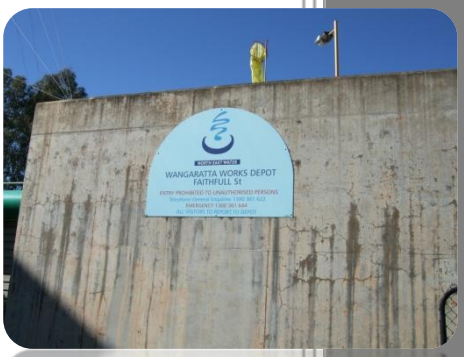
2012

Water Supply – Demand Strategy



Wangaratta System Plan

North East Water

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Glossary

Term	Description
$M	Million dollars – 1,000,000 dollars.
Average Annual Demand	The water demand for a system varies depending on the climatic conditions for any given year. The average annual demand is the amount of water used in a year under average conditions. The required demand can vary by as much as ±20%.
Bounce back	The possibility that residential usage may demonstrate a "bounce back" in demand if wetter conditions persist and some users revert to their water use behaviour from prior to the 2006/07.
Bulk Entitlement (BE)	The right to water held by water and other authorities defined in the Water Act 1989. The BE defines the amount of water that an authority is entitled to from a river or storage, and may include the rate at which it may be taken and other conditions.
CIV	Commercial, Industrial and Vacant land customers.
Clear Water Storage	Storage that is used to store potable water.
DSE	Department of Sustainability and Environment
ESC	Essential Services Commission.
EWR	Environmental Water Reserve – water set aside to meet environmental water requirements defined in the Water Act 1989.
General reclaimed water	Reclaimed water fit for substitution of potable water, where appropriate, in low risk environments, such as pasture irrigation and sub-surface irrigation in public open spaces.
ML	Megalitre (1 million litres).
Non Revenue Water (NRW)	Non revenue water is defined as the difference between the amount of water diverted from the source and the amount of water delivered to our customers.
Potable	Suitable for drinking.
Premium reclaimed water	Reclaimed water fit for the substitution of potable water, where appropriate, in high risk environments such as unrestricted non-potable uses in residential and public open space areas.
Qualification of Rights	The Minister for Water may grant a temporary qualification of rights to water in extreme circumstances to ensure critical water needs are met. For example, granting North East Water access to water on the Murray System when no allocation is available.
Regulated supply	A surface water source that has an on-stream storage of sufficient size to regulate the flow of water to downstream customers and even out variation in catchment runoff from year to year. The most notable example locally is the Murray River that has Lake Hume and Dartmouth Dam.
Return flow credits	Reclaimed water discharged to stream that can be used to credit extraction downstream, or potentially traded to another raw water customer.
Unregulated supply	A surface water source without an on-stream storage of sufficient size to regulate the flow of water to downstream customers. Supply in these systems is dependent on seasonal catchment runoff. Water availability is typically lowest in summer when demand is highest.
Unrestricted demand	Average annual demand for water without any restrictions.
Water Plan	North East Water's five year plan (approved by the Essential Services Commission) containing its approved pricing for services and capital works program.
WSDS	Water Supply Demand Strategy.
WTP	Water treatment plant.

1 Introduction

North East Water provides water and wastewater services to an estimated population of 115,000 people across 39 communities in north east Victoria. North East Water is responsible for 21 water delivery systems across its area of operation, which is shown in Figure 1.

North East Water recently revised its Water Supply Demand Strategy (WSDS), which was previously prepared in 2007 and is required to be revised every five years under its Statement of Obligations. The WSDS aims to identify the best mix of measures to maintain a balance between the demand for water and available supply in urban supply systems now and into the future.

The revision of the WSDS will enable effective and efficient planning for future water requirements. The WSDS considers the actions needed to meet increased demand for water arising from population and industry growth, together with the possible effects of climate change and other environmental factors.

As part of the WSDS, a plan has been developed for the Wodonga water supply system to guide the future planning and management for the next 50 years. The system plan provides an assessment of the water delivery system's capacity to meet increased water demand and outlines options considered to ensure demand can be met until at least 2025.

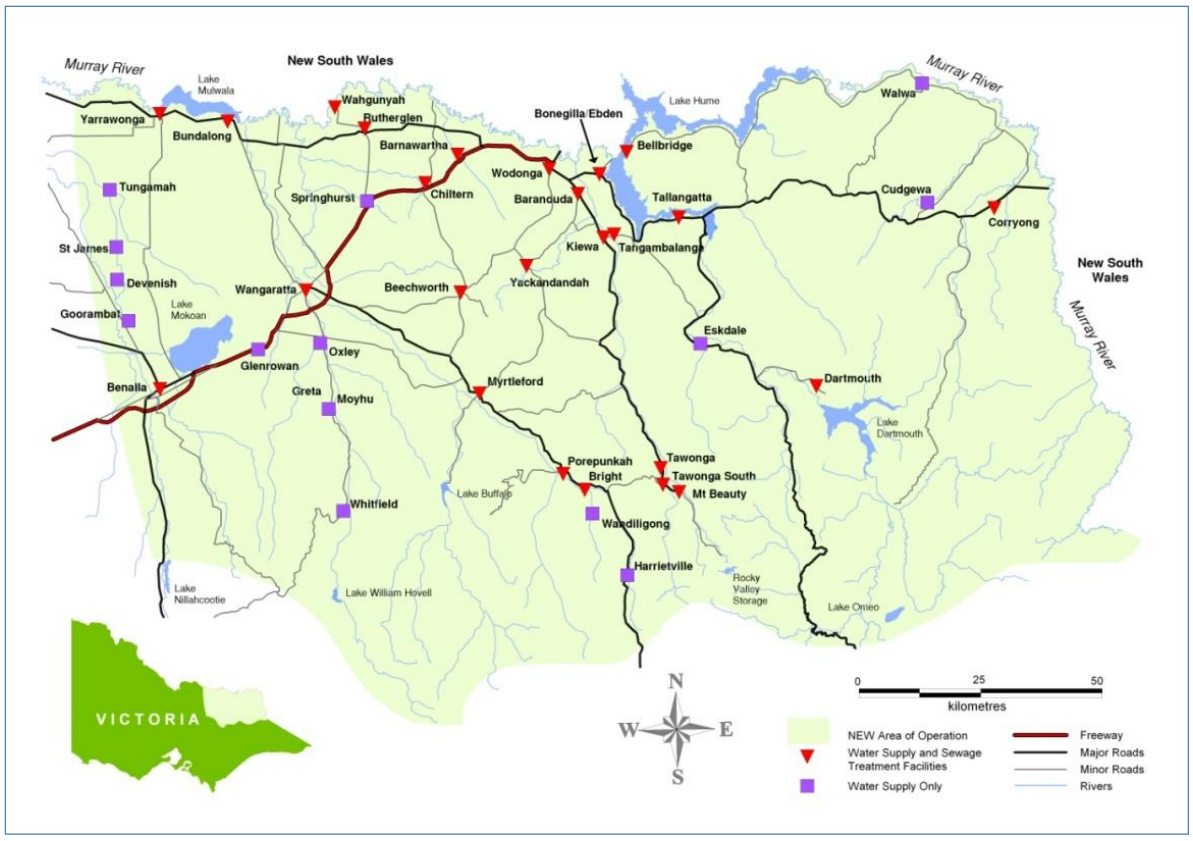


Figure 1: North East Water's area of Operation

2 Water System

2.1 Overview

Wangaratta is a rural city located at the confluence of the Ovens and King Rivers approximately 60 km south west of Wodonga. The water supply services 9,013 connections (June 2011) with a population of 18,379. The Wangaratta water system also supplies the town of Glenrowan via a pipeline. Wangaratta is a large residential centre supported by a number of large industries. Wangaratta has schools, hospitals and general businesses. Major industries include a textiles manufacturer, particle board manufacturer and a meat processing facility.

2.2 Sources of Water

2.2.1 Active Sources

The Wangaratta water supply is sourced from the Ovens River, immediately downstream of the King River confluence. Lake Buffalo (23,900 ML) provides a significant portion of flow in the Ovens River, whilst Lake William Hovell (13,710 ML) provides the majority of flow in the King River. The catchment includes all of the King Valley and the Ovens Valley and is extremely large with a variety of land uses including farming and urban development. There is a significant amount of agriculture including livestock grazing, vineyards and softwood timber production in both the King and Ovens valleys.

The Ovens River source has been unavailable on several occasions due to drought or floods. Three contingency bores are maintained to supplement or replace the Ovens River source when this occurs. Two bores are located at Kerr Street and one at the Faithful Street Water Treatment Plant site.

2.2.2 Water Sources not currently Used

Nine Mile Creek at Glenrowan was previously used to supply the Town of Glenrowan.

Two bores located at Kerr Street Wangaratta are used for contingency purposes. These bores are drilled to a depth of 91 m and 125 m respectively.

The Faithfull Street bore is used for contingency purposes. The bore is drilled to a depth of 121 m and located approximately 50 m from the Ovens River.

2.3 Water Entitlement

2.3.1 Active Entitlement

The Ovens System Bulk Entitlement (BEE017172) covers water extraction for the towns of Moyhu, Oxley and Wangaratta. Annual entitlement of up to 7,720 ML is available for Wangaratta with a maximum extraction rate of 79 ML/day.

As the resource manager, Goulburn-Murray Water may impose rostered restrictions on the Ovens and King Rivers if full water requirements are unavailable.

The Ovens Operating Agreement specifies roles and responsibilities for North East Water, Goulburn-Murray Water and North East Catchment Management Authority in relation to resource management. This includes passing flow requirements and operation of Lake Buffalo and Lake William Hovell.

A locality plan of the water system is shown in Figure 2 and a schematic of the water system is shown in Figure 3.

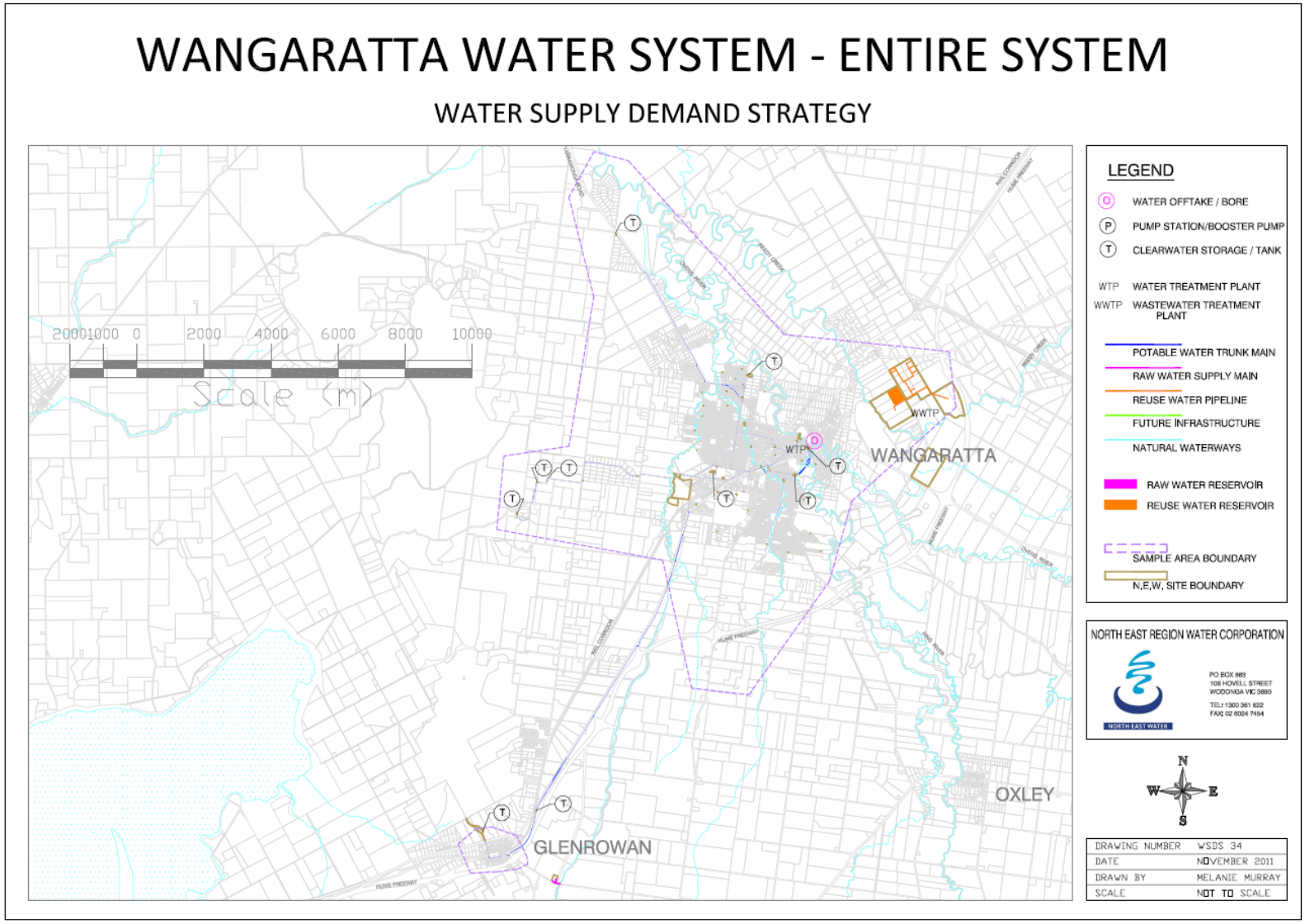


Figure 2: Locality plan of Wangaratta Water System

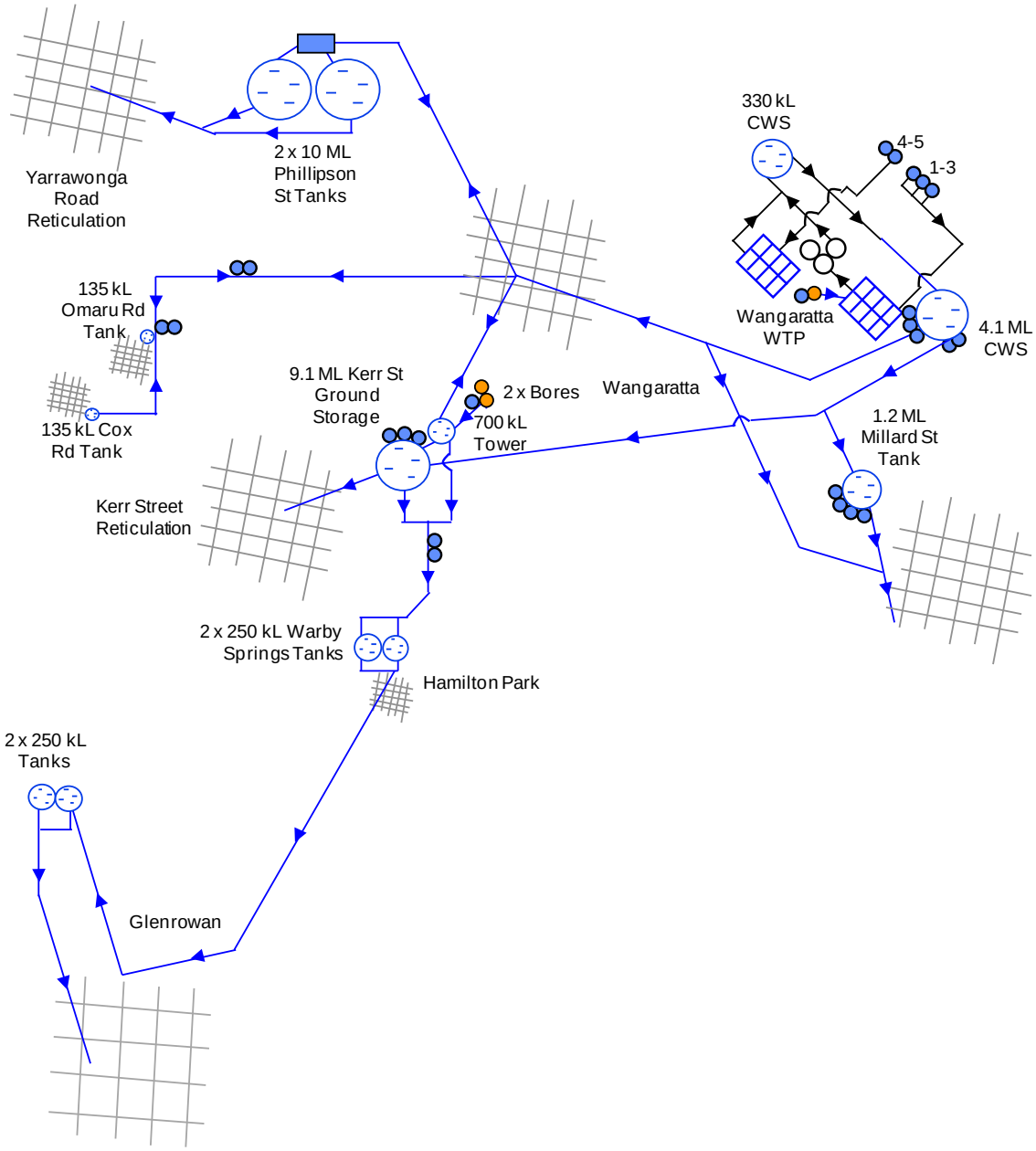


Figure 3: Schematic of Wangaratta Water System

2.3.2 Entitlement not currently Used

A groundwater licence (7079206) provides access to 415 ML annually from the two Kerr Street bores (combined) at a maximum extraction rate of 3 ML/day each. This entitlement is used intermittently for contingency purposes.

A groundwater licence (8032870) provides access to 200 ML annually from the Faithfull Street bore at a maximum extraction rate of 2.6 ML/day. Two observation bores located nearby are monitored for groundwater level as part of the licence conditions for the Faithfull Street production bore. This entitlement is yet to be uses, but is available if required.

A groundwater licence (881228) provides access to 50 ML annually from the Apex Lane bore at a maximum extraction rate of 10 ML/day. There is currently no infrastructure associated with this bore, but the entitlement can be traded to other Wangaratta bores if required.

The Glenrowan Bulk Entitlement (BEE049490) provides access to 90 ML from Nine Mile Creek annually. The Glenrowan Bulk Entitlement also has provision for up to 40 ML of carryover entitlement annually (drought reserve). The bulk entitlement is subject to passing flow requirements and has a maximum extraction rate of 0.65 ML/day.

2.4 Treatment

The Wangaratta Water Treatment Plant has two separate treatment trains:

1. Sedimentation plant that incorporates three pressure filtration vessels.
2. Direct filtration plant that utilises eight multimedia filter cells.

Each of these is fed by different raw water pumps sets directly from the Ovens River. Raw water can be treated individually by one of the two treatment trains, or the trains can operate in series if required.

Raw water is treated via pH correction, flocculation, sedimentation (if sedimentation plant is in operation), filtration, pH correction, chlorination and fluoridation. The plant has a maximum capacity of 54 ML/day. Treated water enters the 4.1 ML clear water storage.

One of the two Kerr Street Bores (Bore 2) is operational. This bore has its own package treatment plant that treats raw water via flocculation, filtration and chlorination. Treated water is pumped to the 700 kL Kerr Street tower. A maximum of 3 ML/day can be pumped as per licence conditions. Kerr Street Bore 1 currently has no treatment facility.

The Faithful Street production bore can pump raw water directly into the Wangaratta water treatment plant for regular treatment. A maximum of 2.6 ML/day can be pumped as per licence conditions. The faithful street bore has not been utilised as yet.

2.5 Distribution

2.5.1 Overview

The Wangaratta water system supplies Wangaratta and outlying areas as well as the town of Glenrowan via a pipeline.

2.5.2 Wangaratta

Treated water is pumped from the 4.1 ML clear water storage to several different zones in the Wangaratta reticulation. Storages within the system include:

- 1.2 ML Millard Street tank.
- 9.1 ML Kerr Street ground storage.
- 700 kL Kerr Street tower.
- 135 kL Omaru Road tank.
- 135 kL Cox Road tank.
- 2x 10 ML Phillipson Street tanks.
- 2 x 250 kL Warby Springs tanks.

Booster dosing occurs at the two 10 ML Phillipson Street tanks and on the outlet of the Kerr Street storages prior to the Wangaratta-Glenrowan pipeline.

The Wangaratta distribution system has 233 km of water mains, with 217 mains failures over the past three years.

A locality plan of the water system is shown in Figure 2 and a schematic of the water system is shown in Figure 5.

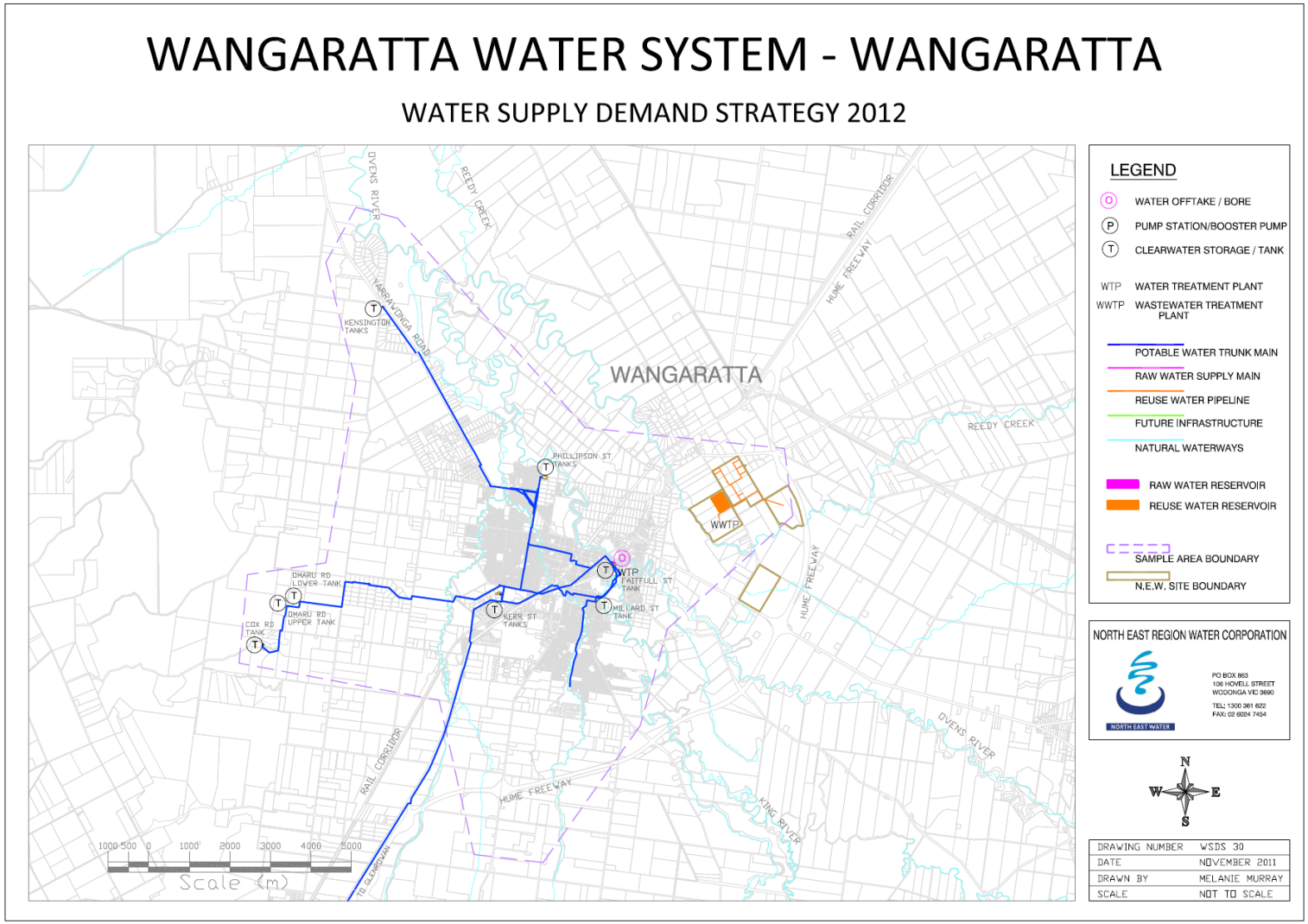


Figure 4: Locality Plan of Wangaratta System

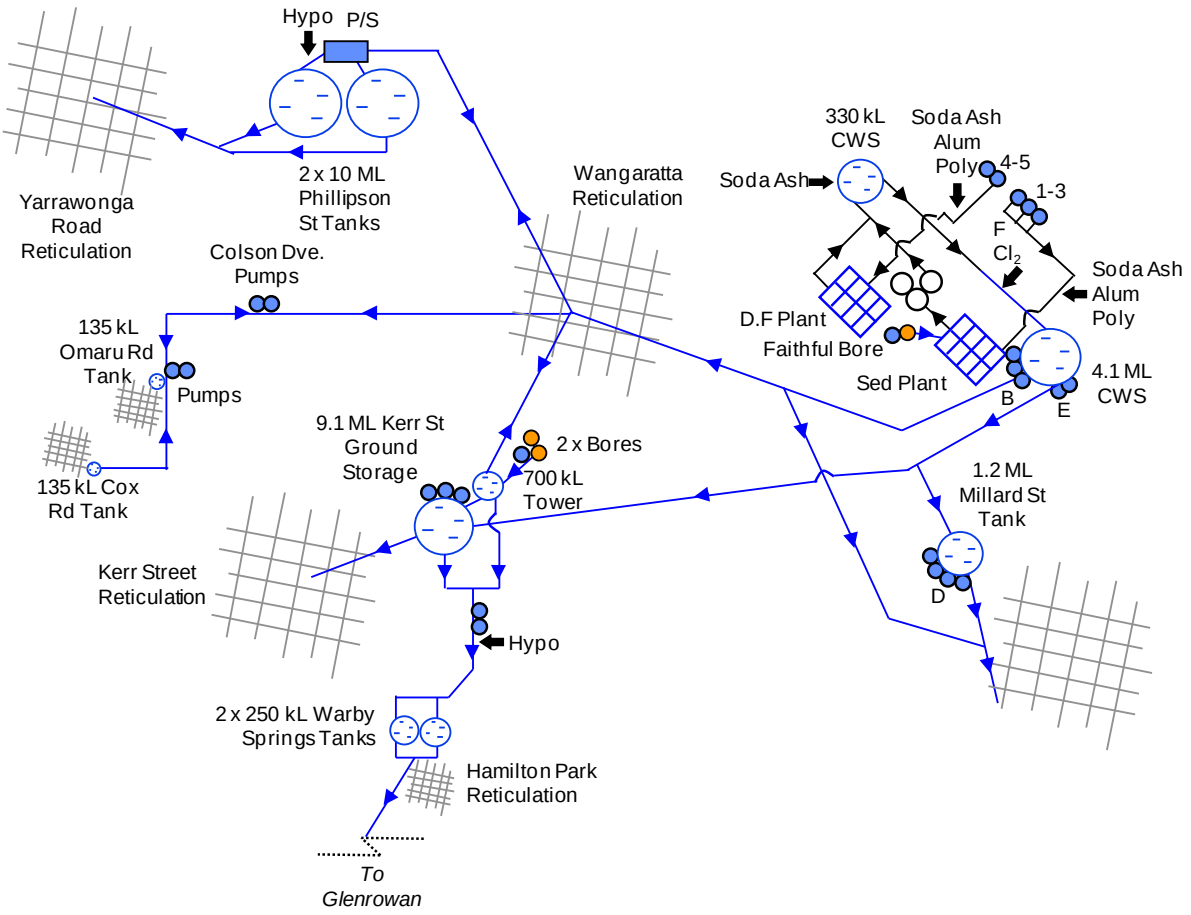


Figure 5: Schematic of Wangaratta System

2.5.3 Glenrowan

Treated water is pumped from the Kerr Street storages through Warby Springs and then to Glenrowan (total pipeline length 12 km). Booster dosing occurs Kerr Street storages prior to the Wangaratta-Glenrowan pipeline, and then again just prior to entering the two 250 kL tanks at Glenrowan. The distribution system has 11 km of water mains, with eight mains failures over the past three years.

The Nine Mile Creek off take and lower raw water storage are still in place at Glenrowan, but there is no infrastructure in place to pump raw water to a treatment facility or directly to town.

A locality plan and schematic of the Glenrowan component within the entire water system is shown in Figure 6 and Figure 7, respectively.

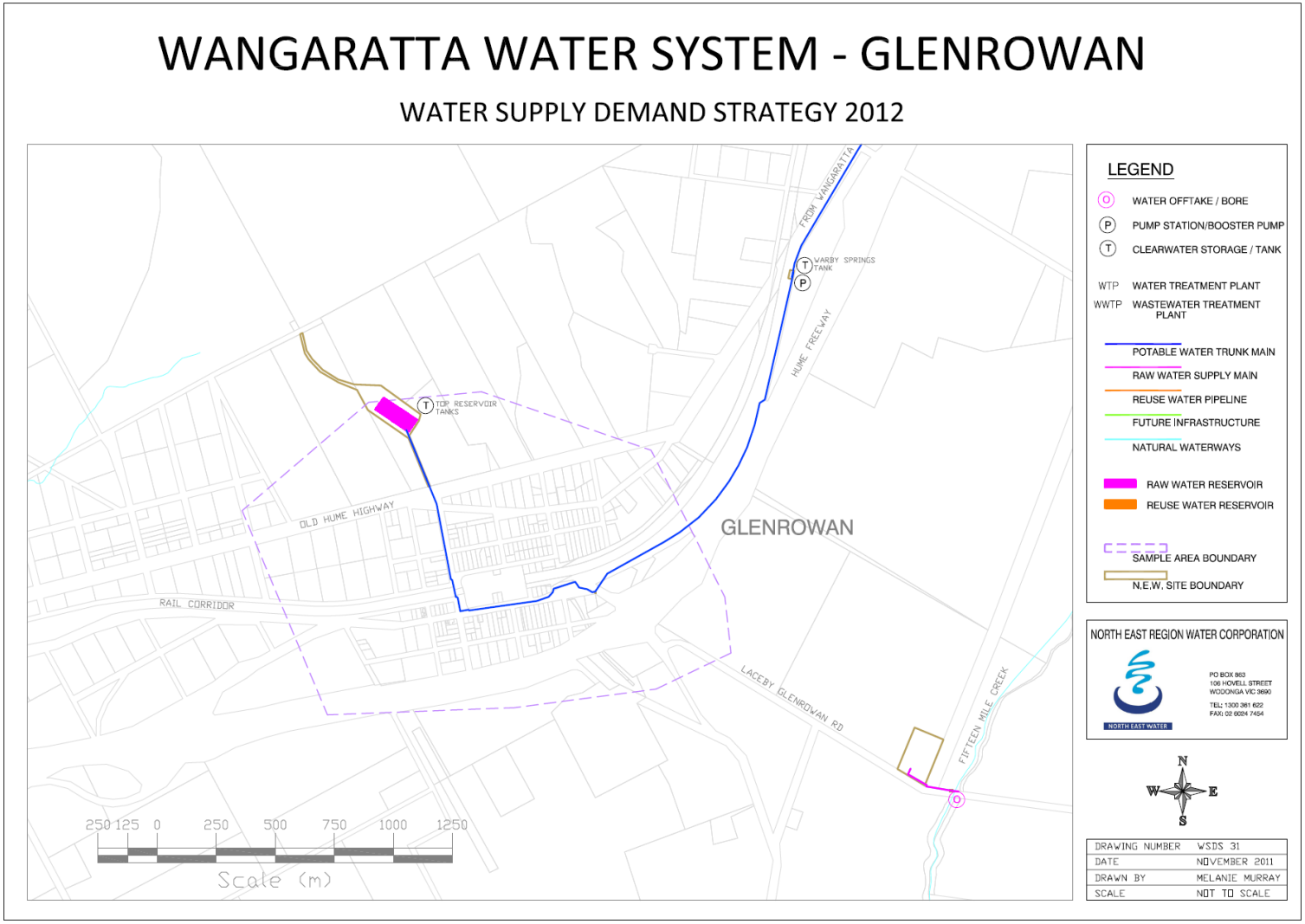


Figure 6: Locality Plan of Glenrowan System

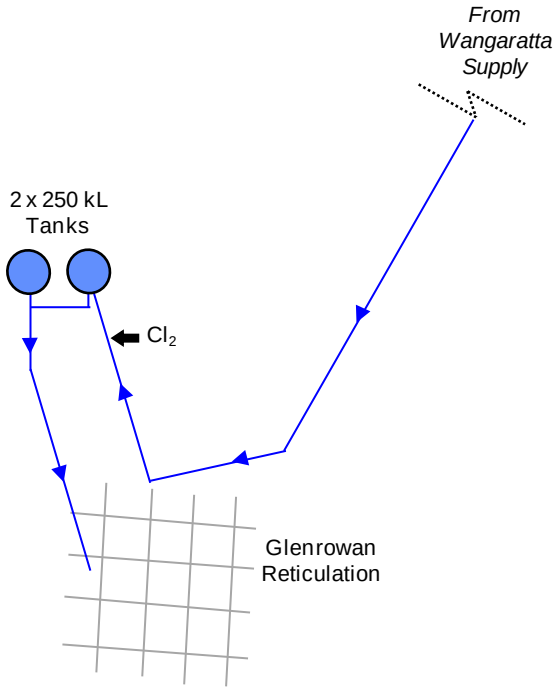


Figure 7: Schematic of Glenrowan System

2.6 Water Supply Infrastructure Capacity Assessment

An assessment of the water system's infrastructure capacity to meet peak daily demand is shown in Figure 8, which shows that the Wangaratta system has adequate raw water supply capacity, treatment and clear water storage capacity.

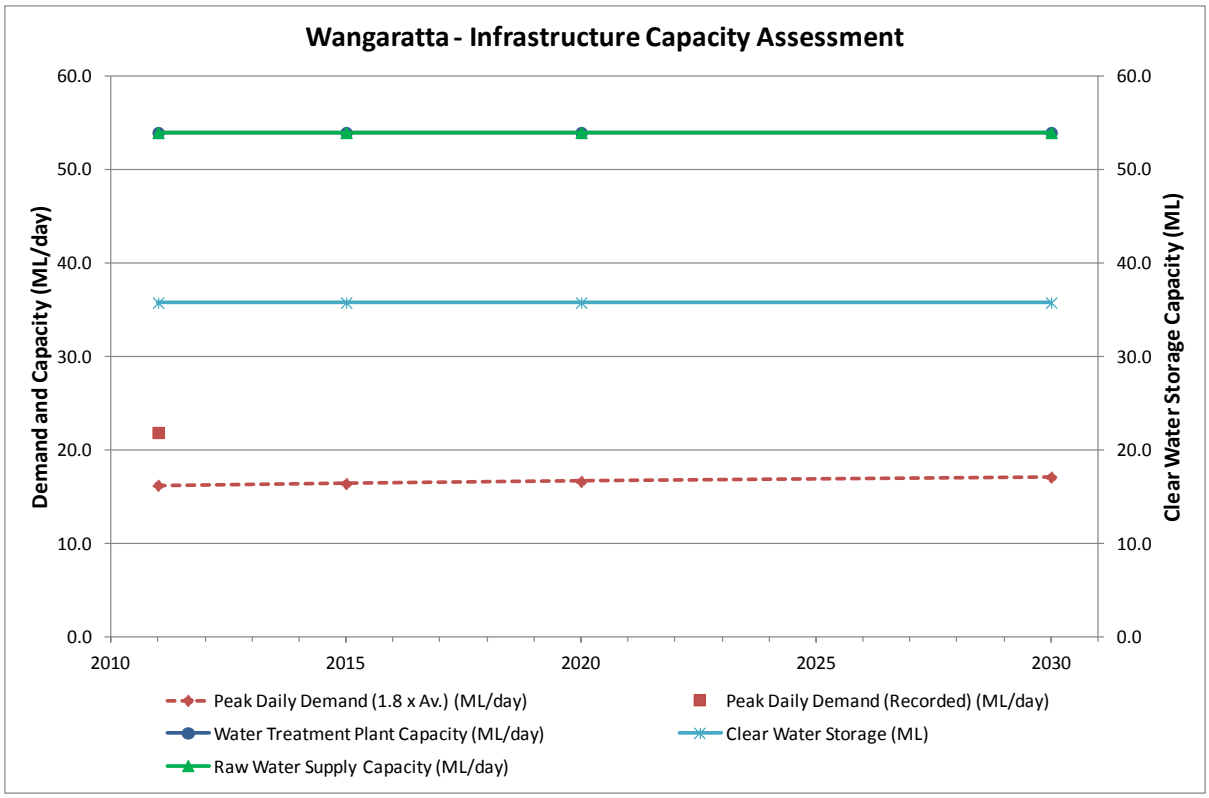


Figure 8: Water supply infrastructure capacity assessment

2.7 Issues

Specific issues relating to the Wangaratta water system are:

- Water quality can vary depending on flows in the Ovens and King Rivers.
- Water treatment plant has limited space for any future augmentation.

This system is at low residual risk for pathogens, but extreme residual risk for protozoa. This system is at low residual risk for chemical and physical properties.

2.8 Alternative Water Atlas

North East Water has prepared an Alternative Water Atlas for each of its systems. It has been prepared to inform future water supply decisions, providing information regarding relevant, achievable alternative water resources related to specific geographic locations within the North East Water service area. The Alternative Water Atlas is an inventory of alternative water supplies and the extent to which they are currently being used by customers. It includes:

- The volumes of stormwater, recycled water and other alternative water sources available within the works of North East Water (including wetlands and retarding basins) and/or local council.
- Provides information that will inform future opportunities for the use of treated stormwater, recycled water and other alternative water sources in the control of either North East Water or local council.

The inventory of current and potential alternative water supplies for this system is included in Appendix 1.

3 Reliability of Supply Analysis

3.1 System Yield

Water is managed by the Victorian Government through Bulk Entitlements. Bulk Entitlements generally specify the *maximum* amount of water that can be extracted from a waterway annually and rules that govern the extraction. Water is allocated for extraction up to 100% of the Bulk Entitlement depending on the amount of water available in the waterway in any given year.

Water supply system yield is the amount of water that can be reliably harvested from a supply system. Yield can be affected by several factors, such as the amount of rainfall in North East Water's supply catchments, the mix of water sources in each supply system, the available storage, operational rules that North East Water must follow for extracting water, passing environmental flows and North East Water's target levels of service. Yield is defined by the Water Services Association of Australia as "the average annual volume that can be supplied by a water supply system subject to an adopted set of operational rules and a typical demand pattern without violating a given level of service standard" (Erlanger and Neal, 2005).

The Ovens/King water resource model was used for the Wangaratta water supply system. This model is maintained by DSE and was last updated in 2009. It estimates how much water could be supplied over a long-term climate sequence without experiencing restrictions more frequently than desired under the agreed level of service, whilst also maintaining the minimum level of service in the most severe drought over that climate sequence. Yield at any point over the planning horizon is defined for this strategy as the average annual demand at which these levels of service objectives are just met. Using the average annual demand to define yield allows direct comparison with the future demand projections to determine when demand exceeds available yield.

When projected demands exceed the available yield, it does not imply that North East Water will no longer be able to supply its customers. For most supply systems it means that the frequency of restrictions would be expected on average over the long-term to be more frequent than desired by North East Water's customers.

3.2 Level of Service

The level of service refers to the long-term reliability of supply of a water supply system. Reliability of supply is measured by the frequency, severity and/or duration of water restrictions, as well as the ability to maintain a minimum supply during drought. Reliability of supply is often used interchangeably with the term security of supply, which has an equivalent meaning in North East Water's WSDS. There are two aspects to North East Water's level of service:

- **A minimum level of service**, which reflects North East Water's commitment to maintain supply for in-house residential water consumption and commercial/industrial demand. North East Water has planned to be able to supply this volume during a repeat of the worst historical drought on record, adjusted for future climate change.
- **An agreed level of service**, which reflects a desired maximum frequency of restrictions for a supply system in the long-term. If this level of service is not met, then customers would expect to experience restrictions more frequently than desired. North East Water has planned to be able to maintain this level of service in the long-term under anticipated future climate change conditions.

The level of service in the WSDS is assessed using long-term water resource models of each supply system. The actual level of service experienced by customers at any time over the next 50 years may differ from this long-term modelled estimate, as occurred from 1997-2009 when a series of unforeseen consecutive dry years

resulted in a high frequency of restrictions. Level of service will be higher during prolonged and/or severe wet climate periods and lower during prolonged dry climate periods.

Restrictions can vary for different customer segments, refer to North East Water's website (www.newater.com.au) for more information on water restriction details.

3.2.1 Minimum Level of Service

North East Water's minimum level of service is to provide the demand for unrestrictable in-house and commercial/industrial use. This component of demand is what would be provided to customers under Stage 4 restrictions, as outlined on our website (www.newater.com.au). In accordance with this, North East Water is planning to be able to supply the Wangaratta system with a minimum of 1773 ML/yr in a severe drought, based on the current (2010/11) level of demand. The magnitude of this demand will change over time with changes in population, in-house water use efficiency and the nature of commercial/industrial demand.

3.2.2 Agreed Level of Service

North East Water's agreed level of service is to provide the Wangaratta system with a 90% reliability of supply, which equates to a 90% likelihood that customers connected to a particular water supply system will not be asked to reduce water consumption in any given year, based on forecast community needs for water over the 50 year planning horizon.

North East Water has considered yield at two levels of service, namely at 90% annual supply reliability, which is the trigger for demand reduction or supply enhancement measures, and 95% annual reliability, which is the target level of service for the supply system when these measures are first implemented.

3.3 System Demand

The water demand for a system varies depending on the climatic condition for any given year. The *average annual demand* is the amount of water used in a year under average climatic conditions. The *required demand* in any given year is dependant on the climatic conditions, and can vary by as much as ± 20%. Other factors that influence demand include water use behaviour, demographics, technological development and the state of the economy.

A sector based approach has been adopted to forecast demand. Historical demand from residential, industrial, commercial and vacant land connections in each supply system were separately analysed and forecasted. Raw and treated water losses were also separately forecasted. The components of demand by customer type at the current level of demand were estimated using the sum of recent customer meter data.

Demand was estimated as a function of input climate, but also having regard to changes in population and water use behaviour over recent years. Residential demand is a function of baseline demand and population growth, whereas industrial, commercial and vacant land demand has been assumed to be equal to the year 2010/11 for most systems. The population forecast for communities connected to the Wangaratta water supply system is shown in Appendix 2.

An allowance has been made for losses between North East Water's raw water off take and the treatment plant outlet, and distribution losses downstream of the treatment plant. Losses between North East Water's raw water off take and the treatment plant outlet have been determined by comparing historical metered raw and clear water data over the last few years. A comparison of system water losses per connection across the region is shown in Appendix 3. The headworks losses are above the regional average and the distribution losses are less than the regional average.

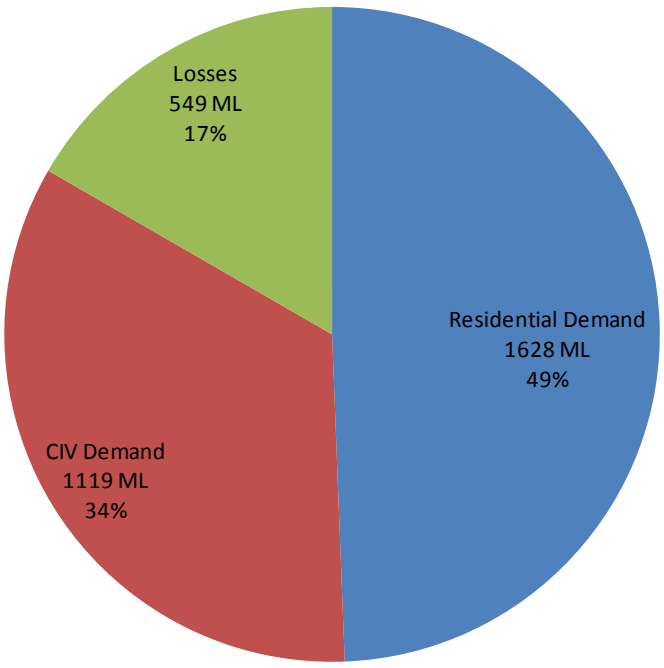
The forecast connections, population, demand and losses for the Wangaratta system are shown in Table 1, with the distribution of current (2010/11) water consumption across the different sectors shown in Figure 9. A

comparison of residential demand per connection across the region is shown in Appendix 4, which indicates that residential demand per connection in Wangaratta is less than the regional average.

Table 1: Forecast connections, population, demand and losses

Item	Units	2011	2015	2020	2030	2060
Residential Connections		8,003	8,397	8,897	9,773	11,354
Serviced Population		18,379	18,753	19,239	20,277	22,676
Total Demand	(ML/yr)	3,296	3,333	3,380	3,473	3,752
Residential Demand	(ML/yr)	1,628	1,659	1,697	1,775	2,008
CIV[1] Demand	(ML/yr)	1,119	1,119	1,119	1,119	1,119
Losses - Headworks	(ML/yr)	244	247	250	257	278
Losses - Treatment	(ML/yr)	305	309	313	322	347
Average Daily Demand	(kL/day)	9,029	9,131	9,259	9,514	10,280
Peak Daily Demand[2]	(kL/day)	16,253	16,437	16,666	17,126	18,504
Peak Daily Demand[3]	(kL/day)	21,903				
Average System Residential Demand per Connection	(kL/yr)	203	198	191	182	177
Average Regional Residential Demand per Connection	(kL/yr)	215	213	211	206	193
Average System Residential Demand per Capita	(kL/yr)	89	88	88	88	89
Average Regional Residential Demand per Capita	(kL/yr)	90	90	90	90	90

[1]Commercial, Industrial and Vacant land
[2]Average Daily Demand multiplied by an industry standard factor of 1.8
[3]Based on recent metered data. Refer to BD/00000026 'Water Quality - Water Supply Systems - Security of Supply Summary'



CIV = Commercial, Industrial and Vacant land

Figure 9: Distribution of current water demand for the Wangaratta and Glenrowan

3.4 Long-term Supply-Demand Analysis

A long-term supply-demand analysis has been undertaken for all systems to determine their current and future capacity to meet the agreed level of service (i.e. reliability of supply), and is shown in Figure 10. This has been determined by comparing forecast demand against available supply under historic climatic and stream flow conditions, with climate change scenarios incorporated into analyses projected into the future. In reality, the level of service (both in terms frequency and severity of restrictions) will be determined by the future climatic conditions.

The long-term supply-demand balance analysis in Figure 10 shows the:

- Bulk entitlement.
- Current system yield with a 90% reliability of supply reliability.
- Forecast system yield under median climate change scenarios with a 90% supply reliability (level of service).
- Current and forecast average annual demand.
- Current and future level of service (reliability of supply).
- Bounce back demand. The level of service shown was also applicable to the bounce back demand scenario for this supply system.
- Current and forecast demand and system losses.
- Timing of supply and demand intersecting under different scenarios.

Town	Wangaratta
Other towns supplied:	Glenrowan, Killawarra, Laceby, Waldara

Bulk Entitlement	8620 ML

	Current	2030 Median CC	2060 Median CC
System yield (90% Rel) (ML/yr)	Not applicable	Not applicable	Not applicable
Average annual demand (ML)	3296	3497	3752
Level of service (%)	93%	91%	90%
Bounceback demand (ML/yr)	*3472*	*3685*	*3953*

Year	Total Demand	Residential Demand	CIV Demand	Losses
2011	3296	1628	1119	549
2060	3752	2008	1119	625

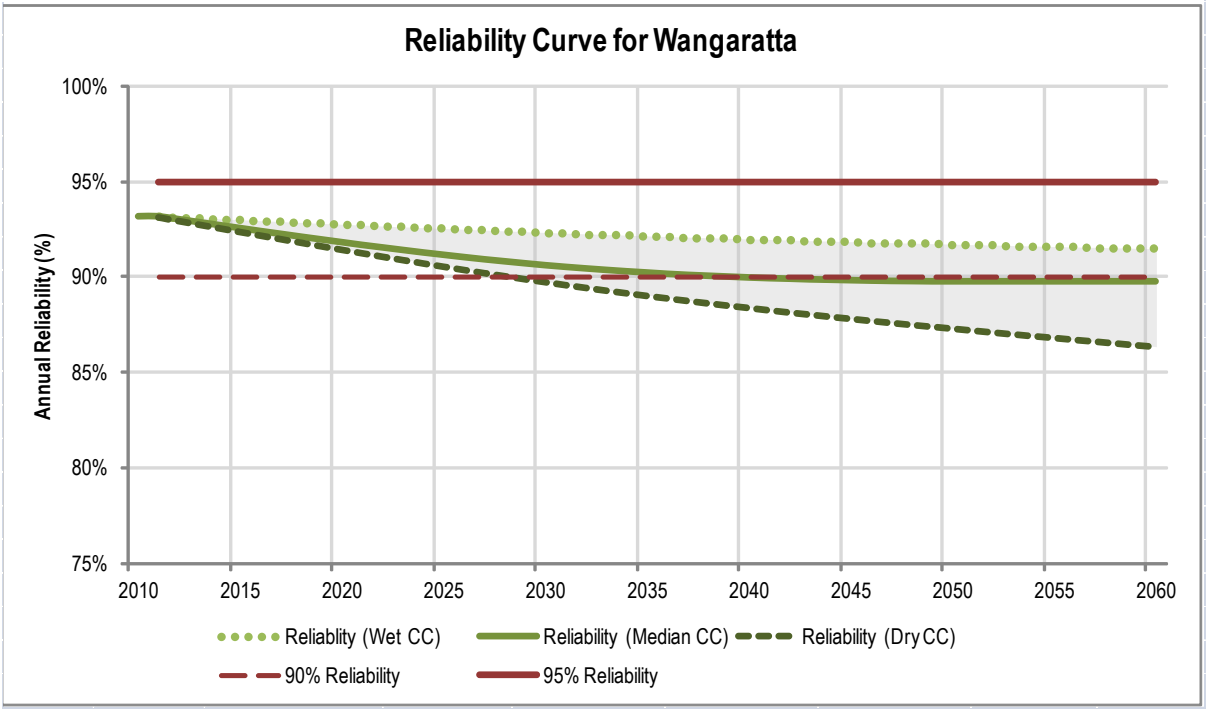


Figure 10: Long-term Supply-Demand Balance Analysis

3.5 Short-term Supply-Demand Analysis

The short-term assessment of system performance under different scenarios was based on North East Water's Annual Water Security Outlook. Compared with other areas of Victoria, inflows to North East Water's storages are high relative to their storage capacity and demand. This means that North East Water's supply system storages can quickly be drawn down during drought and equally recover quickly once the drought has broken. The period over which a short-term assessment of system performance can reasonably be assessed by North East Water is not longer than around 12 months, because storages would be expected to fill and spill within any given 12 month period.

The Annual Water Security Outlook was approached differently for each of North East Water's different supply system types.

The Ovens and King System Water Security Outlook contains the following aspects:

- Entitlement volume and volume extracted so far this year.
- Monthly water consumption in comparison with the historical five-year average consumption.
- Bureau of Meteorology climate forecast information.
- Goulburn Murray Water storage operation information.
- Volume in storage.
- Forecast water restriction levels based on the above information.

An example of the Annual Water Security Outlook relevant to this system is shown in Appendix 5.

4 Ensuring Reliability of Supply

4.1 Provision of Minimum and Agreed Level of Service

The supply and demand balance has been examined for each supply system over the 50 year planning horizon. This analysis highlighted that with the reduction in demand achieved by North East Water and its customers in recent years, many of the previously proposed supply augmentation options can be deferred or are no longer required over the planning horizon.

The agreed level of service is currently met for this system, Table 2 highlights and the anticipated range of years at which either the minimum or agreed level of service is expected to no longer be met with the current supply system. The expected year at which the agreed level of service (reliability of supply) would no longer be met is based on the projected demands with system savings (no bounce back) and median climate change projections. The earliest year corresponds to the projected demands with bounce back to slightly higher per capita consumption (bounce back) and dry climate change conditions. The latest year corresponds to projected demands with system savings (no bounce back) and wet climate change conditions.

North East Water will continue to monitor and report the system's behaviour with the Annual Water Security Outlook (refer to Appendix 5 for an example).

Table 2: Provision of Minimum and Agreed Level of Service

Supply system	Is minimum level of service currently met?	Is agreed level of service currently met?	Range of years over planning horizon at which agreed level of service would no longer be met with current supply system		
			Expected	Earliest	Latest
Wangaratta	Yes	Yes	2041	2029	2060

Note: "-"indicates that the level of service objectives are expected to be satisfied over the next 50 years with the current supply system and existing operating rules.

4.2 Approaches to provide Agreed Level of Service

Approaches available to balance supply and demand may be categorised under demand management, supply augmentation, or in some cases both. The approaches to ensure North East Water provides the agreed level of service into the future have been categorised in the following five themes:

- Delivery System Performance (demand management).
- Demand Management (demand management).
- *One Resource* (demand management/supply enhancement).
- Using Water Markets (supply enhancement).
- Secure Water Source (supply enhancement).

A brief description of each approach is set out below.

4.2.1 Delivery System Performance

This approach aims to overcome any knowledge shortfalls, improve the understanding of water losses in each delivery system, improve the management of these systems and ultimately reduce water losses. This approach is a continuation of the Delivery System Performance Strategy recommended in the last WSDS and aims to increase water savings already achieved in the delivery systems since its inception in 2007. This approach will involve water balance studies, leak detection and management, improved metering and investigations into zoned metering and pressure reduction opportunities.

4.2.2 Demand Management

Given the success of North East Water's demand reduction initiatives to date, this WSDS has assumed that no further reduction in per capita demand is anticipated. North East Water will aim to hold the current ground gained on water savings and minimise any "bounce back" in demand levels through its ongoing programs, which use customer education, pricing and regulation measures to contain individual customers' demand for water. There is some overlap with the *One Resource* approach but this latter approach is focused on delivery system scale options.

4.2.3 One Resource

The opportunities and challenges associated with alternative water use vary from system to system. The WSDS does not identify preferred alternative water options for each of its systems, instead it recommends the use of the *One Resource* framework to take a holistic approach considering all initiatives that reduce demand on North East Water's supply system, such as rainwater tanks and grey water use, and initiatives that enhance its supply, such as raw water irrigation schemes. The customer-focussed approach of *One Resource* aligns the quality of water required by the customer with the most efficient delivery infrastructure and the capacity of the environment to meet the outcome sought. This approach will enables efficient, appropriate and feasible alternative water options to be implemented when the opportunities arise.

4.2.4 Using Water Markets

North East Water considers the water markets to be a very effective tool for balancing supply and demand in the long term for its regulated supply systems. During extended dry periods, water markets can also be used by North East Water to purchase seasonal allocations (valid for use in a single year only) to meet the minimum level of service. North East Water will continue to access entitlements through the water trading market to allow for future growth and to manage the annual variation in demand.

4.2.5 Secure Water Source

This approach involves augmenting the supply for a system that has a resource constraint. Supply augmentations may involve:

- Connecting a delivery system to one that has a more secure supply with a pipeline.
- Constructing off-stream storage to increase the 'yield' of the supply source by capturing 'winter fill'.
- Supplementing supply with an alternative source such as groundwater.
- Supplementing supply with carted water.

Supply augmentations are required in the Water Plan 3 period where the Level of Service is currently, or is forecast to drop, below the agreed level of service by 2018 (the end of the next Water Plan period).

4.2.6 Supply Augmentation (Secure Water Source) Principles

Supply augmentation principles have been developed in accordance with the agreed level of service (reliability of supply), and are detailed below.

1. No communities will have a reliability of supply of less than 90%, subject to funding availability for required augmentations and inclusion in Water Plan 3.
2. Communities with a reliability of supply between 90% and 95%:
    a. Understand options and cost (planning) to increase reliability of supply to 95%.
    b. Consider increasing reliability to 95% if compelling need is demonstrated.

4.2.7 Evaluation of Secure Water Source Options

All supply augmentation options have been scoped (and costed) to deliver safe drinking water and include water treatment components, where required. Each option has been assessed to determine its impact on social, environmental and economic sustainability. The assessment criteria are listed below.

- Economic:
    - Net Present Cost.
    - Regional Gross Domestic Product.
- Environmental:
    - Greenhouse Gas.
    - Environmental Flow.
    - Water Quality.
    - Effect on Ecosystems.
- Social:
    - Acceptability.
    - Heritage/Recreational.

The Net Present Cost Assessment has been conducted using a discount rate of 5.1% over a 20 year evaluation period. The economic criteria consider net present costs and potential impact on regional pricing.

4.3 Viable System Options

Options that have been deemed to be viable for this system are outlined below and provided in more detail in Table 3.

- DSP-1: Delivery System Water Audits.
- DSP-3: Leakage Control.
- DSP-4: Annual Meter Verification Program.
- DM-1: Customer Education – Provision of advice and information.
- DM-2: Incentives for Water Conservation Devices and Efficient Appliances.
- DM-3: Customer (non-residential) Water Conservation and Demand Reduction.
- DM-4: Customer (local government) Water Conservation and Demand Reduction.
- DM-5: Pricing.
- DM-6: Regulation – Water Restrictions.
- DM-7: Innovative Technology
- OR-1: Use *One Resource* approach for Supply Augmentations assessments.
- OR-2: Populated *One Resource* Frameworks.
- OR-3: Sustainability assessment of *One Resource* Frameworks.
- UWM-1: Regulated Supply - Bulk Entitlement.
- UWM-3: Unregulated Supply – Groundwater Licence.
- SWS-2a: Wangaratta supply augmented with off-stream storage.
- SWS-2b: Wangaratta supply augmented with groundwater.

Table 3: Viable System Options

Code	Option and Description
DSP-1	**Delivery System Water Audits** Ongoing auditing of delivery systems to identify areas of high loss and opportunities for leakage reduction and recovering backwash water in fit-for-purpose applications.
DSP-3	**Leakage Control** Implement a leakage detection program to actively identify high water losses and follow up with actions to reduce leakage. Install additional meter(s) in priority delivery systems to improve leakage assessments and focus leakage mitigation efforts. This option could reduce distribution water losses by approximately 50% (47°ML/yr)
DSP-4	**Annual Meter Verification Program** Annually check the operation of all water meters to ensure that they are working within manufacturer's tolerances for accuracy.
DM-1	**Customer Education – Provision of advice and information** Continue North East Water's education program to develop and enhance the Corporation's commitment to raising community awareness of sustainable water use. The main objectives of this program are to: • Increase community awareness of sustainable water use. • Develop and provide tools and resources to empower communities to conserve water. • Promote North East Water and water conservation messages. Mechanisms include: • Informative bills, guidelines, fact sheets, media • Representation at expos and fairs • Targeted programs such as tours of water treatment plants by school children and focus groups • Participation in National Water Week • Public forums, information sessions and meetings • Working with councils and North East Catchment Management Authorities (e.g. Waterwatch) • Building capacity in schools in programs such as the School Environment Education Directory (SEED) • Partnerships with industry (e.g. Rutherglen Garden Club) to promote efficient gardening practices and water conservation. • Customer information available on website • Call centre Monday to Friday office hours – 8.30am to 5pm.

Code	Option and Description
DM-2	**Incentives for Water Conservation Devices and Efficient Appliances** Continue to facilitate Government Water Rebate Programs. Living Victoria Water Rebate Program is the current Government scheme, which provides rebates for: • Water conservation audits • Hot water recirculators • Water efficient showerheads • Dual flush toilets • Permanent grey water systems • Rainwater tanks • Pool covers • Efficient washing machines • Other low cost water saving measures. Supply and installation costs would be borne by owners with incentives being provided through government rebate programmes.
DM-3	**Customer (non-residential) Water Conservation and Demand Reduction** Continue to facilitate the Government's waterMAP initiative that encourages industrial and commercial customers to develop a Water Management Action Plan to improve their water efficiency to achieve water and cost savings. Due to the success of the waterMAP initiative, the Government has expanded the program on a voluntary basis to encourage industrial and commercial customers that consume more than 5 ML/yr from an urban water supply. North East Water will actively engage with these customers over the next 18 months to raise their awareness of the benefits of water conservation and assist them in securing funding for projects suitable under current grants schemes offered.
DM-4	**Customer (local government) Water Conservation and Demand Reduction** Continue to work with Local Government Authorities to identify opportunities to reduce demand for potable water and utilise fit-for-purpose applications. Potential initiatives have been identified in each of the respective system plans.
DM-5	**Pricing** North East Water's tariff structure empowers customers to manage their water costs (and consumption) by placing high reliance on the volumetric component of the tariff relative to the fixed component. This tariff structure should continue as a means of providing price signals for the use of water.
DM-6	**Regulation – Water Restrictions** Continue to apply restrictions in accordance with North East Water's Drought Response Plan (2011).
DM-7	**Innovative Technology** Continue to work with the broader water industry (e.g. Intelligent Water Networks) to understand how new technology (e.g. smart water meters) could be used to manage demand.
OR-1	**Use *One Resource* approach for Supply Augmentations assessments** Use the *One Resource* approach for all future supply augmentations assessment to ensure the efficient water service delivery of outcomes sought by the community by taking a holistic approach to water resource management.

Code	Option and Description
OR-2	**Populated *One Resource* Frameworks** Work with councils and communities to populate *One Resource* frameworks for each of the 21 water delivery systems to align fit-for-purpose water resources with community sought outcomes. (N.B. *One Resource* frameworks have already been populated for Yackandandah and Wodonga).
OR-3	**Sustainability assessment of *One Resource* Frameworks** Work with councils and communities to shortlist water service delivery options identified in the populated *One Resource* frameworks considering social, environmental and financial implications. Where feasible, implement shortlisted water service delivery options. The infrastructure to deliver the water service may be owned by North East Water or a third party (e.g. Council).
UWM-1	**Regulated Supply - Bulk Entitlement** Use the current market arrangements to purchase additional entitlement as required to maintain the long term agreed level of service. Assumes that the necessary upgrades to water treatment plant and distribution mains are made.
UWM-3	**Unregulated Supply – Groundwater Licence** Purchase additional entitlement if required. May require substantial modelling to determine suitable sites and sustainable yield from bores.
SWS-2a	**Wangaratta supply augmented with off-stream storage** Wangaratta's existing supply is from the Ovens river which is regulated by Goulburn-Murray Water. Extraction from the river is restricted during periods of low flow, which limits the volume that North East Water can supply and results in the need for restrictions to manage supply and demand. This option involves the construction of a 200 ML storage on North East Water's Crosher Lane property which would be filled during winter from the existing extraction point and treated with the existing water treatment plant.
SWS-2b	**Wangaratta supply augmented with groundwater** This option involves supplementing the existing surface water supply with groundwater. Development of additional groundwater supply may be required to ensure a supply of 10 ML/day can be provided. This option would also require a water treatment plant upgrade for groundwater supply to ensure compliance with the Safe Drinking Water Act 2003.

4.3.1 Non-viable Secure Water Source Options

Pipeline from Lake William Hovell or Lake Buffalo to Wangaratta

This option has been postponed in the short-term and medium term on the grounds that the cost is unacceptably high compared to other options to augment Wangaratta's supply.

4.3.2 Secure Water Source Options Assessment

An overview of the assessment of Secure Water Source options is presented in Table 4. Details of the multi-criteria assessment scoring are included in Appendix 6.

Table 4: Secure Water Source Options Assessment

Item	Unit	Option 1 - Groundwater Supply	Option 2 - 200 ML Off-stream Storage
Potential Water Gain	ML	280	280
Capital Cost	$	$1,590,000	$6,360,000
O&M Cost	$/yr	$130,000	$22,000
Net Present Cost (@ 5.1%)	$	$3,200,000	$6,630,000
Net Present Cost/(PV* of ML)	$/(PV ML)	$1,147	$2,376
GHG Generation	CO_2e t/yr	159	38
Unit GHG Generation	CO_2e t/yr/ML	1	0
Multi Criteria Analysis Score	-	0.8	-0.7

* PV = Present Value

4.3.3 Other Initiatives

DSE is leading an investigation into options for augmenting supply in the Wangaratta region by increasing storage capacity (Lake Buffalo and/or Lake William Hovell) or supplementing with groundwater. The outcome of this investigation will be considered in assessing supply augmentation options for the Wangaratta urban supply system. North East Water will work with DSE and other stakeholders in the review of the supply augmentation options in the Wangaratta region.

5 Implementation

Implementation of the viable system options shown in Section 4.3 will ensure that North East Water can deliver the agreed level of service (i.e. reliability of supply) into the future. These options fall within the following five approaches.

- Delivery System Performance (demand management).
- Demand Management (demand management).
- *One Resource* (demand management/supply enhancement).
- Using Water Markets (supply enhancement).
- Secure Water Source (supply enhancement).

The implementation of these approaches to balance supply and demand for this system is presented in Table 5, which shows the outcome of their implementation (nominal additional water or savings) and the timing that implementation is required by.

Table 5: Implementation of Approaches to balance Supply and Demand

Approach	Nominal additional water or savings (ML/yr)	Implementation required by
Delivery System Performance	183	2017
Demand Management	0	Ongoing
One Resource	237	Ongoing
Using Water Markets	0	-
Secure Water Source	65	-

The results of the long-term supply-demand analysis shown in Section 3.4 were conducted on the basis of water savings achieved from Delivery System Performance measures being implemented over the next five years. Demand Management measures will be continued to ensure current ground gained on water savings are maintained, and hence no additional water savings have been identified. North East Water's *One Resource* approach will continue to be rolled out across the region, with efficient, appropriate and feasible alternative water options to be implemented when the opportunities arise. The volumetric outcomes identified in Table 5 are nominal and are subject to further investigation and feasibility assessments that will involve external stakeholders for the *One Resource* approach. Secure Water Source options should be reviewed using the *One Resource* approach to ensure the efficient water service delivery option is identified, should the need for early implementation eventuate.

6 Bibliography

Erlanger, P. and Neal, B. (2005) *Framework for Urban Water Resource Planning*. Water Services Association of Australia Occasional Paper No. 14 – June 2005.

NEW (North East Water), 2012, *Water Supply Demand Strategy*.

North East Water (2011) *Drought Response Plan.*

Victorian Water Industry Association (2011) *Victorian Uniform Water Restriction and Permanent Water Saving Rule Guidelines - Outcome of the Review of Victoria's Approach to Water Restrictions and Permanent Water Saving Rules*. Position Paper. FINAL. 23/09/2011.

Appendix 1: Alternative Water Atlas (inventory)

Township: Wangaratta **Municipality:** Wangaratta (RC)

Source	Location/Description	Average Annual Yield/Demand (~ML/yr)	Existing or Potential?	Supply or Demand?	Reference	Responsible Entity
Groundwater	Targoora Park - Baseball Complex uses bore for irrigation	5.0	Existing	Demand reduction	Rural City of Wangaratta	Sport Club
Groundwater/Rainwater/Raw Water	Barr Reserve - four ovals plus surrounds (10-15ha). Currently uses 130 ML Ovens River entitlement 14ML groundwater entitlement + 1ML rainwater tank.	50.0	Existing	Demand reduction	Rural City of Wangaratta	Council
Rainwater	High School - Large tanks used for irrigation and toilet flushing, new building will be connected to rainwater tanks in the future	Unknown	Existing	Demand reduction	Wangaratta High School	High School
Rainwater	GO TAFE - 6 x 22kL used for Horticulture. All other roof water from the site is redirected back into 3 Mile Creek.	Unknown	Existing	Demand reduction	GOTAFE	Private Landholders / Business
Rainwater	Wangaratta Primary School - Large tank used for toilet flushing, Smaller tank used by school and adult education centre for irrigation	Unknown	Existing	Demand reduction	Wangaratta P.S.	Primary School
Rainwater/Stormwater/Groundwater	Cathedral College - 7 x 45kL rainwater tanks used for toilet flushing, groundwater used for irrigation, stormwater directed to small retention basin for flood mitigation and used for irrigation at Targoora Park	Unknown	Existing	Demand reduction	Cathedral College	School
Raw Water	Golf Course - 144ML entitlement from Ovens, 66ML spill (high flow) entitlement from Ovens	144.0	Existing	Demand reduction	Wangaratta Golf Club	Sport Club
Reclaimed Water	Third party urban irrigation development (0.4 ha) at the North Wangaratta Recreation Reserve	4.0	Existing	Supply	NEW	North East Water
Stormwater	One Mile Creek Flood Mitigation - Stormwater captured in weir and released to King River	Unknown	Existing	Demand reduction	Rural City of Wangaratta	Council
Stormwater	Racecourse (for irrigation) - Raw water source from 15 Mile Creek stored in 2 x 10ML (approx) dams water used for irrigation	20.0	Existing	Demand reduction	Wangaratta racecourse	Sport Club
Stormwater	Stormwater is returned to stream via lagoons and billabong at Merriwa Park	Unknown	Existing	Demand reduction	Rural City of Wangaratta	Council

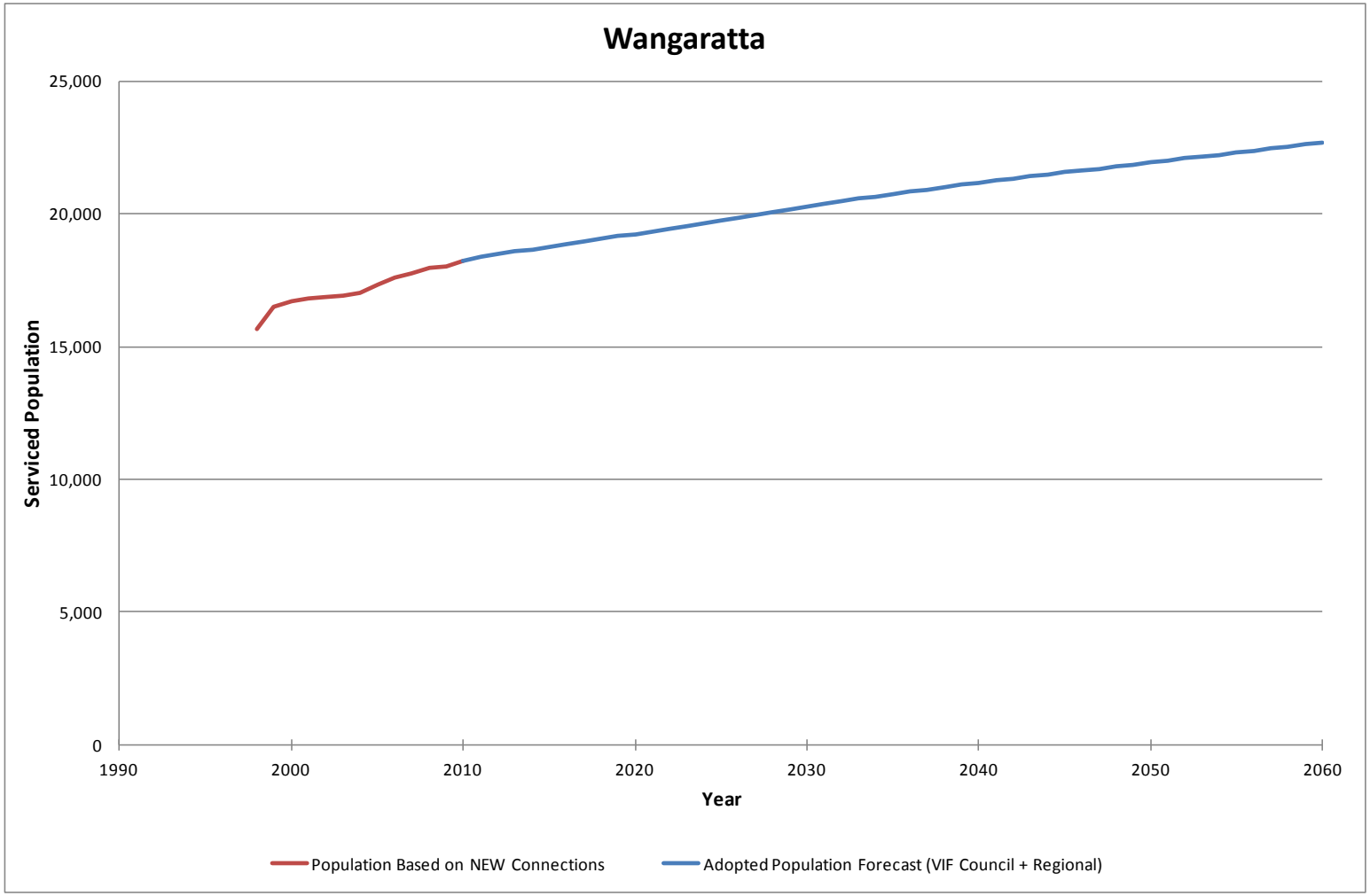
Township: Wangaratta **Municipality:** Wangaratta (RC)

Source	Location/Description	Average Annual Yield/Demand (~ML/yr)	Existing or Potential?	Supply or Demand?	Reference	Responsible Entity
Stormwater/Rainwater	St Johns retirement village- Stormwater and rainwater captured in two dams (approx 20ML capacity total) and treated in wetland system. Water provides approx 95% of irrigation requirements and overflow goes to the Three Mile Creek.	Unknown	Existing	Demand reduction	St. John Retirement Village	Private Landholders
Stormwater/Raw Water	Tennis Court - 6.5ML entitlement used to irrigate 20 tennis courts with raw/storm water from Merriwa Park lagoon. Raw water comes form King River.	13.4	Existing	Demand reduction	Wangaratta Tennis Club	Sport Club
Reclaimed Water	South Wangaratta - Soccer Fields, Oval, motorcycle speedway track, have all expressed interest in receiving water from NEW TWTP once upgrade is complete. Demand. Equestrian club and Ledgers training could also potentially utilise alternate water in this precinct.	190.0	Potential	Supply	NEW / Rural City of Wangaratta	North East Water
Stormwater	Wangaratta common - Hay avenue. Remnant Vegetation. Opportunity for wetland/stormwater detention	Unknown	Potential	Demand reduction	Rural City of Wangaratta	Council
Stormwater	Old Aerodrome site is being developed and could capture and treat stormwater via a wetland system.	Unknown	Potential	Demand reduction	Rural City of Wangaratta	Council
Stormwater	Worland Road subdivisions could provided stormwater opportunities.	Unknown	Potential	Demand reduction	Rural City of Wangaratta	Council
Stormwater/Rainwater	Wareerina park Oval (Stormwater drainage goes straight past this oval park)	5.0	Potential	Demand reduction	Rural City of Wangaratta	Council
To be determined	Bachelor's green is irrigated with potable water .Water could potentially be captured off police station roof.	1.5	Potential	Demand reduction	Rural City of Wangaratta	Council
To be determined	Apex Park - a small part of this is irrigated with potable water	30.0	Potential	Demand reduction	Rural City of Wangaratta	Council
To be determined	King George park uses potable water for irrigation	11.0	Potential	Demand reduction	Rural City of Wangaratta	Council
	Total	**473.9**				

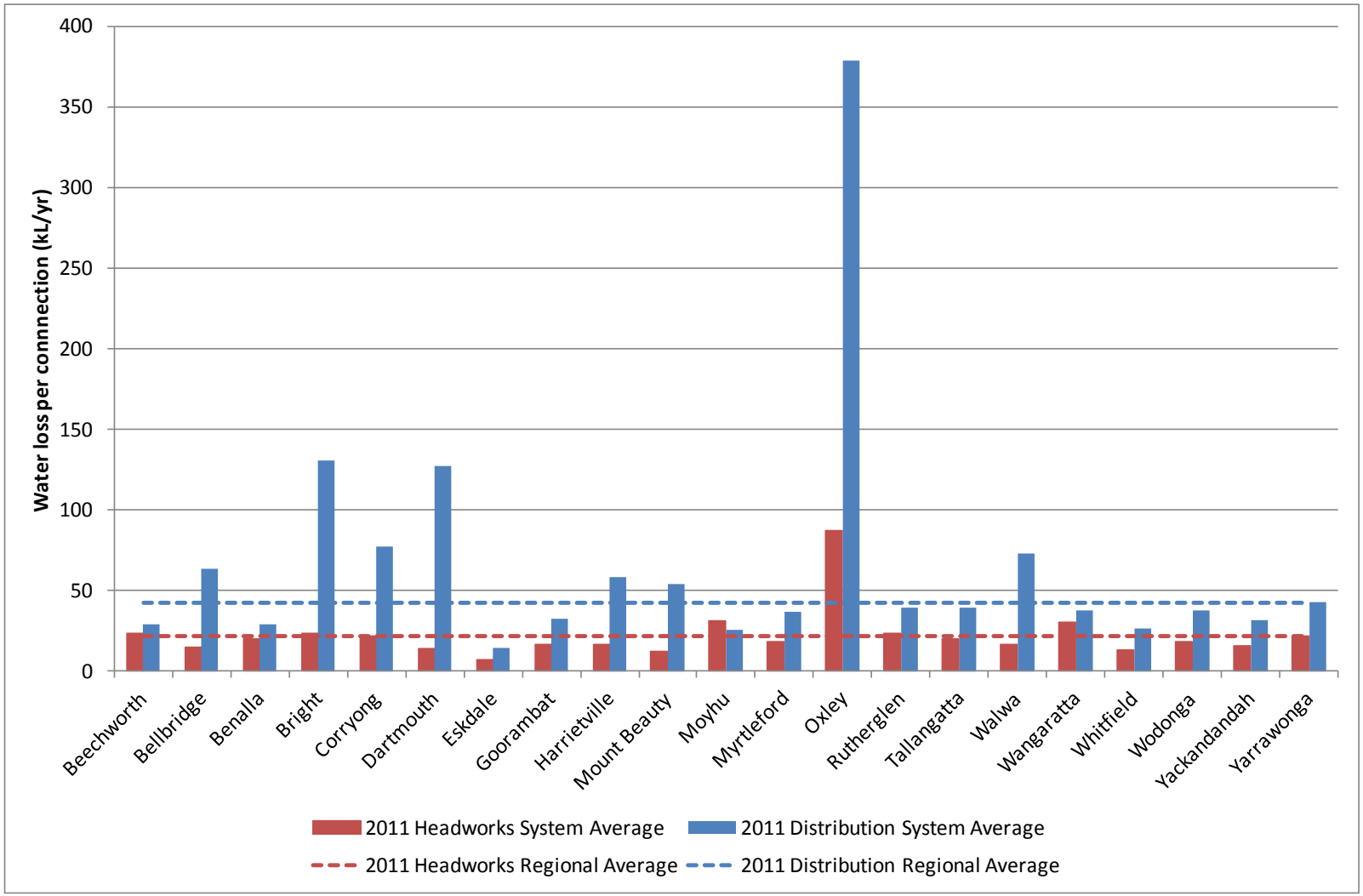
Township: Glenrowan **Municipality:** Wangaratta (RC)

Source	Location/Description	Average Annual Yield/Demand (~ML/yr)	Existing or Potential?	Supply or Demand?	Reference	Responsible Entity
Rainwater	Glenrowan primary School - rainwater tanks used	Unknown	Existing	Demand reduction	Glenrowan P.S.	Primary School
River Water	Foster's Park (cnr. Glenrowan-Moyhu Rd/Main St.) - Spring Water used for irrigation	Unknown	Existing	Demand reduction	Rural City of Wangaratta	Council
Stormwater	Football Oval (irrigation)	Unknown	Existing	Demand reduction	Rural City of Wangaratta	Sport Club
	Total	**0.0**				

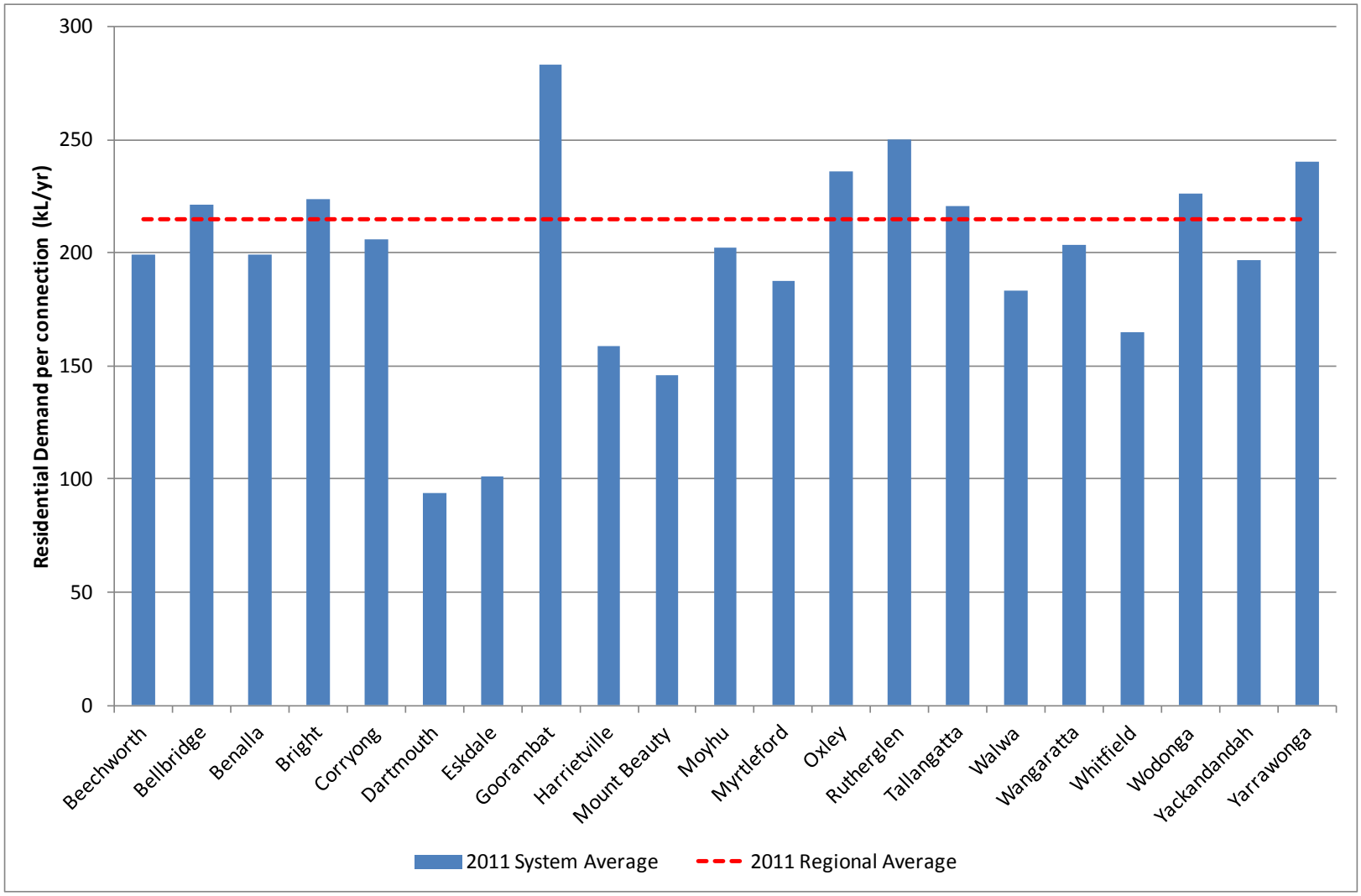
Appendix 2: Population Forecast



Appendix 3: Comparison of system water losses per connection across the region



Appendix 4: Comparison of residential demand per connection across the region



Appendix 5: Annual Water Security Outlook (example)

Appendix 6: Secure Water Source Options Assessment Details

Multi Criteria Analysis Criteria	Criteria Weighting	Multi Criteria Analysis Score		Comment
		Option 1 - Groundwater Supply	Option 2 - 200 ML Off-stream Storage	
Economic				
Net Present Cost/(PV of ML)	25%	5	-1	
Regional GDP	8%	0	0	
Environmental				
Greenhouse Gas	10%	-5	-4	
Environmental Flow	10%	0	0	
Water Quality	7%	0	0	
Effect on Ecosystems	7%	0	-1	Pipeline construction will impact terrestrial ecosystem.
Social				
Acceptability	17%	0	0	
Heritage/Recreational	17%	0	0	
Total Weighted Score		**0.8**	**-0.7**	

Multi-Criteria Analysis Scoring Criteria

Criteria: Net Present Cost

Score	Descriptor
-5	>$3250 /ML
-4	$3000-3250 /ML
-3	$2750 3000 /ML
-2	$2500-2750 /ML
-1	$2250-2500 /ML
0	$2000-2250 /ML
1	$1750-2000/ML
2	$1500-1750 /ML
3	$1250-1500 /ML
4	$1000-1250 /ML
5	<$1000 /ML

Criteria: Effect on Regional GDP and development

Score	Descriptor
-5	Major Industry; 25% Immediate output reduction
-4	Major Industry; 10% Immediate output reduction
-3	Minor Industry; 25% Immediate output reduction
-2	Minor Industry; 10% Immediate output reduction
-1	Minor or Major Industry; Negative Impact to Potential Growth Opportunities
0	Insignificant change to net regional production
1	Minor or Major Industry; Positive Impact to Potential Growth Opportunities
2	Minor Industry; 10% Immediate output expansion
3	Minor Industry; 25% Immediate output expansion
4	Major Industry; 10% Immediate output expansion
5	Major Industry; 25% Immediate output expansion

Criteria: Greenhouse Gas

Score	Descriptor
-5	*Extreme* increase (+100%) in unit GHG generation (t CO2e/ML) compared to existing system.
-4	*Significant* increase (+50%) in unit GHG generation (t CO2e/ML) compared to existing system.
-3	*Moderate* increase (+30%) in unit GHG generation (t CO2e/ML) compared to existing system.
-2	*Small* increase (+15%) in unit GHG generation (t CO2e/ML) compared to existing system.
-1	*Marginal* increase (+5%) in unit GHG generation (t CO2e/ML) compared to existing system.
0	Insignificant change (<5%) in unit GHG generation (t CO2e/ML) compared to existing system.
1	*Marginal* decrease (-5%) in unit GHG generation (t CO2e/ML) compared to existing system.
2	*Small* decrease (-15%) in unit GHG generation (t CO2e/ML) compared to existing system.
3	*Moderate* decrease (-30%) in unit GHG generation (t CO2e/ML) compared to existing system.
4	*Significant* decrease (-50%) in unit GHG generation (t CO2e/ML) compared to existing system.
5	*Extreme* decrease (-100%) in unit GHG generation (t CO2e/ML) compared to existing system.

Impact on environmental flow objectives

Score	Descriptor
-5	*Extreme decline* in River Health from reduced flows.
-4	*Significant decline* in River Health from reduced flows.
-3	*Moderate decline* in River Health from reduced flows.
-2	*Small decline* in River Health from reduced flows.
-1	*Marginal decline* in River Health from reduced flows.
0	No change in flows and River Health from current conditions
1	*Marginal improvement* in River Health from improved flows.
2	*Small improvement* in River Health from improved flows.
3	*Moderate improvement* in River Health from improved flows.
4	*Significant improvement* in River Health from improved flows.
5	*Extreme improvement* in River Health from improved flows.

Impact on surface water, groundwater and marine water quality

Score	Descriptor
-5	*Extreme decline* in water quality with inability to meet existing beneficial uses all of the time.
-4	*Significant decline* in water quality with inability to meet existing beneficial uses for most of the time.
-3	*Moderate decline* in water quality with inability to meet existing beneficial uses some of the time.
-2	*Small decline* in water quality with inability to meet existing beneficial uses for limited periods.
-1	*Marginal decline* in water quality but continues to meet existing beneficial uses all of the time.
0	No change in water quality and beneficial uses from current conditions
1	*Marginal improvement* in water quality for existing beneficial uses all of the time.
2	*Small improvement* in water quality with ability to meet additional beneficial uses for limited periods.
3	*Moderate improvement* in water quality with ability to meet additional beneficial uses some of the time.
4	*Significant improvement* in water quality with ability to meet additional beneficial uses most of the time.
5	*Extreme improvement* in water quality with ability to meet additional beneficial uses all of the time.

Effect on terrestrial ecosystems

Score	Descriptor
-5	Extreme loss of significant Ecological Vegetation Classes
-4	Significant loss of a significant Ecological Vegetation Classes
-3	Moderate loss of a significant Ecological Vegetation Classes
-2	Small loss of a significant Ecological Vegetation Classes
-1	Marginal loss of a significant Ecological Vegetation Classes
0	No change from current conditions
1	Marginal gain in a significant Ecological Vegetation Classes
2	Small gain in a significant Ecological Vegetation Classes
3	Moderate gain in a significant Ecological Vegetation Classes
4	Significant gain in a significant Ecological Vegetation Classes
5	Extreme gain in a significant Ecological Vegetation Classes

Social Acceptability

Score	Descriptor
-5	*Extreme opposition* by the community.
-4	*Significant opposition* by the community.
-3	*Moderate opposition* by the community.
-2	*Small opposition* across the community.
-1	*Marginal opposition* within the community.
0	Option is neither supported nor opposed by the community.
1	*Marginal support* across the community.
2	*Small support* across the community.
3	*Moderate support* by the community.
4	*Significant support* by the community.
5	*Extreme support* by the community.

Cultural, heritage and recreational values

Score	Descriptor
-5	*Extreme decline* in cultural, heritage or recreational values.
-4	*Significant decline* in cultural, heritage or recreational values.
-3	*Moderate decline* in cultural, heritage or recreational values.
-2	*Small decline* in cultural, heritage or recreational values.
-1	*Marginal decline* in cultural, heritage or recreational values.
0	No change from current conditions
1	*Marginal improvement* in cultural, heritage or recreational values.
2	*Small improvement* in cultural, heritage or recreational values.
3	*Moderate improvement* Cultural, heritage or recreational values.
4	*Significant improvement* in cultural, heritage or recreational values.
5	*Extreme improvement* in cultural, heritage or recreational values.

Water Security Outlook

November 2011

Ovens and King Water Supply System

Ovens and King Water Supply System supplies water to the towns of:

Glenrowan, Moyhu, Oxley, Wangaratta, Whitfield

Ovens and King Water Supply System is supplied from the Ovens and King rivers

All of our supply systems have different sources of water and supply constraints. Please ensure you read the Water Security Outlook relevant to your town

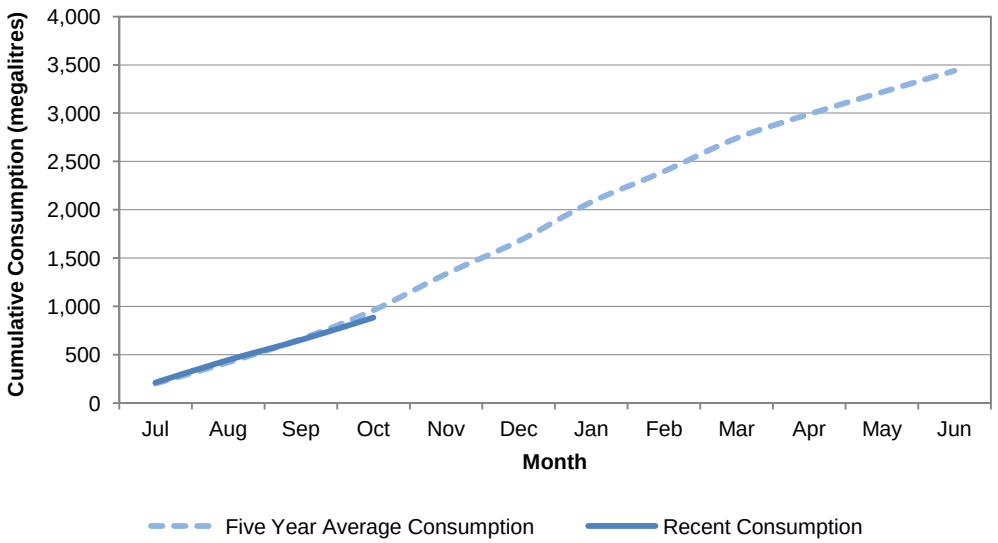
Water Supply Information

Water resources held by North East Water for the Ovens and King Water Supply System.

Water Component	Entitlement	Volume Extracted 2011-12	Volume Remaining 2011-12
Ovens BE	12,794 ML	1,010 ML	11,784 ML
Glenrowan BE	90 ML	0 ML	90 ML
Whitfield BE	34 ML	2 ML	32 ML
Groundwater	705 ML	36 ML	669 ML
Other	100 ML	0 ML	100 ML
Total Water Resources Available as at 1 November 2011			12,675 ML

Water Consumption

Ovens and King Water Supply System monthly actual water consumption versus historical consumption.



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NORTH EAST WATER

Further System Information:

- Ovens and King Water Supply System towns are on Permanent Water Savings Plan
- Lake Buffalo which supplies the Ovens River was at full supply level as at 1 November 2011
- Lake William Hovell which supplies the King River was at full supply level as of 1 November 2011
- Goulburn-Murray Water is the resource manager for the Ovens and King rivers
- Goulburn-Murray Water can enact water restrictions on Ovens and King system rural customers when storages are below target filling curves. If this occurs, North East Water must also enact water restrictions for our urban customers
- 1 megalitre (ML) is equivalent to 1,000,000 litres (approximately one Olympic sized swimming pool)

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Climate Conditions

Forecast climate conditions for the coming three months based on Bureau of Meteorology climate information.

Chance of Exceeding Median Rainfall	Chance of Exceeding Median Maximum Temperature	Likely Climate Scenario
55%	75%	Average

Wet	Conditions that have a 90% chance of exceeding median rainfall
Average	Conditions that have a 50% chance of exceeding median rainfall
Dry	Conditions that have a 10% chance of exceeding median rainfall

Urban Water Restrictions Outlook

Goulburn-Murray Water is the resource manager for Lake Buffalo and Lake William Hovell. Inflows to both storages were exceeding the minimum inflow requirements as at 1 November 2011.

Forecast urban water restriction levels based on volume in storage outlook and Bureau of Meteorology climate information are outlined below to 1 February 2012.

Climate Scenario	Outlook
	1 February 2012
Wet	PWSP
Average	**PWSP**
Dry	PWSP

PWSP	Permanent Water Savings Plan

The information provided in this Water Security Outlook is intended as a guide only. A new Water Security Outlook will be issued if conditions change during this outlook period.