservation (DEC) is the primary regulator of stormwater in the study area.

Whilst the Works Directorate of RVC manages all the above services (water, sewerage and stormwater), funding for each of the services remains separate and largely non-transferable within the directorate.

The Northern Rivers Catchment Management Authority (NRCMA) is also an administrative body relevant to the management of the Richmond Valley urban water cycle. It's Integrated Catchment Management Plan (NRCMB 2003) and subsequent Catchment Action Plan (NRCMA 2005) set targets to protect and enhance the natural resources of the region.

2.1.3 Physical Boundaries

Figure 1 shows the Richmond Valley LGA boundary in relation to the state of NSW. **Figure 2** shows the towns of the LGA. **Figure 3** shows the sub-catchments of the Richmond River catchment.

Figure 1: Richmond Valley Local Government Area.

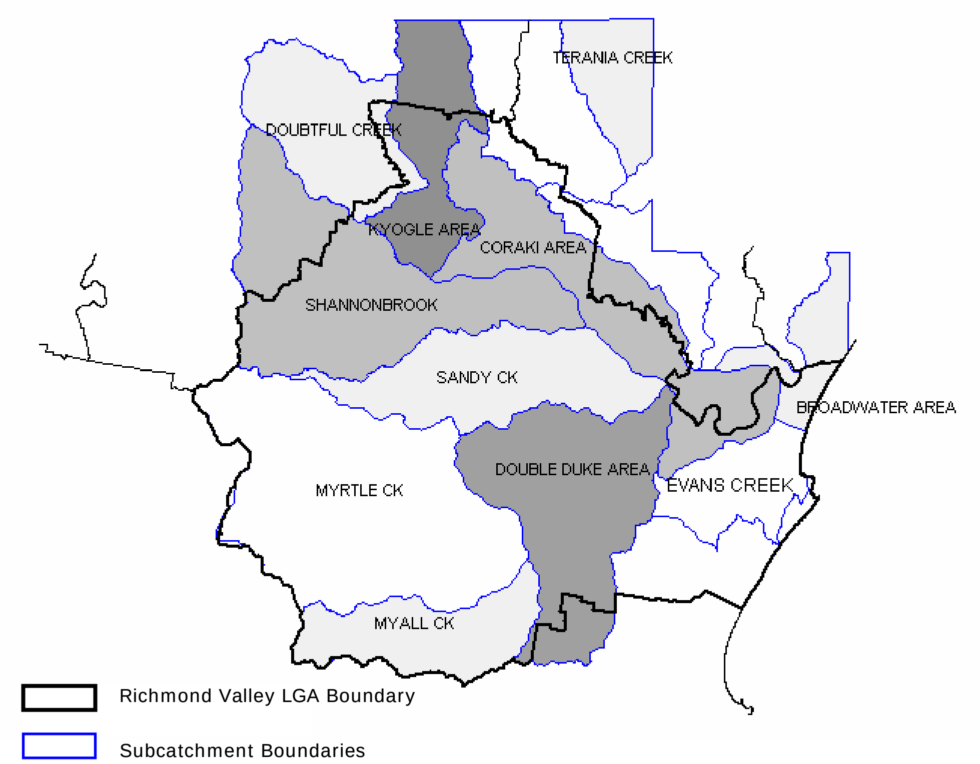
Source: RVC SoE (2004).

Figure 2: Towns of the Richmond Valley LGA.

Source: RVC SoE (2004).

Figure 3: Sub-Catchments of the Richmond River associated with the Richmond Valley LGA.

Source: RVC's GIS SubCatch database, RVC's lga database



2.2 Catchment Information

Available information on the catchments related to the Richmond Valley Council water cycle was categorised as:

- Location information: describing the main features of the study area and the region;
- Population information: describing the historical population trends of the study area and the available forecasts of expected population;
- Climate information: describing the rainfall, runoff and evaporation characteristics of the area;
- Soil and geological information: describing the characteristics of the land resources that shape land use in the study area;
- Land use: describing the current major land uses of the study area and expected changes in this use into the future; and
- Flooding: describing patterns of catchment inundation and the impacts on urban areas.

Detailed information for each category is presented in the following sections. As the Terania Creek subcatchment and Rocky Creek Dam supply water to the RVC LGA details on this subcatchment are also presented in the subsequent sections.

2.2.1 Location

Location data is important to the IWCM process as location influences climate, the availability of water resources and the types of land uses and urban development within a study area.

Richmond Valley is on the Far North Coast of NSW, approximately 260 km south of Brisbane and 800 km north of Sydney. The LGA has an area of 3,048 km^2 and is bound by the Lismore and Ballina Councils to the north-east, Kyogle Council to the north-west and Clarence Valley Council to the south.

The LGA stretches some 85km inland from the coast at Evans Head to the foothills of the Great Dividing Range. It encapsulates the southern side of the Richmond River valley at the lower portion of the river and the Casino hinterland. The southern and western boundaries roughly follow the top of the Richmond Range. The region comprises mountain bush and hilly scrubland, timber country and grazing land, sugar cane and tea tree stands to floodplain vegetation and coastal heath.

The area upstream and surrounding Casino is generally characterised by extensive floodplain areas developing into steep country towards the top of the catchment. The town of Casino lies on the Richmond River floodplain and is interspersed with lagoons and swamps.

The coastal fringe of the LGA is dominated by long sandy surf beaches broken up by a rocky headland and the mouth of the Evans River at Evans Head, and occasional outcrops of coffee rock.

The major population centre of the LGA is Casino. Located on the hinterland, near the north of the LGA, Casino has an area of 8 km^2. Other urban areas in the LGA are Evans Head, Coraki, Woodburn and Broadwater. The main towns and subcatchments are shown in **Figure 2**.

The LGA is the result of the amalgamation of Casino Municipality and Richmond River Shire councils in 2000, and the subsequent additions of part of Copmanhurst Shire and the loss of Jackybulbin and Doubleduke in 2004.

Data Source: RVC SoE (2004), RVC SMP (2005).

2.2.2 Population

Population information is important to the IWCM process as it is the nature and location of population growth that will determine future urban water infrastructure and operational requirements.

As set out in **Table 1**, the population of the Richmond Valley LGA was recorded as 20,351 at the 2001 national census.

Table 1: Population of Richmond Valley LGA.

Location	Population 1996 census	Population 2001 census	Estimated 2005 Population
Urban Area	17,654	17,398	18,657
Total LGA	20,865	20,351	21,394

Source: RVC (2006), RVC Population predictions (year unknown).

Based on the 2001 census data, the population of the LGA is rising steadily, although Casino township showed a minor decline. Over 85% of the LGA's population lives in the urban areas. Casino has the largest population with 12,289 or 57% of the total LGA population. Evans Head and Coraki are the next largest settlements, with populations of 2,914 and 1,159 in 2001 respectively. Other villages include Broadwater, Woodburn and Rileys Hill. These populations are based on the existing data and estimates as defined by the 2006 Strategic Business Plans for water supply and sewerage.

The Australian Bureau of Statistics (ABS) reports that the population of the North Coast of NSW as a region has been growing at a rate of 2% annually for the past 5 to 10 years. Whilst a slight overall negative population growth in the Richmond Valley LGA was recorded for the period 1996 to 2001, the number of approved new dwellings remained positive and growing during the same period. Beyond this period however, the forecasted annual residential population growth for the period 2005-2030 is 1.57%. The highest growth is expected on the coastal strip at Evans Head, and in rural residential developments surrounding Casino (RVC, 2004).

IWCM issue: *High rate of growth expected*

Table 2 shows the forecasted number of additional dwellings which will be required to house the future population and the additional land area which will be required to develop such dwellings. The calculated density within the areas is estimated to be 8 allotments per hectare, which allows land for roads, open space and communal areas. Occupation rates of 2.25 persons per dwelling have been utilised in order to calculate the number of dwellings required in each stage (RVC SBP 2006).

In terms of the demand for urban water infrastructure however, it is important to note that the bulk water supply scheme which provides a small proportion of the Richmond Valley LGA town water supplies is a regional scheme. Planning for this scheme also considers the growth in water requirements for town water supplies outside of RVC (for the other constituent councils). These towns are experiencing levels of population growth similar to or greater than those in Richmond Valley LGA.

Data Sources: RVC (2004), RVC Population projections (year unknown), RVC SBP (2006).

Table 2: Housing Balance Sheet for Richmond Valley Council.

Casino					
	Infill Dev. (2005-2007)	Stage 1 (2008-2012)	Stage 2 (2010-2015)	Stage 3 (2015-2025)	Beyond* (2025-2030)
Population Increase (No)		939	567	1,679	810
Land Area Required (ha)	10	42	31.5	124	80.5 (future growth)
Number of dwellings required		417	252	746	360

Evans Head			
	Stage 1 (2008-2012)	Stage 2 (2010-2015)	Beyond* (2025-2030)
Population Increase (No)	1,128	695	537
Land Area Required for low/medium density (ha)	24	16	-
Land Area Required for medium density (ha)	3.6	2.4	-
Number of dwellings required	501	309	238
Villages (Coraki, Broadwater, Rilleys Hill, Woodburn & Rappville)			
	Stage 1 (2008-2012)	Stage 2 (2010-2015)	Beyond* (2025-2030)
Population Increase (No.)	240	264	139
Land Area Required (ha)	13	15	145 (available for future growth)
Number of dwellings required	107	117	62

*2025-2030 growth has been estimated based in the same average annual growth rate for the 2020-2025 period.

Source: RVC SBP (2006)

2.2.3 Climate

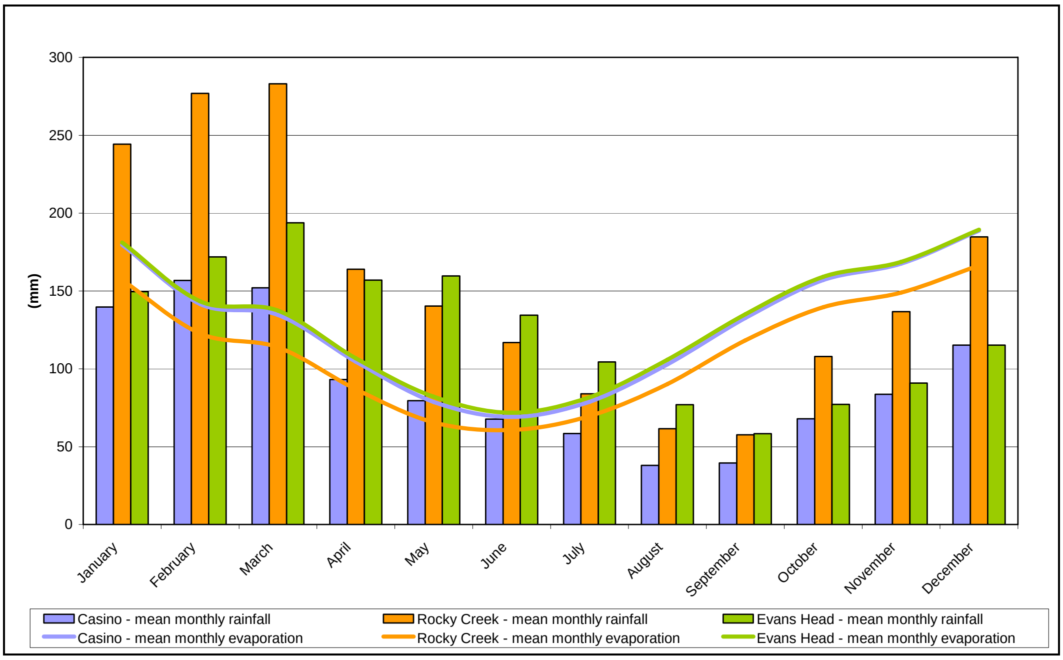
Climate data is important to the IWCM process as it is a key determinant in the nature and availability of surface and ground water resources.

Richmond Valley is in a sub-tropical area, characterised by hot humid summers and mild winters. The LGA experiences an average rainfall of over 1,100 mm, with ranges of more than 1,650mm along the coast, to less than 1,025mm within the inland areas. There is a pronounced wet season in summer through to autumn. Continually high rainfall over these months can trigger flood events. Late winter to spring is usually the dry period and is accompanied by rising evaporation rates.

December and January are generally the hottest months, with temperatures sometimes exceeding 40°C. The inland valleys and coast experience overall warmer temperatures, with mean summer temperature ranges of 27°C whilst in the higher altitude areas the mean summer temperature is 20°C. Thunderstorms are common in the summer months. July and August are the coldest months. On the coastal strip, temperatures rarely fall below 7°C in winter. Away from the coastal fringe, frosts occur and can be severe on low-lying flats.

As illustrated in **Figure 4**, rainfall tends to exceed evaporation in Casino for only two months of the year with a rainfall deficit from April to January. On the coast at Evans Head however, rainfall exceeds evaporation from February to July, with a deficit for six months of the year. At the Rocky Creek Dam catchment (which is the source water for the lower river town water supply), rainfall exceeds evaporation for eight months of the year. This graph does however, use average data which is likely to be skewed by the impact of very high rainfall events and may over-estimate the period of time in which rainfall exceeds evaporation.

Figure 4: Average Monthly Rainfall and Evaporation at Casino, Evans Head and Rocky Creek.



Source: SILO (2006)

On average, the coastal area of northern NSW is affected by tropical cyclones once every two years. These events bring heavy rain and/or very strong winds, resulting in heavy seas, severe coastal erosion and potential catchment wide flooding. Cyclone season extends from December to mid-April.

Data Source: SILO (2006), BOM (2006), RVC SoE (2004), RVC SMP (2005)

2.2.4 Geology & Soils

Geologic and soil information is important to the IWCM as it can be a significant determinant of the water quality of the study area and will also impact on the type of land use.

Soil types within the study area range from:

- Poorly drained alluvial soils with a high clay content and extensive sand dune formations along the riverine areas and coastal areas; to
- Chocolate, kraznozems and podzolic soils of low fertility in the hilly areas, with areas of fertile black soil and pure sand.

IWCM issue: *poor fertility soils may be leading to high fertiliser application rates and high nutrient concentrations in waterways*

The steeper areas of the upper catchments of Rocky Mouth Creek and the Evans River have a higher erosion potential, whilst overall, the erosion potential of the catchment is low. Sheet, gully and rill erosion are more common in the west of the Richmond Valley LGA. Additionally, the Evans River has increasing siltation, attributed to coastal sand drift and deposition of river sediments, which in turn, is attributed to the partial diversion of Richmond River flood flow through the Tuckombil Canal and clearing in the upper catchment. This deposition affects flooding in the downstream reaches of the catchment.

IWCM issue: *erosion potential in upper areas of catchments impacting on water quality*

Acid sulphate soils (ASS) have been identified in the estuarine zones of the catchment. Approximately 441 km^2 or 14% of the soils of the LGA are classified as potential ASS. Two hotspots have also been identified in the RVC area, being Rocky Mouth Creek, Woodburn and Sandy Creek – Bungawalbin Creek, via Coraki. Whilst *DCP No. 5 – Acid Sulfate Soils* provides some guidance on effective management of ASS, a detailed Acid Sulphate Soils Management Plan has yet to be developed. A map showing the areas of the LGA affected by potential ASS is attached in **Appendix E**. If disturbed, these soils have the potential to impact on waterways and the provision of road, water supply and sewerage services in the urban areas. These soils may be exacerbating infiltration issues with the aged sewerage infrastructure.

Data gap*:* *comprehensive documentation of soil erosion and erosion prone areas*

IWCM issue: *ASS soils in RVC urban areas potentially impacting on sewer infrastructure*

Data Sources: RVC SoE (2004), RVC SMP (2005).

2.2.5 Land Use

Land use data is important in the IWCM process as it influences the demands on the available water resources. Further, land use also impacts on the water quality of the available resources.

Table 3 shows the different land use zonings in the LGA as set under the three local environmental plans (LEP) in use in RVC.

Table 3: Land Uses in Richmond Valley LGA.

Zone Description	Area (km^2)	% of LGA
Rural	2,761.89	90.63
Residential	16.15	0.53
Commercial	0.29	0.01
Industrial	0.62	0.02
Open Space	0.85	0.03
Special Uses	1.49	0.05
State Forest	-	-
National Parks and Nature Reserves	157.97	5.18
Environmental Protection	108.34	3.55
TOTAL	**3,047.60**	**100**

Source: RVC SoE (2004).

However, these zonings have not been updated to reflect recently changed land-use status. More than a quarter of the Richmond Valley LGA is now protected through state forest (14.7%) or Environmental Protection, including

National Parks, Nature Reserves and wetlands (12.6%). Logging of forested areas can cause significant impacts to water resource management, including soil erosion, hydrological modifications and alterations to aquatic habitats. The Terania subcatchment (that of Rocky Creek Dam) is largely protected water catchment.

The water supply catchments for Richmond Valley LGA have poor vegetation coverage. The Kyogle Area sub-catchment has only four percent coverage by National Park and just one percent State Forest coverage. Terania Creek (for Rocky Creek Dam) subcatchment is slightly better with eight percent covered by National Park and another eight percent by State Forest. In both sub-catchments riparian vegetation is under stress and stream bank erosion and water quality are issues. Toonumbar Dam, as potential backup supply, has better coverage with 20% as National Parks and 51% State Forest.

IWCM issue: *impact of agricultural land uses on the quality and quantity of water resources*

However, the vast majority of the LGA is rural land. Whilst the SoE has conflicting data with regards to agriculture in the LGA, it is estimated from the LEP Land-Use Zones that agricultural land uses, including beef cattle, dairying, sugar cane, tea tree oil, poultry and timber, account for almost half (48.8%) of the land of the Richmond Valley LGA. These practices may exert pressures on the quality of water resources through the impacts of vegetation clearing and subsequent erosion, the application of treatments to improve soils or eliminate pests, ploughing and the trampling of soils and destabilisation of stream banks by stock. These practices may also impact on the quantity of water available as water is extracted for irrigation purposes.

Whilst the currency of data is not clear, DEC (formerly NPWS) estimate that approximately 47% or 1,434 km^2 of the Richmond Valley LGA is cleared (having a canopy of less than 20%). **Table 4** identifies that of the 3.01 km^2 of native vegetation that was authorised for clearing under the Native Vegetation Conservation Act in 2003/04, nearly 63% was for logging/forestry.

Table 4: Area of Authorised Vegetation Cleared in 2003/04.

Purpose of clearing	**Area (km^2)**
Removal of exotic species	0.64
Safety purposes	0.13
Drainage feature management	0.01
Cropping and grazing	0.15
Grazing	0.19
Logging/forestry	1.89
TOTAL	**3.01**

Source: RVC SoE (2004)

The Macleay/Macpherson Overlap in the Richmond Valley LGA is an area of extremely high biodiversity, being the overlap between the tropical and temperate ecosystems.

Increasing urban development in the northern and western areas of Casino and Evans Head has been noted since 2000-01, due to dwindling land availability in the rural north and the desirability of coastal property. The zoned urban area of the Richmond Valley LGA is 16.3 km^2.

Up to 22 extractive industries, including 4 licensed activities, operate in the Richmond Valley LGA. These include:

- quarry rock (weathered basalt road based and hard rock);
- quarry clay (brick clay);
- sand deposits (terrestrial and river bed sands); and
- sandstone (road base and dimension stone).

Land use in the catchment also brings with it the likelihood of land and waterway contamination. There are 268 potential sources of contamination in the LGA including cattle tick dip sites (of which there are at least 211 known sites), service stations, tobacco and banana plantations, junk yards, gasworks, sawmills, sewage treatment plants and landfills. Mineral sand storage and processing plant sites containing radioactive residues and an unexploded ordinance are potentially contaminated sites in Evans Head. On-site sewage management systems may also be a source of waterway contamination.

IWCM issue: *potential waterway contamination from known point sources*

Activities within the LGA, licensed under the *Protection of the Environment Operations Act* 1997 (POEO), with the potential to impact on waterways are set out in **Table 5**.

Table 5: Activities in Richmond Valley LGA Licensed Under the POEO.

Licence No.	Licensed Activity	Parameters Monitored	Max. Allowable Daily Discharge Volume (kL/d)	Last Non-Compliance
4536	Blue Circle Southern Cement			
1693	Fast Freeze International Limited	Oil and grease, pH, TSS, BOD	400	05/2004: pH outside licence limit
3372	Clovass Quarry			Non-compliance with a PRP requiring the installation of stormwater detention ponds.
172	NSW Sugar Milling Co-operative	pH, temperature, TSS, BOD	85,000	07/2005: Exceeded BOD limit.
3500	Northern Co-operative Meat Company	Calcium, Chromium, Conductivity, Magnesium, Nitrogen, TP, Sodium, pH, BOD, oil and grease, TSS		11/2000:Soil monitoring reporting did not occur in specified time frame
5659	Mullers Pit			
10192	Woodview Quarry			

Licence No.	Licensed Activity	Parameters Monitored	Max. Allowable Daily Discharge Volume (kL/d)	Last Non-Compliance
2386	Evans Head Sewage Treatment Plant	Oil and grease, pH, TSS, BOD	6,500	07/2005: Non-compliance with TSS and pH limits and performance limits set in PRP.
2476	Casino Water Treatment Plant	TSS	600	
3397	Petersons Quarry			
351	Coraki Sewage Treatment Plant	Oil and grease, TSS, BOD	400	10/2005: Non-compliance with limit for SS and daily discharge
3878	Casino Regional Livestock Exchange		250	
585	Casino Wastewater Treatment Works	BOD, TN, oil and grease, TP, TSS	35,500	11/2004: Sampling error and broken flow meter.
5872	Namoona Landfill Facility	TSS	NA	11/2002: Not all water analytes were tested for during all quarterly monitoring rounds
6065	Broadwater Landfill Facility *(closed)*	Leachate quality and level, groundwater quality, surface water quality monitoring		09/2005: Dry sampling points for reporting periods.
6084	Evans Head Landfill Facility *(operates as a transfer station)*	Leachate quality and level, groundwater quality, surface water quality monitoring		09/2005: No monitoring undertaken at monitoring points.
7666	Rileys Hill Sewage Treatment System	Oil and grease, pH, TP, TN, faecal coliforms, nitrogen (ammonia), TSS, BOD	216	07/2005: Exceeded TP limits.
5375	Casino Concrete			
5848	Riverina Stock Feeds			
3534	Signium Pig Production		10	

Source: DEC (2006)

RVC uses one licensed (Namoona) landfill, one unlicensed (Bora Ridge) landfill and two transfer stations (Evans Head and Rappville). The volumes of waste-to-landfill and recycled waste have increased since 1999/2000, resulting in a 2003/04 volume sent to landfill of approximately 19,423 tonnes. Water quality from Namoona is monitored for total suspended solids.

Two of the seven former landfills (Evans Head and Broadwater) have been remediated by RVC since 2003.

Data Sources: RVC SoE (2004), RVC SMP (2005), DEC (2006), RVC's GIS Contaminated Land database, DLWC (1999).

2.2.6 Flooding

Information on flooding is important to the IWCM process as inundation areas may constrain the provision of some urban water services (such as the location of STPs above flood level and the potential of infiltration into sewers) and impact on their operation.

Flooding at Casino and downstream urban areas is a regular occurrence, due to the confluence of three major inflows: the Richmond River, Wilsons River and Bungawalbyn Creek. A natural constriction in the river and floodplain at Broadwater, form an extensive floodplain basin between Broadwater, Woodburn and Coraki. Approximately 1,073 km^2 of land (35%) in the Richmond Valley LGA is prone to flooding under a probable maximum flood. A map showing this area is attached in **Appendix E.**

Urban areas in Casino are effected by floods with recurrence intervals of 70 to 80 years, whilst the lower river towns are impacted by floods with recurrence intervals of only 5 to 10 years.

Recent flood events include those of 2001 and 2004. The 2001 event was of significance causing complete desolation of aquatic life in Richmond River, resulting in NSW Fisheries closing the system to commercial and recreational fishing for seven months. The 2004 event was considerably smaller, but did kill large volumes of fish and crustaceans behind Rocky Mouth Creek flood gates.

Previous attempts to manage floodwaters have included the installation of floodgates including those at Rocky Mouth Creek, Swan Bay, Bora Ridge Canal and Boggy Creek and the construction of Tuckombil Canal.

IWCM issue: *management of floodplain drainage infrastructure impacting on water quality*

Floodgates, whilst preventing tidal water moving upstream, affect wetland drying, fish migration, dissolved oxygen levels and contribute to the exposure of potential acid sulphate soils. Improved management of these floodgates by Richmond River County Council include the scheduled and land-owner directed opening of the gates for flushing.

The Tuckombil canal was constructed in the early 1900s to divert floodwater down the Evans River. Additional works to increase its capacity and prevent saline intrusion upstream have included the installation of an inflatable rubber dam (fabridam) and a now temporary weir. A committee is currently considering options to resolve this situation.

Floodplain risk management studies and plans have been developed for both the Casino and Lower Richmond areas, based on the impact of flood risk, whilst considering social, ecological and economic factors. All of Casino's electrical assets associated with the sewerage system are above the 1 in 100 year flood level.

Data gap: *implementation status and effectiveness of floodplain risk management plans*

The floodplain risk management plans identify immediate and longer-term mitigation measures, including:

- Flood warning and emergency planning;

- Raising community awareness;
- Development control planning;
- Voluntary house raising/purchase; and
- Infrastructure measures including levees, creek protection and drainage measures.

Data Source: RVC SoE (2004), RVC Casino Floodplain Risk Management Plan (2002a), RVC Mid-Richmond Floodplain Risk Management Risk (2002b), RVC GIS floodprone database, RVC Mid Richmond Floodplain Risk Management

Data gap: *flooding impact on specific water and sewerage infrastructure*

2.3 Water Resource Information

Knowing the characteristics of the available water resource is important to the IWCM process as it is essential for determining how the demands on the resource can best be met.

The quantity of water available will play a role in determining the storage requirements for communities and may drive the search for alternative sources and more efficient water use. The quality of water available plays a role in determining the type of treatment the water will require in order to be used in a particular way, and may impact on the cost of providing the water. Understanding these characteristics is important in ensuring that the resource is used in the most efficient and sustainable way.

Surface waters are the primary water resource utilised in the study area although there are also some groundwater sources utilised. Details of each resource are set out in the following sections.

2.3.1 Surface Waters

The main rivers of the Richmond Valley LGA are the Richmond River and Evans River. The Richmond River drains from its source on the Queensland/ New South Wales border in the north through Casino to its confluence with the Wilsons River at Coraki. It continues towards the ocean, through Woodburn and Broadwater and discharges to the ocean at Ballina. A flood mitigation channel at Woodburn takes some high level flows from the Richmond River to the Evans River. The Evans River flows into the ocean at Evans Head. All three of these rivers have tidal influences; the Richmond River up to just below Casino; beyond Lismore outside of the Richmond Valley LGA on Wilsons River; and for the full length of Evans River. Salt wedges protrude further upstream during periods of drought, with implications for water use for irrigation.

The main subcatchments of the Richmond River are: Myall Creek, Myrtle Creek, Kyogle Area, Coraki Area, Sandy Creek and Evans Creek. Rocky Creek Dam is in the upper reaches of the Terania subcatchment.

A map of the hydrology of the Richmond River catchment is provided in **Appendix E.**

Water Volume

The average annual runoff from the Richmond River catchment is 1,920,000 ML. The runoff coefficient is 18% which is slightly above average for coastal rivers. Stream flows vary between 15 and 233 percent of average yearly discharge, which is lower than other coastal catchments.

There are 224 surface water extraction licences, as listed in **Table 6**, held in the Richmond Valley LGA with a total entitlement of 17,832 ML per year (as at 2004), which is less than 1% of the average annual flow. The majority of these (203 licences for 17,232 ML) are for irrigation, with 16.6% of these (3,427 ML/yr) for urban water (Casino's water supply only as the Rocky Creek Dam extraction is not within the LGA). There are a number of licenses still operating on unregulated streams in the Richmond Valley LGA that are based on area rather than volume, and as such overall consumption is unknown. An embargo on the granting of new surface water licences is in place in all Upper North Coast catchments.

__Data gap:__ total licensed surface water consumption

Table 6: Licensed Surface Water Uses within Richmond Valley LGA.

Extraction Purpose	Number of Licences as at 2004*
Aquaculture	1
Conservation of Water	20
Domestic	14
Drainage	1
Farming	18
Industrial	3
Irrigation	203
Stock	14
Town Water Supply	2
TOTAL	**276**

* Note: One licence may have multiple purposes

Source: RVC SoE (2004)

Three licences are held for town water supply (two in RVC LGA and one for Rocky Creek Dam). The licensed allocation (held by Rous Water for the purposes of supplying bulk water to four local government areas) for town water extraction for Rocky Creek Dam, which is in the upper reaches of the Terania Creek subcatchment, is 14,000ML per annum. Whilst this is a small fraction of the average annual flow in the whole Richmond River, town water extraction, is impacting on the hydrologic stress rating of the Terania Creek subcatchment. As illustrated in **Figure 5**, Terania Creek was classified as part of the Stressed Rivers assessment as under high environmental and high extraction stresses. High extraction stress means that current extractions are reducing the volumes in the creeks below what is required for sustainable environmental flows.

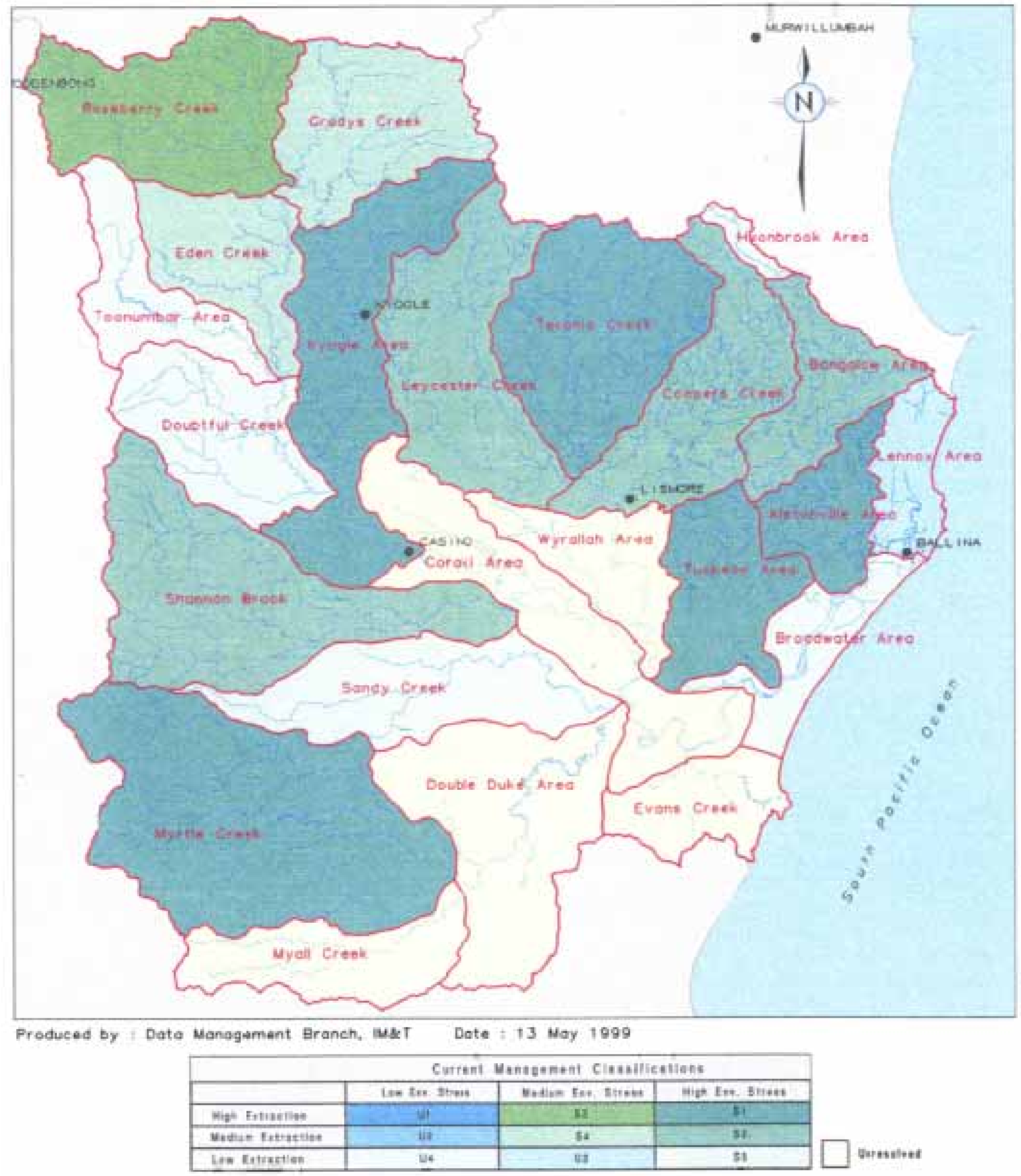
__IWCM issue:__ over-extraction from Rocky Creek Dam catchment for town water supply

Casino town water is extracted from Jabour Weir, in the Kyogle Area subcatchment, which has a storage volume of 1,623 ML. Kyogle area is under high environmental and extraction stress, as shown in **Figure 5.** Myrtle Creek and Shannon Brook are also under high environmental stress and high and medium extraction stress.

RVC also holds a licence to extract from Manyweathers Weir, which was the original town water supply. When a new raw water pump station (1985) and water treatment plant off Jabour Weir were installed, the old treatment and extraction facilities at Manyweatherss Weir were decomissioned.

The Department of Natural Resources operates Cookes Weir, which is only to serve as a water source during periods of town water supply restrictions.

Figure 5: RV Catchments Stress Classifications.



Source: DLWC (1999)

Toonumbar Dam, with a storage volume of 11,000 ML, is potentially available as a backup supply (RVC has verbal advice to this effect, but no agreement in writing) but has never been used. It is managed by Department of Natural Resources (DNR).

Table 7 lists the subcatchments of the Richmond Valley LGA and its supply areas, their classifications and the reasons for those classification.

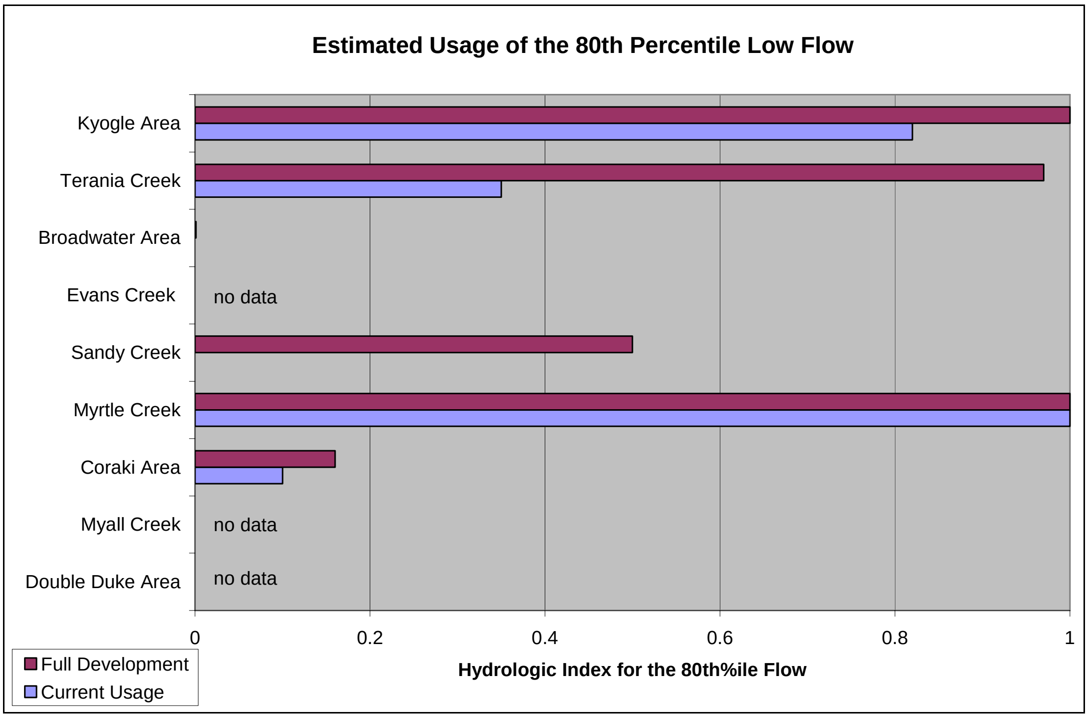
Table 7: Subcatchment Stress Classifications.

Creek	Catchment area (km^2)	Primary Stress Factors	Hydrological Stress	Environmental Stress
Richmond Catchment				
Double Duke Area	452	Riparian vegetation, water quality	Unresolved	High
Myall Creek	225	Riparian vegetation, stream bank erosion, water quality, overall stream condition	Unresolved	High
Coraki Area	391	Riparian vegetation, stream bank erosion, structures, high usage, water quality, urban pressure, tree cover	Unresolved	Medium
Myrtle Creek	756	Riparian vegetation, stream bank erosion, water quality, acid soils, overall stream condition	High	High
Sandy Creek	347	Riparian vegetation, stream bank erosion, water quality, acid soils, overall stream condition	Low	High
Evans Creek	158	Riparian vegetation, water quality, acid soils, urban pressure	Unresolved	Low
Broadwater Area	160	Riparian vegetation, structures, acid soils, algal outbreaks, point source, urban pressure	Low	High
Kyogle Area	456	Riparian vegetation, stream bank erosion, bed instability, high usage, structures, water quality, tree cover	High	High
Toonumbar Area	192	Riparian vegetation, streambank erosion, algal outbreaks	Low	High
Rocky Creek Catchment				
Terania Creek	422	Riparian vegetation, stream bank erosion, algal outbreaks, Rocky Creek Dam	High	High

Source: DLWC (1999)

Further, as illustrated in **Figure 6**, 100% of the 80th%ile flow (which is the environmentally important low flow regime) is extracted from some subcatchments.

Figure 6: Estimated Usage of the 80th%ile Flow in Catchments.



Source: NSW DLWC (1999)

Increasing urbanisation of some of these subcatchments is resulting in alterations to the natural flow regime and subesquently increasing the erosive potential of discharges and pollution loads to waterways. In November 2005, RVC prepared a stomwater management plan to assist in rectifying this issue. Further details on this plan are presented in **Section 2.4.3**.

Surface Water Quality

Surface water quality data is available for 20 sites in the Richmond Valley LGA listed **Table 8.** AusRivAS biological and physical assessments have been conducted for nine sites across the LGA, giving an overall rating from very poor to good. The DEC's water quality assessment (EPA 1996) ranked 49 sites against Australia and New Zealand Environment and Conservation Council's (ANZECC) water quality objectives, with similar results (see **Figure 10**).

Table 8: Water Quality Monitoring Sites and Available Parameters.

Location	Parameters	Data Source
Bungawalbin catchment	pH, EC, turbidity, DO, temp, salinity	RVC River Water Quality
Richmond River Casino	pH, EC, turbidity, DO, temp, salinity	RVC River Water Quality
Evans River	pH, EC, turbidity, DO, temp, salinity	RVC River Water Quality

Data gap: *recent coliform data for Richmond River and Rocky Creek catchments*

Location	Parameters	Data Source
Iron Gates	pH, EC, turbidity, DO, temp, salinity	RVC River Water Quality
Barlings Creek Casino	pH, EC, turbidity, DO, temp, salinity	RVC River Water Quality
Bora – Codrington Road	pH, EC, turbidity, DO, temp, salinity	Lower Richmond Water Quality Monitoring Group
Coraki Ellangowan Road	pH, EC, turbidity, DO, temp, salinity	Lower Richmond Water Quality Monitoring Group
Ellangowan Road	pH, EC, turbidity, DO, temp, salinity	Lower Richmond Water Quality Monitoring Group
Elliots Road	pH, EC, turbidity, DO, temp, salinity	Lower Richmond Water Quality Monitoring Group
Myall Creek	pH, EC, turbidity, DO, temp, salinity	Lower Richmond Water Quality Monitoring Group
Bungawalbin Whiporie Road	pH, EC, turbidity, DO, temp, salinity	Lower Richmond Water Quality Monitoring Group
Neiley's Lagoon Road	pH, EC, turbidity, DO, temp, salinity	Lower Richmond Water Quality Monitoring Group
Robinsons Bungawalkbin Creek	pH, EC, turbidity, DO, temp, salinity	Lower Richmond Water Quality Monitoring Group
Tatham Ellangowan Road	pH, EC, turbidity, DO, temp, salinity	Lower Richmond Water Quality Monitoring Group
Myrtle Creek Road	pH, EC, turbidity, DO, temp, salinity	Lower Richmond Water Quality Monitoring Group
Mt Marsh Road/Camira Creek	pH, EC, turbidity, DO, temp, salinity	Lower Richmond Water Quality Monitoring Group
Summerland Way	pH, EC, turbidity, DO, temp, salinity	Lower Richmond Water Quality Monitoring Group
Flood Gate Swan Bay School Road	pH, EC, turbidity, DO, temp, salinity	Lower Richmond Water Quality Monitoring Group
Flood Gate Rosolens Canal	pH, EC, turbidity, DO, temp, salinity	Lower Richmond Water Quality Monitoring Group
Casino WFP raw water	pH, turbidity, temp, colour, alkalinity, hardness, ammonia	WFP tests

Further, the Stressed Rivers Assessment Report (DLWC 1999) identifies water quality as a primary stress factor for eight of the ten subcatchments of the Richmond River catchment. The ninth subcatchment received a medium ranking.

IWCM issue: *poor water quality across catchment*

The construction of Tuckombil Canal for alleviation of floods in the Richmond River has impacted upon the value of the estuary, through increased bank erosion and sedimentation, reduced water quality, biodiversity and ecological health. Other factors that degrade the river include drainage from acid sulphate soils, and urban runoff.

IWCM issue: *Blue-green algae outbreaks during low flows and hot weather*

Blue green algae is occasionally an issue for the Richmond River, especially during hot spells with low river flows. A major outbreak occurred in Jabour Weir in November 2002, which rapidly spread to the offtake for the town water supply. Low to medium algae counts were also recorded in the second half of 2005.

Fish kills are not uncommon in the Richmond Valley catchment and may be attributed to the rapid depletion of dissolved oxygen from high organic loading of water bodies and the decomposition of inundated introduced pastures. Additionally, the flushing of drainage channels through acid sulphate soil areas contributes to reduce the quality of the water. Two significant kills have been recorded in recent years; a major kill in 2001, and a less significant kill in 2004.

IWCM issue: *low dissolved oxygen contributing to poor water quality and low river health*

The Northern Rivers Catchment Action Plan (2005), Evans River Estuary Management Study and Plan (2002) and the RVC SoE Report (2004) recognise potential water quality issues relating to land use in the catchments and have set targets to identify water quality issues for the catchment.

IWCM issue: *impact of ASS exposure on river health*

A catchment wide assessment of the water quality data set out in **Figure 10** is presented in **Section 3.1.2**.

Data Sources: RVC SoE (2004), RVC SMP (2005), Mid-Richmond Flood Management Study (2002a), Stressed Rivers Report (1999), RVC SMP (2000), EPA (1996), Evans River Estuary Management Study and Plan (2002), NRCMA (2005), Rous Water (2005), RVC Quote Document (2006)

2.3.2 Groundwater

The groundwater resource in the Richmond Valley area is not covered by a water sharing plan and the sustainable yield of the system has not been determined.

IWCM issue: *lack of water sharing plans and knowledge of groundwater resource yields*

In the Richmond Valley LGA, 1,860 groundwater licences have been issued. Those licences entitle their holders to 5,117 ML/year for the purposes listed in **Table 9**. These are however based on estimates, rather than metered consumption. In addition, there is also a large number of small, unmetered bores.

Table 9: Licensed Groundwater Extraction Uses and Volumes.

Extraction Purpose	Allocation (ML/year)
Stock	1,991
Domestic	703
Farming	271
Property*	2,152
Total	**5,117**

Data gap: *groundwater consumption*

* A Groundwater Property Allocation relates to any purpose other than Stock, Domestic and Farming

Source: RVC SoE 2004.

Rous Water currently holds a licence to extract 530 ML per year from Zone 1 and 150 ML per year from Zone 3 of the Alstonville aquifer (totalling 8% of the available resource), which is used to augment surface water supplies for Woodburn, Evans Head and Broadwater/Rileys Hill. The Alstonville aquifer is located along the south western border of the Byron LGA and is fed by infiltration through the basalt soils surrounding Mt Warning. The aquifer has

IWCM issue: *groundwater stress due to over extraction and land use threats* been classified as high risk of over extraction. A water sharing plan was put in place in 2004 to help reduce and manage extraction from the aquifer. The Alstonville aquifer is the highest at risk aquifer in the northern rivers region and is characterized by land use threats, groundwater dependant ecosystems, poor quality water adjacent to aquifer, licensed entitlements compared to sustainable yields and high water levels and salinity. During an extended period of drought in 2001, above average amounts of water were pumped from bores to augment the supply from Rocky Creek Dam. Groundwater levels declined as a result and yields were lower than expected. The aquifer has since recovered due to rainfall.

Negligible groundwater quality testing has been carried out.

Data Sources: RVC SoE (2004), NSW DIPNR (2003), RVC Borewater Sampling Results.

2.4 Urban Information

Information on the urban water services (water supply, sewerage and stormwater) provided in the Richmond Valley LGA is presented in the following sections.

2.4.1 Town Water Supply

Data on the existing water supply system is important for the IWCM process in order to determine how well the system is performing in terms of the delivery of water services. Records of the water volumes extracted, treated and consumed are used to determine how efficiently the water supply system is operated, and to identify places where water is lost or unaccounted for. Understanding how water is consumed allows water demand management planning to encourage people to use water wisely. Data on the capacity of the existing system is important for identifying places where the system may be unable to deliver services in the future and may require improvement.

There are two discrete town water supplies in the Richmond Valley LGA: the Casino scheme, which serves the vast majority of customers; and the Lower Richmond River scheme. **Table 10** sets out the capacity and demands in the Richmond Valley service area as planned in the RVC Development Servicing Plan (DSP).

Table 10: Water Supply Systems Capacity

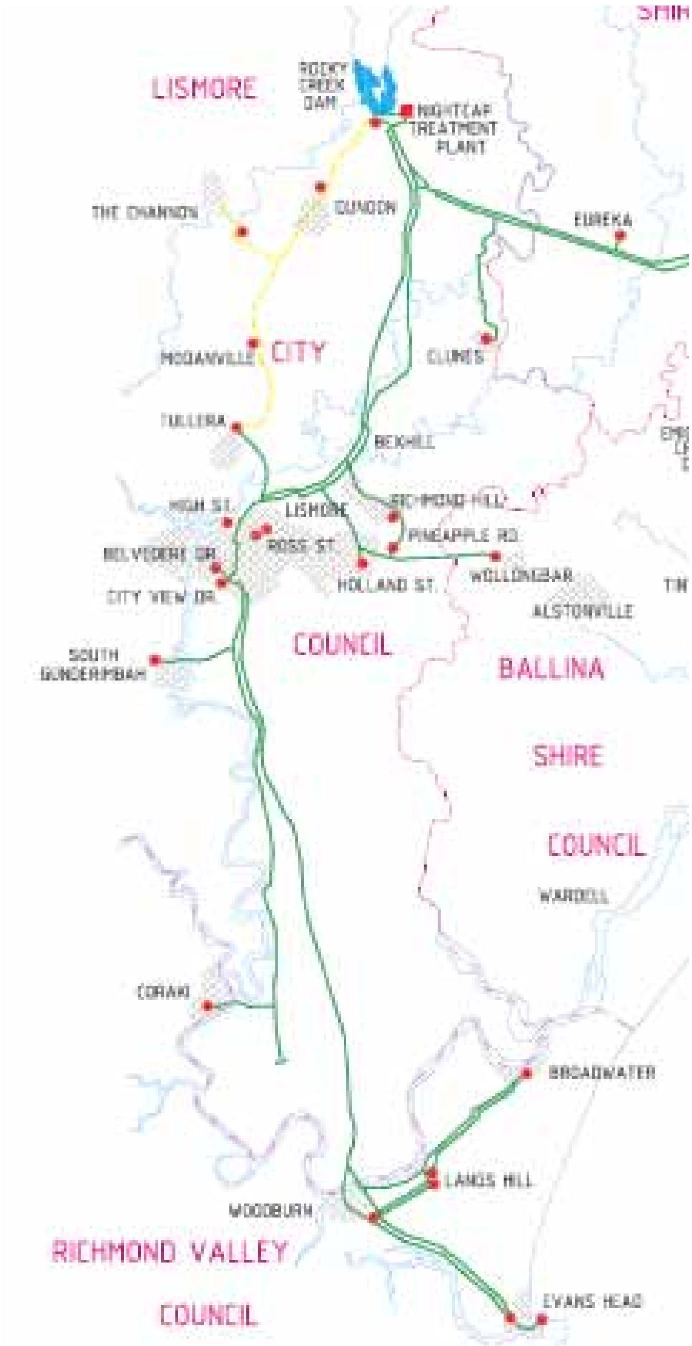
Service Area	Ultimate Treatment Works Capacity		Ultimate Transfer Works Capacity
	ML/d	ET	ET
Casino	23	7,667	6,655
Coraki	Water treated by Rous		606
Broadwater/Rileys Hill			246
Evans Head			2,428
Woodburn			275

Source: RVC WS DSP (2006)

Bulk Water Supply

Bulk water is supplied by Rous Water from Rocky Creek Dam via three trunk mains, as illustrated in Figure 7. One trunk main runs from Lismore city with a branch off to Coraki, Woodburn, Broadwater, Rileys Hill and ultimately Evans Head in RVC's service area. The other two mains supply Lismore City Council, Byron Bay and Ballina Shires. A small reticulation system which pumps groundwater from the Alstonville Aquifer is located between Woodburn and Evans Head and is used to supplement the Rocky Creek supply.

Figure 7: Rous Water Bulk Supply Scheme.



Source: Lismore Council (2000)

Rocky Creek Dam, shown in **Figure 8** is an on-stream dam with a secure yield of 9,600 ML. Rous Water also operates Emigrant Creek Dam, bringing the combined system safe yield to 11,200 ML. Water taken from Rocky Creek Dam is treated at Nightcap water treatment plant before being distributed to the storage reservoirs of the reticulating LWUs. Rous Water also has access to limited supplies of the Alstonville aquifer.

Figure 8: Rocky Creek Dam.

Source: The Echo Newspaper, June 2003

Rous Water is currently investigating an additional supply option called the Lismore Source. The aim is to extract water from the Wilsons River upstream of Lismore City. With the Lismore Source, the secure yield of the Rous Water system will be approximately 15,800 ML/a. The Lismore Source will extract up to 30 ML/day from the Wilsons River. Rous Water will extract water from the Lismore Source when Rocky Creek Dam is less than 95% full and when the flow in the river is above the 90%ile in summer and above the 95%ile in winter. The average annual diversion or amount of water extracted from the Lismore Source will be about 5,000 ML.

IWCM issue: *lack of long-term source security for Lower Richmond*

As a significant stakeholder, RVC has representation on Rous Water. Longer term (2025) supply security plans also include consideration of a possible Dunoon Dam.

A series of 13 reservoirs (**Table 11)** store water for distribution in both the Lower Richmond and Casino systems.

Table 11: Richmond Valley Reservoirs.

Zone	Reservoir	Volume (ML)	Capacity (ETs)
Casino	South	3.26	1,087
	North 1	1.82	607
	North 2	4.61	1,537
	North 3	11.32	3,667

Zone	Reservoir	Volume (ML)	Capacity (ETs)
Evans Head	Lower	4	1,330
	Higher	0.5	170
Woodburn	Langs Hill	2.3	770
Coraki	Lower	0.9	300
	Reservoir 2	0.12	40
	Reservoir 3	0.12	40
Broadwater/Rileys Hill	Lower	0.23	80
	Upper	0.6	200
	Rileys Hill	0.05	18

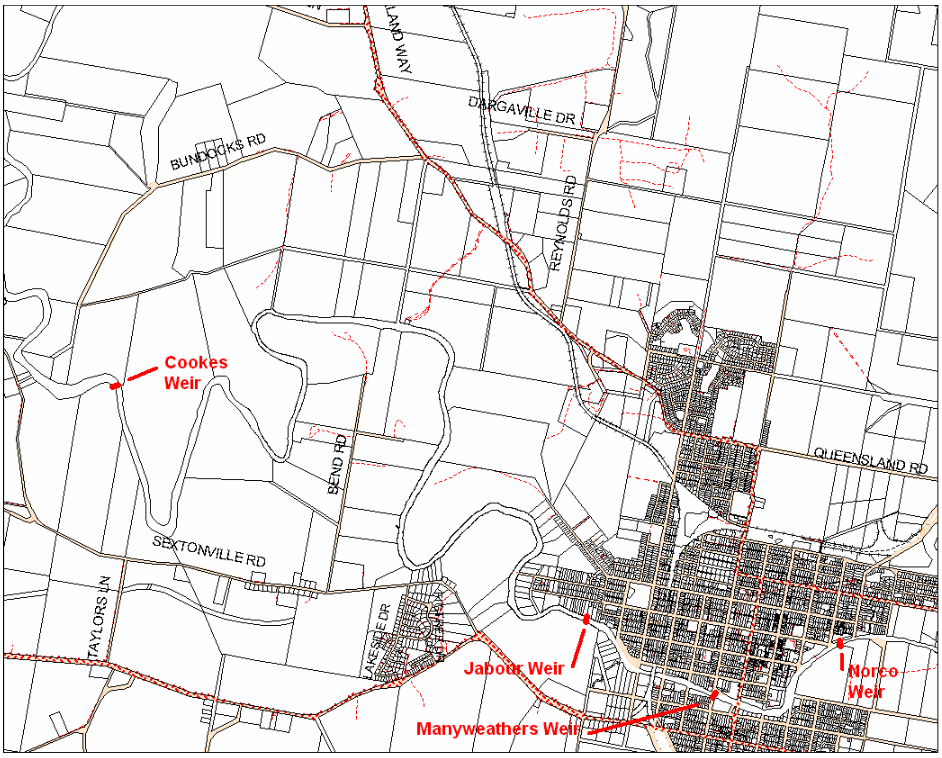
Casino Water Supply

The Casino system extracts raw water from the Jabour Weir (**Figure 9**). The weir is an on-stream storage and has a capacity of 1,623 ML, which is approximately 13 weeks supply (based on 1994 figures). The demand for 2004/05 was 2,437ML. The storage could be supplemented by Toonumbar Dam. However, despite many requests over the years, there is no formal agreement with DNR for the use of this supply and it has not been used before.

Data gap: *secure yield of Jabour weir*

IWCM issue: *lack of reliable backup water supply for Casino*

Figure 9: Location of Jabour, Cookes and Manyweathers weirs.



A verbal commitment from DNR exists to use Cookes Weir to supplement Jabour Weir when level 5 restrictions are in place. At other times, the Cookes Weir spillway is drowned out by normal Jabour Weir water levels. It is assumed that the Cookes Weir will not be drowned when level 5 restrictions are in place. Cookes Weir has a capacity of 500 to 1000 ML.

Casino's water supply is fully treated by way of sedimentation and filtration at a treatment plant adjacent to the Summerland Way, north west of Casino. Water is reticulated to the town of Casino through a system comprised of one raw water pumping station, four reservoirs and a network of pipes that distributes water to customers.

This supply serves approximately 5,265 assessments.

Lower Richmond River System

The Lower Richmond River reticulation system distributes water purchased from Rous Water. This supply serves approximately 2,482 assessments in the town of Evans Head, and the villages of Broadwater, Woodburn, Rileys Hill and Coraki (which also services nearby Box Ridge). RVC owns nine reservoirs and a network of pipes from the reservoirs. There is no formal agreement regarding the time length of the contract, the specifications of the quality of water provided or the responsibilities of each party.

The villages of Rappville and Fairy Hill are not supplied with a reticulated water supply; water is provided by individual rainwater tanks.

Data gap: *rainwater tank details*

The total demand of the Lower Richmond system for 2004/05 was 599 ML, as illustrated in **Table 12**. This represents a decrease in the annual demand since 2000/01 and 2001/02, but also a period in which water restrictions have been frequent.

Table 12: RVC Demand.

Town	**Production (ML)**				
	2000/01	**2001/02**	**2002/03**	**2003/04**	**2004/05**
Casino	**2,578**	**2,612**	**2,413**	**2,374**	**2,437**
Lower Richmond					
Coraki	127.7	145.4	105.08	123.6	118.4
Broadwater	85.1	103.4	72.2	76.6	83.6
Evans Head	351.4	366.4	282.4	323.9	322.3
Woodburn	75.7	87.4	68.3	74.9	75.2
TOTAL (Lower Richmond)	**639.9**	**702.6**	**528.0**	**599.0**	**599.5**

Source: RVC's Rous Monthly H_20 Consumption Data

Water Supply Quality

The results of the weekly sampling program of the RVC water supplies compared to the *1996 Australian Drinking Water Quality Guidelines* are reported to the NSW Department of Health and to DEUS (for the *NSW Water Supply and Sewerage Benchmarking Report*). Results for the Lower Richmond service area until September 2005 and for Casino for 2003/04 are presented in **Table 13**, showing full compliance in the Lower Richmond area but poor chemical and total coliform results for Casino.

Table 13: Compliance with ADWG.

Supply Sampled	% for Quarter Passed		% Previous 12 Months
Lower Richmond			
Nightcap WTP	100		100
Coraki Reservoir	100		100
Langs Hill/ Broadwater/Woodburn Reservoirs	100		100
South Evans Head Reservoir	100		100
Casino			
	Chemical	E. coli	Total Coliforms
Casino	96	100	79

Source: Rous Water (2005), DEUS Performance Report

IWCM issue: Non-compliance with ADWG in Casino's water supply

Water Consumption

Water production figures for each of the urban areas of the RVC LGA are presented in **Table 14**. These figures show that the annual production has dropped since 2000/01. Water restrictions were in place in from 2002/03, accounting for the particularly low demands. Adjusted figures also provided in this table account for the impact of major industries in the area, such as the sugar mill, meat co-operative, Fast Freeze and Seine Australia. The adjusted demand (which has the impact of industry removed) per capita ranges from 108 kL/year for Coraki to 158 kL/year for Casino. Using an occupancy ratio of 2.25, this translates to 243 to 356 kL/year per assessment, well above the state median of 215 kL/year per assessment.

Table 14: Water Production in the Urban Areas of RVC.

Town	Average Annual Per Capita Water Production (KL)				
	2000/01	2001/02	2002/03	2003/04	Adjusted
Casino	271	274	253	255	158
Evans Head	127	133	102	117	120
Coraki	110	125	91	107	108
Woodburn	148	170	133	146	149
Broadwater/Rileys Hill	180	220	154	163	143

Source: RVC SoE (2004)

IWCM issue: high unaccounted for water

Richmond Valley's unaccounted for water (UFW) was reported in the 2003/04 NSW Performance Reports as 10%. A separate analysis of production and consumption data for Casino, however, indicates up to 23% of the water produced is not metered as consumed. Generally, 10% is recognised as a best-practice level of UFW, however, the industry is moving towards a benchmark of 6%. Due to the heavy clay soils in the LGA, it is expected that system leakage would be low, and that perhaps metering issues explain a significant part of the UFW.

RVC actively participates and promotes demand management initiatives in conjunction with Rous Water. This program includes:

- Residential House and Tourist Accommodation Water Tune-Up Program;
- Direct Sales of Shower Heads to Customers
- Every Drop Counts Primary School Education Program, School Grant Program, Secondary School Education Program;
- Rainwater Tank Rebate Program;
- Washing Machine Rebate Program; and
- Residential Dual Flush Toilet/Cistern Rebate Program.

As part of its demand management program, Rous Water is also managing a water audit of the RVC-owned caravan park in Evans Head.

RVC applied user pays pricing uniformly across the LGA in 2004 (**Table 15**) to reflect the full cost of providing the water supply and hence act as a demand management measure.

Table 15: Historical Tariff Structures.

Date	Town	Access ($)	Usage Step 1		Usage Step 2	
			Volume (kL)	Price (c/kL)	Volume (kL)	Price (c/kL)
2003/04	Casino	145	< 375	40	375 or >	60
	Richmond River	229	< 360	90	360 or >	125
2004/05	Casino	215	< 200	55	200 or >	80
2005/06	Casino	215	< 200	55	200 or >	80

The 2003/04 typical residential bill for water supply was $262, which was increased to $385 for 2004/05 in order to recoup sufficient income for planned capital and operating expenditure. The usage cost to residents is $0.55 for the first 200kL and then $0.80 thereafter.

Water restrictions have been enforced yearly in both the Casino and Lower Richmond areas since 2002, with level 4 and 5 restrictions being reached in the Lower Richmond area in 2002/03. In 2003/04 Casino had water restrictions in place for 35% of the year. RVC (and other constituent Councils) have developed and adopted Rous Water's drought management plan for the Lower Richmond area. RVC is currently preparing its own drought management plan. Casino's own water restriction policy bases its tier system on the water levels at Jabour weir (DNR 2006) and in conjunction with the Richmond Water Users Association which includes irrigators and Kyogle Council.

Irrigators on the Richmond River are also subject to restrictions based on flows at Casino weir. These are set by DNR in the Macro Water Sharing Plan Kyogle Area.

Other Issues

Norco weir was initially installed to provide the Casino Norco factory with raw water. Whilst the factory still holds a licence for this operation, the weir is not currently used for this purpose. However, the presence of Norco Weir affects fish passage amongst other community concerns. NSW Fisheries and RVC are working together to improve management of this facility, in conjunction with Manyweathers Weir (1,500 metres upstream).

Data Source: RVC SBP (2006), RVC WS DSP (2005), Rous Water Demand Management Plan, Rous Monthly H2O Consump Data, RVC SOE (2004), NSW Fisheries (2001), RVC's Casino water restriction policy, RVC's GIS ws_plant database, RVC's Details of Casino Reservoirs, RVC's Dates when water restrictions imposed, DNR (2006)

2.4.2 Sewerage Services

Existing sewerage services include four sewage treatment plants (STP) located at Casino, Evans Head (which also receives raw effluent from Woodburn), Coraki and Rileys Hill. The four plants and their treatment capacity are presented in **Table 16**. The town of Broadwater and villages of Rappville and Fairy Hill utilise on-site systems for treatment of their wastewater. Investigations and planning to supply Broadwater with reticulated sewerage services are underway.

Table 16: Richmond Valley STP Treatment Type and Design Capacity.

STP	Treatment type	Design Capacity - Equivalent Population (EP)	Average Dry Weather Flow (ML/day)
Casino STP	Combined trickling filter/activated sludge - tertiary treatment	13,300	NA
Evans Head STP	Trickling filter - secondary treatment	3,700	1.8-2.6
Coraki STP	Trickling filter - tertiary treatment	1,200	NA
Rileys Hill STP	Activated sludge - tertiary treatment	200	NA

Source: RVC SoE (2004), RVC SBP (2006), RVC S DSP (2006)

Casino Sewerage

Casino STP was originally built in 1932 and augmented in 1955, 1976 and 1990. The plant comprises three trickling filters and an extended aeration tank (EAT) which operates in parallel under higher flows. The treated effluent is discharged into a tertiary pond and then into a constructed wetland area within the STP site. Three percent of Casino STP effluent is reused at the Casino Golf Course and 36% for agricultural irrigation by Blue dog. The remainder of the effluent (which was 1073 ML in 2004/05) is discharged to Barlings Creek, which eventually discharges to the Richmond River, via a series of wetlands on site at the STP.

Recent developments in the Casino area mean that Casino STP will reach its capacity. An augmentation is now planned to be completed sooner than originally scheduled (which was 2009/10).

A planned new pumping station and rising main to address the proposed motorhome village development (which has not yet been approved) at the site of the former Casino Airport will reduce loadings on the existing transfer system from this development. Should the proposed development (totaling 541 ET) be granted a licence for on site treatment and disposal, then the proposed augmentation will be deferred.

A major program of mains relining is being undertaken over the next 30 years to reduce infiltration of the sewerage system.

Evans Head Sewerage

Evans Head STP, constructed in 1942 and augmented in 1970, is a trickling filter plant currently awaiting augmentation. It treats sewage from Evans Head and Woodburn. Secondary treated effluent is discharged via an open drain and natural - Salty Lagoon (a designated SEPP 14 wetland located in Broadwater National Park). The augmentation, to be completed by 2007/08, is required to accommodate the growth in the area and to meet the stringent licence requirements for effluent disposal with the likely alternatives for disposal effluent reuse and ebb tide discharge. Options for reuse include the NSW Sugar Mill cogeneration plant at Broadwater although this may only be able to take dry weather flows.

Sewering of Broadwater village is expected to be completed by 2009, with sewage transferred to Evans Head STP for treatment.

There have been lengthy investigations into effluent reuse for the Evans Head STP and the sewering of Broadwater. The following reclaimed water options were considered in combination with STP options:

- Agricultural reuse;
- Re-use at the Sugar Mill;
- Dual water supply;
- Potable re-use;
- Ebb tide discharge;
- Partial and total release to Richmond River; and
- Deepwell injection at Evans Head.

Coraki STP

Coraki STP was constructed in 1966 and comprises a trickling filter and two tertiary ponds. Effluent is discharged onto adjacent swampland which drains to the Richmond River. Augmentations comprising odour control at the Coraki Golf Club have been recently completed and are operational. Effluent reuse associated with this scheme is planned.

IWCM issue:
little reuse of wastewater

Rileys Hill STP

Rileys Hill STP is a package plant installed in 1998. Effluent is discharged to the Richmond River.

On-Site Sewage Systems

There are a total of 2,840 licensed on-site sewage systems in the RVC area (2004/05), with an increasing number of new septic approvals per year. RVC has prepared and is implementing an *On-Site Sewage Management Strategy* (OSMS) for the area focusing on existing and new systems. Random audits of the existing systems to assess compliance with legislation and pre-purchase inspections of conditions are made by RVC. This strategy is part of the Richmond Tweed On-site Regional Sewage and Wastewater Strategy (Anderson and Associates 1999).

Data gap: *condition and pump out details of existing on–site sewage systems*

Other Issues

In terms of POEO licensing, minor non-conformances have occurred at the sewage treatment works at Evans Head, Rileys Head and Coraki in the last five years. An augmentation at Evans Head aims to address some of these issues.

IWCM issue: *non-compliances at Coraki and Rileys Head STPs*

Whilst stormwater infiltration to the sewerage system has been identified anecdotally, no data is available.

Data gap: *data on the nature and extent of stormwater infiltration to the sewerage system*

Data Source: RVC SoE (2004), RVC SBP (2006), RVC S DSP (2006), RVC Annual Report (2005)

2.4.3 Stormwater

The Richmond Valley LGA has a drainage network servicing urban areas consisting of kerb and guttering, pipes, gross pollutant traps, detention basins and natural drainage lines. The system discharges urban stormwater to local creeks, lagoons, the Richmond River and ultimately the ocean. Some catchments discharge in the vicinity of SEPP 14 wetlands in Evans Head. **Table 17** lists the urban catchments with stormwater systems, illustrating the dominance of Casino with respect to overall volume of runoff likely to be generated.

Table 17: Urban areas serviced by stormwater systems.

Town/Village	Urban Area (ha)	Volume (ML/a)*
Casino	800	2,634
Evans Head	400	1,779
Woodburn	50	165
Coraki	300	988
Broadwater/Rileys Hill	80	356

Source: RVC SMP (2005). *Estimate assuming 0.3 run-off co-efficient.

Data gap: *quality and quantity of stormwater runoff*

RVC prepared a *Revised Stormwater Management Plan* (SMP) in 2005 to meet the requirements set out by the DEC to minimise the ecological and economical effect of urban stormwater on the receiving environment and community. The SMP covered the ten urbanised sub-catchments, documenting the drainage paths, catchment areas, potential hot-spots and opportunities for implementing stormwater management practices. It also explored community-identified issues for stormwater management such as litter, water quality, weeds, funding and infrastructure maintenance.

The SMP also assessed catchment conditions and stormwater issues in the LGA. It found that erosion was not a major problem for the area, although steeper areas of the upper catchments of Rocky Mouth Creek and the Evans River demonstrate higher erosion potential, particularly during flood events. Other potential pollutants identified in the SMP were sewage effluent discharges, acid sulphate soils, some industrial discharges and runoff from urban and agricultural land usage, including landfills.

IWCM issue: *erosion in Evans Rivers due to Tuckombil Canal*

Measures to improve the situation in the associated action plan included the construction of wetlands and sediment basins at Evans Head, maintenance of gross pollutant traps (GPTs) and other stormwater control devices, litter control, acid sulphate soil identification and exploring rainwater tanks.

Additionally, *DCP 9 – Water Sensitive Urban Design* was prepared and adopted in 2005, outlining principles such as water conservation, water quality control, management of stormwater generation, management of riparian areas, habitat corridors, vegetation and landform and the management of construction, erosion and sediment control. The requirements outlined by this DCP are included in development application approvals.

Data Source: RVC SoE (2004), RVC SMP (2005), DCP 9 (2005)

2.5 Adequacy of Data

Following the review and compilation of available information, a gap analysis was undertaken to identify those areas where critical information for developing an IWCM Strategy is missing or otherwise deficient. The DEUS data audit sheet was used to identify these gaps. A copy of the audit conducted for Richmond Valley is provided in **Appendix A**. The areas of missing or inadequate data will need to be managed as part of the IWCM Strategy development process.

Table 18 is a summary of critical data gaps and possible measures to fill the gaps. Each gap was also assigned a priority as follows:

1. Data to be collected during IWCM strategy; and
2. Data to be collected prior to the first review of the IWCM strategy.

Table 18: Data Gap Analysis.

Priority	Data Gap	Measures to Remedy Gap
1	Secure yield of Jabour weir.	Undertake yield assessment of Jabour Weir. This analysis should take into account the 1990 investigation completed by NSW Department of Public Works and Services on behalf of Rous Water.

Priority	Data Gap	Measures to Remedy Gap
	Data on the nature and extent of stormwater infiltration to the sewerage system.	Condition assessment, sewer system modelling.
	Limited data on on-site sewage management systems (location, condition, pump out etc).	Expand the current rolling audit program to be based on a risk assessment and management approach.
	Quality and quantity of stormwater runoff.	Review of SMP, with focus on quantity management opportunities in line with the assessment of urban stormwater systems in Evans Head and Casino which RVC plans to undertake in 2006/07.
	Flooding impact on specific water and sewerage infrastructure.	Review outcomes of floodplain mapping to identify at risk assets for systems other than Casino (which has already been assessed for the 1 in 100 year event).
2	Limited data on rainwater tanks.	Audit all existing urban systems.
	Raw data for water quality in Richmond River and Rocky Creek dam catchments.	Develop and implement program to facilitate assessment of urban (stormwater and effluent discharges).
	Licensed surface and ground water extraction information	DNR to collect and compile data.
	Comprehensive documentation of soil erosion and erosion prone areas.	Map catchment land use and practices.
	Implementation status of effectiveness of floodplain risk management strategy.	Review and document strategy, with focus on impact on water and sewerage infrastructure.

3 What Are The Issues?

The purpose of this section is to identify issues within the catchment and urban water cycles. This involves:

- Auditing the available data to identify current and potential future water cycle management issues;
- Discussing the audit results with stakeholders to further clarify issues; and
- Prioritising the identified issues.

Although some issues have been highlighted by collating background data (see **Section 2**), auditing the available information on the water system against relevant policy frameworks and guideline documents is important for understanding how well the system is performing and identifying system issues. Issues can then be verified through consultation with stakeholders. Confirmed issues can then be prioritised by stakeholders so that they can be systematically addressed.

3.1 Audit of Available Data to Identify Issues

The purpose of undertaking the audit is to identify relevant issues that the IWCM Strategy may contribute to addressing. Utilising the audit guide provided by DEUS, an audit of available data was undertaken in three parts:

- Catchment audit;
- Water resource audit; and
- Urban area audit.

In each case, the system has been compared to existing policy and guideline frameworks which set objectives for system performance. A summary of the frameworks utilised is set out in **Table 19**.

Table 19: Audit Frameworks.

Audit Area	Audit Framework
Catchment	DEUS developed catchment icons representing the state wide catchment management policy framework (refer to DEUS IWCM guidelines, 2004).
Water resource	EPA Water Quality and River Flow Interim Objectives
Urban area	DEUS Best-Practice Management Guidelines for LWUs.

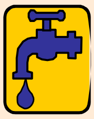
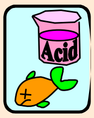
The results of the audit are set out in the following sections.

3.1.1 Catchment Audit

DEUS developed a series of catchment icons (see **Table 20**) to represent the objectives of the NSW catchment policy framework. The information on the catchment system was compared to these objectives, using the descriptors set out in the DEUS IWCM guidelines, and a simple assessment made. The results are interpreted as follows:

- Coloured icon: objective is identified as an issue;
- White icon: not enough information available on which to make an assessment; and
- Grey icon: Objective is not identified as an issue.

Table 20: Audit Against the DEUS Catchment Objectives.

Objective	Discussion
Water Stress: 	The Stressed Rivers Report found that Kyogle Area (upstream of Jabour Weir for Casino) and Terania (catchment for Rocky Creek Dam and Lower Richmond's water supply) were under high extraction stress. The option for extractions from Wilsons River for additional water for Lower Richmond supply impact on the Coopers Creek subcatchment, which is already at medium extraction stress. Toonumbar Area, the possible backup supply for Casino, is at low extraction stress. The NRCMB Management Plan identifies Myrtle Creek as a priority area for establishing water sharing plans by 2007. The stress classification of Myrtle Creek and Kyogle Area subcatchments must also be lowered by at least one management category. Additionally, environmental flow requirements must be met by 2016. A Water Sharing Plan has been prepared for the Alstonville Aquifer, to the east and south of Lismore CBD, which commenced on July 1 2004. This places limits on extractions to reduce water stress. The status of other groundwater sources is unknown, however, the Blueprint targets that extractions be within identified sustainable yields by 2016.
Salinity: 	Salt water intrusions upstream, particularly during periods of low flow, impact upon water usage in the Richmond River catchment.
Acid Soils: 	There are about 441 square kilometres of acid sulphate soils in Richmond Valley LGA. Urban areas including Evans Head, Woodburn, Coraki and Broadwater are constructed on ASS. Hotspots in the RVC area are Rocky Mouth Creek, Woodburn and Sandy Creek – Bungawalbin Creek via Coraki. Development in these areas has previously impacted on waterways. Planning controls to prevent future ASS impacts are now in place. It is unclear to what extent acidic conditions may be impacting on urban water infrastructure. The Catchment Management Plan sets a target of 50% reduction of flows from acid hotspots by 2011.
Chemical Cocktails: 	There are activities within the LGA (e.g. landfills, cattle tick dip sites) that have the potential to contribute to chemical releases into waterways and the environment. However, due to the paucity of data on this objective, it has been identified as an issue without enough information on which to make an assessment.

Objective	Discussion
Soil Erosion:	Whilst the erosion potential of the catchment is typically low, clearing, overgrazing, and quarrying have all contributed to streambank erosion. Sheet, gully and rill erosion are found on the sandstone areas in the west of the catchment. The rehabilitation of 85% of targeted stream sections by 2012 in the following subcatchments has priority identified by the Catchment Management Plan: Terania Creek; Sandy Creek; Myrtle Creek; Myall Creek; Double Duke Area; and Evans River.
Deforestation:	More than 25% of the Richmond Valley LGA is State Forest or under Environmental Protection. Despite this, larger areas of rural land (47%) have been cleared in the Richmond River catchment for agriculture including steep terrain in high rainfall areas. This leads to soil erosion and pollution of the coastal waterways. Streambank erosion is also an issue in parts of the Richmond River and Rocky Mouth Creek as a result of riparian vegetation loss.
Greenhouse Gases:	Due to a paucity of data, no assessment was made on the greenhouse impact of Richmond Valley. However, as with large parts of Australia, climate modelling predicts the region is likely to be affected by significant temperature increases and reductions in rainfall by the year 2030 due to climate change.
Monodiversity:	Richmond River's main agricultural products have been dairying, grazing, poultry, mixed cultivation, sugar cane and tea tree oil. Additional industries include stone fruit, soya bean, hay and maize. The biodiversity of the region, particularly that associated with the Macleay/Macpherson Overlap is threatened by wildlife habitat loss or degradation, clearance or modification of native vegetation, aquatic species habitat loss or degradation, declining condition of remnant vegetation, fire management practices, poor management of waterways, environmental or aquatic pest plants (weeds) and animals. The Catchment Management Plan targets 50% of riparian vegetation to be actively managed by 2006, suggesting it is a high priority.
Algal Blooms and Nutrients:	The Stressed Rivers reports algal blooms as an issue in Broadwater and Toonumbar Areas and Terania Creek. Although there are no towns discharging treated effluent or stormwater here, the extractions from these subcatchments are high, leaving minimal flow in the creeks, which may provide conditions for blooms, especially during hot spells.
Flooding:	Periodic flooding occurs in Richmond Valley with urban areas temporarily affected. Floodplain management plans have been developed for both the Lower Richmond and Casino areas.
Resource Scarcity:	The Northern Rivers Catchment Action Plan sets targets to provide environmental water from surface and groundwaters by 2009 and 2016. Surface and groundwater sharing plans are not available for the Richmond River catchment.

3.1.2 Water Resource Audit

Water quality in the Richmond River was assessed against the *Water Quality and River Flow Interim Environmental Objectives* defined for the Richmond River Catchment. The objectives were developed in a whole of government process lead by the NSW Department of Environment and Conservation (then, the EPA). Objectives were developed through extensive community consultation and are intended to assist resource managers in assessing and setting targets for environmental values. Each of these objectives is defined by a series of icons representing an identified environmental value with associated water quality indicators (see **Table 15**) defined by the Australian and New Zealand Environment and Conservation Council (ANZECC).

The primary contact recreation environmental value for example, includes swimming or any activity with a likelihood of water being swallowed. Each of the environmental values and associated criteria are defined in **Table 22**.

As an environmental value is represented by a group of water quality indicators, all indicator criteria must be met for that environmental value to be considered protected. The extent to which the value was considered protected was ranked from very poor to good, based on the percentage of samples where the indicator criteria were met (see **Table 21**). Where sufficient information is currently unavailable to assess criteria, the icons are presented in black and white.

Table 21: Ranking of Environmental Values.

Ranking	Lower Limit	Upper Limit	Icon Colour
Good	75%	100%	Green
Fair	50%	74%	Yellow
Poor	25%	49%	Orange
Very Poor	0%	24%	Red
Insufficient Data	-	-	Black and white

Table 22: Environmental Values and their Criteria.

Aquatic Ecosystem Protection	Primary Contact Recreation	Secondary Contact Recreation	Agricultural Irrigation	Agricultural Livestock	Edible Seafoods	Drinking Water
Maintaining or improving the ecological condition of waterbodies and their riparian zones over the long term.	Maintaining or improving water quality for activities such as swimming in which there is a high probability of water being swallowed.	Maintaining or improving water quality for activities such as boating and wading, where there is a low probability of water being swallowed.	Protecting the quality of waters applied to crops and pasture.	Protecting water quality to maximise the production of healthy livestock.	Protecting water quality for safe consumption of foods taken from natural waterbodies.	Quality of drinking water drawn from the raw surface and groundwater sources before any treatment.
ANZECC threshold levels for available data						
Total P <0.1 mg/L **Total N** <0.75 mg/L **Dissolved Oxygen** > 6.0 mg/L **pH** 6.5 – 9	**Faecal coliforms** < 150 cfu/100mL **pH** 5 – 9	**Faecal coliforms** < 1000 cfu/100mL	**Faecal coliforms** < 1000 cfu/100mL **pH** 4.5 – 9 **Salinity** < 0.28 µS/cm	**Faecal coliforms** < 1000 cfu/100mL **pH** 6.5 – 9 **Chlorides** **Sulphates** **Calcium**	**Faecal coliforms** < 14 MPN/100mL; < 10% >43 MPN/100mL	**Faecal coliforms** 0 cfu/100 mL **Total coliforms** 95% samples 0 cfu/100 mL **pH:** 6.5 – 8.5 **Dissolved Oxygen** >6.5 mg/L **Electrical Conductivity** <1500µS/cm **Blue-green algae**

Surface Water

The results of the assessment of surface water data are graphically set out in **Figure 10** and **Figure 11.**

This assessment is based largely on a 1996 assessment of five sites in the RVC LGA (EPA 1996). Additional sampling data for the Richmond River catchment is available from 1999 to 2002, but contains only pH, salinity and electrical conductivity data and is therefore incomplete to make a revision of the 1996 assessment against the objectives.

The key features of the results are as follows:

- The urban area of Casino did not appreciably affect water quality, when compared to the impacts of upstream areas.
- There was little change in water quality between Coraki, Broadwater and Woodburn. Consistent rankings of “Very Poor” for Protection of Aquatic Ecosystems and Primary Contact Recreation indicate that urban influences do not stand out particularly in relation to upstream factors, such as the highly fertile soils in the north of the catchment may be responsible for some of the high nutrient concentrations noted.

In the absence of more recent water quality data, it is assumed that, in the absence of major improvements in land use management, diffuse pollution remains a problem for the Richmond River catchment.

The assessment of surface waters in the Rocky Creek Dam catchment is based on fourteen dry and wet weather sampling events at two sites from 2003 to 2005. The water quality indicators measured include: dissolved oxygen, turbidity, pH, chlorophyll a, nitrogen and phosphorous. This sampling excluded E. coli. This is based on the assessment in Rous Water’s 2004/05 Annual Report, and as such, raw data was not available.

The key features of the results as reported by Rous Water are as follows:

- There was little variation in compliance for water quality between wet and dry weather events;
- Compliance with most Environmental Values was good.
- The overall compliance of the upstream site water slightly better during both dry and wet weather events than the downstream site.

The overall compliance reflects well on the management of the Rocky Creek catchment, particularly with respect intact riparian vegetation.

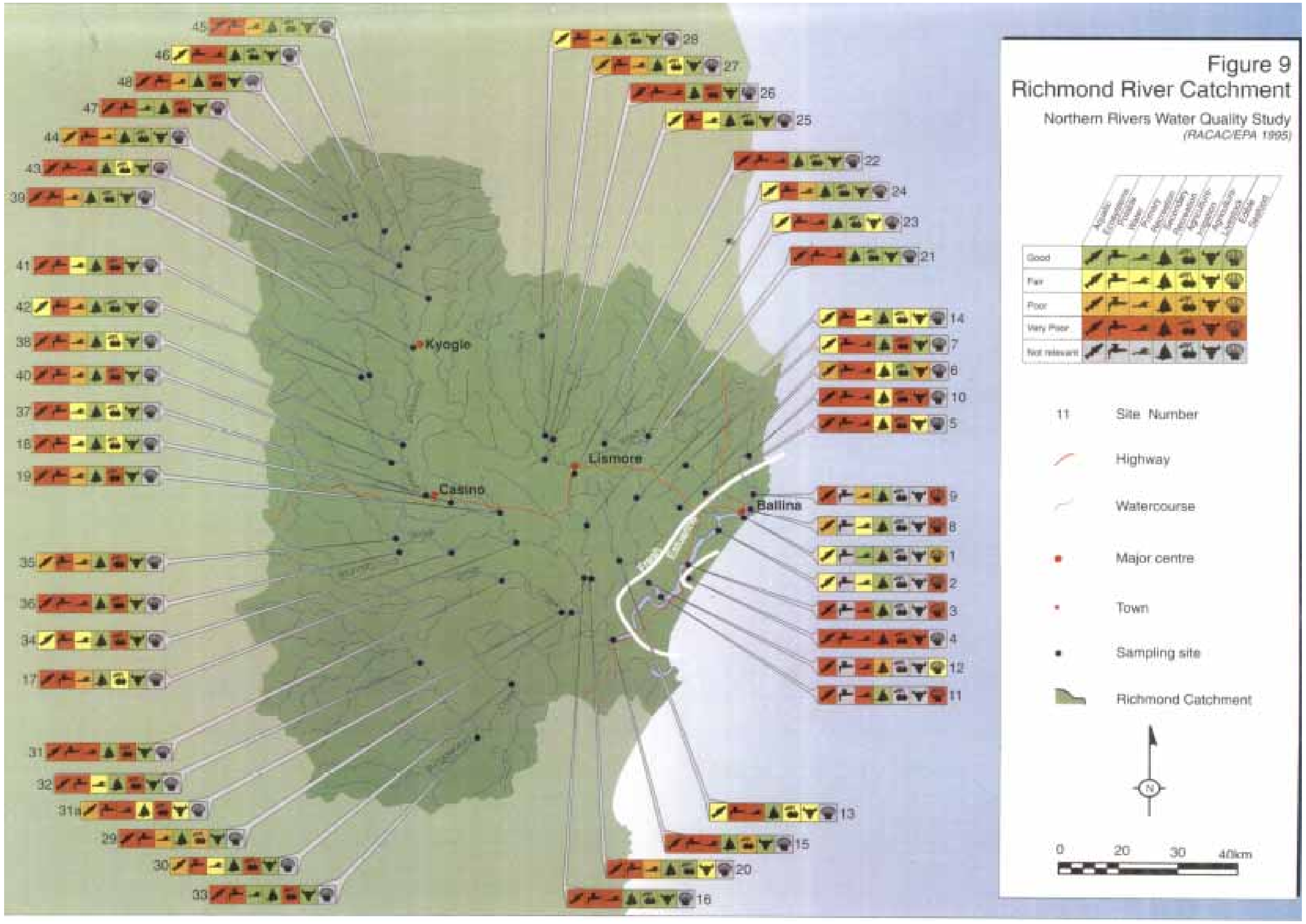
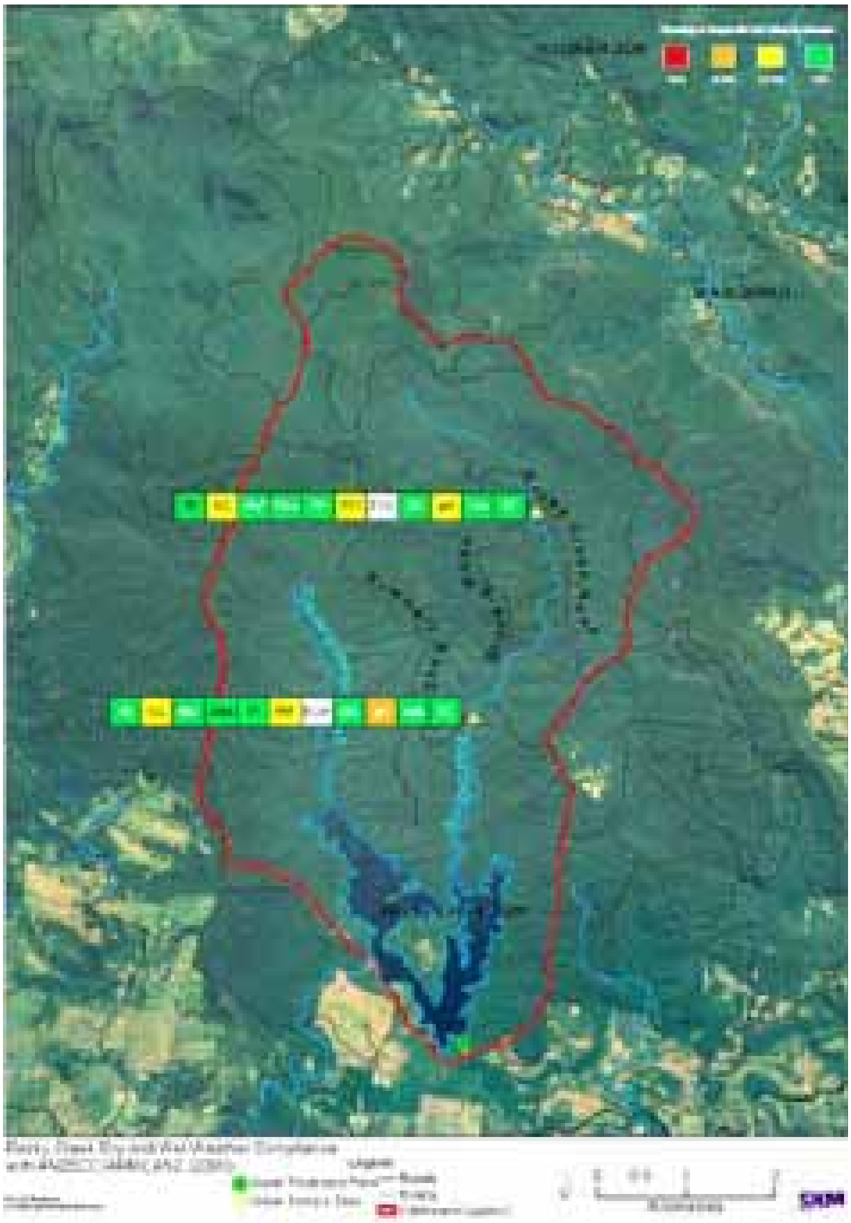


Figure 10: Water Quality Sampling Sites and Environmental Indicator Results for Richmond River Catchment.

Source: EPA (1996)

Figure 11: Water Quality Sampling Sites and Environmental Indicator Results for Rocky Creek Dam Catchment.



Source: Rous Water (2005)

3.1.3 Urban Area Audit

The Richmond Valley Urban Area Audit was undertaken in two parts:

- A preliminary environmental assessment of existing urban area impacts on the quality of the water resource; and
- An audit against DEUS Best-Practice Management Guidelines.

Environmental Impact of Urban Area

As detailed in **Appendix A**, desktop estimates of nutrient loads from urban water discharges (treated effluent and stormwater – but not the unmeasured impact of sewer overflows) were calculated.

For stormwater, estimates were based on average levels of total phosphorus and total nitrogen of 1 mg/L and 0.7 mg/L respectively and an assumed catchment runoff coefficient of 30%. The estimated stormwater loads would be influenced by this assumption.

Sewage loads were estimated from monitored discharge quality and are more reliable than the stormwater estimates. However, as these estimates rely on fortnightly or monthly sampling, results may be skewed.

These estimates are summarised in **Table 23**, which demonstrates the relative impact of each urban pollutant source on the waterways.

Table 23: Estimated Annual Nutrient Loads from the Urban Areas of Richmond Valley.

Parameter	Stormwater (kg)	Sewage (kg)	Total Urban (kg)	River (kg)*
Total Nitrogen	5,922	1,564	7,037	1,440,000
Total Phosphorus	4,145	868	4,668	192,000

*Assuming annual average flow and meeting IEO water quality triggers for TN and TP.

DEUS Best-Practice Guidelines

DEUS prescribes six best practice criteria for LWUs to meet. In 2004/05, RVC met three of the best practice criteria. These were; strategic business, financial and development servicing plans for sewerage and water supply and complete reporting of performance for the period.

RVC is currently preparing an IWCM strategy and compliant drought management plans. The only shortfall for RVC for best practice management compliance is a compliant demand management plan although RVC actively promotes the implementation of the Rous Water plan and has budgeted to complete its own plan in the 2006/07 financial year.

An assessment of the performance of urban water services was undertaken by comparing the performance of the Richmond Valley Council water supply and sewerage services against the *2003/4 Water Supply and Sewerage Performance Monitoring Report*. Each year, NSW Councils are required to submit water supply and sewerage performance data to DEUS for the development of a state-wide performance comparison document and Triple Bottom Line (TBL) reports for each Council. These reported results are presented in **Table 24** and **Table 25**.

Water consumption per assessment (including the impact of industry) in the RVC service area is relatively high, reflecting poor demand management strategies. Typical residential bills have increased dramatically since 2002, from $265 to $385, which reflects the relatively high operating and management cost. Drinking water quality results were 100% microbiologically compliant and 96% chemically compliant.

Table 24: Performance Summary of the RVC Water Supply System.

Water Supply System	2003/04	State Median
Number of Assessments	6,719	
Residential Consumption (kL/property)	275	215
Average Residential Bill ($ per property) (2004/05)	244 (265)	325
Typical Residential Bill ($ per property) (2004/05)	262 (385)	330
Number of main breaks (per 100km)	11	11
Drought Water Restrictions (% of time)	35	55
Water Quality Complaints (per 1000 properties)	0	5
Water Service Complaints (per 1000 properties)	6	9
Chemical Water Quality Compliance (%)*	96	100
Microbiological (E. coli) Water Quality Compliance (%)*	100	100
Operating cost ($ per property)	350	255
Management cost ($ per property)	142	100

* note, these parameters are for the Casino town water supply only as Rous Water is responsible for the compliance of the Lower Richmond River supply.

Over the past 2 years, there have been no water quality complaints and an average of 6 water service complaints, which is less than the state median.

Table 25: Performance Summary of RVC Sewerage System.

Sewerage System	2003/04	State Median
Number of connected properties	6,080	
Volume of sewage treated (kL per property)	293	240
Average Residential Bill ($ per property) (2004/05)	421 (431)	355
Typical Residential Bill ($ per property) (2004/05)	495 (418)	375
Operating cost ($ per property)	320	265
Management cost ($ per property)	148	95
Sewer Choke/Collapse (per 100km of main)	9	41
Sewer Overflows (per 100km of main)	2	7
Odour Complaints (per 1000 properties)	2	0.4
Service Complaints (per 1000 properties)	7	13

Whilst RVC typical residential bills were significantly greater than the state average in 2003/04, they have decreased since then from $495 to $418. However, the operating and management costs are still greater than the state average. This is likely to be caused partially by the level of service provided.

RVC has two staff and equipment for high pressure sewer cleaning and camera work in assessing the condition of assets.

There were 9 sewer chokes or collapses in 2003/04, which was significantly less than the state average.

Sewer overflows have reduced significantly since 2000/01, to below the state average.

Generally all STPs in NSW, including all of RVC's, complied with the BOD requirements. In comparison however, RVC complied with the licence requirements of its STPs for suspended solids only 91% of the time in 2003/04, which is an improvement on previous years: 77% in 2000/01 and 88% in 2002/03.

3.1.4 Summary of Issues

Having undertaken individual assessments of the Catchment, Water Resource and the Urban Area, it is important to draw together, and link where possible the outcomes of those audit processes and the issues identified in **Section 2**. By doing so, an integrated set of water resource and urban water service management issues can be identified.

A summary of the issues identified by the background data collation and the audit is set out in **Table 26**.

Table 26: Summary of Catchment, Water Resource and Urban Area Audit Issues.

Audit Component	Issues
Catchment	• Surface water stress exists in the catchment due to extractions. Town water extractions (including the impact of Rocky Creek Dam) are a factor causing water stress; • Kyogle Area and Myrtle Creek: lack of water sharing plans; need to reduce stress classifications; and need to address environmental flow requirements. • Groundwater stress due to overextraction and land use threats; • Poor fertility soils may be leading to high fertiliser application rates and high nutrient concentrations in waterways • Acid sulphate soils have the potential to affect water quality in catchment; • Erosion potential in steeper sections of upper catchment may be impacting on water quality; • Clearing and overgrazing have contributed to streambank erosion. Rehabilitation of priority subcatchments is required; • Impacts of agricultural land uses on the water cycle both in terms of extractions and reducing water quality; • High extractions leading to minimal flow in creeks and hot weather may be linked to algal blooms in waterways; and • Climate change may adversely alter the rainfall and temperature patterns of the study area.

Audit Component	Issues
Water resources	• Town water use and water cycle management contributing to hydrologic stress in the water supply catchments; • Poor management of floodgates increasing erosion and sedimentation of waterways; • Environmental flow requirements of town water extractions to protect the water resource and associated ecosystems; • Low dissolved oxygen contributing to poor water quality and low river health; • Lack of water sharing plans and knowledge of groundwater resource yields; • Groundwater stress due to over extraction and land use threats; • Potential contamination from known point sources; • Blue green algae outbreaks during low flows and hot weather; • Salt water intrusions, particularly during drought; and • Potential for reduced rainfall and increased temperatures if human induced climate change is realised.
Urban area	• Poor security of the Casino water supply (unknown yield water Jabour Weir) and long-term security of Lower Richmond supply (Rous Water supply security); • Over-extraction from Rocky Creek Dam catchment for town water supply; • Lack of a formal service agreement between Rous Water and RVC; • High rate of growth expected in urban area resulting in increased demand for services; • Lack of reliable backup/emergency water supply for Casino and Lower Richmond areas; • Historical non-compliance of Casino water supply with ADWG with respect to some chemical parameters and total coliforms; • Non-conformances at Coraki and Rileys Head sewage treatment plants; • Potential for further reuse of wastewater; • High water consumption, reflecting poor demand management planning; • High unaccounted for water; • High operating and management bills for water and sewerage systems leading to relatively high typical residential bills; • ASS soils in RVC urban areas potentially impacting on sewer infrastructure; and • Potential contamination from known point sources.

3.2 Issues Verification

To assist in the verification and prioritisation of the issues identified in the IWCM Concept Study process, a project reference group (PRG) was formed by bringing together representatives of Council, DEUS, the Department of

Planning, the Department of Natural Resources, the Fisheries Division of the Department of Primary Industries, North Coast Public Health Unit, Rous Water and community stakeholders. Although invited, a representative from DEC was unable to attend, but forwarded issues for consideration. A full list of PRG participants is given in **Appendix B**.

The issues identified in collating and auditing (see **Table 26**) the data presented in the previous sections were summarised and presented to the PRG in a workshop on the 3 May 2006. **Table 27** lists all of the issues raised and prioritised by the PRG. The prioritisation was achieved through a simple ballot process.

Priorities have been assigned to the issues in the following way:

- Priority 1: issues identified as high priority by the PRG ; and
- Priority 2: issues identified as lower priority by the PRG.

It is important to remember that these issues were identified and prioritised by the PRG only and are not necessarily representative of the wider stakeholder group. Additionally, the wording of these issues is considered indicative only and will be finalised in the Strategy. Finally, note that the solutions presented in this table are those suggested in the workshop, and are not an exhaustive list of possibilities.

Table 27: PRG Identified Issues and Proposed Solutions.

Priority	Issues	Possible Solutions
1	Poor urban (domestic and commercial) water supply security.	▪ Connect Casino to the Rous water supply system. ▪ Connect Casino to Toonumbar Dam (including considering options for Kyogle supply). ▪ RVC to take over Rous Water supplies in RVC.
	The need for a water sharing plan process to consider all water users together rather than a number of processes in isolation.	DNR Regional Water Strategy
	Sustainable sewage treatment plant effluent management across the LGA.	▪ Direct/indirect potable reuse ▪ Replace sugar mill needs with Evans Head effluent. ▪ Environmental flows. ▪ Source other reuse opportunities including assessing potential of large industrial customers of potable water supply to utilise effluent.
	Diversification of water sources.	▪ Effluent ▪ Stormwater ▪ Bores ▪ Other storages

Priority	Issues	Possible Solutions
	General water quality in the river as a result of landuse practices including agriculture, town (stormwater), industrial flood management, ASS etc, including blue-green algae outbreaks.	Not identified by PRG
	Affordability/pricing of options.	
2	Consider end users (industries in particular) that may not be able to use potable supply if treated effluent is returned to it.	
	Population growth is increasing the impact of water extractions on rivers.	
	Toonumbar Dam was originally provided for irrigation purposes not town water supply.	
	Water sharing and water quality in the Coraki area.	
	Capacity to treat water to drinking water standards (which may change) as the LGA continues to grow.	
	Sustainability of extractions and high hydrologic stress in the Kyogle area.	
	Sustainable localised (decentralised) system management.	
	Health issues related to water.	
	Community acceptance of sewage treatment plant effluent reuse opportunities.	
	Need for community education regarding septic system management.	
	Stormwater infiltration of sewerage system.	
	Rate of population growth and future development.	
	Environmental impacts of stormwater and rainwater harvesting.	
	Management of Toonumbar Dam subcatchments (Eden Creek, Doubtful Creek).	

As mentioned earlier, although unable to attend, the DEC forwarded the following comments:

- Consider all aspects of the water cycle e.g. stormwater in addition to water supply and sewage;
- Stormwater is a potential source of water (e.g. rainwater tanks) as well as pollution;
- Stormwater from traditional residential subdivisions is an ongoing source of pollution. Sound development practice such as using grassed swales rather than kerb and guttering reduces the impact of both the quantity and quality of stormwater. The low slopes and sometimes porous soils within the Shire are suitable for appropriately designed grassed swales;

- BASIX only deals with stormwater at an individual lot level. There are very significant issues at a subdivision scale which should be dealt with and are best addressed through planning instruments such as council's LEP;
- It is important to document the details of all water users, the nature of their use including the source and quality and volume requirements so that sources of water for reuse can be matched to water needs within the shire;
- Satisfying water needs from any natural supply/source (e.g. groundwater or water from streams and rivers) does have an adverse environmental impact; and
- The objective should be to reduce water use, reduce reliance on potable water where non potable water will suffice and use recycled water wherever possible.

4 Where Do We Want To Be?

The purpose of this section is to identify where RVC wants to be in terms of water cycle management into the future. This involves setting water cycle management objectives based on the Priority 1 issues identified in the previous section.

Subsequent to the PRG workshop outlined in **Section 3.2**, objectives for the development and implementation of an IWCM Strategy have been formulated based on the priority issues identified in the workshop. These objectives are set out in **Table 28**.

For each objective measurable targets have also been developed. The objectives will form the framework for assessing options and scenarios in the IWCM Strategy development phase.

Table 28: Priority Issues, Objectives and Measures.

Priority Issue	Objective	Measure
General water quality in the river as a result of landuse practices including agriculture, town (stormwater), industrial flood management, ASS etc, including blue-green algae outbreaks.	Improve land use management through education and demonstration.	Percentage of land and riparian vegetation protected and rehabilitated.
The need for a water sharing plan process to consider all water users together rather than a number of processes in isolation.	Coordinated approach to sharing of surface and ground waters.	Integration of urban water planning and the Macro Water Sharing Process.
Sustainable sewage treatment plant effluent management across the LGA.	Maximise high value (priority to substitution of potable water) reuse.	Percentage of treated effluent and stormwater reused.
Diversification of water sources.	Increase number of alternative water sources.	Percentage of water drawn from alternative water sources (rainwater tanks, stormwater harvesting, effluent reuse systems).
Poor urban (domestic and commercial) water supply security.	Improved security of urban water supply.	Ability to meet 5-10-20 rule for system security.
Affordability/pricing of options.	Provide highest level of service relative to users' willingness to pay.	Percentage change in typical residential bill.

5 How Will We Get There?

The purpose of this section is to recommend a process for developing an IWCM Strategy that delivers against the objectives set by the PRG and assists in improving the management of the Richmond Valley Council cycle. This involves:

- Examining options for integration; and
- Scoping the IWCM Strategy.

5.1 Potential Options

As part of this Concept Study, various methods of addressing the priority issues raised have been identified. For some of the options, preliminary assessment to test their level of effectiveness in Richmond Valley has also been undertaken. Preliminary assessment has been conducted only were some additional information is required to develop the scope of works presented in **Section 5.2**. **Table 29** lists the potential options to be further investigated in the strategy study.

Table 29: Potential Options.

Issues	Potential Options	Preliminary Assessment
Poor urban (domestic and commercial) water supply security.	▪ Connect Casino to the Rous water supply system. ▪ Connect Casino to Toonumbar Dam (including considering options for Kyogle supply). ▪ RVC to take over Rous Water supplies in RVC. ▪ Reuse of Casino WTP backwash water ▪ Reduce demand through demand management program. ▪ Investigate and reduce unaccounted for water.	A preliminary assessment of a series of individual demand management measures was undertaken. This is set out in **Appendix C**. The preliminary assessment highlights the following individual measures as likely to be of considerable benefit to reducing water consumption on a cost benefit basis: ▪ Adjustment of user pays pricing; ▪ Community education; ▪ An active unaccounted for water program; ▪ Replacement of potable water demand with effluent and/or stormwater/rainwater.
The need for a water sharing plan process to consider all water users together rather than a number of processes in isolation.	▪ DNR Regional Water Strategy. ▪ Macro water sharing process.	No preliminary assessment required to scope strategy phase works.

Issues	Potential Options	Preliminary Assessment
Sustainable sewage treatment plant effluent management across the LGA.	▪ Direct/indirect potable reuse. ▪ Dual reticulation to serve new development. ▪ Municipal irrigation. ▪ Agricultural irrigation. ▪ Replace sugar mill needs with Evans Head effluent. ▪ Environmental flows.	Preliminary investigation of effluent options highlighted: ▪ Potential difficulties in undertaking effluent irrigation activities in Evans Head (and surrounding coast regions) due to the fact that rainfall potentially exceeds evaporation for six months of the year, hence requiring large storage for effluent. In Casino however, rainfall exceeds evaporation for potentially only two months of the year and as such, storage options for reuse may be more feasible although storage would need to be removed from the potential impacts of significant floodplain inundation. ▪ Options for reuse in Casino in high value end uses (that is, existing potable uses) are few. However, the potential for this source to indirectly supplement the drinking water supply is considerable. Dual reticulation is limited due to the largely infill nature of growth. ▪ Whilst one option for reuse at Evans Head includes use (albeit potentially limited to dry flows and seasonal demand) at the NSW Sugar Mill co-generation plant, other irrigative uses in Evans Head are limited due to the surrounding National Parks land. Additionally, potable reuse is limited largely due to the infill nature of development. Further, presence of the Pygmy Perch in the waterways in the Evans Head locality limits the options for reuse in the area. ▪ Before an assessment of the Meat Cooperative can be completed, European Union standards on meat production (which cover the use of treated effluent) need to be considered. Consideration also needs to be given to the on-site recycling of 0.5 ML per week of the clear water streams and demand management (electronic hand basin faucets and efficient shower roses) already in place at the cooperative.

Issues	Potential Options	Preliminary Assessment
Diversification of water sources.	▪ Effluent ▪ Stormwater ▪ Rainwater ▪ Bores ▪ Other storages	A spreadsheet water balance model (**Appendix D**) was used to assess the effectiveness of rainwater tanks. The model demonstrated that for Casino: • The optimal tank size for this area is between 2,000 L and 3,000 L from a water supply perspective. This is consistent with the optimal tank size of between 2,000 L and 5,000L for this area under BASIX; • Larger tanks were found to provide incrementally less water savings proportional to increase in volume of the tank. 5,000 L rainwater tanks on new developments should be included in bulk supply water modelling options to gain water supply and stormwater benefit; • Up to 43% of the outdoor and toilet flushing water needs of an individual home could be supplied by a 5,000 L rainwater tank in Casino.
General water quality in the river as a result of landuse practices including agriculture, town (stormwater), industrial flood management, ASS etc, including blue-green algae outbreaks.	▪ Streambank restoration; ▪ Fencing of riparian areas; ▪ Sustainable agricultural practices; ▪ Stormwater harvesting. ▪ Implementation of the catchment action plan.	No preliminary assessment required to scope strategy phase works.
Affordability/pricing of options.	▪ Innovative, community leading solutions which attract grant money; ▪ Rebate schemes for customers to implement demand management	No preliminary assessment required to scope strategy phase works.

5.2 Proposed Scope of Works for IWCM Strategy

Drawing on the data gaps (**Table 18**) priority issues and potential options (**Table 29**), a proposed scope of works for the development of the RVC IWCM Strategy is presented in this section.

Task 1: Define responsibilities and formalise service agreement between Rous Water and Richmond Valley Council.

- Workshop the development of an MOU between Richmond Valley Council and Rous Water for implementation of the IWCM Strategy in a coordinated manner;
- Delineate and agree on each utility's responsibilities in the MOU with respect to management, operations, funding and service provision, especially in relation to specific IWCM options for Richmond Valley Council; and
- Invite Lismore, Byron and Ballina Councils to a meeting prior to commencement of the strategy to inform them of the IWCM process and the terms of the MOU and encourage their involvement in the process.
- Constituent Councils, including Richmond Valley, to develop a bulk water supply agreement with Rous Water.

Task 2: Community and Agency Consultation

Stakeholders are to be consulted via the Project Reference Group constituted for the Concept Study. Following the development of draft IWCM scenarios, the PRG is to be involved in the review and assessment of the scenarios against the objectives developed as part of the Concept Study (**Table 28**). This process should deliver a preferred IWCM Scenario for implementation.

Representatives from DNR attended the PRG meeting for the development of the Concept Study. However, representative of the CMA did not participate. This task will involve a separate facilitated meeting between RVC and these parties (and any others relevant to the process) to discuss the expected outcomes of the macro water sharing plan process, the regional water strategy it is understood DNR is developing for the North Coast and the progress of implementing the catchment action plan. The meeting should define the opportunities for the IWCM process to assist in the delivery of an integrated approach to water management across the Richmond Valley as this has been identified as a high priority issue for stakeholders.

IWCM Principle:

A whole of catchment integration of natural resource use and management

For the purposes of gaining community feedback on the IWCM Strategy, the preferred scenario for implementation (as identified by the PRG), should be presented to the community at an evening meeting. Comments received should be addressed in the process of finalising the IWCM Strategy for implementation.

Task 3: Demand Analysis and Forecasting

The development of a baseline 30 year demand forecast, informed by a historical demand analysis, has been completed for Casino as part of the Concept Study. Additionally, RVC is in the process of developing a Drought Management Plan. As Casino represents the greatest proportion of consumption in the RVC service area, further baseline demand analysis and forecasting is not anticipated to provide any additional benefit.

A preliminary assessment of demand management measures has been completed as part of the Concept Study. In particular, the level of unaccounted for water requires further investigation, especially in terms of the costs of an appropriate investment program for actively reducing the level of UFW. These measures will need to be finalised as part of the Strategy phase to develop a series of final demand forecasts showing the impact of a number of different demand management strategies. These strategies will need to be incorporated into the scenarios built.

This task will also involve developing 30 year forecasts of the treated effluent resource available as well as the potential harvestable stormwater resource. Forecasts should also give consideration to the quality of the available resource.

The analysis should also identify water demands that can be met by alternative water sources such as stormwater, rainwater and treated sewage effluent (matching quality and quantity to location of demand).

Task 4: Bulk Supply Analysis.

The purpose of this task is to address the known data gap in terms of the security of the Jabour Weir as well as complete a bulk water supply analysis, utilizing WATHNET, to assess the reliability of the existing Casino system and to be able to test management options (such as the development of rainwater, stormwater harvesting and effluent reuse opportunities). This task should deliver:

- An assessment of the safe yield of the existing system including Jabour Weir;
- An assessment of the various alternative arrangements of the existing system (i.e. the connection of Kyogle to Casino, the connection of Toonumbar Dam, the supply of the Lower Richmond from Casino, the supply of Casino from the Rous Water scheme etc)
- Scenarios demonstrating the assessment of the effectiveness of 5,000kL rainwater tanks on new development and retrofitted to a proportion of existing development, stormwater harvesting, and effluent management options; and
- A workshop to review WATHNET bulk system supply analysis.

Task 5: Distribution System Modelling.

RVC does not have current water supply distribution system or sewerage network models. A preliminary assessment of the water supply is required, considering the demand management influenced forecasts of demand in Task 2, to ensure key infrastructure (trunk mains and pump stations if required) are adequate.

This task will deliver an assessment of the costs (both capital and operating) of the infrastructure requirements identified.

Task 6: Sewerage System Modelling.

Infrastructure requirements for the sewerage systems of RVC have been identified in the Broadwater Waste Water Management Strategy and in the Evans Head

Detailed analysis of the sewerage system is required. This should involve identification of floodprone sewerage assets and sources of infiltration to the sewer system. This investigation should consider the trade-offs between reducing infiltration and the potential use of this source of stormwater once it passes through the STPs. Consideration should be given to the development of a condition based asset management program for sewerage assets.

This modelling should deliver an assessment of the infrastructure requirements to minimise the occurrence of sewerage overflows and establish the extent of sewer rehabilitation requirements.

This task will also deliver an assessment of the costs (both capital and operating) of the infrastructure requirements identified.

Task 7: Assessment of Sewerage Requirements.

Infrastructure requirements for the sewerage systems of RVC have been identified in the Broadwater Waste Water Management Strategy and in the augmentation of Evans Head STP.

However, the management of on-site systems requires consideration. A risk assessment to develop a risk based management approach for these systems should be completed as part of this task.

IWCM Principle:

Integration of water use and natural water processes

Task 8: Assessment of Treatment Requirements.

This task will deliver an assessment of the treatment options required to deliver the potable and non-potable water demands identified in Task 2 (i.e. the treatment requirements for the water, sewage, stormwater and other water sources under consideration). This should include an assessment of the options to repair the riparian environment including actions arising from consultation with State water and catchment managers in Task 2.

The task will also deliver an assessment of the costs (both capital and operating) of the treatment infrastructure requirements and other management measures identified.

Task 9: Scenario Development and TBL Assessment.

The purpose of this task is to develop a number of scenarios demonstrating the economic, environmental and social impact of urban water service integration. The number of scenarios should not exceed five. This task should deliver:

- Scenarios highlighting different levels of water system integration drawing on the outcomes of tasks 2 to 8;
- A capital works program and a schedule of operation, maintenance and administration for each scenario;
- Identification of funding opportunities for each scenario;
- A financial assessment of each of the scenarios developed, utilising FINMOD, and demonstrating the impact of each scenario on the typical residential bills faced by customers;
- An economic, environmental and social (triple bottom line - TBL) assessment of each of the scenarios, considering the objectives developed in the Concept Study;
- Workshops with the PRG to review and evaluate the scenarios and identify a preferred scenario; and
- Public consultation.

IWCM Principle:

The sustainable and equitable use and reuse of all water sources

Task 10: Strategy Documentation.

The preferred for implementation will be documented for Council and DEUS. This task should deliver a strategy consistent with the DEUS IWCM Guidelines and meeting the requirements of Best-Practice Management Guidelines as well as the needs of the Richmond Valley community. :

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Appendix A – Data Audit

Richmond Valley Council - General Description

Factor	Information required	Information		Notes/Source
General background	**What are the current urban issues within your LGA particularly in relation to infrastructure requirements e.g. are there PRPs on any STPs?**	Broadwater wastewater upgrade		RVC SoE 2004
		Effluent reuse at Evans Head		
		Security of water supply		
		Tourism and growth: additional pressure on local infrastructure		
What is the area of your LGA?	**Give area in sq. km.**	3,051 sq.km		RVC SoE (2004) p13
		304,759 ha		Sum of land use areas in RVC SoE (2004) p75
What other LGAs adjoin your LGA?	**Name all the LGAs**	**Name**	**Area (sq.km)**	
		Clarence Valley	10,440	Council website
		Kyogle	3,589	Council website
		Lismore	1,287	Council website
		Ballina	480	Council website
What catchment/s are within your LGA?	**Give names of all catchments**	**Name**	**Area (sq. km)**	
		Richmond River	3,051	RVC SoE (2004) p13
Subcatchments within Richmond Valley LGA	**Give names of all sub-catchments**	**Sub Catchments within Richmond Valley LGA**	**Area (sq. km)**	Stressed Rivers Report (DLWC 1999) and RVC GIS (SubCatch) database
		Myall Creek	225	
		Myrtle Creek	756	
		Sandy Creek	347	
		Evans River	158	(Small part of RVC LGA in south that is not part of the Richmond River catchment, and hence the disparity between this total and that for LGA area.)
		Double Duke Area	416	
		Coraki Area	329	
		Broadwater Area	33	
		Doubtful Creek	**33**	
		Leycester Creek	36	
		Shannon Brook	409	
		Kyogle Area	145	
		Wyralla Area	22	
		Sub Total	**2909**	

Richmond Valley Council - General Description

Factor	Information required	Information			Notes/Source
Urban areas of Richmond Valley LGA	**Give names of all urban and village areas**	**Name**	**sq km**		
		Casino (incl Gays Hill)		8	RVC Stormwater Management Plan (2005) p3
		Evans Head		4	
		Coraki		3	
		Broadwater		0.8	
		Woodburn		0.5	
					Includes 353.9ha for development
		TOTAL		**16.3**	RVC SoE (2004) p156

Ref.	Factor	Yes/ No?	Information				Notes/Source
1.1	**What is the forested area of the subcatchments in Richmond Valley LGA?**		**Area (sq. km)**	**Description**		**Proportion (%)**	
			1,855	Woody vegetation is defined as forest or woodland, native or exotic, with >20% canopy cover. Estuary vegetation, heathland, alpine herbland, rock, lakes, swamp, watercourses, dams, reservoirs, built up areas, cleared land less than 20% canopy cover and natural non-woody vegetation such as grasslands are all attributed as non-woody.		53	RVC SoE (2004) p100
			158	National Parks and Nature Reserves			RVC SoE (2004) p75
			108	Environmental Protection			
1.2	**Have the subcatchments of the Richmond Valley LGA been subject to clearing?**		**Description**	**Area cleared in 2003-4 (sq. km)**	**Proportion cleared in 2003-4 (%)**	**% of total LGA**	
		YES					
			OVERALL	1,645	47		RVC SoE (2004) p100 (unsure of year from NPWS)
1.3	**What is the upstream extent of your estuary (tidal and saline)?**		**Location**				
		Evans River	Tuckombil Canal, south of Woodburn	96.58 km2			RVC SoE (2004) p45
						Picture p1-2 Estuary Management Plan of Evans River	
						Picture p47 RVC SOE of coastal zone and SEPP 14 wetlands	
			Estuary Area Catchment Waterway Area	62 km^2 1.8 km^2		http://www.dlwc.nsw.gov.au/care/water/estuaries/inventory/evans.html	
		Richmond River	Estuary Area Catchment Waterway Area	6850 km^2 19 km^2		http://www.dlwc.nsw.gov.au/care/water/estuaries/inventory/richmond.html	

1.0	Landscape Characteristics Audit Questions						Appendix A
Ref.	**Factor**	**Yes/ No?**	**Information**				**Notes/Source**
1.4	**Are there wetlands in your catchment?**		**Subcatchment Location**	**Mangrove area (sq. km.)**	**Seagrass area (sq.km)**	**Coastal heath (ha)**	**Saltmarsh (sq. km)**
		17,738 ha	Bundjalung National Park	http://www.deh.gov.au/cgi-bin/wetlands/wetlandmap.pl?type=wetland;refcode=NSW026			
		20,359 ha	Bundjalung National Park	http://www.nationalparks.nsw.gov.au/parks.nsf/ParkContent/N0041?OpenDocument&ParkK			
						Coastal zone including SEPP 14 wetlands: Figure 3.03 RVC SoE (2004) p47	
	http://www.dlwc.nsw.gov.au/care/water/estuaries/inventory/evans.html		Evans River	0.33	0		0.375
	http://www.dlwc.nsw.gov.au/care/water/estuaries/inventory/richmond.html		Richmond River	4.949	0.189		0.099
			TOTAL	**5.279**	**0.189**	**0**	**0.474**
	Total SEPP 14 wetland area in RV LGA		36.45 km2	RVC SoE (2004) p61			

1.5	**What are the predominant vegetation types in Richmond Valley LGA?**		**Area (km2)**	**Cover (%)**	**Type**		
		overlay between tropical and temperate ecosystems, known as the Macleay/Macpherson Overlap					RVC SoE (2004) p99
							Riparian vegetation details p36 RVC SoE (2004)
	Cleared		218				
	Coastal Complex		258				
	Disturbed bushland		147				RV GIS RVC_ebd database
	Dry Forest System		1,161				
	Moist Forest System		17				Mapping is incomplete
	Plantation		36				
	Rainforest System		1				

1.6	**Does your catchment have potential acid sulphate soils?**		**Occurrence Class**	**Catchment Affected (ha)**	**Description**		RVC SoE (2004) p87
			1	927		This is in the former Richmond River area. No data re PASS in either Casino or Copmanhurst LEPs	
			2	6,141			
			3	19,110			
			4	4,777			
			5	13,190			
			Total	**44,145**			

1.0 Landscape Characteristics Audit Questions — Appendix A

Ref.	Factor	Yes/ No?	Information			Notes/Source
1.7	**Are there acid impacts in your catchment waters?**		**Description**			
			Hotspots			Picture RVC SoE (2004) p68
			Rocky Mouth Creek			
			Sandy Creek - Bungawalbin creek			
1.8	**Are urban areas located in areas of potential acid sulphate soil?**	Yes	**Description**		**Class**	
			Broadwater		1,2,3,5	Richmond River LEP Acid Sulphate Soils Planning Maps
			Coraki		1,3,4,5	
			Woodburn		1,3,5	
			Evans Head		All Classes	
			Riley's Hill		5	
1.9	**Are there acid impacts in your urban areas?**		See section 1.8			
1.1	**Does either dryland or irrigation salinity occur in your catchment?**		**Location**	**Type**		
		When no barrier exists between Rocky Creek River and Evans River, salinity intrudes upstream, with impact on its usability for irrigation and stock watering				MidRichmond Floodplain Risk Management Study p4-70
		Picture of salinity in the Richmond River				RVC SoE (2004) p 35
					Nothing in Catchment Action Plan, Integrated Catchment Management Plan, ROUS Water Annual Report, Casino Floodplain Risk Management Study, Mid Richmond Floodplain Risk Management Plan, Copmanhurst LEP, Casino LEP, Richmond Valley Management Plan	
1.11	**What is the area of catchment salt affected?**		**Location**	**Area (ha)**		
		NA				
1.12	**Are urban areas salt affected?**		**Location**	**Proportion**		
		NA				
1.13	**Are there salinity targets for waterways?**	No				

1.0	Landscape Characteristics Audit Questions					Appendix A
Ref.	**Factor**	**Yes/ No?**	**Information**			**Notes/Source**
1.14	**What are the predominant soil types in your catchment?**		**Description** Coastal sands Krasnozems Alluvial Soils Yellow earths Red Podzolics Chocolate Soils			RVC SoE (2004) p72
1.15	**Are there national parks in your catchment?**		**Description**	**Area within catchment (ha)**		
			Bundjalung National Park	20,359	http://www.nationalparks.nsw.gov.au/parks.nsf/ParkContent/N00	
			Broadwater National Park	4,226	http://www.nationalparks.nsw.gov.au/parks.nsf/ParkContent/N00	
					Also nature reserves, state conservation areas, wilderness areas	
			TOTAL	**24,585**		General NP details RVC SoE (2004) p46
1.16	**Are there protected areas (including water supply catchments and aquifers) in your catchment?**		**Description**	**Area within catchment (ha)**		
			Wetlands (as above)			
			National Parks (as above)			
			State Forests NSW (under public forestry)	44,979	Although LEP zoning says none p75	RVC SoE (2004) p3
			Conservation areas	37,102	NOT SEPP 14 or enviro protection zoning under LEP	
			Environmental Protection	10,835		RVC SoE (2004) p75
			Rocky Creek Dam catchment	31		SoE 2000
1.17	**What is the topography of your catchment?**		**Description**	Lower part: broad river valleys dominated by floodplains and used extensively for agricultural. Upper part: relatively narrow valleys with steeply timbered slopes.	Picture in catchment action plan p15	**SOE 2004 p 15 RV LGA only**
			Casino at 10-94m AHD - smp 2004			

Ref.	Factor	Yes/ No?	Information		Notes/Source
1.18	What is the average catchment runoff?		**Catchment**	**Catchment Runoff (%)**	
			NSW Average	10	NSW SoE 1997
			Richmond River	18	RVC SoE 2004 p31
					RVC supplied: CD 1\Enviro Info\Catchment runoff info

Ref.	Factor	Yes/ No?	Information					Notes/Source
2.1	**Are there STPs in the Richmond Valley Local Government Area?**		**Name and Location**	**Other**	**Description**	**Pumping Stations**	**EP**	
			Casino STP	Generally meets licence requirements on most occasions. High inflow/infiltration during extended wet weather -daily flow rate can increase upwards of 7 times normal flows	Combined trickling filter/activated sludge - tertiary treatment	14 PS; 1 comminuter	13,300	RVC SoE (2004) p27, 28
			Evans Head STP (servicing Evans Head and Woodburn)	Currently overloaded and having trouble meeting daily flow requirements. Investigation ongoing for plant upgrade. Tertiary (UV) treatment to be installed in late 2004.	Trickling filter - secondary treatment	12 PS	3700 (RVC SBP)	
			Coraki STP	high infiltration	Trickling filter - tertiary treatment	2 PS	1,200	
			Rileys Hill STP	Under loaded, causing low amounts of new feed for process	activated sludge plant - tertiary treatment	2 PS	200	
							Broadwater Wastewater Management Strategy	

Ref.	Factor	Yes/ No?	Name (of STP)	BOD (mg/L)	SS (mg/L)	TN (mg/L)	TP (mg/L)	E Coli (cfu)
2.2	**Is STP effluent quality monitored?**			**Mean values 2004/05**				
		RVC supplied: CD 1\IWCM Adam\2_02	Casino STP	5.2	4.3	2.7	5.2	315.6
			Evans Head	20.1	24.8	30.2	4.7	403074.1
			Coraki	8.9	32			300.3
			Rileys Hill STP	1.4	1.9	3.5	1.3	6

Ref.	Factor	Yes/ No?	Name	2004/05	Ocean Discharge (ML/year)	River Discharge (ML/year)	Reuse (ML/year)	Ave Daily Flow Rate (ML/d)	Notes/Source
2.3	**Is the STP discharge volume monitored?**								
			Casino STP			1,073	418	3	Casino STP EPA Monitoring & reporting data 2004 - 2005.xls
									2004/05 DEUS Report
							597		2004/05 DEUS Report
			Evans Head				0	2	Evans Head STP EPA Monitoring & reporting data 2004 - 2005.xls
			Coraki				0	0.31	Coraki WWTP EPA Monitoring & reporting data 2004 - 2005.xls
			Rileys Hill STP				0	0.02	Riley's Hill STP EPA Monitoring & reporting data 2004 - 2005.xls
			Total system		**0**	**1,073**	**1,015**		

2.0 Urban and Agriculture Audit Questions								Appendix A
Ref.	**Factor**	**Yes/ No?**	**Information**					**Notes/Source**
2.4	**Where are the STP discharge locations?**		**Name**		**Discharge Location**			
			Casino STP		On-site wetland			RVC SBP (2005)
			Evans Head		Nearby wetlands, to be upgraded to ebb tide discharge			
			Coraki		Richmond River			
			Rileys Hill STP		Richmond River			

Ref.	Factor	Yes/ No?	Name		Annual BOD Load (kg)	Annual TSS Load (kg)	Annual TN Load (kg)	Annual TP Load (kg)	Notes/Source
2.5	**What is the annual load of nutrients and any other monitored contaminants from the STP discharge?**		Casino STP	(2004/05)	298	192	156	307	Casino STP EPA
			Evans Head	(2004/05)	912	1,121	959	216	Evans Head STP EPA Monitoring & reporting data 2004 - 2005.xls
				(2004/05)			13,000	300	http://www.npi.gov.au/cgi-bin/npireport.pl?proc=source;instance=public;year=2005;loc_lga=Richmond%20Valley;loc_type=lga;loc_state=NSW;anz_category=370
			Coraki		996	3,346	431	338	Calculated from EPA monitoring and reporting data and STP flows
			Rileys Hill STP		7	11	18	7	
			TOTAL		**2,213**	**4,669**	**1,115**	**523**	

Ref.	Factor	Yes/ No?	STP	Current Average Effluent Discharge (ML/year)	Expected Average Effluent Discharge (ML/year)	Notes/Source
2.6	**What is the expected effluent flow (total and dry weather only) in 25 years time?**	**Based on % growth per annum**	Casino STP	1,054	1,459	
			Evans Head	623	1,263	
			Coraki	8,226	10,994	
			Rileys Hill STP	6	8	(based on rapville population)

Ref.	Factor	Yes/ No?	STP	Annual BOD Load (kg)	Annual TSS Load (kg)	Annual TN Load (kg)	Annual TP Load (kg)	Notes/Source
2.7	**What is the expected load of nutrients and any other monitored contaminants in 25 years time?**	**Based on % growth**	Casino STP	413	265	216	425	Calculated figures
			Evans Head	1849	2273	1945	438	
			Coraki	Not available				
			Rileys Hill STP	Not available				

Ref.	Factor	Yes/ No?	Information				Notes/Source
2.8	**Are there WTPs in your catchment?**		**Name**		**Type**		
			Nightcap WTP		Flocculation, aeration, sand filtration, then chlorine and ammonia added		Rous Water Fact sheet on the web
			Summerland Way (Casino)		Sedimentation and filtration		RVC SOE 2004
2.9	**Is WTP final water quality monitored?**		**Name**		**Parameters**		
			Casino WTP		Total col., E.Coli, Total Plate, Free Cl2, Total CL2, Temp, DO, Turb, pH, True colour, Apparent colour, Alum, Alk, Iron, Mang, Hardness, Nitrate, Nitrite, TDS, TOH, THM, VHO, DOC, Toc, TP, MIB, Geosmin		raw treated sampling updated sheet.xls
					Turbidity, colour, pH, alkalinity, hardness, residual CL, alum		RVC supplied: CD 1\IWCM Adam\Cas WTP flow and qual data
			Nightcap WTP		Turbidity, colour, manganese, iron, total coliforms, alum, lime, ammonia and chlorine		Rous Water fact sheet on web. Values not known.
2.1	**What is the WTP treatment capacity?**		**Name**		**Daily average volume treated (kL)**		
			Summerland Way (Casino) WTP		23		RVC supplied: CD 1\IWCM Adam\DEUS reports\DEUS Casino Water 04-05.xls
			Nightcap WTP		70		From Lismore data audit
2.11	**Size and location of aquaculture?**		**Location**		**Type**	**Size (Approximate % of Foreshore Area)**	
			Richmond River	knockrow, goldfish, silverperch , koi			http://www.fisheries.nsw.gov.au/__data/assets/pdf_file/7088/Directory-edition-3-1-Oct-2004-Section-A.pdf#PDF
		Extraction licenses	Surface Water		1		RVC SoE (2004) p22, 24
			Groundwater		2		
2.12	**What is the urban area in your catchment?**		**Name**		**Size (sq. km)**		
			Casino (incl Gays Hill)		8		RVC SMP 2004 p 3
			Evans Head		4		
			Coraki		3		
			Broadwater		0.8		
			Woodburn		0.5		
			TOTAL		**16.3**		

2.0 Urban and Agriculture Audit Questions							Appendix A
Ref.	Factor	Yes/ No?	Information				Notes/Source
	2.13 What types of agriculture are there in your catchment?		**Description**		**Area (ha)**	**Location**	
			sugar cane			coastal zone, esp between Ballina and Coraki	RVC SoE (2004) p84
			tea tree			In and around Coraki, and through the Bungawalbin	
			cattle grazing			inland	
			dairying				
			poultry				
			mixed cultivation				
							RVC SoE (2004) p75
			Agricultural zones in former Richmond River Shire		46380		
					90140		
					28330		
			TOTAL IN RICHMOND RIVER		**164850**		
			Agricultural zones in former Casino Council		3815		
					3768		
			TOTAL IN CASINO		**7583**		
			Cropping		3.30%		SoE (2005) from Brief
			Horticulture		0.50%		
			Grazing		45%		
			102225 ha				RVC SoE (2004) p84
			221748 ha				RVC SoE (2004) p84
						Diagrams in RVC GIS; also LEP zones	
			Total				
	2.14 What is the location and area of this agriculture?		**Description**				
			See section 2.13				
	2.15 Is there modified or contaminated runoff or wastewater generated from this agriculture?		**Land Use**		**Nitrogen (kg/year)**	**Phosphorus (kg/year)**	
			Agricultural/horticultural activieis: pesticides, herbicides, fungicides, fertilisers, defoliants, desiccants	Cropping and horticulture	117	11	McKee, Eyre and Hossain (1998) - Nitrogen and
				Forest	4	0	
				Grazing	722	162	
				TOTAL	**843**	**173**	
	2.16 What is Richmond Valley LGA population?		**Population (2001 census)**		**Population (1996 census)**		
			20625		20833		RVC SoE (2004) p154
			20351		20865		RVC supplied: CD 2\Population\Population
			17398		17654		RVC SBP (2005)

2.0	Urban and Agriculture Audit Questions			Appendix A
Ref.	Factor	Yes/ No?	Information	Notes/Source

Factor	Location		Population (2001 census) (SBP 2001)	% of total population	SMP (2004)	RVC SOE 2004/Brief	Notes/Source
2.17 What is the urban population?	Casino		12289	**71**	10000	9522	
	Evans Head		2914	**17**	2757	2757	
	Coraki		1159	**7**	1159	1159	
	Broadwater		408	**2**	470	470	
	Woodburn		513	**3**	513	513	
	Rappville		115	**1**			
	Rural (east)					1697	
	Rural (north)					2233	
	Rural (west)					2336	
		TOTAL	17398		14899	20687	

Factor	Year		Population projection	Notes/Source
2.18 What is the expected total population growth?		2030	25845	RVC SBP (2005) p10

Factor	Year		Population projection (from RVC SBP (2005))		% Growth (calculated)
2.19 What is the expected urban and rural population growth?	**2030**	Casino	17013		38
		Evans Head	5909		103
		Coraki	1549		34
		Broadwater	523		28
		Woodburn	704		37
		Rappville	147		28
				25845	

Factor	Location	New on-site systems approved			Number	Notes/Source
2.2 How many on-site sewage systems operate in the catchment?		2002/03	55			RVC SoE (2004) p28
		2003/04	102			
				Total	2438	RVC SoE (2004) p28

2.0 Urban and Agriculture Audit Questions **Appendix A**

Ref.	Factor	Yes/ No?	Information					Notes/Source
2.21	**What types of industry operate within the catchment?**	**Licence No. (if applicable)**	**Industry**	**Type of Licence/Waste**	**Discharge Location**	**Parameters**	**Volume (kL/d)**	
		L4536	Blue Circle Southern	Cement or Lime Handling				
		L1693	Fast Freeze International	Milk Processing	Casino Golf Course	Oil and grease, pH, TSS, BOD	400	www.dec.nsw.gov.au
		L3372	Clovass Quarry	Hard Rock Gravel Quarrying	NA			POEO Register
		L172	NSW Sugar Milling Co-operative	Other Agricultural Crop Processing	Discharge to waters and utilitsation area	pH, temperature, TSS, BOD	85,000	
		L1461	Northern Co-operative Meat Company	Animal Slaughtering, Tanning or Fellmongery, Rendering or Fat Extraction	6 collection dams/land irrigation	Calcium, Chromium, Conductivity, Magnesium, Nitrogen, TP, Sodium, pH, BOD, oil and grease, TSS	3,500	No irrigation within 50m of a watercourse
		L5659	Mullers Pit	Hard Rock Gravel Quarrying	NA			
		L10192	Woodview Quarry	Hard Rock Gravel Quarrying; Crushing, Grinding or Separating Works	NA			
		L2386	Evans Head Sewage Treatment Plant	Sewage Treatment Plant - processing by small plants	Nearby wetlands, to be upgraded to ebb tide discharge	Oil and grease, pH, TSS, BOD	6500	
		L2476	Casino Water Treatment Plant	Miscellaneous Licensed Discharge to Waters	Unnamed branch of Barlings Creek	TSS	600	
		L3397	Petersons Quarry	Hard Rock Gravel Quarrying	NA			
		L351	Coraki Sewage Treatment Plant	Sewage Treatment - processing by small plants	Richmond River	Oil and grease, TSS, BOD	400	
		L3878	Casino Regional Livestock Exchange	Saleyards	Utilisation area		250	
		L585	Casino Wastewater Treatment Works	Sewage treatment - processing by small plants	Barlings Ck; Last rock wall/weir into wetland	BOD, TN, oil and grease, TP, TSS	35500	
Sei		L5872	Namoona Landfill Facility	Solid waste landfilling	Spillway from sedimentation pond - to	TSS	NA	
		L6065	Broadwater Landfill Facility	Environmentally Sensitive or Inappropriate Landfilling	Discharge to waters	Leachate quality and level, groundwater quality, surface water quality monitoring		
		L6084	Evans Head Landfill Facility	Environmentally Sensitive or Inappropriate Landfilling	Discharge to waters	Leachate quality and level, groundwater quality, surface water quality monitoring		
		L7666	Rileys Hill Sewage Treatment System - discharge to waters	Sewage treatment - processing by small plants	Richmond River	Oil and grease, pH, TP, TN, faecal coliforms, nitrogen (ammonia), TSS, BOD	216	
		L5375	Casino Concrete	Concrete Batching	NA			
		L5848	Riverina Stock Feeds	Other Agricultural Crop	NA			
		L3534	Signium	Pig Production	Irrigated on utilisation area		2*10	

Ref.	Factor	Yes/ No?	Information	Notes/Source
2.22	**Where is this industry located?**		See section 2.21	
2.23	**Is the volume of industry waste discharge monitored?**	Yes - for some	See section 2.21	
2.24	**Where is industry wastewater discharged?**		See section 2.21	

2.25 Is there wastewater/ reclaimed water use in the catchment?

Description	Location	Volume (ML) 2004	Notes/Source
Casino STP: effluent reused at Casino Golf Course on an as needed basis, and by Blue-dog for agricultural irrigation.		23	Casino STP EPA Monitoring & reporting data 2004 - 2005.xls
		597	2004/05 DEUS Report
Coraki: Report "Coraki Wastewater Augmentation Effluent Reuse Study and Effluent Management Plan". Favoured option to irrigate Coraki Golf Course			

2.26 Is reuse water monitored?

Location	2004/05 results	Parameters Monitored	Values (mg/L)	Volume (ML)	Notes/Source
Casino STP		BOD	5.1	23	RVC supplied: CD 1\IWCM
		SS	20.8		
		Grease and oil	1.6		
		TN	3.4		
		TP	5.3		
		Faec col	2289.7		
		pH	7.5		
		EC	775.8		

2.27 What is the annual volume of urban stormwater generated by each urban centre?

Urban Area	Catchment Area (sq km) (SMP 2004)	Av Annual Rainfall (mm)	Volume (ML)	TN (kg)	TP (kg)	Assumptions	
Casino	8	1,098	2,634	2,634	1,844	Runoff co-efficient = 30%	
Evans Head	4	1,483	1,779	1,779	1,246		0.3
Coraki	3	1,098	988	988	691	TP 0.7 mg/L	
Broadwater/Riley Hill	0.8	1,483	356	356	249		0.7
Woodburn	0.5	1,098	165	165	115	TN 1.0 mg/L	
							1
				5,922	**4,145**		

Casino, Coraki, Woodburn rainfall data from http://www.bom.gov.au/climate/averages/tables/cw_058063.shtml

Evans Head, Broadwater/Riley Hill data from http://www.bom.gov.au/climate/averages/tables/cw_058065.shtml

Ref.	Factor	Yes/ No?	Information						Notes/Source
2.28	**Is stormwater quality monitored?**		**Location**		**Turbidity (NTU)#**	**Dissolved Oxygen (mg/L)#**	**Faecal coliforms (colonies/ 100mL)#**	**TN (mg/L)***	**TP (mg/L)***
			Casino U/S	**Casino D/S**	**Coraki - Site 16**	**Woodburn - Site 15**	**Broadwater - site 11**	EPA (1996) The Northern Rivers - A Water Quality Assessment, from RVC SMP (2005)	
		Aquatic Ecosystem Protection	Very Poor	Very Poor	Very Poor	Very Poor	Very Poor		
		Potable Water	Very Poor	Very Poor	Very Poor	Very Poor			
		Primary Contact Recreation	Fair	Fair	Very Poor	Very Poor	Very Poor		
		Secondary Contact Recreation	Fair	Fair	Good	Good	Good		
		Agricultural - Irrigation	Fair	Fair	Good	Poor	NA		
		Agricultural - Livestock	Good	Good	Good	Good	NA		
		Edible Seafood	NA	NA	NA	NA	Very Poor		
		North Coast Region	good					DLWC (1996) Key Sites Investigation, from RVC SMP (2005)	
		Richmond River	slightly less than other North Coast Rivers	but considered less parameters					
		Data for Tuckombil Canal and Rocky Mouth Creek							RVC SMP (2005)
				TN (kg)	TP (kg)				
		Stormwater runoff from diffuse sources (cropping, native vegetation, unimproved and improved pasture from Richmond and Clarence Rivers)		621,000	78,000			http://www.npi.gov.au/cgi-bin/npireport.pl?proc=location_detail;instance=public;year=2005;loc_type=lga;loc_lga=Richmond%20Valley;loc_state=NSW	
		Water Watch NSW has no data for the three sites of Richmond River catchment							
			AVERAGE						**0.75**
2.29	**What is the expected stormwater flow volume in 25 years time?**	**Pop. Growth (%pa)**	**Urban Centre**		**Predicted Volume (ML)**	**Predicted TN (tonnes)**	**Predicted TP (tonnes)**		
		38	Casino		3647	3647	2553		
		103	Evans Head		2463	2463	1724		
		34	Coraki		1367	1367	957		
		28	Broadwater/Riley Hill		493	493	345		
		37	Woodburn		228	228	160		
		28	Rappville						
			Total		**8,198**	**8,198**	**5,739**		

2.0 Urban and Agriculture Audit Questions | **Appendix A**

Ref.	Factor	Yes/ No?	Information						Notes/Source
2.3	**What is the expected stormwater load of nutrients and any other monitored contaminants in 25 years time?**	See section 2.29							
2.31	**Are there landfills in your catchment?**		**Location**		**Type**	**Amount (tonnes)**			
					All landfills include toxic and hazardous chemical disposal.	*2001/2*	*2002/3*	*2003/4*	
			Casino (Namoona)			12654.1	11870.29	13085.27	RVC SoE (2004) p80
			Coraki (Bora Ridge)			2,110	4,768	5,171	
			Casino (Former)						
			Evans Head (former; remediated)			987	503	1,167	
			Coraki (former)						
			Woodburn (former)						
			Broadwater (former; remediated)						
			Whiporie (former)						
			Rappville (former)						
			Transfer station (Whiporie,						
			Transfer station (Evans Head)						
			Transfer station (Rapville)						
2.32	**Are there contaminated sites in your catchment?**		**Potential Contaminant Type**		**Number**				
		Cattle Tick Dip Sites	Arsenic and organochlorine residues		At least 211				RVC SoE (2004) p79
		Service stations	Lead and hydrocarbon						
		Mineral sand storage and processing plant sites	Radioactive sand						
		Tobacco plantations							2004/05 RVC Annual Report
		Banana plantations							
		Junk yards							
2.33	**Have algal blooms been recorded in your catchment?**		**Location**						
			Major outbreak in Nov 2002 in Richmond River within the Casino town raw water storage. 5000+ cells/ml						SOE 2004 p30
			8/11/2002	Richmond River	High warning level			RVC supplied: CD 1\Blue Green Algae\Blue Green Algae Register	
			31/01/2003	Barling Creek Long Lagoon	High warning level				
			The onset of new algae in Rocky Creek Dam which has the potential to cause taste and odour problems in water treated at Nightcap WTP was recognised during the previous year.						Rous Water Annual Report 04/05 p10

TABLE 8

2.0 Urban and Agriculture Audit Questions — **Appendix A**

Ref.	Factor	Yes/ No?	Information						Notes/Source
2.34	**What are your water demands?**				**Volume (ML/year)**	**Metered ProductionsVolumes (ML/yr) 2004/05 (inc. UFW)**		**UFW (ML/yr)**	
			Casino	00-01	2632				RVC supplied: CD 1\IWCM Adam\DEUS reports
				01-02	2744				
				02-03	2498		2940	294	
				03-04	2392		2930 NA		
				04-05	2437				
			Rous	02-03	528		Supplies several areas		
				03-04	551				Performance Monitoring
				04-05	599				
			Total	**(2004-05)**	**3036**		**0**	**0**	
2.35	**What is your water consumption?**		**Category**		**Consumption (ML/year)**				
					Richmond Valley (2002/03)	Casino WFP (2004/05)			DEUS Performance Monitoring Table 8
			Unaccounted for water		294.00				
			Potable town water supplied		2,940.00	2437			wfpoperation 2004 2005
			Recycled water for agricultural use		45.00				
			Surface water		2,412.00				
			Bulk purchases		528.00				
			TOTAL		3,279.00	2,437.09	0.00		
TABLE 13									
2.36	**What is your energy consumption for your water and wastewater facilities and what is your bill?**		**Energy Cost ($/property)(OPERATING COST) (2003/04)**	**Energy Cost ($/property) (PUMPING COST) (2003/04)**	**Energy consumed (KW hours) (3 months 2005)**	**Energy Bill (3 months 2005)**	**Tariff Type and/or Electricity supplier**		
	Water	RV	8	11			Country Energy & AGL		**Performance Monitoring Table 13**
		ROUS	4	12					
	Sewerage	RV	14	1375					Performance Monitoring Table 19
				Sewerage	303468	$ 50,263			RVC Bills
				Water	5142	$ 1,358			
TABLES 6, 7 and 11									
2.37	**Operating Costs**		**Water**		**Sewerage**				
		c/kL	73 03/04		109 03/04				DEUS Performance Reports
		$/property	350 03/04						
	Management Costs	c/kL	10 03/04						
		$/property	142 03/04						
TABLES 9 and 14									
2.57	**Number of connected properties**		**Water Supply**		**Sewerage**				
			6,500 RV		6,100			DEUS Performance Reports 2003/04	
		Lower Richmond	2380		1622			2004/05 DEUS Report (spreadsheets)	
		Casino	4330		4,330				
		Total (2004/05)	**6710**						
TABLE 12									

Ref.	Factor	Yes/ No?	Information						Notes/Source
2.0	**Urban and Agriculture Audit Questions**								**Appendix A**
2.52	**Drinking water quality tests**		**Physical**		**Chemical**	**Ecoli**	**Total coliforms**		DEUS Performance Reports
	Richmond Valley	01/02				100%	97%		
		02/03				100%	81%		
		03/04			96%	100%	79%		
	Rous (Bulk)	01/02	100%		100%	100%	100%		
		02/03	100%		100%	100%	100%		
		03/04	100%		100%	100%	100%		
TABLE 12									
2.4	**Water supply quality complaints per 1000 properties**	00/01	2	01/02	4	02/03	0	03/04	0
								DEUS Performance Reports	
TABLE 12									
2.39	**Service complaints per thousand properties**		**Water**		**Sewerage**				
		00/01	5		5				DEUS Performance Reports
		01/02	7		8				
		02/03	6		7				
		03/04	6		7				
Table 10									
2.41	**Number of supply main breaks per 100 km**	01/02	23	02/03	11	03/04	11		
TABLE 15									
2.42	**Sewer chokes and collapses per 100km of main**	00/01	11	01/02	9	02/03	9	03/04	9
2.43	**Sewer overflows to the environment per 100km of main**	00/01	9	01/02	1	02/03	2	03/04	2
2.47	**Volume of sewage treated kL per property**	00/01	299	01/02	258	02/03	235	03/04	293
	Volume of sewage collected (ML/year)	00/01	2050	01/02	1550	02/03	1420	03/04	1780
2.44	**Are sewer overflows monitored?**	NO							
2.48	**Urban properties without reticulated sewerage and water supply**		Sewerage (2004/05)	Water (2004/05)					RVC supplied: CD 1\IWCM Adam\DEUS reports
		Casino	1	0					
		Lower Richmond	280	45					
TABLE 6	Table 6								
2.49	**Annual water allowance (if given)**	**RV**	NIL	Rous	NIL				p105, 03/04

Ref.	Factor	Yes/ No?	Information				Notes/Source
	Table 6						
2.5	**Water usage charge c/kL**		Residential $0.55 for 1st 200Kl then $0.80 thereafter. Larger consumers current charge is $0.42/Kl but will be ramped up to $0.55/Kl in 2007/2008.				Casino Kyogle water supply.doc Also, DEUS Performance Report 2004/05
	Table 6						
2.51	**Water access charge per property**		**2003/4**		**2004/5**		
				$229 p105 DEUS		$215	
	Table 6						
2.45	**Typical developer charges for sewerage and water supply**		**2003/4**		**2004/5**		
		Water		$2,192 p119 deus		$2,334	
		Sewerage		$4,680		$4,820	
	Table 6						
2.46	**Average residential bill per property**	2002/03	**Water Supply**	$309	**Sewerage**	$412	
	Typical residential bill per assessment			$262		$495	
	Average residential bill per property	2003/04	**Water Supply**	$244	**Sewerage**	$421 p119 deus 02/03	p105, 2002/03
	Typical residential bill per assessment			$262		$495	
	Average residential bill per property	2004/05	**Water Supply**	$265	**Sewerage**	$431	
	Typical residential bill per assessment			$385		$418	
2.53	**Rainwater quality data at extraction point**	Casino (Raw Water Tests)	Turbidity, colour, pH, Temp, Alkalinity, Hardness, Ammonia				RVC supplied: CD 1\IWCM Adam\Cas WTP flow and qual data
			Tot col, E. coli, TN, TP + others				RVC supplied: CD 2\Potable Water\raw treated sampling update sheet.xls
		Rocky Mouth Creek	NIL				
2.54	**STP quality licence monitoring results**	See section 2.5					

2.0 Urban and Agriculture Audit Questions **Appendix A**

Ref.	Factor	Yes/ No?	Information			Notes/Source
2.55	**Water quality monitoring results for local waterways**	**Locations**	**Parameters**			
		Bungawalbin catchment	pH, EC, turbidity, DO, temp,			RVC River Water Quality
		Richmond River Casino	pH, EC, turbidity, DO, temp,			RVC River Water Quality
		Evans River	pH, EC, turbidity, DO, temp,			RVC River Water Quality
		Iron Gates	pH, EC, turbidity, DO, temp,			RVC River Water Quality
		Barlings Creek Casino	pH, EC, turbidity, DO, temp,			RVC River Water Quality
		Bora – Codrington Road	pH, EC, turbidity, DO, temp,			Lower Richmond Water Quality Monitoring Group
		Coraki Ellangowan Road	pH, EC, turbidity, DO, temp,			Lower Richmond Water Quality Monitoring Group
		Ellangowan Road	pH, EC, turbidity, DO, temp, salinity			Lower Richmond Water Quality Monitoring Group
		Elliots Road	pH, EC, turbidity, DO, temp, salinity			Lower Richmond Water Quality Monitoring Group
		Myall Creek	pH, EC, turbidity, DO, temp, salinity			Lower Richmond Water Quality Monitoring Group
		Bungawalbin Whiporie Road	pH, EC, turbidity, DO, temp, salinity			Lower Richmond Water Quality Monitoring Group
		Neiley's Lagoon Road	pH, EC, turbidity, DO, temp, salinity			Lower Richmond Water Quality Monitoring Group
		Robinsons Bungawalkbin Creek	pH, EC, turbidity, DO, temp, salinity			Lower Richmond Water Quality Monitoring Group
		Tatham Ellangowan Road	pH, EC, turbidity, DO, temp, salinity			Lower Richmond Water Quality Monitoring Group
		Myrtle Creek Road	pH, EC, turbidity, DO, temp, salinity			Lower Richmond Water Quality Monitoring Group
		Mt Marsh Road/Camira Creek	pH, EC, turbidity, DO, temp, salinity			Lower Richmond Water Quality Monitoring Group
		Summerland Way	pH, EC, turbidity, DO, temp, salinity			Lower Richmond Water Quality Monitoring Group
		Flood Gate Swan Bay School Road	pH, EC, turbidity, DO, temp, salinity			Lower Richmond Water Quality Monitoring Group
		Flood Gate Rosolens Canal	pH, EC, turbidity, DO, temp, salinity			Lower Richmond Water Quality Monitoring Group
		Casino WFP raw water	pH, turbidity, temp, colour, alkalinity, hardness, ammonia			WFP tests
2.56	**Water supply, sewerage and stormwater system maps**	GIS for water supply and sewerage. Marked up photos of stormwater system			RVC supplied: RVC GIS\Services	RVC supplied: CD 2\Stormwater\SMP\RVC SMP 1_2004 pt1.doc (pg34+)
2.58	**Range of typical residential block sizes**	NA	Broadwater	1200 m^2		p50 RVC SOE 2004

Ref.	Factor	Yes/ No?	Information	Notes/Source
2.59	**Number and size of rainwater tanks**	NA		
2.6	**Number of tanks connected to the potable system for top-up**	NA		
2.61	**Rainwater tank rebate**	670	(for Casino and Lower Richmond)	RVC supplied: CD 1\IWCM Adam\DEUS reports
2.62	**Is there polluted atmospheric fallout over the urban area?**		**Description** Sugar cane burning Bushfires	RVC SoE
		Licensed point discharges	Northern Co-operative Meat Co Broadwater Sugar mill Fast Freeze International Namoona Landfill Facility Broadwater Landfill Facility Evans Head Landfill Facility	
2.63	**Is there an OSD policy?**	**Council's On-site sewage management strategy (OSMS)**	2004 SOE p90 and Strategy	

3.0	Climatic Audit Questions			Appendix A
Ref.	**Factor**	**Information**		**Source/Notes**
	3.1 What is the mean annual rainfall for the catchment or catchment regions?		**Mean Annual Rainfall (mm)**	
	Casino		1,098	http://www.bom.gov.au/climate/averages/tables/cw_058063.shtml
	Broadwater		1,483	http://www.bom.gov.au/climate/averages/tables/cw_058065.shtml
	Lismore East BOM station		1,695	SILO
	Lismore North BOM station		1,797	SILO
p141 SOE has 2004 rainfall data			**Mean Daily Rainfall (mm)**	
	Lismore East BOM station		4.64	SILO
	Lismore North BOM station		4.92	SILO
	3.2 What is the mean annual evaporation for the catchment or catchment regions?	**Location**	**Mean Annual Evaporation (mm)**	
		Lismore East BOM station	1,289	SILO
		Lismore North BOM station	1,129	SILO
			Mean Daily Evaporation (mm)	
		Lismore East BOM station	3.53	SILO
		Lismore North BOM station	3.09	SILO

4.0	River and Groundwater Audit Questions					Appendix A
Ref.	**Factor**	**Yes/ No?**	**Information**			**Location of available information***
4.1	**What is the water quality of dry weather river flows**		**Location**	**AusRivAS Assessment**		RVC SoE (2004) p 34
			Mangrove Ck @ Gibberagee SF	good		Map identifying sampling sites
			Esk River @Causeway Bundjalung NP	poor		
			Richmond River off Bent Rd	poor		
			Yellow Ck @ Uralba	poor		
			Richmond River off Strongs Rd	fair		
			Bungawalbin Ck	fair		
			Myrtle CK u/s Summerland Hwy	fair		
			Emigrant Ck @Tintenbar	poor		
			Richmond River @ Casino	fair		
			Richmond River	**U/S of Casino**	**D/S of Casino**	**RVC SMP (2005) p12**
			Aquatic Ecosystem protection	Very Poor	Very poor	
			Potable water	Very Poor	Very poor	
			Primary Contact Recreation	Fair	fair	
			Secondary Contact Recreation	Fair	fair	
			Agricultural - Irrigation	Fair	fair	
			Agricultural - Livestock	Good	Good	
		Also have monthly data (from 1998-2000) for 14 sites in the lower Richmond River; tested for rainfall; EC; pH; turbidity; DO; salinity; temp		RVC supplied: CD 2\Waterways\River Water Quality\Lower Rich Water Q		
		Also, have additional data for 5 more locations for same parameters (and streamflow (L,M,H))				

4.0	River and Groundwater Audit Questions					Appendix A
Ref.	**Factor**	**Yes/ No?**	**Information**			**Location of available information***
4.2	**What is the total annual dry weather discharge volume**		**Location**	**Volume (ML/year)**		
			Casino	30,000ML/day for 2% of the year; < 3500 ML/day for 95% of the year		Manyweathers weir fishway.pdf
			Richmond River at Casino	486,588		RVC supplied: CD 1\Enviro Info\Catchment runoff info
			Richmond River at Casino	1,920,000		RVC SOE 2004 p31
		Richmond River at Casino (site 203004)	Minimum Maximum Median	19,540 1,725,000 508,200		RVC supplied: CD 1\Enviro Info\Catchment runoff info
			Evans River Rocky Mouth Creek	Not Available Not Available		
4.3	**What is the annual dry weather contaminant load**		**Location** Rocky Mouth Creek Evans River Richmond River at Casino	**N (tonnes)** Not Available	**P (tonnes)**	
			Evans River	300	20	Evans River Estuary Management Plan p 2-3
4.4	**What is the water quality of wet weather**		**Location**	Not Available	Funds are available in RVC for water quality monitoring	
4.5	**What is the wet weather mean annual discharge**		**Location** See section 4.2 for flow regime.	**Volume ML/year**		
4.6	**What is the annual wet weather contaminant load**		**Location**	Not Available		

4.0	River and Groundwater Audit Questions					Appendix A
Ref.	**Factor**	**Yes/ No?**	**Information**			**Location of available information***
4.7	**Have environmental flow requirements been identified for catchment streams?**		**Description** Catchment Management Target W4 - Aquifer Health and River Flow: By 2016, extractions from 95% of aquifers are within *identified sustainable yields* and extractions from unregulated surface waters in 95% of sub-catchments will provide for *environmental water* (80% of aquifers and 80% of sub-catchments meeting requirements by 2009).			Northern Rivers Catchment Action Plan (2005) p92
4.8	**What is the location of all catchment dams?**		**Location**	**Type**	**Area (sq. km)**	
			Rocky Creek Dam	On-stream	31	RVC SoE (2004)
			Jabour Weir	On-stream		
4.9	**What is the capacity of each catchment dam?**		**Location**	**Capacity (ML)**		RVC SoE (2004)
			Rocky Creek Dam	14,000		
			Jabour Weir	772		RVC SoE (2004) p18
			Toonumbar Dam	11,000	(3,000 ML instream losses)	Chris Hennessy email 10/05/06
4.1	**What is the secure yield of each catchment dam?**		**Location**	**Secure Yield (ML)**		
			Rocky Creek Dam	9600 + Emigrant Ck Dam = 11200		RVC SoE (2004)
			Toonumbar Dam	11,000		

4.0	**River and Groundwater Audit Questions**					**Appendix A**
Ref.	**Factor**	**Yes/ No?**	**Information**			**Location of available information***
4.11	**What is the water quality in each dam?**	**Parameter**	**Rocky Creek Dam Units**		**% compliance with Health guidelines**	Lismore Data Audit
		Total Coliforms	cfu/100mL	1.1098	92	
		Thermotolerant Coliforms	cfu/100mL	0.1132	99	
		E. coli	cfu/100mL	0.1132	99	
		pH		8.0114	100	
		Turbidity	NTU	0.6596	97	
		Total Dissolved Solids (TDS)	mg/L	95.9412	100	
		Aluminium	mg/L	0.0773	96	
		Antimony	mg/L	0.001	100	
		Arsenic	mg/L	0.001	100	
		Barium	mg/L	0.0055	100	
		Boron	mg/L	0.099	100	
		Cadmium	mg/L	0.0005	100	
		Calcium	mg/L	23.6873	100	
		Chloride	mg/L	13.4885	100	
		Chromium	mg/L	0.005	100	
		Copper	mg/L	0.0196	100	
		Cyanide	mg/L	0.0099	100	
		Fluoride	mg/L	0.099	100	
		Iodine	mg/L	0.0404	96	
		Iron	mg/L	0.0661	92	
		Lead	mg/L	0.002	100	
		Magnesium	mg/L	1.0438	100	
		Manganese	mg/L	0.0209	100	
		Mercury	mg/L	0.0001	100	
		Molybdenum	mg/L	0.0057	100	
		Nickel	mg/L	0.0099	100	
		Nitrate	mg/L	0.9994	100	
		Nitrite	mg/L	0.1562	100	
		Selenium	mg/L	0.002	100	
		Silver	mg/L	0.002	100	
		Sodium	mg/L	10.2179	100	
		Sulfate	mg/L	18.5586	100	
		Total Hardness as CaCO3	mg/L	63.4538	100	
		True Colour	Hazen Units (HU)	2.435	100	
		Zinc	mg/L	0.0365	100	

Ref.	Factor	Yes/ No?	Information			Location of available information*
4.12	**What is the location of all catchment weirs?**		**Location**	**Area (sq. km)**	**Notes**	Manyweathers weir fishway.pdf
			Manyweathers Weir		0.8m high	Manyweathers and Norco, 1km apart - Fisheries Community Survey of Casino Weirs 2000.doc
			Norco Weir		1.3m high	
			Jabour Weir		4m high	
			Cookes Weir			Weir locations in Casino
			Manyweathers weir fishway.pdf and Appendix E FINAL casino Weirs Report M Mallen-Cooper ver 2.pdf duplicate the report.			
			Weir locations in Casino diagram			
4.13	**What is the capacity of all catchment weirs?**		**Location**	**Capacity (ML)**		
			Jabour Weir	772		RVC (2006) Quote Document
			Cookes Weir	500-1000	Emergency supply at Level 4	Casino water restrictions policy.doc
4.14	**What is the secure yield of all catchment weirs?**		**Location**	**Pumping rate (ML/day)**		
4.15	**What is the water quality in each weir?**		**Description**			
			Data for 5 sites above Jabour weir; 1 site at Norco wier for 1 sampling event		RVC supplied: CD 2\Waterways\River Water	

4.0	**River and Groundwater Audit Questions**					**Appendix A**
Ref.	**Factor**	**Yes/ No?**	**Information**			**Location of available information***
4.16	**Are returned flows provided from, or intended to be provided to catchment storage/s or weirs?**	No				
4.17	**Is the water quality of the return flows expected to be the same as the water quality in dam or weir?**					
4.18	**What is the extent and nature of groundwater resources within the catchment?**		**Groundwater Extraction Licences - Purpose**	**Volume extracted (ML/Year)**	**Number**	
			Aquaculture		2	RVC SoE (2004) p24
			Commercial		6	
			Domestic	703	699	
			Experimental/Research		1	
			Farming	271	71	
			Industrial		38	
			Industrial - Sand and gravel		1	
			Irrigation		50	
			Monitoring Bore		5	
			Recreation (groundwater)		8	
			Stock	1991	951	
			Test Bore		25	
			Town Water Supply		3	
			Other	2152		
			TOTAL	**5117**	**1860**	
				Water Sharing Plan for Alstonville Plateau Basalt Groundwater source only		

4.0	River and Groundwater Audit Questions					Appendix A
Ref.	**Factor**	**Yes/ No?**	**Information**			**Location of available information***
4.19	**Does catchment include one or more estuary habitats?**		yes			
4.2	**Are there licensed extractions in the catchment?**		**Number of licences under Water Act 1912**		**Entitlement (ML/year)**	
		From RVC (incl Toonumbar)		224	17,832	RVC SoE (2004) p 21
		From Toonumbar alone		60	10,330	Email from Chris Hennessy 10/05/06
4.21	**Are there licensed town water extractions in the catchment?**		**Licenced under Water Act 1912**		**Volume (ML/year)**	
			Domestic		54	RVC SoE (2004) p23
			Urban Water		3427	DIPNR (2004) in RVC Quote Document (2006)

Appendix B – PRG Workshop Participants

Table 30 sets out the list of attendees of the PRG workshop.

Table 30: Invitees and Attendees the RVC IWCM PRG Workshop.

Representative	Invitee	Attendance
Chris Hennessy	NSW Department of Energy, Utilities and Sustainability	✓
Jennie Fenton	Northern Rivers Management Authority	
Jeanine Murray	NSW Department of Natural Resources (DNR - Grafton)	Deb Tkachenko
James Flockton	Richmond Valley Council	✓
Mark Hesse	Richmond Valley Council	✓
Brian Eggins	Richmond Valley Council	✓
Charlie Cox	Richmond Valley Council	✓
Ray Jeffery	Richmond Valley Council	
Sandra Humphrys	Richmond Valley Council	
John Hession	Richmond Valley Council	✓
Gary Murphy	Richmond Valley Council	✓
Geoff Sullivan	North Coast Area Health Service	✓
Graham Budd	NSW Department of Environment and Conservation (DEC)	
Michael Woods	Richmond River County Council	
Patrick Dwyer	NSW Department of Primary Industries	✓
Wayne Franklin	Rous Water	Paul Muldoon
Les Helyar	Richmond River Water Users Association	
	Casino Chamber of Commerce	
	Evans Chamber of Commerce	
Richard Crapp	Woodburn Chamber of Commerce	
	Northern Co-operative Meat Company	Gary Burridge
Chris Magner	Richmond / Wilson Tidal Water / Freshwater Users	✓

Representative	Invitee	Attendance
	Group (No. 1)	
Maureen McDonald	Richmond / Wilson Tidal Water / Freshwater Users Group (No. 2)	Stephen McDonald
B. May	Evans Head Progress Association	
Ron Doyle	Evans Head District Rate Payers and Residents Association	
Pam Brayley	Casino Rate Payers and Residents Association	Andrew Braid
	Ballina Shire Council	
	Kyogle Shire Council	

Appendix C - Demand Management

Demand management simply means implementing initiatives designed to reduce the demand for (potable) water by consumers, and make better use of the water resource. Demand management programs can include community driven initiatives such as the installation of more water efficient technologies (including showerheads, toilets, and washing machines), and education programs to promote water conservation.

Analysis - Decision Support System: DSS

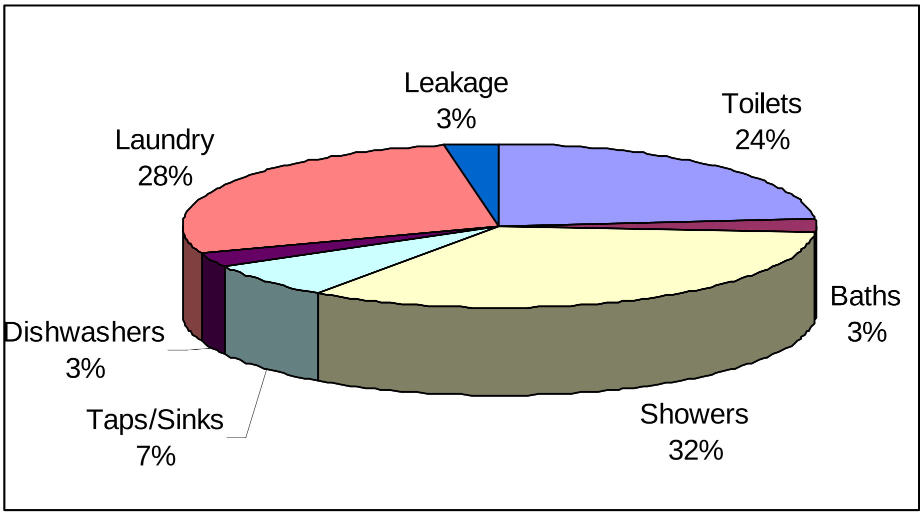
The DSS is an Excel-based least cost planning evaluation framework for water demand management programs developed by DEUS. One model was setup based on the Casino sewage treatment plant catchment. The purpose of setting models on sewerage catchment is to enable forecasts of the effluent likely to be generated to be made as well as forecasts of water demand. In this way, substitutable end uses and available resource are identified. The model was set up using available data to give a broad indication of the relative merit and impact of various demand management methods.

Method

The baseline, or do-nothing, scenario was set up and projected thirty years into the future. Water consumption data was split into customer categories including single residential, multi-residential, commercial and public parks and gardens. For each user category, the split of internal and external use was then assigned. All non-residential accounts were given an 80% internal and 20% external demand split except parks which were assumed to be 90% external. Single residential (houses) were split 50% internal, 50% external and residential flats, 65% internal and 35% external.

The estimated breakdown of internal use by domestic customers is shown in **Figure 12**.

Figure 12: Assumed Breakdown of Internal Household Uses (ABS,2005).



Water production data

Daily water production data from RVC was used to determine production. The production volume was found to be 7 ML/day.

Results

The following demand management measures were modelled against the baseline:

- Implementation of best-practice pricing;
- Measures to reduce unaccounted for water;
- Education program targeted at water conservation;
- Household and commercial retrofitting of dual flush toilets and low flow showers;
- Water conservation order (also known as permanent Level 1 restrictions);
- Rainwater tanks under BASIX;
- Rainwater tanks (5,000 L tanks) under a rebate program; and
- Household tune-up program for residential dwellings.

A preliminary cost-benefit analysis of the individual measures was then undertaken. The results are set out in **Table 31**.

Table 31: Preliminary Rankings of Demand Management Measures.

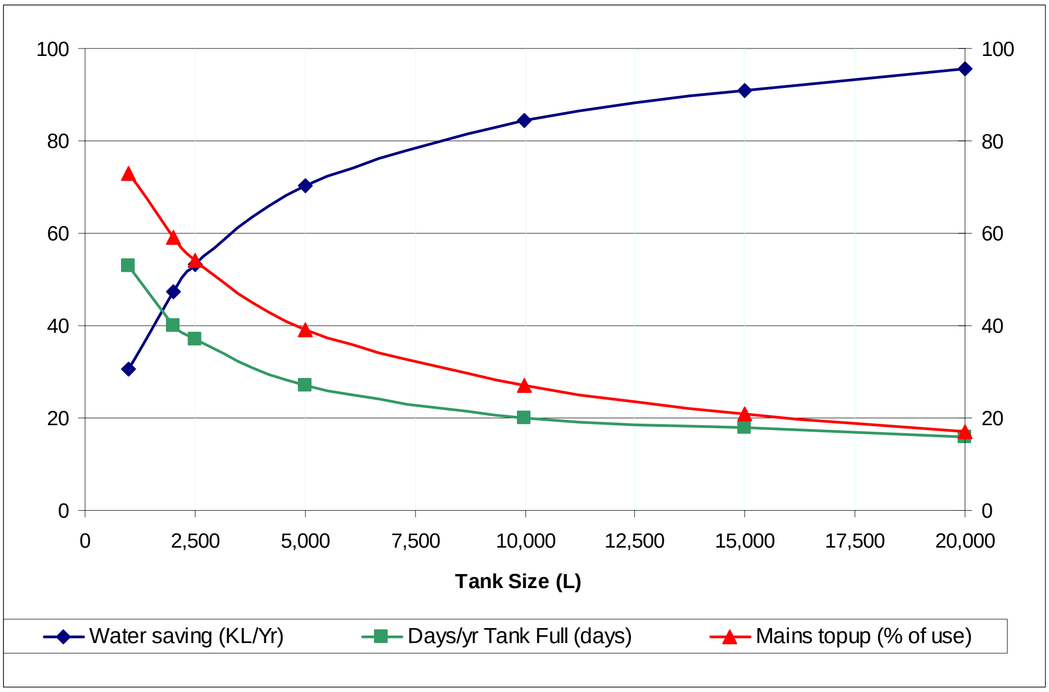
Measure	Utility Benefit	Community Benefit
Pricing Measure Model	Very High	Very High
Rainwater Tanks under BASIX	Very High	Low
Education Program internal and external uses	High	High
Shower Retrofit	Medium	Medium
Rainwater Tanks Rebate	Low	Low
Residential Household Tune-Up	Low	Low
Dual Flush Toilet Retrofit	Medium	Medium
Unaccounted for Water	High	High
Permanent Restrictions	High	High

Appendix D – Rainwater Harvesting

An analysis was carried out on the impact of a range of tank sizes on mains water consumption and stormwater runoff utilising a spreadsheet approach originally developed by DEUS for the Kempsey IWCM Strategy. The spreadsheet is based on 100 years of rainfall data. DEUS plans to develop an improved 20 year version and the analysis may be repeated during the development of the IWCM Strategy with this new model.

Figure 13 and **Figure 14** show the relative impact of a range of tank sizes for Casino. The effectiveness of the tank increased greatly between the size range of 1,000 L and 3,000 L for Casino. The water savings after this point become incrementally smaller as volume of tank is increased.

Figure 13: Rainwater Tank Size Comparison (Casino 1890 – 2005)



These are consistent with the BASIX assessment of rainwater tanks presented in **Figure 14.**

Figure 14: Rainwater Tank Size Comparison in BASIX for Casino.

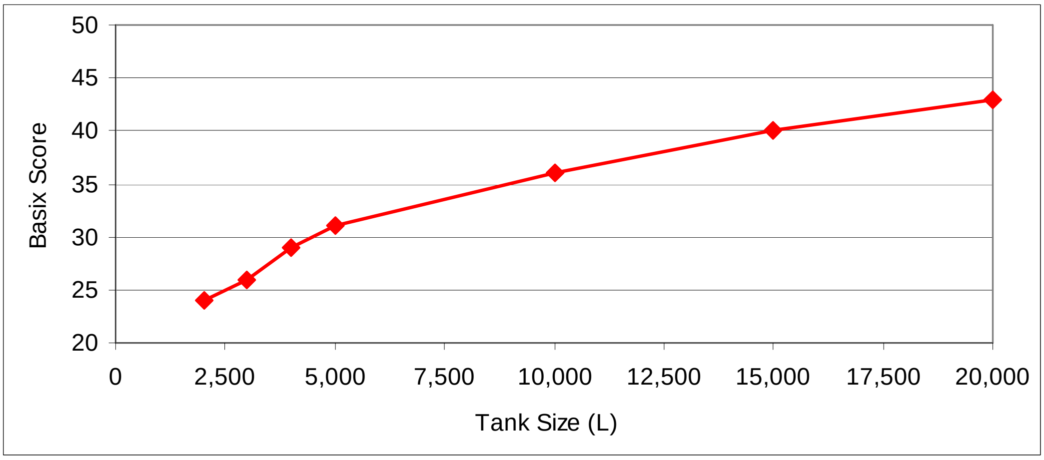


Table 32 outlines the assumptions used by the model and the resulting volumes captured, re-used and discharged when a 3,000 L tank is installed on an average sized house.

Historical rainfall and temperature information available from SILO for Casino was used for the analysis.

The analysis indicated that:

- 43% of the outdoor and toilet flushing water needs (which are currently supplied from the reticulation) could be supplied by a 3,000 L rainwater tank in Casino; and
- Harvesting of the rainwater that fell on the roof and supplied the tank resulted in preventing 58 kL per year of stormwater flowing from this house, which equates to a 42% reduction in runoff;

Table 32: Assumptions and Results from Preliminary Rainwater Tank Modelling for Casino.

ASSESSMENT OF RAINWATER TANKS - PER HOUSHOLD				
IMPACT ON WATER MAINS SUPPLY AND ROOF STORMWATER RUNOFF				
Casino 3,000L Rainwater Tank + Mains Supply (1889 to 2005)				
Uses: OUTSIDE + TOILET				
Roof Area (m2)	150	Tank Size (L)	3,000	
First Flush Vol/ Storm (L)	20	Roof Runoff to Tank/Year (L)	136,569	
Wetting & Evap/Storm (mm)	0.5	Tank Overflow/Year (L)	78,015	57%
Roof Runoff Factor (%)	90	Rainwater Usage/Year (L)	58,554	43%
Tank Starting Volume (L)	1	Average Tank Volume (L)(%)	1,295	
Ann Av Outside Usage (L/d)	218	No. of overflow Days/Year	35	
Av. Daily Toilet Usage (L/day)	98	Average Overflow Vol/Overflow Day (L)	2,253	
		Max Day Overflow (113years) (L)	32,755	
Mains Top-up Trigger Min Level (L)	600	Days per Year Tank is Full	35	9%
Roof Runoff Days/Yr	108	Mains Top-up Usage per Year (L)	57,670	50%
Mains Water Saving & Roof Stormwater Runoff Reduction (KL/Yr) (%)			**57.7**	**42%**

Appendix E – Maps

Figure 15: Potential ASS within the RV LGA.

Source: RVC SoE (2004).

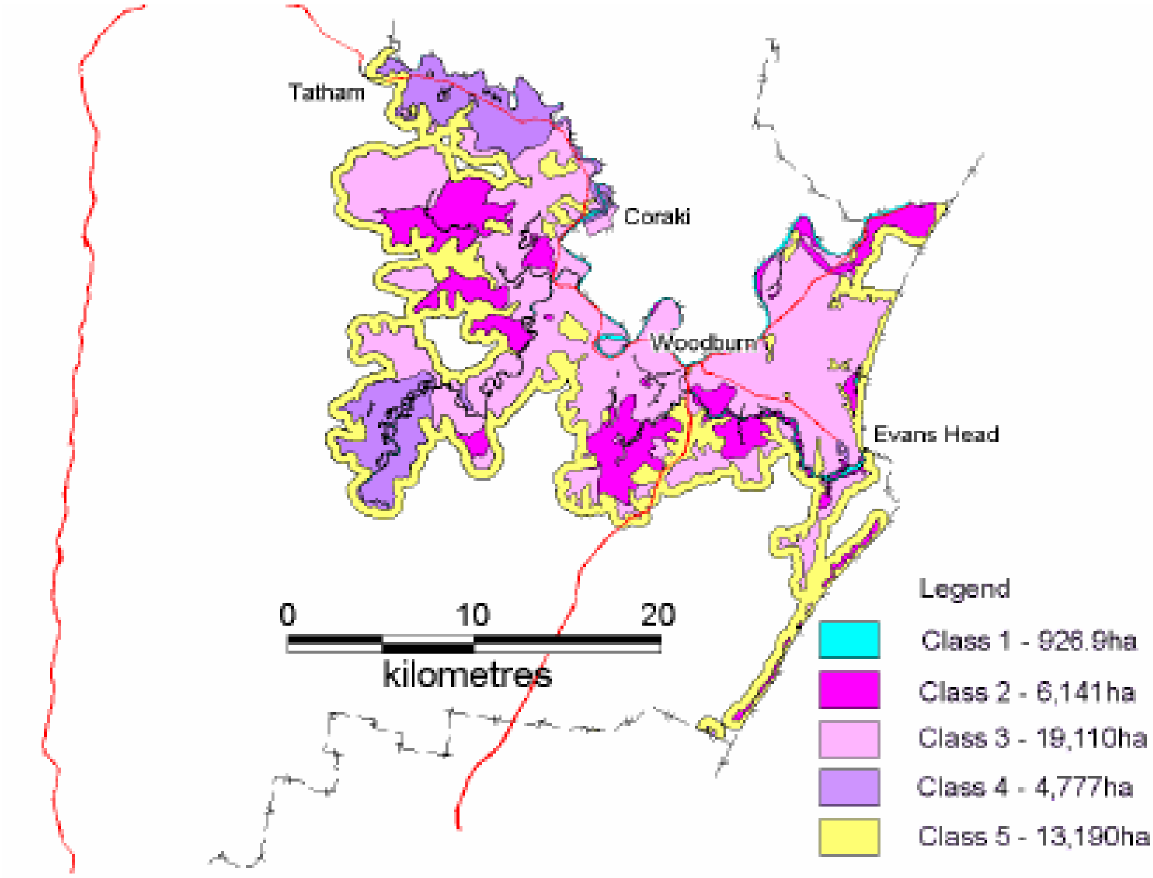


Figure 16: Floodprone area in Richmond Valley LGA.

Source: RVC GIS floodprone database

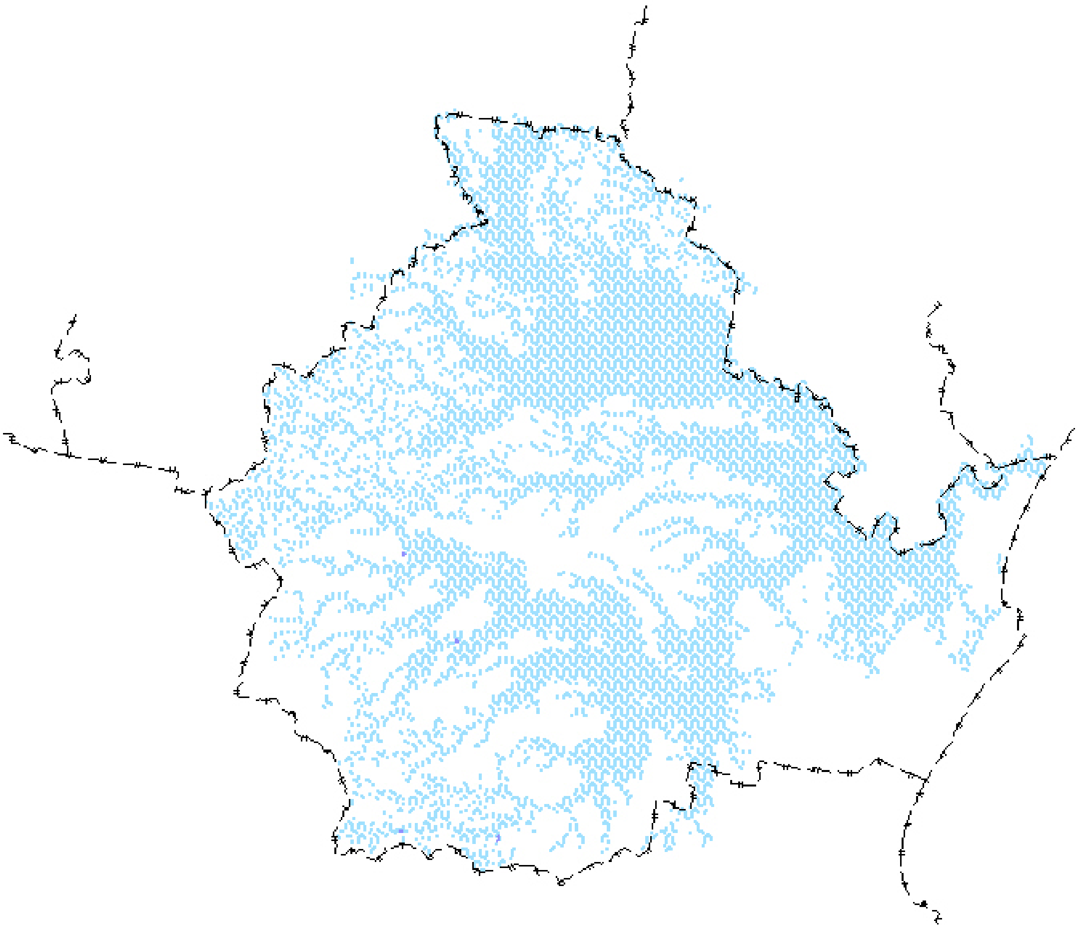
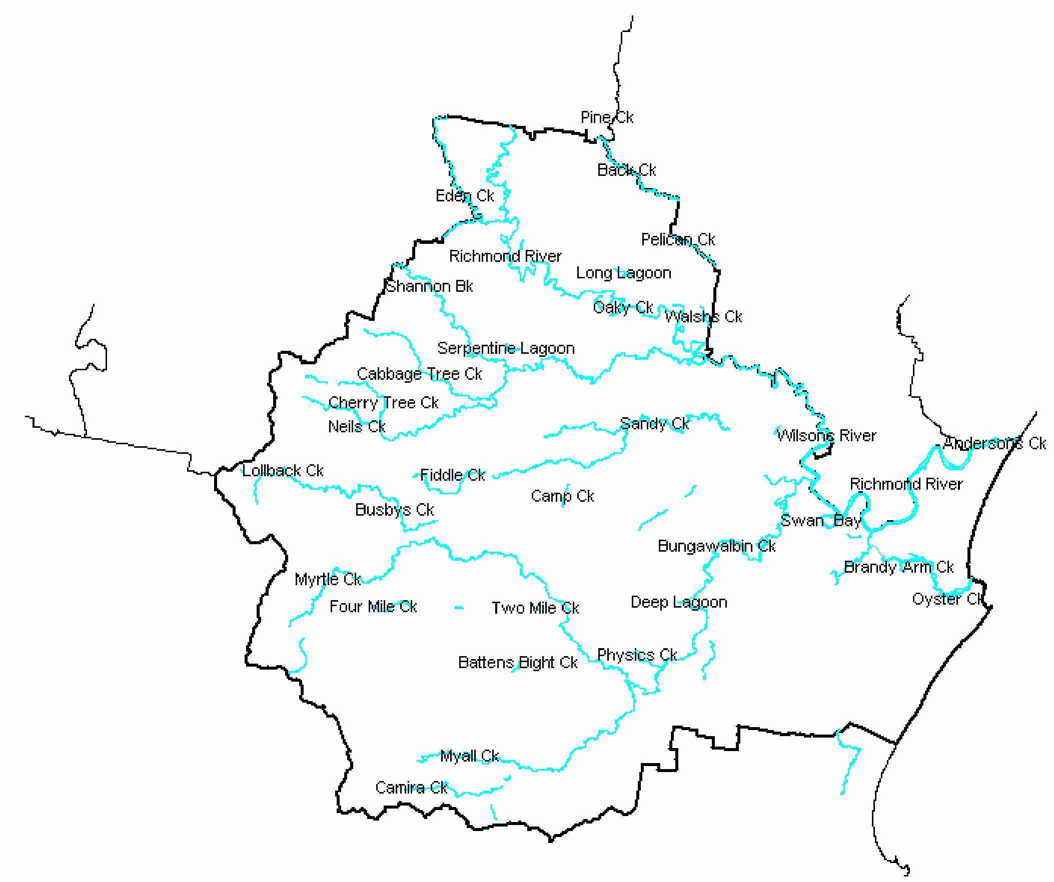


Figure 17: Creeks of RVC LGA

Source: RVC GIS Creeks database



Appendix B

Stakeholder Consultation

PRG Workshop 1

PRG Workshop 2

Richmond Valley IWCM Strategy

Project Reference Group Workshop 1 Briefing Paper

1st PRG workshop
Thursday 29 March 07
Administration Bld.

1 Introduction

This paper is the first briefing note to the Project Reference Group (PRG) for the development of an Integrated Water Cycle Management Strategy (IWCMS) for Richmond Valley Council (RVC).

In 2006, RVC commenced the process of implementing a new best-practice approach to water utility planning known as **integrated water cycle management** (IWCM). The process is supported by the NSW Department of Energy, Utilities and Sustainability (DEUS), who have published guidelines on the subject for Local Water Utilities (LWUs).

As a member of the PRG, you were invited to the PRG workshop held on 3 May 2006 as part of IWCM Concept Study. At that workshop we:

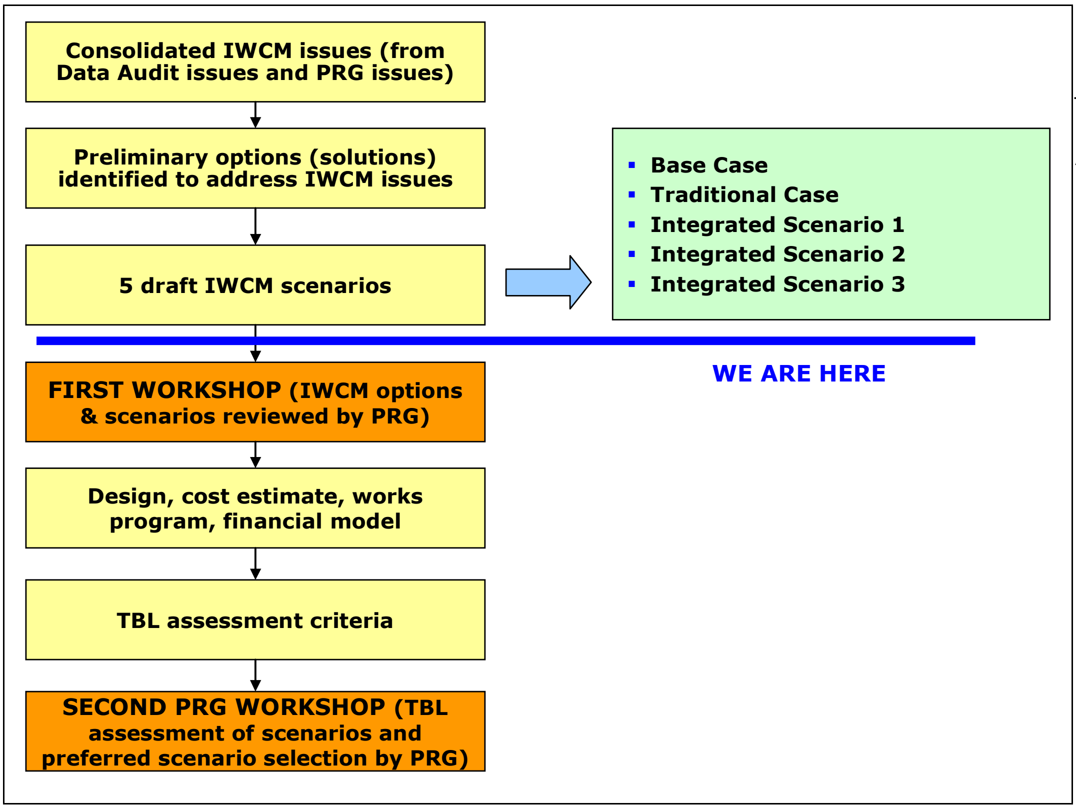
- introduced the DEUS concept of IWCM;
- identified and prioritised water cycle management issues; and
- agreed on a set of IWCM objectives and measures.

Based on these inputs from the concept study PRG meeting, the management scenarios developed by the Richmond IWCMS planning team are presented in this briefing paper.

2 What happened since the first PRG workshop?

A number of steps in the IWCM process have been completed since the first PRG workshop as shown in Figure 1.

Figure 1 - What Happened Since the First PRG Workshop?



Data audit issues and PRG identified issues were consolidated into a set of IWCM issues in consultation with RVC. Based on the consolidated IWCM issues, a preliminary list of options (ie. solutions) that could potentially address the identified issues were developed.

The merits of each identified potential option were assessed. A refined list of options was selected to solve the IWCM issues and thus be carried through for inclusion in the IWCM scenario development.

Five IWCM scenarios were developed (See Attachment A) based on the refined list of options as follows:

- A "base" case (also known as "business as usual") which does not include any solutions beyond what RVC is already doing to improve or maintain the water supply and sewerage businesses;
- A "traditional" case based on traditional solutions that solve issues in an isolated, non-integrated way; and
- Three "integrated" solutions that incorporate combinations of various build and non-build options and an increasing level of integration of water supply, sewerage and stormwater management by including recycled water use and stormwater harvesting, among other options.

Consolidated issues, options (solutions), and developed scenarios were also reviewed by RVC.

3 What is happening at the second PRG workshop?

Based on the combined IWCM issues (See Attachment A), the project elements considered (See Attachment B) and five draft scenarios developed (See Attachment C), the PRG will:

- Review the combined IWCM issues;
- Review the options (project elements); and,
- Review the draft scenarios;

The proposed agenda for the second PRG workshop is detailed in Table 1.

Table 1 – Second PRG Workshop Agenda.

Time	Details	Leader
9.30 am	Welcome and introduction	Council
9.40	Objectives, review of IWCM process, role of PRG for Workshop 1 and discussion of work done to date	JWP
10.00	Present combined IWCM issues, project elements and draft scenarios to PRG for discussion	All, facilitated by JWP
11.30	Short break	
12.00 pm	The Way Forward	All, facilitated by JWP
1.00	Close	

Workshop Date	Workshop Time	Workshop Venue
Thursday, March 29th, 2007.	9.30 am – 1.00 pm	RVC Administration Building 68 Walker Street, CASINO, NSW 2470

4 What will happen after the first PRG workshop?

Following the workshop, a summary paper will be forwarded to participants. The planning team will finalise the draft scenarios and prepare a strategy document.

A capital works program, OMA (Operation, maintenance, administration) schedule and financial model will be set up for each IWCM scenario in order to compare levels of expenditure and typical residential bills (TRB) to be paid by water and sewerage customers under each IWCM scenario. This enables the IWCM scenarios to be compared in terms of TRB, a key social criteria identified by the PRG.

A preliminary Triple Bottom Line (TBL – social, environmental, economic) assessment for each IWCM scenario will be prepared in order to make comparisons of environmental, social and economic outcomes between IWCM scenarios. This will be based on the agreed set of objectives and measures developed at the PRG meeting for the concept study.

Community consultation on the draft strategy will be also undertaken to inform the community about the outcomes of the IWCM process and the adoption of a preferred scenario.

5 Who Can I Contact?

Should you have any queries regarding this PRG workshop or about the IWCM Strategy, Council's primary contact for this project is Michael McKenzie, on (02) 6660 0236, email michael.mckenzie@richmondvalley.nsw.gov.au.

6 Attachments

A Combined IWCM issues

B Project elements considered

C Draft Scenarios

060501 Richmond IWCM Combined IWCM issues

	PRG Issues		Related Data Audit Issues		IWCM Issue
1	Poor urban (domestic and commercial) water supply security.	21	Poor security of the Casino water supply (unknown yield water Jabour Weir) and long-term security of Lower Richmond supply (Rous Water supply security);	1	Poor town water supply security
		22	Over-extraction from Rocky Creek Dam catchment for town water supply;		
		23	Lack of a formal service agreement between Rous Water and RVC;		
		25	Lack of reliable backup/ emergency water supply for Casino and Lower Richmond areas;		
4	Diversification of water sources.				
8	Population growth is increasing the impact of water extractions on rivers.				
9	Toonumbar Dam was originally provided for irrigation purposes not town water supply.				
18	Rate of population growth and future development.	24	High rate of growth expected in urban area resulting in increased demand for services;		
2	The need for a water sharing plan process to consider all water users together rather than a number of processes in isolation.	2	Kyogle Area and Myrtle Creek: lack of water sharing plans; need to reduce stress classifications; and need to address environmental flow requirements.	2	Lack of ground and surface water sharing plans
		15	Lack of water sharing plans and knowledge of groundwater resource yields;		
10	Water sharing and water quality in the Coraki area.				
3	Sustainable sewage treatment plant effluent management across the LGA.	28	Potential for further reuse of wastewater;	3	Sustainable effluent reuse with end user requirements considered
7	Consider end users (industries in particular) that may not be able to use potable supply if treated effluent is returned to it.				
15	Community acceptance of sewage treatment plant effluent reuse opportunities.				

060501 Richmond IWCM Combined IWCM issues

No.	PRG Issues	No.	Related Data Audit Issues	No.	IWCM Issue
5	General water quality in the river as a result of landuse practices including agriculture, town (stormwater), industrial flood management, ASS etc, including blue-green algae outbreaks.	4	Poor fertility soils may be leading to high fertiliser application rates and high nutrient concentrations in waterways	4	Existing landuse practices and urban impacts are affecting surface water quality
		5	Acid sulphate soils have the potential to affect water quality in catchment;		
		6	Erosion potential in steeper sections of upper catchment may be impacting on water quality;		
		7	Clearing and overgrazing have contributed to streambank erosion. Rehabilitation of priority subcatchments is required;		
		8	Impacts of agricultural land uses on the water cycle both in terms of extractions and reducing water quality;		
		9	High extractions leading to minimal flow in creeks and hot weather may be linked to algal blooms in waterways;		
		12	Poor management of floodgates increasing erosion and sedimentation of waterways;		
		14	Low dissolved oxygen contributing to poor water quality and low river health;		
		17, 33	Potential contamination from known point sources;		
		18	Blue green algae outbreaks during low flows and hot weather;		
		19	Salt water intrusions, particularly during drought;		
20	Management of Toonumbar Dam subcatchments (Eden Creek, Doubtful Creek).				
10	Water sharing and water quality in the Coraki area.				
6	Affordability/pricing of options.	31	High operating and management bills for water and sewerage systems leading to relatively high typical residential bills;	5	High operating and management costs for water and sewerage systems leading to relatively high typical residential bills
11	Capacity to treat water to drinking water standards (which may change) as the LGA continues to grow.			6	Compliance with current and future potable water standards
14	Health issues related to water.				
		26	Historical non-compliance of Casino water supply with ADWG with respect to some chemical parameters and total coliforms;		

060501 Richmond IWCM Combined IWCM issues

	PRG Issues		Related Data Audit Issues		IWCM Issue
12	Sustainability of extractions and high hydrologic stress in the Kyogle area.	1	Surface water stress exists in the catchment due to extractions. Town water extractions (including the impact of Rocky Creek Dam) are a factor causing water stress;	7	Hydrologic stress in catchments due to unsustainable extraction
		8	Impacts of agricultural land uses on the water cycle both in terms of extractions and reducing water quality;		
		11	Town water use and water cycle management contributing to hydrologic stress in the water supply catchments;		
		13	Environmental flow requirements of town water extractions to protect the water resource and associated ecosystems;		
13	Sustainable localised (decentralised) system management.		*Not identified in Data Audit*	8	Need for sustainable management of onsite sewage systems
16	Need for community education regarding septic system management.		*Not identified in Data Audit*		
17	Stormwater infiltration of sewerage system.		*Not identified in Data Audit*	9	Stormwater infiltration into sewerage system
19	Environmental impacts of stormwater and rainwater harvesting.		*Not identified in Data Audit*	10	Need for sustainable stormwater / rainwater reuse
		3, 16	Groundwater stress due to overextraction and land use threats	11	Groundwater stress due to overextraction and land use threats
		10	Climate change may adversely alter the rainfall and temperature patterns of the study area.	12	Climate change may adversely alter the rainfall and temperature patterns of the study area.
		20	Potential for reduced rainfall and increased temperatures if human induced climate change is realised.		
		27	Non-conformances at Coraki and Rileys Head sewage treatment plants;	13	Non-conformances at Coraki and Rileys Head sewage treatment plants;
		29	High water consumption, reflecting poor demand management planning;	14	Poor demand management in terms of consumption and unaccounted for water
		30	High unaccounted for water;		
		32	ASS soils in RVC urban areas potentially impacting on sewer infrastructure;	15	ASS soils in RVC urban areas potentially impacting on sewer infrastructure;

Richmond IWCM - Options considered in the draft scenarios

Category	Options	Included Scenarios	Source	Note
Demand Management	No demand management	B	DSS	
	DEUS best practice two part pricing	T, 1, 2, 3	DSS	
	Rainwater tank under BASIX (for new development)	T, 1, 2, 3	DSS	
	Educational program for external water uses	T, 1, 2, 3	DSS	
	Reduction for unaccounted for water	T, 1, 2, 3	DSS	
	Shower head retrofit	1, 2, 3	DSS	
	Pernanent restriction	1, 2, 3	DSS	
	Business audit	1, 2, 3	DSS	
	Rainwater tank retrofit (for existing development)	NO	DSS	
	Residential audit	NO	DSS	
	Dual flush toilet retrofit	NO	DSS	
Study / investigation cost	Feasibility study on regional water supply arrangemnts	T, 1, 2, 3	Capital Works Program (CWP)	
	Consideration of alternate emergency supplies in Regional Water Supply Strategy TOR	T, 1, 2, 3	No cost	
	Regional demand management strategy	1, 2, 3	CWP	
	Metering in distribution system	All	CWP	
	Contribute to DNR Macro Water Sharing Plan	T, 1, 2, 3	No cost	
	Sensitivity analysis on yield with reduced rainfall	1, 2, 3	CWP	
Source augmentation	Raising of the Jabour Weir and /or off stream storage	All		
Dual reticulation	TBC	2	Design	
Indirect potable use	Casino STP to river at a point upstream of water intake	3	Design	
Effluent management	Irrigate additional area	T, 1, 2, 3	Design	
	Sale of effluent to RW	2, 3	No cost	
Stormwater harvesting	Stormwater harvesting for all new development	2, 3	Design	
Asset renewal	Mains renewal only	B, T	SBP	
	Matching renewal for investment (Mains, bores, pumps, reticulation, reservoirs)	1, 2, 3	Renewal program	
	Consideration of ASS impacts	1, 2, 3	Renewal program	
SWM	On going implementation	All		
	Update SWM plan	All	SWM plan	
Catchment initiatives	Liaison with CMA to implement CAP	All	No cost	
Flood Management	On going implementation	All		
	Update FM plan	All	FM plan	
STP	Casino:	All	SBP	
	Coraki	All	SBP	
	Rileys Head	All	SBP	
	Evans Head	All	SBP	
WTP	Casino: Review and adjust operational procedure	T, 1, 2, 3	No cost	
	Lower: Include a quality compliance clause in SLA	T, 1, 2, 3	No cost	
OMA cost	SBP OMA cost	B	SBP	
	SBP OMA cost modified by JWP	T, 1, 2, 3	OMA Program	
	Regulated on-site system design approval	All	No cost	
	On-site sewage management strategy	All	No cost	Cost is included in the SBP OMA cost
	Incentives for better on site technologies	1, 2, 3	OMA program	
	Liaison with DEC to enforce POEO license	1, 2, 3	No cost	
	Education on sustainable land management practice	1, 2, 3	OMA Program	
	Update DSP and financial plan	All	No cost	Cost is included in the SBP OMA cost
	Implement DCP 5:	All	OMA Program	

Richmond IWCM - Project elements of draft scenarios

IWCM Issue Number	IWCM Issues	Location	Option	Base Case (B)	Traditional (T)	Integrated 1 (IN 1)	Integrated 2 (IN 2)	Integrated 3 (IN 3)
Water supply security								
1	Poor town water supply security	Shire-wide	Regional institutional arrangements	No change	Conduct feasibility study into regional water supply arrangements including connection to Rous water supply system and RVC management of Lower Richmond River supply	Same as T	Same as T	Same as T
		Casino	Emergency backup	No change	Include consideration of alternative emergency supplies in feasibility study eg Toonumbar Dam, Cookes Weir off-stream storage, groundwater etc. in Regional Water Supply Strategy TOR (no cost considered)	Same as T	Same as T	Same as T
		Casino	Demand management	None Projected peak demand 20.6 ML/d (in 2036) Projected avg demand 9.8 ML/d (in 2036)	Demand management including BASIX, pricing, education and UFW reduction. Projected peak demand 17.1 ML/d (in 2036) Projected avg demand 7.9 ML/d (in 2036)	High level demand management (T + showerhead retrofit, business audit and permanent restriction) Projected peak demand 16.6 ML/d (in 2036) Projected avg demand 7.8 ML/d (in 2036)	Same as IN 1	Same as IN 1
		Lower Richmond	Regional demand management	As per Rous Demand Management Plan	Same as B	Regional Demand Management Strategy (partial cost added)	Same as IN 1	Same as IN 1
		Casino	Treatment capacity security	Present WTP capacity 23 ML/d No augmentation required	Same as B	Same as B	Same as B	Same as B
		Casino	Security of supply	Present unrestricted avg demand is 7.2 ML/d Present unrestricted safe yield is 6.6 ML/d Raising of the Jabour Weir and /or Off stream storage	B OR Investigate alternate source like groundwater and Toonumbar Dam and investigate on regional water supply arrangements	Same as T	T + Increase of security of supply through dual reticulation for new development	T + Increase of security of supply through indirect potable reuse
		Casino	Effluent management	Reuse at Golf Course and irrigation = 597 ML (in 04/05, DEUS report)	B + Irrigate additional areas (TBC)	Same as T	T+dual reticulation for new development (Increase of security of supply)	T+indirect potable reuse (Increase of security of supply)
		Lower Richmond	Effluent management	None	Irrigation of sporting fields and open space area	Same as T	T+sale of effluent to Rous for dual reticulation (no cost added)	T + sale of effluent to Rous for indirect potable reuse through bore recharge (no cost added)
		Casino	Stormwater harvesting	None	Same as B	Same as B	New development fully supplied by rainwater/stormwater (TBC) If feasible, Casino demand reduction	Same as IN 2
		Lower Richmond	Stormwater harvesting	None	Same as B	Same as B	New development fully supplied by rainwater/stormwater (TBC) If feasible, Rous Water demand reduction	Same as IN 2
		Shire-wide	UFW reduction (metering)	Metering in distribution system	Same as B	Same as B	Same as B	Same as B
			UFW reduction (renewal)	Renewal program as in SBP	Same as B	Condition based asset renewal including pumps, reservoirs and bores	Same as IN 1	Same as IN 1
			UFW reduction (leak detection)	*As in demand management of 1 (UFW reduction)*				
Ground and surface water sharing								
2	Lack of ground and surface water sharing plans	Shire-wide	Macro Water Sharing Plan (WSP)	None	Contribute to DNR Macro WSP development process (no cost considered)	Same as T	Same as T	Same as T
Effluent reuse								
3	Sustainable effluent reuse with end user requirements considered	Casino	Effluent management	*As in 1*				
		Lower Richmond	Effluent management	*As in 1*				
		Shire-wide	Education	None	None	Education on effluent reuse	Same as IN 1	Same as IN 1
Surface water quality								
4	Existing landuse practices and urban impacts are affecting surface water quality	Shire-wide	On-site sewage management (design regulation)	Regulated design approval (no cost considered)	Same as B	Same as B	Same as B	Same as B
		Shire-wide	On-site sewage management (monitoring)	Implement existing program (RVC On-site Sewage Management Strategy)	Same as B	Same as B	Same as B	Same as B
		Shire-wide	On-site sewage management (improvement)	None	Same as B	Incentives for better on site technologies (cost added in OMA)	Same as IN 1	Same as IN 1
		Shire-wide	Environmental flows	None	*As in 2*	Same as T	Same as T	T+indirect potable reuse to increase base flows
		Shire-wide	Stormwater quality improvement and management	Stormwater Management Plan (2005) - on going Update periodically	Same as B	Same as B	Same as B	Same as B
		Shire-wide	Salt water intrusion reduction	*As in 2*				
		Shire-wide	Catchment management initiatives	Liaison with CMA to implement Northern Rivers CMA Catchment Action Plan	Same as B	Same as B	Same as B	Same as B
		Shire-wide	Water Sharing Plan	*As in 2*				
		Shire-wide	Flood management	Flood Management Plan (2002) - on-going Update FMP	Same as B	Same as B	Same as B	Same as B
		Casino	Blue-green algae	*As per Emergency backup in 1, as per environmental flows in 4, and as per regional institutional arrangement (via alternate source) in 1*				

Richmond IWCM - Project elements of draft scenarios

IWCM Issue Number	IWCM Issues	Location	Option	Base Case (B)	Traditional (T)	Integrated 1 (IN 1)	Integrated 2 (IN 2)	Integrated 3 (IN 3)
		Casino	STP point source contamination control	Current capacity 13,300 EP Augmentation as SBP				
		Coraki	STP point source contamination control	Current capacity 1,200 EP, licensed discharge = 400kL/d Upgrade as SBP	Same as B	Same as B	Same as B	Same as B
		Rileys Head	STP point source contamination control	Current capacity 200EP, licensed discharge = 216kL/day Renewals as SBP	Same as B	Same as B	Same as B	Same as B
		Evans Head	STP point source contamination control	Current capacity 3,700 EP, licensed discharge = 6,50kL/d Augmentation as SBP	Same as B	Same as B	Same as B	Same as B
		Shire-wide	Point source contamination control	None	Liaison with DEC to enforce POEO licence requirements (no cost considered)	Same as T	Same as T	Same as T
		Shire-wide	Education	None	None	Education on sustainable land management practices	Same as IN 1	Same as IN 1
Typical residential bills								
5	High operating and management costs for water and sewerage systems leading to relatively high typical residential bills	Shire-wide	Financial management	Update DSP and Financial Plan	B + Apply full cost recovery pricing	T+Designed to be self funding and less costly. Greater access to funds through diversified services and product delivery (No cost included).	Same as IN 1	Same as IN 1
		Shire-wide	Water and sewerage asset renewals	Renewal program as in SBP	Same as B	Condition based asset renewal including pumps, reservoirs and bores	Same as IN 1	Same as IN 1
Potable water quality								
6	Compliance with current and future potable water standards	Casino	Treatment plant process upgrade	Current processes include sedimentation and filtration 2005 compliances are Total coliform 79% and Chemical 96%	Review and adjust current operational procedure (no cost considered)	Same as T	Same as T	Same as T
		Lower Richmond	Drinking water quality	As per Rous water supply	Include a quality compliance clause in SLA (no cost considered)	Same as T	Same as T	Same as T
Hydrologic stress								
7	Hydrologic stress in catchments due to unsustainable extraction	Shire-wide	Regional institutional arrangements	*As in 1*				
			Emergency backup	*As in 1*				
			Demand management	*As in 1*				
		Shire-wide	Catchment management initiatives	*As in 4*				
		Shire-wide	Environmental flows	*As in 4*				
On-site systems								
8	Need for sustainable management of onsite sewage systems	Shire-wide	On-site sewage management systems (design regulation, monitoring and incentives)	*As in 4*				
Sewerage assets								
9	Stormwater infiltration into sewerage system	Shire-wide	Sewerage asset renewals	*As in 5*				
Stormwater / rainwater reuse								
10	Need for sustainable stormwater/rainwater reuse	Shire-wide	Rainwater tanks	*As in demand management of 1 (BASIX)*				
		Shire-wide	Stormwater harvesting	*As in 1*				
Groundwater stress								
11	Groundwater stress due to overextraction and land use threats	Shire-wide	Macro Water Sharing Plan	*As in 2*				
Climate change								
12	Climate change may adversely alter the rainfall and temperature patterns of	Shire-wide	Risk management	None	Same as B	Sensitivity analysis on yield with reduced rainfall - (national urban water report - climate change)	Same as IN 1	Same as IN 1

Richmond IWCM - Project elements of draft scenarios

IWCM Issue Number	IWCM Issues	Location	Option	Base Case (B)	Traditional (T)	Integrated 1 (IN 1)	Integrated 2 (IN 2)	Integrated 3 (IN 3)
	and temperature patterns of the study area	Shire-wide	Alternative water sources	*As in 1 (Regional institutional arrangements, emergency back up, demand management, effluent management, stormwater harvesting, UFW reduction)*				
Sewerage systems								
13	Non-conformances at Coraki and Rileys Head sewage treatment plants	Coraki	Treatment plant process upgrade	*As in 4 (STP point source contamination control)*				
		Rileys Head	Treatment plant process upgrade	*As in 4 (STP point source contamination control)*				
Demand management								
14	Poor demand management in terms of consumption and unaccounted for water	Shire-wide	Demand management	*As in 1*				
			UFW	*As in 1*				
ASS soils								
15	ASS soils in RVC urban areas potentially impacting on sewer infrastructure	Shire-wide	New infrastructure to consider ASS impacts	Implement DCP5 - Acid Sulfate Soils: identification, assessment and management	Same as B	Same as B	Same as B	Same as B
			Renewal program to consider ASS impacts	None	None	Renewals to consider ASS impacts	Same as IN 1	Same as IN 1

Richmond Valley Council
IWCM Strategy Plan
Summary Paper
Project Reference Group Workshop 1

This paper is a summary note to the Project Reference Group (PRG) for the development of an Integrated Water Cycle Management (IWCM) Strategy Plan for Richmond Valley Council (RVC). The paper provides an overview of the outcomes of PRG Workshop 1 (Assessing draft Scenarios) which was held at RVC on 29th March, 2007.

1. Introduction

RVC, with the guidance of the NSW Department of Energy, Utilities and Sustainability (DEUS) is preparing an Integrated Water Cycle Management Strategy (IWCMS).

Integrated water cycle management 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 is important as it attempts to balance the current and future needs of urban and non-urban water users while reducing pressures on the available water resources.

As RVC moves towards completing the **Integrated Water Cycle Management Strategy**, involvement from council staff and other stakeholders is essential in determining the future direction of the Local Water Utility (LWU).

This workshop followed on from the identification of water cycle management issues carried out in a workshop as part of the IWCM Concept Study. After the first workshop, the project team developed a number of scenarios which provide a variety of management solutions to address the identified issues.

Each scenario depicts how urban water services in RVC may be provided in the future using combinations of the options for water supply, sewerage, and stormwater service provisions as well as stormwater management and catchment initiatives. Five scenarios were developed, each representing a progressively greater level of service provision and integration of the urban water cycle. Each scenario varies in its ability to manage the water cycle issues identified and the costs associated with its implementation.

2. Project Reference Group members

Workshop invitations and a briefing paper were sent to the stakeholders prior to the workshop. Attendees at Workshop 1 are listed in Table 1. A copy of this summary paper has been sent to each of the PRG members listed in this table.

Table 1: Attendees at PRG Workshop 1 of the Richmond IWCMS

Name	Position	Stakeholder
Chris Hennessy	Regional Manager	NSW Department of Energy, Utilities and Sustainability (DEUS)
Michael Wood	Floodplain Resource Management	Richmond River County Council
Graham Kent	Representative	Kyogle Shire Council
Wayne Franklin	Operation Services Manager	Rous Water
Chris Magner	Chairman	Richmond / Wilson Tidal / Freshwater users group No. 1
Greg Williams	Representative	Northern Co-operative Meat Company
Ron Doyle	Chairman	Evans Head Progress Association
Andrew Braid	Representative	Casino Rate Payers and Residents Association
Gary Murphy	Director of Works	Richmond Valley Council
Ray Medhurst	Manager of Strategic Planning	Richmond Valley Council
Mark Hesse	Water and Sewer Planning Development Engineer	Richmond Valley Council
Brian Eggins	Senior Administration Engineer	Richmond Valley Council
David Holstein	Services Engineer	Richmond Valley Council
John Hession	Strategic Planner	Richmond Valley Council
Michael McKenzie	Administration Engineer	Richmond Valley Council
Mick Howland	Consultant	JWP Ballina
Robyn Campbell	Consultant	JWP
Nurul Islam	Consultant	JWP

3. The workshop program

The PRG workshop followed the program set out in Table 2. A presentation was made by JWP (the consultant assisting RVC to prepare the IWCMS) providing some background on IWCM and the issues already identified in the workshop as part of Concept Study. The presentation also provided an explanation of the draft scenarios which had been developed to address the issues. A handout with all options considered (but not necessarily included in scenarios) was distributed at the meeting. A copy of the presentation slides is attached (see Section 7).

Table 2: Workshop Program.

Details	Leader
Welcome and introduction	Michael McKenzie
Objectives and agenda for Workshop 1	Robyn Campbell and Nurul Islam
Review of IWCM process, outline role of PRG for Workshop 1	
Consolidated IWCM issues	

Details	Leader
Presentation of work done to date including the development of scenarios and options considered	
Discussion of Draft Scenarios	All facilitated by JWP
Outlining the Next Steps	Robyn Campbell and Nurul Islam
Close & Thanks	Michael McKenzie

4. Workshop outcomes

The PRG reviewed the IWCM issues consolidated from data audit issues and PRG identified issues. The PRG in general agreed with the IWCM issues and made the following comments:

1. For issue 7 (Hydrologic stress), add 'particularly during low flows'.
2. Remove issue 11 (Groundwater stress) as it is not an IWCM issue for RVC.

The PRG also discussed the project elements within draft scenarios. The PRG accepted the scenario formulation and made the following observations:

1. For issue 1, under security of supply option, add Cookes weir and stormwater harvesting as potential alternate source.
2. For issue 1, under effluent management for Casino, remove abattoir as a potential treated effluent end user as confirmed by meat works representative.
3. For issue 1, under effluent management for Casino, consider return flow credits for indirect potable reuse.
4. For issue 1, under effluent management for lower Richmond, replace 'sale' with 'transfer' of effluent to Rous Water for dual reticulation. Based on precedent at Ballina Heights, 50% cost to be borne by Council (cost sharing with Rous Water).
5. For issue 1, Casino WTP Base Case includes PAC.
6. For issue 1, under effluent management for lower Richmond, remove the option of bore recharge for indirect potable reuse as those bores are used only for emergency supply and this is not a feasible option.
7. For issue 4, RVC is planning to adopt a stormwater levey from 07/08 and a catchment levy will not be considered.
8. For issue 9, RVC has a infiltration/inflow reduction program in place.
9. For issue 15, options to be considered only for lower Richmond as Casino is not affected by ASS.

10. The amount of subsidy required to achieve a neutral benefit:cost ratio for the demand management measures not included in the draft scenarios is to be discussed in the report.
11. A sensitivity analysis on current level of dual flush toilets to be undertaken and discussed in the report.

5. Where to from here?

The planning team will finalise the draft scenarios considering the input provided by the PRG.

A capital works program, OMA (Operation, maintenance, administration) schedule and financial model will be set up for each IWCM scenario in order to compare levels of expenditure and typical residential bills (TRB) to be paid by water and sewerage customers under each IWCM scenario. This enables the IWCM scenarios to be compared in terms of TRB, a key social criteria identified by the PRG.

A preliminary Triple Bottom Line (TBL – social, environmental, economic) assessment for each IWCM scenario will be prepared in order to make comparisons of environmental, social and economic outcomes between IWCM scenarios. This will be based on the agreed set of objectives and measures developed at the PRG meeting for the concept study.

A second PRG workshop is planned where you will be invited to assist in evaluating the draft scenarios based on the TBL assessment. From the outcomes of the next Workshop, the preferred scenario and TBL assessment will be documented as part of the IWCM Strategy report.

6. Who can I contact?

Should you have any queries regarding this PRG workshop or about the IWCM Strategy, Council's primary contact for this project is Michael McKenzie, on (02) 6660 0236, email michael.mckenzie@richmondvalley.nsw.gov.au.

7. Slide presentation

A copy of the slide presentation given at the workshop is attached.

Success through Partnership, Success through People

Richmond Valley Council

Integrated Water Cycle Management (IWCM) Strategy Planning

Project Reference Group (PRG)

Workshop 1

29 March 2007

www.jwp.com.au

Workshop Objectives

- → Review IWCM approach
- → Review issues identified in concept study and by PRG
- → Examine consolidated IWCM issues
- → Evaluate draft scenarios developed

What is IWCM?

JWP

Best Practice: NSW Department of Energy, Utilities and Sustainability (DEUS) introduced Integrated Water Cycle Management (IWCM)

→ Integration of urban water services – water supply, sewerage and stormwater so that water is used optimally

→ Catchment considerations, not just urban

Present IWCM Strategy for RVC is being prepared to DEUS guidelines.

RICHMOND VALLEY COUNCIL

The IWCM Approach

We are here!

→ IWCM is based on three questions

1. What are the issues? — Concept Study
2. How do we fix the problems? — Strategy Plan
3. How do we know the problems are fixed? — Ongoing review

→ Answering the questions helps to set the direction of future service provision

→ Community, regulator and water utility input in helping to answer each question

Project Reference Group (PRG)

JWP

- → Stakeholder involvement in entire planning process
- → Identify issues
- → Identify solutions
- → Assist in developing criteria for evaluating scenarios based on triple bottom line (TBL) approach (economic, social, environmental)
- → Assist in choosing future direction

Richmond Valley Council

JWP

Outcomes of Previous PRG Workshop

A PRG workshop was held on 3 May 2006 as part of RVC Concept Study. At that workshop, we:

→ introduced the perception of IWCM;

→ identified and prioritised water cycle management issues; and

→ agreed on a set of IWCM objectives and measures (for high priority issues).

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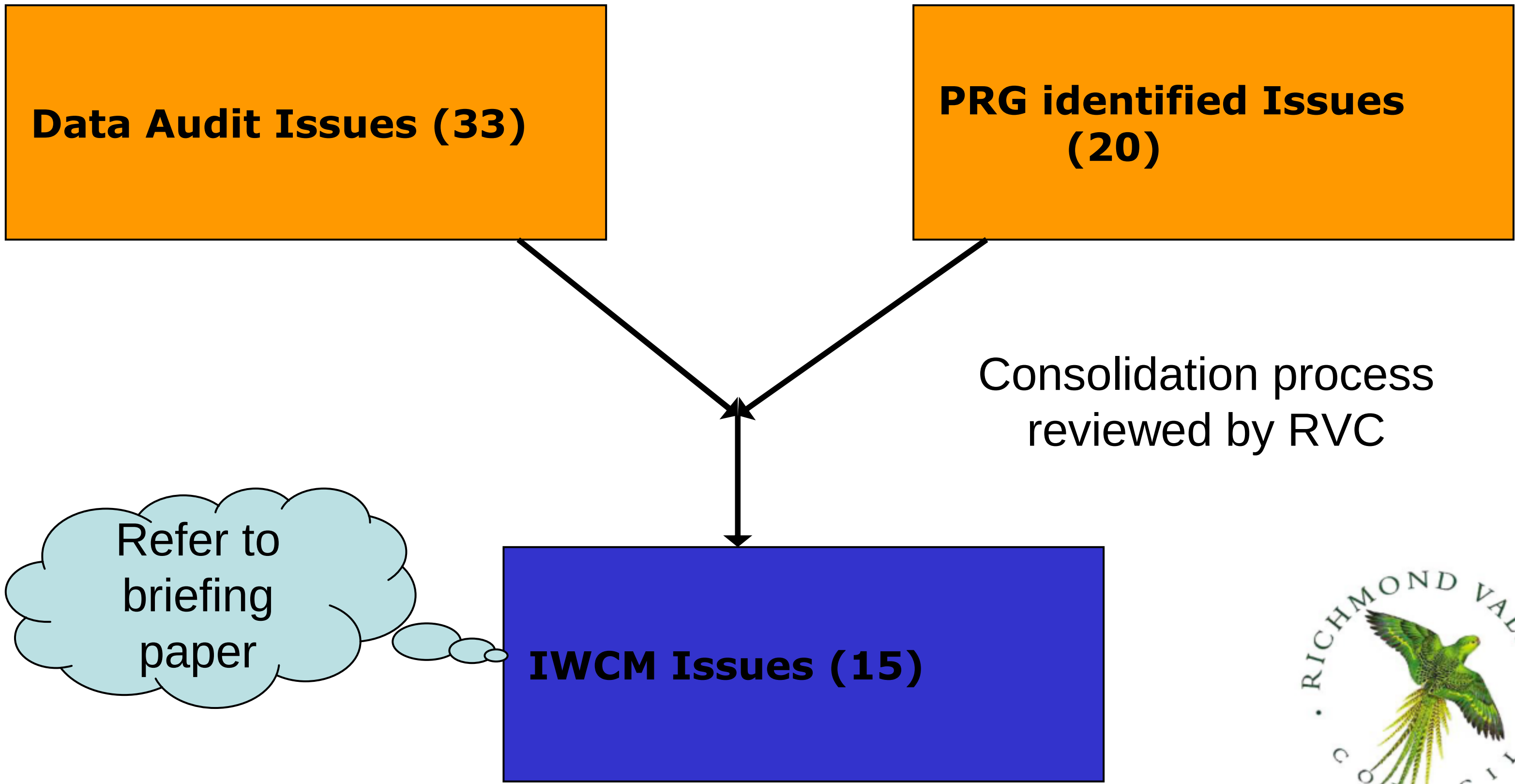
Draft scenario development process

A holistic approach:



Draft scenario development process

JWP

The process:

→ Estimation of growth (demand)

→ Identify potential solutions to solve issues

→ Preliminary feasibility of each element

→ Bundle feasible solutions into 5 scenarios: different pictures of future service provision

→ Financial planning

→ Cost, environmental and social impacts of each scenario varies

→ RVC, with input from the PRG need to select a preferred direction

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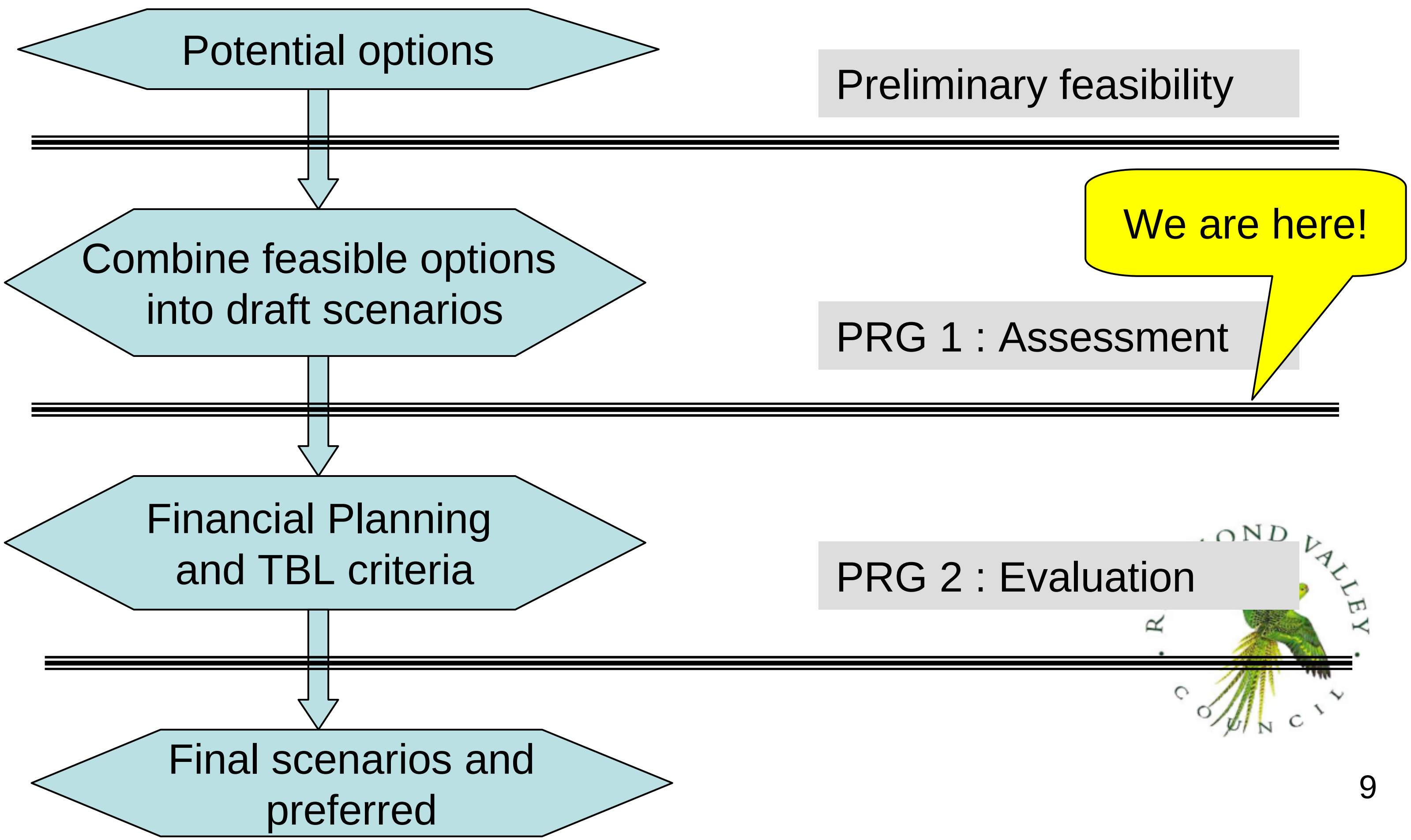
Draft scenario development process

JWP

The flow:



Draft scenario development process

The scenarios:

→ Base Case: essentially “business as usual” to examine what is happening now

→ Traditional: solutions for water, sewerage and stormwater developed in isolation, considering current standards

→ Integrated (3): increasing integration of management of water, sewer and stormwater

Draft scenario development process

Growth Forecast:

Projected Population of Water Supply Areas (from DSP)

DSP	2005	2010	2015	2020	2025	2030	2035
Casino	13,018	13,771	14,523	15,363	16,203	17,013	17,881
Coraki	1,208	1,272	1,335	1,405	1,475	1,549	1,628
Broadwater / Riley's Hill	508	541	562	586	609	634	661
Evans Head	3,279	3,843	4,407	4,890	5,372	5,909	6,524
Woodburn	548	577	606	638	670	704	740
RVC	18,561	20,004	21,433	22,882	24,329	25,809	27,434

Average growth 2.05%

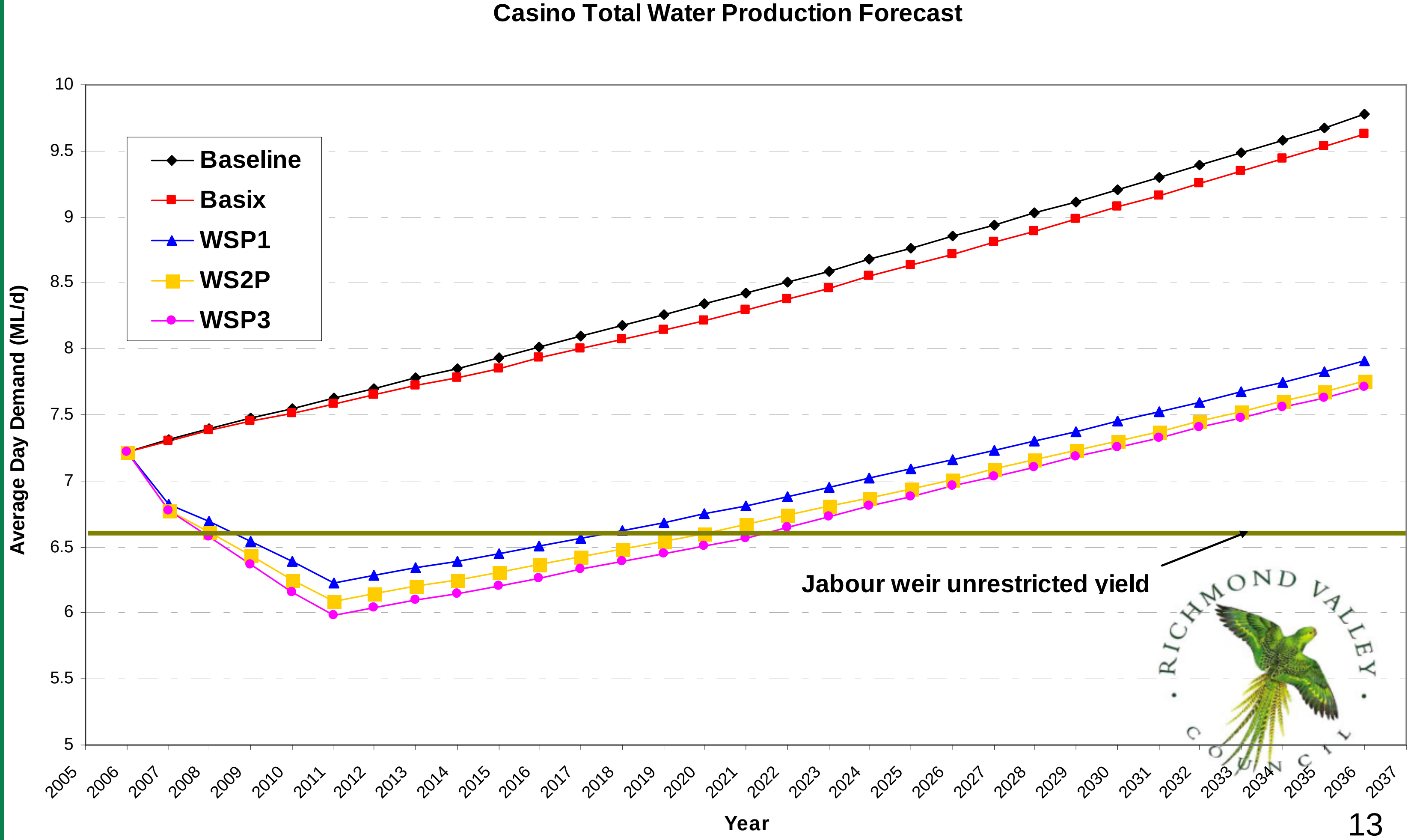
Demand Measures Considered

Measures	WSP1	WSP2	WSP3
DEUS best practice pricing			
BASIX			
Education program			
Unaccounted for Water reduction			
Permanent restriction			
Showerhead retrofit			
Residential audit program			
Business audit program			
Rainwater tank retrofit			
Dual Flush Toilet Retrofit			

For more: refer to briefing paper

Future Water Use

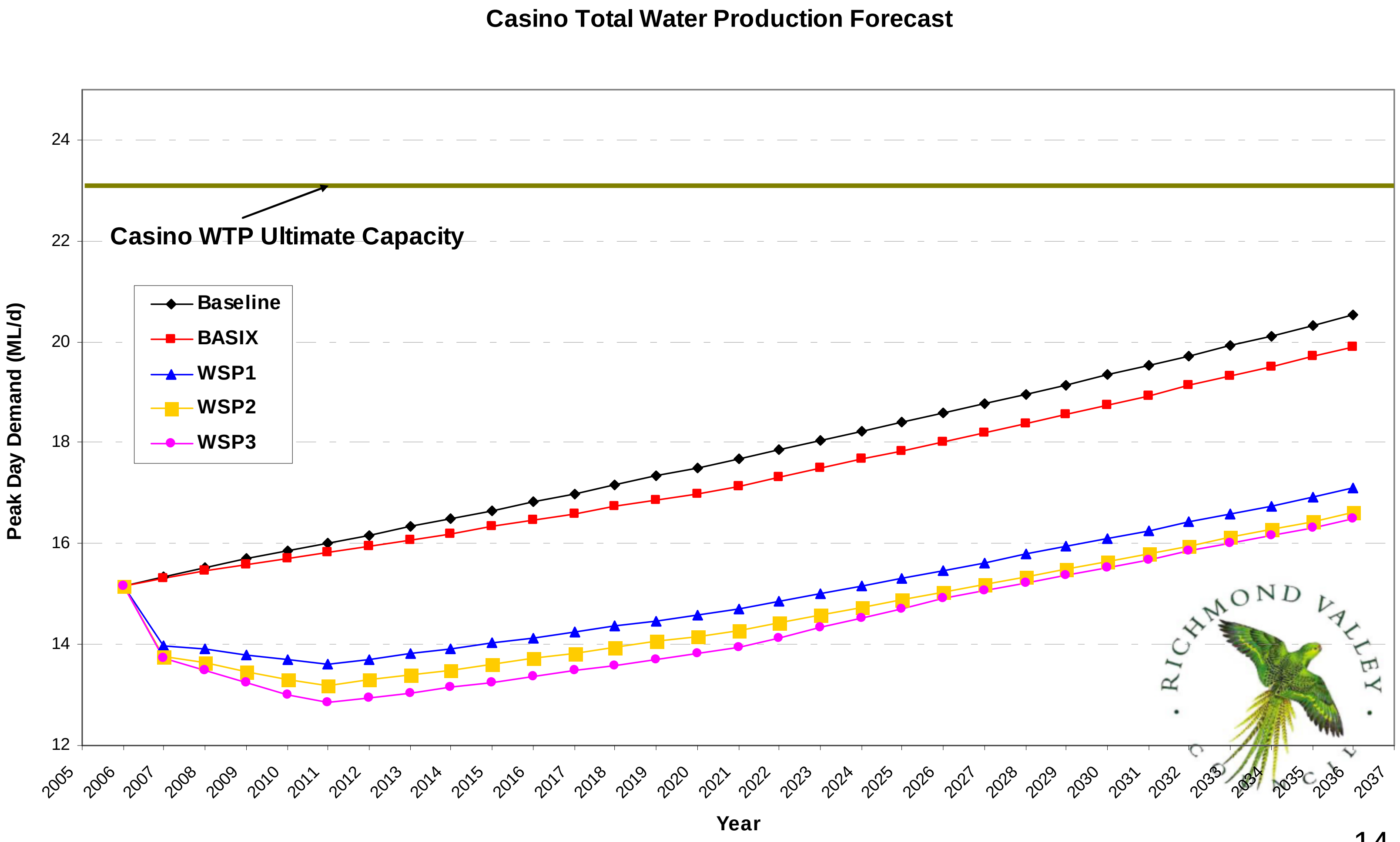
Casino Average Day Demand (ADD)



JWP

Future Water Use

Casino Peak Day Demand (PDD):



Source Security

→ Source is not secure

→ Present Jabour weir yield is between 6.6 ML/d and 7.7 ML/d, against present demand of 7.2 ML/d (based on historical inflow data).

→ Projected demand is 9.8 ML/d without any demand management and 7.8 ML/d under WSP2.

→ However, stochastic simulation predicts severe future drought conditions.

Alternate Source

- → Alternate source is required at least for emergency back up.
- → WATNET model simulation indicates an off-stream storage (OSS) requirement of between 3 and 3.5 GL.
- → Alternate source should be investigated such as Toonumbar Dam, groundwater or bulk supply from Rous.
- → Dual reticulation, indirect potable reuse and stormwater harvesting should be investigated.

Recycling

- → Continue present regime
- → Increase direct watering
- → Dual Reticulation for new development
- → Partial requirement for abattoir
- → Indirect potable reuse

Opportunity to meet other Commitments

- → Stormwater Management Plan
- → State of the Environment Report
- → Flood Management Plan
- → Catchment Action Plan

Discussion of Scenarios

JWP

Refer to briefing paper

www.jwp.com.au

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JWP

Thank you

RICHMOND VALLEY COUNCIL

Richmond Valley IWCM Strategy

Project Reference Group Workshop 2 Briefing Paper

2nd PRG workshop
Thursday 21 June 07
Administration Bld.
RVC

1 Introduction

This paper is a briefing note to the Project Reference Group (PRG) for the development of an Integrated Water Cycle Management Strategy (IWCMS) for Richmond Valley Council (RVC).

In 2006, RVC commenced the process of implementing a new best-practice approach to water utility planning known as **integrated water cycle management** (IWCM). The process is supported by the NSW Department of Water and Energy (DWE), who have published guidelines on the subject for Local Water Utilities (LWUs).

As a member of the PRG, you were invited to the PRG workshops held on 3 May 2006 as part of IWCM Concept Study and 29 March 2007 as part of the IWCM Strategy Planning. At those workshops we:

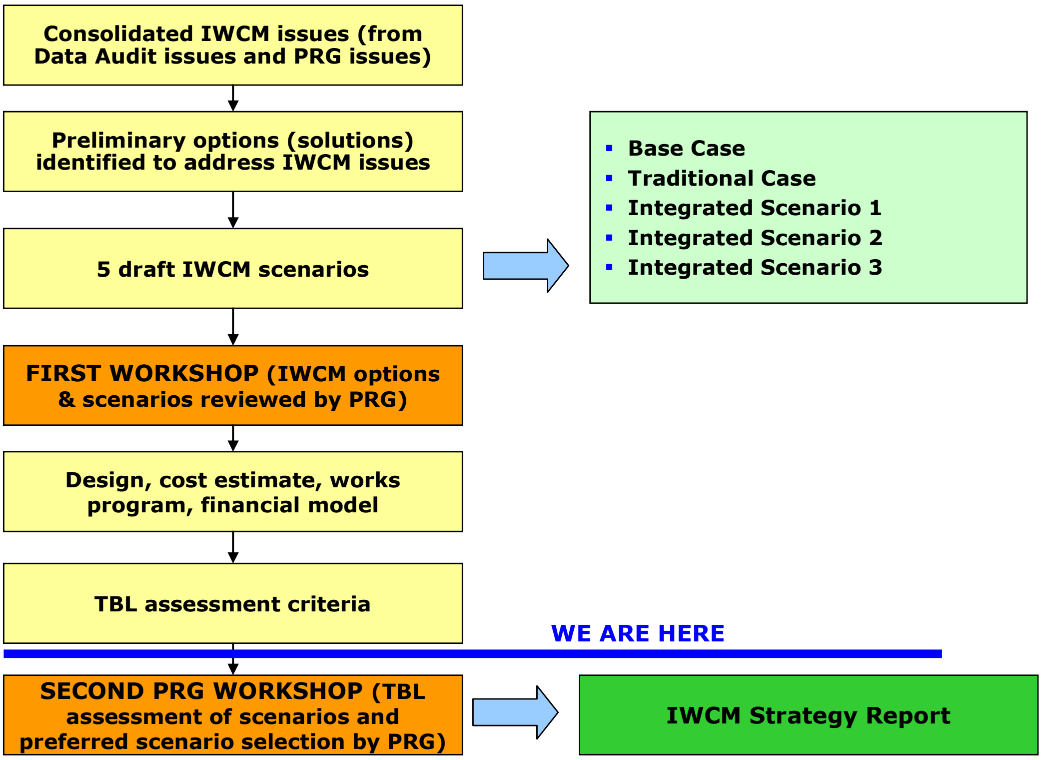
- introduced the DEUS concept of IWCM;
- identified and prioritised water cycle management issues;
- agreed on a set of IWCM objectives and measures;
- confirmed a consolidated set of IWCM issues;
- assessed merits of each identified potential option; and
- reviewed the 5 draft scenarios developed.

Based on these inputs from the PRG meetings, the assessment of management scenarios has been undertaken by the Richmond Valley IWCMS planning team and is presented in this briefing paper.

2 What happened since the last workshop?

A number of steps in the IWCM process have been completed as shown in Figure 1.

Figure 1 –IWCM Strategy Planning Flow Diagram



The five draft scenarios incorporating suggestions from the last PRG workshop are shown in attachment A. A list of all options (solutions) considered in the development process is shown in Attachment B. Only options which satisfied the preliminary assessment were carried through for inclusion in the IWCM scenario development.

Preliminary design and cost estimates have been prepared for all options considered.

A capital works program, OMA (operation, maintenance, administration) schedule and financial model have been set up for each IWCM scenario in order to compare levels of expenditure and typical residential bills (TRB) to be paid by water and sewerage customers under each IWCM scenario. This enables the IWCM scenarios to be compared in terms of TRB or affordability.

A preliminary Triple Bottom Line (TBL – social, environmental, economic) assessment for each IWCM scenario was prepared in order to make comparisons of environmental, social and economic outcomes between IWCM scenarios (Attachment C). This is based on the agreed set of objectives and measures developed at the PRG meeting for the concept study.

3 What is happening at this PRG workshop?

Based on the updated draft scenarios developed (see Attachment A), the project elements considered (see Attachment B) and preliminary TBL assessment criteria (Attachment C), the PRG will:

- Review the five draft scenarios;

- Review the options (project elements);
- Review the preliminary TBL assessment criteria;
- Rank the five IWCM scenarios considering the social, economic and environmental costs and benefits of each scenario; and
- Identify a preferred scenario or preferred scenario components for implementation.

The proposed agenda for the second PRG workshop is detailed in Table 1.

Table 1 – Second PRG Workshop Agenda.

Time	Details	Leader
11.30 am	Welcome and introduction	Council
11.40	Objectives, review of IWCM process, role of PRG and discussion of work done to date	JWP
12.00	Discussion of updated draft scenarios and project elements	All, facilitated by JWP
1.00	Lunch	
1.30	TBL analysis and selection of preferred scenario	All, facilitated by JWP
3.00 pm	The way forward	JWP
3.15	Closing remarks	Council
Workshop Date	**Workshop Time**	**Workshop Venue**
Thursday, June 21st, 2007.	11.30 am – 3.30 pm	RVC Administration Building 68 Walker Street, CASINO, NSW 2470

4 What will happen after this workshop?

Following the workshop, a summary paper will be forwarded to participants.

The planning team will finalise the preferred scenario and prepare a strategy document.

Community consultation on the draft strategy will be undertaken to inform the community about the outcomes of the IWCM process and the adoption of a preferred scenario.

5 Who Can I Contact?

Should you have any queries regarding this PRG workshop or about the IWCM Strategy, Council's primary contact for this project is Michael McKenzie, on (02) 6660 0236, email michael.mckenzie@richmondvalley.nsw.gov.au.

6 Attachments

A Draft Scenarios

B Project elements considered

C TBL assessment criteria

Richmond IWCM - Project elements of draft scenarios

No.	IWCM Issues	Location	Option	Base Case (B)	Traditional (T)	Integrated 1 (IN 1)	Integrated 2 (IN 2)	Integrated 3 (IN 3)
				Water supply security				
1	Poor town water supply security	Shire-wide	Regional institutional arrangements	No change	Conduct feasibility study into regional water supply arrangements including connection to Rous water supply system and RVC management of Lower Richmond River supply	Same as T	Same as T	Same as T
		Casino	Demand management	None Projected peak demand 20.6 ML/d (in 2036) Projected avg demand 9.8 ML/d (in 2036)	Demand management including BASIX, pricing, education and UFW reduction. Projected peak demand 17.1 ML/d (in 2036) Projected avg demand 7.9 ML/d (in 2036)	High level demand management (T + showerhead retrofit, business audit and permanent restriction) Projected peak demand 16.6 ML/d (in 2036) Projected avg demand 7.8 ML/d (in 2036)	Same as IN 1	Same as IN 1
		Lower Richmond	Regional demand management	As per Rous Demand Management Plan	Same as B	Regional Demand Management Strategy (partial cost added)	Same as IN 1	Same as IN 1
		Casino	Treatment capacity	Present WTP capacity 23 ML/d No augmentation required	Same as B	Same as B	Same as B	Same as B
		Casino	Security of supply	Present unrestricted avg demand is 7.2 ML/d Present restricted safe yield is about 13.1 ML/d, Present unrestricted safe yield is 7.7 ML/d, Casino would run out of water during more severe droughts (WATHNET) Lack of security; SBP allocation for augmentation	B + Alternate Source investigation (cost added) including Raising of the Jabour Weir / Off stream storage / groundwater / Cookes weir / stormwater harvesting / Toonumbar dam / regional water supply arrangements	Same as T	T + Increase of security of supply through dual reticulation for new development	T + Increase of security of supply through indirect potable reuse
		Casino	Emergency backup	No change	Include consideration of alternative emergency supplies in Alternate Source investigation (alternate source will act as emergency back-up as well)	Same as T	Same as T	Same as T
		Casino	Effluent management	Reuse at Golf Course and irrigation = 597 ML (in 04/05, DEUS report)	B + Blue circle cement, sporting fields (Albert park, Queens Elizabeth Park, Crawford square)	Same as T	T+dual reticulation for new development of Bruxner, Summerland and Reynolds Road (Increase of security of supply)	T+indirect potable reuse (Increase of security of supply / return flow credits)
		Lower Richmond	Effluent management	Coraki golf course	B + Irrigation of sporting fields and open space area (Evans Head effluent reuse scheme, Broadwater agricultural including Woodburn)	Same as T	T+ transfer of effluent to Rous for dual reticulation (50% cost added) Southwest Coraki, Broadwater incl. cogeneration, Evans Head and Woodburn combined	T + recharge Woodburn aquifer + transfer of effluent to Rous for dual reticulation (50% cost added) for Southwest Coraki and Broadwater incl. cogeneration
		Casino	Stormwater harvesting	None	Same as B	Encourage individual developer / industry for stormwater harvesting	IN 1 + New development fully supplied by rainwater/stormwater NOT FEASIBLE due to rainfall pattern and development size	Same as IN 2
		Lower Richmond	Stormwater harvesting	None	Same as B	Encourage individual developer / industry for stormwater harvesting	IN 1 + New development fully supplied by rainwater/stormwater NOT FEASIBLE due to rainfall pattern and development size	Same as IN 2
		Shire-wide	UFW reduction (metering)	None	Metering in distribution system	Same as T	Same as T	Same as T
			UFW reduction (renewal)	Renewal program as in SBP	Condition based asset renewal	Same as T	Same as T	Same as T
			UFW reduction (leak detection)	*As in demand management of 1 (UFW reduction)*				
				Ground and surface water sharing				
2	Lack of ground and surface water sharing plans	Shire-wide	Macro Water Sharing Plan (WSP)	None	Contribute to DNR Macro WSP development process (no cost considered)	Same as T	Same as T	Same as T
				Effluent reuse				
3	Sustainable effluent reuse with end user requirements considered	Casino	Effluent management	*As in 1*				
		Lower Richmond	Effluent management	*As in 1*				
		Shire-wide	Education	None	Same as B	Same as B	Education on effluent reuse	Same as IN 2
				Surface water quality				
4	Existing landuse practices and urban impacts are affecting surface water quality	Shire-wide	On-site sewage management (design regulation)	Regulated on-site system design approval (no cost considered)	Same as B	Same as B	Same as B	Same as B
		Shire-wide	On-site sewage management (monitoring)	Implement existing program (RVC On-site Sewage Management Strategy)	Same as B	Same as B	Same as B	Same as B
		Shire-wide	On-site sewage management (improvement)	None	Same as B	Incentives for better on site technologies (cost to be added to Gen Fund)	Same as IN 1	Same as IN 1
		Shire-wide	Environmental flows	None	*As in 2*	*As in 2*	*As in 2*	T+indirect potable reuse to increase base flows
		Shire-wide	Stormwater quality improvement and management	Stormwater Management Plan (2005) - on going Update periodically	Same as B	Full implementation of SMP	Same as IN 1	Same as IN 1
		Shire-wide	Salt water intrusion reduction	*As in 2*				
		Shire-wide	Catchment management initiatives	None	Same as B	Liaison with CMA to implement Northern Rivers CMA Catchment Action Plan	Same as IN 1	Same as IN 1
		Shire-wide	Water Sharing Plan	*As in 2*				
		Shire-wide	Flood management	Flood Management Plan (2002) - on-going Update FMP	Same as B	Full implementation of FMP	Same as IN 1	Same as IN 1
		Casino	Blue-green algae	*As per Emergency backup in 1, as per environmental flows in 4, and as per regional institutional arrangement (via alternate source) in 1*				
		Casino	STP point source contamination control	Current capacity 13,300 EP Augmentation to 19,000 as SBP	JWP cost estimate	Same as T	Same as T	Tertiary treatment

Richmond IWCM - Project elements of draft scenarios

No.	IWCM Issues	Location	Option	Base Case (B)	Traditional (T)	Integrated 1 (IN 1)	Integrated 2 (IN 2)	Integrated 3 (IN 3)
		Coraki	STP point source contamination control	Current capacity 1,200 EP, licensed discharge = 400kL/d Upgrade to 1,800 EP as SBP	Same as B	Same as B	Same as B	Same as B
		Rileys Hill	STP point source contamination control	Current capacity 200EP, licensed discharge = 216kL/day Renewals only as SBP	Same as B	Same as B	Same as B	Same as B
		Evans Head	STP point source contamination control	Current capacity 3,700 EP, licensed discharge = 6,50kL/d Augmentation to 11,000 as SBP	Same as B	Same as B	Same as B	Tertiary treatment
		Shire-wide	Point source contamination control	None	Liaison with DEC to enforce POEO licence requirements (no cost considered)	Same as T	Same as T	Same as T
		Shire-wide	Education	None	None	Education on sustainable land management practices (cost to be included in Gen Fund)	Same as IN 1	Same as IN 1
					Typical residential bills			
5	High operating and management costs for water and sewerage systems leading to relatively high typical residential bills	Shire-wide	Financial management	Update DSP and Financial Plan	B + Apply full cost recovery pricing	T+Designed to be self funding and less costly. Greater access to funds through diversified services and product delivery (No cost included).	Same as IN 1	Same as IN 1
		Shire-wide	Water and sewerage asset renewals	Renewal program as in SBP and budget	Condition based asset renewal	Same as T	Same as T	Same as T
					Potable water quality			
6	Compliance with current and future potable water standards	Casino	Treatment plant process upgrade	Current processes include sedimentation and filtration Addition of PAC and KMnO4 as in SBP 2005 compliances are Total coliform 79% and Chemical 96%	B + Review and adjust current operational procedure (no cost considered)	Same as T	Same as T	Same as T
		Lower Richmond	Drinking water quality	As per Rous water supply	B + Include a quality compliance clause in SLA (no cost considered)	Same as T	Same as T	Same as T
					Hydrologic stress			
7	Hydrologic stress in catchments due to unsustainable extraction particularly during low flows	Shire-wide	Regional institutional arrangements	*As in 1*				
			Emergency backup	*As in 1*				
			Demand management	*As in 1*				
		Shire-wide	Catchment management initiatives	*As in 4*				
		Shire-wide	Environmental flows	*As in 4*				
					On-site systems			
8	Need for sustainable management of onsite sewage systems	Shire-wide	On-site sewage management systems (design regulation, monitoring and incentives)	*As in 4*				
					Sewerage assets			
9	Stormwater infiltration into sewerage system	Shire-wide	Sewerage asset renewals	Infiltration / inflow reduction program	*B + As in 5 (asset renewal)*	Same as T	Same as T	Same as T
					Stormwater / rainwater reuse			
10	Need for sustainable stormwater / rainwater reuse	Shire-wide	Rainwater tanks	*As in demand management of 1 (BASIX)*				
		Shire-wide	Stormwater harvesting	*As in 1*				
					Climate change			
11	Climate change may adversely alter the rainfall and temperature patterns of the study area	Shire-wide	Risk management	None	Same as B	Sensitivity analysis on yield with reduced rainfall - (national urban water report - climate change)	Same as IN 1	Same as IN 1
		Shire-wide	Alternative water sources	*As in 1 (Regional institutional arrangements, emergency back up, demand management, effluent management, stormwater harvesting, UFW reduction)*				
					Sewerage systems			
12	Non-conformances at Coraki and Rileys Head sewage treatment plants	Coraki	Treatment plant process upgrade	*As in 4 (STP point source contamination control)*				
		Rileys Head	Treatment plant process upgrade	*As in 4 (STP point source contamination control)*				
					Demand management			
13	Poor demand management in terms of consumption and unaccounted for water	Shire-wide	Demand management	*As in 1*				
			UFW	*As in 1*				
					ASS soils			
14	ASS soils in RVC urban areas potentially impacting on sewer infrastructure	Lower Richmond	New infrastructure to consider ASS impacts	Implement DCP5 - Acid Sulfate Soils: identification, assessment and management	Same as B	Same as B	Same as B	Same as B
		Lower Richmond	Renewal program to consider ASS impacts	None	None	Renewals to consider ASS impacts	Same as IN 1	Same as IN 1

Richmond IWCM - Options considered in the draft scenarios

Category	Options	Included Scenarios	Source	Note
Regional institutional arrangement	Feasibility study on regional water supply arrangements	T, 1, 2, 3	Estimate	20% capital cost to RVC
Demand Management	No demand management	B		
	DMP - DEUS best practice two part pricing	T, 1, 2, 3	DSS	
	DMP - Rainwater tank under BASIX (for new development)	T, 1, 2, 3	DSS	
	DMP - Educational program for external water uses	T, 1, 2, 3	DSS	
	DMP - Reduction for unaccounted for water	T, 1, 2, 3	DSS	
	DMP - Shower head retrofit	1, 2, 3	DSS	
	DMP - Pernanent restriction	1, 2, 3	DSS	
	DMP - Business audit	1, 2, 3	DSS	
	Rainwater tank retrofit (for existing development)	NO	DSS	**Poor cost benefit**
	Residential audit	NO	DSS	**Poor cost benefit**
	Dual flush toilet retrofit	NO	DSS	**Poor cost benefit**
	Rous demand management strategies for lower Richmond	All	No cost	
	Regional demand management strategy	1, 2, 3	Estimate	20% capital cost to RVC
Water sharing	Contribute to DNR Macro Water Sharing Plan	T, 1, 2, 3	No cost	
Climate change	Sensitivity analysis on yield with reduced rainfall	1, 2, 3	Estimate	
Source augmentation	Augmentation planned as in SBP	All		**Can not solve issue**
	Alternate source investigation	T, 1, 2, 3	Estimate	
	Off stream storage of 3.5 GL as a pool money	NO	Design	**Design Alternative**
	Off stream storage of 3.0 GL as a pool money	NO	Design	**Design Alternative**
	Off stream storage of 2.8 GL as a pool money	1A	Design	**Special investigation**
Emergency backup	No back up planned	B		**Can not solve issue**
	Emergency backup supplies in Alternate source investigation	T, 1, 2, 3	No cost	Already included in the alternate source investigation scope of works.
Dual reticulation	Dual reticulation new development area west Casino (Bruxner Hwy)	2	Design	
	Dual reticulation new development area North Casino (Summerland Way)	2	Design	
	New development area South west of Coraki STP	2, 3	Design	50% capital cost to RVC
	New development area North east of Coraki STP	NO	Design	**Poor cost benefit**
	Broadwater dual reticulation - urban residential reuse (incl. Cogeneration plant) (145 ML/y)	2, 3	Geolink	50% capital cost to RVC
	Broadwater dual reticulation - urban residential reuse (excl. Cogeneration plant) (72 ML/y)	NO	Geolink	**Lower enviro outcomes**
	Evans Head & Woodburn dual reticulation - urban residential reuse (370 ML/y)	2	Geolink	50% capital cost to RVC
	Evans Head dual reticulation - urban residential reuse (300 ML/y)	NO	Geolink	**Combined option is more effective**
	Woodburn dual reticulation - urban residential reuse (70 ML/y)	NO	Geolink	**Combined option is more effective**
	New development area at Rileys Head	NO		**Too small scale to justify**
Indirect potable use	Casino indirect potable reuse - Route 1 (via street)	NO	Design	**Less cost-effective option**
	Casino indirect potable reuse - Route 2 (via agric land)	3	Design	
	Recharging Woodburn aquifer	3		**Not viable as par Rous**
Effluent management	Casino - Golf Course	All	SBP	
	Casino - Abbatoir	NO	Design	**Abbatoir declined offer**
	Casino - Blue Circle Cement Ltd (Dyraaba St)	T, 1, 2, 3	Design	
	Present reuse regime at lower Richmond (Coraki golf course)	B	SBP	
	Broadwater agricultural reuse (incl. Woodburn) (256 ML/y)	T, 1, 2, 3	Geolink	
	Broadwater industrial reuse (73 ML/y)	NO	Geolink	**Geolink recommendation**
	Evans Head irrigation open spaces	T, 1, 2, 3	Geolink	
	Woodburn irrigation open spaces	NO	Geolink	**Combined option is more effective**
Stormwater harvesting	Stormwater harvesting for Casino new development (Bruxner)	NO	Design	**Can not solve issue**
	Stormwater harvesting for Casino new development (Summerland)	NO	Design	**Can not solve issue**
	Encourage individual developer / industry for stormwater harvesting	1, 2, 3	No cost	
Asset renewal	Renewal as in SBP and budget	B	SBP, budget	
	Condition based asset renewal including pumps, reservoirs and bores	T, 1, 2, 3	Renewal program	
	Consideration of ASS impacts for lower richmond	1, 2, 3	Renewal program	
	Lower Richmond - Metering in distribution system	T, 1, 2, 3	Estimate	
SWM	On going implementation	All	SWM plan	
	Update SWM plan	All	SWM plan	
Catchment initiatives	Liaison with CMA to implement CAP	All	No cost	
	Implement CAP	1, 2, 3	CAP	
Flood Management	On going implementation	All	FM plan	
	Update FM plan	All	FM plan	
STP	Casino: RVC budget estimate	B	Budget	
	Casino: JWP cost review for conventional treatment	T, 1, 2	Design	
	Casino: Tertiary treatment	3	Design	

Richmond IWCM - Options considered in the draft scenarios

Category	Options	Included Scenarios	Source	Note
	Coraki: RVC budget estimate	All	Budget	
	Coraki: JWP cost review for conventional treatment	NO	Design	**RVC cost is conservative**
	Coraki: Tertiary treatment	NO	Design	**Design Alternative**
	Evans Head: RVC budget estimate	All	Budget	
	Evans Head: JWP cost review for conventional treatment	NO	Design	**RVC cost is conservative**
	Evans Head: Tertiary treatment	3	Design	
	Rileys Hill : Tertiary	NO	Design	**Design Alternative**
WTP	Casino: Review and adjust operational procedure	T, 1, 2, 3	No cost	
	Casino: Add PAC - RVC budget estimate	All	Budget	
	Casino: Add PAC: JWP cost review	NO	Design	**RVC cost is conservative**
	Lower: Include a quality compliance clause in SLA	T, 1, 2, 3	No cost	
OMA cost	SBP / budget OMA cost	B	SBP	
	OMA cost modified by JWP	T, 1, 2, 3	OMA Program	
	Regulated on-site system design approval	All	No cost	
	On-site sewage management strategy	All	Gen Fund	
	Incentives for better on site technologies	1, 2, 3	Gen Fund	
	Liaison with DEC to enforce POEO license	T, 1, 2, 3	No cost	
	Education on effluent reuse	2, 3	OMA Program	
	Education on sustainable land management practice	1, 2, 3	Gen Fund	
	Update DSP and financial plan	All	No cost	Cost is included in the SBP OMA cost
	Apply full cost recovery pricing	T, 1, 2, 3	No cost	
	Implement DCP 5: for ASS	All	OMA Program	
	Infiltration / inflow reduction program	ALL	No cost	Cost is included in the SBP OMA cost
Additional projects requested by RVC	Effluent management - Casino sporting fields (Albert park, Queens Elizabeth Park, Crawford square)	T, 1, 2, 3	Design	
	Dual Reticulation - Reynolds road	2		

TBL Assessment Criteria

Priority Issue	No.	IWCM Issue	Objective	Measure	Measure used in TBL Assessment of Scenarios
General water quality in the river as a result of landuse practices including agriculture, town (stormwater), industrial flood management, ASS etc, including blue-green algae outbreaks.	4	Existing landuse practices and urban impacts are affecting surface water quality	Improve land use management through education and demonstration.	Percentage of land and riparian vegetation protected and rehabilitated.	Number of on-site systems improved or replaced
					Contribution to improvement in surface water quality through involvement in water sharing process
					Contribution to improvement in surface water quality through involvement in catchment action plan implementation
					Achievement of water quality objectives (%)
					Implementation and regular review of SMP
					Compliance with DEC Licence limits for effluent discharge and PRPs met (%)
					Contribution to reduction in point source contamination through liaison with DEC
					Improvement in land management practices through education
The need for a water sharing plan process to consider all water users together rather than a number of processes in isolation.	2	Lack of ground and surface water sharing plans	Coordinated approach to sharing of surface and ground waters.	Integration of urban water planning and the Macro Water Sharing Process.	Contribution to improvement in surface water quality through involvement in water sharing process
Sustainable sewage treatment plant effluent management across the LGA.	3	Sustainable effluent reuse with end user requirements considered	Maximise high value (priority to substitution of potable water) reuse.	Percentage of treated effluent and stormwater reused.	Use of alternative water sources (recycled effluent, stormwater etc) (ML/a reuse volume)
					Implementation of education program for effluent reuse
Diversification of water sources.	1	Poor town water supply security	Increase number of alternative water sources.	Percentage of water drawn from alternative water sources (rainwater tanks, stormwater harvesting, effluent reuse systems).	Town water consumption per residential house assessment (kL/year; ultimate 2036)
					Use of alternative water sources (recycled effluent, stormwater etc) (ML/a reuse volume)
Poor urban (domestic and commercial) water supply security.	1	Poor town water supply security	Improved security of urban water supply.	Ability to meet 5-10-20 rule for system security.	Security of Supply - implementation of alternate bulk supply strategy or source
					Unnacounted-for-water reduction
Affordability/pricing of options.	5	High operating and management costs for water and sewerage systems leading to relatively high typical	Provide highest level of service relative to users' willingness to pay.	Percentage change in typical residential bill.	Combined 2007/08 typical residential water and sewage bill
					Asset renewal program (NPV of 30 year renewals expenditure, $'000)

Richmond Valley Council
IWCM Strategy Plan
Summary Paper
Project Reference Group Workshop 2

This paper is a summary note to the Project Reference Group (PRG) for the development of an Integrated Water Cycle Management (IWCM) Strategy Plan for Richmond Valley Council (RVC). The paper provides an overview of the outcomes of Strategy Phase PRG Workshop 2 (Evaluating draft Scenarios) which was held at RVC on 21st June 2007.

1. Introduction

RVC, with the guidance of the NSW Department of Water and Energy (DWE) is preparing an Integrated Water Cycle Management Strategy (IWCMS).

Integrated water cycle management 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 is important as it attempts to balance the current and future needs of urban and non-urban water users while reducing pressures on the available water resources.

As RVC moves towards completing the Integrated Water Cycle Management Strategy, involvement from council staff and other stakeholders is essential in determining the future direction of the Local Water Utility (LWU).

This workshop followed on from the assessment of draft scenarios carried out in PRG workshop 1 as part of the IWCM strategy planning. After that workshop, the project team finalised the draft scenarios, developed Triple Bottom Line (TBL) assessment criteria and undertook financial analysis of the scenarios.

Preliminary design and cost estimates have been prepared for all options considered. A capital works program (CWP), OMA (operation, maintenance, administration) schedule and financial model have been set up for each IWCM scenario in order to compare levels of expenditure and typical residential bills (TRB) to be paid by water and sewerage customers under each IWCM scenario. This enables the IWCM scenarios to be compared in terms of TRB or affordability.

A preliminary TBL (comprising social, environmental, economic) assessment for each IWCM scenario was prepared in order to make comparisons of environmental, social and economic outcomes between IWCM scenarios. This is based on the agreed set of objectives and measures developed at the PRG meeting held for the concept study.

2. Project Reference Group members

Workshop invitations and a briefing paper were sent to the stakeholders prior to the workshop. Attendees at the Workshop are listed in Table 1. A copy of this summary paper has been sent to each of the PRG members listed in this table.

Table 1: Attendees at PRG Workshop 2 of the Richmond IWCM Strategy

Name	Position	Stakeholder
Chris Hennessy	Regional Manager	NSW Department of Water and Energy (DWE)
Peter Corlis	Representative	Northern Rivers Management Authority
Wayne Franklin	Operation Services Manager	Rous Water
Chris Magner	Chairman	Richmond / Wilson Tidal / Freshwater users group No. 1
Steven McDonald	Representative	Richmond / Wilson Tidal / Freshwater users group No. 2
Greg Williams	Representative	Northern Co-operative Meat Company
Jan Ackerman	Representative	Casino Rate Payers and Residents Association
Daniellea Kinnish	President	Evans Head District Rate Payers and Residents Association
Gary Murphy	Director of Works	Richmond Valley Council
Mark Hesse	Water and Sewer Planning Development Engineer	Richmond Valley Council
Brian Eggins	Senior Administration Engineer	Richmond Valley Council
Michael McKenzie	Administration Engineer	Richmond Valley Council
Robyn Campbell	Consultant	JWP
Nurul Islam	Consultant	JWP

3. The workshop program

The PRG workshop followed the program set out in Table 2.

Table 2: Workshop Program.

Details	Leader
Welcome and introduction	Michael McKenzie
Objectives and agenda for Workshop 2	Robyn Campbell and Nurul Islam
Review of IWCM process, role of PRG for Workshop 2	
Review of updated draft scenarios and project elements	
TBL analysis criteria and evaluation tool	
Discussion on TBL evaluation tool and evaluation of scenarios	All facilitated by JWP
Outlining the Next Steps	Robyn Campbell and Nurul Islam
Close & Thanks	Michael McKenzie

A presentation was made by JWP (the consultant assisting RVC to prepare the IWCMS) providing some background on IWCM and the changes made in the draft scenarios in the light of previous PRG workshop outcomes (refer Attachment A). The presentation also provided an explanation of the TBL assessment criteria which had been developed from the objectives and measures agreed at the PRG meeting under the concept study. A handout with the scenario evaluation tool was distributed at the meeting and each parameter was explained.

Ranking of the draft scenarios was carried out by a voting process where each PRG member was able to vote according to relative importance (low, medium or high i.e. 0, 1 or 2 respectively) against each of the 15 parameters considered.

4. Workshop outcomes

Minor changes to the IWCM issues will be made to ensure focus on RVC activities.

The PRG reviewed the changes made in the draft scenarios after the last PRG workshop. The PRG generally agreed with the modifications. The PRG requested that the education program for effluent reuse be included in the scenario "Integrated 1".

The PRG also discussed the development of the TBL assessment criteria from the set of objectives and measures agreed at the PRG meeting for the concept study. The PRG agreed on the developed criteria and approved the evaluation tool (refer Attachment B).

The PRG voted on the relative importance of each assessment criteria and the final ranking was obtained. After the voting process, the scenario "Integrated 3" received the highest score in the TBL ranking (refer Attachment C).

However, the PRG found that the implementation of this scenario will require a relatively long lead time due to the investigations, risk assessment and consultation required for the indirect potable reuse component. The PRG considered that the scenario "Integrated 1" should be adopted as a short term solution. Also, the PRG agreed that it was worth considering dual reticulation for new development (from Integrated scenario 2) if feasible.

Therefore, a hybrid of Integrated Scenarios 1, 2 and 3 will be adopted by RVC as the preferred scenario.

RVC considers that it is important to undertake planning for the indirect potable reuse component in conjunction with a regional water supply strategy, alternate source investigation and emergency supply strategy.

The PRG agreed to review the IWCM strategy in five years time to assess the appropriateness of the measures implemented and the success of the preferred scenario.

5. Where to from here?

Considering the PRG output, the planning team will finalise the preferred scenario and prepare a strategy document.

Community information dissemination on the draft strategy will be undertaken to inform the community about the outcomes of the IWCM process and the adoption of a preferred scenario.

6. Who can I contact?

Should you have any queries regarding this PRG workshop or about the IWCM Strategy, Council's primary contact for this project is Michael McKenzie, on (02) 6660 0236, email michael.mckenzie@richmondvalley.nsw.gov.au.

7. Attachments

A – Workshop presentation.

B – TBL assessment method.

C – TBL assessment results.

Success through Partnership, Success through People

Richmond Valley Council

Integrated Water Cycle Management (IWCM) Strategy Planning

Project Reference Group (PRG)
Workshop 2
21 June 2007

www.jwp.com.au

Workshop Objectives

→ Review IWCM approach

→ Review updated draft scenarios

→ Review the options (project elements)

→ Review the preliminary TBL assessment criteria

→ Rank the five IWCM scenarios considering the social, economic and environmental costs and benefits of each scenario, and

→ Identify a preferred scenario or preferred scenario components for implementation.

What is IWCM?

JWP

Best Practice: NSW Department of Water and Energy (DWE) introduced Integrated Water Cycle Management (IWCM).

→ Integration of urban water services – water supply, sewerage and stormwater so that water is used optimally

→ Catchment considerations, not just urban

Present IWCM Strategy for RVC is being prepared to DWE guidelines.

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The IWCM Approach

We are here!

→ IWCM is based on three questions

1. What are the issues?	Concept Study
2. How do we fix the problems?	Strategy Plan
3. How do we know the problems are fixed?	Ongoing review

→ Answering the questions helps to set the direction of future service provision

→ Community, regulator and water utility input in helping to answer each question

Project Reference Group (PRG)

JWP

- → Stakeholder involvement in entire planning process
- → Identify issues
- → Identify solutions
- → Assist in developing criteria for evaluating scenarios based on triple bottom line (TBL) approach (economic, social, environmental)
- → Assist in choosing future direction

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Outcomes of Previous PRG Workshops

A PRG workshop was held on 3 May 2006 as part of RVC Concept Study. At that workshop, we:

→ introduced the concept of IWCM;
→ identified and prioritised water cycle management issues; and
→ agreed on a set of IWCM objectives and measures (for high priority issues).

Outcomes of Previous PRG Workshops

A PRG workshop was held on 29 March 2007 as part of RVC Strategy Planning. At that workshop, we:

- → confirmed a consolidated set of IWCM issues;
- → assessed merits of each identified potential option; and
- → reviewed the 5 draft scenarios developed.

Draft scenario development process

The scenarios:

- → **Base Case:** essentially "business as usual" to examine what is happening now
- → **Traditional:** solutions for water, sewerage and stormwater developed in isolation, considering current standards
- → **Integrated (3):** increasing integration of management of water, sewer and stormwater

Draft scenario development process

The process:

→ Estimation of growth (demand)

→ Identify potential solutions to solve issues

→ Preliminary feasibility of each element

→ Bundle feasible solutions into 5 scenarios: different pictures of future service provision

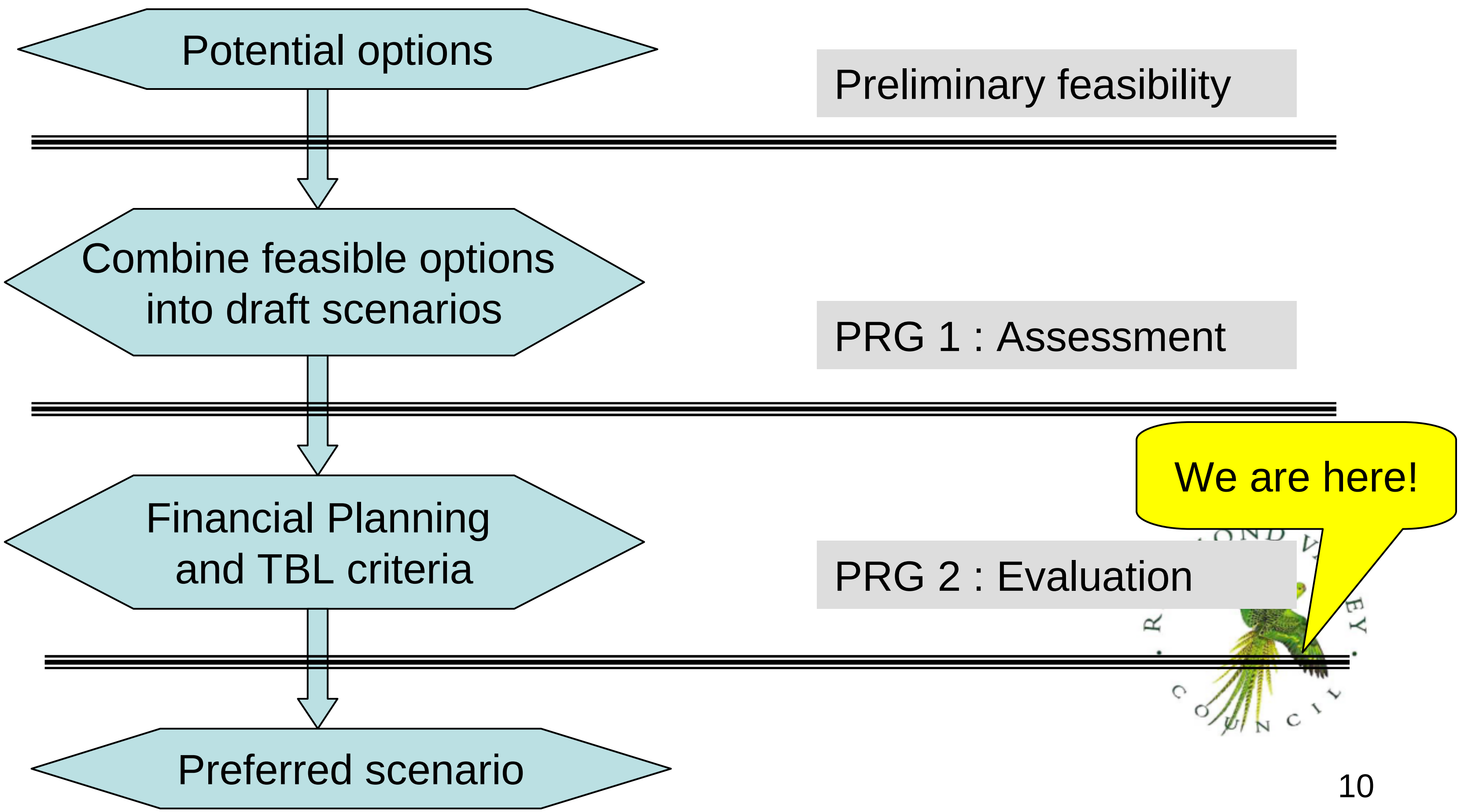
→ Financial planning

→ Cost, environmental and social impacts of each scenario varies

→ RVC, with input from the PRG needs to select a preferred direction

Draft scenario development process

The flow:



Draft Scenarios

Major changes since last PRG meeting:

→ Effluent management in Casino and lower Richmond,

→ For lower Richmond dual reticulation options 50% cost is to be borne by RVC,

→ Stormwater harvesting in Casino and lower Richmond,

→ Bore recharge is kept in the draft scenario as per RVC request,

→ Security of supply (more details later)

Source Security

- → Present average demand is 7.2 ML/d
- → Casino unrestricted yield is 7.7 ML/d
- → Casino restricted yield is 13.1 ML/d
- → Projected demand with no demand management measures 9.8 ML/d
- → Projected demand with low demand management measures 7.9 ML/d
- → Projected demand with high demand management measures 7.8 ML/d
- → Stochastic simulation model (WATHNET) predicts that source is not secure under future drought conditions (failure probability 0.5%)

Source Security Solutions

JWP

→ SBP allocation of $ 4m for source augmentation.

→ Cost for alternate source investigation included in T onwards.

→ The financial impact of including an off-stream storage on preferred scenario will be included in the report.

→ Alternate source can also act as an emergency back up.

→ Emergency drought management is included in the alternative source investigation.

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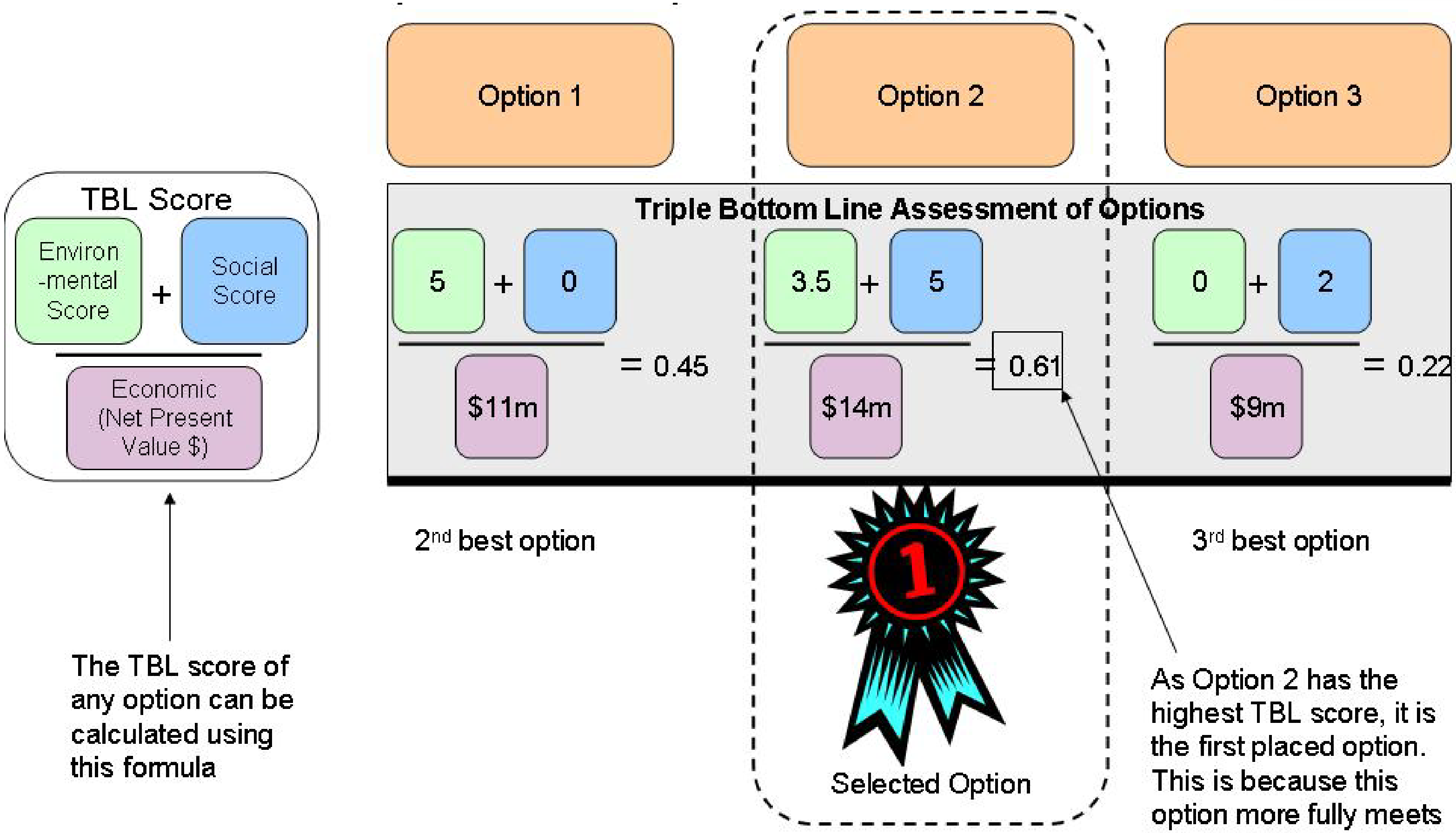
TBL analysis criteria

- In the meeting of 3 May 2006, PRG agreed on a set of IWCM objectives and measures for high priority issues.
- The measures were used to obtain a set of parameters to use for ranking scenarios (see attachment of briefing paper).
- Numerical assessment based on the measures developed (see handouts).

TBL Evaluation of scenarios



The TBL score of any option can be calculated using this formula

As Option 2 has the highest TBL score, it is the first placed option. This is because this option more fully meets the criteria set by stakeholders for every dollar spent putting the option in place.

Main Components of Scenarios

Scenario	Demand Measure	Security	Effluent Reuse
Base Case	None	None	Golf courses
Trad	Low level	Source Investigation	B + sporting fields, industry
IN1	High level	Source Investigation	B + sporting fields, industry
IN2	High level	T + Increase of security through dual reticulation	T + Dual reticulation for new development
IN3	High level	T + Increase of security through Indirect Potable Reuse	T + Indirect potable reuse

Ranking of Scenarios

Refer to handout

The Way Forward

- → Preferred Scenario
- → Workshop Summary Paper
- → Strategy Report
- → Information session for community
- → Council adoption of Strategy

JWP

Thank you

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Table G - 2: Triple Bottom Line Assessment Method.

Measure used in TBL Assessment	TBL Data Used and Results	Scoring System
Contribution to improvement in surface water quality through involvement in water sharing process	In the traditional and integrated scenarios RVC will become actively involved in the DNR water sharing process to ensure town water supplies are adequate. This is not currently undertaken (base case).	Yes = 1, No = 0
Contribution to improvement in surface water quality through involvement in catchment action plan implementation	In the integrated scenarios RVC will actively encourage (through liaison and / or catchment levy) the Northern Rivers CMA to implement the Catchment Action Plan to contribute to improvement in surface water quality. This is not currently undertaken (base case or traditional).	Yes = 1, No = 0
Contribution to reduction in point source contamination through liaison with DECC	In the traditional and integrated scenarios RVC will actively liaise with the DECC to reduce point source contamination. This is not currently undertaken (base case).	Yes = 1, No = 0
Improvement in land management practices through education	In the integrated scenarios RVC will implement a program of education on sustainable land management practices to contribute to improvement in surface water quality. This is not currently undertaken (base case or traditional).	Yes = 1, No = 0
Achievement of water quality objectives (%)	In the IWCM Concept Study, Water quality in the Richmond River was assessed against the *Water Quality and River Flow Interim Environmental Objectives* (IEOs) defined for the Richmond River Catchment. Each of these objectives is defined by identified environmental values. The extent to which each value was considered protected was ranked from very poor to good, based on the percentage of samples where the indicator criteria were met. The dominant ranking against the indicator criteria for the available data was "fair" with a result of between 50% and 74% compliance. The existing situation was therefore given a result of 65%. Projects which are considered to influence this result include STP upgrades, stormwater quality improvement and effluent reuse schemes. These projects (included in the integrated scenarios) are expected to increase compliance with the IEOs by about 10%.	Linear scoring (out of a maximum of 5). The score for each scenario is obtained by dividing that result by the maximum result (multiplied by 5).
Asset renewal program (NPV of 30 year renewals expenditure, $'000)	Asset renewal expenditure can be targeted at problem areas such as system leakage, aging assets (replacement) and can reduce long term operating costs. The existing asset renewal program (from RVC's Management Plan and Strategic Business Plan) proposes a high level of expenditure in the short term. For the traditional and integrated scenarios, the required asset renewal expenditure considers the development of a condition based asset management plan and expenditure based on asset condition, remaining asset life and depreciation. The resulting expenditure is lower than in the base case. Increased capital expenditure is considered to improve asset condition.	Linear scoring (out of a maximum of 5). The score for each scenario is obtained by dividing that result by the maximum result (multiplied by 5).

Measure used in TBL Assessment	TBL Data Used and Results	Scoring System
Combined 2007/08 typical residential water and sewage bill	The 2007/08 typical residential bills (TRB) were determined using FINMOD, the financial model developed by DWE for local water utilities for water supply and sewerage (in 2006/07 $). The TRB is the annual bill paid by a residential assessment with typical water use which is not a vacant or pensioner assessment. The result is expressed as the increase above the 2006/07 combined TRB of $1,204 per assessment.	Non-linear scoring based on assumed willingness-to-pay the increase in TRB. An increase of less than 3% received the maximum score of 5. Between 3% and 6% received a score of 4.5, 6% - 12% received a score of 4.0, 12% - 18% received a score of 3.5, and 18% - 25% received a score of 3.0.
Compliance with DECC Licence limits for effluent discharge and PRPs met (%)	RVC currently plans to upgrade its STPs to meet licence limits and Pollution Reduction Programs (PRPs). All scenarios include these upgrades so all are expected to result in 100% compliance.	Linear scoring (out of a maximum of 5). The score for each scenario is obtained by dividing that result by the maximum result (multiplied by 5).
Implementation and regular review of SMP	RVC currently (base case) has a stormwater management plan prepared in 2005 which is updated on a periodic basis. In the integrated scenarios RVC will implement the existing stormwater management plan and regularly review the outcomes and stormwater requirements to contribute to improvement in surface water quality.	Yes = 1, No = 0
Number of on-site systems improved or replaced	RVC currently regulates the sewage management practices in new development areas without reticulated sewerage and implements the On-site Sewage Management Strategy to identify systems at risk of environmental or health impacts. This is expected to result in improvements to 50% of the on-site systems. In the integrated scenarios, RVC will provide incentives for new advanced on-site systems in areas with high risk. This is expected to result in approximately 25% of systems improved or replaced.	Linear scoring (out of a maximum of 5). The score for each scenario is obtained by dividing that result by the maximum result (multiplied by 5).
Security of Supply - implementation of alternate bulk supply strategy or source	Currently (base case) the water supply source is not secure. The traditional and integrated scenarios include investigation of an alternate source to provide security. In the integrated 2 and 3 scenarios, additional security is provided by dual reticulation and indirect potable reuse respectively.	Alternate bulk supply strategy: Yes = 1, No = 0. Alternate source: Yes = 1, No = 0.

Measure used in TBL Assessment	TBL Data Used and Results	Scoring System
Unaccounted-for-water reduction	Currently, reduction of unaccounted-for-water (UFW) is achieved through asset renewals (replacement of leaking assets). Active UFW reduction is included in the demand management programs for the traditional scenario (low level) and the integrated scenarios (high level).	Yes = 1, No = 0
Use of alternative water sources (recycled effluent) (ML/a reuse volume)	The volume of water sourced from recycled effluent has been determined for each scenario. This is expressed as the percentage replacement of raw water extracted at the end of the planning horizon (2036) determined from expected production of water.	Linear scoring (out of a maximum of 5). The score for each scenario is obtained by dividing that result by the maximum result (multiplied by 5).
Implementation of education program for effluent reuse	Currently there is no education program implemented by RVC to encourage the sustainable use of recycled water. The integrated scenarios include an education program.	Yes = 1, No = 0
Town water consumption per residential house assessment (kL/year; ultimate 2036)	RVC does not currently implement a demand management program. Low level demand management (with BASIX, best-practice pricing, education and UFW reduction) is included in the traditional scenario. Higher level demand management is included in the integrated scenarios (also including showerhead retrofit, business audit and water conservation order). From the demand modeling undertaken for the IWCM Strategy, the expected town water consumption for residential houses (single dwellings) at the end of the planning horizon (2036) was determined. The result is expressed as the town water savings from the base case consumption.	Linear scoring (out of a maximum of 5). The score for each scenario is obtained by dividing that result by the maximum result (multiplied by 5).

TBL Assessment

No	Measures	Criteria Weighting	Base Case	Traditional	Integrated 1	Integrated 2	Integrated 3
			Scenarios				
1	**Contribution to improvement in surface water quality through involvement in water sharing process**	9.0	No	Yes	Yes	Yes	Yes
	Score		0	1	1	1	1
2	**Contribution to improvement in surface water quality through involvement in catchment action plan implementation**	13.0	No	No	Yes	Yes	Yes
	Score		0	0	1	1	1
3	**Contribution to reduction in point source contamination through liaison with DEC**	4.0	No	Yes	Yes	Yes	Yes
	Score		0	1	1	1	1
4	**Improvement in land management practices through education**	7.0	No	No	Yes	Yes	Yes
	Score		0	0	1	1	1
5	**Achievement of water quality objectives (%)**		65	65	75	75	75
	Score	14.0	4.3	4.3	5.0	5.0	5.0
6	**Asset renewal program (NPV of 30 year renewals expenditure, $'000)**		20,244	8,906	8,906	8,906	8,906
	Score	11.0	5.0	2.2	2.2	2.2	2.2
7	**Combined 2007/08 typical residential water and sewage bill** 2006/07 combined TRB $1,204		$1,270	$1,225	$1,230	$1,400	$1,450
	% increase in medium term TRB (above 2006/07)		5%	2%	2%	15%	19%
	Score	12.0	4.5	5.0	5.0	3.5	3.0
8	**Compliance with DEC Licence limits for effluent discharge and PRPs met (%)**		100%	100%	100%	100%	100%
	Score	10.0	5	5	5	5	5
9	**Implementation and regular review of SMP**		No	No	Yes	Yes	Yes
	Score	7.0	0	0	1	1	1
10	**Number of on-site systems improved or replaced**		50%	50%	75%	75%	75%
	Score	3.0	3.3	3.3	5.0	5.0	5.0
11	**Security of Supply - implementation of alternate bulk supply strategy or source**		0	1	1	2	2
	Score	20.0	0.0	2.5	2.5	5.0	5.0
12	**Unnacounted-for-water reduction**		No	Yes	Yes	Yes	Yes
	Score	9.0	0	1	1	1	1
13	**Use of alternative water sources (recycled effluent) (ML/a reuse volume)**						
	% replacement of total raw water extracted (ultimate 2036)		17%	34%	34%	55%	95%
	Score	16.0	0.9	1.8	1.8	2.9	5.0
14	**Implementation of education program for effluent reuse**		No	No	Yes	Yes	Yes
	Score	3.0	0	0	1	1	1
15	**Town water consumption per residential house assessment (kL/year; ultimate 2036)**		202	81	71	71	71
	% savings		0%	60%	65%	65%	65%
	Score	13.0	0.0	4.6	5.0	5.0	5.0
	Capital cost over thirty years (NPV $'000)		**$75,364**	**$66,645**	**$66,645**	**$76,980**	**$79,729**
	Operating cost over thirty years (NPV $'000)		**$151,467**	**$155,761**	**$156,268**	**$167,412**	**$177,035**
	TBL Score		**16.1**	**24.7**	**27.9**	**28.5**	**28.8**
	Ranking		**5.0**	**4.0**	**3.0**	**2.0**	**1.0**

Appendix C

Demand Forecasting Report

Success through Partnership
Success through People

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Richmond Valley Council

Water Demand Analysis and Water and Effluent Forecasting Report

April 2008

RICHMOND VALLEY COUNCIL

Richmond Valley Council

Water Demand Analysis & Water and Effluent Forecasting Report

April 2008

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Document Control

Revision	Author	Reviewer	Approved for Issue		
			Name	Signature	Date
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Rev 2	R. Campbell	R. Campbell	R. Campbell	R.C.	15/4/2008

Executive Summary

This report sets out the Water Demand Analysis and Water and Effluent Forecasting undertaken for Richmond Valley Council (RVC) as part of its Integrated Water Cycle Management (IWCM) Plan. This report focuses on customers serviced by the Casino water supply system and excludes those within the RVC LGA connected to Rous Water, a local bulk water supplier.

The key components of this study included:

- Data collection and review: to establish the adequacy of available water production, consumption, restriction and demand management information held by RVC;
- A water demand analysis: to climate-correct RVC's historical water demand records, establish the level of unaccounted for water, and establish the categories of existing RVC consumers and the breakdown of their water use activities;
- Water demand and effluent forecasts: to identify the drivers of future demand in the RVC service area in order to establish a baseline forecast of the water demands and effluent flows that would be expected in the service area over the next 30 years; and
- A water efficiency analysis: to determine a preliminary cost-benefit assessment of potential water efficiency measures, and assess the impact of a set of four potential water saving programs (demand-side management programs) for Casino.

The key outcomes of this analysis are set out in Table 1.

Table 1: Key Outcomes and Recommendations of the Analysis.

Element	Key outcomes and recommendations
Data collection and review	RVC should review their customer consumption database to ensure customers are appropriately assigned to customer categories reflective of the DWE reporting requirements. This is particularly significant for "business" assessments and also "multi-residential" dwellings. RVC should also consider a review of water loss in terms of unbilled or unmetered water use. This may require the calibration of bulk and customer meters, and a thorough review of the customer database and assessment records. This will enable UFW to be addressed in the most cost-effective and targeted manner.
Water demand analysis	The climate corrected production for Casino water supply system was calculated to be 2,638 ML/a between July 1996 and June 2006. Average metered potable consumption for the Casino area was 2,017 ML/a between 2004/05 and 2005/06. Therefore, the climate corrected UFW was calculated to be 24% of production. The UFW value may not only represent actual water loss and leakage, but also inaccurate and/or incomplete metering of production and consumption volumes. It is also likely that ageing infrastructure is causing some leakage. Residential demand accounts for approximately 46% of the total metered consumption volume in the Casino water supply system. Hence, the adopted demand management program should also consider business water use to ensure its effectiveness.

Element	Key outcomes and recommendations
Water demand and effluent forecasts	Modest population growth of 1.2% from 2005-2030 is predicted and is expected to be the most important driver of demand over the next 30 years. Baseline water forecasts predict that annual average production in the Casino water supply scheme will rise from 7.2 ML/d in 2006 to 9.8 ML/d in 2036 (a 36% increase in water use). Peak demand will become 20.5 ML/d from 15.2 ML/d over the next 30 years which is an increase of approximately 35%. The baseline water forecasts should be reviewed to include the measured impact of BASIX and best-practice pricing once these mandatory requirements have been implemented by RVC.
Water efficiency analysis	By applying a number of individual demand management measures to the baseline forecast and examining the costs and benefits (in terms of both dollars and water saved) the relative merit of each measure was determined for the Casino water supply system. The best performing individual measures were progressively bundled together as a number of efficiency programs. The most cost-effective measures for reducing demands in the Casino system in addition to the mandatory requirements of BASIX and best-practice pricing is implement a UFW reduction program in conjunction with a complementary outdoor water use education program. WSP 2 is expected to reduce the predicted baseline annual average demand by up to 19% by 2036 based on current demand trends. However, further review of costing for each water efficiency measure is required to finalise the cost benefit analysis used to develop these water saving programs. This will be undertaken during the ongoing review and update of the RVC Demand Management Plan.

Table of Contents

1 Introduction

In 2006, Richmond Valley Council (RVC) engaged JWP to develop an Integrated Water Cycle Management (IWCM) Strategy Plan. As part of that commission, a study of historical demand analysis and forecasts of future water demands and effluent volumes was undertaken. This report sets out the findings of that study.

As a local water utility (LWU), RVC provides bulk and reticulated water services to the town of Casino. The remaining towns and villages including the towns of Evans Head, Coraki, Broadwater/Rileys Hill and Woodburn are serviced by Rous Water. In these areas, Rous Water plan and implement their own demand management program. As a result, this study focuses only on the current and future water demands and effluent volumes of the Casino water supply system.

1.1 Study Aims

The aims of this study were to:

- Climate-correct historical water demand records for the township of Casino. This would ensure that appropriate historical demands are used for developing forecasts of future demand;
- Establish the level and potential sources of unaccounted for water;
- Examine the categories of existing RVC water consumers and establish the breakdown of their water use activities;
- Build an end-use model of the water demand for the Casino water supply. This will be used to forecast future demands and to develop appropriate water saving programs;
- Identify the drivers of future water demands for the Casino water supply. This analysis is important for developing baseline forecasts of the water demands and effluent flows that could be expected over the next 30 years;
- Develop a preliminary cost-benefit assessment of potential water saving measures. From this analysis, potential water saving programs for RVC can be developed and applied to the baseline forecasts of water demands; and
- To identify the water savings that could be achieved by each Water Savings Program (WSP), and the consequent impact on effluent flows.

The water demand and effluent forecasts developed will be an important input into the development of a demand management program and the assessment of the future water and sewerage infrastructure requirements of RVC's customers. In addition, this study identifies potentially replaceable non-potable end-use for water and the volume of the potential effluent resource available.

1.2 Important Demand Analysis Terms

Different organisations use different terms when discussing water demands. For consistency, the following definitions (Table 2) have been adopted for the purposes of the analysis presented in this report.

Table 2: Important Demand Analysis Terms.

Term	Adopted definition
Production	Total water that is passed through bulk meters and treatment facilities into the reticulation system.
Consumption	Total water passing from reticulation mains into customer's service lines and captured by a water meter.
Distribution	System used for conveying bulk water to a water utility.
Reticulation	System used for conveying water from the distribution points to the customer's service lines.
Demand-side management	Process of improving efficiency in demand for services rather than augmenting the supply available. Sometimes simply referred to as demand management.
External use	Water that is used for irrigation and cooling, and hence is influenced by climate.
Internal use	Water that is used within buildings and any other water consumption that is not influenced by climate. This demand is assumed to remain unchanged by seasonal effects.
Non-revenue water	The difference between the amount of water produced and that which is metered as consumed and subject to the utility's pricing structure.
Unaccounted for water (UFW)	The difference between metered consumption and production. Strictly speaking, a reticulation system with no consumption metering would have 100% unaccounted for water.

1.3 Structure of this document

The scope of this study can be summarised as follows:

- **Section 2 System Background:** sets out details of the RVC water supply system;
- **Section 3 Data Collection & Review:** sets out the available sources of data for the analysis and the limitations of the data set;
- **Section 4 Water Demand Analysis:** establishes historical water production (corrected for climate), water consumption and unaccounted for water in the RVC supply system;
- **Section 5 Water Demand and Effluent Forecasts:** examines the consumption drivers for the RVC service area and establishes a baseline forecast of the resultant water demands. In addition, consideration is also given to the resultant effluent generated;
- **Section 6 Water Efficiency Analysis:** details a cost-benefit assessment of a variety of water efficiency measures that could be used to reduce the baseline forecast of water demands; and
- **Section 7 Conclusions:** sets out the pertinent aspects of the analysis for RVC's business planning activities.

2 System Background

RVC is the local water utility (LWU) responsible for the extraction, treatment and reticulation of water to the town of Casino. Other towns and villages within Richmond Valley local government area (LGA) with reticulated water supplies (Coraki, Broadwater/Rileys Hill, Evans Head and Woodburn) are serviced by the Mid and Lower Richmond River (MLRR) bulk water supply scheme operated by Rous Water.

All sewerage services within the Richmond Valley LGA are owned and operated by RVC.

Table 3 describes the two water supply systems servicing the Richmond Valley LGA and their capacities.

Table 3: Water Supply Systems

Water Supply System	Service Area	Ultimate Treatment Works Capacity		Ultimate Transfer Works Capacity
		ML/d	ET	ET
Casino	Casino	23	7,667	6,655
MLRR	Coraki	Water treated by Rous		606
	Broadwater/Rileys Hill			246
	Evans Head			2,428
	Woodburn			275

Source: (JWP, 2006b)

As Rous Water undertake their water planning and implement their own demand management program within the MLRR service area, this demand analysis and forecasting report focuses on the Casino water supply system only.

Casino Water Supply

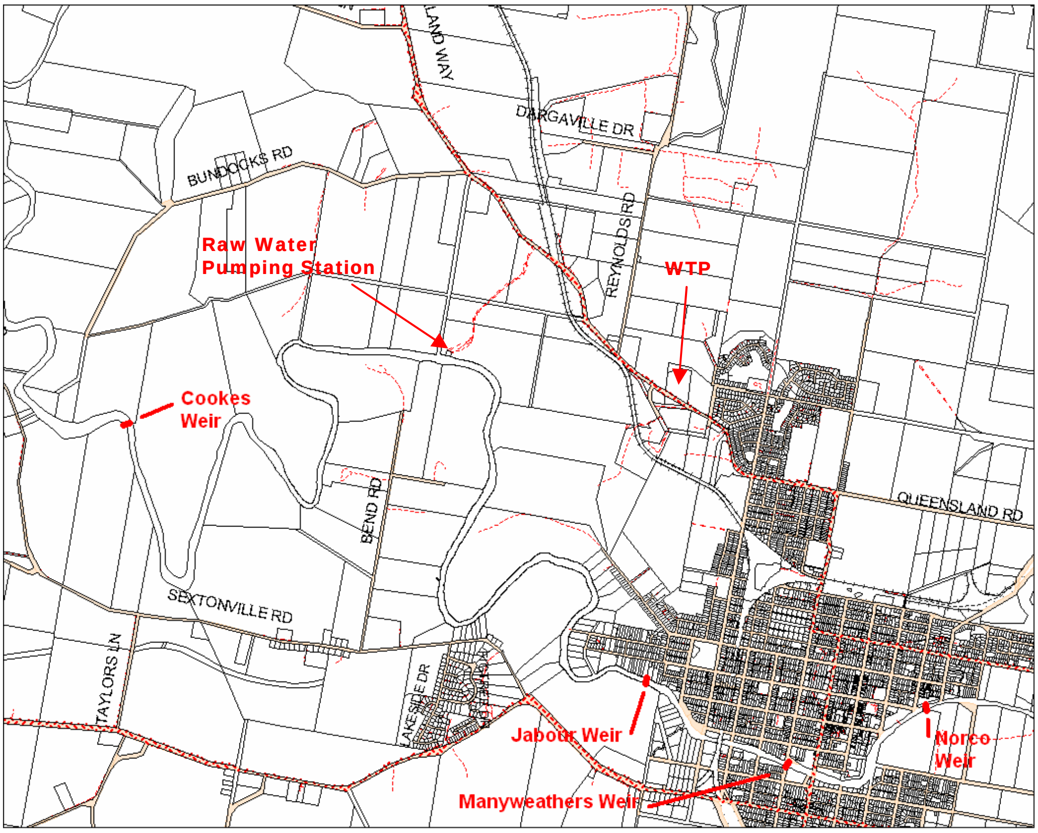
The Casino system provides reticulated water supply to 5,265 assessments in the town of Casino. From time to time, the system also sells bulk water to some residential rural properties to top up their rainwater tanks.

Raw water for the Casino system is extracted from the Richmond River 5.5 km upstream of Jabour Weir which is located about 9 km upstream of the Casino central business district (Figure 1).

The weir is an on-stream storage and has a capacity of 1,623 ML, which is approximately 13 weeks supply (based on 1994 figures). The storage could be supplemented by Toonumbar Dam. However, there is no formal agreement with the Department of Natural Resources (DNR) for the use of this supply and it has not been used before. A verbal commitment from DNR exists to use Cookes Weir to supplement Jabour Weir when level 5 restrictions are in place. At other times, the Cookes Weir spillway is drowned out by normal Jabour Weir water levels. It is assumed that the Cookes Weir will not be drowned when level 5 restrictions are in place. Cookes Weir has a capacity of 500 to 1000 ML.

RVC holds a licence to extract 3,427 ML/year from the Richmond River at Jabour Weir. A licence to extract town water from Manyweathers Weir is also held by RVC, to serve as a potential water source during periods of town water supply restrictions. Manyweathers Weir was the previous town water supply source for the area.

Figure 1: Location of Jabour, Cookes and Manyweathers weirs.



The Casino system has an overall treatment capacity of 23 ML/d. The raw water is pumped from the Jabour Weir pool and transported through a 500 mm rising main to the Casino Water Treatment Works (WTW) constructed in 1985 and located adjacent to the Summerland Way north west of Casino. Raw water is treated at this plant by sedimentation, filtration and disinfection. The quality of the produced water generally complies with the Australian Drinking Water Guidelines (ADWG) standards. However, low compliance has been occasionally reported for total coliforms and chemical parameters. Treated water is stored in four reservoirs, three of them located at North Casino and one at South Casino and subsequently distributed through a network of pipes to RVC's customers.

3 Data Collection and Review

Data available for undertaking this demand analysis, including data sources and limitations, are set out in Table 4.

Table 4: Water Demand Analysis Input Data.

Data	Source	Description (including limitations)
Production records	RVC	Historical daily metered records of water pumped between 1/7/1995 to 30/6/2006 for the Casino water supply system. Limited records of maintenance or calibration of this meter exist.
Climate records	Silo Data Drill	Daily rainfall, evaporation and temperature records for Lat: -28.85, Long: 153.05 (Casino). Records prior to 1970 are of poor quality and have not been used.
Population data	ABS Census	Census information from 1991, 1996 and 2001.
	RVC	Population projections sourced from RVC Strategic Business Plan for water supply. 80% of the documented population has been assumed based on discussions with RVC to exclude rural residential assessments for the demand analysis.
Consumption records	RVC	Customer database of metered consumption containing tri-annual billing records (in kilolitres) for 2004/05, 2005/06 and the first quarter of 2006/07.
Meter losses	RVC	No data was available on specific losses related to aged or inaccurate customer meters. No losses have been reported in the 2004/05 DWE Performance Reports, however 72 L/d per connection leakage was noted.
Water restrictions	RVC	Records of the date and level of restrictions imposed from 2002 to March 2006 were available. Restrictions have been implemented annually and in 2003/04 were in place for 35% of the year. These restriction periods are illustrated in Figure 3.
Efficiency programs	RVC, Rous Water	Excluding user pays pricing, RVC currently does not implement any water efficiency programs within their service area. However, Rous Water does implement a comprehensive water savings program for the MLRR system. Parts of this program have been extended by Rous Water to cover the Casino water supply.

4 Water Demand Analysis

The purpose of the water demand analysis is to establish how water has historically been used in the RVC service area. From a detailed understanding of historical use it is possible to begin to predict (or forecast) expected future water demands.

The water demand analysis presented here considers both water produced and water consumed. The analysis also considers the difference between these two amounts (the produced and the consumed), which is known as unaccounted for water (UFW). Similarly, the seasonal (external) and fixed (internal) components of water demand are also taken into account in the analysis.

The analysis was undertaken in the following steps:

- Correction of historical water demand records for Casino to identify the impact of climate on water demand in order to establish an appropriate peak to average day demand ratio;
- Determination of total annual water consumption;
- Estimation of UFW; and
- Determination of the breakdown of total consumption by customer category and within customer categories.

Details of each of these steps are set out in the following sections.

4.1 Water Production Analysis

RVC provided daily water production data for the Casino water supply system for this analysis. This production data extended from the 1st of July 1995 until the 30th of June 2006 and was of good quality. The data showed weekly cycles in water extraction, with lower volumes being extracted on weekends and on public holidays. This highlights the operation methods of the Casino system.

The record included volumes prior to and after treatment. Raw water volumes have been used to calculate the long-term average production using the NSW Department of Water and Energy (DWE, formerly Department of Energy, Utilities and Sustainability, DEUS) Climate Correction Model. The following sections describe the process and the results of the climate correction.

4.1.1 DWE Climate Correction Model Overview

The NSW Department of Water and Energy (DWE) has developed climate-correction software suitable for use by LWUs in analysing water production and effluent generation data. The DWE Water Demand Trend Tracking and Climate Correction Model and Manual (Version 10) were utilised for the purpose of climate-correcting the water production records available for the Casino water supply scheme (DLWC, 2002 a).

The model analysis is undertaken in four main steps:

- Model calibration – development of a baseline from a short-time series of recorded production data;
- Hindcasting – the projection of the calibrated model through historical climate data to establish the statistical parameters of climate normalised baseline year consumption;

- Trend-tracking – comparison of observed and model predicted production data to establish trends in observed changes in fixed and seasonal demand; and
- Peak and average day demand and their ratio – calculation of the peak day and average day demands, as well as the peak day to average day ratio (PDD:ADD) based on the results of the trend tracking process.

4.1.2 Model Calibration

The purpose of this task is to develop a model based on historical daily production data to determine trends in the baseline production volumes for the Casino WTP. The following flowchart illustrates the calibration process and input data used.

Table 5 lists the results of from the calibration of the model.

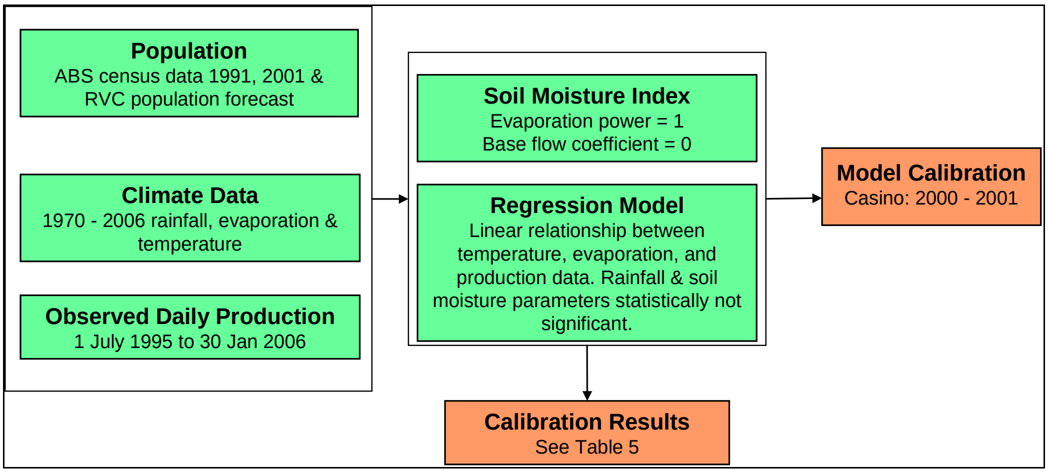


Table 5: Model Calibration Results.

Parameter	Value	Discussion
Soil moisture model correlation coefficient		
Soil moisture model correlation coefficient	0.16	Represents correlation of soil moisture and climate data. Result of 1 represents a perfect correlation, while 0 represents no correlation.
Regression model calibration		
R^2	0.658	Because of the water restriction in place, Model shows a moderate relationship between climatic parameters and historical daily production records.
Standard error of y estimate	124.37	
Model F Statistic	172.75	
Degrees of freedom	360	
Durban Watson statistic	1.881	Durban Watson statistic determines whether residuals are randomly distributed or not. Durban Watson < 2.0 suggests that residuals are not random and that some serial auto correlation exists within the model.

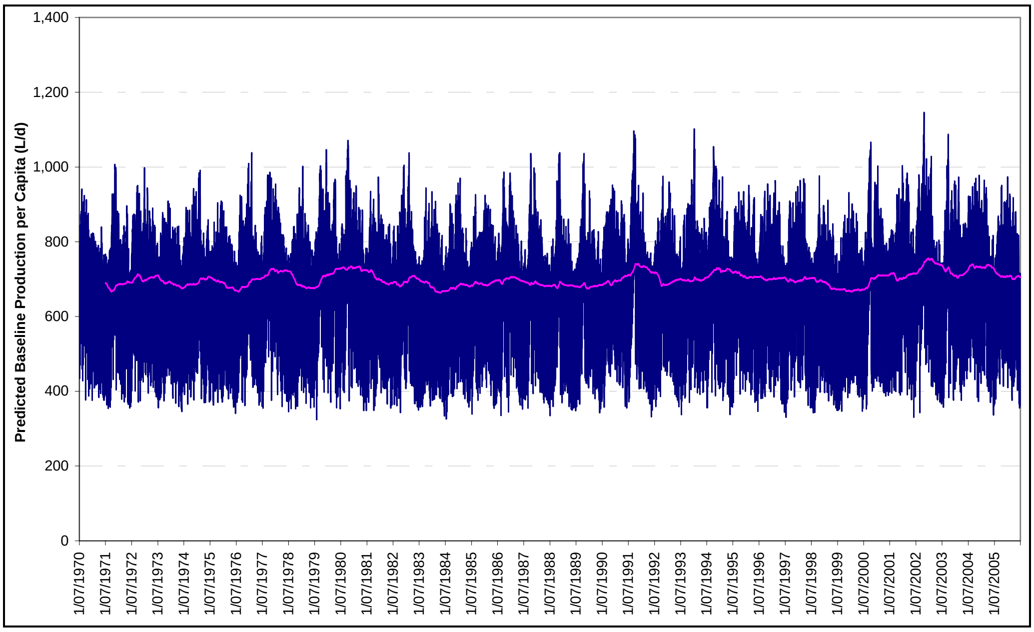
Parameter	Value	Discussion
T statistic – maximum temperature	1.85	Statistically significant climatic parameter. T => 1.6
T statistic – evaporation	1.58	Statistically not significant climatic parameter. T is not => 1.6

4.1.3 Hindcast

The hindcast set out in Figure 2 was developed by projecting the historical climate record available through the calibrated regression model, as developed in Section 4.1.2. In so doing, the hindcast represents the demand that would have been expected to have occurred over this period. In this sense, the hindcast extends the production data record.

The hindcast demonstrates that the long-term mean production per capita for the Casino water supply system is 700 L/d.

Figure 2: Regression Model Hindcast for Casino.

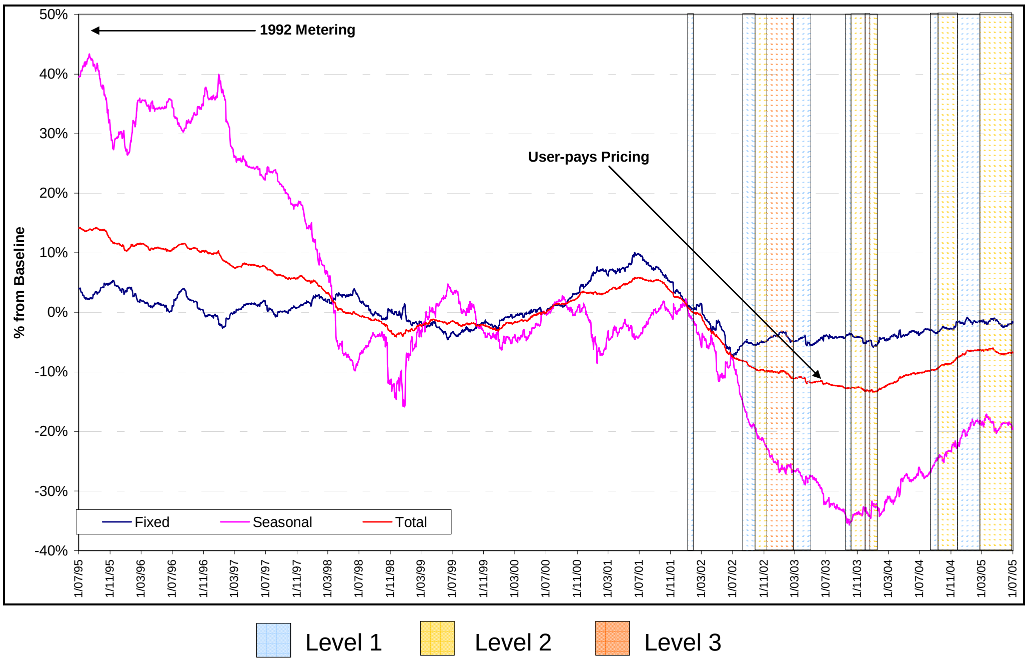


4.1.4 Climate Correction of Water Production Records

The calculated percentage change in seasonal demand is illustrated in Figure 3. Also included in the graph are all the water restrictions enforced by RVC between 2002 and 2005. From this, it can be seen that water restrictions have been a regular occurrence during this time period.

The climate-corrected production volume for the Casino water supply scheme was found to be 2,638 ML/annum.

Figure 3: Percentage in fixed and seasonal demand relative to the baseline total demand year for Casino including the implementation of water restrictions and user pays pricing.



4.1.5 Peak to Climate Corrected Average Day Demand Ratio

Climate-corrected demand was used to estimate the peak day to average day demand ratio (PD:ADD) for the Casino systems. The PD:ADD for the Casino water supply system is 2.1.

4.2 Water Consumption Analysis

RVC provided two full years (04/05 to 05/06) of consumption data and the billing of first quarter for 2006/07 from the Casino consumption database. The customer database identified the customer categories set out in Table 6.

Table 6: RVC Customer Categories

Single Residential;	Single Business;
Multi Residential;	Multi Business;
Vacant Residential;	Vacant Business; and
Rural;	Park.

The dataset also contained the following data for each customer account:

- Meter number;
- Account number;
- Street and Locality;
- Water and Sewerage Tariff; and
- Consumption in kL.

4.2.1 Identification of Customer Categories and their Water Use

For the purposes of undertaking an end-use based forecast of water demands, it can be useful to break these customer categories down further to better isolate customers who use water in similar ways. DWE recommends that consumption be split into six categories as listed below:

Table 7: DWE Recommended Consumption Categories.

Single residential;	Institutional;
Multi-residential;	Industrial; and
Commercial;	Public parks and gardens.

RVC generally complies with the DWE customer categories, however the "business" category should be split further into institutional, industrial and commercial assessments. It is recommended that RVC undertake a review of its customer database prior to the next revision of the demand management plan.

The breakdown of assessments and consumption between categories from RVC's customer database is summarised in Table 8.

Table 8: Summary of Customer Database

Customer Categories	Consumption (%)	Assessments	Consumption (kL/assessment)
Single Residential	42%	4,165	201
Multi Residential	4%	347	211
Business	52%	598	1761
Rural	1%	60	407
Parks	1%	115	246
Total	**100%**	**5,285**	**382**

These consumption figures and percentages are based on the average of the 2004/05 and 2005/06 financial years, which are assumed to be representative of the typical annual demand. Water restrictions have been enforced yearly in Casino since 2002 with restrictions in place for 35% of the financial year 2003/04 and most of 2004/05.

4.2.2 Breakdown of Customer Category Water Use

Within each customer category the total water consumption can be separated into water consumed internally (i.e. toilets, baths, showers, taps, sinks, dishwashers, laundry) and water consumed externally or in relation to climate (outdoor irrigation, pools, fountains, wash-downs, car washing, evaporative air conditioning). External water use tends to vary seasonally and may also be more responsive to water prices and water efficiency education programs. Internal water use tends to be more constant throughout the year and is generally less sensitive to demand management techniques.

However, as meter readings for RVC were not provided in quarterly format, it was not possible to determine the difference in seasonal demands. Therefore, the following external and internal consumption splits have been used.

Table 9: Assumed Breakdown of Internal and External use by Customer Category.

Customer category	Internal (%)	External (%)
Single Residential	50	50
Multi Residential	50	50
Business	80	20
Rural	80	20
Park	20	80

No internal end-use data is available for RVC. Therefore the following assumptions have been made regarding the split of internal water use within residential assessments, based on the Australian Bureau of Statistics end-use study (ABS, 2005).

Table 10: Assumed breakdown of residential internal water use.

Internal Use	% of Internal Consumption
Shower	31
Toilet	28
Laundry	19
Kitchen	12
Internal Leakage	10

4.3 Unaccounted for Water Estimates

UFW is the difference between water production and metered water consumption. The current total water production for the Casino water supply system, including the impact of climate correction is 2,638 ML/a. The average consumption for 2004/05 and 2005/06 is 2,017 ML/a. The available data for 2006/07 (one billing quarter) indicates that consumption for 2006/07 may be as low as 1,831 ML/a which is assumed to be due to water restrictions. However, this is much lower than that recorded in previous years and hence will not been used for further consumption modelling. Table 11 details the production and consumption volumes for the Casino system.

The results of this analysis estimate an UFW of 24%, using the long term average production volume from the climate correction model. This value is higher than the DWE Best Practice target of UFW of 10%. The 24% UFW may not only represent actual water loss and leakage, but also inaccurate and/or incomplete metering of production and consumption volumes. It is also likely that ageing infrastructure is causing some leakage.

Table 11: Unaccounted for water analysis for the Casino water supply system.

Year	Production (ML/a)	Consumption (ML/a)	UFW (ML/a)
2004/05	2,478	2,009	469 (19%)
2005/06	2,535	2,025	510 (20%)
Average	2,507	2,017	490 (20%)
Climate Corrected*	2,638	2,017	621 (24%)

* Long term average production volume. This value used in the DSS.

5 Water Demand and Effluent Forecasts

The purpose of developing forecasts of water demand (and the subsequent effluent expected to be generated in a service area) for the future is primarily to understand the likely requirements which will need to be met by the supplier both in terms of water sources and water supply infrastructure.

The production of a baseline water demand and effluent forecasts was undertaken in the following steps:

- An analysis of historical and expected future demand drivers; and
- An application of these drivers to the current level of consumption of each of the customer categories expected to be impacted by these drivers.

5.1 Demand Drivers

Before forecasts of the water demands can be developed, it is important to have a good understanding of the drivers influencing water demands.

There are several key demand drivers that may influence trends in water demand in the Casino service area. These include population growth, household size, occupancy rate, dwelling mix, and the uptake of water efficient appliances. Each of these drivers is discussed in the following sections.

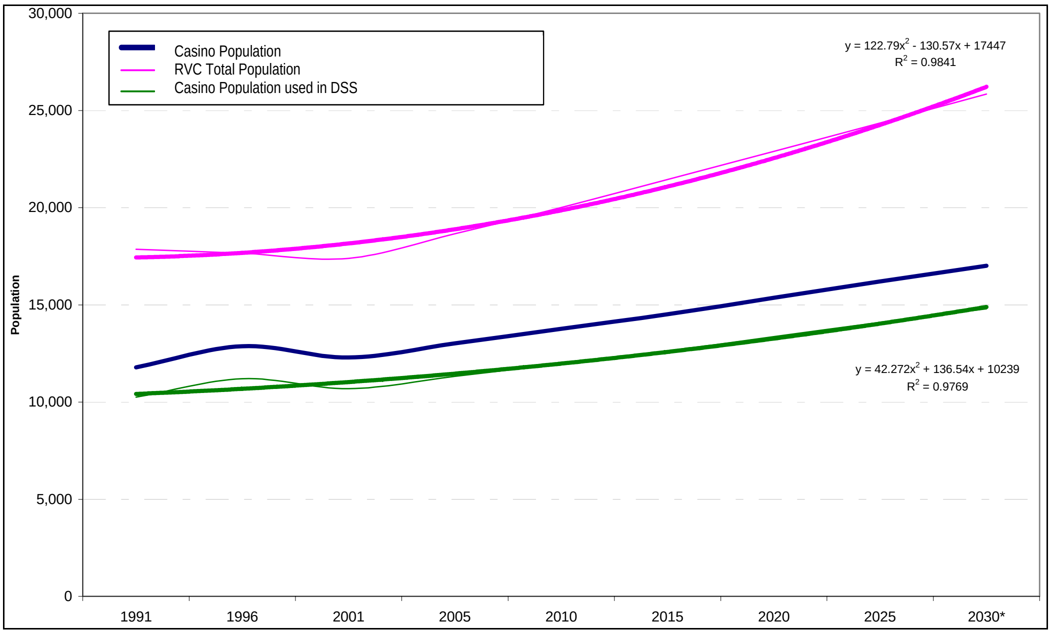
5.1.1 Population

Changes in population growth, either increases or decrease, can significantly impact on the level of water demand in a service area. Historical population information and existing population forecasts are one way of assessing the likely influence of population as a demand driver.

In 2006, RVC updated its Strategic Business Plan for Water Supply and Sewerage services. These growth projections were based on statistics, the Department of Planning (former DIPNR) population projections, DWE data and the 2005 Urban Land Release Strategies (ULRS) for Casino. Although historical trends show a decline in population growth between the years 2000 and 2005, the number of approved new dwellings remained positive and growing during the same period. It is estimated that Casino will experience a growth rate of approximately 1.57% between 2005 and 2030. The population projection, as set out in Figure 4, has been adopted for this study.

Following on from discussions with RVC, 80% of the population has been used in the demand modelling which excludes some rural residential assessments and those customers that are not connected to the Casino sewage treatment plant.

Figure 4: Historical population data and population forecast for RVC.



*2025-2030 growth has been estimated based in the same average annual growth rate for the 2020-2025 period.

5.1.2 Dwelling Mix

As the number of individuals in an average household decreases (which is a common trend in Australia), so may the internal water use of individual households. However, if residential development occurs at a higher rate than population growth, particularly single residential dwellings, then the total volume of water used for external purposes may increase as the number of gardens increase.

The average occupancy rate for Casino is 2.4 and 1.5 for single and multi-residential dwellings respectively. These have been assumed based on ABS census data as well as the population figures (see Section 5.1.1) and the assessment numbers from the customer database. For the purpose of study, these occupancy ratios have been assumed constant for the next 30 years.

Single residential dwellings are more likely to have a higher water use per capita than multi-residential dwellings. This is a result of lower external water use, due to either smaller or no gardens in multi-residential dwellings.

Between the 1996 and 2005, the type of residential dwellings within the Casino district has remained constant with approximately 79% of all assessments in 2005 being single residential assessments. This dwelling type split is not expected to change significantly over the next 30 years.

5.1.3 Water Efficient Appliance Uptake

Over time, the number of water using appliances in homes has increased. In addition, ownership levels for such appliances, including fixed and automatic reticulation of domestic gardens, dishwashers and washing machines have also increased (Loh, 2003). At the same time, there has been a general shift towards the production of more water and energy efficient appliances in general.

Despite these impacts, Australian end-use studies have previously concluded that the only significant influence on in-house usage is the number of people living in a household (Loh, 2003). Although the distribution of water use between internal water uses such as showers, baths, toilets and washing machines has changed over time (e.g. showers usage has increased as bath usage has decreased) the overall level of consumption per person has remained fairly constant. Hence the impact of water efficient appliances and the tendency to use more water using appliances in the home are likely to cancel each other out. Hence, the overall internal water use per capita in the baseline estimate has been held constant.

However, external water use is more highly correlated to changes in technology, and can be considered to be comprised largely of discretionary water use (i.e. the consumer has a significant degree of choice in the level of consumption). Historically, as incomes have risen, the amount of water consumed in discretionary water uses has increased.

5.2 Baseline Water Demand and Effluent Forecast

The DWE developed DSS (DLWC, 2002b) provides a detailed least cost planning evaluation framework for water demand management programs. One model was created to develop a baseline forecast of water production until 2036 for the Casino system as a result of the current demand trends as discussed in previous sections (illustrated in Figure 5). The model was created based on the Casino sewerage catchment to enable effluent forecasting to be conducted simultaneously.

The baseline forecast was developed using the climate corrected production data generated from historical records (June 1995 - June 2006) and RVC customer billing records for 2004/05 and 2005/06.

Despite BASIX being made mandatory from 2005/06, no reduction in demand can be identified as a result from on RVC's 2004/05 and 2005/06 customer billing records.

The baseline forecast does not include best-practice pricing compliant with the DWE guidelines. In the 2005/06 financial year RVC recovered only 45% of its water supply revenue from water usage, which is below the DWE required 75%. Therefore, despite the DWE requirement of best-practice pricing by 2005/06 it is not fully included within RVC's current baseline forecast. As a result, both BASIX and best-practice pricing will be considered as Water Saving Program 1 (WSP 1) as discussed further in Section 6. This program will highlight the potential water savings which may be achieved by RVC through the full implementation of mandatory/minimum requirements. It is expected that following the full implementation of these measures, the baseline forecast will be reviewed and the true impact of BASIX and best-practice pricing will be determined.

From the baseline average demand forecast, the average demand at the end of 2036 planning horizon would not be able to be met by the Jabour extraction licence. Current trends in production indicate that production would exceed the licence entitlement by the year 2032. However, RVC also has an existing extraction licence for Manyweathers Weir which may be able to meet future demands until 2036. However, the consistency of water availability is a concern.

A bulk supply investigation undertaken as part of the IWCM Strategy indicates that the unrestricted yield of the Casino system is 2.8 GL/a. However, the probability of Casino running out of water in any year is relatively high with 0.5% chance of occurrence. It can be concluded that a source augmentation is required.

Based on current water demand trends, the average day effluent forecast for Casino Sewage Treatment Plant (STP) was estimated (Figure 7). The current treatment capacity of the Casino STP is sufficient to meet future treatment demands until 2035.

Figure 5: Baseline average day demand forecast for Casino WTP (ML/d)

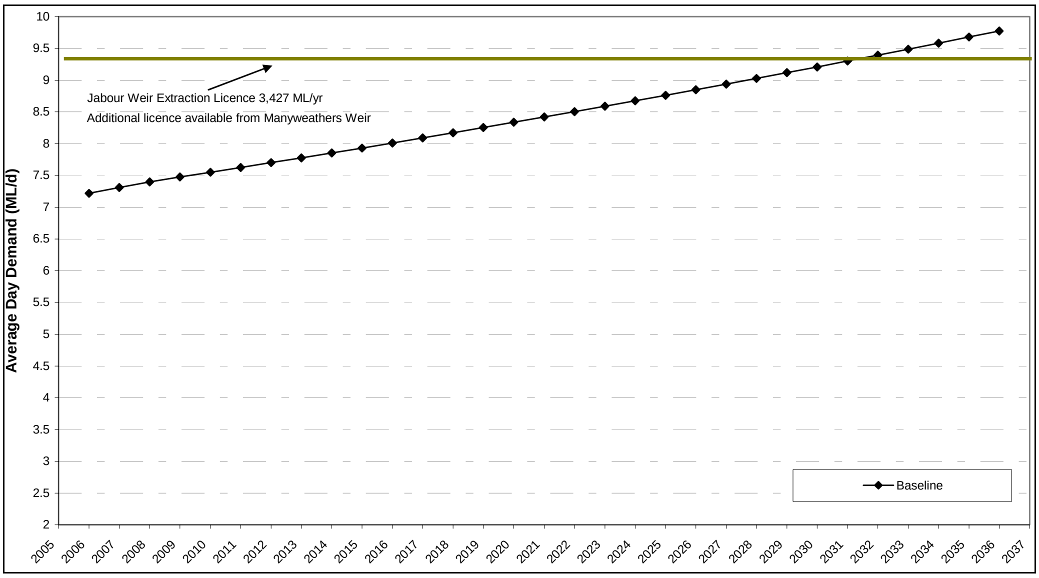


Figure 6: Baseline peak day demand forecast for Casino WTP (ML/d)

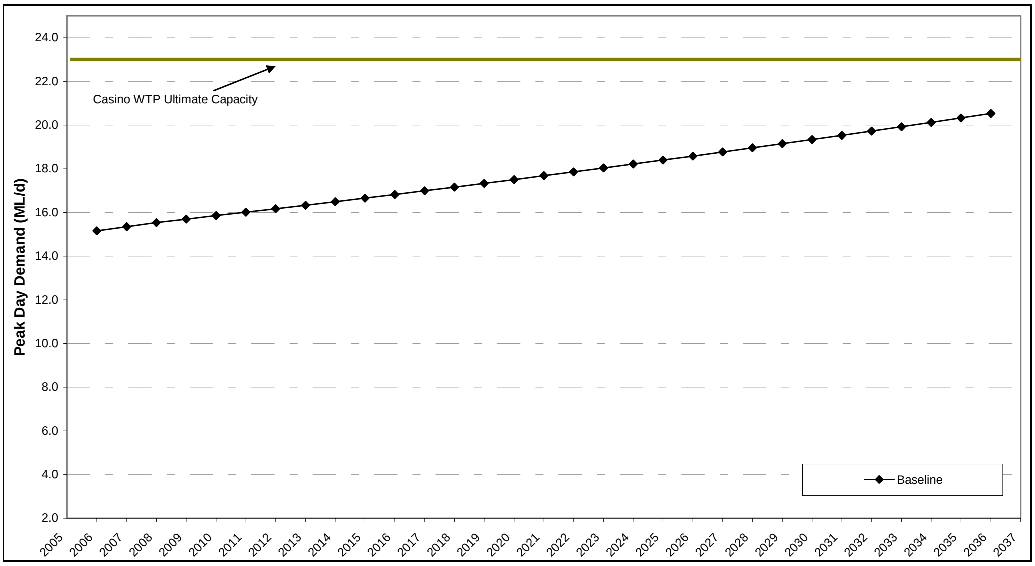
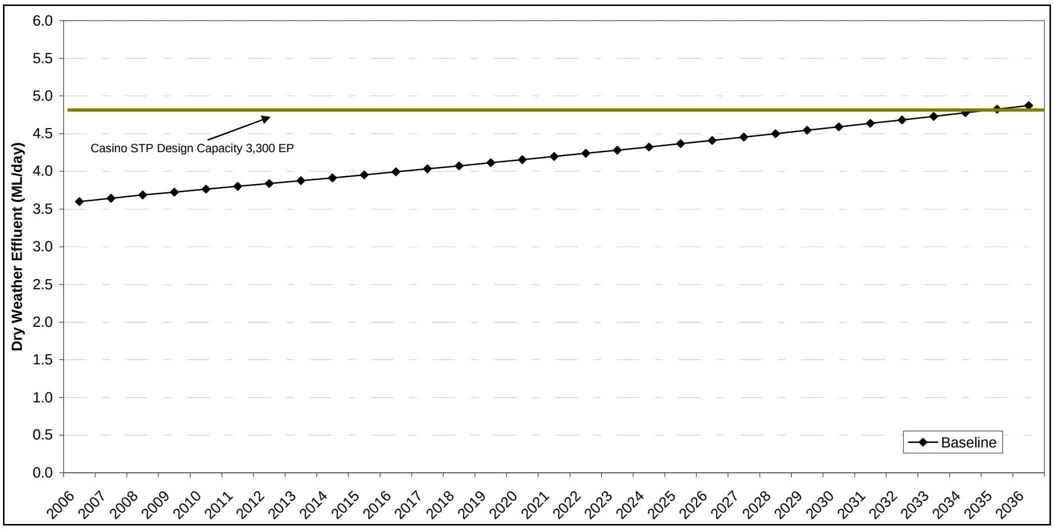


Figure 7: Baseline average day effluent forecast for Casino STP (ML/d)



6 Water Efficiency Analysis

The purpose of the water efficiency analysis is to determine the impact of water efficiency programs on the baseline level of forecast water demand.

The DSS is designed to undertake a cost-benefit analysis of potential demand management measures and possible program combinations to determine which combination of options will provide the greatest water and energy savings per dollar spent by RVC and their customers.

6.1 Water Efficiency Measures

A series of individual water efficiency measures were considered as part of this analysis. The details of these measures are set out in Table 12.

Table 12: Individual Water Efficiency Measures.

Measure	Description
Pricing Measure Model	RVC has already adopted user pays pricing. However, currently only 45% of revenue comes from usage charges (2005/06). In order to be fully compliant with DWE requirements, 75% of revenue is required to come from usage. In order to achieve this, revenue from usage charges must increase by 30%. The pricing model assumes that RVC will increase its usage charge in the next financial year to meet the DWE Pricing and best practice guidelines. The impact of this measure is expected to reduce outdoor use only. It is recommended that RVC review the production and consumption data for 2004/05, 2005/06 and 2006/07 to determine the real impact of implementing a best practice pricing tariff on customer water use and alter the baseline forecast accordingly. RVC should also update its Strategic Business Plan to reflect these changes.
BASIX	Adoption of the NSW Government BASIX Program from 2005/06 onwards. This will be included in WSP 1 as a mandatory measure. It has been assumed in this model that BASIX will be most commonly implemented in new developments through the installation of rainwater tanks for outdoor use and internally for toilet flushing. However, developers may consider other alternatives such as centralised stormwater harvesting or grey water reuse or effluent reuse to meet NSW Government BASIX requirements. It is expected that similar BASIX outcomes would result if an alternative to BASIX rainwater was implemented. This program assumes a cost to the customer of $3,000 for a 5 kL tank in all new residential accounts. It is recommended that RVC review the production and consumption data for 2004/05, 2005/06 and 2006/07 to determine the real impact of BASIX on customer water use and alter the baseline forecast accordingly.
Rainwater Tank Rebate	Rous Water offers rainwater tank rebates for the Casino area. This program assumes that RVC will build on the Rous Water program and will offer a $500 rebate to any existing single residential dwelling interested in installing a rainwater tank. This program is separate from the BASIX program and focuses on existing single residential dwellings. It is estimated that 10% of existing single residential dwelling will take up this offer over the next 5 years.

Measure	Description
Education program.	Education programs are generally considered to be necessary to support any demand management effort (Turner, 2006). Rous Water implements the water demand management strategy for the entire RVC LGA (including Casino). Rous Water runs a schools education program which encourages better garden practices such as mulching, plant types and watering methods. Education is also aims to help reduce excess water use and reinforce the effectiveness of other measures. This program should also focus on educating RVC operating staff when it comes to watering practices on public land. It is assumed that RVC will become more proactive is this area and expand the education program further over the next 30 years to build on and support all other demand management measures adopted by RVC. It has been assumed that this measure will reduce external water use by 20% and 10% for residential and business respectively.
Showerhead Retrofit	Rous Water has promoted the installation of water saving showerheads. This measure aims to provide residential dwellings with a rebate to access water saving showerheads. This model assumes RVC will implement a showerhead retrofit rebate for existing dwellings. This would also build on the outcomes of the residential audit program.
Dual Flush Toilet Retrofit	Similar to showerhead retrofitting, Rous has promoted the removal of continually flushing urinals or offered a rebate for the installation of dual flush cisterns. This measure aims to replace high flow and 9/4.5 L dual flush with 6/3 L dual flush toilets by offering a rebate to customers.
Water Conservation Order	This measure implements permanent water conservation measures throughout the area focusing on urban irrigation, car washing and other external water uses. This also includes the monitoring, education and passive enforcement of sensible water use.
Residential Household Tune-Up	This measure offers local residents the opportunity to have an analysis of their household water using devices and activities by a licensed plumber focussing on ways to improve water use efficiency (Turner, 2005). It consists of an assessment of internal and external household water use and identification of potential water saving methods/activities that could be implemented by the homeowner. This may result in the uptake of the showerhead retrofit program which is outside of the cost of the residential audit. It has been assumed that this measure 2% of all residential dwellings will take up this offer over the 30 year period.
Business Audit	Similar to the residential audit, this measure offers local businesses the opportunity to have an analysis of their business water using devices and activities focussing on ways to eliminate wasteful water use practices. It has been assumed that the top 25% of water users will be targeted over a 5 year period. This program will then roll over every 5 years for the entire 30 year period.
UFW	A program to actively identify and target the control of leakage from the distribution system. This program aims to reduce UFW to 10% which is the industry benchmark for UFW.

The results of the cost-benefit analysis of each of these individual demand management measures for the Casino water supply scheme are set out in Table 13.

The assessment is made from both a utility perspective as well as a customer perspective. For example, in the case of residential audits the costs of the audit are borne by the utility, which also sees a subsequent reduction in the amount of water it is required to pump and treat. In addition to these benefits, the recommendation of the audit may result in water and energy savings for the homeowner, but also come with costs to implement audit findings, such as new washers, water efficient appliances, etc. The combination of these benefits and costs mean that the overall effectiveness of this measure is different from the community perspective, and from the utility perspective alone.

Initial analysis of these water efficiency measures indicated that residential audit, dual flush toilets and the rainwater tank rebates performed the poorest across both the utility and community sectors. Hence, these measures were included only in the last water savings program (WSP).

Following discussions from the Project Reference Workshop (PRG) for the RVC Integrated Water Cycle Management (IWCM) Strategy, a sensitivity analysis was undertaken to further review the effectiveness of dual flush toilets as a demand management measure. Using the DSS, three different uptake rates of dual flush toilets were modeled. The model calculated the potential water savings assuming three different starting points - 50%, 60% and 80% of existing toilets being high flush. However, in each case the results indicated that even when the uptake of water efficient toilets was high the dual flush toilet measure still ranked poorly in the cost-benefit analysis.

Similarly, a sensitivity analysis of UFW was undertaken. The aim of this analysis was to assess the cost-benefit ranking of the UFW measure if UFW can only be reduced by around 9% instead of the 14% target with the available budget. It was found that even if the UFW program did not meet it's target of 10% UFW, the measure still ranked very highly.

For implementation purposes, it is likely that the most cost effective WSP would focus on reducing the UFW and adopt a complementary education program in addition to the mandatory best practice requirements of water pricing and BASIX.

Table 13: Comparison of cost-benefit effectiveness of individual water efficiency measures.

Option	**Cost Benefit Effectiveness**		
	LWU	**Customer**	**Overall**
Pricing Measure Model	High	Very High	Very High, mandatory
Rainwater Tanks under BASIX	Very High	Very Low	Medium, but mandatory
Education Program (external uses)	Medium	Medium	Medium, but complementary
Unaccounted for Water (UFW)	High	High	High
Shower Retrofit	Medium	Medium	Medium
Water Conservation	Medium	Medium	Medium
Business Audit	High	Low	Medium
Rainwater Tanks Rebate	Low	Very Low	Low
Residential Audit Program	Very Low	Low	Low
Dual Flush Toilet Retrofit	Low	Low	Low

6.2 Water Saving Programs

Utilising the preliminary cost-benefit analysis presented above, four WSPs were developed. The details of each of these programs are set out in Table 14.

Table 14: Potential water saving programs for RVC

Program	Pricing	BASIX	Education	UFW	Showerhead Retrofit	Business Audit	Water Conservation	RWT Rebate	Residential Audit	Toilet Retrofit
WSP 1 (regulatory / minimum compliance)	✓	✓								
WSP 2	✓	✓	✓	✓						
WSP 3	✓	✓	✓	✓	✓	✓	✓			
WSP 4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Initial analysis of water efficiency measures indicated that BASIX and education have medium overall benefit:cost ratios across the utility and community sectors. However, these measures are included in more WSPs because BASIX is a mandatory measure and education will help create awareness for the shower and toilet retrofit measures and also lead to hot water and hence energy savings.

The estimated impact of each of these programs on the average day water demand, the peak day water demand and dry weather effluent flows for the Casino system are set out in the following figures. WSP 2 was considered as having the greatest benefit for the level of investment.

Figure 8: WSP influenced average day demand forecast (ML/d)

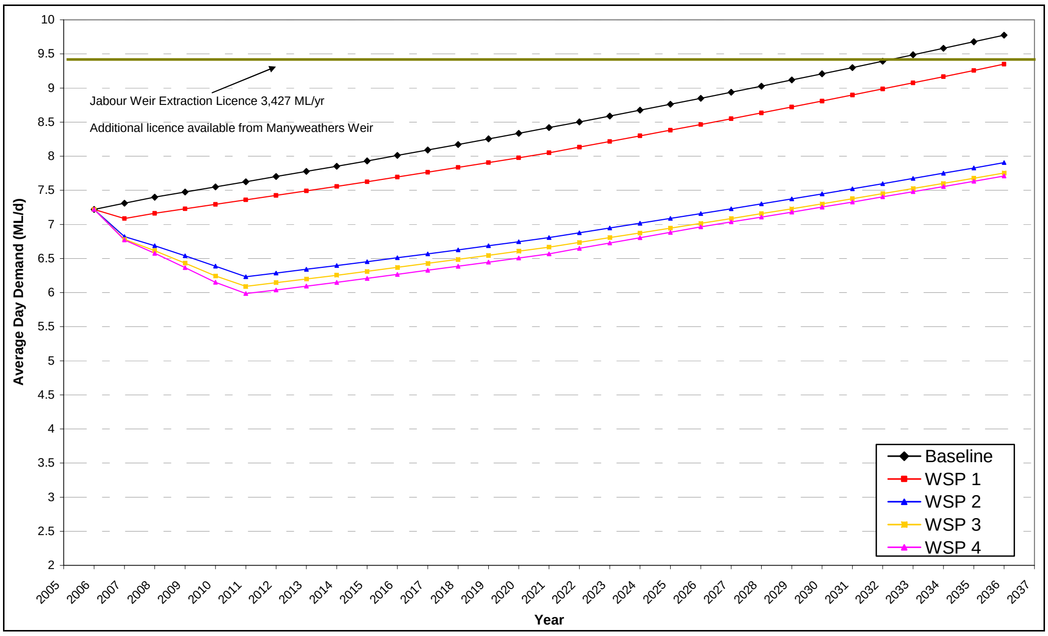


Figure 9: WSP influenced peak day demand forecast (ML/d)

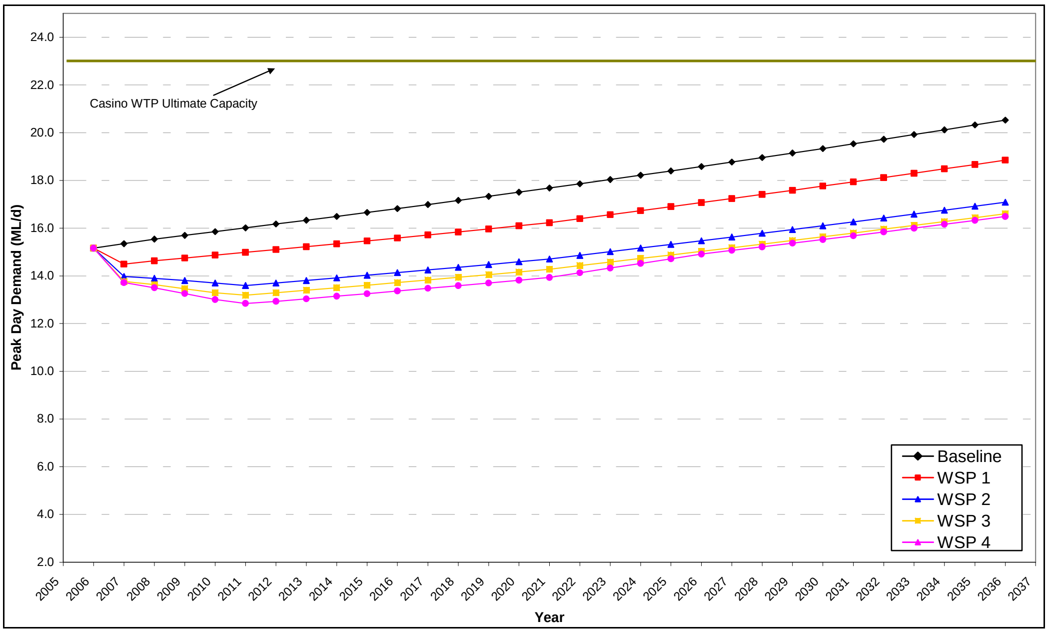
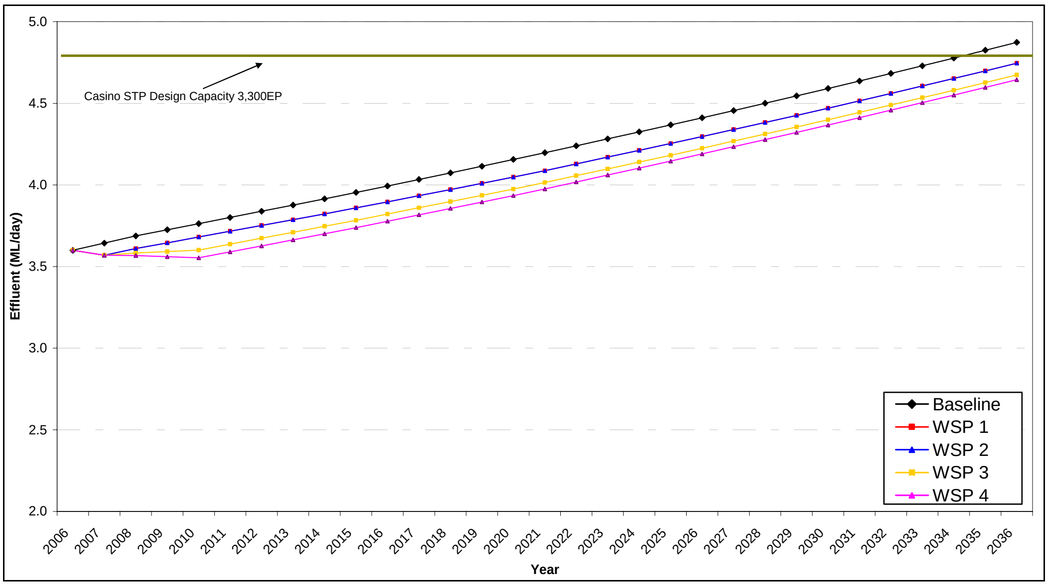


Figure 10: WSP influenced dry weather effluent forecast (ML/d)



7 Conclusions

The key outcomes and recommendations of each of the aspects of this water demand and effluent forecasting analysis are set out in the table below.

Table 15: Key Outcomes and Recommendations of the Analysis.

Element	Key outcomes and recommendations
Data collection and review	RVC should review their customer consumption database to ensure customers are appropriately assigned to customer categories reflective of the DWE reporting requirements. This is particularly significant for "business" assessments and also "multi-residential" dwellings. RVC should also consider a review of water loss in terms of unbilled or unmetered water use. This may require the calibration of bulk and customer meters, and a thorough review of the customer database and assessment records. This will enable UFW to be addressed in the most cost-effective and targeted manner.
Water demand analysis	The climate corrected production for Casino water supply system was calculated to be 2,638 ML/a. Average metered potable consumption for the Casino area was 2,017 ML/a between 2004/05 and 2005/06. Therefore, the climate corrected UFW was calculated to be 24% of production. The UFW value may not only represent actual water loss and leakage, but also inaccurate and/or incomplete metering of production and consumption volumes. It is also likely that ageing infrastructure is causing some leakage. Residential demand accounts for approximately 46% of the total metered consumption volume in the Casino water supply system. Hence, the adopted demand management program should also consider business water use to ensure its effectiveness.
Water demand and effluent forecasts	Modest population growth of 1.2% from 2005-2030 is predicted and is expected to be the most important driver of demand over the next 30 years. Baseline water forecasts predict that annual average production in the Casino water supply scheme will rise from 7.2 ML/d in 2006 to 9.8 ML/d in 2036 (a 36% increase in water use). Peak demand will become 20.5 ML/d from 15.2 ML/d over the next 30 years which is an increase of approximately 35%. The baseline water forecasts should be reviewed to include the measured impact of BASIX and best-practice pricing once these mandatory requirements have been implemented by RVC.
Water efficiency analysis	By applying a number of individual demand management measures to the baseline forecast and examining the costs and benefits (in terms of both dollars and water saved) the relative merit of each measure was determined for the Casino water supply system. The best performing individual measures were progressively bundled together as a number of efficiency programs. The most cost-effective measures for reducing demands in the Casino system in addition to the mandatory requirements of BASIX and best-practice pricing is implement a UFW reduction program in conjunction with a complementary outdoor water use education program. WSP 2 is expected to reduce the predicted baseline annual average demand by up to 19% by 2036 based on current demand trends. However, further review of costing for each water efficiency measure is required to finalise the cost benefit analysis used to develop these water saving programs. This will be undertaken during the ongoing review and update of the RVC Demand Management Plan.

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Appendix D

Casino Bulk Water Supply – WATHNET Modelling

Richmond Valley Council Integrated Water Cycle Management Strategy

Casino Bulk Water Supply – WATHNET

Project No. 941/07

RVC Integrated
Water Cycle Management Strategy
Casino Bulk Water Supply - WATHNET

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April 2007

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Project					
Project: RVC Integrate Water Cycle Management Strategy Casino Bulk Water Supply - WATHNET		Project No: 941/07			
Authors: Pavel Kozarovski		Date: April 2007 Approved by: PK			
	Final Draft Report		PK	PK	APR 07
Revision	Description	By	Checked	Approved	Date
Key words: Water Supply Demand modelling Behaviour modelling Hydrology WATHNET		Classification: ☐ Open ☐ Internal ☒ Proprietary			

Distribution		No of copies
JWP	Helen Salvestrin	Digital copy
Kozarovski and Partners:	PK	1

Table of Contents

1. Executive summary

The secure yield which can be extracted from Jabour Weir is 4.8 GL/a on average, using historical streamflow and climate data and corresponding to the climate demand.

Restrictions would be frequent, however the system would not run out of water if 4.8 GL are supplied every year on average (higher demand during drier years and lower demand during wetter years).

The above estimate is based on an assumption that the historical sequence will repeat in the future. This is quite unlikely and stochastic streamflow and corresponding climate data were generated to assess the system's performance during 1000 synthetic sequences with similar statistical properties to historical, which would contain some sequences with more severe droughts. Each synthetic sequence has an equal probability of occurrence of 1 in 1000 or 0.1%. This analysis is referred to as a Monte-Carlo analysis.

The results of Monte Carlo analysis indicated that there is a relatively high probability of 0.5% that the system might run out water in any year (approximately once in 200 years on average). An additional source of water would be required to ensure that the system will not run out of water during more severe droughts.

An off-stream storage of some 3GL would be required to minimise the probability to run out of water (it was assumed that the storage would be created using a 3.5 m high ring levee). The results of Monte Carlo simulation indicated that the system would not run out water in any of the 1000 synthetic sequences if the above off-stream storage is constructed.

2. Overview

Richmond Valley Council (RVC) water supply is comprised of two separate systems. The Casino system is operated by the RVC and it draws water from Richmond River, while the Lower Richmond River water supply is based on water purchased from Rous Water.

The reliability of Casino bulk water supply has been investigated for a range of future demand scenarios and the results are presented in this report. The investigation forms part of the Richmond Valley Integrated Water Cycle Management (IWCM) Study. This report documents the reliability investigation of Casino Water Supply.

Casino's water supply is dependent on surface water extraction from the Richmond River at Jabour Weir.

RVC has a set of operation rules for water extraction, including identification of demand restriction application and levels. These rules apply during periods of prolonged low flows in the Richmond River and during low supply storage levels. The recorded flows over Jabour Weir are used to trigger operational changes and demand restrictions in combination with the storage level and restriction regimes in Kyogle and Lower Richmond River area. The influence of these operation rules are considered in this investigation.

3. Approach

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; and
3. Water balance model.

The schematic representation of the approach and the models used is shown on Figure 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 30 years long, 1000 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 JWP);
- develop an end-use forecasting model known as the DSS[1] based on historical data and various demand management and system improvement options (by JWP);

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

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

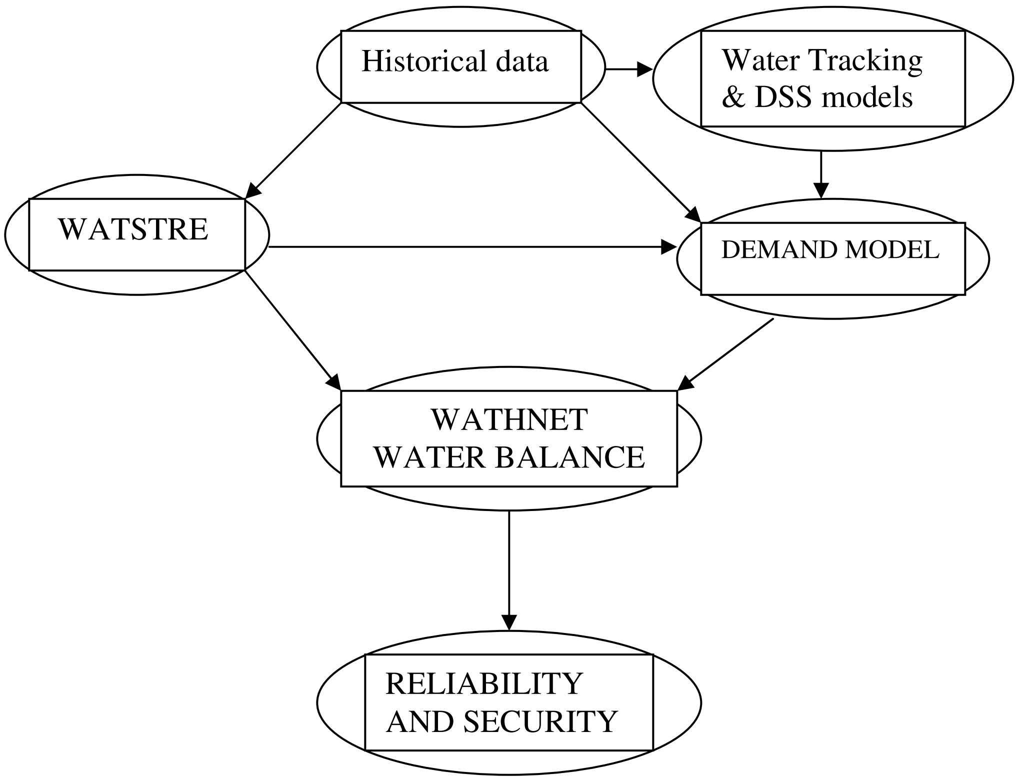


Figure 1: Schematic diagram of models used in Water Balance Study

Reliability of supply is defined as a percent 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.

4. Data collection and analysis

RVC, JWP, DEUS and Department of Natural Resources (DNR) supplied data for Casino area including:

- Historical streamflow records;
- Historical daily rainfall records;
- Historical temperature records;

- Historical and generated evaporation data;
- Historical demands;
- Decision Support System spreadsheet for IWCM containing the end use demand data of future water consumption;
- Water tracking model.

4.1 Historical rainfall, temperature and evaporation data

The historical records of temperature, rainfall and evaporation records were sourced from the SILO service (located at Bureau of Meteorology's website).

The SILO service provides long term climate for any site within Australia through interpolation of information from available meteorological stations. The information provided included daily rainfall, temperature and evaporation data between 1889 and September 2006.

SILO evaporation data prior to 1970 has been derived through interpolated long term averages and has proven to be poor for describing daily catchment runoff. To allow a complete climate dataset of more than 95 years of daily records to be generated, a multi-variable regression (non-linear) analysis should be made to generate synthetic evaporation data dependent on temperature, solar radiation, vapour pressure and relative humidity (maximum temperature). A non-linear regression model should be calibrated to fit the observed evaporation data post 1970 and synthetic evaporation data should be generated for the period prior to 1970. However, there are no streamflow records for Richmond River at Casino available for the period prior to 1970, therefore, the above approach should be adopted if longer streamflow records become available. The long term averages are summarised in Table 1.

Table 1: Average climatic data for Casino

Period	Max.Temp (° C)	Rain (mm/a)	Evap. (mm/a)
1889-2006	25.85	1090	1534
1889-1970	25.8	1104	1528
1971-2006	26.0	1056	1549

Source: SILO, 2006

4.2 Streamflows

4.2.1 Richmond River at Casino

Recorded streamflows at Casino (station number 203004) were obtained from DNR (by JWP) for a period between September 1970 to September 2006. The flow duration curve is shown on Figure 2 and the flow values corresponding to low flow values of the curve are given in Table 2 for clarity.

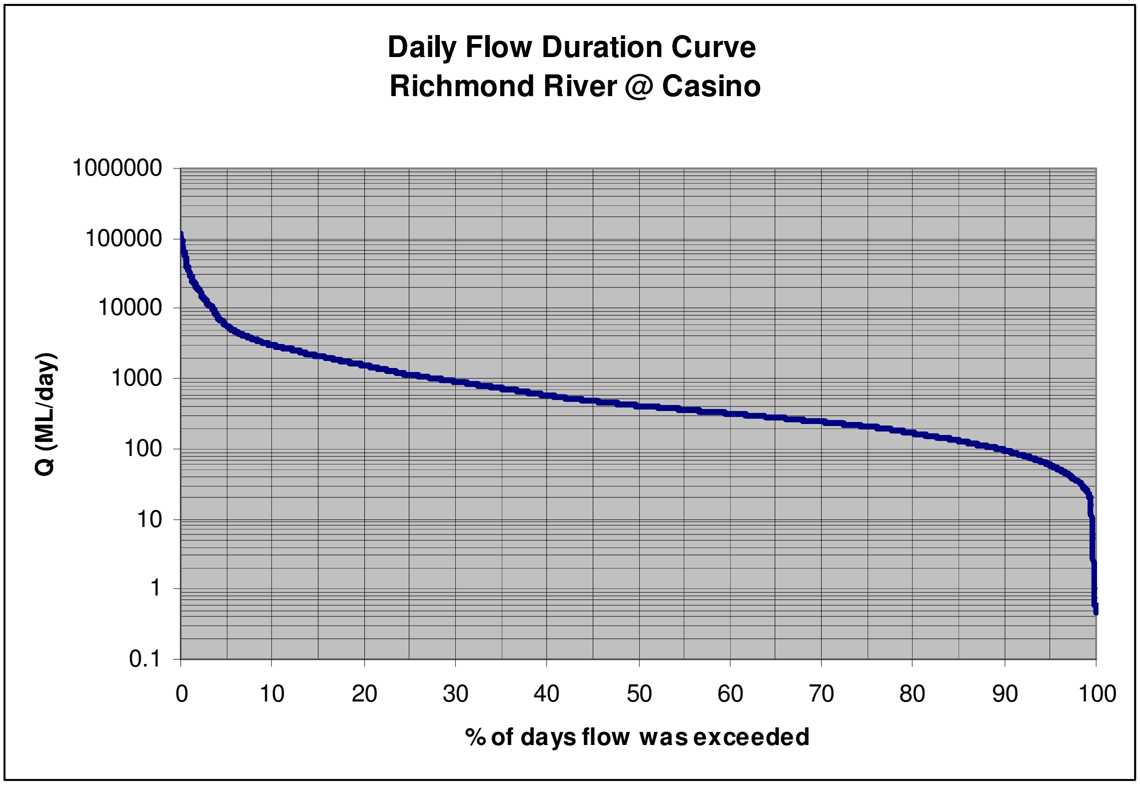


Figure 2: Flow duration curve for Richmond River measured at Casino

Table 2: Low flow values For Richmond River at Casino

% of days flow was exceeded	80	85	90	95	96	97	98	99	99.5	99.9	99.99
Q (ML/day)	167.6	130.2	95.5	58.5	49.9	42.1	34.6	25.2	10.5	0.681	0.465

Source: DNR

The streamflow as described above were input into the stochastic data generator (part of WATHNET software package) as an independent variable, together with the rainfall, maximum daily temperature and evaporation sequences. The resulting overlapping period of useable streamflow and climate data is between 1971 to 2005.

4.3 Characteristics of the reservoirs

It is necessary to simulate the evaporation from the reservoir water surface in order to obtain realistic water balance analysis results. The area of the storage reservoirs is summarised in Table 3.

Table 3: Reservoir Surface Area

Reservoir	Surface area (km^2)	Storage capacity (ML)
Jabour Weir	*$A = 0.0005+1.78 \times V^{0.79}$	*1623
Residual Storage between Jabour Weir and Cookes Weir	**$A = 0.0000861 \times V$	*1100
Cookes Weir	**$A = 0.002 \times V^{0.68}$	*1000

Source: *JWP, **Assumed

The evaporation losses are calculated by multiplying the surface area by the pan evaporation and by pan to lake evaporation correction factor. A constant factor of 0.7 was used to convert pan to lake evaporation. The rainfall over the lake surface is simulated similarly, by multiplying the lake area by the rainfall. Net Evaporation was used to simulate the balance. When the evaporation is higher than the rainfall - Net Evaporation is positive and a loss is calculated by WATHNET. When rainfall is higher than the evaporation – Net Evaporation is negative and a gain is calculated by WATHNET.

4.4 Operating rules and restrictions

The current RVC's operational and restriction protocol is described in Table 4. The restrictions rules were incorporated into WATHNET model. The Rous Water and Kyogle restrictions were not incorporated as this would require WATHNET model to be established for their systems, which was outside of the scope of work. Only external demand reduction was allowed, with the anticipated reductions deduced from the description of demand reduction measures.

Table 4: Water restriction trigger levels

Res. Lev.	Description	Trigger used in WATHNET model	Deamand reduction
1	Richmond River Flow < 25 ML/day or measured depth of water over Jabour Weir Crest is less than 25 mm or when Rouse Water imposes restrictions L1 or when Kyogle imposes Level 1 restrictions.	Q downstream of Jabour Weir is less than 25 ML/day	10%
2	Water stoped flowing over the main portion of the Jabour Weir but it is still flowing over the lower portion of the weir or when DNR imposes tight restrictions on Rouse Water or when Kyogle imposes level 2 restrictions.	Q d/s of Jabour Weir is less than 10 ML/day	20%
3	Only minor flow over the weir (less than 25 mm over the lower portion of Jabour Weir) or when DNR suspends all irrigation in upstream of Casino or when Kyogle imposes level 3 restrictions.	Q d/s of Jabour Weir is less than 10 ML/day	30%
4	No additional restrictions, Rouse Water applies additional restrictions.	Q d/s of Jabour Weir is less than 10 ML/day	40%
5	Water has stopped flowing over Jabour Weir and has dropped over 100 mm below the weir	Remaining Jabour Weir Storage is less than 700 ML	60%
6	Richmond River level falls down to 1 m above the 800 mm inlet pipe into raw water pumping station	Remaining Jabour Weir Storage is less than 100 ML	90%

Source: JWP report

4.4 Demand forecast

The water tracking model parameter values were used to map the annual demand forecasts into daily demand time series corresponding to the synthetically generated streamflows and climate data.

A total of four demand management scenarios were analysed in the DSS and the annual forecasts are documented in Table 5.

Table 5: Annual Demand Forecast for Casino Water Supply Area

Year	SCENARIO				
	Baseline	WEP1	WEP2	WEP3	WEP4
2007	2516	2513	2412	2398	2394
2008	2547	2540	2438	2411	2398
2009	2573	2563	2461	2421	2397
2010	2599	2586	2483	2431	2397
2011	2625	2609	2505	2453	2415
2012	2651	2632	2527	2476	2437
2013	2677	2655	2550	2498	2459
2014	2704	2679	2573	2521	2483
2015	2731	2703	2596	2544	2506
2016	2758	2727	2619	2568	2530
2017	2786	2752	2643	2592	2555
2018	2814	2777	2667	2616	2579
2019	2842	2802	2691	2640	2603
2020	2870	2827	2716	2664	2628
2021	2899	2852	2740	2689	2653
2022	2928	2881	2768	2717	2685
2023	2957	2911	2796	2745	2716
2024	2987	2940	2824	2772	2747
2025	3017	2969	2853	2800	2778
2026	3047	2999	2881	2829	2810
2027	3077	3029	2910	2858	2840
2028	3108	3059	2939	2886	2868
2029	3139	3090	2968	2915	2897
2030	3170	3121	2998	2945	2927
2031	3202	3152	3028	2975	2957
2032	3234	3184	3058	3005	2987
2033	3266	3215	3089	3035	3018
2034	3299	3247	3120	3065	3048
2035	3332	3280	3151	3096	3079
2036	3365	3313	3183	3127	3111

Source: DSS by JWP

It is assumed that the in-house demand is independent of climate variation and that only the ex-house demand varies with the climate as per the water tracking model. Only the external demand is subject to restrictions. 10% external demand restrictions would apply during level 1 restrictions, 20% during level 2, 30% would apply during level 3, 40%

during level 4, 60% during level 5 and 90% demand reduction would during level 6 restrictions.

5. Models

5.1 Synthetic Data Generation Model WATSTRE

It is un-realistic to expect that the climate and the resulting streamflows from the last 30 years will repeat in the next 30 years. The historical data were produced by a natural process, and the aim of the Monte Carlo analysis is to identify and fit a mathematical model capable of producing synthetic sequences which have similar statistical parameters to historical, produce many synthetic sequences (replicates) and then simulate the performance of the system and define the reliability and security by analysing a much larger sample (in our case 1000 replicates compared to one historical sequence).

A multi-site synthetic data generation model “WATSTRE” (part of WATHNET package) was fitted to the historical streamflow and climate data. The model generates annual totals which are disaggregated into daily values using the *method of fragments*. In the case of missing data, the model fills in the annual values and then assigns the fragments from the key site. Recorded streamflows site was used as a key site and 1000, 30 year long synthetic replicates of streamflows and the corresponding maximum temperature, rainfall and evaporation were generated.

The generated sequences have similar statistical properties to historical data. One synthetic replicate contains 30 years of synthetically generated, cross correlated daily data such streamflows, rainfall, maximum daily temperature and evaporation. Each synthetic sequence (replicate) has an equal chance of occurrence, so, instead of using one historical sequence for assessment of the performance of a given water supply system, many replicates are used. This can be compared to trowing dice. One trow would be equivalent to the historical sequence, while 1000 trows would be equivalent to 1000 sequences, hence the term “Monte Carlo” analysis.

The synthetic data preserves the cross and auto correlation of annual values, while the cross and auto correlation of daily values is preserved by using the method of fragments. The capability of the synthetic generator to preserve the long term persistency of low flows is demonstrated on Figure 3. 1 to 10 year lowest flow sequences were extracted from the generated data set and compared to historical. It can be seen that the historical low flow sequences are between the 5% and 95% confidence limits. Further more the means and median values of the synthetic data are similar to the historical low flow sequences. The spread of the generated set is indicated by the 5% and 95% limits, indicating that much more sewer droughts than historical could be expected.

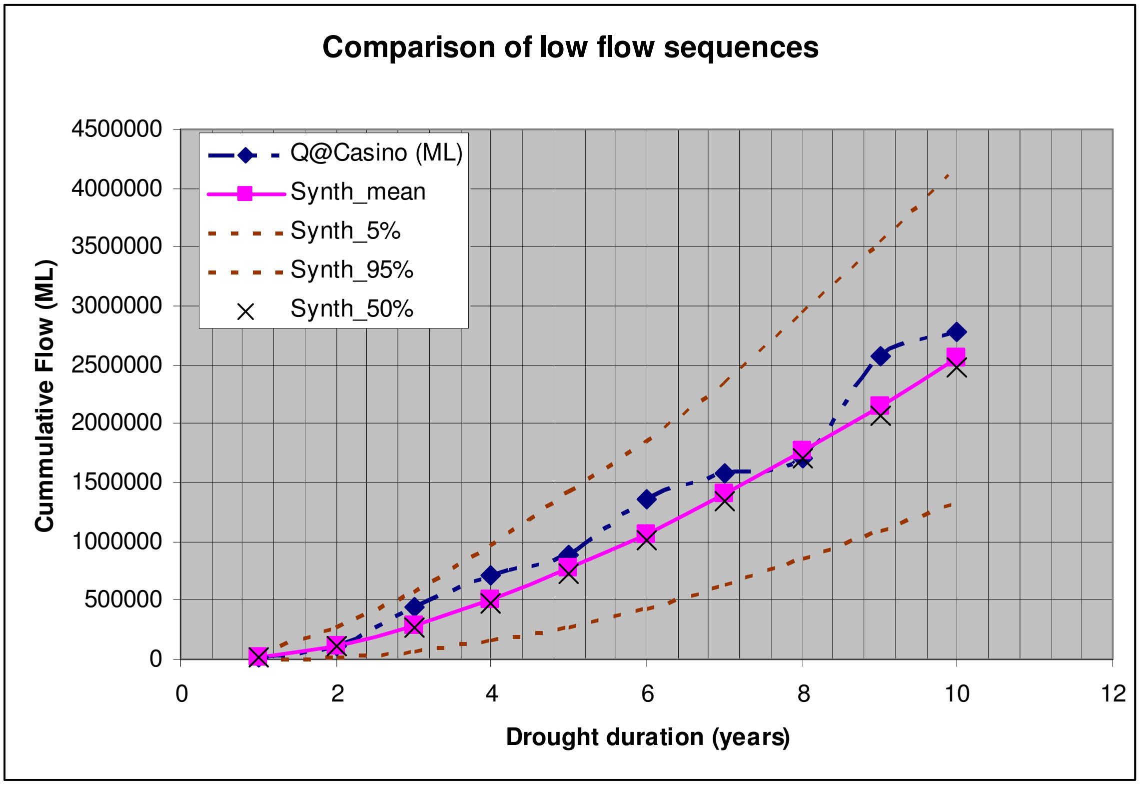


Figure 3: Comparison of historical and generated overlapping low flow sequences

Based on Figure 3, it can be seen that the generated replicates contain low flow sequences similar to the historical.

The statistical properties of generated and historical sequences are compared in Table 6. It can be seen that these are quite similar. Hence, the 30 year long synthetic replicates were used for "Monte Carlo" water balance simulations.

Table 6: Average of Replicate Annual Data Statistics (1,000 replicates, 30 (years)

Site	Case	Mean	Std Dev	Skew	Lag-1	Min	Max
Q_Casino (GL/a)	Generated median	506.77	422.11	1.258	0.222	10.28	1848.44
	Historical	511.49	433.62	0.876	0.371	19.61	1516.45
Average max_temp	Generated median	25.98	0.57	0.217	0.115	24.73	27.28
	Historical	25.98	0.59	0.109	0.071	24.75	27.30
Rainfall (mm/a)	Generated median	1045.2	279.7	0.581	0.171	550.2	1789.8
	Historical	1042.7	285.6	0.386	0.226	556.3	1679.1
Evap (mm/a)	Generated median	1551.4	89.8	0.265	0.422	1359.4	1758.8
	Historical	1551.4	95.4	0.252	0.472	1350.6	18110

Source: WATSTRE summary

5.2 Water Balance model

WATHNET, a generic water balance model developed by Dr. George Kuzcera from University of Newcastle was used to simulate the behaviour of the water supply system. The system's schematic is shown on Figure 4. The description, the capacities and the relevant comments of the model components are given in Table 7.

Table 7: Casino water supply system represented by WATHNET network

Nodes & links	Description	Capacity	Comment
1	System outlet	unlimited	
2	Jabour Weir	1623 ML	
7	Residual storage in the river	1100 ML	Remaining storage in the river between Jabour weir and Cookes Weir
8	Cookes Weir	1000 ML	
5	Richmond River	unlimited	Inflow point of the system
6, 9, 10, 11, 12, 13	External Demand nodes for restrictions level 1 to 6	NA	N13 – represents 10% of external demand, Nodes 12, 11 and 10 also represent 10% of the external demand, Node 9 represents 20% of the demand and Node 6 represents 30% of external demand
22	Unrestricted External Demand	NA	Remaining 10% of external demand which is not subject to restrictions
3	Internal Demand	NA	This is an unrestricted internal demand
2 to 23	Pumping and WTP	unlimited	It is modelled as an unlimited link, assuming that transfer capacities and WTP capacity would be increased if required.
23 to 4	Dummy	unlimited	Represents total supply to external demand
23 to 4	Dummy	unlimited	Represents the internal supply
4 to 13	10% external supply	0 or unlimited	0 when L1 restrictions, unlimited otherwise
4 to 12	10% external supply	0 or unlimited	0 when L2 restrictions, unlimited otherwise
4 to 11	10% external supply	0 or unlimited	0 when L3 restrictions, unlimited otherwise
4 to 10	10% external supply	0 or unlimited	0 when L4 restrictions, unlimited otherwise
4 to 9	20% external supply	0 or unlimited	0 when L5 restrictions, unlimited otherwise
4 to 6	30% external supply	0 or unlimited	0 when L6 restrictions, unlimited otherwise
14, 15, 16, 17, 18, 19 and 20	Dummy reservoirs	10 units for 19, 18, 17 and 16, 20 for 15 and 30 units for R14. R20 has a capacity of 90 units	These reservoirs are used to formulate the restriction policy within WATHNET. The system starts with reservoirs 14 to 19 full and reservoir 20 is empty. When a restriction condition is experienced the link connecting the reservoir to R20 becomes active, passing 10 units to R20. When the condition for a particular restriction is lifted link 20 to 21 is activated.

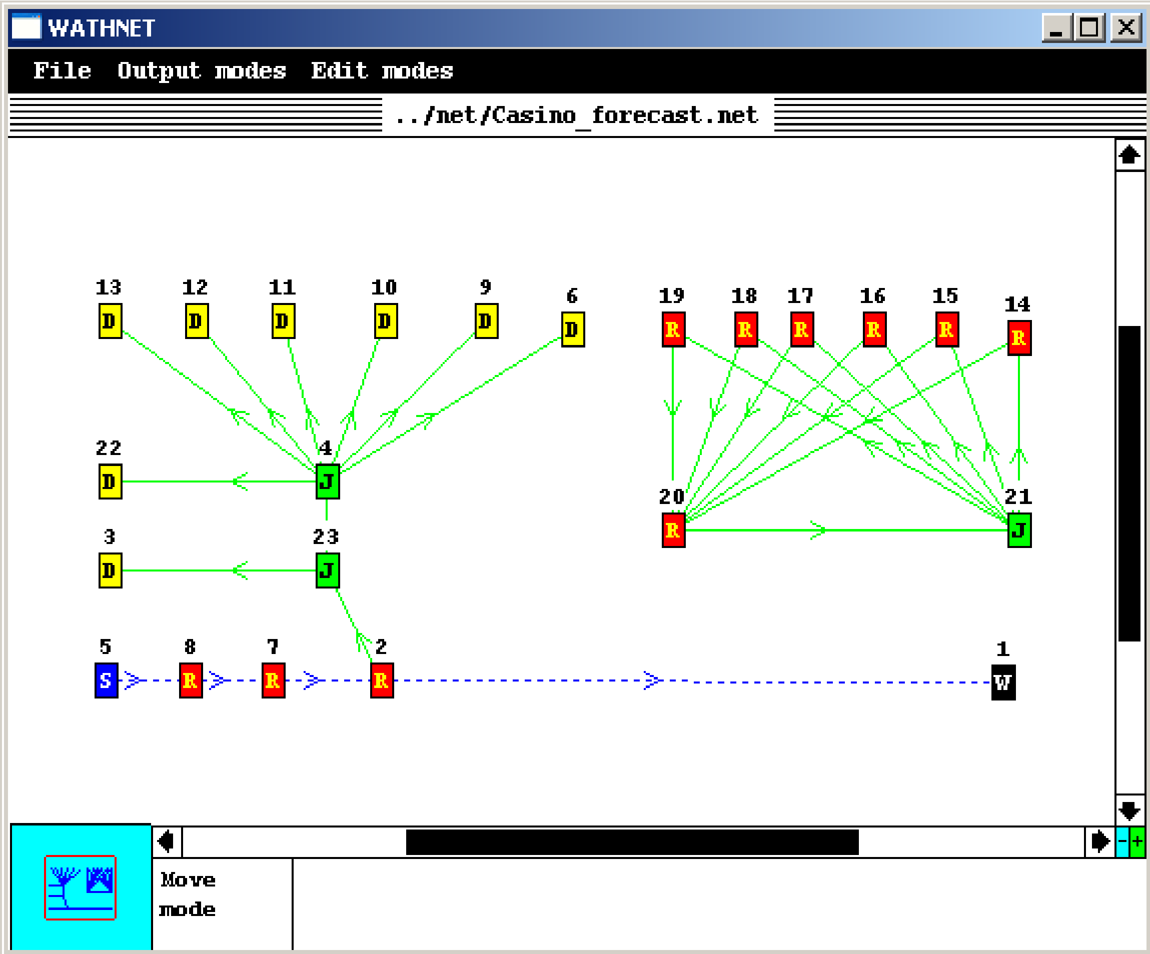


Figure 4: Casino WATHNET network

6. Water Balance Modelling Results

The maximum amount of supply which can be extracted from a given system using historical data without running out of water is referred to as a “safe yield”. Daily demand sequence corresponding to historical streamflow and climate data was produced, with a constant population. The demand values were multiplied by a constant to assess the performance of the system for various average annual demands. The maximum average annual demand which can be supplied from the Jabour Weir, assuming that the historical sequence will repeat, is 4.8 GL/a without running out of water. However, restrictions level 1 to level 6 would be experienced and their frequency is given in Table 8.

Table 8: Probability of Daily Restrictions

Scenario	Frequency of daily restrictions (%)					
	L1	L2	L3	L4	L5	L6
Constant average demand of 4.8 GL/a	15.78	13.13	11.64	11.35	2.08	0.77

Source: WATHNET results

The daily demands as per the DSS and the water tracking model were input into WATHNET together with the corresponding synthetic time series. The results provide an estimate of the frequency of annual restrictions and daily restrictions (indicating system reliability) and the lowest reservoir storage volumes (indicating system security).

R=100-F, where R is the reliability (%) and F is the frequency of restrictions. The graphical presentation of these results for the Baseline Scenario is provided in Appendix A, while the summary of annual and daily frequency of restrictions for all scenarios is given in Tables 9 to 10.

Tables 11 and 12 indicate the security of supply. The internal demand should not be restricted and the restrictions if present indicate that the system had run out of water. The frequency of internal demand restrictions is given in Table 11, while the number of days the total storage had fallen below 1% of the total storage is given in Table 12, together with the probability. The results from table 12 can be also used as an indication of the system's security.

The security indicators point to the fact that the system can run out of water and that the probability to run out of water in any day is some 0.10% and in any year is 0.5%. In order to reduce the probability to run out of water an additional source is required.

Table 9: Probability of Annual Restrictions (all IWCM demand scenarios)

Scenario	Frequency of annual restrictions (%)					
	L1	L2	L3	L4	L5	L6
Baseline	83.53	78.08	74.42	73.4	14.77	4.25
WEP 1	83.46	78.01	74.32	73.31	14.68	4.13
WEP 2	83.24	77.74	74.01	73.02	14.4	3.78
WEP 3	83.24	77.6	73.86	72.9	14.27	3.62
WEP 4	83.13	77.56	73.8	72.84	14.23	3.55

Source: WATHNET results

Table 10: Probability of Daily Restrictions (all IWCM demand scenarios)

Scenario	Frequency of daily restrictions (%)					
	L1	L2	L3	L4	L5	L6
Baseline	15.78	13.13	11.64	11.35	2.08	0.77
WEP 1	15.74	13.09	11.6	11.31	2.06	0.76
WEP 2	15.61	12.97	11.47	11.19	1.99	0.73
WEP 3	15.56	12.91	11.42	11.14	1.95	0.71
WEP 4	15.53	12.88	11.39	11.11	1.93	0.7

Source: WATHNET results

Table 11: Probability of Restrictions on Internal Demand

Scenario	Frequency of restrictions (%)	
	Annual	Daily
Baseline	0.54	0.12
WEP 1	0.54	0.11
WEP 2	0.53	0.11
WEP 3	0.53	0.11
WEP 4	0.52	0.1

Source: WATHNET results

Table 12: Probability of reservoir storage falling below 1% - security

Scenario	Number of days total storage < 1%	Probability (%)
Baseline	14399	14399x100/(365x30x1000)=0.131
WEP 1	14192	0.13
WEP 2	13572	0.14
WEP 3	13128	0.120
WEP 4	12922	0.118

Source: WATHNET results

An off-stream storage could become an additional source of water which could minimise the probability to run out of water. The size of the required storage was determined by trial and error for each scenario aiming at a system which would not run out of water in all 1000 replicates. The result of the trial and error runs are presented in Table 13. It must be noted that even though there is still a chance to reach 1% storage, there were no internal demand restrictions, which indicates that the system did not run out of water in all 1000 replicates.

Table 13:Off-stream storage required

Scenario	Size of Off-stream storage (GL)	Number of days total storage < 1%	Probability (%)
WEP 1	3.1	14	14*100/(365x30x1000)=0.000128
WEP 2	3.0	3	0.000027
WEP 3	2.8	7	0.000064
WEP 4	2.7	12	0.000109

Source: WATHNET results

7. Conclusions

The annual reliability of RVC's water supply system of 17% is relatively low, it means that level 1 to level 4 restrictions could be expected almost every year. Level 5 and level 6 restrictions are much less frequent. However, the probability to run out of water is high 0.5% in any year (or once in 200 years on average) and a back up source would be required. An off-stream storage of some 3GL would be required to minimise the probability to run out of water.

8. Bibliography

1. JWP*, Richmond Valley Council Strategic business plan for water supply and sewerage services, 2006*,
2. *WATHNET Manual*, Dr. George Kuzcera, University of Newcastle, 1997.
3. *SILO*
4. DSS (as supplied by JWP)

Appendix A

Graphical presentation of WATHNET Results for Baseline Scenario

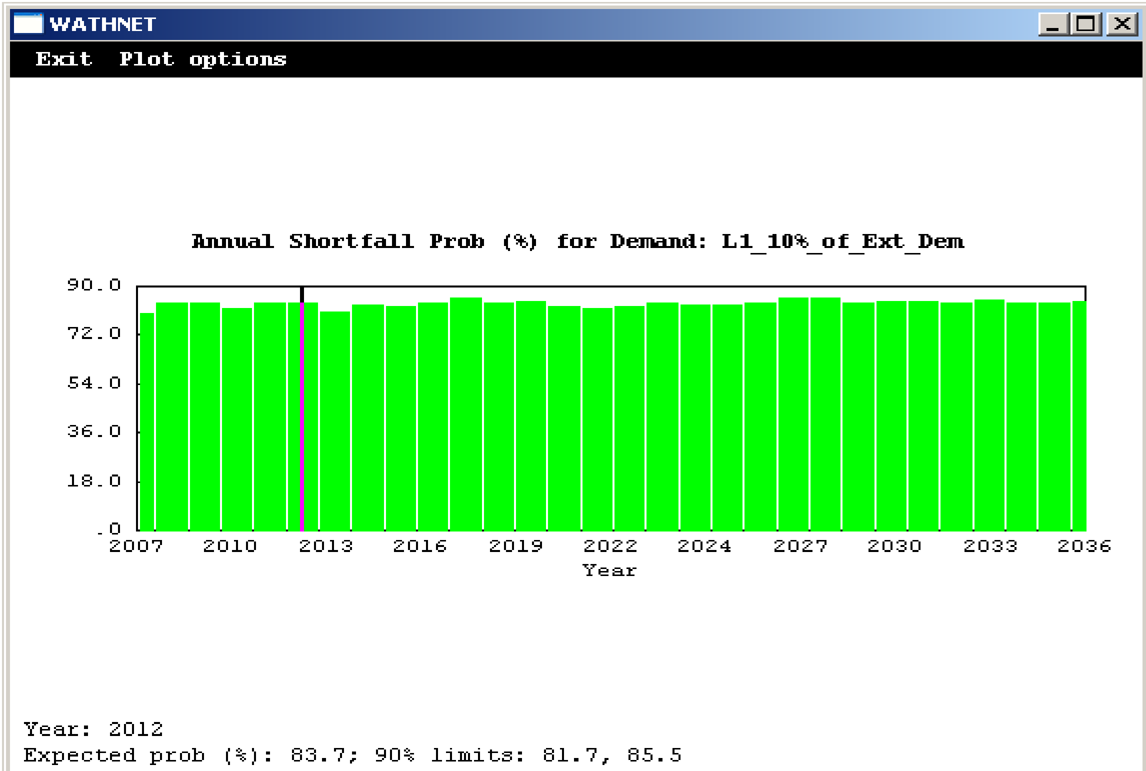


Figure A1: Baseline Scenario - Probability of Level 1Annual Restrictions

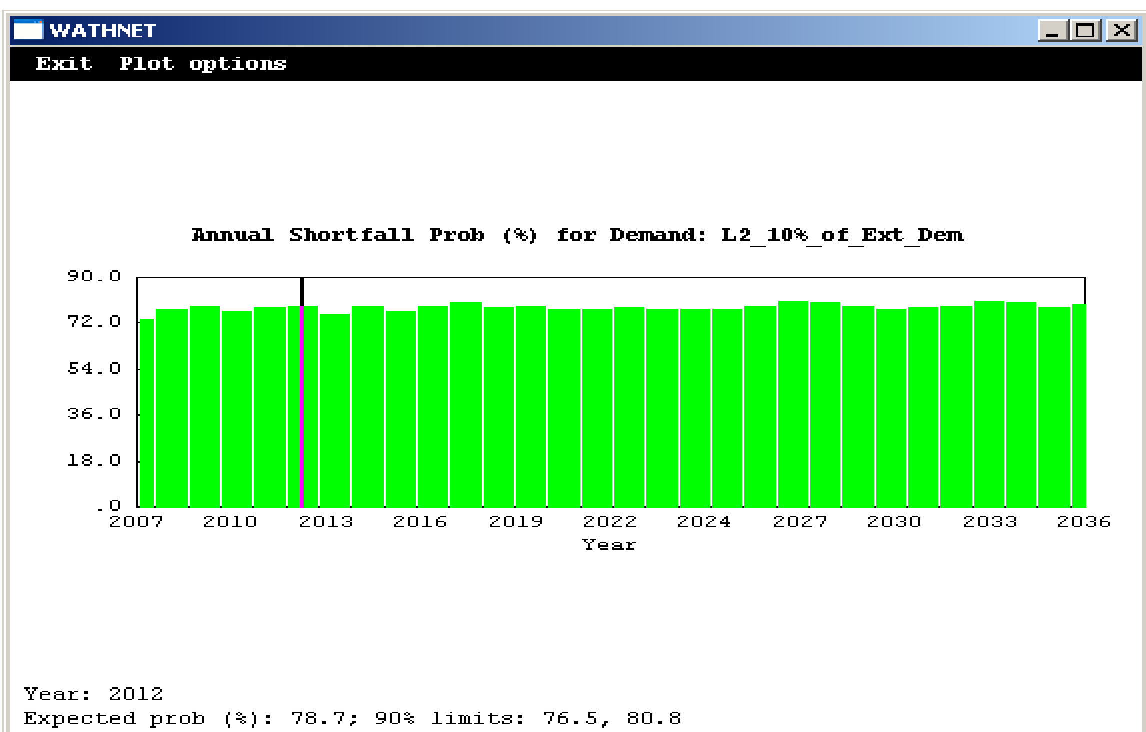


Figure A2: Baseline scenario - Probability of Level 2 restrictions in any year, (cumulative 20% of external demand)

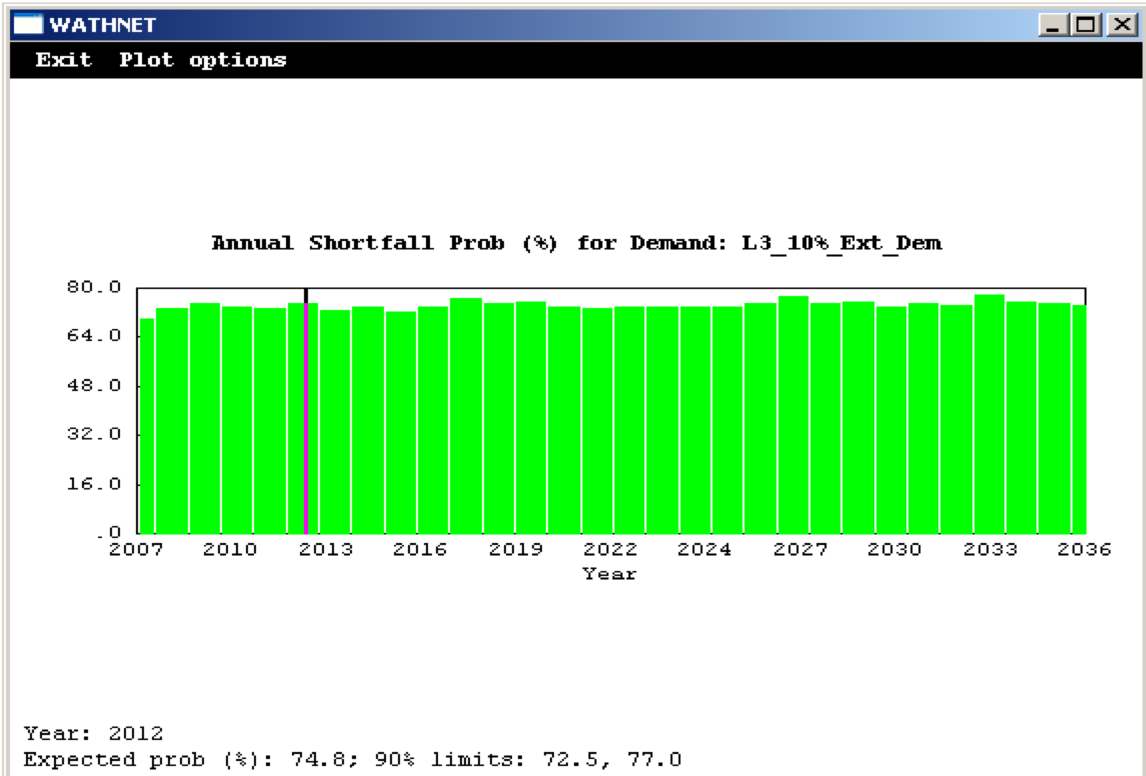


Figure A3: Baseline scenario - Probability of Level 3 restrictions in any year, (cumulative 30% of external demand)

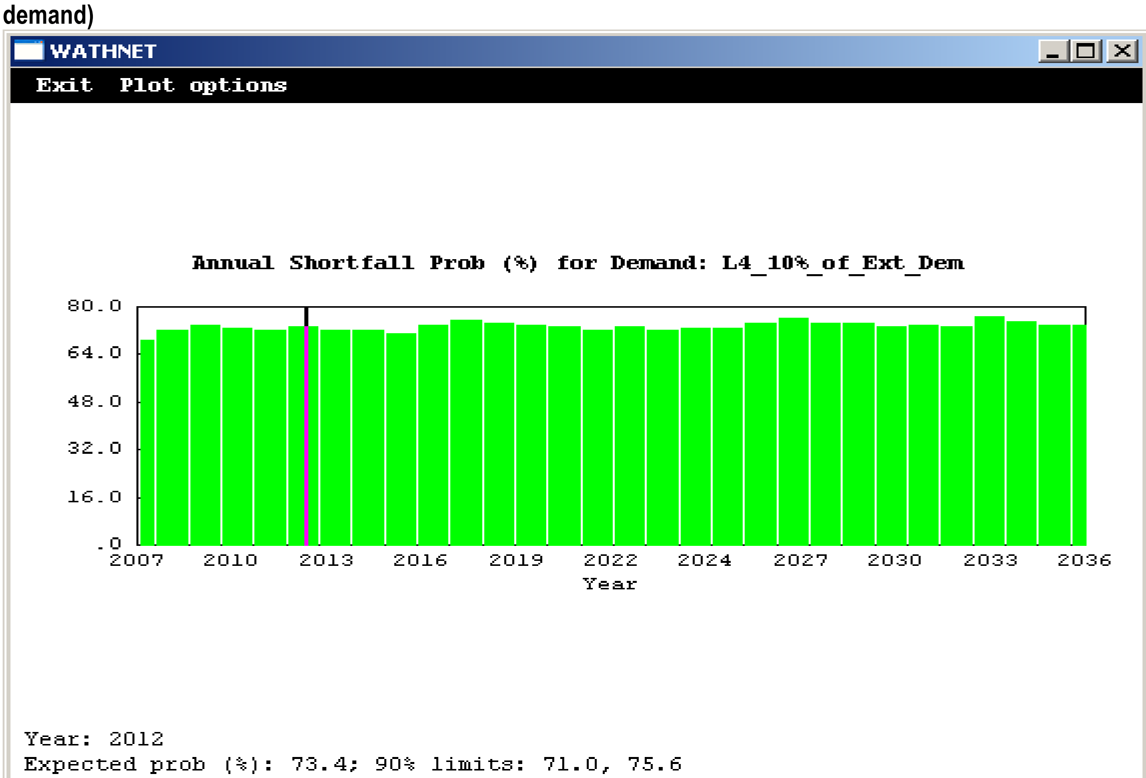


Figure A4: Baseline scenario - Probability of Level 4 restrictions in any year (cumulative 40% of external demand)

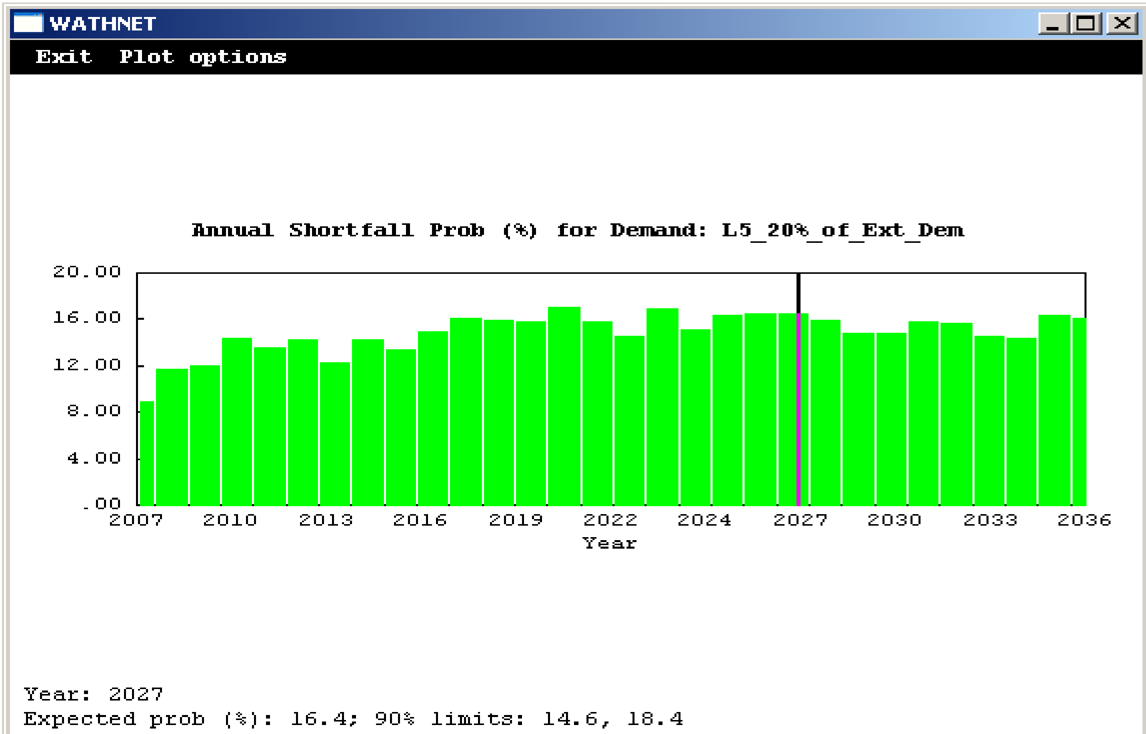


Figure A5: Baseline scenario - Probability of Level 4 restrictions in any year (cumulative 60% of external demand)

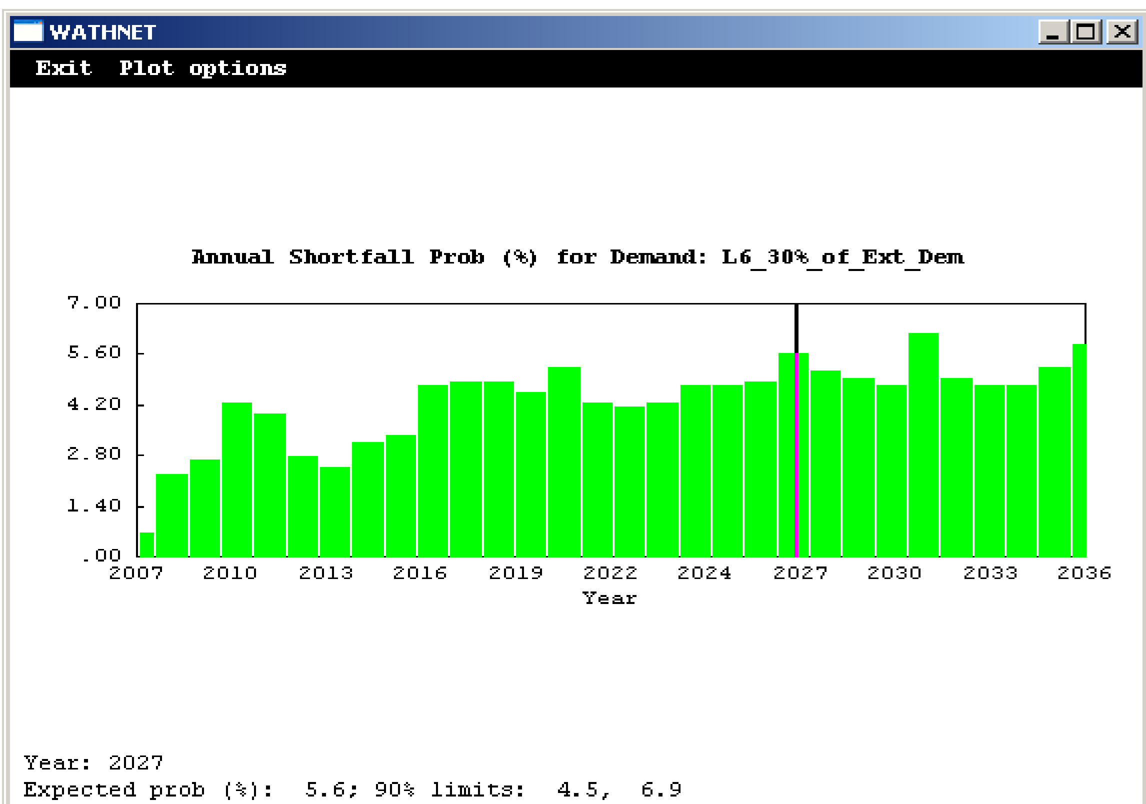


Figure A6 Baseline scenario - Probability of Level 4 restrictions in any year (cumulative 90% of external demand)

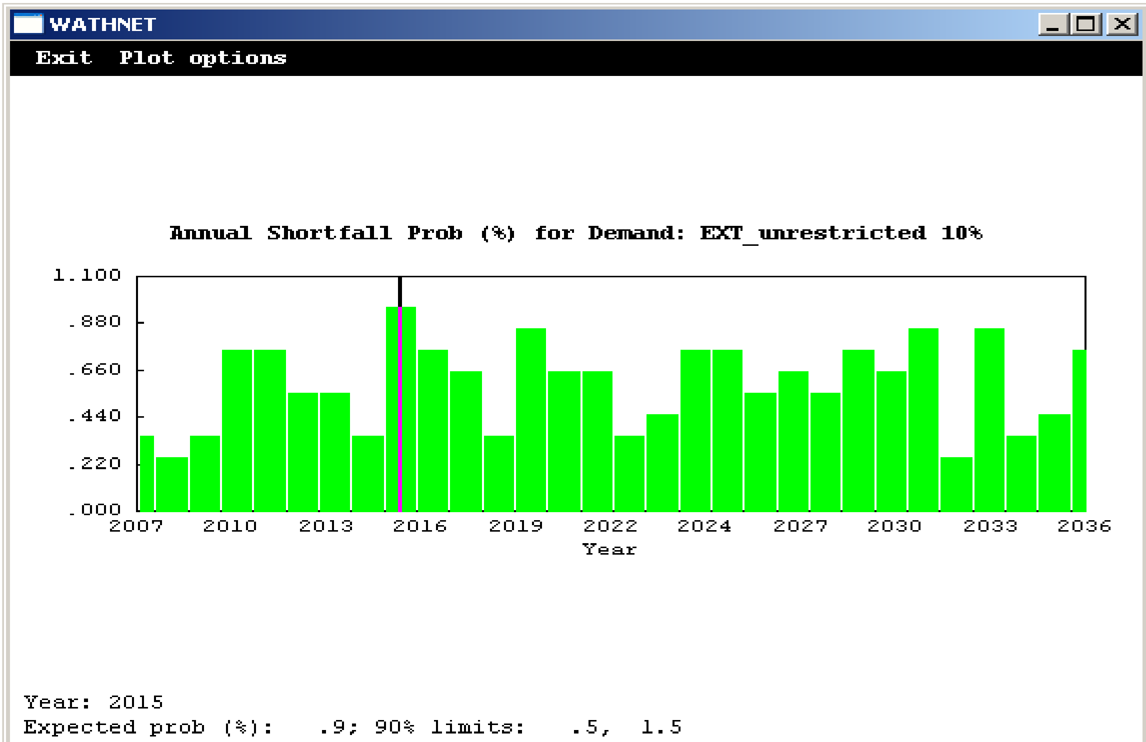


Figure A7: Baseline scenario - Probability of failure to supply any external demand in any year

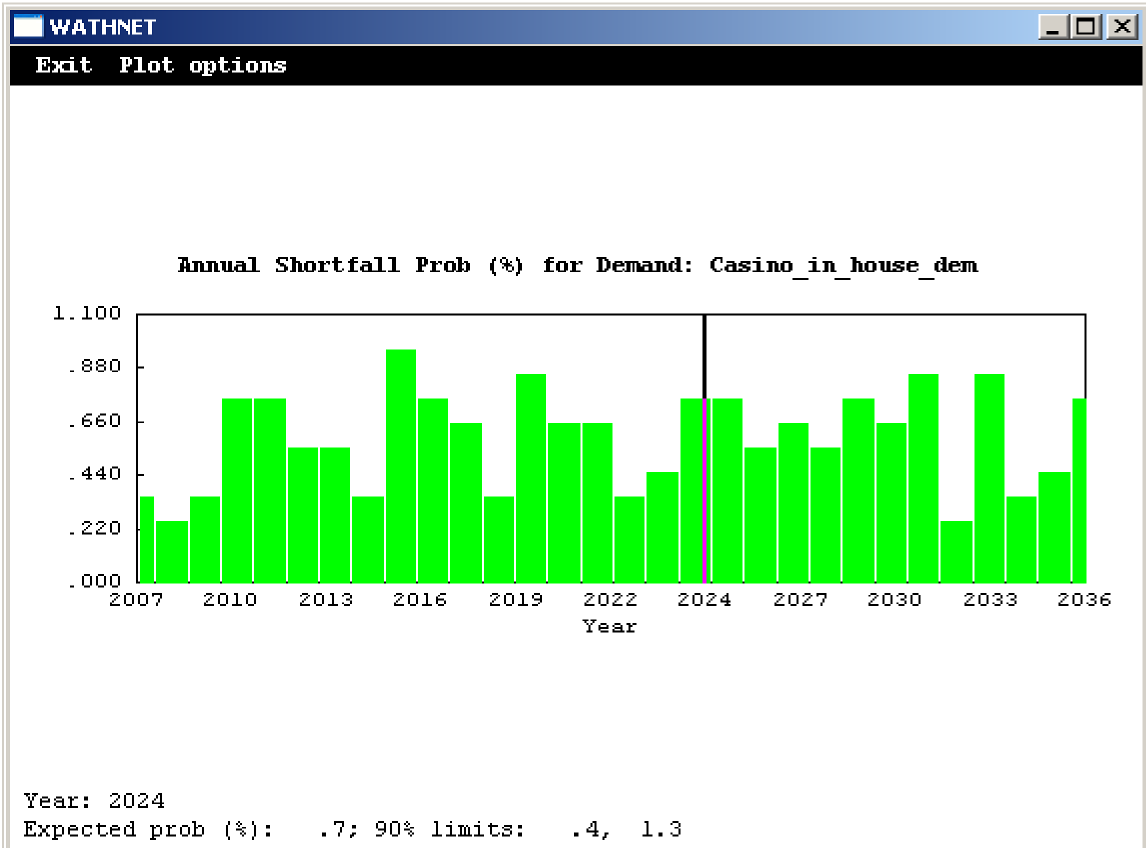


Figure A8: Baseline scenario - Probability of failure to supply internal demand in any year

Appendix E

Capital Works Programs and OMA Schedules for Draft Scenarios

060501 Richmond Valley Council IWCM

Capital Works Program Water - Base Case
2005
All values are in year 2005/06 $'000

Asset	Type of works: Improved LOS	Type of works: New System Assets	Type of works: Renewals	30 year total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
					2005/06	2006/07	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	2032/33	2033/34	2034/35
					2005	2006	2007	2008	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
Data Source																																		
CASINO SYSTEM																																		
Source																																		
Automatic Cartage Fill Up Point	75%	25%		50		25	25																											
Off stream storage		100%		4,101										513	513	3075																		
Casino T/Works - Jabour Weir Structural Asse	100%			32		32																												
Treatment																																		
Re-use of Wastewater (EPA)	75%	25%		2		2																												
Construct PAC System	75%	25%		265		75	100	90																										
Replace Dry Soda Ash Dosing System			100%	215		75	70	70																										
Filter Walls - Concrete Repairs			100%	90		45		45																										
Clear Water Pumps	75%	25%		40		20		20																										
Convert CL2 Gas to Sodium Hypo	75%	25%		190		70		120																										
Draw up PLC Schematics	75%	25%		12				12																										
Resurface No 2 Sludge Lagoon with Clay	100%			20				20																										
Flouridate Water Supply	100%			100			25	75																										
Concrete Repairs to Floc Tanks			100%	30					30																									
Concrete Repairs to Sedimentation Tanks			100%	60					60																									
Casino T/Works - Butterfly Valve Backwash P	75%	25%		10		10																												
Casino T/Works - Taste/Odour Investigation	100%			12		12																												
Works to service new growth		100%		195	4	4	4	4	4	4	4	4	4	4	4	10	10	21	21	21	10	10	4	4	4	4	4	4	4	4	4	4	4	4
Augmentation - Treatment Plant (new sed basin, filters, e		100%		4,100																1025	2050	1025												
Distribution																																		
Augmentation - New Gays Hill reservoir		100%		1,026						103	923																							
Main Upgrades - Low pressure area improve	75%	25%		256	51					205																								
Minor Works	60%	40%		780	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Works to service new growth (reservoir)		100%		72		4		4		4		8		4		4		4		4		8		4		4		4		4		8		4
Works to service new growth (mains)		100%		1,395	51	51	51	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
Casino Reservoir - Communications Hut Sth I	100%			31		31																												
Communications Hut South Reservoir	75%	25%		120			120																											
Remove Old Pipework South Reservoir			100%	60				60																										
Seal Leaks North Reservoir 3			100%	50				50																										
Replace Ladders/Install Davit Arm			100%	200				200																										
Renewals																																		
Mains			100%	11,100			300	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Casino - Mains Replacements 06/07 (various)			100%	468		468																												
RWPS and TP			100%	778	16	16	16	16	16	16	16	16	16	16	16	41	41	82	82	82	41	41	16	16	16	16	16	16	16	16	16	16	16	16
Casino T/Works - Raw Water P/Stn Replace Valves			100%	25		25																												
Reservoirs			100%	291		16		16		16		33		16		16		16		16		33		16		16		16		16		33		16
Other																																		
Plant & Equipment		100%		280			10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Telemetry - minor upgrades & Casino WTP U	100%			618		58	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
Upgrades - Effluent Management (sewer dis	75%	25%		308	51	103	154																											
LOWER RICHMOND SYSTEM																																		
Soruce																																		
PROVIDED BY ROUS WATER																																		
Treatment																																		
PROVIDED BY ROUS WATER																																		
Distribution																																		
South Evans Head - Replace Roof			100%	479		89	90	300																										
Evans Head - Replace Lids on Pump Station			100%	15				15																										
Reservoir Upgrades - Raise level of Sth Evar	75%	25%		308															308															
Works to service new growth (reservoir)		100%		68		4		4		4		8		4		4		4		4		8		4		4		4		4		4		4
Works to service new growth (mains)		100%		930	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Seal Langs Hill reservoir (moved to 10/11 as per RVC email 27/7/07)			100%	103						103																								
Augmentation Coraki MRRV	75%	25%		205	205																													
Mains Upgrades (removed as per RVC email 2	70%	30%																																
Renewals																																		
Coraki			100%	2,750			50	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
Coraki - Mains Replacements 06/07 (various)			100%	82		82																												
Broadwater			100%	1,100			20	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
Broadwater - Mains Replacements 06/07 (various)			100%	45		45																												
Evans Head			100%	2,210			50	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Evans Head - Mains Replacements 06/07 (various)			100%	106		106																												
Rileys Hill			100%	1,100			20	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
Rileys Hill - Mains Replacements 06/07 (various)			100%	30		30																												
Woodburn			100%	1,100			20	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
Woodburn - Mains Replacements 06/07 (various)			100%	60		60																												
Coraki Reservoir - Replace 2x120kL Reservoirs			100%	145		145																												
Reservoir renewals			100%	258				16		16		33		16		16		16		33		16		16		16		16		16		16		16
Other																																		
Acquisition of P&E (Various)		100%		8		8																												
Minor works	60%	40%		450	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
SBP/DSP review	75%	25%		156	26					26					26					26					26					26				
Drought Management Plan	75%	25%		50		50																												
IWCM plan / outcomes	75%	25%		500	50	50	100	100	100	50	50																							
			Total	**39,638**	**526**	**1,881**	**1,317**	**2,085**	**1,058**	**1,395**	**1,841**	**950**	**868**	**1,421**	**1,407**	**4,014**	**899**	**991**	**1,259**	**2,059**	**2,949**	**1,989**	**868**	**908**	**894**	**908**	**868**	**908**	**868**	**934**	**868**	**929**	**868**	**908**
Improved LOS				**3,411**	312	460	444	396	120	255	82	45	45	45	64	45	45	45	276	64	45	45	45	45	64	45	45	45	45	64	45	45	45	45
Other New System Assets (growth w				**13,278**	198	220	237	201	132	289	1,043	123	107	628	627	3,196	113	132	201	1,164	2,163	1,154	107	115	114	115	107	115	107	122	107	119	107	115
Renewals				**22,949**	16	1,201	636	1,488	806	851	716	782	716	748	716	773	741	814	782	831	741	790	716	748	716	748	716	748	716	748	716	765	716	748

Other Grants

Water Base Case - OMA (2005/06 $'000)

	30 Year TOTAL	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014
Management Expenses											
Administration	55,728	996	1,334	1,277	1,294	1,327	1,353	1,422	1,432	1,473	1,525
Engineering and Supervision	12,095	116	225	252	260	270	281	292	304	316	329
Operation and Maintenance Expenses	-										
Operation Expenses	20,662	399	369	475	489	505	519	535	551	568	586
Maintenance Expenses	22,846	525	503	520	534	551	568	584	602	622	642
Energy Costs	3,630	66	58	83	86	88	91	94	96	100	103
Chemical Costs	8,821	210	140	204	210	217	223	230	237	244	251
Purchase of Water	28,673	353	401	492	565	649	746	769	792	816	840
Depreciation	-										
System Assets	15,097	444	468	507	507	507	507	507	507	507	507
Plant & Equipment	84	-	-	3	3	3	3	3	3	3	3
Interest Expenses	-	-	-	-	-	-	-	-	-	-	-
Other Expenses	44	1	2	2	2	2	2	2	2	2	2
TOTAL	167,680	3,109	3,500	3,815	3,949	4,118	4,292	4,437	4,524	4,649	4,788

	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024
Management Expenses										
Administration	1,574	1,655	1,687	1,743	1,800	1,856	1,937	1,969	2,025	2,082
Engineering and Supervision	342	356	370	383	397	411	424	438	452	466
Operation and Maintenance Expenses										
Operation Expenses	605	624	642	661	680	699	718	736	755	774
Maintenance Expenses	662	683	704	725	746	766	787	808	829	850
Energy Costs	106	109	113	116	120	123	126	130	133	137
Chemical Costs	259	267	274	282	290	298	306	313	321	329
Purchase of Water	866	892	918	944	970	996	1,022	1,048	1,074	1,100
Depreciation										
System Assets	507	507	507	507	507	507	507	507	507	507
Plant & Equipment	3	3	3	3	3	3	3	3	3	3
Interest Expenses	-	-	-	-	-	-	-	-	-	-
Other Expenses	2	2	2	2	2	2	2	2	2	2
TOTAL	4,925	5,096	5,218	5,365	5,512	5,659	5,831	5,953	6,100	6,247

	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034
Management Expenses										
Administration	2,138	2,219	2,251	2,307	2,364	2,420	2,501	2,533	2,589	2,646
Engineering and Supervision	479	493	507	520	534	548	561	575	589	603
Operation and Maintenance Expenses										
Operation Expenses	793	812	830	849	868	887	906	924	943	962
Maintenance Expenses	870	891	912	933	954	974	995	1,016	1,037	1,058
Energy Costs	140	143	147	150	154	157	160	164	167	171
Chemical Costs	337	345	352	360	368	376	384	391	399	407
Purchase of Water	1,126	1,152	1,178	1,204	1,230	1,256	1,282	1,308	1,334	1,360
Depreciation										
System Assets	507	507	507	507	507	507	507	507	507	507
Plant & Equipment	3	3	3	3	3	3	3	3	3	3
Interest Expenses	-	-	-	-	-	-	-	-	-	-
Other Expenses	2	2	2	2	2	2	2	2	2	2
TOTAL	6,394	6,565	6,687	6,834	6,981	7,128	7,300	7,422	7,569	7,716

compared with FINMOD projections

Administration	32,495	834	851	868	885	902	920	937	954	971	988
Engineering and Supervision	9,625	248	253	258	263	268	273	278	283	288	293
Operation Expenses	16,000	415	423	431	439	447	456	464	472	480	488
Maintenance Expenses	14,125	367	374	381	388	395	403	410	417	424	431
Energy Costs	2,565	71	72	73	74	75	76	77	78	79	80
Chemical Costs	6,380	168	171	174	177	180	184	187	190	193	196
Purchase of Water	13,585	351	358	365	372	379	386	393	400	407	414
	94,775	2,454	2,502	2,550	2,598	2,646	2,698	2,746	2,794	2,842	2,890

Administration	1005	1022	1039	1056	1073	1090	1107	1124	1141	1158
Engineering and Supervision	298	303	308	313	318	323	328	333	338	343
Operation Expenses	496	504	512	520	528	536	544	552	560	568
Maintenance Expenses	438	445	452	459	466	473	480	487	494	501
Energy Costs	81	82	83	84	85	86	87	88	89	90
Chemical Costs	199	202	205	208	211	214	217	220	223	226
Purchase of Water	421	428	435	442	449	456	463	470	477	484
	2,938	2,986	3,034	3,082	3,130	3,178	3,226	3,274	3,322	3,370

Administration	1175	1193	1211	1229	1247	1265	1284	1303	1322	1341
Engineering and Supervision	348	353	358	363	368	373	379	385	391	397
Operation Expenses	576	585	594	603	612	621	630	639	648	657
Maintenance Expenses	508	516	524	532	540	548	556	564	572	580
Energy Costs	91	92	93	94	95	96	97	98	99	100
Chemical Costs	229	232	235	238	241	244	248	252	256	260
Purchase of Water	491	498	505	512	519	526	534	542	550	558
	3,418	3,469	3,520	3,571	3,622	3,673	3,728	3,783	3,838	3,893

060501 Richmond Valley Council IWCM

Capital Works Program Water - Traditional
2005
All values are in year 2005/06 $'000

Asset	Type of works			30 year total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Improved LOS	New System Assets	Renewals		2005/06	2006/07	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	2032/33	2033/34	2034/35
					2005	2006	2007	2008	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
CASINO SYSTEM																																		
Source																																		
Automatic Cartage Fill Up Point	75%	25%		50		25	25																											
Off stream storage		100%		4,101										513	513	3075																		
Casino T/Works - Jabour Weir Structural Asse	100%			32		32																												
Treatment																																		
Re-use of Wastewater (EPA)	75%	25%		2		2																												
Construct PAC System	75%	25%		265		75	100	90																										
Replace Dry Soda Ash Dosing System			100%	215		75	70	70																										
Filter Walls - Concrete Repairs			100%	90		45		45																										
Clear Water Pumps	75%	25%		40		20		20																										
Convert CL2 Gas to Sodium Hypo	75%	25%		190		70		120																										
Draw up PLC Schematics	75%	25%		12				12																										
Resurface No 2 Sludge Lagoon with Clay	100%			20				20																										
Flouridate Water Supply	100%			100			25	75																										
Concrete Repairs to Floc Tanks			100%	30					30																									
Concrete Repairs to Sedimentation Tanks			100%	60					60																									
Casino T/Works - Butterfly Valve Backwash P	75%	25%		10		10																												
Casino T/Works - Taste/Odour Investigation	100%			12		12																												
Works to service new growth		100%		195	4	4	4	4	4	4	4	4	4	4	4	10	10	21	21	21	10	10	4	4	4	4	4	4	4	4	4	4	4	4
Augmentation - Treatment Plant (new sed basin, filters, e		100%		4,100																1025	2050	1025												
Distribution																																		
Augmentation - New Gays Hill reservoir		100%		1,026						103	923																							
Main Upgrades - Low pressure area improve	75%	25%		256	51					205																								
Minor Works	60%	40%		780	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Works to service new growth (reservoir)		100%		72		4		4		4		8		4		4		4		4		8		4		4		4		4		8		4
Works to service new growth (mains)		100%		1,395	51	51	51	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
Casino Reservoir - Communications Hut Sth F	100%			31		31																												
Communications Hut South Reservoir	75%	25%		120			120																											
Remove Old Pipework South Reservoir			100%	60				60																										
Seal Leaks North Reservoir 3			100%	50				50																										
Replace Ladders/Install Davit Arm			100%	200				200																										
Renewals																																		
Mains			100%	1,827	62	62	62	62	62	62	62	62	62	62	62	61	61	61	61	61	61	61	61	61	61	60	60	60	59	59	59	58	58	58
Point (eg valve, hydrants, fitt etc)			100%	1,149	40	40	40	40	40	40	40	40	39	39	39	39	39	39	39	39	39	38	38	38	38	38	38	37	37	36	36	35	35	34
Plant & Reservoirs			100%	3,409	118	118	118	118	118	118	118	118	114	114	114	114	114	114	114	112	111	111	111	111	111	111	111	111	111	111	111	111	111	105
Other																																		
Plant & Equipment		100%		300	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Telemetry - minor upgrades & Casino WTP Up	100%			618		58	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
Upgrades - Effluent Management (sewer disc	75%	25%		308	51	103	154																											
LOWER RICHMOND SYSTEM																																		
Soruce																																		
PROVIDED BY ROUS WATER																																		
Treatment																																		
PROVIDED BY ROUS WATER																																		
Distribution																																		
South Evans Head - Replace Roof			100%	479		89	90	300																										
Evans Head - Replace Lids on Pump Station			100%	15				15																										
Reservoir Upgrades - Raise level of Sth Evan	75%	25%		308															308															
Works to service new growth (reservoir)		100%		68		4		4		4		8		4		4		4		4		8		4		4		4		4		4		4
Works to service new growth (mains)		100%		930	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Seal Langs Hill reservoir (moved to 10/11 as per RVC email 27/7/07)			100%	103						103																								
Augmentation Coraki MRRV	75%	25%		205	205																													
Mains Upgrades (removed as per RVC email 2	70%	30%																																
Renewals																																		
Reservoirs Renewals			100%	1,226	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
Main Renewals			100%	1,030	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Other																																		
Acquisition of P&E (Various)		100%		8		8																												
Lower Richmond - Metering in distribution sys	75%	25%		130					130																									
Minor works	60%	40%		450	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
SBP/DSP review	75%	25%		156	26					26					26					26					26					26				
Drought Management Plan	75%	25%		50		50																												
IWCM plan / outcomes	75%	25%		500	50	50	100	100	100	50	50																							
Total				**26,783**	**816**	**1,194**	**1,137**	**1,633**	**768**	**942**	**1,420**	**463**	**443**	**964**	**982**	**3,531**	**448**	**467**	**767**	**1,515**	**2,494**	**1,485**	**437**	**445**	**463**	**445**	**437**	**444**	**434**	**468**	**433**	**444**	**431**	**433**
Improved LOS				**3,508**	312	460	444	396	217	255	82	45	45	45	64	45	45	45	276	64	45	45	45	45	64	45	45	45	45	64	45	45	45	45
Other New System Assets (growth w				**13,331**	208	230	237	201	165	289	1,043	123	107	628	627	3,196	113	132	201	1,164	2,163	1,154	107	115	114	115	107	115	107	122	107	119	107	115
Renewals				**9,944**	296	504	456	1,036	386	398	295	295	291	291	291	290	290	290	290	287	286	286	285	285	285	285	285	284	282	282	281	280	279	273

Other Grants

Water - Traditional Case - OMA (2005/06 $'000)

Additional OMA items (2005/06 $'000)

	Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	of	2005/06	2006/07	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	2032/33	2033/34	2034/35
	Expend	2005	2006	2007	2008	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
Feasibility study on regional water supply arrangements	adm				99																										
DMP - DEUS best practice two part pricing	adm																														
DMP - Rainwater tank under BASIX (for new development)	adm																														
DMP - Educational program for external water uses	adm				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
DMP - Reduction for unaccounted for water	adm		400	400	400	400	400	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Contribute to DNR Macro Water Sharing Plan	adm																														
Alternate source investigation	adm				132																										
SBP OMA cost modified by JWP	adm			20					20					20					20					20					20		
Lower Richmond - Metering in distribution system	mai										5					5					5					5					5

Total

	Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	30
	of	2005/06	2006/07	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	2032/33	2033/34	2034/35	YEAR
	Expend	2005	2006	2007	2008	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	TOTAL
Management Expenses																																
Administration	adm	996	1,734	1,697	1,955	1,757	1,783	1,472	1,502	1,523	1,575	1,624	1,705	1,757	1,793	1,850	1,906	1,987	2,039	2,075	2,132	2,188	2,269	2,321	2,357	2,414	2,470	2,551	2,603	2,639	2,696	59,369
Engineering and Supervision	eng	116	225	252	260	270	281	292	304	316	329	342	356	370	383	397	411	424	438	452	466	479	493	507	520	534	548	561	575	589	603	12,095
Operation and Maintenance Expenses																																
Operation Expenses	ope	399	369	475	489	505	519	535	551	568	586	605	624	642	661	680	699	718	736	755	774	793	812	830	849	868	887	906	924	943	962	20,662
Maintenance Expenses	mai	525	503	520	534	551	568	584	602	622	647	662	683	704	725	751	766	787	808	829	855	870	891	912	933	959	974	995	1,016	1,037	1,063	22,871
Energy Costs	ene	66	58	83	86	88	91	94	96	100	103	106	109	113	116	120	123	126	130	133	137	140	143	147	150	154	157	160	164	167	171	3,630
Chemical Costs	che	210	140	204	210	217	223	230	237	244	251	259	267	274	282	290	298	306	313	321	329	337	345	352	360	368	376	384	391	399	407	8,821
Purchase of Water	pur	353	401	492	565	649	746	769	792	816	840	866	892	918	944	970	996	1,022	1,048	1,074	1,100	1,126	1,152	1,178	1,204	1,230	1,256	1,282	1,308	1,334	1,360	
Depreciation																																-
System Assets	sys	444	468	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	15,097
Plant & Equipment	pla	-	-	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	84
Interest Expenses	int	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Expenses	oth	1	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	44
	171,346	3,109	3,900	4,235	4,610	4,548	4,722	4,487	4,594	4,699	4,843	4,975	5,146	5,288	5,415	5,567	5,709	5,881	6,023	6,150	6,302	6,444	6,615	6,757	6,884	7,036	7,178	7,350	7,492	7,619	7,771	

060501 Richmond Valley Council IWCM

Capital Works Program Water - Integrated 1 2005

All values are in year 2005/06 $'000

Asset	Type of works			30 year total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Improved LOS	New System Assets	Renewals		2005/06	2006/07	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
					2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
CASINO SYSTEM																			
Source																			
Automatic Cartage Fill Up Point	75%	25%		50		25	25												
Off stream storage		100%		4,101										513	513	3075			
Casino T/Works - Jabour Weir Structural Asse	100%			32		32													
Treatment																			
Re-use of Wastewater (EPA)	75%	25%		2		2													
Construct PAC System	75%	25%		265		75	100	90											
Replace Dry Soda Ash Dosing System			100%	215		75	70	70											
Filter Walls - Concrete Repairs			100%	90		45		45											
Clear Water Pumps	75%	25%		40		20		20											
Convert CL2 Gas to Sodium Hypo	75%	25%		190		70		120											
Draw up PLC Schematics	75%	25%		12				12											
Resurface No 2 Sludge Lagoon with Clay	100%			20				20											
Flouridate Water Supply	100%			100			25	75											
Concrete Repairs to Floc Tanks			100%	30					30										
Concrete Repairs to Sedimentation Tanks			100%	60					60										
Casino T/Works - Butterfly Valve Backwash P	75%	25%		10		10													
Casino T/Works - Taste/Odour Investigation	100%			12		12													
Works to service new growth		100%		195	4	4	4	4	4	4	4	4	4	4	4	10	10	21	21
Augmentation - Treatment Plant (new sed basin, filters, e		100%		4,100															
Distribution																			
Augmentation - New Gays Hill reservoir		100%		1,026						103	923								
Main Upgrades - Low pressure area improve	75%	25%		256	51					205									
Minor Works	60%	40%		780	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Works to service new growth (reservoir)		100%		72		4		4		4		8		4		4		4	
Works to service new growth (mains)		100%		1,395	51	51	51	46	46	46	46	46	46	46	46	46	46	46	46
Casino Reservoir - Communications Hut Sth F	100%			31		31													
Communications Hut South Reservoir	75%	25%		120			120												
Remove Old Pipework South Reservoir			100%	60				60											
Seal Leaks North Reservoir 3			100%	50				50											
Replace Ladders/Install Davit Arm			100%	200				200											
Renewals																			
Mains			100%	1,827	62	62	62	62	62	62	62	62	62	62	62	61	61	61	61
Point (eg valve, hydrants, fitt etc)			100%	1,149	40	40	40	40	40	40	40	40	39	39	39	39	39	39	39
Plant & Reservoirs			100%	3,409	118	118	118	118	118	118	118	118	114	114	114	114	114	114	114
Other																			
Plant & Equipment		100%		300	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Telemetry - minor upgrades & Casino WTP Up	100%			618		58	20	20	20	20	20	20	20	20	20	20	20	20	20
Upgrades - Effluent Management (sewer disc	75%	25%		308	51	103	154												
LOWER RICHMOND SYSTEM																			
Soruce																			
PROVIDED BY ROUS WATER																			
Treatment																			
PROVIDED BY ROUS WATER																			
Distribution																			
South Evans Head - Replace Roof			100%	479		89	90	300											
Evans Head - Replace Lids on Pump Station			100%	15				15											
Reservoir Upgrades - Raise level of Sth Evan	75%	25%		308															308
Works to service new growth (reservoir)		100%		68		4		4		4		8		4		4		4	
Works to service new growth (mains)		100%		930	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Seal Langs Hill reservoir (moved to 10/11 as per RVC email 27/7/07)			100%	103						103									
Augmentation Coraki MRRV	75%	25%		205	205														
Mains Upgrades (removed as per RVC email 2	70%	30%																	
Renewals																			
Reservoirs Renewals			100%	1,226	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
Main Renewals			100%	1,030	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Other																			
Acquisition of P&E (Various)		100%		8		8													
Lower Richmond - Metering in distribution sys	75%	25%		130					130										
Minor works	60%	40%		450	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
SBP/DSP review	75%	25%		156	26					26					26				
Drought Management Plan	75%	25%		50		50													
IWCM plan / outcomes	75%	25%		500	50	50	100	100	100	50	50								
Total				26,783	816	1,194	1,137	1,633	768	942	1,420	463	443	964	982	3,531	448	467	767
Improved LOS				3,508	312	460	444	396	217	255	82	45	45	45	64	45	45	45	276
Other New System Assets (growth w				13,331	208	230	237	201	165	289	1,043	123	107	628	627	3,196	113	132	201
Renewals				9,944	296	504	456	1,036	386	398	295	295	291	291	291	290	290	290	290
Other Grants																			

Asset	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
CASINO SYSTEM															
Source															
Automatic Cartage Fill Up Point															
Off stream storage															
Casino T/Works - Jabour Weir Structural Asse															
Treatment															
Re-use of Wastewater (EPA)															
Construct PAC System															
Replace Dry Soda Ash Dosing System															
Filter Walls - Concrete Repairs															
Clear Water Pumps															
Convert CL2 Gas to Sodium Hypo															
Draw up PLC Schematics															
Resurface No 2 Sludge Lagoon with Clay															
Flouridate Water Supply															
Concrete Repairs to Floc Tanks															
Concrete Repairs to Sedimentation Tanks															
Casino T/Works - Butterfly Valve Backwash P															
Casino T/Works - Taste/Odour Investigation															
Works to service new growth	21	10	10	4	4	4	4	4	4	4	4	4	4	4	4
Augmentation - Treatment Plant (new sed basin, filters, e	1025	2050	1025												
Distribution															
Augmentation - New Gays Hill reservoir															
Main Upgrades - Low pressure area improve															
Minor Works	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Works to service new growth (reservoir)	4		8		4		4		4		4		8		4
Works to service new growth (mains)	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
Casino Reservoir - Communications Hut Sth F															
Communications Hut South Reservoir															
Remove Old Pipework South Reservoir															
Seal Leaks North Reservoir 3															
Replace Ladders/Install Davit Arm															
Renewals															
Mains	61	61	61	61	61	61	60	60	60	59	59	59	58	58	58
Point (eg valve, hydrants, fitt etc)	39	39	38	38	38	38	38	38	37	37	36	36	35	35	34
Plant & Reservoirs	112	111	111	111	111	111	111	111	111	111	111	111	111	111	105
Other															
Plant & Equipment	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Telemetry - minor upgrades & Casino WTP Up	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Upgrades - Effluent Management (sewer disc															
LOWER RICHMOND SYSTEM															
Soruce															
PROVIDED BY ROUS WATER															
Treatment															
PROVIDED BY ROUS WATER															
Distribution															
South Evans Head - Replace Roof															
Evans Head - Replace Lids on Pump Station															
Reservoir Upgrades - Raise level of Sth Evan															
Works to service new growth (reservoir)	4		8		4		4		4		4		4		4
Works to service new growth (mains)	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Seal Langs Hill reservoir (moved to 10/11 as per RVC email 27/7/07)															
Augmentation Coraki MRRV															
Mains Upgrades (removed as per RVC email 2															
Renewals															
Reservoirs Renewals	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
Main Renewals	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Other															
Acquisition of P&E (Various)															
Lower Richmond - Metering in distribution sys															
Minor works	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
SBP/DSP review	26					26					26				
Drought Management Plan															
IWCM plan / outcomes															
Total	1,515	2,494	1,485	437	445	463	445	437	444	434	468	433	444	431	433
Improved LOS	64	45	45	45	45	64	45	45	45	45	64	45	45	45	45
Other New System Assets (growth w	1,164	2,163	1,154	107	115	114	115	107	115	107	122	107	119	107	115
Renewals	287	286	286	285	285	285	285	285	284	282	282	281	280	279	273
Other Grants															

Water - Integrated 1 - OMA (2005/06 $'000)

Additional OMA items (2005/06 $'000)

Item	Type of Expend	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019
Feasibility study on regional water supply arrangements	adm				99											
DMP - DEUS best practice two part pricing	adm															
DMP - Rainwater tank under BASIX (for new development)	adm															
DMP - Educational program for external water uses	adm				30	30	30	30	30	30	30	30	30	30	30	30
DMP - Reduction for unaccounted for water	adm		400	400	400	400	400	20	20	20	20	20	20	20	20	20
Contribute to DNR Macro Water Sharing Plan	adm															
Alternate source investigation	adm				132											
SBP OMA cost modified by JWP	adm			20					20					20		
DMP - Shower head retrofit	adm			40	41	41	-	-	-	-	-	-	-	-	-	-
DMP - Pernanent restriction	adm			10	10	10	10	10	10	10	10	10	10	10	10	10
DMP - Business audit	adm			-	25	25	25	-	-	26	26	26	-	-	27	27
Regional demand management strategy	adm				32											
Sensitivity analysis on yield with reduced rainfall	adm				149											
Alternate emergency supplies in Regional Water Supply Strat	adm				0											
Lower Richmond - Metering in distribution system	mai										5					5

Item	Type of Expend	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034
Feasibility study on regional water supply arrangements	adm															
DMP - DEUS best practice two part pricing	adm															
DMP - Rainwater tank under BASIX (for new development)	adm															
DMP - Educational program for external water uses	adm	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
DMP - Reduction for unaccounted for water	adm	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Contribute to DNR Macro Water Sharing Plan	adm															
Alternate source investigation	adm															
SBP OMA cost modified by JWP	adm			20					20					20		
DMP - Shower head retrofit	adm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DMP - Pernanent restriction	adm	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
DMP - Business audit	adm	28	-	-	28	29	29	-	-	30	30	31	-	-	31	32
Regional demand management strategy	adm															
Sensitivity analysis on yield with reduced rainfall	adm															
Alternate emergency supplies in Regional Water Supply Strat	adm															
Lower Richmond - Metering in distribution system	mai					5					5					5

Total

Item	Type of Expend	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019
Management Expenses																
Administration	adm	996	1,734	1,748	2,210	1,833	1,818	1,482	1,512	1,559	1,611	1,660	1,715	1,767	1,830	1,887
Engineering and Supervision	eng	116	225	252	260	270	281	292	304	316	329	342	356	370	383	397
Operation and Maintenance Expenses																
Operation Expenses	ope	399	369	475	489	505	519	535	551	568	586	605	624	642	661	680
Maintenance Expenses	mai	525	503	520	534	551	568	584	602	622	647	662	683	704	725	751
Energy Costs	ene	66	58	83	86	88	91	94	96	100	103	106	109	113	116	120
Chemical Costs	che	210	140	204	210	217	223	230	237	244	251	259	267	274	282	290
Purchase of Water	pur	353	401	492	565	649	746	769	792	816	840	866	892	918	944	970
Depreciation																
System Assets	sys	444	468	507	507	507	507	507	507	507	507	507	507	507	507	507
Plant & Equipment	pla	-	-	3	3	3	3	3	3	3	3	3	3	3	3	3
Interest Expenses	int	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Expenses	oth	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	172,403	3,109	3,900	4,285	4,865	4,624	4,757	4,497	4,604	4,735	4,879	5,011	5,156	5,298	5,452	5,604

Item	Type of Expend	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034	30 YEAR TOTAL
Management Expenses																	
Administration	adm	1,944	1,997	2,049	2,114	2,170	2,227	2,279	2,331	2,397	2,454	2,511	2,561	2,613	2,681	2,737	60,427
Engineering and Supervision	eng	411	424	438	452	466	479	493	507	520	534	548	561	575	589	603	12,095
Operation and Maintenance Expenses																	
Operation Expenses	ope	699	718	736	755	774	793	812	830	849	868	887	906	924	943	962	20,662
Maintenance Expenses	mai	766	787	808	829	855	870	891	912	933	959	974	995	1,016	1,037	1,063	22,871
Energy Costs	ene	123	126	130	133	137	140	143	147	150	154	157	160	164	167	171	3,630
Chemical Costs	che	298	306	313	321	329	337	345	352	360	368	376	384	391	399	407	8,821
Purchase of Water	pur	996	1,022	1,048	1,074	1,100	1,126	1,152	1,178	1,204	1,230	1,256	1,282	1,308	1,334	1,360	
Depreciation																	-
System Assets	sys	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	15,097
Plant & Equipment	pla	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	84
Interest Expenses	int	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Expenses	oth	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	44
		5,747	5,891	6,033	6,188	6,340	6,483	6,625	6,767	6,924	7,076	7,219	7,360	7,502	7,660	7,812	

060501 Richmond Valley Council IWCM

Capital Works Program Water - Integrated 2
2005

All values are in year 2005/06 $'000

Asset	Type of works				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Improved LOS	New System Assets	Renewals	30 year total	2005/06	2006/07	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	2032/33	2033/34	2034/35
					2005	2006	2007	2008	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
CASINO SYSTEM																																		
Source																																		
Automatic Cartage Fill Up Point	75%	25%		50		25	25																											
Off stream storage		100%		4,101										513	513	3075																		
Casino T/Works - Jabour Weir Structural Asse	100%			32		32																												
Treatment																																		
Re-use of Wastewater (EPA)	75%	25%		2		2																												
Construct PAC System	75%	25%		265		75	100	90																										
Replace Dry Soda Ash Dosing System			100%	215		75	70	70																										
Filter Walls - Concrete Repairs			100%	90		45		45																										
Clear Water Pumps	75%	25%		40		20		20																										
Convert CL2 Gas to Sodium Hypo	75%	25%		190		70		120																										
Draw up PLC Schematics	75%	25%		12				12																										
Resurface No 2 Sludge Lagoon with Clay	100%			20				20																										
Flouridate Water Supply	100%			100			25	75																										
Concrete Repairs to Floc Tanks			100%	30					30																									
Concrete Repairs to Sedimentation Tanks			100%	60					60																									
Casino T/Works - Butterfly Valve Backwash P	75%	25%		10		10																												
Casino T/Works - Taste/Odour Investigation	100%			12		12																												
Works to service new growth		100%		195	4	4	4	4	4	4	4	4	4	4	4	10	10	21	21	21	10	10	4	4	4	4	4	4	4	4	4	4	4	4
Augmentation - Treatment Plant (new sed basin, filters, e		100%		4,100																1025	2050	1025												
Distribution																																		
Augmentation - New Gays Hill reservoir		100%		1,026						103	923																							
Main Upgrades - Low pressure area improve	75%	25%		256	51					205																								
Minor Works	60%	40%		780	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Works to service new growth (reservoir)		100%		72		4		4		4		8		4		4		4		4		8		4		4		4		4		8		4
Works to service new growth (mains)		100%		1,395	51	51	51	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
Casino Reservoir - Communications Hut Sth R	100%			31		31																												
Communications Hut South Reservoir	75%	25%		120			120																											
Remove Old Pipework South Reservoir			100%	60				60																										
Seal Leaks North Reservoir 3			100%	50				50																										
Replace Ladders/Install Davit Arm			100%	200				200																										
Renewals																																		
Mains			100%	1,827	62	62	62	62	62	62	62	62	62	62	62	61	61	61	61	61	61	61	61	61	61	60	60	60	59	59	59	58	58	58
Point (eg valve, hydrants, fitt etc)			100%	1,149	40	40	40	40	40	40	40	40	39	39	39	39	39	39	39	39	39	38	38	38	38	38	38	37	37	36	36	35	35	34
Plant & Reservoirs			100%	3,409	118	118	118	118	118	118	118	118	114	114	114	114	114	114	114	112	111	111	111	111	111	111	111	111	111	111	111	111	111	105
Other																																		
Plant & Equipment		100%		300	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Telemetry - minor upgrades & Casino WTP Up	100%			618		58	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
Upgrades - Effluent Management (sewer disc	75%	25%		308	51	103	154																											
LOWER RICHMOND SYSTEM																																		
Soruce																																		
PROVIDED BY ROUS WATER																																		
Treatment																																		
PROVIDED BY ROUS WATER																																		
Distribution																																		
South Evans Head - Replace Roof			100%	479		89	90	300																										
Evans Head - Replace Lids on Pump Station			100%	15				15																										
Reservoir Upgrades - Raise level of Sth Evan	75%	25%		308															308															
Works to service new growth (reservoir)		100%		68		4		4		4		8		4		4		4		4		8		4		4		4		4		4		4
Works to service new growth (mains)		100%		930	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Seal Langs Hill reservoir (moved to 10/11 as per RVC email 27/7/07)			100%	103						103																								
Augmentation Coraki MRRV	75%	25%		205	205																													
Mains Upgrades (removed as per RVC email 27/7/07)		100%																																
Renewals																																		
Reservoirs Renewals			100%	1,226	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
Main Renewals			100%	1,030	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Other																																		
Acquisition of P&E (Various)		100%		8		8																												
Lower Richmond - Metering in distribution sys	75%	25%		130					130																									
Minor works	60%	40%		450	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
SBP/DSP review	75%	25%		156	26					26					26					26					26					26				
Drought Management Plan	75%	25%		50		50																												
IWCM plan / outcomes	75%	25%		500	50	50	100	100	100	50	50																							
			Total	**26,783**	**816**	**1,194**	**1,137**	**1,633**	**768**	**942**	**1,420**	**463**	**443**	**964**	**982**	**3,531**	**448**	**467**	**767**	**1,515**	**2,494**	**1,485**	**437**	**445**	**463**	**445**	**437**	**444**	**434**	**468**	**433**	**444**	**431**	**433**
	Improved LOS			3,508	312	460	444	396	217	255	82	45	45	45	64	45	45	45	276	64	45	45	45	45	64	45	45	45	45	64	45	45	45	45
	Other New System Assets (growth w			13,331	208	230	237	201	165	289	1,043	123	107	628	627	3,196	113	132	201	1,164	2,163	1,154	107	115	114	115	107	115	107	122	107	119	107	115
	Renewals			9,944	296	504	456	1,036	386	398	295	295	291	291	291	290	290	290	290	287	286	286	285	285	285	285	285	284	282	282	281	280	279	273

Other Grants

Water - Integrated 2 - OMA (2005/06 $'000)

Additional OMA items (2005/06 $'000)

	Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	of	2005/06	2006/07	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	2032/33	2033/34	2034/35
	Expend	2005	2006	2007	2008	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
Feasibility study on regional water supply arrangements	adm				99																										
DMP - DEUS best practice two part pricing	adm																														
DMP - Rainwater tank under BASIX (for new development)	adm																														
DMP - Educational program for external water uses	adm				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
DMP - Reduction for unaccounted for water	adm		400	400	400	400	400	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Contribute to DNR Macro Water Sharing Plan	adm																														
Alternate source investigation	adm				132																										
SBP OMA cost modified by JWP	adm			20					20					20					20					20					20		
DMP - Shower head retrofit	adm			40	41	41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DMP - Pernanent restriction	adm			10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
DMP - Business audit	adm			-	25	25	25	-	-	26	26	26	-	-	27	27	28	-	-	28	29	29	-	-	30	30	31	-	-	31	32
Regional demand management strategy	adm				32																										
Sensitivity analysis on yield with reduced rainfall	adm				149																										
Alternate emergency supplies in Regional Water Supply Strat	adm				0																										
Lower Richmond - Metering in distribution system	mai										5					5					5					5					5

Total

	Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	30
	of	2005/06	2006/07	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	2032/33	2033/34	2034/35	YEAR
	Expend	2005	2006	2007	2008	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	TOTAL
Management Expenses																																
Administration	adm	996	1,734	1,748	2,210	1,833	1,818	1,482	1,512	1,559	1,611	1,660	1,715	1,767	1,830	1,887	1,944	1,997	2,049	2,114	2,170	2,227	2,279	2,331	2,397	2,454	2,511	2,561	2,613	2,681	2,737	60,427
Engineering and Supervision	eng	116	225	252	260	270	281	292	304	316	329	342	356	370	383	397	411	424	438	452	466	479	493	507	520	534	548	561	575	589	603	12,095
Operation and Maintenance Expenses																																
Operation Expenses	ope	399	369	475	489	505	519	535	551	568	586	605	624	642	661	680	699	718	736	755	774	793	812	830	849	868	887	906	924	943	962	20,662
Maintenance Expenses	mai	525	503	520	534	551	568	584	602	622	647	662	683	704	725	751	766	787	808	829	855	870	891	912	933	959	974	995	1,016	1,037	1,063	22,871
Energy Costs	ene	66	58	83	86	88	91	94	96	100	103	106	109	113	116	120	123	126	130	133	137	140	143	147	150	154	157	160	164	167	171	3,630
Chemical Costs	che	210	140	204	210	217	223	230	237	244	251	259	267	274	282	290	298	306	313	321	329	337	345	352	360	368	376	384	391	399	407	8,821
Purchase of Water	pur	353	401	492	565	649	746	769	792	816	840	866	892	918	944	970	996	1,022	1,048	1,074	1,100	1,126	1,152	1,178	1,204	1,230	1,256	1,282	1,308	1,334	1,360	28,673
Depreciation																																-
System Assets	sys	444	468	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	15,097
Plant & Equipment	pla	-	-	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	84
Interest Expenses	int	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Expenses	oth	1	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	44
	172,403	3,109	3,900	4,285	4,865	4,624	4,757	4,497	4,604	4,735	4,879	5,011	5,156	5,298	5,452	5,604	5,747	5,891	6,033	6,188	6,340	6,483	6,625	6,767	6,924	7,076	7,219	7,360	7,502	7,660	7,812	

060501 Richmond Valley Council IWCM

Capital Works Program Water - Integrated 3 2005

All values are in year 2005/06 $'000

Asset	Type of works				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Improved LOS	New System Assets	Renewals	30 year total	2005/06	2006/07	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
					2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
CASINO SYSTEM																			
Source																			
Automatic Cartage Fill Up Point	75%	25%		50		25	25												
Off stream storage		100%		4,101										513	513	3075			
Casino T/Works - Jabour Weir Structural Asse	100%			32		32													
Treatment																			
Re-use of Wastewater (EPA)	75%	25%		2		2													
Construct PAC System	75%	25%		265		75	100	90											
Replace Dry Soda Ash Dosing System			100%	215		75	70	70											
Filter Walls - Concrete Repairs			100%	90		45		45											
Clear Water Pumps	75%	25%		40		20		20											
Convert CL2 Gas to Sodium Hypo	75%	25%		190		70		120											
Draw up PLC Schematics	75%	25%		12				12											
Resurface No 2 Sludge Lagoon with Clay	100%			20				20											
Flouridate Water Supply	100%			100			25	75											
Concrete Repairs to Floc Tanks			100%	30					30										
Concrete Repairs to Sedimentation Tanks			100%	60					60										
Casino T/Works - Butterfly Valve Backwash P	75%	25%		10		10													
Casino T/Works - Taste/Odour Investigation	100%			12		12													
Works to service new growth		100%		195	4	4	4	4	4	4	4	4	4	4	4	10	10	21	21
Augmentation - Treatment Plant (new sed basin, filters, e		100%		4,100															
Distribution																			
Augmentation - New Gays Hill reservoir		100%		1,026						103	923								
Main Upgrades - Low pressure area improve	75%	25%		256	51					205									
Minor Works	60%	40%		780	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Works to service new growth (reservoir)		100%		72		4		4		4		8		4		4		4	
Works to service new growth (mains)		100%		1,395	51	51	51	46	46	46	46	46	46	46	46	46	46	46	46
Casino Reservoir - Communications Hut Sth F	100%			31		31													
Communications Hut South Reservoir	75%	25%		120			120												
Remove Old Pipework South Reservoir			100%	60				60											
Seal Leaks North Reservoir 3			100%	50				50											
Replace Ladders/Install Davit Arm			100%	200				200											
Renewals																			
Mains			100%	1,827	62	62	62	62	62	62	62	62	62	62	62	61	61	61	61
Point (eg valve, hydrants, fitt etc)			100%	1,149	40	40	40	40	40	40	40	40	39	39	39	39	39	39	39
Plant & Reservoirs			100%	3,409	118	118	118	118	118	118	118	118	114	114	114	114	114	114	114
Other																			
Plant & Equipment		100%		300	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Telemetry - minor upgrades & Casino WTP U	100%			618		58	20	20	20	20	20	20	20	20	20	20	20	20	20
Upgrades - Effluent Management (sewer disc	75%	25%		308	51	103	154												
LOWER RICHMOND SYSTEM																			
Soruce																			
PROVIDED BY ROUS WATER																			
Treatment																			
PROVIDED BY ROUS WATER																			
Distribution																			
South Evans Head - Replace Roof			100%	479		89	90	300											
Evans Head - Replace Lids on Pump Station			100%	15				15											
Reservoir Upgrades - Raise level of Sth Evan	75%	25%		308															308
Works to service new growth (reservoir)		100%		68		4		4		4		8		4		4		4	
Works to service new growth (mains)		100%		930	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Seal Langs Hill reservoir (moved to 10/11 as per RVC email 27/7/07)			100%	103						103									
Augmentation Coraki MRRV	75%	25%		205	205														
Mains Upgrades (removed as per RVC email 2	70%	30%																	
Renewals																			
Reservoirs Renewals			100%	1,226	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
Main Renewals			100%	1,030	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Other																			
Acquisition of P&E (Various)		100%		8		8													
Lower Richmond - Metering in distribution sys	75%	25%		130					130										
Minor works	60%	40%		450	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
SBP/DSP review	75%	25%		156	26					26					26				
Drought Management Plan	75%	25%		50		50													
IWCM plan / outcomes	75%	25%		500	50	50	100	100	100	50	50								
			Total	**26,783**	**816**	**1,194**	**1,137**	**1,633**	**768**	**942**	**1,420**	**463**	**443**	**964**	**982**	**3,531**	**448**	**467**	**767**
	Improved LOS			**3,508**	312	460	444	396	217	255	82	45	45	45	64	45	45	45	276
	Other New System Assets (growth w			**13,331**	208	230	237	201	165	289	1,043	123	107	628	627	3,196	113	132	201
	Renewals			**9,944**	296	504	456	1,036	386	398	295	295	291	291	291	290	290	290	290
	Other Grants																		

Asset	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
CASINO SYSTEM															
Source															
Automatic Cartage Fill Up Point															
Off stream storage															
Casino T/Works - Jabour Weir Structural Asse															
Treatment															
Re-use of Wastewater (EPA)															
Construct PAC System															
Replace Dry Soda Ash Dosing System															
Filter Walls - Concrete Repairs															
Clear Water Pumps															
Convert CL2 Gas to Sodium Hypo															
Draw up PLC Schematics															
Resurface No 2 Sludge Lagoon with Clay															
Flouridate Water Supply															
Concrete Repairs to Floc Tanks															
Concrete Repairs to Sedimentation Tanks															
Casino T/Works - Butterfly Valve Backwash P															
Casino T/Works - Taste/Odour Investigation															
Works to service new growth	21	10	10	4	4	4	4	4	4	4	4	4	4	4	4
Augmentation - Treatment Plant (new sed basin, filters, e	1025	2050	1025												
Distribution															
Augmentation - New Gays Hill reservoir															
Main Upgrades - Low pressure area improve															
Minor Works	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Works to service new growth (reservoir)	4		8		4		4		4		4		8		4
Works to service new growth (mains)	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
Casino Reservoir - Communications Hut Sth F															
Communications Hut South Reservoir															
Remove Old Pipework South Reservoir															
Seal Leaks North Reservoir 3															
Replace Ladders/Install Davit Arm															
Renewals															
Mains	61	61	61	61	61	61	60	60	60	59	59	59	58	58	58
Point (eg valve, hydrants, fitt etc)	39	39	38	38	38	38	38	38	37	37	36	36	35	35	34
Plant & Reservoirs	112	111	111	111	111	111	111	111	111	111	111	111	111	111	105
Other															
Plant & Equipment	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Telemetry - minor upgrades & Casino WTP U	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Upgrades - Effluent Management (sewer disc															
LOWER RICHMOND SYSTEM															
Soruce															
PROVIDED BY ROUS WATER															
Treatment															
PROVIDED BY ROUS WATER															
Distribution															
South Evans Head - Replace Roof															
Evans Head - Replace Lids on Pump Station															
Reservoir Upgrades - Raise level of Sth Evan															
Works to service new growth (reservoir)	4		8		4		4		4		4		4		4
Works to service new growth (mains)	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Seal Langs Hill reservoir (moved to 10/11 as per RVC email 27/7/07)															
Augmentation Coraki MRRV															
Mains Upgrades (removed as per RVC email 2															
Renewals															
Reservoirs Renewals	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
Main Renewals	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Other															
Acquisition of P&E (Various)															
Lower Richmond - Metering in distribution sys															
Minor works	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
SBP/DSP review	26					26					26				
Drought Management Plan															
IWCM plan / outcomes															
Total	**1,515**	**2,494**	**1,485**	**437**	**445**	**463**	**445**	**437**	**444**	**434**	**468**	**433**	**444**	**431**	**433**
Improved LOS	64	45	45	45	45	64	45	45	45	45	64	45	45	45	45
Other New System Assets (growth w	1,164	2,163	1,154	107	115	114	115	107	115	107	122	107	119	107	115
Renewals	287	286	286	285	285	285	285	285	284	282	282	281	280	279	273
Other Grants															

Water Integrated 3 - OMA (2005/06 $'000)

Additional OMA items (2005/06 $'000)

Item	Type of Expend	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019
Feasibility study on regional water supply arrangements	adm				99											
DMP - DEUS best practice two part pricing	adm															
DMP - Rainwater tank under BASIX (for new development)	adm															
DMP - Educational program for external water uses	adm				30	30	30	30	30	30	30	30	30	30	30	30
DMP - Reduction for unaccounted for water	adm		400	400	400	400	400	20	20	20	20	20	20	20	20	20
Contribute to DNR Macro Water Sharing Plan	adm															
Alternate source investigation	adm				132											
SBP OMA cost modified by JWP	adm			20					20					20		
DMP - Shower head retrofit	adm			40	41	41	-	-	-	-	-	-	-	-	-	-
DMP - Pernanent restriction	adm			10	10	10	10	10	10	10	10	10	10	10	10	10
DMP - Business audit	adm			-	25	25	25	-	-	26	26	26	-	-	27	27
Regional demand management strategy	adm				32											
Sensitivity analysis on yield with reduced rainfall	adm				149											
Alternate emergency supplies in Regional Water Supply Stra	adm				0											
Lower Richmond - Metering in distribution system	mai										5					5

Item	Type of Expend	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034
Feasibility study on regional water supply arrangements	adm															
DMP - DEUS best practice two part pricing	adm															
DMP - Rainwater tank under BASIX (for new development)	adm															
DMP - Educational program for external water uses	adm	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
DMP - Reduction for unaccounted for water	adm	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Contribute to DNR Macro Water Sharing Plan	adm															
Alternate source investigation	adm															
SBP OMA cost modified by JWP	adm			20					20					20		
DMP - Shower head retrofit	adm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DMP - Pernanent restriction	adm	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
DMP - Business audit	adm	28	-	-	28	29	29	-	-	30	30	31	-	-	31	32
Regional demand management strategy	adm															
Sensitivity analysis on yield with reduced rainfall	adm															
Alternate emergency supplies in Regional Water Supply Stra	adm															
Lower Richmond - Metering in distribution system	mai					5					5					5

Total

Item	Type of Expend	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019
Management Expenses																
Administration	adm	996	1,734	1,748	2,210	1,833	1,818	1,482	1,512	1,559	1,611	1,660	1,715	1,767	1,830	1,887
Engineering and Supervision	eng	116	225	252	260	270	281	292	304	316	329	342	356	370	383	397
Operation and Maintenance Expenses																
Operation Expenses	ope	399	369	475	489	505	519	535	551	568	586	605	624	642	661	680
Maintenance Expenses	mai	525	503	520	534	551	568	584	602	622	647	662	683	704	725	751
Energy Costs	ene	66	58	83	86	88	91	94	96	100	103	106	109	113	116	120
Chemical Costs	che	210	140	204	210	217	223	230	237	244	251	259	267	274	282	290
Purchase of Water	pur	353	401	492	565	649	746	769	792	816	840	866	892	918	944	970
Depreciation																
System Assets	sys	444	468	507	507	507	507	507	507	507	507	507	507	507	507	507
Plant & Equipment	pla	-	-	3	3	3	3	3	3	3	3	3	3	3	3	3
Interest Expenses	int	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Expenses	oth	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	172,403	3,109	3,900	4,285	4,865	4,624	4,757	4,497	4,604	4,735	4,879	5,011	5,156	5,298	5,452	5,604

Item	Type of Expend	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034	30 YEAR TOTAL
Management Expenses																	
Administration	adm	1,944	1,997	2,049	2,114	2,170	2,227	2,279	2,331	2,397	2,454	2,511	2,561	2,613	2,681	2,737	60,427
Engineering and Supervision	eng	411	424	438	452	466	479	493	507	520	534	548	561	575	589	603	12,095
Operation and Maintenance Expenses																	
Operation Expenses	ope	699	718	736	755	774	793	812	830	849	868	887	906	924	943	962	20,662
Maintenance Expenses	mai	766	787	808	829	855	870	891	912	933	959	974	995	1,016	1,037	1,063	22,871
Energy Costs	ene	123	126	130	133	137	140	143	147	150	154	157	160	164	167	171	3,630
Chemical Costs	che	298	306	313	321	329	337	345	352	360	368	376	384	391	399	407	8,821
Purchase of Water	pur	996	1,022	1,048	1,074	1,100	1,126	1,152	1,178	1,204	1,230	1,256	1,282	1,308	1,334	1,360	28,673
Depreciation																	-
System Assets	sys	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	15,097
Plant & Equipment	pla	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	84
Interest Expenses	int	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Expenses	oth	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	44
		5,747	5,891	6,033	6,188	6,340	6,483	6,625	6,767	6,924	7,076	7,219	7,360	7,502	7,660	7,812	

060501 Richmond Valley Council IWCM

Capital Works Program Sewerage - Base Case
2005
All values are in year 2005/06 $'000

Asset	Type of works				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Improved LOS	New System Assets	Renewals	30 year total	2005/06	2006/07	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	2032/33	2033/34	2034/35
					2005	2006	2007	2008	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
CASINO SYSTEM																																		
Collection & Transfer																																		
Upgrades - PS2 upgrade from dry well	75%	25%		426		96	330																											
Casino Mains - Norco Weir Services Conduit RM		100%		425		425																												
PS5 External Valve Pit	75%	25%		30		30																												
Pump Station 10 - Replace Pumps	75%	25%		170		70		100																										
Pump Stations 1 & 10 - Variable Speed Drives	75%	25%																																
Replace Fence at Comminuter			100%	6				6																										
Manholes, pipelines for growth	100%			652	10	10	15	21	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	21	21	21	21	21	15	15	15	15	15
Manholes, pipelines for ILOS	100%			652	10	10	15	21	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	21	21	21	21	21	15	15	15	15	15
Upgardes Page Pl etc.	10%	50%	40%	522	15	51	51	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Augmentation - Airport gravity sewer (ie. CMCA Design Rising Main)		100%		55	51	4																												
Work to serve growth (PS)		100%		99	5	3	3	3	3	10	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
PS Augmentation - airport, CMCA (removed as per RVC email 27/7/27)		100%																																
Treatment																																		
Upgrades - Treatment works	30%	70%		1,845		205			205				205				205			205			205			205			205			205		
Augmentation Investigation		100%		50				50																										
Augmentation Design		100%		450					450																									
Augmentation Construction		100%		9,613						2000	3000							2563	2050															
Davit Arm for WAS Pump	75%	25%		15				15																										
Replace 20mm Plumbing Lines	100%			8				8																										
Replace Handrails at Sedimentation Tanks & Trickling Filters	100%			15				15																										
T/Plant Casino - Sludge Transfer Pump	100%			9		9																												
T/Plant Casino - Septic Disposal Area Concrete Works	100%			10		10																												
Effluent Management																																		
Casino - Golf Course (existing)																																		
Renewals																																		
Relining works			100%	270		270																												
Junction repairs			100%	24		24																												
Casino Mains - Junction Repairs			100%	27		27																												
Pump station			100%	922	46	28	28	28	28	92	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Treatment plant			100%	1,080	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	36
T/Plant Casino - Replace Roof Grit Removal Area			100%	20		20																												
T/Plant Casino - Replace Lids PS10-12			100%	6		6																												
Other																																		
Plant & Equipment	40%	20%	40%	285			15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Minor upgrades - telemetry	20%	30%	50%	604	20	24	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
EVANS HEAD & WOODBURN SYSTEM																																		
Collection & Transfer																																		
Pumping station works for ILOS	100%			150	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Mains works for ILOS	100%			468	21	21	21	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Mains works for growth		100%		468	21	21	21	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Evans Hd Mains - Re-divert RM1 to PS8	100%			60		60																												
Evans Hd Mains - Design PS & RM Upgrades	100%			150		150																												
P/Stn Evans Hd - Augment PS4	100%			130		130																												
Evans Head - Upgrade Pump Stations - to be allocated	75%	25%		420			30		30		30		30		30		30		30		30		30		30		30		30		30		30	
Evans Head/Woodburn Pump Station & Rising Main Upgrades	75%	25%		2,300			1000	1300																										
Treatment																																		
Treatment works for ILOS	100%			19	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Augmentation - Project Management (Geolink)	75%	25%		675		150	75	75	75	75	75	75	75																					
Augmentation - Design (Dept Commerce)	75%	25%		260		200	60																											
Augmentation - UV Disinfection Plant	75%	25%		15			15																											
Augmentation - Effluent re-use trial (ie. Effluent Re-use Trial at Evans Aerodrome)	75%	25%		486		286	200																											
Augmentation - Treatment Plant Stage 1 Construction	75%	25%		12,650		11650	1000																											
Augmentation - Treatment Plant Stage 2 Construction	75%	25%		6,000								500	5500																					
Augmentation - T/Plant Ancillary Items - Upgrade Entrance Road 700m x 4m	75%	25%		80			80																											
Augmentation - T/Plant Ancillary Items - Upgrade Entrance Road with Broadwater Rd	75%	25%		40			40																											
Augmentation - T/Plant Ancillary Items - Security System	75%	25%		4			4																											
Augmentation - T/Plant Ancillary Items - Programming of PLC	75%	25%		40			40																											
Augmentation - T/Plant Ancillary Items - Laboratory Equipment	75%	25%		22			22																											
Augmentation - Construct Dry Weather Re-use System	75%	25%		3,497		497	750	1250		1000																								
T/Plant Evans Hd Aug - Dry Weather Re-use Scheme (Geolink)	75%	25%		46		46																												
Augmentation - Wet Weather Release EIS	75%	25%		815		115	200	500																										
Augmentation - Design/Document Wet Weather Release System	75%	25%		430		80		350																										
T/Plant Evans Hd - Water Main 150mm 1500m	75%	25%		180		180																												
T/Plant Evans Hd - Security System	75%	25%		4		4																												
T/Plant Evans Hd - Whitegoods & Furniture Amenities Building	75%	25%		4		4																												
T/Plant Evans Hd - Programming PLC	75%	25%		40		40																												
T/Plant Evans Hd - Catch Pond Cleaner (VOR)	75%	25%		81		81																												
T/Plant Evans Hd - Laboratory Equipment	75%	25%		22		22																												
Augmentation - Construct Wet Weather Release System	75%	25%		4,000					2000	2000																								
Salty Lagoon Rehabilitation Program	75%	25%		1,975			105	660	715	120	375																							
Construction of Dam	75%	25%		2,100			1100	1000																										
Aerodrome service track pipeline construction	75%	25%		750			750																											
Effluent Management																																		
Renewals																																		
Evans head - relining works			100%	286		286																												
Treatment works renewal			100%	175	14	14	14	14	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Pumping station renewal			100%	1,380	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
Other																																		
CORAKI SYSTEM																																		
Collection & Transfer																																		
Coraki Mains - Windsor Park	75%	25%		25		25																												
P/Stn Coraki - KRT Submersible Pump	75%	25%		6		6																												
Mains works for growth		100%		160	5	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Mains works for ILOS	100%			160	5	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Growth works		100%		126			21					21					21					21					21					21		
Upgrade Pump Station No.1	75%	25%		75				75																										
Treatment																																		
Augmentation Investigation		100%		50					50																									
Augmentation Design		100%		450						450																								
Augmentation Construction		100%		3,500							1500	2000																						
Effluent Management																																		
T/Plant Coraki - Effluent Pond	100%			35		35																												
Reuse line to golf course	75%	25%		590		100	490																											
Golf club mains	75%	25%		10		10																												
Renewals																																		
Relineing works			100%	287		287																												
P/Stn Coraki - PS1 & 2 Ladder Repair			100%	5		5																												
Treatment works renewal			100%	461	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Other																																		
RYLEYS HILL / BROADWATER SYSTEM																																		
Collection & Transfer																																		
Pumping Stations	75%	25%		60		10					10					10					10					10					10			
Treatment																																		
T/Plant Rileys Hill - Install Generator Switch	75%	25%		3		3																												
Rileys Hill - Gantry Crane for CDEAT	75%	25%		15				15																										
Broadwater - Sewerage Augmentation	75%	25%		6,000		200	1500	2500	1800																									
Effluent Management																																		
Renewals																																		
Rileys Hill - Treatment works			100%	126		21					21					21					21					21					21			
MISCELLANEOUS																																		
Sewerage System Analysis (all area)	75%	25%		75				75																										
Minor works	30%	40%	30%	923	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
SBP / DSP review	75%	25%		154	26					26					26					26					26					26				
IWCM plan / outcome	75%	25%		500	50	50	100	100	100	50	50																							
Pump station DWF overflow strategy (removed as per RVC email 27/7/07)	100%																																	
Upgrade Pump Stations - to be allocated	75%	25%		1,350				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
Main Repairs - to be allocated			100%	2,100			75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Relining - to be allocated			100%	18,200			650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650
P/Stn All Areas - Install Mesh Screens	100%			35		35																												
P/Stn All Areas - Generator Tarps	100%			4		4																												
Acquisition of P&E assets (various)	100%			9		9																												
			Total	**93,996**	**433**	**16,311**	**8,995**	**9,175**	**6,506**	**6,873**	**6,142**	**3,677**	**6,891**	**1,081**	**1,136**	**1,112**	**1,337**	**3,644**	**3,161**	**1,311**	**1,142**	**1,102**	**1,316**	**1,081**	**1,126**	**1,307**	**1,122**	**1,071**	**1,306**	**1,085**	**1,120**	**1,285**	**1,089**	**1,059**
	Improved LOS			38,514	124	11,046	6,010	6,159	3,735	2,587	539	565	4,399	134	175	141	218	134	156	214	164	134	218	134	165	193	146	124	208	131	142	173	134	112
	Other New System Assets (growth			29,213	127	4,140	2,075	2,117	1,887	3,338	4,698	2,228	1,608	63	77	66	235	2,626	2,121	213	73	84	214	63	77	209	92	63	214	70	73	228	71	63
	Renewals			26,269	182	1,125	910	899	884	948	905	884	884	884	884	905	884	884	884	884	905	884	884	884	884	905	884	884	884	884	905	884	884	884

Sewerage Base Case - OMA (2005/06 $'000)

	30 Year TOTAL	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014
Management Expenses											
Administration	87,705	879	1,566	1,551	1,711	1,784	1,946	2,022	2,101	2,172	2,246
Engineering and Supervision	11,981	116	189	251	258	269	279	291	302	314	327
Operation and Maintenance Expenses	-										
Operation Expenses	36,752	913	867	936	920	948	965	1,003	1,022	1,063	1,085
Maintenance Expenses	17,205	434	443	452	461	470	488	497	506	515	524
Energy Costs	7,134	124	99	171	176	181	186	191	196	202	207
Chemical Costs	2,044	0	3	48	50	51	53	54	56	58	60
Depreciation	-										
System Assets	41,121	762	958	1,062	1,170	1,286	1,290	1,292	1,295	1,299	1,302
Plant & Equipment	638	-	22	22	22	22	22	22	22	22	22
Interest Expenses	38,817	36	804	1,166	1,453	1,683	1,936	2,139	2,229	2,401	2,302
Other Expenses	-	-	-	-	-	-	-	-	-	-	-
TOTAL	243,397	3,264	4,951	5,659	6,221	6,694	7,165	7,511	7,728	8,045	8,075

	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024
Management Expenses										
Administration	2,273	2,425	2,527	2,655	2,782	2,909	3,061	3,163	3,291	3,418
Engineering and Supervision	340	354	367	381	394	408	422	435	449	462
Operation and Maintenance Expenses										
Operation Expenses	1,127	1,151	1,175	1,198	1,222	1,245	1,269	1,293	1,316	1,340
Maintenance Expenses	533	542	551	560	569	578	587	596	605	614
Energy Costs	213	219	225	231	237	243	249	255	261	267
Chemical Costs	62	64	66	68	70	72	74	76	78	80
Depreciation										
System Assets	1,305	1,307	1,312	1,366	1,442	1,447	1,450	1,452	1,457	1,459
Plant & Equipment	22	22	22	22	22	22	22	22	22	22
Interest Expenses	2,197	2,085	1,973	1,861	1,749	1,637	1,525	1,413	1,301	1,189
Other Expenses	-	-	-	-	-	-	-	-	-	-
TOTAL	8,072	8,169	8,218	8,342	8,487	8,561	8,659	8,705	8,780	8,851

	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034
Management Expenses										
Administration	3,545	3,697	3,799	3,927	4,054	4,181	4,333	4,435	4,563	4,690
Engineering and Supervision	476	490	503	517	530	544	558	571	585	598
Operation and Maintenance Expenses										
Operation Expenses	1,363	1,387	1,411	1,434	1,458	1,481	1,505	1,529	1,552	1,576
Maintenance Expenses	623	633	643	653	663	673	683	693	703	713
Energy Costs	273	279	285	291	297	303	309	315	321	327
Chemical Costs	82	84	86	88	90	92	94	96	98	100
Depreciation										
System Assets	1,462	1,466	1,469	1,471	1,505	1,539	1,573	1,607	1,641	1,675
Plant & Equipment	22	22	22	22	22	22	22	22	22	22
Interest Expenses	1,077	965	853	741	629	517	405	293	181	69
Other Expenses	-	-	-	-	-	-	-	-	-	-
TOTAL	8,923	9,023	9,071	9,144	9,248	9,352	9,482	9,561	9,666	9,770

060501 Richmond Valley Council IWCM

Capital Works Program Sewerage - Traditional
2005
All values are in year 2005/06 $'000

Asset	Type of works: Improved LOS	New System Assets	Renewals	30 year total	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034
CASINO SYSTEM																																		
Collection & Transfer																																		
Upgrades - PS2 upgrade from dry well	75%	25%		426		96	330																											
Casino Mains - Norco Weir Services Conduit RM		100%		425		425																												
PS5 External Valve Pit			100%	30		30																												
Pump Station 10 - Replace Pumps	75%	25%		170		70		100																										
Pump Stations 1 & 10 - Variable Speed Drives	75%	25%																																
Replace Fence at Comminuter			100%	6				6																										
Manholes, pipelines for growth	100%			652	10	10	15	21	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	21	21	21	21	21	15	15	15	15	15
Manholes, pipelines for ILOS	100%			652	10	10	15	21	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	21	21	21	21	21	15	15	15	15	15
Upgardes Page Pl etc.	10%	50%	40%	522	15	51	51	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Augmentation - Airport gravity sewer		100%		51	51																													
Work to serve growth (PS)		100%		99	5	3	3	3	3	10	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
PS Augmentation - airport, CMCA (removed as per RVC e		100%																																
Treatment																																		
Upgrades - Treatment works	30%	70%		1,845		205			205				205				205			205			205			205			205			205		
Augmentation Investigation, design and construction		100%		6,165				62	555	2466	3083																							
Davit Arm for WAS Pump	75%	25%		15				15																										
Replace 20mm Plumbing Lines	100%			8				8																										
Replace Handrails at Sedimentation Tanks & Tri	100%			15				15																										
T/Plant Casino - Sludge Transfer Pump	100%			9		9																												
T/Plant Casino - Septic Disposal Area Concrete V	100%			10		10																												
Effluent Management																																		
Casino - Golf Course (existing)																																		
Casino - Blue Circle Cement Ltd (Dyraaba St)	75%	25%		922								922																						
Casino - Sporting fields (Albert, Queen Elizabeth	75%	25%		1,566								1566																						
Renewals																																		
Renewals - mains			100%	2,259	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Renewals - point (eg. manhole, fitting, ventstack, etc)			100%	570	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	19	19	19	19	17	17	17	17	16	15
Renewals - Treatment works			100%	2,291	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	77	76	76	76	76	76	76	75	72	67	66
Other																																		
Plant & Equipment	40%	20%	40%	305	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Minor upgrades - telemetry	20%	30%	50%	604	20	24	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
ANS HEAD & WOODBURN SYST																																		
Collection & Transfer																																		
Pumping station works for ILOS	100%			150	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Mains works for ILOS	100%			468	21	21	21	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Mains works for growth		100%		468	21	21	21	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Evans Hd Mains - Re-divert RM1 to PS8	100%			60		60																												
Evans Hd Mains - Design PS & RM Upgrades	100%			150		150																												
P/Stn Evans Hd - Augment PS4	100%			130		130																												
Evans Head - Upgrade Pump Stations - to be all	75%	25%		420			30		30		30		30		30		30		30		30		30		30		30		30		30		30	
Evans Head/Woodburn Pump Station & Rising M	75%	25%		2,300			1000	1300																										
Treatment																																		
Treatment works for ILOS	100%			19	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Augmentation - Project Management (Geolink)	75%	25%		675		150	75	75	75	75	75	75	75																					
Augmentation - Design (Dept Commerce)	75%	25%		260		200	60																											
Augmentation - UV Disinfection Plant	75%	25%		15			15																											
Augmentation - Effluent re-use trial (ie. Effluent	75%	25%		486		286	200																											
Augmentation - Treatment Plant Stage 1 Constr	75%	25%		12,650		11650	1000																											
Augmentation - Treatment Plant Stage 2 Constr	75%	25%		6,000								500	5500																					
Augmentation - T/Plant Ancillary Items - Upgrad	75%	25%		80			80																											
Augmentation - T/Plant Ancillary Items - Upgrad	75%	25%		40			40																											
Augmentation - T/Plant Ancillary Items - Securi	75%	25%		4			4																											
Augmentation - T/Plant Ancillary Items - Progra	75%	25%		40			40																											
Augmentation - T/Plant Ancillary Items - Labora	75%	25%		22			22																											
Augmentation - Construct Dry Weather Re-use S	75%	25%		3,497		497	750	1250		1000																								
T/Plant Evans Hd Aug - Dry Weather Re-use Sch	75%	25%		46		46																												
Augmentation - Wet Weather Release EIS	75%	25%		815		115	200	500																										
Augmentation - Design/Document Wet Weather	75%	25%		430		80		350																										
T/Plant Evans Hd - Water Main 150mm 1500m	75%	25%		180		180																												
T/Plant Evans Hd - Security System	75%	25%		4		4																												
T/Plant Evans Hd - Whitegoods & Furniture Ame	75%	25%		4		4																												
T/Plant Evans Hd - Programming PLC	75%	25%		40		40																												
T/Plant Evans Hd - Catch Pond Cleaner (VOR)	75%	25%		81		81																												
T/Plant Evans Hd - Laboratory Equipment	75%	25%		22		22																												
Augmentation - Construct Wet Weather Release	75%	25%		4,000					2000	2000																								
Salty Lagoon Rehabilitation Program	75%	25%		1,975			105	660	715	120	375																							
Construction of Dam	75%	25%		2,100			1100	1000																										
Aerodrome service track pipeline construction	75%	25%		750			750																											
Effluent Management																																		
Evans Head irrigation open spaces	75%	25%		2,065										2065																				
Renewals																																		
Evans head - mains			100%	1,085	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	36
Evans head - point (eg. manhole, fitting, ventstack, etc)			100%	0.3	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Evans head - Treatment works			100%	1,193	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
Woodburn - mains			100%	229	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Woodburn - point (eg. manhole, fitting, ventstack, etc)			100%																															
Woodburn - Treatment works			100%	200	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Other																																		
CORAKI SYSTEM																																		
Collection & Transfer																																		
Coraki Mains - Windsor Park	75%	25%		25		25																												
P/Stn Coraki - KRT Submersible Pump	75%	25%		6		6																												
Mains works for growth		100%		160	5	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Mains works for ILOS	100%			160	5	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Growth works		100%		126			21					21					21					21					21					21		
Upgrade Pump Station No.1	75%	25%		75				75																										
Treatment																																		
Augmentation Investigation		100%		50					50																									
Augmentation Design		100%		450						450																								
Augmentation Construction		100%		3,500							1500	2000																						
Effluent Management																																		
T/Plant Coraki - Effluent Pond	100%			35		35																												
Reuse line to golf course	75%	25%		590		100	490																											
Golf club mains	75%	25%		10		10																												
Renewals																																		
Renewals - mains			100%	423	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Renewals - point (eg. manhole, fitting, ventstack, etc)			100%																															
Renewals - Treatment works			100%	654	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Other																																		
EYS HILL / BROADWATER SYS																																		
Collection & Transfer																																		
Pumping Stations	75%	25%		60		10					10					10					10					10					10			
Treatment																																		
T/Plant Rileys Hill - Install Generator Switch	75%	25%		3		3																												
Rileys Hill - Gantry Crane for CDEAT	75%	25%		15				15																										
Broadwater - Sewerage Augmentation	75%	25%		6,000		200	1500	2500	1800																									
Effluent Management																																		
Broadwater agricultural reuse (incl. Woodburn)	75%	25%		1,980						1980																								
Renewals																																		
Rileys Hill - mains			100%	55	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	2
Rileys Hill - point (eg. manhole, fitting, ventstack, etc)			100%	48	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	2
Rileys Hill - Treatment works			100%	247	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
MISCELLANEOUS																																		
Sewerage System Analysis (all area)	75%	25%		75				75																										
Minor works	30%	40%	30%	923	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
SBP / DSP review	75%	25%		154	26					26					26					26					26					26				
IWCM plan / outcome	75%	25%		500	50	50	100	100	100	50	50																							
Pump station DWF overflow strategy (removed a	100%																																	
Upgrade Pump Stations - to be allocated	75%	25%		1,350				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
P/Stn All Areas - Install Mesh Screens	100%			35		35																												
P/Stn All Areas - Generator Tarps	100%			4		4																												
Acquisition of P&E assets (various)	100%			9		9																												
Total				**80,491**	**602**	**15,546**	**8,437**	**8,634**	**6,067**	**8,711**	**5,660**	**5,621**	**6,347**	**2,601**	**592**	**547**	**793**	**537**	**567**	**767**	**577**	**558**	**772**	**536**	**579**	**739**	**575**	**524**	**757**	**536**	**549**	**732**	**530**	**498**
Improved LOS				**43,399**	130	11,028	6,008	6,159	3,735	4,072	539	2,431	4,399	1,682	175	141	218	134	156	214	164	134	218	134	165	193	146	124	208	131	142	173	134	112
Other New System Assets				**26,892**	130	4,131	2,074	2,129	1,992	4,299	4,781	2,850	1,608	579	77	66	235	63	71	213	73	84	214	63	77	209	92	63	214	70	73	228	71	63
Renewals				**10,200**	342	387	355	346	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	339	337	337	337	337	335	335	334	331	325	323

Other Grants

Sewerage Traditional - OMA (2005/06 $'000)

Additional OMA items (2005/06 $'000)

	Type of Expend	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034
Casino - Blue Circle Cement Ltd (Dyraaba St)	ope								45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
	mai								14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
	ene								50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Broadwater agricultural reuse (incl. Woodburn) (256 ML/	ope						7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	mai						15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
	ene						3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Evans Head irrigation open spaces	ope										19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
	mai										40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
	ene										8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
SBP OMA cost modified by JWP	adm			20					20					20					20					20					20		
Assume Casio STP OMA cost as in Budget																															
Casino - Sporting fields (Albert, Queen Elizabeth, Crawfo	ope								39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
	mai								23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
	ene								32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32

Total

	Type of Expend	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034	30 YEAR TOTAL
Management Expenses																																
Administration	adm	879	1,566	1,571	1,711	1,784	1,946	2,022	2,121	2,172	2,246	2,273	2,425	2,547	2,655	2,782	2,909	3,061	3,183	3,291	3,418	3,545	3,697	3,819	3,927	4,054	4,181	4,333	4,455	4,563	4,690	87,825
Engineering and Supervision	eng	116	189	251	258	269	279	291	302	314	327	340	354	367	381	394	408	422	435	449	462	476	490	503	517	530	544	558	571	585	598	11,981
Operation and Maintenance Expenses																																
Operation Expenses	ope	913	867	936	920	948	972	1,010	1,113	1,154	1,195	1,238	1,261	1,285	1,308	1,332	1,356	1,379	1,403	1,426	1,450	1,474	1,497	1,521	1,544	1,568	1,592	1,615	1,639	1,662	1,686	39,266
Maintenance Expenses	mai	434	443	452	461	470	503	512	558	567	616	625	634	643	652	661	670	679	688	697	706	715	725	735	745	755	765	775	785	795	805	19,277
Energy Costs	ene	124	99	171	176	181	189	194	281	287	300	306	312	318	324	330	336	342	348	354	360	366	372	378	384	390	396	402	408	414	420	9,264
Chemical Costs	che	0	3	48	50	51	53	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	2,044
Depreciation																																
System Assets	sys	762	958	1,062	1,170	1,286	1,290	1,292	1,295	1,299	1,302	1,305	1,307	1,312	1,366	1,442	1,447	1,450	1,452	1,457	1,459	1,462	1,466	1,469	1,471	1,505	1,539	1,573	1,607	1,641	1,675	41,121
Plant & Equipment	pla	-	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	638
Interest Expenses	int	36	804	1,166	1,453	1,683	1,936	2,139	2,229	2,401	2,302	2,197	2,085	1,973	1,861	1,749	1,637	1,525	1,413	1,301	1,189	1,077	965	853	741	629	517	405	293	181	69	38,817
Other Expenses	oth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	250,233	3,264	4,951	5,679	6,221	6,694	7,190	7,536	7,977	8,274	8,371	8,368	8,464	8,534	8,637	8,783	8,857	8,954	9,021	9,075	9,147	9,219	9,318	9,387	9,439	9,544	9,648	9,777	9,877	9,961	10,066	

060501 Richmond Valley Council IWCM

Capital Works Program Sewerage - Integrated 1
2005
All values are in year 2005/06 $'000

Asset	Type of works				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Improved LOS	New System Assets	Renewals	30 year total	2005/06	2006/07	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	2032/33	2033/34	2034/35
					2005	2006	2007	2008	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
CASINO SYSTEM																																		
Collection & Transfer																																		
Upgrades - PS2 upgrade from dry well	75%	25%		426		96	330																											
Casino Mains - Norco Weir Services Conduit RM		100%		425		425																												
PS5 External Valve Pit			100%	30		30																												
Pump Station 10 - Replace Pumps	75%	25%		170		70		100																										
Pump Stations 1 & 10 - Variable Speed Drive	75%	25%																																
Replace Fence at Comminuter			100%	6				6																										
Manholes, pipelines for growth	100%			652	10	10	15	21	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	21	21	21	21	21	15	15	15	15	15
Manholes, pipelines for ILOS	100%			652	10	10	15	21	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	21	21	21	21	21	15	15	15	15	15
Upgardes Page Pl etc.	10%	50%	40%	522	15	51	51	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Augmentation - Airport gravity sewer		100%		51	51																													
Work to serve growth (PS)		100%		99	5	3	3	3	3	10	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
PS Augmentation - airport, CMCA (removed as per RVC		100%																																
Treatment																																		
Upgrades - Treatment works	30%	70%		1,845		205			205				205				205			205			205			205			205			205		
Augmentation Investigation, design and construction		100%		6,165				62	555	2466	3083																							
Davit Arm for WAS Pump	75%	25%		15				15																										
Replace 20mm Plumbing Lines	100%			8				8																										
Replace Handrails at Sedimentation Tanks &	100%			15				15																										
T/Plant Casino - Sludge Transfer Pump	100%			9		9																												
T/Plant Casino - Septic Disposal Area Concre	100%			10		10																												
Effluent Management																																		
Casino - Golf Course (existing)																																		
Casino - Blue Circle Cement Ltd (Dyraaba St)	75%	25%		922								922																						
Casino - Sporting fields (Albert, Queen Elizab	75%	25%		1,566								1566																						
Renewals																																		
Renewals - mains			100%	2,259	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Renewals - point (eg. manhole, fitting, ventstack, etc)			100%	570	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	19	19	19	19	17	17	17	17	16	15
Renewals - Treatment works			100%	2,291	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	77	76	76	76	76	76	76	75	72	67	66
Other																																		
Plant & Equipment	40%	20%	40%	305	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Minor upgrades - telemetry	20%	30%	50%	604	20	24	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
NS HEAD & WOODBURN SYS																																		
Collection & Transfer																																		
Pumping station works for ILOS	100%			150	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Mains works for ILOS	100%			468	21	21	21	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Mains works for growth		100%		468	21	21	21	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Evans Hd Mains - Re-divert RM1 to PS8	100%			60		60																												
Evans Hd Mains - Design PS & RM Upgrades	100%			150		150																												
P/Stn Evans Hd - Augment PS4	100%			130		130																												
Evans Head - Upgrade Pump Stations - to be	75%	25%		420			30		30		30		30		30		30		30		30		30		30		30		30		30		30	
Evans Head/Woodburn Pump Station & Risin	75%	25%		2,300			1000	1300																										
Treatment																																		
Treatment works for ILOS	100%			19	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Augmentation - Project Management (Geolin	75%	25%		675		150	75	75	75	75	75	75	75																					
Augmentation - Design (Dept Commerce)	75%	25%		260		200	60																											
Augmentation - UV Disinfection Plant	75%	25%		15			15																											
Augmentation - Effluent re-use trial (ie. Efflu	75%	25%		486		286	200																											
Augmentation - Treatment Plant Stage 1 Cor	75%	25%		12,650		11650	1000																											
Augmentation - Treatment Plant Stage 2 Cor	75%	25%		6,000								500	5500																					
Augmentation - T/Plant Ancillary Items - Upg	75%	25%		80			80																											
Augmentation - T/Plant Ancillary Items - Upg	75%	25%		40			40																											
Augmentation - T/Plant Ancillary Items - Sec	75%	25%		4			4																											
Augmentation - T/Plant Ancillary Items - Pro	75%	25%		40			40																											
Augmentation - T/Plant Ancillary Items - Lab	75%	25%		22			22																											
Augmentation - Construct Dry Weather Re-u	75%	25%		3,497		497	750	1250		1000																								
T/Plant Evans Hd Aug - Dry Weather Re-use	75%	25%		46		46																												
Augmentation - Wet Weather Release EIS	75%	25%		815		115	200	500																										
Augmentation - Design/Document Wet Weat	75%	25%		430		80		350																										
T/Plant Evans Hd - Water Main 150mm 1500	75%	25%		180		180																												
T/Plant Evans Hd - Security System	75%	25%		4		4																												
T/Plant Evans Hd - Whitegoods & Furniture A	75%	25%		4		4																												
T/Plant Evans Hd - Programming PLC	75%	25%		40		40																												
T/Plant Evans Hd - Catch Pond Cleaner (VOR	75%	25%		81		81																												
T/Plant Evans Hd - Laboratory Equipment	75%	25%		22		22																												
Augmentation - Construct Wet Weather Rele	75%	25%		4,000					2000	2000																								
Salty Lagoon Rehabilitation Program	75%	25%		1,975			105	660	715	120	375																							
Construction of Dam	75%	25%		2,100			1100	1000																										
Aerodrome service track pipeline constructio	75%	25%		750			750																											
Effluent Management																																		
Evans Head irrigation open spaces	75%	25%		2,065										2065																				
Renewals																																		
Evans head - mains			100%	1,085	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	36
Evans head - point (eg. manhole, fitting, ventstack, etc)			100%	0.3	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Evans head - Treatment works			100%	1,193	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
Woodburn - mains			100%	229	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Woodburn - point (eg. manhole, fitting, ventstack, etc)			100%																															
Woodburn - Treatment works			100%	200	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Other																																		
CORAKI SYSTEM																																		
Collection & Transfer																																		
Coraki Mains - Windsor Park	75%	25%		25		25																												
P/Stn Coraki - KRT Submersible Pump	75%	25%		6		6																												
Mains works for growth		100%		160	5	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Mains works for ILOS	100%			160	5	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Growth works		100%		126			21					21					21					21					21					21		
Upgrade Pump Station No.1	75%	25%		75				75																										
Treatment																																		
Augmentation Investigation		100%		50					50																									
Augmentation Design		100%		450						450																								
Augmentation Construction		100%		3,500							1500	2000																						
Effluent Management																																		
T/Plant Coraki - Effluent Pond	100%			35		35																												
Reuse line to golf course	75%	25%		590		100	490																											
Golf club mains	75%	25%		10		10																												
Renewals																																		
Renewals - mains			100%	423	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Renewals - point (eg. manhole, fitting, ventstack, etc)			100%																															
Renewals - Treatment works			100%	654	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Other																																		
YS HILL / BROADWATER SY																																		
Collection & Transfer																																		
Pumping Stations	75%	25%		60		10					10					10					10					10					10			
Treatment																																		
T/Plant Rileys Hill - Install Generator Switch	75%	25%		3		3																												
Rileys Hill - Gantry Crane for CDEAT	75%	25%		15				15																										
Broadwater - Sewerage Augmentation	75%	25%		6,000		200	1500	2500	1800																									
Effluent Management																																		
Broadwater agricultural reuse (incl. Woodbur	75%	25%		1,980						1980																								
Renewals																																		
Rileys Hill - mains			100%	55	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	2
Rileys Hill - point (eg. manhole, fitting, ventstack, etc)			100%	48	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	2
Rileys Hill - Treatment works			100%	247	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
MISCELLANEOUS																																		
Sewerage System Analysis (all area)	75%	25%		75				75																										
Minor works	30%	40%	30%	923	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
SBP / DSP review	75%	25%		154	26					26					26					26					26					26				
IWCM plan / outcome	75%	25%		500	50	50	100	100	100	50	50																							
Pump station DWF overflow strategy (remove	100%																																	
Upgrade Pump Stations - to be allocated	75%	25%		1,350				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
P/Stn All Areas - Install Mesh Screens	100%			35		35																												
P/Stn All Areas - Generator Tarps	100%			4		4																												
Acquisition of P&E assets (various)	100%			9		9																												
			Total	80,491	602	15,546	8,437	8,634	6,067	8,711	5,660	5,621	6,347	2,601	592	547	793	537	567	767	577	558	772	536	579	739	575	524	757	536	549	732	530	498
	Improved LOS			43,399	130	11,028	6,008	6,159	3,735	4,072	539	2,431	4,399	1,682	175	141	218	134	156	214	164	134	218	134	165	193	146	124	208	131	142	173	134	112
	Other New System Assets (g			26,892	130	4,131	2,074	2,129	1,992	4,299	4,781	2,850	1,608	579	77	66	235	63	71	213	73	84	214	63	77	209	92	63	214	70	73	228	71	63
	Renewals			10,200	342	387	355	346	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	339	337	337	337	337	335	335	334	331	325	323

Other Grants

Sewerage Integrated 1 - OMA (2005/06 $'000)

Additional OMA items (2005/06 $'000)	Type of Expend	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034
Casino - Blue Circle Cement Ltd (Dyraaba St)	ope								45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
	mai								14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
	ene								50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Broadwater agricultural reuse (incl. Woodburn) (256 ML/	ope						7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	mai						15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
	ene						3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Evans Head irrigation open spaces	ope										19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
	mai										40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
	ene										8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
SBP OMA cost modified by JWP	adm			20					20					20					20					20					20		
Assume Casio STP OMA cost as in Budget																															
Casino - Sporting fields (Albert, Queen Elizabeth, Crawfo	ope								39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
	mai								23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
	ene								32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32

Total

	Type of Expend	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034	30 YEAR TOTAL
Management Expenses																																
Administration	adm	879	1,566	1,571	1,711	1,784	1,946	2,022	2,121	2,172	2,246	2,273	2,425	2,547	2,655	2,782	2,909	3,061	3,183	3,291	3,418	3,545	3,697	3,819	3,927	4,054	4,181	4,333	4,455	4,563	4,690	87,825
Engineering and Supervision	eng	116	189	251	258	269	279	291	302	314	327	340	354	367	381	394	408	422	435	449	462	476	490	503	517	530	544	558	571	585	598	11,981
Operation and Maintenance Expenses																																
Operation Expenses	ope	913	867	936	920	948	972	1,010	1,113	1,154	1,195	1,238	1,261	1,285	1,308	1,332	1,356	1,379	1,403	1,426	1,450	1,474	1,497	1,521	1,544	1,568	1,592	1,615	1,639	1,662	1,686	39,266
Maintenance Expenses	mai	434	443	452	461	470	503	512	558	567	616	625	634	643	652	661	670	679	688	697	706	715	725	735	745	755	765	775	785	795	805	19,277
Energy Costs	ene	124	99	171	176	181	189	194	281	287	300	306	312	318	324	330	336	342	348	354	360	366	372	378	384	390	396	402	408	414	420	9,264
Chemical Costs	che	0	3	48	50	51	53	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	2,044
Depreciation																																
System Assets	sys	762	958	1,062	1,170	1,286	1,290	1,292	1,295	1,299	1,302	1,305	1,307	1,312	1,366	1,442	1,447	1,450	1,452	1,457	1,459	1,462	1,466	1,469	1,471	1,505	1,539	1,573	1,607	1,641	1,675	41,121
Plant & Equipment	pla	-	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	638
Interest Expenses	int	36	804	1,166	1,453	1,683	1,936	2,139	2,229	2,401	2,302	2,197	2,085	1,973	1,861	1,749	1,637	1,525	1,413	1,301	1,189	1,077	965	853	741	629	517	405	293	181	69	38,817
Other Expenses	oth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	250,233	3,264	4,951	5,679	6,221	6,694	7,190	7,536	7,977	8,274	8,371	8,368	8,464	8,534	8,637	8,783	8,857	8,954	9,021	9,075	9,147	9,219	9,318	9,387	9,439	9,544	9,648	9,777	9,877	9,961	10,066	

General Fund Items

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Incentives for better on site technologies	adm			50			15			15			15			15			15			15			15			15			15
	ope			25			25			25			25			25			25			25			25			25			25
	eng			60			60			60			60			60			60			60			60			60			60
	adm				200	175	175	175	175	175	175	175	175	175																	
Education on sustainable land management practice	adm				30	30	30	30	30																						
TOTAL GENERAL FUND		0	0	135	230	205	305	205	205	275	175	175	275	175	0	100	0	0	100	0	0	100	0	0	100	0	0	100	0	0	100

060501 Richmond Valley Council IWCM

Capital Works Program Sewerage - Integrated 2
2005
All values are in year 2005/06 $'000

Asset	Type of works: Improved LOS	New System Assets	Renewals	30 year total	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034
CASINO SYSTEM																																		
Collection & Transfer																																		
Upgrades - PS2 upgrade from dry well	75%	25%		426		96	330																											
Casino Mains - Norco Weir Services Conduit RM		100%		425		425																												
PS5 External Valve Pit			100%	30		30																												
Pump Station 10 - Replace Pumps	75%	25%		170		70		100																										
Pump Stations 1 & 10 - Variable Speed Drives	75%	25%																																
Replace Fence at Comminuter			100%	6				6																										
Manholes, pipelines for growth	100%			652	10	10	15	21	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	21	21	21	21	21	15	15	15	15	15
Manholes, pipelines for ILOS	100%			652	10	10	15	21	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	21	21	21	21	21	15	15	15	15	15
Upgardes Page Pl etc.	10%	50%	40%	522	15	51	51	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Augmentation - Airport gravity sewer		100%		51	51																													
Work to serve growth (PS)		100%		99	5	3	3	3	3	10	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
PS Augmentation - airport, CMCA (removed as per RVC email 27/7/27)		100%																																
Treatment																																		
Upgrades - Treatment works	30%	70%		1,845		205			205				205				205			205			205			205			205			205		
Augmentation Investigation, design and construction		100%		6,165				62	555	2466	3083																							
Davit Arm for WAS Pump	75%	25%		15				15																										
Replace 20mm Plumbing Lines	100%			8				8																										
Replace Handrails at Sedimentation Tanks & Trickling Filters	100%			15				15																										
T/Plant Casino - Sludge Transfer Pump	100%			9		9																												
T/Plant Casino - Septic Disposal Area Concrete Works	100%			10		10																												
Effluent Management																																		
Casino - Golf Course (existing)																																		
Casino - Blue Circle Cement Ltd (Dyraaba St)	75%	25%		922								922																						
Casino - Sporting fields (Albert, Queen Elizabeth, Crawford)	75%	25%		1,566								1566																						
Dual reticulation new development area west Casino (Bruxner Hwy)		100%		3,704								3704																						
Dual reticulation new development area west Casino (Reynolds road)		100%		649								649																						
Dual reticulation new development area North Casino (Summerland Wa		100%		3,077								3077																						
Renewals																																		
Renewals - mains			100%	2,259	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Renewals - point (eg. manhole, fitting, ventstack, etc)			100%	570	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	19	19	19	19	17	17	17	17	16	15
Renewals - Treatment works			100%	2,291	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	77	76	76	76	76	76	76	75	72	67	66
Other																																		
Plant & Equipment	40%	20%	40%	305	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Minor upgrades - telemetry	20%	30%	50%	604	20	24	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
EVANS HEAD & WOODBURN SYSTEM																																		
Collection & Transfer																																		
Pumping station works for ILOS	100%			150	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Mains works for ILOS	100%			468	21	21	21	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Mains works for growth		100%		468	21	21	21	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Evans Hd Mains - Re-divert RM1 to PS8	100%			60		60																												
Evans Hd Mains - Design PS & RM Upgrades	100%			150		150																												
P/Stn Evans Hd - Augment PS4	100%			130		130																												
Evans Head - Upgrade Pump Stations - to be allocated	75%	25%		420			30		30		30		30		30		30		30		30		30		30		30		30		30		30	
Evans Head/Woodburn Pump Station & Rising Main Upgrade	75%	25%		2,300			1000	1300																										
Treatment																																		
Treatment works for ILOS	100%			19	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Augmentation - Project Management (Geolink)	75%	25%		675		150	75	75	75	75	75	75	75																					
Augmentation - Design (Dept Commerce)	75%	25%		260		200	60																											
Augmentation - UV Disinfection Plant	75%	25%		15			15																											
Augmentation - Effluent re-use trial (ie. Effluent Re-use Tria	75%	25%		486		286	200																											
Augmentation - Treatment Plant Stage 1 Construction	75%	25%		12,650		11650	1000																											
Augmentation - Treatment Plant Stage 2 Construction	75%	25%		6,000								500	5500																					
Augmentation - T/Plant Ancillary Items - Upgrade Entrance I	75%	25%		80			80																											
Augmentation - T/Plant Ancillary Items - Upgrade Entrance I	75%	25%		40			40																											
Augmentation - T/Plant Ancillary Items - Security System	75%	25%		4			4																											
Augmentation - T/Plant Ancillary Items - Programming of PL	75%	25%		40			40																											
Augmentation - T/Plant Ancillary Items - Laboratory Equipm	75%	25%		22			22																											
Augmentation - Construct Dry Weather Re-use System	75%	25%		3,497		497	750	1250		1000																								
T/Plant Evans Hd Aug - Dry Weather Re-use Scheme (Geolir	75%	25%		46		46																												
Augmentation - Wet Weather Release EIS	75%	25%		815		115	200	500																										
Augmentation - Design/Document Wet Weather Release Sys	75%	25%		430		80		350																										
T/Plant Evans Hd - Water Main 150mm 1500m	75%	25%		180		180																												
T/Plant Evans Hd - Security System	75%	25%		4		4																												
T/Plant Evans Hd - Whitegoods & Furniture Amenities Buildi	75%	25%		4		4																												
T/Plant Evans Hd - Programming PLC	75%	25%		40		40																												
T/Plant Evans Hd - Catch Pond Cleaner (VOR)	75%	25%		81		81																												
T/Plant Evans Hd - Laboratory Equipment	75%	25%		22		22																												
Augmentation - Construct Wet Weather Release System	75%	25%		4,000					2000	2000																								
Salty Lagoon Rehabilitation Program	75%	25%		1,975			105	660	715	120	375																							
Construction of Dam	75%	25%		2,100			1100	1000																										
Aerodrome service track pipeline construction	75%	25%		750			750																											
Effluent Management																																		
Evans Head irrigation open spaces	75%	25%		2,065										2065																				
Evans Head & Woodburn dual reticulation - urban residential reuse (370	100%			7,460										7460																				
Renewals																																		
Evans head - mains			100%	1,085	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	36
Evans head - point (eg. manhole, fitting, ventstack, etc)			100%	0.3	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Evans head - Treatment works			100%	1,193	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
Woodburn - mains			100%	229	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Woodburn - point (eg. manhole, fitting, ventstack, etc)			100%																															
Woodburn - Treatment works			100%	200	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Other																																		
CORAKI SYSTEM																																		
Collection & Transfer																																		
Coraki Mains - Windsor Park	75%	25%		25		25																												
P/Stn Coraki - KRT Submersible Pump	75%	25%		6		6																												
Mains works for growth		100%		160	5	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Mains works for ILOS	100%			160	5	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Growth works		100%		126			21					21					21					21					21					21		
Upgrade Pump Station No.1	75%	25%		75				75																										
Treatment																																		
Augmentation Investigation		100%		50					50																									
Augmentation Design		100%		450						450																								
Augmentation Construction		100%		3,500							1500	2000																						
Effluent Management																																		
T/Plant Coraki - Effluent Pond	100%			35		35																												
Reuse line to golf course	75%	25%		590		100	490																											
Golf club mains	75%	25%		10		10																												
Development South west Coraki STP (dual retic)		100%		244									244																					
Renewals																																		
Renewals - mains			100%	423	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Renewals - point (eg. manhole, fitting, ventstack, etc)			100%																															
Renewals - Treatment works			100%	654	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Other																																		
RYLEYS HILL / BROADWATER SYSTEM																																		
Collection & Transfer																																		
Pumping Stations	75%	25%		60		10					10					10					10					10					10			
Treatment																																		
T/Plant Rileys Hill - Install Generator Switch	75%	25%		3		3																												
Rileys Hill - Gantry Crane for CDEAT	75%	25%		15				15																										
Broadwater - Sewerage Augmentation	75%	25%		6,000		200	1500	2500	1800																									
Effluent Management																																		
Broadwater agricultural reuse (incl. Woodburn) (256 ML/y)	75%	25%		1,980						1980																								
Broadwater dual reticulation - urban residential reuse (incl.	75%	25%		3,130						3130																								
Renewals																																		
Rileys Hill - mains			100%	55	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	2
Rileys Hill - point (eg. manhole, fitting, ventstack, etc)			100%	48	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	2
Rileys Hill - Treatment works			100%	247	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
MISCELLANEOUS																																		
Sewerage System Analysis (all area)	75%	25%		75				75																										
Minor works	30%	40%	30%	923	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
SBP / DSP review	75%	25%		154	26					26					26					26					26					26				
IWCM plan / outcome	75%	25%		500	50	50	100	100	100	50	50																							
Pump station DWF overflow strategy (removed as per RVC e	100%																																	
Upgrade Pump Stations - to be allocated	75%	25%		1,350				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
P/Stn All Areas - Install Mesh Screens	100%			35		35																												
P/Stn All Areas - Generator Tarps	100%			4		4																												
Acquisition of P&E assets (various)	100%			9		9																												
Total				**98,755**	**602**	**15,546**	**8,437**	**8,634**	**6,067**	**11,841**	**5,660**	**13,051**	**6,591**	**10,061**	**592**	**547**	**793**	**537**	**567**	**767**	**577**	**558**	**772**	**536**	**579**	**739**	**575**	**524**	**757**	**536**	**549**	**732**	**530**	**498**
Improved LOS				**45,746**	130	11,028	6,008	6,159	3,735	6,419	539	2,431	4,399	1,682	175	141	218	134	156	214	164	134	218	134	165	193	146	124	208	131	142	173	134	112
Other New System Assets (grov				**42,809**	130	4,131	2,074	2,129	1,992	5,082	4,781	10,280	1,852	8,039	77	66	235	63	71	213	73	84	214	63	77	209	92	63	214	70	73	228	71	63
Renewals				**10,200**	342	387	355	346	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	339	337	337	337	337	335	335	334	331	325	323

Other Grants

Sewerage Integrated 2 - OMA (2005/06 $'000)

Additional OMA items (2005/06 $'000)

Item	Type of Expend	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034
Casino - Blue Circle Cement Ltd (Dyraaba St)	ope								45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
	mai								14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
	ene								50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Broadwater agricultural reuse (incl. Woodburn) (256 ML/	ope						7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	mai						15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
	ene						3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Evans Head irrigation open spaces	ope										19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
	mai										40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
	ene										8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
SBP OMA cost modified by JWP	adm			20					20					20					20					20					20		
Development South west Coraki STP (dual retic)	ope									6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	mai									7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	ene									1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Broadwater dual reticulation - urban residential reuse (incl	ope								70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
	mai								149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149
	ene								29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Evans Head & Woodburn dual reticulation - urban residen	ope									63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	mai									134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134
	ene									26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Dual reticulation new development area west Casino (Bru	ope								252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252
	mai								56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56
	ene								301	301	301	301	301	301	301	301	301	301	301	301	301	301	301	301	301	301	301	301	301	301
Dual reticulation new development area North Casino (Su	ope								190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190
	mai								46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
	ene								223	223	223	223	223	223	223	223	223	223	223	223	223	223	223	223	223	223	223	223	223	223
Education on effluent reuse	adm							35	20																						
Assume Casio STP OMA cost as in Budget																															
Casino - Sporting fields (Albert, Queen Elizabeth, Crawfo	ope								39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
	mai								23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
	ene								32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Dual reticulation new development area west Casino (Rey	ope								21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
	mai								10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	ene								20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20

Total

	Type of Expend	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034	30 YEAR TOTAL
Management Expenses																																
Administration	adm	879	1,566	1,571	1,711	1,784	1,946	2,057	2,141	2,172	2,246	2,273	2,425	2,547	2,655	2,782	2,909	3,061	3,183	3,291	3,418	3,545	3,697	3,819	3,927	4,054	4,181	4,333	4,455	4,563	4,690	87,880
Engineering and Supervision	eng	116	189	251	258	269	279	291	302	314	327	340	354	367	381	394	408	422	435	449	462	476	490	503	517	530	544	558	571	585	598	11,981
Operation and Maintenance Expenses																																
Operation Expenses	ope	913	867	936	920	948	972	1,010	1,646	1,756	1,796	1,839	1,863	1,886	1,910	1,933	1,957	1,981	2,004	2,028	2,051	2,075	2,099	2,122	2,146	2,169	2,193	2,217	2,240	2,264	2,287	53,030
Maintenance Expenses	mai	434	443	452	461	470	503	512	818	969	1,018	1,027	1,036	1,045	1,054	1,063	1,072	1,081	1,090	1,099	1,108	1,117	1,127	1,137	1,147	1,157	1,167	1,177	1,187	1,197	1,207	28,370
Energy Costs	ene	124	99	171	176	181	189	194	854	886	900	906	912	918	924	930	936	942	948	954	960	966	972	978	984	990	996	1,002	1,008	1,014	1,020	23,026
Chemical Costs	che	0	3	48	50	51	53	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	2,044
Depreciation																																
System Assets	sys	762	958	1,062	1,170	1,286	1,290	1,292	1,295	1,299	1,302	1,305	1,307	1,312	1,366	1,442	1,447	1,450	1,452	1,457	1,459	1,462	1,466	1,469	1,471	1,505	1,539	1,573	1,607	1,641	1,675	41,121
Plant & Equipment	pla	-	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	638
Interest Expenses	int	36	804	1,166	1,453	1,683	1,936	2,139	2,229	2,401	2,302	2,197	2,085	1,973	1,861	1,749	1,637	1,525	1,413	1,301	1,189	1,077	965	853	741	629	517	405	293	181	69	38,817
Other Expenses	oth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	286,906	3,264	4,951	5,679	6,221	6,694	7,190	7,571	9,362	9,876	9,973	9,970	10,067	10,136	10,240	10,385	10,459	10,557	10,623	10,678	10,749	10,821	10,921	10,989	11,042	11,146	11,250	11,380	11,479	11,564	11,668	

General Fund Items

Item	Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Incentives for better on site technologies	adm			50			15			15			15			15			15			15			15			15			15
	ope			25			25			25			25			25			25			25			25			25			25
	eng			60			60			60			60			60			60			60			60			60			60
	adm				200	175	175	175	175	175	175	175	175	175																	
Education on sustainable land management practice	adm				30	30	30	30	30																						
TOTAL GENERAL FUND		0	0	135	230	205	305	205	205	275	175	175	275	175	0	100	0	0	100	0	0	100	0	0	100	0	0	100	0	0	100

060501 Richmond Valley Council IWCM

Capital Works Program Sewerage - Integrated 3
2005

All values are in year 2005/06 $'000

Asset	Type of works: Improved LOS	New System Assets	Renewals	30 year total	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034
CASINO SYSTEM																																		
Collection & Transfer																																		
Upgrades - PS2 upgrade from dry well	75%	25%		426		96	330																											
Casino Mains - Norco Weir Services Conduit RM		100%		425		425																												
PS5 External Valve Pit			100%	30		30																												
Pump Station 10 - Replace Pumps	75%	25%		170		70		100																										
Pump Stations 1 & 10 - Variable Speed Drives	75%	25%																																
Replace Fence at Comminuter			100%	6				6																										
Manholes, pipelines for growth	100%			652	10	10	15	21	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	21	21	21	21	21	15	15	15	15	15
Manholes, pipelines for ILOS	100%			652	10	10	15	21	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	21	21	21	21	21	15	15	15	15	15
Upgardes Page Pl etc.	10%	50%	40%	522	15	51	51	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Augmentation - Airport gravity sewer		100%		51	51																													
Work to serve growth (PS)		100%		99	5	3	3	3	3	10	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
PS Augmentation - airport, CMCA (removed as per RVC e		100%																																
Treatment																																		
Upgrades - Treatment works	30%	70%		1,845		205			205				205				205			205			205			205			205			205		
Augmentation Investigation, design and construction		100%		6,165				62	555	2466	3083																							
Advanced treatment		100%		7,551						7551																								
Davit Arm for WAS Pump	75%	25%		15				15																										
Replace 20mm Plumbing Lines	100%			8				8																										
Replace Handrails at Sedimentation Tanks & Tr	100%			15				15																										
T/Plant Casino - Sludge Transfer Pump	100%			9		9																												
T/Plant Casino - Septic Disposal Area Concrete	100%			10		10																												
Effluent Management																																		
Casino - Golf Course (existing)																																		
Casino - Blue Circle Cement Ltd (Dyraaba St)	75%	25%		922								922																						
Casino - Sporting fields (Albert, Queen Elizabe	75%	25%		1,566								1566																						
Indirect potable reuse Route 2 (via agricultural	75%	25%		1,347						1347																								
Renewals																																		
Renewals - mains			100%	2,259	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Renewals - point (eg. manhole, fitting, ventstack, etc)			100%	570	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	19	19	19	19	17	17	17	17	16	15
Renewals - Treatment works			100%	2,291	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	77	76	76	76	76	76	76	75	72	67	66
Other																																		
Plant & Equipment	40%	20%	40%	305	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Minor upgrades - telemetry	20%	30%	50%	604	20	24	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
ANS HEAD & WOODBURN SYST																																		
Collection & Transfer																																		
Pumping station works for ILOS	100%			150	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Mains works for ILOS	100%			468	21	21	21	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Mains works for growth		100%		468	21	21	21	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Evans Hd Mains - Re-divert RM1 to PS8	100%			60		60																												
Evans Hd Mains - Design PS & RM Upgrades	100%			150		150																												
P/Stn Evans Hd - Augment PS4	100%			130		130																												
Evans Head - Upgrade Pump Stations - to be a	75%	25%		420			30		30		30		30		30		30		30		30		30		30		30		30		30		30	
Evans Head/Woodburn Pump Station & Rising	75%	25%		2,300			1000	1300																										
Treatment																																		
Treatment works for ILOS	100%			19	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Augmentation - Project Management (Geolink)	75%	25%		675		150	75	75	75	75	75	75	75																					
Augmentation - Design (Dept Commerce)	75%	25%		260		200	60																											
Augmentation - UV Disinfection Plant	75%	25%		15			15																											
Augmentation - Effluent re-use trial (ie. Effluer	75%	25%		486		286	200																											
Augmentation - Treatment Plant Stage 1 Const	75%	25%		12,650		11650	1000																											
Augmentation - Treatment Plant Stage 2 Const	75%	25%		6,000								500	5500																					
Augmentation - T/Plant Ancillary Items - Upgra	75%	25%		80			80																											
Augmentation - T/Plant Ancillary Items - Upgra	75%	25%		40			40																											
Augmentation - T/Plant Ancillary Items - Secur	75%	25%		4			4																											
Augmentation - T/Plant Ancillary Items - Progr	75%	25%		40			40																											
Augmentation - T/Plant Ancillary Items - Labor	75%	25%		22			22																											
Augmentation - Construct Dry Weather Re-use	75%	25%		3,497		497	750	1250		1000																								
T/Plant Evans Hd Aug - Dry Weather Re-use So	75%	25%		46		46																												
Augmentation - Wet Weather Release EIS	75%	25%		815		115	200	500																										
Augmentation - Design/Document Wet Weathe	75%	25%		430		80		350																										
T/Plant Evans Hd - Water Main 150mm 1500m	75%	25%		180		180																												
T/Plant Evans Hd - Security System	75%	25%		4		4																												
T/Plant Evans Hd - Whitegoods & Furniture Am	75%	25%		4		4																												
T/Plant Evans Hd - Programming PLC	75%	25%		40		40																												
T/Plant Evans Hd - Catch Pond Cleaner (VOR)	75%	25%		81		81																												
T/Plant Evans Hd - Laboratory Equipment	75%	25%		22		22																												
Augmentation - Construct Wet Weather Releas	75%	25%		4,000					2000	2000																								
Salty Lagoon Rehabilitation Program	75%	25%		1,975			105	660	715	120	375																							
Construction of Dam	75%	25%		2,100			1100	1000																										
Aerodrome service track pipeline construction	75%	25%		750			750																											
Advanced treatment	75%	25%		4,372			2186						2186																					
Effluent Management																																		
Evans Head irrigation open spaces	75%	25%		2,065										2065																				
Indirect potable reuse - Rous borefield	75%	25%		3,862										3862																				
Renewals																																		
Evans head - mains			100%	1,085	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	36
Evans head - point (eg. manhole, fitting, ventstack, etc)			100%	0.3	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Evans head - Treatment works			100%	1,193	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
Woodburn - mains			100%	229	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Woodburn - point (eg. manhole, fitting, ventstack, etc)			100%																															
Woodburn - Treatment works			100%	200	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Other																																		
CORAKI SYSTEM																																		
Collection & Transfer																																		
Coraki Mains - Windsor Park	75%	25%		25		25																												
P/Stn Coraki - KRT Submersible Pump	75%	25%		6		6																												
Mains works for growth		100%		160	5	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Mains works for ILOS	100%			160	5	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Growth works		100%		126			21					21					21					21					21					21		
Upgrade Pump Station No.1	75%	25%		75				75																										
Treatment																																		
Augmentation Investigation		100%		50					50																									
Augmentation Design		100%		450						450																								
Augmentation Construction		100%		3,500							1500	2000																						
Effluent Management																																		
T/Plant Coraki - Effluent Pond	100%			35		35																												
Reuse line to golf course	75%	25%		590		100	490																											
Golf club mains	75%	25%		10		10																												
Development South west Coraki STP (dual retic)		100%		244									244																					
Renewals																																		
Renewals - mains			100%	423	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Renewals - point (eg. manhole, fitting, ventstack, etc)			100%																															
Renewals - Treatment works			100%	654	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Other																																		
EYS HILL / BROADWATER SYS																																		
Collection & Transfer																																		
Pumping Stations	75%	25%		60		10					10					10					10					10					10			
Treatment																																		
T/Plant Rileys Hill - Install Generator Switch	75%	25%		3		3																												
Rileys Hill - Gantry Crane for CDEAT	75%	25%		15				15																										
Broadwater - Sewerage Augmentation	75%	25%		6,000		200	1500	2500	1800																									
Effluent Management																																		
Broadwater agricultural reuse (incl. Woodburn)	75%	25%		1,980						1980																								
Broadwater dual reticulation - urban residential reuse (in	100%			3,130						3130																								
Renewals																																		
Rileys Hill - mains			100%	55	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	2
Rileys Hill - point (eg. manhole, fitting, ventstack, etc)			100%	48	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	2
Rileys Hill - Treatment works			100%	247	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
MISCELLANEOUS																																		
Sewerage System Analysis (all area)	75%	25%		75				75																										
Minor works	30%	40%	30%	923	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
SBP / DSP review	75%	25%		154	26					26					26					26					26					26				
IWCM plan / outcome	75%	25%		500	50	50	100	100	100	50	50																							
Pump station DWF overflow strategy (removed	100%																																	
Upgrade Pump Stations - to be allocated	75%	25%		1,350				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
P/Stn All Areas - Install Mesh Screens	100%			35		35																												
P/Stn All Areas - Generator Tarps	100%			4		4																												
Acquisition of P&E assets (various)	100%			9		9																												
			Total	**100,997**	**602**	**15,546**	**10,623**	**8,634**	**6,067**	**20,739**	**5,660**	**5,621**	**8,776**	**6,464**	**592**	**547**	**793**	**537**	**567**	**767**	**577**	**558**	**772**	**536**	**579**	**739**	**575**	**524**	**757**	**536**	**549**	**732**	**530**	**498**
Improved LOS				**50,585**	130	11,028	7,648	6,159	3,735	5,082	539	2,431	6,038	4,579	175	141	218	134	156	214	164	134	218	134	165	193	146	124	208	131	142	173	134	112
Other New System Assets (g				**40,212**	130	4,131	2,620	2,129	1,992	15,317	4,781	2,850	2,398	1,545	77	66	235	63	71	213	73	84	214	63	77	209	92	63	214	70	73	228	71	63
Renewals				**10,200**	342	387	355	346	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	339	337	337	337	337	335	335	334	331	325	323

Other Grants

Sewerage Integrated 3 - OMA (2005/06 $'000)

Additional OMA items (2005/06 $'000)

Item	Type of Expend	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034
Casino - Blue Circle Cement Ltd (Dyraaba St)	ope								45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
	mai								14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
	ene								50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Broadwater agricultural reuse (incl. Woodburn) (256 ML/y	ope						7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	mai						15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
	ene						3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Evans Head irrigation open spaces	ope										19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
	mai										40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
	ene										8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
SBP OMA cost modified by JWP	adm			20					20					20					20					20					20		
Development South west Coraki STP	ope									6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	mai									7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	ene									1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Broadwater dual reticulation - urban residential reuse (incl	ope								70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
	mai								149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149
	ene								29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Education on effluent reuse	adm							35	20																						
Advanced treatment at Casino	mai						189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189
	ene						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
	ope						25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Casino indirect potable reuse - Route 2 (via agric land)	ope						576	576	576	576	576	576	576	576	576	576	576	576	576	576	576	576	576	576	576	576	576	576	576	576	576
	mai						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
	ene						795	795	795	795	795	795	795	795	795	795	795	795	795	795	795	795	795	795	795	795	795	795	795	795	795
Assume Casio STP OMA cost as in Budget																															
Casino - Sporting fields (Albert, Queen Elizabeth, Crawfo	ope								39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
	mai								23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
	ene								32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Indirect potable reuse - Rous borefield	ope										257	257	257	257	257	257	257	257	257	257	257	257	257	257	257	257	257	257	257	257	257
	mai										58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58
	ene										305	305	305	305	305	305	305	305	305	305	305	305	305	305	305	305	305	305	305	305	305
Advanced treatment at Evans Head	ope			109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109
	mai			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
	ene			14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14

Total

Item	Type of Expend	1 2005/06 2005	2 2006/07 2006	3 2007/08 2007	4 2008/09 2008	5 2009/10 2009	6 2010/11 2010	7 2011/12 2011	8 2012/13 2012	9 2013/14 2013	10 2014/15 2014	11 2015/16 2015	12 2016/17 2016	13 2017/18 2017	14 2018/19 2018	15 2019/20 2019	16 2020/21 2020	17 2021/22 2021	18 2022/23 2022	19 2023/24 2023	20 2024/25 2024	21 2025/26 2025	22 2026/27 2026	23 2027/28 2027	24 2028/29 2028	25 2029/30 2029	26 2030/31 2030	27 2031/32 2031	28 2032/33 2032	29 2033/34 2033	30 2034/35 2034	30 YEAR TOTAL
Management Expenses																																
Administration	adm	879	1,566	1,571	1,711	1,784	1,946	2,057	2,141	2,172	2,246	2,273	2,425	2,547	2,655	2,782	2,909	3,061	3,183	3,291	3,418	3,545	3,697	3,819	3,927	4,054	4,181	4,333	4,455	4,563	4,690	87,880
Engineering and Supervision	eng	116	189	251	258	269	279	291	302	314	327	340	354	367	381	394	408	422	435	449	462	476	490	503	517	530	544	558	571	585	598	11,981
Operation and Maintenance Expenses																																
Operation Expenses	ope	913	867	1,045	1,030	1,057	1,683	1,721	1,893	1,941	2,238	2,281	2,304	2,328	2,351	2,375	2,399	2,422	2,446	2,469	2,493	2,517	2,540	2,564	2,587	2,611	2,635	2,658	2,682	2,705	2,729	64,483
Maintenance Expenses	mai	434	443	476	485	494	736	745	940	956	1,063	1,072	1,081	1,090	1,099	1,108	1,117	1,126	1,135	1,144	1,153	1,162	1,172	1,182	1,192	1,202	1,212	1,222	1,232	1,242	1,252	29,972
Energy Costs	ene	124	99	186	190	195	1,040	1,045	1,161	1,168	1,487	1,492	1,498	1,504	1,510	1,516	1,522	1,528	1,534	1,540	1,546	1,552	1,558	1,564	1,570	1,576	1,582	1,588	1,594	1,600	1,606	37,685
Chemical Costs	che	0	3	48	50	51	53	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	2,044
Depreciation																																
System Assets	sys	762	958	1,062	1,170	1,286	1,290	1,292	1,295	1,299	1,302	1,305	1,307	1,312	1,366	1,442	1,447	1,450	1,452	1,457	1,459	1,462	1,466	1,469	1,471	1,505	1,539	1,573	1,607	1,641	1,675	41,121
Plant & Equipment	pla	-	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	638
Interest Expenses	int	36	804	1,166	1,453	1,683	1,936	2,139	2,229	2,401	2,302	2,197	2,085	1,973	1,861	1,749	1,637	1,525	1,413	1,301	1,189	1,077	965	853	741	629	517	405	293	181	69	38,817
Other Expenses	oth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	314,621	3,264	4,951	5,827	6,369	6,842	8,985	9,366	10,039	10,330	11,047	11,044	11,141	11,210	11,313	11,459	11,533	11,631	11,697	11,751	11,823	11,895	11,995	12,063	12,115	12,220	12,324	12,454	12,553	12,637	12,742	

General Fund Items

Item	Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Incentives for better on site technologies	adm			50			15			15			15			15			15			15			15			15			15
	ope			25			25			25			25			25			25			25			25			25			25
	eng			60			60			60			60			60			60			60			60			60			60
	adm				200	175	175	175	175	175	175	175	175	175																	
Education on sustainable land management practice	adm				30	30	30	30	30																						
TOTAL GENERAL FUND		0	0	135	230	205	305	205	205	275	175	175	275	175	0	100	0	0	100	0	0	100	0	0	100	0	0	100	0	0	100

Appendix F

Financial Analysis of Draft Scenarios

A series of financial models were developed to assess the draft water and sewerage IWCM scenarios using FINMOD. The inputs and outcomes of these models are discussed below.

Input Data and Assumptions

Base data utilised in the Richmond Valley Council (RVC) financial models are summarised in Table F - 1 below.

Table F - 1: Input Data

Item	**Data Used**	
Historical Data	Historical Financial Statements from 2004/05 and 2005/06 supplied by RVC	
Financial Data	Inflation Rate 2.5% pa Borrowing Interest Rate 6.5% pa Investment Interest Rate 5.5% pa	
Balance sheet key data (2005/06)	**Water Supply**	**Sewerage**
Cash ($'000)	3,543	11,413
Debt ($'000)	0	5,800
System Assets (2005/06)	**Water Supply**	**Sewerage**
Replacement Costs ($'000)	34,202	48,866
Assessments/Bills	**Water Supply**	**Sewerage**
Residential Growth Rates (30 year average, Shirewide) %	1.7	1.8
06/07 Typical Residential Bill (TRB) ($/assessment)	479	707
06/07 Typical Developer Charge ($/assessment)	4,161	13,723
% of TRB for Vacant Assessments	24	100
Pensioner Rebate Subsidy (%)	55	55
Other	**Water Supply**	**Sewerage**
Existing Loan Payments ($'000)	Nil	Principal: 5,800 Interest: 4,603
Capital Works Programs - Base Case ($'000)	40,020	94,622
Capital Works Grants ($'000)	Nil	Nil

Item	Data Used
Operation, Maintenance and Administration (OMA) Costs ($'000)	Based on RVC OMA expenditure forecasts used in the developer charges financial model (with overrides for OMA expenditure in IWCM scenarios)

Only the capital works and OMA expenditure varied between different scenarios.

Outcomes

A summary of the major outcomes of the financial comparison are given in Table F - 2 and Table F - 3. These tables provide a representation of the results for each initial scenario, and are provided to demonstrate the key outcomes of the modelling, in particular the difference in financial outcomes, such as cash levels and borrowings.

Table F - 2: Water Supply Modelling Results (2006/07 $)

Scenario	30yr Capital Works Program ($'000)	30yr OMA ($'000)	Typical Residential Bill ($ per assessment)
Base case Scenario	40,020	167,680	465
Traditional Scenario	26,400	171,346	440
Integrated Scenario 1	26,400	172,403	445
Integrated Scenario 2	26,400	172,403	445
Integrated Scenario 3	26,400	172,403	445

Table F - 3: Sewerage Modelling Results (2006/07 $)

Scenario	30yr Capital Works Program ($'000)	30yr OMA ($'000)	Typical Residential Bill ($ per assessment)
Base case Scenario	94,622	243,397	790
Traditional Scenario	80,307	250,233	770
Integrated Scenario 1	80,307	250,233	770
Integrated Scenario 2	98,651	286,906	940
Integrated Scenario 3	100,893	314,621	990

Notes:

1. Capital works includes works for improved levels of service (LOS), renewals and growth.
2. All figures are in 2006/07 dollars. They will need to be adjusted for inflation.
3. Net cash in the final year for all the options is similar.

Financing New Works

Where possible, the capital works program and recurrent expenditure is funded through existing cash levels which is determined by the amount of income generated from bills (TRB). Where planned expenditure exceeds the available cash levels, loans are required. A minimum cash level of at least 20% of annual turnover has been maintained for each fund.

Loans are not required for the water supply fund. Loans required to fund the draft sewerage scenarios are presented in Table F - 4.

Table F - 4: New Loans – Sewerage (06/07 $'000)

Year	Base Case	Traditional	Scenario 1	Scenario 2	Scenario 3
07/08	5,600	5,600	5,600	5,600	5,600
08/09	4,900	4,900	4,900	4,900	4,900
09/10	4,250	4,250	4,250	4,250	4,250
10/11	5,000	8,000	8,000	8,000	17,000
11/12	4,000	4,000	4,000	4,000	4,000
12/13	2,000	2,000	2,000	7,000	4,000
13/14	6,000	6,000	6,000	6,000	8,000
14/15	-	2,000	2,000	9,500	6,000
18/19	2,000	-	-	-	-
19/20	2,000	-	-	-	-
TOTAL LOANS	**35,750**	**36,750**	**36,750**	**49,250**	**53,750**

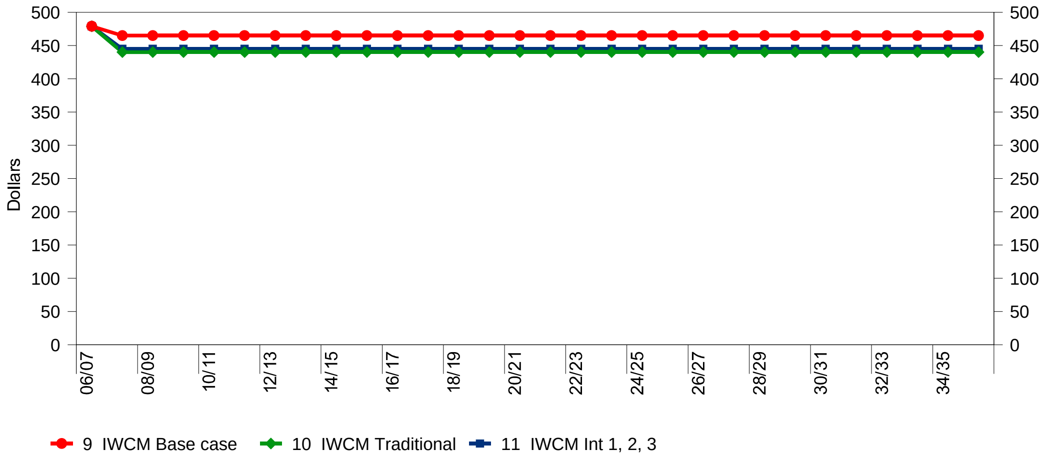
Analysis of Outcomes

The financial modelling provided an indication of the relative cost of each scenario to RVC and their customer's in terms of a TRB. The following conclusions have been drawn from the analysis. Graphs of the TRB for water and sewerage over the next 30 years for all scenarios are presented in Figure F- 1 and Figure F- 2.

Water Supply:

- The current TRB can be decreased slightly; and
- The TRB is similar for each scenario ($440 - $465 per assessment).

Figure F- 1: Typical Residential Bill (TRB) 2006/07$ for Draft Water Supply Scenarios



Sewerage:

- The current TRB needs to increase to meet the current operation and maintenance costs of RVC's sewerage business;
- With the proposed implementation of new capital works items, the TRB needs to increase further to ensure that these projects can be paid for and to ensure the long term sustainability of RVC's sewerage business;
- Of the integrated scenarios, Scenario 1 provides the lowest TRB of $770 per assessment; and
- Scenario 3 is the most expensive option over the next 30 years. This is due to the inclusion of tertiary treatment at the Casino sewage treatment works and the provision for indirect potable reuse.

Figure F- 2: Typical Residential Bill (TRB) 2005/06$ for Draft Sewerage Scenarios

Appendix G

Capital Works Programs and OMA Schedules for Stormwater and Catchment Management

060501 Richmond Valley Council IWCM

Capital Works Program Stormwater - Integrated Case
2005
All values are in year 2005/06 $'000

Asset	Type of works			30 year total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Improved LOS	New System Assets	Renewals		2005/06	2006/07	2007/08	2008/09	2009/1(	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	2024/2	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35
					2005	2006	2007	2008	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
Install stormwater treatment on the Caravan Park Drain system at	100%			20					20																									
Coraki stormwater works at Grenfell/Church Lane & Bridge St: Stage 1+2 Work		100%		700			175	175	175	175																								
Rileys Hill stormwater works - Drainage Extension DP 755624.		100%		90							90																							
Implement sewage system for Broadwater.																																		
Install stormwater treatment on the Caravan Park Drain system at	100%			20					20																									
			Total	**830**			**175**	**175**	**215**	**175**	**90**																							
	Improved LOS			**40**					40																									
	Other New System Assets (growth v			**790**			175	175	175	175	90																							
	Renewals																																	

060501 Richmond Valley Council IWCM

OMA Schedule for Stormwater - Integrated Case
2005

All values are in year 2005/06 $'000

Asset	Type of works			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Labor	Materials	30 year total	2005/06	2006/07	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	2032/33	2033/34	2034/35
				2005	2006	2007	2008	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
Audit existing stormwater management issues																																	
Coordinate and implement SMP (establish team)																																	
Coordinate and implement SMP (awareness program)																																	
Coordinate and implement SMP (env officer)	100%		810				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
Develop a maintenance program for council operated GPT's.						25					10					10					10					10					10		
Review existing wet sump GPT's to determined if they can be converted into leaky well devices to reduce liquid component.																																	
Upgrade AUS SPEC to include the design of stormwater quality improvement devices.																																	
Manage stormwater in context of urban water management i.e. look to use it as resource.																																	
Investigate rainwater tank rebates from state government and/or water supply authority.																																	
Source additional funding for stormwater management.																																	
Be involved in processes such as Catchment Blueprints to secure funding.																																	
Write letter to NSW Stormwater Trust and member agencies seeking stormwater funding for SMP implementation.																																	
Review s94 plan in context of stormwater management and funding requirements.	100%		20			20																											
Implement monitoring program for groundwater and surface water. Establish extent of contamination caused by on s	50%	50%	84			3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Beef week stormwater management procedures. Sausages and street sweeping to be used to keep contaminants out of stormwater system.																																	
Council to develop policy requiring organisations that hire sports fields to manage and clean up litter on site. Review Lismore City Council policy for applicability to Richmond situation.																																	
Internal audit of erosion and sediment controls used during Council maintenance activities.																																	
Develop and train staff in auditing procedures from SEA project.	100%		145		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Develop drain maintenance program to maintain outlets, floodgates, pits and open drains. Audit scour impacts																																	
Education campaign on littering, car washing, garden disposal, erosion and sediment control and other issues as the opportunity arises.																																	
Establish objectives and determine parameters for monitoring																																	
Conduct integrated catchment wide water quality monitoring program in conjunction with other catchment managers.																																	
Identify priority areas for rehabilitation projects																																	
Review performance of pit insert litter trap at Evans Head.																																	
Review performance of pit insert trial being undertaken by Ballina Council.																																	
Based on above develop policy on the use of pit inserts in the council area. Include within DCP for stormwater quality / sustainable water.																																	
Review service level of sweeping programs to respond to demand variations, to comply with Council budget.																																	
Review service level of emptying street bins programs to respond to demand variations, to comply with Council budget.																																	
Develop a priority program for the urban areas.																																	
Implement Water Sensitive Urban Design Strategies for Evans Head, Woodburn and Casino.																																	
Implement Casino and Mid-Richmond SWM Plans.																																	
Street Cleaning Program	80%	20%	8,577		265	285	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297
GPT M & R (Casino & Evans head)	80%	20%	232		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Stormwater Management Plan	100%		174		29					29					29					29					29					29			
Monitor Water Quality Richmond River (incl in the catchment budget)	20%	80%																															
Routine M & R - All RVC areas	80%	20%	1,677		55	56	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58
Other Stormwater expenditure	50%	50%	150		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Drainage strategy	100%		210		30				30					30					30					30					30				30
Investigate Relocation GPT - Evans head	100%		7		7																												
Beech St Wetlands M & R - Evans Head	80%	20%	315		10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Evans Estuary MP Stg 2 - GPT	80%	20%	28		28																												
Evans Estuary MP Stg 2 - Stormwater Management Plan	100%		180		30					30					30					30					30					30			
Urban Drain Monitoring - Evans Head & Casino	50%	50%	455		10	15	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
		Total	**13,055**		**481**	**408**	**433**	**433**	**463**	**492**	**433**	**433**	**433**	**463**	**492**	**433**	**433**	**433**	**463**	**492**	**433**	**433**	**433**	**463**	**492**	**433**	**433**	**433**	**463**	**492**	**433**	**433**	**463**
	Labor		**10,542**		401	324	346	346	376	405	346	346	346	376	405	346	346	346	376	405	346	346	346	376	405	346	346	346	376	405	346	346	376
	Materials		**2,513**		80	84	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87

060501 Richmond Valley Council IWCM

Capital Works Program Catchment - Integrated Case
2005
All values are in year 2005/06 $'000

Asset	Type of works				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Improved LOS	New System Assets	Renewals	30 year total	2005/06	2006/07	2007/08	2008/09	2009/1(	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	2024/2!	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35
					2005	2006	2007	2008	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
NO CAPITAL WORKS ITEMS WERE IDENTIFIED																																		

Total

Improved LOS

Other New System Assets (growth \

Renewals

060501 Richmond Valley Council IWCM

OMA Schedule for Catchment - Integrated Case
2005
All values are in year 2005/06 $'000

Asset	Type of works		30 year total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Labor	Materials		2005/06	2006/07	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	2032/33	2033/34	2034/35
				2005	2006	2007	2008	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
ALL AREAS																																	
Raising Community Awareness																																	
Floodgating & Maintenance Of All Drainage Works																																	
Acid sulfate soil management through drain management plans, hazard identification, floodgate management, ad																																	
Finalise/Implement Estuary Management Plan for Richmond River.																																	
Implement actions of Flood Management Plans (Casino, Mid Richmond).	50%	50%	700			25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Complete Identified Foreshore Protection, River Protection, Flood Mitigation Works.																																	
Implement On-site Sewage Management Strategy (OSMS).																																	
Adopt a catchment basis for waterways management (NRRS, CCMV)																																	
Develop pollution control and environmental guidelines for industry and urban development (TCMS, RCMS)																																	
Ensure treatment of point source pollution by filtering, nutrient removal and reuse systems on dairies, piggeries,													25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Minimise impact of urban and agricultural runoff by encouraging reuse and use of source controls, buffer and infi																																	
Householder education about on-site system maintenance (DNREAP)																																	
Awareness program about vulnerability of some aquifers to effluent pollution (DNREAP)																																	
River plans using flow objectives and stressed river classifications as part of the 'water reform' process (DNREAP																																	
Groundwater management plans (DNREAP)																																	
Water use during low flow periods minimised through use of off stream storages, and pumping during high flows																																	
Adoption of water efficient technologies wherever possible (TCMS, RCMS)																																	
Education to encourage reduced use of water (TCMS, RCMS)																																	
Incentive schemes, such as user pays schemes, with users paying the full cost of water (including environmental																																	
Dissemination of best practice alternatives (TCMS, RCMS)																																	
Investigate alternate water and waste treatment systems, and water efficient technologies (TCMS, RCMS)																																	
Assist 'care' and other community groups with the preparation of river management pl	100%		900	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
Nutrient pollution management plan for each catchment based on water quality monitoring (DNREAP)																																	
Identification of appropriate indicator species for a suite of expected impacts (flow stress, pollution etc) in rivers,																																	
Environmental audit of floodgates (DNREAP)																																	
Support and develop Streamwatch program in schools and Landcare groups (TCMS, RCMS)																																	
Reduce sediment at its source by use of settling ponds, sediment filters and litter traps and other erosion control																																	
Education on flood mitigation and structures; the breeding cycles, habitat and ecology of aquatic species; riverin																																	
Incentives for best practice, such as fencing from stock and revegetation (TCMS, RCMS)																																	
Restore vegetation and profile structure to riverbanks (DNREAP)																																	
BIODIVERSITY - 6. By 2016, rehabilitate and /or revegetate 10,000 ha of native terres	75%	25%	440		40	40	40	40	40	40	40	40	40	40	40																		
WATER - 1. By 2016, rehabilitate and protect the stream health (in terms of structure, riparian vegetation and fi																																	
WATER - 2. By 2016, 100% of local water utilities to have undertaken planning for managing their water system																																	
WATER - 4. By 2016, extractions from 95% of aquifers are within identified sustainable yields and extractions fro																																	
SOIL & LAND - 2. By 2016, 12,000 ha of high risk ASS land is under ASS active management (4 000 ha by 2009																																	
Implement monitoring program for groundwater and surface water. Establish extent of contamination caused by																																	
CASINO																																	
Junbung Riverbank Project (already funded) and other river bank projects in the Casino area currently unfunded																																	
Norco Weir Removal (work in progress)																																	
EVANS HEAD																																	
Implement Estuary Strategy for Evans Head.																																	
Evans Estuary MP Stg 2 - GPT	30%	70%	290		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Evans Estuary MP Stg 2 - Water Quality Monitoring	70%	30%	580		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
CORAKI																																	
Coraki Riverside Stabilisation Investigation.																																	
DIPNR Coraki Riverbank Stabilisation Monitoring	70%	30%	87		4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
WOODBURN																																	
BROADWATER																																	
Pacific Hwy Sth of Eversons Ck Protection																																	
Rattle Creek Flood Mitigation Works																																	
RURAL																																	
3. River water quality monitoring program																																	
Lower Bungawalbin Riparian Restoration Project (already funded by the NSW Environmental Trust)																																	
		Total	2,996	30	103	127	128	128	128	128	128	128	128	128	128	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88
	Labor		2,144	30	79	91	92	92	92	92	92	92	92	92	92	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62
	Materials		852		24	36	36	36	36	36	36	36	36	36	36	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26

Appendix H

Triple Bottom Line Assessment Process

Triple Bottom Line Assessment

The scenarios developed were ranked using a Triple Bottom Line (TBL) assessment. The methodology and outcomes of this assessment for RVC is detailed below.

Triple Bottom Line Measures

TBL assessment is an approach of assessing individual or bundled management options against a set of social, environment and economic measures. It is possible to develop many environmental and social measures upon which to measure the appropriateness of the management options. However, for practical purposes, it is necessary to identify key criteria which best represent local values.

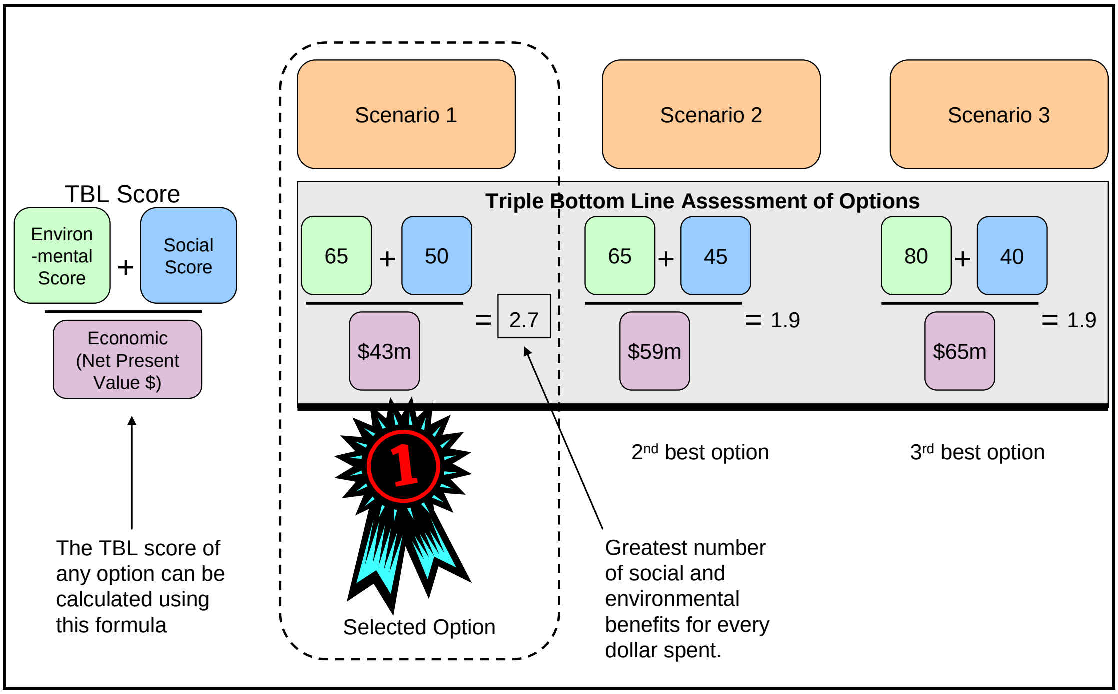
The inputs of the PRG, government agencies and RVC staff, as part of the community consultation process (during the Concept Study phase) were utilised to determine a set of triple bottom line assessment measures for RVC (refer Appendix B and Section 2.2). These measures are set out in Table H - 1. Generally, it is difficult to classify measures as wholly environmental, social or economic. Most criteria could be readily categorised as two or three.

Ranking of Scenarios Against Triple Bottom Line Measures

Each of the three scenarios were ranked, using the TBL measures in Table H - 1.

An example of the TBL assessment approach applied to the RVC draft IWCM Scenarios is set out in Figure H - 1.

Figure H - 1: TBL Assessment Approach.



Based on the measures set, each option was assigned an environmental or social score and weightings for each measure were assigned by the PRG members (refer Appendix B). In order to rank the relative TBL performance of each option, the environmental and social scores for each option (using the weighting determined by the PRG) were summed and then divided by the net present value of the option. Ranking each option in this manner provides a measure of how many positive social and environmental outcomes every dollar invested would buy. Hence, this process provides an opportunity to assess the relative desirability of the outcomes of implementing different scenarios.

The ranking method (data used and scoring system) is presented in Table H - 2, Table H - 3 and Table H - 4.

The results of the assessment and the ranking of the draft scenarios was presented to the PRG in the second PRG workshop of the Strategy phase (refer Appendix B). The results are set out in Table H - 5.

Table H - 1: Triple Bottom Line Objectives and Measures.

Concept Study Phase			Strategy Plan Phase		
Priority Issue identified by PRG	**Objectives identified by PRG**	**Measure identified by PRG**	**IWCM Issue**		**Measure used in TBL Assessment of Scenarios**
General water quality in the river as a result of landuse practices including agriculture, town (stormwater), industrial flood management, ASS etc, including blue-green algae outbreaks.	Improve land use management through education and demonstration.	Percentage of land and riparian vegetation protected and rehabilitated.	4	Existing landuse practices and urban impacts are affecting surface water quality	Number of on-site systems improved or replaced
					Contribution to improvement in surface water quality through involvement in water sharing process
					Contribution to improvement in surface water quality through involvement in catchment action plan implementation
					Achievement of water quality objectives (%)
					Implementation and regular review of SMP
					Compliance with DEC Licence limits for effluent discharge and PRPs met (%)
					Contribution to reduction in point source contamination through liaison with DEC
					Improvement in land management practices through education
The need for a water sharing plan process to consider all water users together rather than a number of processes in isolation.	Coordinated approach to sharing of surface and ground waters.	Integration of urban water planning and the Macro Water Sharing Process.	2	Lack of ground and surface water sharing plans	Contribution to improvement in surface water quality through involvement in water sharing process
Sustainable sewage treatment plant effluent management across the LGA.	Maximise high value (priority to substitution of potable water) reuse.	Percentage of treated effluent and stormwater reused.	3	Sustainable effluent reuse with end user requirements considered	Use of alternative water sources (recycled effluent, stormwater etc) (ML/a reuse volume)
					Implementation of education program for effluent reuse

Concept Study Phase			Strategy Plan Phase		
Priority Issue identified by PRG	**Objectives identified by PRG**	**Measure identified by PRG**	**IWCM Issue**		**Measure used in TBL Assessment of Scenarios**
Diversification of water sources.	Increase number of alternative water sources.	Percentage of water drawn from alternative water sources (rainwater tanks, stormwater harvesting, effluent reuse systems).	1	Poor town water supply security	Town water consumption per residential house assessment (kL/year; ultimate 2036)
					Use of alternative water sources (recycled effluent) (ML/a reuse volume)
Poor urban (domestic and commercial) water supply security.	Improved security of urban water supply.	Ability to meet 5-10-20 rule for system security.	1	Poor town water supply security	Security of Supply - implementation of alternate bulk supply strategy or source
					Unaccounted-for-water reduction
Affordability/pricing of options.	Provide highest level of service relative to users' willingness to pay.	Percentage change in typical residential bill.	5	High operating and management costs for water and sewerage systems leading to relatively high typical residential bills	Combined 2007/08 typical residential water and sewage bill
					Asset renewal program (NPV of 30 year renewals expenditure, $'000)

Table H - 2: Triple Bottom Line Assessment Method.

Measure used in TBL Assessment	TBL Data Used and Results	Scoring System
Contribution to improvement in surface water quality through involvement in water sharing process	In the traditional and integrated scenarios RVC will become actively involved in the DNR water sharing process to ensure town water supplies are adequate. This is not currently undertaken (base case).	Yes = 1, No = 0
Contribution to improvement in surface water quality through involvement in catchment action plan implementation	In the integrated scenarios RVC will actively encourage (through liaison and / or catchment levy) the Northern Rivers CMA to implement the Catchment Action Plan to contribute to improvement in surface water quality. This is not currently undertaken (base case or traditional).	Yes = 1, No = 0
Contribution to reduction in point source contamination through liaison with DECC	In the traditional and integrated scenarios RVC will actively liaise with the DECC to reduce point source contamination. This is not currently undertaken (base case).	Yes = 1, No = 0
Improvement in land management practices through education	In the integrated scenarios RVC will implement a program of education on sustainable land management practices to contribute to improvement in surface water quality. This is not currently undertaken (base case or traditional).	Yes = 1, No = 0
Achievement of water quality objectives (%)	In the IWCM Concept Study, Water quality in the Richmond River was assessed against the *Water Quality and River Flow Interim Environmental Objectives* (IEOs) defined for the Richmond River Catchment. Each of these objectives is defined by identified environmental values. The extent to which each value was considered protected was ranked from very poor to good, based on the percentage of samples where the indicator criteria were met. The dominant ranking against the indicator criteria for the available data was "fair" with a result of between 50% and 74% compliance. The existing situation was therefore given a result of 65%. Projects which are considered to influence this result include STP upgrades, stormwater quality improvement and effluent reuse schemes. These projects (included in the integrated scenarios) are expected to increase compliance with the IEOs by about 10%.	Linear scoring (out of a maximum of 5). The score for each scenario is obtained by dividing that result by the maximum result (multiplied by 5).
Asset renewal program (NPV of 30 year renewals expenditure, $'000)	Asset renewal expenditure can be targeted at problem areas such as system leakage, aging assets (replacement) and can reduce long term operating costs. The existing asset renewal program (from RVC's Management Plan and Strategic Business Plan) proposes a high level of expenditure in the short term. For the traditional and integrated scenarios, the required asset renewal expenditure considers the development of a condition based asset management plan and expenditure based on asset condition, remaining asset life and depreciation. The resulting expenditure is lower than in the base case. Increased capital expenditure is considered to improve asset condition.	Linear scoring (out of a maximum of 5). The score for each scenario is obtained by dividing that result by the maximum result (multiplied by 5).

Measure used in TBL Assessment	TBL Data Used and Results	Scoring System
Combined 2007/08 typical residential water and sewage bill	The 2007/08 typical residential bills (TRB) were determined using FINMOD, the financial model developed by DWE for local water utilities (refer Appendix F) for water supply and sewerage (in 2006/07 $). The TRB is the annual bill paid by a residential assessment with typical water use which is not a vacant or pensioner assessment. The result is expressed as the increase above the 2006/07 combined TRB of $1,204 per assessment.	Non-linear scoring based on assumed willingness-to-pay the increase in TRB. An increase of less than 3% received the maximum score of 5. Between 3% and 6% received a score of 4.5, 6% - 12% received a score of 4.0, 12% - 18% received a score of 3.5, and 18% - 25% received a score of 3.0.
Compliance with DECC Licence limits for effluent discharge and PRPs met (%)	RVC currently plans to upgrade its STPs to meet licence limits and Pollution Reduction Programs (PRPs). All scenarios include these upgrades so all are expected to result in 100% compliance.	Linear scoring (out of a maximum of 5). The score for each scenario is obtained by dividing that result by the maximum result (multiplied by 5).
Implementation and regular review of SMP	RVC currently (base case) has a stormwater management plan prepared in 2007 which is updated on a periodic basis. In the integrated scenarios RVC will implement the existing stormwater management plan and regularly review the outcomes and stormwater requirements to contribute to improvement in surface water quality.	Yes = 1, No = 0
Number of on-site systems improved or replaced	RVC currently regulates the sewage management practices in new development areas without reticulated sewerage and implements the On-site Sewage Management Strategy to identify systems at risk of environmental or health impacts. This is expected to result in improvements to 50% of the on-site systems. In the integrated scenarios, RVC will provide incentives for new advanced on-site systems in areas with high risk. This is expected to result in approximately 25% of systems improved or replaced.	Linear scoring (out of a maximum of 5). The score for each scenario is obtained by dividing that result by the maximum result (multiplied by 5).
Security of Supply - implementation of alternate bulk supply strategy or source	Currently (base case) the water supply source is not secure. The traditional and integrated scenarios include investigation of an alternate source to provide security. In the integrated 2 and 3 scenarios, additional security is provided by dual reticulation and indirect potable reuse respectively.	Alternate bulk supply strategy: Yes = 1, No = 0. Alternate source: Yes = 1, No = 0.

Measure used in TBL Assessment	TBL Data Used and Results	Scoring System
Unaccounted-for-water reduction	Currently, reduction of unaccounted-for-water (UFW) is achieved through asset renewals (replacement of leaking assets). Active UFW reduction is included in the demand management programs for the traditional scenario (low level) and the integrated scenarios (high level).	Yes = 1, No = 0
Use of alternative water sources (recycled effluent) (ML/a reuse volume)	The volume of water sourced from recycled effluent has been determined for each scenario. This is expressed as the percentage replacement of raw water extracted at the end of the planning horizon (2036) determined from expected production of water.	Linear scoring (out of a maximum of 5). The score for each scenario is obtained by dividing that result by the maximum result (multiplied by 5).
Implementation of education program for effluent reuse	Currently there is no education program implemented by RVC to encourage the sustainable use of recycled water. The integrated scenarios include an education program.	Yes = 1, No = 0
Town water consumption per residential house assessment (kL/year; ultimate 2036)	RVC does not currently implement a demand management program. Low level demand management (with BASIX, best-practice pricing, education and UFW reduction) is included in the traditional scenario. Higher level demand management is included in the integrated scenarios (also including showerhead retrofit, business audit and water conservation order). From the demand modeling undertaken for the IWCM Strategy, the expected town water consumption for residential houses (single dwellings) at the end of the planning horizon (2036) was determined. The result is expressed as the town water savings from the base case consumption.	Linear scoring (out of a maximum of 5). The score for each scenario is obtained by dividing that result by the maximum result (multiplied by 5).

Table H - 3: Effluent Reuse Volumes.

Reuse Volume (ML/a)	Base Case	Traditional	Integrated 1	Integrated 2	Integrated 3
Casino					
Demand Program	Baseline	Water Savings Program 2	Water Savings Program 3	Water Savings Program 3	Water Savings Program 3
DSS Production 2036	3570	2888	2833	2833	2833
Golf Course and Blue Dog Agricultural irrigation - 2004/05	597	597	597	597	597
Blue circle cement		101	101	101	101
Dual reticulation (W & N)				257	
Indirect potable					1717
Total Casino Reuse	597	698	698	955	2415
Lower Richmond River					
Production [1]	877	877	877	877	877
Coraki					
Golf course (assume only uses available effluent)	164	164	164	157	157
Dual reticulation (SW)				7	7
Total Coraki STP [2]	164	164	164	164	164
Broadwater/Evans Head/Woodburn					
Broadwater/Woodburn agriculture		256	256	256	256
Broadwater dual reticulation				145	145
Evans Head irrigation open spaces		160	160	160	160
Evans Head/Woodburn dual reticulation				370	370
Total Evans Head STP [3]	0	416	416	931	931

Reuse Volume (ML/a)	Base Case	Traditional	Integrated 1	Integrated 2	Integrated 3
Total MLRR Reuse	164	580	580	1095	1095
Total RVC Production	4447	3765	3709	3709	3709
Total RVC Reuse	761	1279	1279	2050	3510

1. Average MLRR production is 2.4 ML/d. RVC Drought Management Plan (2007).
2. Coraki STP capacity (1,800 EP) based on 250 L/EP/day is 164 ML/a.
3. Evans Head STP capacity (11,000 EP) based on 250 L/EP/day is 1,004 ML/a.

Table H - 4: Ultimate Residential Consumption.

Scenario	Base Case	Traditional	Integrated 1	Integrated 2	Integrated 3
DSS Results	Baseline	Water Savings Program 2	Water Savings Program 3	Water Savings Program 3	Water Savings Program 3
Single Residential Consumption per account (L/d)	553	-	-	-	-
No accounts	5639	5639	5639	5639	5639
Consumption (ML/a)	1140	-	-	-	-
Savings above base case (ML/d)	-	1.9	2.0	2.0	2.0
Consumption (ML/a)	1140	457	402	402	402
Single Residential Consumption per account (kL/a)	202	81	71	71	71

Table H - 5: TBL Assessment Results

Measures	Criteria Weighting	Base Case	Traditional	Integrated 1	Integrated 2	Integrated 3
Contribution to improvement in surface water quality through involvement in water sharing process	*9.0*	**No**	**Yes**	**Yes**	**Yes**	**Yes**
Score		*0*	*1*	*1*	*1*	*1*
Contribution to improvement in surface water quality through involvement in catchment action plan implementation	*13.0*	**No**	**No**	**Yes**	**Yes**	**Yes**
Score		*0*	*0*	*1*	*1*	*1*
Contribution to reduction in point source contamination through liaison with DEC	*4.0*	**No**	**Yes**	**Yes**	**Yes**	**Yes**
Score		*0*	*1*	*1*	*1*	*1*
Improvement in land management practices through education	*7.0*	**No**	**No**	**Yes**	**Yes**	**Yes**
Score		*0*	*0*	*1*	*1*	*1*
Achievement of water quality objectives (%)		**65**	**65**	**75**	**75**	**75**
Score	*14.0*	*4.3*	*4.3*	*5.0*	*5.0*	*5.0*
Asset renewal program (NPV of 30 year renewals expenditure, $'000)		**20,244**	**8,906**	**8,906**	**8,906**	**8,906**
Score	*11.0*	*5.0*	*2.2*	*2.2*	*2.2*	*2.2*
Combined 2007/08 typical residential water and sewage bill		**$1,270**	**$1,225**	**$1,230**	**$1,400**	**$1,450**
% increase in medium term TRB (above 2006/07)		5%	2%	2%	15%	19%
Score	*12.0*	*4.5*	*5.0*	*5.0*	*3.5*	*3.0*

Measures	Criteria Weighting	Base Case	Traditional	Integrated 1	Integrated 2	Integrated 3
Compliance with DEC Licence limits for effluent discharge and PRPs met (%)		**100%**	**100%**	**100%**	**100%**	**100%**
Score	*10.0*	*5*	*5*	*5*	*5*	*5*
Implementation and regular review of SMP		**No**	**No**	**Yes**	**Yes**	**Yes**
Score	*7.0*	*0*	*0*	*1*	*1*	*1*
Number of on-site systems improved or replaced		**50%**	**50%**	**75%**	**75%**	**75%**
Score	*3.0*	*3.3*	*3.3*	*5.0*	*5.0*	*5.0*
Security of Supply - implementation of alternate bulk supply strategy or source		**0**	**1**	**1**	**2**	**2**
Score	*20.0*	*0.0*	*2.5*	*2.5*	*5.0*	*5.0*
Unnacounted-for-water reduction		**No**	**Yes**	**Yes**	**Yes**	**Yes**
Score	*9.0*	*0*	*1*	*1*	*1*	*1*
Use of alternative water sources (recycled effluent) (ML/a reuse volume)						
% replacement of total raw water extracted (ultimate 2036)		17%	34%	34%	55%	95%
Score	*16.0*	*0.9*	*1.8*	*1.8*	*2.9*	*5.0*
Implementation of education program for effluent reuse		**No**	**No**	**Yes**	**Yes**	**Yes**
Score	*3.0*	*0*	*0*	*1*	*1*	*1*
Town water consumption per residential house assessment (kL/year; ultimate 2036)		**202**	**81**	**71**	**71**	**71**
% savings		0%	60%	65%	65%	65%

Measures	Criteria Weighting	Base Case	Traditional	Integrated 1	Integrated 2	Integrated 3
Score	*13.0*	*0.0*	*4.6*	*5.0*	*5.0*	*5.0*
Capital cost over thirty years (NPV $'000)		**$75,364**	**$66,645**	**$66,645**	**$76,980**	**$79,729**
Operating cost over thirty years (NPV $'000)		**$151,467**	**$155,761**	**$156,268**	**$167,412**	**$177,035**
TBL Score		**16.1**	**24.7**	**27.9**	**28.5**	**28.8**
Ranking		**5.0**	**4.0**	**3.0**	**2.0**	**1.0**

Appendix I

Consultation – Service Level Agreement

Richmond Valley Council

Integrated Water Cycle Management (IWCM) Strategy

Workshop with Rous Water Briefing Paper

Background

Richmond Valley Council (RVC) is responsible for water supply, sewerage and stormwater management services within the RVC local government area (LGA). As such, RVC is the Local Water Utility (LWU) for the LGA.

In terms of water supply, the LGA is divided into two areas: Casino and the Lower Valley. Bulk water for the Lower Valley is sourced from Rous Water.

RVC continually plans the provision of these services and implements industry best-practice management practices.

Introduction

Integrated Water Cycle Management (IWCM) Strategy for LWUs involves the integration of urban water services – water supply, sewerage and stormwater – so that water is used optimally. RVC is in the process of developing and implementing a long-term IWCM Strategy for the provision of urban water services.

The IWCM Strategy is developed in two parts, the Concept Study and the Strategic Plan. The Concept Study for RVC has been completed in July 2006. It identified issues relating to the catchment, water resource and the urban area and proposed a scope of work for IWCM Strategy.

RVC has now commenced the second part of this process, the Strategic Plan. JWP, with assistance from HSc, will facilitate this stage of the process which will offer solutions for the issues identified in the Concept Study. This process involves the community through representation on a Project Reference Group (PRG) and workshops with stakeholders.

A PRG was set up to assist in the identification and prioritisation of water cycle management issues. The PRG comprises representatives from the NSW state government agencies and the community. After the workshop on the 3 May 2006 the PRG has prioritised issues and proposed solutions that will be finalised in the Strategy.

Workshop Objectives

One of the tasks for the IWCM strategy, as identified in the concept study is:

> ***Define responsibilities and formalise service agreement between Rous Water and Richmond Valley Council.***

RVC has since prepared a draft bulk water supply agreement between RVC and Rous Water.

The objectives of the workshop are:

1. Identify issues relating to bulk water supply from Rous Water to RVC.
2. Agree on these issues or, if no agreement can be reached, set in place actions to resolve the issues.
3. Define opportunities for the IWCM process to assist in the delivery of an integrated approach to water management across the Richmond Valley.
4. Provide a basis for bulk supply agreement between Rous Water and its other three constituent councils (Ballina, Byron and Lismore).

Issues

There are a number of issues that have been identified by the JWP / HSc team, and some issues raised by DEUS.

Workshop participants are invited to forward any issues relating to the bulk water supply agreement, or any other issue relevant to the responsibilities of Rous Water and RVC, the relationships with bulk supplier or the management of bulk water in the region. Please forward comments to Michael McKenzie of RVC before the workshop.

A list of issues will be tabled at the workshop, as a basis for discussion. Additional issues are likely to be raised.

Workshop agenda

IWCM Strategy – Workshop on Bulk Water Supply Agreement

Location: RVC offices, Graham Place, Casino

Date: 28 November 2006

Time: 9.30 am – 12.30 pm

Program

9.30	Introduction, workshop objectives	Facilitator
9.45	Presentation –IWCM strategy: background and status	JWP
10.00	Presentation – bulk water supply agreement: background and status.	RVC
10.15	Vision of water management in the future	Facilitator
10.30	Issues, resolutions, further actions	Facilitator
12.15	Summary and conclusion	Facilitator
12.30	Close	

Summary Paper
Richmond Valley IWCM Strategy Plan
Workshop with Rous Water

This paper is a summary note to the workshop with Rous Water (RW) for the development of a Service Level Agreement (SLA). This is part of Integrated Water Cycle Management (IWCM) Strategy Plan for Richmond Valley Council (RVC). The paper provides an overview of the outcomes of the Workshop which was held at RVC on 28th November, 2006.

1. Introduction

Richmond Valley Council (RVC) is responsible for water supply, sewerage and stormwater management services within the RVC local government area (LGA). As such, RVC is the Local Water Utility (LWU) for the LGA. RVC continually plans the provision of these services and implements industry best-practice management practices.

As the local water utility (LWU), RVC is also continually planning its business activities. In 2006, RVC commenced the process of implementing a new best-practice approach to LWU strategic planning known as **Integrated Water Cycle Management** (IWCM). The process is supported by the NSW Department of Energy, Utilities and Sustainability (DEUS), who have published guidelines for LWUs on the subject. These guidelines are available at www.deus.nsw.gov.au.

Integrated water cycle management 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 is important as it attempts to balance the current and future needs of urban and non-urban water users while reducing pressures on the available water resources.

The IWCM is developed in two parts, the Concept Study and the Strategy Plan. The Concept Study for RVC was completed in July 2006. It identified issues relating to the catchment, water resource and the urban area and proposed a scope of work for IWCM Strategy.

RVC has now commenced the second part of this process, the Strategy Plan. JWP will facilitate this stage of the process which will offer solutions for the issues identified in the Concept Study. This process involves consultation with the community through representation on a Project Reference Group (PRG) and workshops with stakeholders.

2. Workshop with Rous Water

In terms of water supply, the LGA is divided into two areas: Casino and the Lower Valley. Bulk water for the Lower Valley is sourced from Rous Water (RW).

One of the tasks for the IWCM strategy identified at the PRG meeting held on 3 May 2006 and also in the concept study is: **Define responsibilities and formalise service agreement between Rous Water and Richmond Valley Council.**

Issues from the IWCM concept study which relate to Rous Water are:

- Poor urban water supply security;
- Diversification of water sources;
- General water quality in the rivers;
- Affordability / pricing of options;
- Impact of population growth; and
- The need for sustainable localised system management.

RVC has since prepared a draft bulk water supply Service Level Agreement (SLA) between RVC and Rous Water.

In this context, a workshop with RW was arranged on 28th November, 2006, and all RW constituent councils were invited to attend.

2.1. Workshop Participants

Workshop invitations and a briefing paper were sent to the stakeholders prior to the workshop. Attendees at the Workshop are listed in Table 1. A copy of this summary paper has been sent to each of the participants listed in this table.

Table 1: Attendees at Workshop with Rous Water

Name	Position	Stakeholder
Wayne Franklin	Operational Services Manager	Rous Water
Paul Muldoon	General Manager	Rous Water
Garry Hemsworth	Director of Infrastructure Services	Lismore City Council
Matthew Fanning	Manager Water / Sewerage & Waste	Ballina Shire Council
Peter Rees	Manager Operation Water	Bryon Shire Council
Gary Murphy	Director of Works	Richmond Valley Council
Ray Medhurst	Manager of Strategic planning	Richmond Valley Council
Mark Hesse	Sewer & Water Planning Development Engineer	Richmond Valley Council
David Holstein	Services Engineer	Richmond Valley Council
Michael McKenzie	Senior Engineering Assistant	Richmond Valley Council
Gidi Azar	Consultant	HSc (for JWP)
Nurul Islam	Consultant	JWP

2.2. The Workshop Program

The workshop followed the program set out in **Table 2**. A presentation was made by JWP (the consultants assisting RVC prepare their IWCM).

Table 2: Workshop Program.

Details	Leader
Welcome and introduction	Michael McKenzie
Workshop objectives	Gidi Azar
RVC IWCM strategy: background and status	Nurul Islam
Bulk water supply agreement: background and status.	Mark Hesse
Vision of water management in the future	All facilitated by Gidi Azar
Issues, resolutions, further actions	
Summary and conclusion	
Close & Thanks	Michael McKenzie

2.3. Workshop Objectives

The objectives of the workshop were to:

- Identify issues relating to bulk water supply from Rous Water to RVC;
- Agree on these issues or, if no agreement can be reached, set in place actions to resolve the issues;
- Define opportunities for the IWCM process to assist in the delivery of an integrated approach to water management across the Richmond Valley;
- Provide a basis for the bulk supply agreement (SLA) between Rous Water and RVC, which can also be used by three other constituent councils (Ballina, Byron and Lismore);
- Draft the SLA framework;
- Discuss issues of quality, quantity, price and reliability;
- Determine possible ways of enforcement / compliance with SLA;
- Examine various options identified in the concept study; and
- Synchronize water restrictions between RW and Casino.

2.4. Workshop outcomes

The main outcomes of the workshop are listed below:

- The agreement should be written in plain English rather than 'Legalese'.

- A generic agreement should be developed that can be used by all four constituent councils.
- The agreement should be co-operative, in preference to adversarial.
- The agreement is to be prepared in 4 major sections (Protocol, Quantity/Security, Accountability and Compliance) as shown below.

Protocol

- Information collection:
  - collection
  - water quality
  - usage
  - complaints
- Information sharing
- Education
- Operations
  - Communication lines
  - Responsibilities
  - Notification of failures/incidents
- Charges: annual cycle for providing information in time for Rous to budget and set up tariffs
- Pricing: should comply with best-practice

Quantity / Security

- Levels of service:
  - Drought security: 5/10/20 rule as the basis
  - Annual demand: aim for 200 kL/household
  - Peak day demand: TBA (2.5-3 kL/household)
- Demand Management: regional plan with sub-plan specific to RVC
- Drought Management: regional plan with sub-plan specific to RVC
- Planning: 5 yearly joint studies. Councils to advise Rous of relevant changes.
- Reliability: Interruptions frequency and duration
- Sources
  - List potential sources
  - Review possibility of integration of sources
  - Consideration of effluent and stormwater as source
  - Work together on TBL assessment of sources
  - Relationship to the Northern Rivers Regional Strategy.

Accountability

This section will deal with the obligations of both parties. This must show clear lines of responsibilities by each party. Some of these are listed below.

Rous

- Supply water quality to ADWG requirement,
- Additional parameters in protocol, water quality management,
- Manage the agreement.

RVC

- Manage the agreement,
- Pay for invoices.

Testing and metering

- Water quality: Samples will be taken and tested by Rous Water. The data will be available to RVC, who may audit it if it wishes.
- Quantity: A single meter will be used at the supply points. The meter will be owned and read by Rous Water. The readings and calibration records will be available to RVC.

Compliance

The parties will need to comply with legislative and other requirements. Some of these are:

- Water quality – Meet ADWG standard (more strict requirement can be expected in future)
- BPM – provide audit reports
- Licence requirements
- Efficiency targets
- Leakage targets
- Disputes should be handled at the lowest possible level. If unresolved, they will be escalated as follows:
    - Engineers
    - Managers + Directors
    - Mayor / Chair
    - Minister

3. Where to from here?

The workshop concluded that RVC will prepare a new SLA in light of the workshop outcome. Another workshop is proposed to discuss the new draft agreement.

4. Who Can I Contact?

Should you have any queries about the Richmond Valley IWCM Strategy, Council's primary contact for this project is
Michael McKenzie, phone 02 6660 0244,
email michael.mckenzie@richmondvalley.nsw.gov.au .

Appendix J

Consultation – Water Sharing Plans

Richmond Valley Council

Integrated Water Cycle Management (IWCM) Strategy

Workshop with CMA and DNR Briefing Paper

Background

Richmond Valley Council (RVC) is responsible for water supply, sewerage and stormwater management services within the RVC local government area (LGA). As such, RVC is the Local Water Utility (LWU) for the LGA. Bulk water for towns other than Casino is sourced from Rous Water.

RVC continually plans the provision of these services and implements industry best-practice management practices.

Introduction

Integrated Water Cycle Management (IWCM) Strategy for LWUs, involves the integration of urban water services – water supply, sewerage and stormwater – so that water is used optimally. RVC is in the process of developing and implementing a long-term IWCM Strategy for the provision of urban water services.

The IWCM Strategy is developed in two parts, the Concept Study and the Strategic Plan. The Concept Study for RVC has been completed in July 2006. It identified issues relating to the catchment, water resource and the urban area and proposed a scope of work for IWCM Strategy.

RVC has now commenced the second part of this process, the Strategic Plan. JWP, with assistance from HSc, will facilitate this stage of the process which will offer solutions for the issues identified in the Concept Study. This process involves the community through representation on a Project Reference Group (PRG) and workshop between RVC, Department of Natural Resources (DNR) and Catchment Management Authority (CMA).

A PRG was set up to assist in the identification and prioritization of water cycle management issues. The PRG comprises representatives from the NSW state government agencies and the community. After the workshop on the 3 May 2006 the PRG has prioritised issues and proposed solutions that will be finalised in the Strategy.

Aim of the Workshop

This workshop is part of the consultation process, which is a key element of the IWCM. It aims to better integrate urban water service planning and the water sharing and catchment planning.

Specifically the workshop aims to discuss the expected outcomes of the macro water sharing plan process, the regional water strategy DNR is developing for the North Coast and the progress of implementing the catchment action plan.

The meeting aims to define the opportunities for the IWCM process to assist in the delivery of an integrated approach to water management across the Richmond Valley as this has been identified as a high priority issue for stakeholders.

JWP

HydroScience Consulting Pty Ltd

IWCM issues

The IWCM priority issues were identified in the Concept Study and objectives and measurable targets have been developed to address them, as shown in the table below.. The objectives will form the framework for assessing options and scenarios in the IWCM Strategy development phase.

Priority Issue	Objective	Measure
General water quality in the river as a result of landuse practices including agriculture, town (stormwater), industrial flood management, ASS etc, including blue-green algae outbreaks.	Improve land use management through education and demonstration.	Percentage of land and riparian vegetation protected and rehabilitated.
The need for a water sharing plan process to consider all water users together rather than a number of processes in isolation.	Coordinated approach to sharing of surface and ground waters.	Integration of urban water planning and the Macro Water Sharing Process.
Sustainable sewage treatment plant effluent management across the LGA.	Maximise high value (priority to substitution of potable water) reuse.	Percentage of treated effluent and stormwater reused.
Diversification of water sources.	Increase number of alternative water sources.	Percentage of water drawn from alternative water sources (rainwater tanks, stormwater harvesting, effluent reuse systems).
Poor urban (domestic and commercial) water supply security.	Improved security of urban water supply.	Ability to meet 5-10-20 rule for system security.
Affordability/pricing of options.	Provide highest level of service relative to users' willingness to pay.	Percentage change in typical residential bill.

An additional issue is the potential improvement of the regional water supply management regime through the possible transfer of water from Casino to Rous Water and to the Lower Valley.

Workshop outcomes

The expected outcomes for this workshop are:

- The identification of the objectives and issues of the PRG, as they relate to the development of the IWCM strategy plan.
- All parties understand issues, constraints and possible solutions relevant to the water sharing plan, the regional water strategy and the RVC IWCM.
- The development of a clear and transparent process for meeting and implementing Council's requirements for delivering water services.
- Ensuring a coordinated approach to the sharing of surface and ground waters in the region.
- Assessment of needs for draft water sharing plan and future workshops to address this issue.

Workshop agenda

IWCM Strategy meeting between RVC, DNR and CMA

Location: RVC offices, Graham Place, Casino

Date: 31 October 2006

Time: 1.00 pm – 4.00 pm

Program

1.00	Introduction, workshop objectives	Facilitator
1.15	Presentation – status of IWCM strategy	JWP
1.30	Presentation – status of water sharing plan	CMA
1.45	Presentation – status of regional water strategy	DWR
2.00	Vision of water management in the future	Facilitator
2.15	Issues, objectives and measures	Facilitator
3.15	Where to from here: activities and milestones	Facilitator
3.30	Communication protocol	Facilitator
3.45	Summary and conclusion	Facilitator
4.00	Close	

Summary Paper
Richmond Valley IWCM Strategy Plan
Workshop with DNR and CMA

This paper is a summary note to the workshop with Department of Natural Resources (DNR) and The Northern Rivers Catchment Management Authority (CMA) on macro water sharing, catchment planning and related issues. This is part of Integrated Water Cycle Management (IWCM) Strategy Plan for Richmond Valley Council (RVC). The paper provides an overview of the outcomes of the Workshop which was held at RVC on 28th November, 2006.

1. Introduction

Richmond Valley Council (RVC) is responsible for water supply, sewerage and stormwater management services within the RVC local government area (LGA). As such, RVC is the Local Water Utility (LWU) for the LGA. RVC continually plans the provision of these services and implements industry best-practice management practices.

As the local water utility (LWU), RVC is also continually planning its business activities. In 2006, RVC commenced the process of implementing a new best-practice approach to LWU strategic planning known as **Integrated Water Cycle Management** (IWCM). The process is supported by the NSW Department of Energy, Utilities and Sustainability (DEUS), who have published guidelines for LWUs on the subject. These guidelines are available at www.deus.nsw.gov.au.

Integrated water cycle management 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 is important as it attempts to balance the current and future needs of urban and non-urban water users while reducing pressures on the available water resources.

The IWCM is developed in two parts, the Concept Study and the Strategy Plan. The Concept Study for RVC was completed in July 2006. It identified issues relating to the catchment, water resource and the urban area and proposed a scope of work for IWCM Strategy.

RVC has now commenced the second part of this process, the Strategy Plan. JWP will facilitate this stage of the process which will offer solutions for the issues identified in the Concept Study. This process involves consultation with the community through representation on a Project Reference Group (PRG) and workshops with stakeholders.

2. Workshop with DNR and CMA

One of the tasks for the IWCM strategy identified at the PRG meeting held on 3 May 2006 and also in the concept study is: **Define a regional water sharing strategy.**

Issues from the IWCM concept study which relate to DNR and CMA are:

- Need for a water sharing plan;
- Diversification of water sources;
- General water quality in the river;
- Catchment hydrological stress;
- Environmental flow requirements;
- Groundwater stress; and
- Catchment management.

In this context, a workshop with DNR and CMA was arranged on 28th November, 2006.

2.1. Workshop Participants

Workshop invitations and a briefing paper were sent to the stakeholders prior to the workshop. Attendees at the Workshop are listed in Table 1. A copy of this summary paper has been sent to each of the participants listed in this table.

Table 1: Attendees at Workshop with DNR and CMA

Name	Position	Stakeholder
Michael Healy		DNR
Peter Hackett		DNR
Jennie Fenton	Catchment Coordinator	Northern Rivers CMA
Gary Murphy	Director of Works	Richmond Valley Council
Ray Medhurst	Manager of Strategic planning	Richmond Valley Council
Mark Hesse	Sewer & Water Planning Development Engineer	Richmond Valley Council
David Holstein	Services Engineer	Richmond Valley Council
Michael McKenzie	Senior Engineering Assistant	Richmond Valley Council
Gidi Azar	Consultant	HSc (for JWP)
Nurul Islam	Consultant	JWP

2.2. The Workshop Program

The workshop followed the program set out in **Table 2**. A presentation was made by JWP (the consultants assisting RVC prepare their IWCM).

Table 2: Workshop Program.

Details	Leader
Welcome and introduction	Michael McKenzie
Workshop objectives	Gidi Azar
RVC IWCM strategy: background and status	Nurul Islam
Status of regional water strategy	Michael Healy and Peter Hackett
Status of Catchment Action Plan	Jennie Fenton
Vision of water management in the future	All facilitated by Gidi Azar
Issues, objectives and measures	
Where to from here: activities and milestones	
Communication protocol	
Summary and conclusion	
Close & Thanks	Michael McKenzie

2.3. Workshop Objectives

The objectives of the workshop are as follows.

- All parties understand issues, constraints and possible solutions relevant to the water sharing plan, the regional water strategy and the RVC IWCM;
- The development of a clear and transparent process for meeting and implementing Council's requirements for delivering water services;
- Ensuring a coordinated approach to the sharing of surface and ground waters in the region;
- Assessment of needs for draft water sharing plan and future workshops to address this issue;
- The expected outcomes of the macro water sharing plan process, and the regional water strategy DNR is developing for the North Coast; and
- The progress of implementing the catchment action plan.

This workshop also discussed:

- Environmental flow (now and future)
- Licenses to other users
- Legal aspects of licenses
- Water trading and its impact on Casino
- Fish ladder
- Toonumber Dam

- Indirect potable use, and
- Groundwater recharge

2.4. Workshop outcomes

Macro Water Sharing

DNR explained that macro water plans are water sharing plans that apply to a number of water sources across catchments or to different types of aquifers. This tries to reduce or maintain water extraction in areas of stress mainly at low flow periods.

This plan also addresses the issues of hydraulic stress, water trading, access rule and licence transfer.

Relevant information can be obtained from Northern Rivers CMA website (http://www.northern.cma.nsw.gov.au/water.html) or DNR website (http://www.naturalresources.nsw.gov.au/water/macro_sharing_plans.shtml).

DNR also explained that the preparation of macro water plan is in advance stage. As first step, report cards were prepared.

A Report Card has been developed for each of the 198 water sources across the Northern Rivers region. This also includes potential ground water sources. The report cards provide licence holders with the technical information used to determine classifications and daily access rules.

Each water source is named after the main river or creek in that sub-catchment and includes its tributaries.

Community consultation process on the report cards started from late 2005. The main purpose is to check if it is acceptable, and if not, why it is not and how to make that acceptable to the community.

Based on the outcome of community consultation, a draft macro water plan is expected to be ready by mid 2007. A regional panel drawn from various agencies will review the draft. There will be a plain English version of the draft report for public feedback. RVC is encouraged to make submission to the draft report. The final macro water plan will incorporate appropriate observations, hence the final draft may not available in 2007.

It was observed in the workshop that transfer of licence can activate in-active (sleeping) licences leading to potential increase in withdrawal.

Micro Water Sharing

DNR explained that there are nine micro water sharing plan within Northern Rivers CMA and these will come out progressively. RVC can expect their micro water sharing plan sometime 2007.

Environmental flow

It was explained that environmental flow is a quantity requirement and has no direct quality clause. However, environmental flow can reduce stratification, maintain bio-activities and dissolved oxygen levels.

Toonumbar Dam

DNR stated that Toonumbar Dam is very secure with a yield of 11,000 ML. It is possible to investigate the option of using this dam as a source.

Water Planning Strategy

A new study will soon commence to prepare Northern Rivers Regional Strategy by DNR jointly with DEUS. This will look into future requirements and ways to support future growth. This will also investigate linking different sources. TOR of this work is not yet finalised. It is recommended that RVC contribute their input in the TOR.

Activities of CMA

Northern Rivers CMA explained that there is Catchment Action Plan, which deals with riparian rehabilitation and fish passages, among others. However, it was observed that CMA can buy adaptive water licences from DNR to improve overall river health.

3. Where to from here?

The workshop concluded that RVC will follow up these activities.

- Review draft macro water plan and make submission if required.
- Check status of micro water share plan.
- Review TOR of Northern Rivers Regional Strategy and contribute input if required.
- Contact DNR to obtain preliminary ground water source data.
- Liaison with CMA to implement Catchment Action Plan.
- Investigate possibility of using Toonumbar Dam as an alternate water source.

4. Who Can I Contact?

Should you have any queries about the Richmond Valley IWCM Strategy, Council's primary contact for this project is
Michael McKenzie, phone 02 6660 0244,
email michael.mckenzie@richmondvalley.nsw.gov.au .

Appendix K

Capital Works Program for Alternate Preferred Scenario

060501 Richmond Valley Council IWCM

Capital Works Program Water - Integrated 1 A (Alternate analysis)
2005

All values are in year 2005/06 $'000

Asset	Type of works			30 year total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Improved LOS	New System Assets	Renewals		2005/06	2006/07	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	2032/33	2033/34	2034/35
					2005	2006	2007	2008	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
CASINO SYSTEM																																		
Source																																		
Automatic Cartage Fill Up Point	75%	25%		50		25	25																											
Off stream storage of 2.8 GL as a pool money		100%		14,300					14300																									
Casino T/Works - Jabour Weir Structural Asse	100%			32		32																												
Treatment																																		
Re-use of Wastewater (EPA)	75%	25%		2		2																												
Construct PAC System	75%	25%		265		75	100	90																										
Replace Dry Soda Ash Dosing System			100%	215		75	70	70																										
Filter Walls - Concrete Repairs			100%	90		45		45																										
Clear Water Pumps	75%	25%		40		20		20																										
Convert CL2 Gas to Sodium Hypo	75%	25%		190		70		120																										
Draw up PLC Schematics	75%	25%		12				12																										
Resurface No 2 Sludge Lagoon with Clay	100%			20				20																										
Flouridate Water Supply	100%			100			25	75																										
Concrete Repairs to Floc Tanks			100%	30					30																									
Concrete Repairs to Sedimentation Tanks			100%	60					60																									
Casino T/Works - Butterfly Valve Backwash P	75%	25%		10		10																												
Casino T/Works - Taste/Odour Investigation	100%			12		12																												
Works to service new growth		100%		195	4	4	4	4	4	4	4	4	4	4	4	10	10	21	21	21	10	10	4	4	4	4	4	4	4	4	4	4	4	4
Augmentation - Treatment Plant (new sed basin, filters, e		100%		4,100																1025	2050	1025												
Distribution																																		
Augmentation - New Gays Hill reservoir		100%		1,026						103	923																							
Main Upgrades - Low pressure area improve	75%	25%		256	51					205																								
Minor Works	60%	40%		780	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Works to service new growth (reservoir)		100%		72		4		4		4		8		4		4		4		4		8		4		4		4		4		8		4
Works to service new growth (mains)		100%		1,395	51	51	51	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
Casino Reservoir - Communications Hut Sth F	100%			31		31																												
Communications Hut South Reservoir	75%	25%		120			120																											
Remove Old Pipework South Reservoir			100%	60				60																										
Seal Leaks North Reservoir 3			100%	50				50																										
Replace Ladders/Install Davit Arm			100%	200				200																										
Renewals																																		
Mains			100%	1,827	62	62	62	62	62	62	62	62	62	62	62	61	61	61	61	61	61	61	61	61	61	60	60	60	59	59	59	58	58	58
Point (eg valve, hydrants, fitt etc)			100%	1,149	40	40	40	40	40	40	40	40	39	39	39	39	39	39	39	39	39	38	38	38	38	38	38	37	37	36	36	35	35	34
Plant & Reservoirs			100%	3,409	118	118	118	118	118	118	118	118	114	114	114	114	114	114	114	112	111	111	111	111	111	111	111	111	111	111	111	111	111	105
Other																																		
Plant & Equipment		100%		300	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Telemetry - minor upgrades & Casino WTP Up	100%			618		58	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
Upgrades - Effluent Management (sewer disc	75%	25%		308	51	103	154																											
LOWER RICHMOND SYSTEM																																		
Soruce																																		
PROVIDED BY ROUS WATER																																		
Treatment																																		
PROVIDED BY ROUS WATER																																		
Distribution																																		
South Evans Head - Replace Roof			100%	479		89	90	300																										
Evans Head - Replace Lids on Pump Station			100%	15				15																										
Reservoir Upgrades - Raise level of Sth Evan	75%	25%		308															308															
Works to service new growth (reservoir)		100%		68		4		4		4		8		4		4		4		4		8		4		4		4		4		4		4
Works to service new growth (mains)		100%		930	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Seal Langs Hill reservoir (moved to 10/11 as per RVC email 27/7/07)			100%	103						103																								
Augmentation Coraki MRRV	75%	25%		205	205																													
Mains Upgrades (removed as per RVC email 2	70%	30%																																
Renewals																																		
Reservoirs Renewals			100%	1,226	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
Main Renewals			100%	1,030	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Other																																		
Acquisition of P&E (Various)		100%		8		8																												
Lower Richmond - Metering in distribution sys	75%	25%		130					130																									
Minor works	60%	40%		450	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
SBP/DSP review	75%	25%		156	26					26					26					26					26					26				
Drought Management Plan	75%	25%		50		50																												
IWCM plan / outcomes	75%	25%		500	50	50	100	100	100	50	50																							
Total				**36,982**	**816**	**1,194**	**1,137**	**1,633**	**####**	**942**	**1,420**	**463**	**443**	**451**	**469**	**456**	**448**	**467**	**767**	**1,515**	**2,494**	**1,485**	**437**	**445**	**463**	**445**	**437**	**444**	**434**	**468**	**433**	**444**	**431**	**433**
Improved LOS				**3,508**	312	460	444	396	217	255	82	45	45	45	64	45	45	45	276	64	45	45	45	45	64	45	45	45	45	64	45	45	45	45
Other New System Assets (growth w				**23,530**	208	230	237	201	14,465	289	1,043	123	107	115	114	121	113	132	201	1,164	2,163	1,154	107	115	114	115	107	115	107	122	107	119	107	115
Renewals				**9,944**	296	504	456	1,036	386	398	295	295	291	291	291	290	290	290	290	287	286	286	285	285	285	285	285	284	282	282	281	280	279	273

Other Grants

Water - Integrated 1A - OMA (2005/06 $'000)

Alternate Analysis

Additional OMA items (2005/06 $'000)

	Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	of	2005/06	2006/07	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	2032/33	2033/34	2034/35
	Expend	2005	2006	2007	2008	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
Feasibility study on regional water supply arrangements	adm				99																										
DMP - DEUS best practice two part pricing	adm																														
DMP - Rainwater tank under BASIX (for new development)	adm																														
DMP - Educational program for external water uses	adm				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
DMP - Reduction for unaccounted for water	adm		400	400	400	400	400	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Contribute to DNR Macro Water Sharing Plan	adm																														
Alternate source investigation	adm				132																										
Off stream storage of 2.8 GL as a pool money	eng					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
	ope					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
	mai					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
	ener					363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363	363
SBP OMA cost modified by JWP	adm			20					20					20					20					20					20		
DMP - Shower head retrofit	adm			40	41	41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DMP - Pernanent restriction	adm			10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
DMP - Business audit	adm			-	25	25	25	-	-	26	26	26	-	-	27	27	28	-	-	28	29	29	-	-	30	30	31	-	-	31	32
Regional demand management strategy	adm				32																										
Sensitivity analysis on yield with reduced rainfall	adm				149																										
Alternate emergency supplies in Regional Water Supply Strate	adm				0																										
Lower Richmond - Metering in distribution system	mai										5					5					5					5					5

Total

	Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	30
	of	2005/06	2006/07	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	2032/33	2033/34	2034/35	YEAR
	Expend	2005	2006	2007	2008	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	TOTAL
Management Expenses																																
Administration	adm	996	1,734	1,748	2,210	1,833	1,818	1,482	1,512	1,559	1,611	1,660	1,715	1,767	1,830	1,887	1,944	1,997	2,049	2,114	2,170	2,227	2,279	2,331	2,397	2,454	2,511	2,561	2,613	2,681	2,737	60,427
Engineering and Supervision	eng	116	225	252	260	290	301	312	324	336	349	362	376	390	403	417	431	444	458	472	486	499	513	527	540	554	568	581	595	609	623	12,615
Operation and Maintenance Expenses																																
Operation Expenses	ope	399	369	475	489	535	549	565	581	598	616	635	654	672	691	710	729	748	766	785	804	823	842	860	879	898	917	936	954	973	992	21,442
Maintenance Expenses	mai	525	503	520	534	571	588	604	622	642	667	682	703	724	745	771	786	807	828	849	875	890	911	932	953	979	994	1,015	1,036	1,057	1,083	23,391
Energy Costs	ene	66	58	83	86	88	91	94	96	100	103	106	109	113	116	120	123	126	130	133	137	140	143	147	150	154	157	160	164	167	171	3,630
Chemical Costs	che	210	140	204	210	217	223	230	237	244	251	259	267	274	282	290	298	306	313	321	329	337	345	352	360	368	376	384	391	399	407	8,821
Purchase of Water	pur	353	401	492	565	649	746	769	792	816	840	866	892	918	944	970	996	1,022	1,048	1,074	1,100	1,126	1,152	1,178	1,204	1,230	1,256	1,282	1,308	1,334	1,360	
Depreciation																																-
System Assets	sys	444	468	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	507	15,097
Plant & Equipment	pla	-	-	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	84
Interest Expenses	int	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Expenses	oth	1	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	44
	174,223	3,109	3,900	4,285	4,865	4,694	4,827	4,567	4,674	4,805	4,949	5,081	5,226	5,368	5,522	5,674	5,817	5,961	6,103	6,258	6,410	6,553	6,695	6,837	6,994	7,146	7,289	7,430	7,572	7,730	7,882	

Appendix L

Service Level Agreement

WATER SUPPLY AGREEMENT

Between

ROUS WATER
RICHMOND VALLEY COUNCIL
LISMORE CITY COUNCIL
BYRON SHIRE COUNCIL
AND
BALLINA SHIRE COUNCIL

March 2008

Contents

1 Administration

1.1 Parties

This is an agreement between:

Rous County Council, also known as Rous Water ("Rous")

And

Richmond Valley Council ("Richmond Valley")

And

Lismore City Council also known as Lismore Water ("Lismore")

And

Byron Shire Council ("Byron")

And

Ballina Shire Council ("Ballina").

Richmond Valley, Lismore, Byron, and Ballina are referred to collectively as "The Retailers" in the Agreement.

1.2 Date

This agreement commences on 1 July 2008.

1.3 Term of Agreement

This Agreement has no fixed term and will continue until terminated.

Termination by any party requires a 12 month written notice. If any party, other than Rous, terminates the Agreement, the Agreement will remain in force between the remaining parties.

The terms of this Agreement will be reviewed annually by a forum comprising all parties. The review is the responsibility of Rous. The annual review will include the financial review of Rous operations.

1.4 Structure of the Agreement

This document is a five party agreement comprising the common terms of agreement between all the parties. Specific items relevant to each party are listed in the five Annexures. The parties are responsible to keep the Annexures current. Changes to the Annexure do not require a formal agreement from all parties.

1.5 Management

This agreement will be managed by representatives from each party, as defined in Clause 1 of each Annexure.

2 Background

Rous supplies bulk water to the Richmond Valley, Lismore, Byron and Ballina.

The purpose of this Agreement is to define roles and responsibilities for the management of water supply within the area of operations of the parties.

This is a co-operative Agreement that is intended to formalise the levels of service and the working relationships between the parties. This Agreement is not intended to be used for legal action by any party against another.

3 Protocol

3.1 Communication

The communication lines are listed in Clause 1 of each Annexure.

3.2 Information Collection

3.2.1 Measurement of Bulk Supply

Rous will measure the supply to each of the parties using flow meters at all the points of supply. Daily records will be maintained by Rous and will be available to the Retailers.

If requested by any party, a joint reading of the meters by Rous and that party will be carried out on a periodical basis (e.g. monthly) or as a one-off.

3.2.2 Measurement of Usage

The parties will collect and maintain records of water usage by customers. Annual reports describing relevant data will be prepared by each party and made available to the other parties. The data will include residential, commercial, industrial, and agricultural demand, analysis of residential usage and usage by the top 10 customers.

3.2.3 Water Losses

The parties will maintain registers of main breaks and leakages, including estimates of water losses. On an annual basis the parties will quantify unaccounted water losses. Unaccounted water losses shall not exceed:

- For the Retailers: the target calculated using the method published by the NSW Water Directorate.
- For Rous: a target to be advised by Rous by the first annual review of this Agreement

3.3 Complaints

All parties will maintain records of complaints and failures relating to the water supply by customers and other stakeholders.

Water quality complaints and failures will be recorded in the format shown in Appendix A. The Retailers will forward a copy of the water quality complaints register to Rous on a monthly basis. Rous Water will compile a report of the complaints, and provide a copy of the report to the Retailers in the format shown in Appendix A.

3.4 Information Sharing

Information relevant to the management and performance of the water supply of all parties will be made available to the other parties. Specific reports are listed in Clause 5.4, but other information may be relevant from time to time.

Where possible, data will be posted on the Internet with access given to the other parties. When this is not practical, the party collecting the data will forward copies regularly to the other parties.

3.5 Education

Rous will coordinate communication with the community about wise water use.

The other parties will cooperate with Rous in order to achieve a uniform approach to education across the region.

From time to time Rous will work with individual Retailers to deliver education programs in their respective areas of operation.

Rous and the Retailers will participate in a Regional Steering Committee which shall meet approximately every 3 months to discuss water management issues.

3.6 Operations

3.6.1 Communication Lines

Operational communication lines will be, primarily, between officers listed in Clause 1 of the Annexures.

Each party will be responsible for setting up a group email address within their respective Council. All emails are to be directed through the group email address of each party. It will be the responsibility of each party to keep their respective group email address up to date.

3.6.2 Notification of Departure from Targets and Incidents

Water supplied by Rous, to the other parties, will be in accordance with the Regional Water Management Strategy and the Rous Water Quality Management Plan.

Rous will notify the Retailers of any departure from the target water quality or quantity as soon as possible and within the following targets:

- Planned: minimum 7 days.
- Unplanned: maximum 1 hour after the incidence is observed by Rous.

The Retailers will notify Rous of incidents relating to the bulk water supply as soon as the incidence is observed by, or reported to, them.

Notification will be in person or by phone. The notifying party will ensure that the notification is received by an appropriate person. Notifications will be repeated by email or letter; with a record kept by both parties of the time and nature of the notification, and the personnel involved.

3.7 Tariff and Payment

A tariff will be developed by Rous annually, based on retrospective consumption and budgeted expenditure. The timetable for implementation of the tariff will be as follows:

- 30 March: Rous prepares draft tariff and forwards to the Retailers for review.
- 15 April: The other parties provide comments to Rous.
- 30 April: Rous finalises the tariff and forward to the Retailers.
- May: All parties prepare and exhibit draft management plans.

- June: If required, tariff is updated.
- 1 July: new tariff in force.

Rous Water will convene a meeting between the Finance Managers of the parties to determine a new tariff structure based on forecast consumption and budgeted expenditure. It is the intention that Finance Managers will meet annually to review the tariff structure.

Rous will issue monthly invoices to the Retailers who will pay Rous within twenty-one (21) days after receipt of the invoice.

4 Quantity and Security

4.1 Levels of Service

Rous will supply, and plan to supply, water to meet the requirements of the Retailers, based on projections established in accordance with Clauses 4.4 and 4.5.

The levels of service to be provided by Rous are:

- Drought security: maintain the 5/10/20 rule. This rule limits the restrictions to no more than 5% of the time, and no more frequent than once in 10 years. In addition, Rous will be able to supply 80% of the unrestricted demand in case of a repeat of the worst drought on record.
- Average annual demand: 200 kL/property
- Peak day demand: 2.5 kL/property

4.2 Demand Management

Water demand will be managed in accordance with demand management plans, prepared by each party, in compliance with the latest issue of the Department of Water and Energy (DWE) Best Practice Management guidelines.

Rous is responsible for preparing and implementing a Regional Water Management Strategy. The Retailers are responsible for preparing a local demand management plan containing strategies and actions specific to their operations. The local plans will be sub-plans to the regional plan.

In each year, the maximum volume of water supplied to each Retailer, for domestic use, will not exceed an average of 200kL/property (in accordance with the National Water Initiative National Performance Framework Handbook indicator W9). Where a Retailer experiences a higher domestic consumption than an average of 200 kL/property, and a fine is imposed on Rous Water by Department of Water and Energy, it shall be paid by the Retailer.

The parties will co-operate in the preparation of the demand management plans.

Rous and the Retailers will continually support each other in all appropriate water efficiency initiatives, through staff time and/or cash contribution.

The parties will always consider water efficiency issues when designing and preparing future projects and replacing items of plant and infrastructure.

4.3 Drought Management

4.3.1 Drought Management Plans

Rous is responsible for preparing and implementing the Regional Water Management Strategy approved by the Department of Environment and Climate Change. The strategy will be prepared in consultation with, and using input from, the Retailers.

The strategy will include a drought management plan complying with the latest issue of the Department of Water and Energy Best Practice Management Guidelines.

The Retailers are responsible for preparing local drought management plans containing strategies and actions specific to them. The local plans will be sub-plans to the regional plan.

The parties will co-operate in the preparation of the drought management plans.

The levels of restrictions and water conservation measures will be consistent between the regional and the local drought management plans.

4.3.2 Restrictions

Restrictions on the demand may be imposed if the supply of water is reduced due to a breakdown, drought or other reason.

The restrictions will be applied in accordance with the Regional Water Management Strategy and the Local Draft Management Plans.

Unless caused by a local breakdown, the same restrictions should be applied across all the Rous and Retailers service area.

4.4 Planning

The Retailers will advise Rous of relevant changes in their Environmental Planning Strategies.

Rous will arrange to vary the allocation of water in accordance with the Retailers demands as per the Retailers Settlement Strategies, growth predictions, and Strategic Plans.

Rous and the Retailers will carry out joint population projections and demand studies every 5 years. The first study will be carried out in the 2008/2009 financial year. The management committee, defined in Clause 1 of each Annexure, is responsible for preparing the study.

4.5 Reliability

Rous is required to provide and maintain facilities, and deliver water, to enable the Retailers to provide continuous water supply to their customers.

4.6 Sources

Rous will continue to use its existing water sources. In addition, Rous will continue to investigate integration of additional sources, to supplement and/or replace the existing sources. Additional sources will include, but not be limited to, the following:

- Sewage effluent
- Stormwater
- Surface water
- Groundwater
- Desalinated water

- Existing water sources owned by other utilities including Tweed Shire Council and the Retailers.

The investigation of other water sources shall be in accordance with the Far North Coast Regional Strategy and may involve supply of water, by Rous, to other water utilities. Sources will be assessed using triple bottom line (financial, environmental and social) criteria.

The development of the water sources will be coordinated between the parties and other water utilities, and State government agencies.

5 Accountability

This Clause lists the obligations of all parties.

5.1 Primary Obligations

Rous will:

- Supply to the Retailers at the supply points sufficient quantities to meet peak daily demands, subject to restrictions which may apply from time to time.
- Supply water to the Retailers of quality that meets the Rous Water Quality Management Plan and the Australian Drinking Water Guidelines (ADWG).
- Supply water which will maintain reasonable disinfection residuals.

The Retailers will:

- Manage their infrastructure to best preserve disinfection residuals downstream of the supply points.
- Pay invoices presented by Rous, for water and services provided by Rous.
- Before the end of March of each year, provide Rous with an estimate of its anticipated usage for the following financial year.

The provision of residual disinfection in the reticulation system is a joint responsibility of Rous and the Retailers.

5.2 Testing and Metering

Sampling and testing will be carried by out Rous at the locations and frequencies listed in the Rous Water Quality Management Plan.

The testing protocol is as follows:

Water quality:

- Samples will be taken and tested, at an NATA accredited laboratory, at the expense and discretion of Rous.
- Test results will be made available to all parties.
- The Retailers may audit the results.

Water quantity:

- Rous is responsible for installing, maintaining, reading and calibrating meters at the supply points to the Retailers.
- The readings and calibration records will be available to the Retailers.

- The Retailers may audit the results.

5.3 Responsibility for Infrastructure

The points of supply listed in the Annexures are the limits of responsibility for the infrastructure between the parties.

For reservoirs owned by the Retailers: the limit of responsibility is the downstream end of the Rous meter, on the inlet pipe of the reservoir.

For reservoirs owned by Rous: the limit of responsibility is at the outlet of the reservoir, or at the downstream end of the Rous meter, if the meter is installed downstream of the reservoir.

5.4 Reporting

The parties will provide the reports listed in this Clause, as well as other reports and documents that are considered relevant. The timing of the reports will be as follows:

- Monthly reports: Each report will cover a calendar month and will be provided by the 15th of the following month.
- Annual reports: Each report will cover a financial year, or as otherwise agreed, and will be provided within one calendar month from the end of the reporting period.
- Other reports: The reports will be provided within two weeks of their finalisation.

Reports by Rous:

- Water quantities supplied to the Retailers: Monthly reports and annual summaries.
- Water quality testing results: Monthly.
- Best-Practice Management (BPM) compliance audit report: Annual.
- Strategic business plan, IWCM strategy and Regional Water Management Plan: When completed and when updated.
- Complaints summary: Monthly (refer to Clause 3.3).
- Meeting the targets specified in the Clause 2 of the Annexure: Annual progress reports.
- Reliability performance: Annual (as per Clause 4.5).

Retailers:

- Best Practice Management (BPM) compliance audit report: Annual.
- Strategic business plan for water supply and IWCM strategy : When completed and when updated.
- Meeting the targets specified in Clause 2 of the Annexure: Annual progress reports.
- Complaints: Monthly (refer to Clause 3.3).
- Environmental planning instruments, land use strategies and population forecasts: When updated.

In addition, each party will provide other relevant documents requested by the other party.

6 Compliance

The parties will need to comply with legislative and other requirements to demonstrate that they operate efficiently and effectively.

These requirements include:

- Water quality: Water supplied by Rous should meet the latest standard of ADWG.
- Best practice management: the parties need to comply with the requirements, as defined in the latest issue of the Best Practice Management Guidelines issued by the Department of Water and Energy (DWE). The exception is the Rous tariff where the DWE pricing guidelines are not relevant.
- Environmental protection: the parties' water supply operations need to comply with environment protection licences, and other environmental requirements.
- Water extraction: Rous needs to comply with the requirements of its water access licences.
- Efficiency: the parties will work diligently to meet the targets listed in the Annexure.

Over time additional requirements may be introduced which affect the operations of the parties. All parties will aim to comply with all statutory and legal requirements.

7 Dispute Resolution

Disputes should be handled at the lowest possible level.

If unresolved, they will be escalated to the next level. The levels are listed in clauses 3 of each Annexure. Disputes between Rous and one Retailer should be resolved, if possible, between these two parties only.

8 Signatures

Signed on behalf of Rous Water County Council

Name ____________________

Title General Manager

Signature ____________________

Date ____________________

Signed on behalf of Richmond Valley Council

Name ____________________

Title General Manager

Signature ____________________

Date ____________________

Signed on behalf of Lismore City Council

Name ____________________

Title General Manager

Signature ____________________

Date ____________________

Signed on behalf of Byron Shire Council

Name ____________________

Title General Manager

Signature ____________________

Date ____________________

Signed on behalf of Ballina Shire Council

Name ____________________

Title General Manager

Signature ____________________

Date ____________________

Appendix A - Complaints Register Format

Water Quality Complaints and Failures Register

Date	Time	Location	Description	Action Taken to Rectify

Appendix B - Future Issues for Consideration

Following is a list of future issues that are to be considered by all the parties:

- Catchment Management and Emergency response.
- Key Performance Indicators (KPI's).
- Disinfection study by Rous (Chloramination versus Chlorination).
- Rationalisation of Water sampling and testing between the parties.

It is the intention that these issues are to be reviewed annually.

Notes on Catchment Management and Emergency Response

*** Response to Incidents in the Water Catchment Areas**

Rous has a program in place to undertake formal water quality risk assessment for all of its water catchment areas. These risk assessments then form the basis for the development of a formal catchment risk management plan, which typically identifies a range of actions and initiatives to manage the risk of contamination from the respective sources. However, these existing and proposed risk management measures have an emphasis on the prevention and management of the risk of contamination of the water supply, rather than actual emergency management provisions.

An issue for further consideration through the review process is the potential to develop joint incident response protocols for water quality contamination incidents, in each party's respective water catchment area. This would outline all emergency management steps including the incident notification, response protocols, incident response/management techniques, and all associated communications and monitoring activities.

This is also relevant for incidents occurring at other stages in the water cycle (dams, treatment process, and/or distribution system).

*** Strategic Planning for Water Supply Sources: Land Use and Planning Controls**

The Australian Drinking Water Guidelines (ADWG) state that, the most effective means of assuring drinking water quality and the protection of public health, is through the adoption of a preventive management approach that encompasses all steps in water production, from catchment to consumer. The catchment area forms the first barrier for the protection of the water supply (or, in the case of a groundwater source, the recharge area forms the first barrier for the protection of the water supply). Effective local planning laws are the most critical aspect of catchment management; if inappropriate development was permitted this could negate all the effort and resources invested in on-ground works. As a result, whilst treatment and monitoring are critical, effective local planning laws are required to control potentially hazardous water quality risks that may arise from a range of land uses.

An issue for further consideration through the review process is to consider the planning processes that are in place for each party, to ensure any development that does occur within the designated water catchments (or recharge areas) receives rigorous scrutiny regarding potential adverse impacts on water quality and catchment health.

Annexure A - Rous Water

A1. Communication Lines - Rous

Forum/Role	Rous	Meeting Frequency
Operators Committee: Day-to-day operations	Asset Managers Anthony Acret Belinda Fayle Terry Gobbe	6 Monthly Initiated by Rous
Planning / Management Committee: Manage this agreement	Operational Services Manager Wayne Franklin 6621 8055 wayne.franklin@rouswater.nsw.gov.au	Annually
Senior Executive Committee: Major changes	General Manager Paul Muldoon 6621 8055 paul.muldoon@ rouswater.nsw.gov.au	As required

A2. Performance Target - Rous

Service	KPI	Target
Water Quality	Water quality parameters	Parameters meet Rous Water Water Quality Management Plan
	Able to convey peak day demand	No water restrictions due to pipeline capacity
Quantity	Able to process peak day demand without restrictions	No restrictions imposed due to treatment constraints
Dirty Water Complaints	Number per year	< 30
Taste and Odour Complaints	Number per year	< 30
Construction Activities	Impact on environment	No adverse impact on environment

Interruption to Supply	Notice for planned interruption to retail supply	48 hours
	Notice for planned interruption to bulk supply	7 days
	Maximum duration of interruption to supply – retail and bulk	24 hours (planned) 8 hours (unplanned)
Mains Break	Number/km of main/year	1/20km/year

A3. Dispute Resolution - Rous

Level 1	Operations Services Manager
Level 2	Operations Services Manager
Level 3	General Manager

A4. Points of Supply - Rous

Not Applicable.

A5. Work Procedure – Rous

Not Applicable.

Annexure B - Richmond Valley Council

B1. Communication Lines - Richmond Valley

Forum/Role	Richmond Valley	Meeting Frequency
Operators Committee: Day-to-day operations	Services Engineer Dave Holstein 6660 0224 david.holstein@richmondvalley.nsw.gov.au	6 Monthly
Planning / Management committee: Manage this agreement	Manager Strategic Planning Ray Medhurst 6660 0233 ray.medhurst@richmondvalley.nsw.gov.au	Annually
Senior Executive Committee: Major changes	Director Works Gary Murphy 6660 0262 gary.murphy@ richmondvalley.nsw.gov.au	As required

B2. Performance Targets - Richmond Valley

Parameter	Unit	Current	Target	Time
Unaccounted for Water	ILI	Not known	TBA	TBA
Main breaks	Per 100 km	13	10	June 2010
Average annual residential consumption	kL/property	207	200	June 2012
Peak day demand	kL/property	Not known	2.5	TBA
Residential revenue from usage charges	%	37	In accordance with BPM requirements	June 2009

B3. Dispute Resolution - Richmond Valley

Level 1	Manager Strategic Planning
Level 2	Director Works
Level 3	General Manager

B4. Points of Supply - Richmond Valley
Supply will be at the following reservoirs:

- Coraki
- Broadwater
- Evans Head
- Rileys Hill
- Woodburn.

B5. Work Procedure - Richmond Valley

WORK PROCEDURE

WOODBURN CHLORAMINATION PLANT OPERATION

Purpose:

This document outlines procedure for the operation of Woodburn chloramination booster plant, with the aim of maintaining reasonable chloramine residuals throughout the Richmond Valley Council water reticulation at Woodburn, Broadwater, Riley's Hill, and Evans Head. It also outlines the communication protocol between Rous Water (Rous) and Richmond Valley Council (RVC) regarding information and notification of plant operation and system performance.

Scope:

This document applies to the Rous Supervisors, Operators, and RVC contacts nominated in the document.

Procedure:

- The Rous duty Operator shall measure the chloramine residual every Monday, Wednesday and Friday morning, at the following locations:

    1. 375 main at bore site prior to the booster dose point
    2. Inlet of Langs Hill Reservoir
    3. Outlet of Langs Hill Reservoir
    4. Inlet of South Evans Head Reservoir
    5. Outlet of South Evans Head Reservoir.

- Under normal operation, the Operator shall attempt to maintain a desirable chloramine target of 1.5-2.0 mg/l at the reservoir outlets, with a maximum outlet residual of 2.5mg/l.
- The Operator shall report the chloramine levels weekly, to the Rous Supervisor, by noon each Monday (see nominated Supervisor below), UNLESS the result is 1.3mg/L or less, in which case the Operator shall notify the Supervisor by noon that same day.

- The Supervisor shall notify the RVC contact of chloramine levels as received via email by 4pm on the next business day.
- If chloramine levels taken prior to the booster dose point fall below 1.8mg/L, then the Supervisor shall instruct that the booster plant be put into service. If levels rise above 2.3 mg/L and hold, then plant may be turned off.
- If chloramine levels are less than 0.8mg/L at the outlet of either reservoir, and there is no indication of the presence of nitrifying bacteria, then the Supervisor shall instruct the Operator to lock the reservoir out and drop the level to 25% of capacity, then refill with fresh chloraminated water. Rous owned mains shall be flushed by Rous staff where appropriate. The RVC mains reticulation may also be flushed by RVC staff where appropriate and after discussions between Rous Supervisor and RVC Operations Engineer. Additional residual testing shall be undertaken and if residuals do not improve within two (2) days, the procedure listed in the point below shall be followed.
- If chloramine levels are less than 0.8mg/L at the outlet of either reservoir and there is indication that nitrifying bacteria may be present, the Supervisor shall instruct the Operator to lock the reservoir out and drop the level to 25% of capacity then refill with free chlorine from the booster plant at Woodburn bore site at a dose rate of 5.5mg/l (i.e. with ammonia turned off). Dose rate shall be calculated v/v by dilution. The reservoir shall then be locked out again until the level drops to 25% after which normal chloramination operation may resume.
- If required, the Rous Supervisor shall liaise with RVC contact to organise operational assistance.
- The Supervisor shall notify the RVC contact of any impending action, change of supply or plant operation status using the *Operational Alerts* email notification address.
- The results of the chloramine residual for the RVC reticulation system will be emailed weekly to the Rous Supervisor directly by Richmond Water Laboratory. Rous should use this information to initiate further action, in consultation with RVC contacts to ensure system capabilities are met.

NOMINATED DUTY STAFF

Rous Water Operator

1st contact:
Rodney Hoskins - 0427 788 082
2nd contact:
Gene Hawthorne - 0429 393 009
AFTER HOURS: 6626 6955 - Ask for on-call Operator for mains breaks and water supply complaints.

Rous Water Supervisor

1st contact:
Belinda Fayle Dams & Treatment Operations Manager - 6621 8055 - 0427 938 506 - belinda.fayle@rouswater.nsw.gov.au

2nd contact:
Terry Gobbe Distribution System Assets Manager - 6621 8055 - 0429 155 799 - terry.gobbe@rouswater.nsw.gov.au

3rd contact:
Wayne Franklin Operational Services Manager - 6621 8055 - 0427 261 823 - wayne.franklin@rouswater.nsw.gov.au

Richmond Valley Council Contacts:

1st contact:
David Holstein Operations Engineer Water and Sewer - 6660 0224 - 0428 283 843 - david.holstein@richmondvalley.nsw.gov.au
2nd contact:
Kevin Lowe Overseer Water and Sewer - 6682 5564 - 0428 664 185
3rd contact:
Carla Dzendolet Environmental Technician - 6660 0282 - 0407 480 853 - carla.dzendolet@richmondvalley.nsw.gov.au

Revision 1

Issued to:

R. Hoskins
G. Hawthorne
B. Fayle
T. Gobbe
W. Franklin
D. Holstein
K. Lowe
C. Dzendolet
G. Murphy

September 2007

Annexure C – Lismore City Council

C1. Communication Lines - Lismore

Forum/Role	Lismore	Meeting Frequency
Operators Committee: Day-to-day operations	Operations Engineer Paul Ellem 6625 0500 - 0427 947 820 Paul.ellem@lismore.nsw.gov.au	6 Monthly
Planning / Management committee: Manage this agreement	Operations Engineer Paul Ellem 6625 0500 - 0427 947 820 Paul.ellem@lismore.nsw.gov.au	Annually
Senior Executive Committee: Major changes	Director Infrastructure Services Gary Hemsworth 6625 0500 Garry.hemsworth@lismore.nsw.gov.au	As required

C2. Performance Targets - Lismore

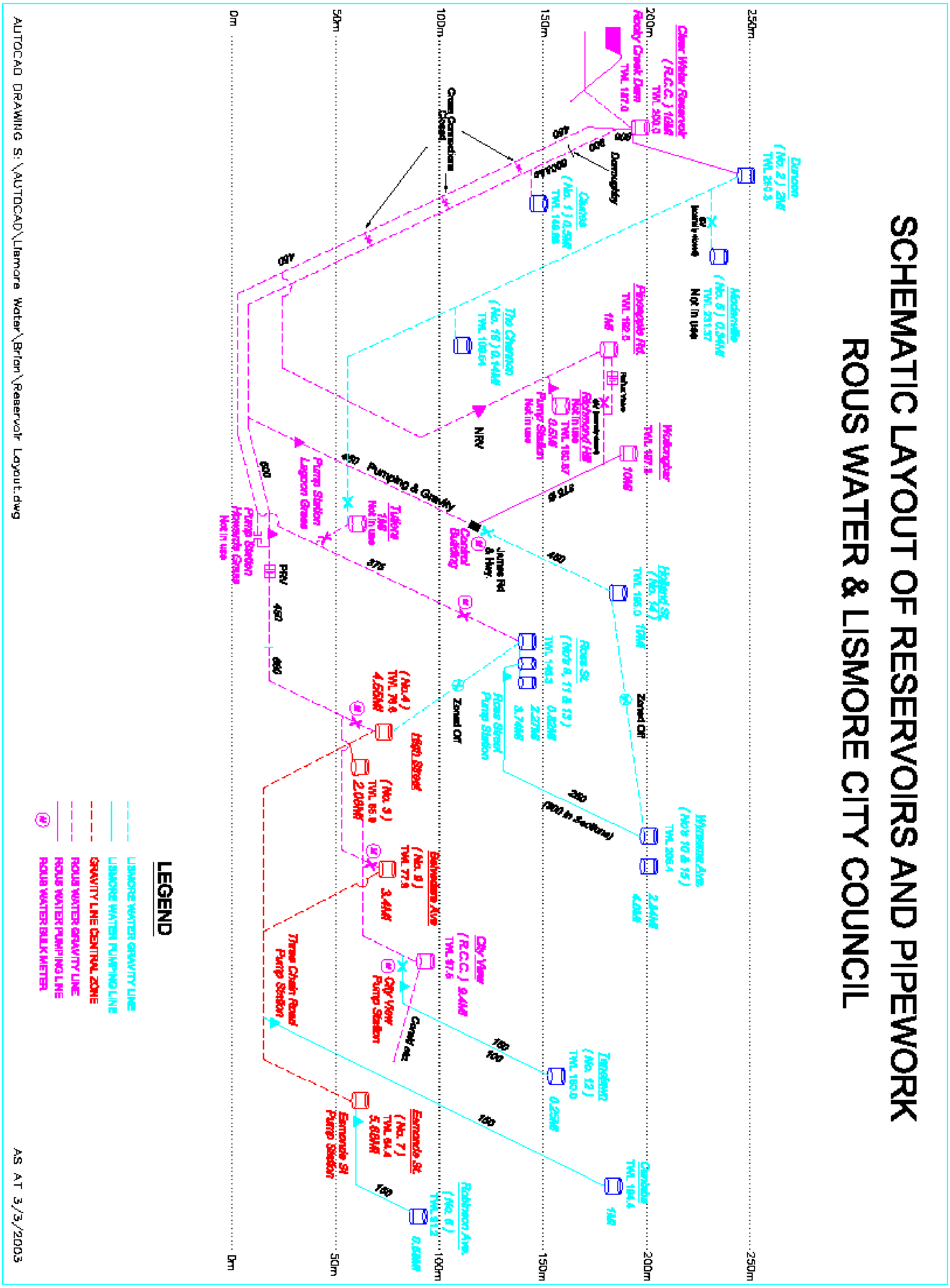
Parameter	Unit	Current	Target	Time
Unaccounted for Water	ILI	Not known	TBA	
Main breaks	Per 100 Km	9	TBA	
Average annual residential consumption	KL/property	196	TBA	
Peak day demand	KL/property		TBA	
Residential revenue from usage charges	%	70	In accordance with BPM requirements	

C3. Dispute Resolution - Lismore

Level 1	Operations Engineer
Level 2	Executive Director Infrastructure Services
Level 3	General Manager

C4. Points of Supply - Lismore

Supply will be at the following reservoirs.



C5. Work Procedure - Lismore

Not Applicable.

Annexure D – Byron Shire Council

D1. Communication Lines - Byron Shire Council

Forum/Role	Byron Shire Council	Meeting Frequency
Operators Committee: Day-to-day operations	Technical Services Engineer Dean Baulch 6685 9300 Dean.Baulch@byron.nsw.gov.au	6 Monthly
Planning / Management committee: Manage this agreement	Manager Operations Water Peter Rees 6685 9300 Peter.Rees@byron.nsw.gov.au	Annually
Senior Executive Committee: Major changes	Director Water & Recycling Management Services Phil Warner 6626 7000 Phil.Warner@ byron.nsw.gov.au	As required

D2. Performance Targets - Byron Shire Council

Parameter	Unit	Current	Target	Time
Unaccounted for Water	ILI	10	8%	June 2010
Main breaks	Per 100 km	8.6	8	June 2010
Average annual residential consumption	kL/property	200	180	June 2012
Peak day demand	kL/property	N/A	2.5	June 2012
Residential revenue from usage charges	%		In accordance with BPM requirements	

D3. Dispute Resolution - Byron Shire Council

Level 1	Manager Operations Water
Level 2	Director Water & Recycling Management Services
Level 3	General Manager

D4. Points of Supply - Byron Shire Council

Supply will be at the following reservoirs:

- Bangalow
- Coopers Shoot
- Paterson Street
- Wategos
- Brunswick Saddle Road (2)
- Warrambool
- Yamble

D5. Sampling and Testing - Byron Shire Council

Sampling and testing program.

Byron Shire Council has the following nominated water quality test locations.

Area	Location
Bangalow	Byron Street
Billinudgel	Wilfred Street
Broken Head	Beach Road
Byron Bay	Bay Street
New Brighton	Byron Street
Ocean Shores	Jarrah Road
South Golden Beach	Rangal Road
Suffolk Park	Broken Head Road
Wategos Beach	Marine Parade

Test Parameters and Frequency.

Parameter	Frequency
pH	Weekly
Alkalinity	Weekly
Faecal Coliforms	Weekly
Total Coliforms	Weekly
HPC-20	Weekly
HPC-35	Weekly
Turbidity	As Requested
True Colour	As Requested
Total Hardness as $CaCO_3$	Weekly
Acid Soluble Aluminium	As Requested
Total Aluminium	As Requested
Total Chlorine	Weekly
Total Dissolved Solids	As Requested
Ammonia-N	
Antimony	
Arsenic	
Barium	
Boron	
Cadmium	
Chromium	
Copper	
Cyanide	
Fluoride	
Iodine	
Iron	
Lead	
Manganese	
Mercury	

Parameter	Frequency
Molybdenum	
Nickel	
NH3-N	
NO3-N	
NO2-N	
TKN	
TN	
Organic - N	
Total Phosphorus	
Selenium	
Silver	
Sodium	
Sulphate	
Zinc	

D6. Work Procedure - Byron Shire Council

Not Applicable.

Annexure E - Ballina Shire Council

E1. Communication Lines - Ballina Shire Council

Forum/Role	**Ballina**	**Meeting Frequency**
Operators Committee: Day-to-day operations	Water & Sewer Operations Engineer Don Chesworth 6686 1259 donc@ballina.nsw.gov.au	6 Monthly
Planning / Management committee: Manage this agreement	Manager Water/Sewer & Waste Matthew Fanning 6686 1226 matthewf@ballina.nsw.gov.au	Annually
Senior Executive Committee: Major changes	Group Manager Civil Services John Truman 6686 1256 johnt@ballina.nsw.gov.au	As required

E2. Performance Targets - Ballina Shire Council

Parameter	Unit	Current	Target	Time
Unaccounted for Water	ILI	2.43	Under investigation	
Main breaks	Per 30 Km	1 per 32km	1	2007/2008
Average annual residential consumption	KL/property	258	<250 kL	2007/2008
Peak day demand	KL/property	N/A	1.8	
Residential revenue from usage charges	%	65	In accordance with BPM requirements	2007/2008

E3. Dispute Resolution - Ballina Shire Council

Level 1	Manager Water/Sewer & Waste
Level 2	Group Manager Civil Services
Level 3	General Manager

E4. Points of Supply - Ballina Shire Council
Supply will be at the following reservoirs:

- Wollongbar Reservoir - refer E4.2.1
- Ross Lane Bulk Supply Metres - refer E4.2.2
- Bicentennial Gardens - Water Wheels - refer E4.2.2

Network Diagrams - Ballina Shire Council

E4.2.1 Alstonville Water Supply System

Error! Objects cannot be created from editing field codes.

E4.2.2 Ballina/Lennox Head Water Supply System

Error! Objects cannot be created from editing field codes.

E4.2.3 Wardell Water Supply System - Council Operated

Error! Objects cannot be created from editing field codes.

E5. Work Procedure - Ballina Shire Council

Not Applicable.