

APPENDIX 1: INTERIM REPORT 1 – EXISTING TOWN WATER RESOURCES AND DEMAND

Northern Rivers Regional Bulk Water Supply Strategy

Interim Report 1 – Existing Water Sources and Demand

December 2012

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PROJECT 12-025– NOROC REGIONAL BWSS – INTERIM REPORT 1

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EXECUTIVE SUMMARY

The Northern Rivers Regional Organisation of Councils (NOROC) has resolved to develop a long-term (50-year) regional water supply strategy incorporating integrated water cycle management approaches. The Regional Bulk Water Supply Strategy (BWSS) is required to investigate and develop potential regional options for the future supply of water to the towns, villages and new development areas in the Local Government Areas (LGAs) of:

- Ballina Shire;
- Byron Shire;
- Kyogle;
- Lismore City;
- Richmond Valley; and
- Tweed Shire.

The first stage of the project (this report) is to identify the status of the existing water resources and current demand for water.

The Northern Rivers water supplies serve approximately 80,000 residential properties and 7,000 non-residential connections with a current regional demand of approximately 23,000 ML/a.

The major sources of water are Rocky Creek Dam and Clarrie Hall Dam providing 48% and 38% of the region's water supply volume respectively. These larger centralised water sources also serve the majority of the study area population over the longest distribution systems. There are also many smaller water sources serving the towns and villages within the study area.

Some data on water supply secure yield exists for the region although there are significant uncertainties regarding environmental flow requirements, water demand and the impact of restrictions as well as modelling methodologies. The current secure yield of the region's water sources is estimated to be 32,000 ML/a, indicating a significant supply surplus when considering the total study area.

The water sources within the study area are listed in Table 1 and the demand in each supply system is compared to the secure yield in Table 2. Figure 1 illustrates the regional water sources, supply systems and current potable supply and demand.

This Interim Report has generally provided good data as the basis for the next steps in the development of the regional BWSS. While climate appears to contribute to the variability in demand, the major climatic and non-climatic influences on demand variability have not been established. Therefore it will be necessary to consider the potential demand variability in the prediction of long-term demand.

The next stage of the Regional BWSS will involve the development of a long-term (50 year) demand forecast for the region. The forecast demand will then be compared to the expected future secure yield. The Regional BWSS will consider potential options for meeting the long-term regional demand with particular consideration of options for regional integration.

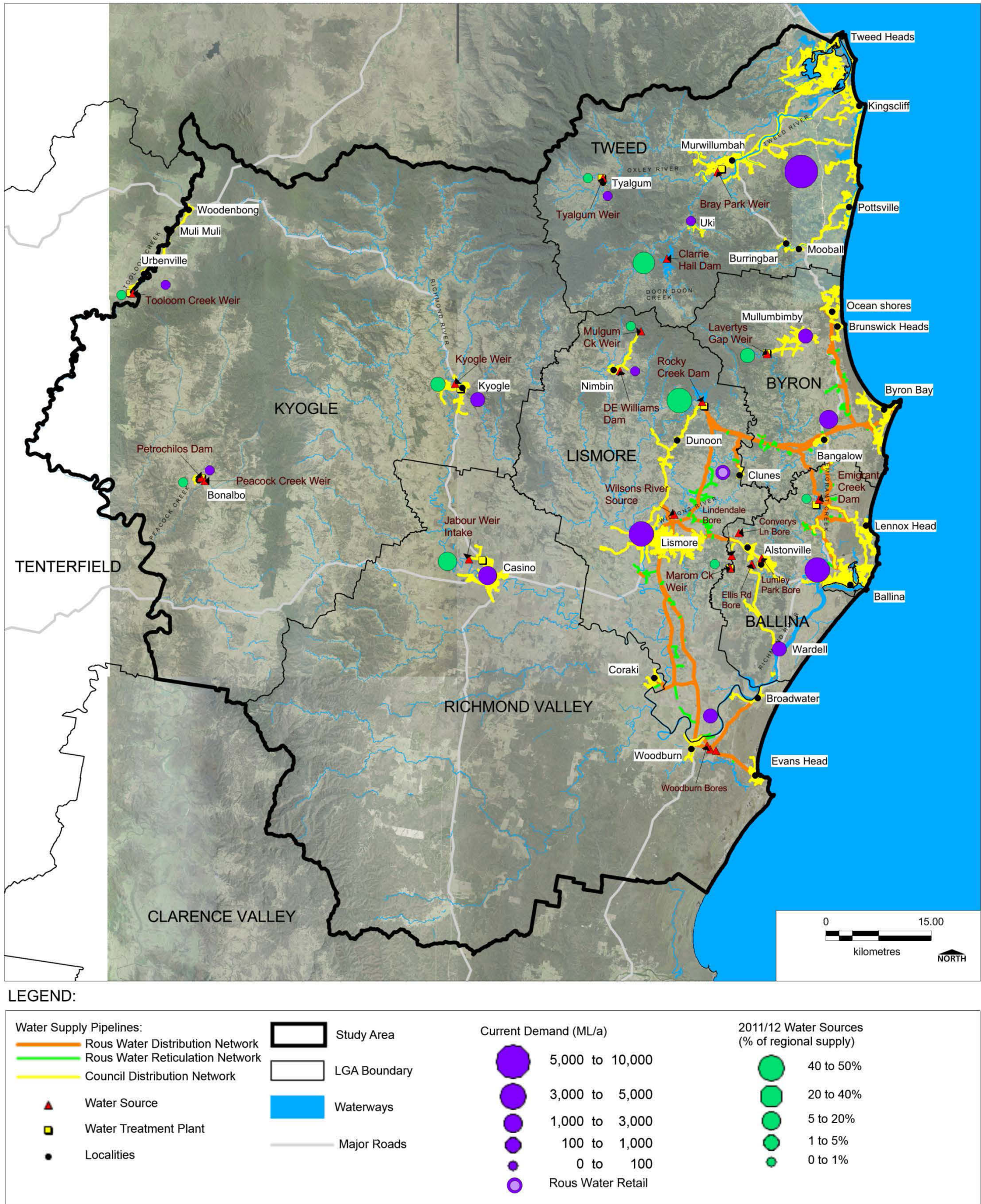


Figure 1: Northern Rivers Regional Water Sources and Current Supply and Demand

Table 1: Regional Water Sources

Water Supply System	Water Source	Water Sourced in 2011/12 (ML/a)	% of total study area
<i>Rous Water</i>			
Rous Water bulk supply	Rocky Creek Dam	11,121	48.2 %
	Emigrant Creek Dam	6	0.03 %
	Wilson's River Source	-	-
	Converys Lane bore	-	-
	Lumley Park bore	-	-
	Woodburn bores	-	-
<i>Total Rous Water Sources</i>		<i>11,127</i>	<i>48.3%</i>
<i>Kyogle Council</i>			
Kyogle	Kyogle weir	290	1.26%
Bonalbo	Peacock Creek weir	28	0.12%
	Bonalbo bores	6	0.02%
Woodenbong/Muli Muli	Toooloom Creek weir (bulk supply from Tenterfield Shire Council)	52	0.22%
<i>Total Kyogle Council sources</i>		<i>374</i>	<i>1.62%</i>
Nimbin	Mulgum Creek weir	63	0.77%
Casino	Jabour weir	2,180	9.46%
Wardell	Marom Creek Weir	119	0.52%
Mullumbimby	Lavertys Gap Weir	358	1.55%
<i>Tweed Shire Council</i>			
Tweed District/Uki	Clarrie Hall Dam/Bray Park weir	8,808	38.2%
Tyalgum	Tyalgum weir	22	0.10%
<i>Total Tweed Shire Council sources</i>		<i>8,830</i>	<i>38.3%</i>
Total Study Area		23,052	100%

Table 2: Study Area Demand and Supply Yield

Water Supply	Current Residential Connections	Current Non-Residential Connections	Total Current Demand (ML/a)	Current Secure Yield (ML/a)	Current Supply Surplus (ML/a)
Ballina bulk supply	12,967	1,489	3,501	14,600	3,735
Byron bulk supply	8,853	1,134	2,374		
Lismore bulk supply	13,000	1,268	3,397		
RVC bulk supply (MLRR)	2,323	274	651		
Rous Water retail	2,229	-	756		
Rous Water unmetered water	-	-	187		
Kyogle	1,182	203	304	320	16
Bonalbo	148	44	34	52	18
Woodenbong/Muli Muli	189	47	52	83	31
Tweed District	32,468	1,704	9,381	13,750	4,318
Uki	173	7	51		
Tyalgum	102	12	31	120	89
Mullumbimby	1482	197	378	435	57
Wardell	284	28	123	N/A	N/A
Nimbin	247	68	60	101	41
Casino	4,070	453	2,338	2,525	187
<i>Total Region</i>	<i>79,717</i>	<i>6,928</i>	<i>23,619</i>	<i>Approx. 32,000</i>	<i>Approx. 8,500</i>

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1. INTRODUCTION

The Northern Rivers Regional Organisation of Councils (NOROC) aims to increase tangible benefits to member Councils through enhanced resource and capacity sharing programs. These programs aim to deliver efficiencies and cost savings for NOROC member Councils and promote local government innovation and excellence.

The NOROC member councils have identified the need for a cooperative approach to water supply within the region including innovative resource sharing initiatives. The NOROC Water Managers Group has developed a Memorandum of Understanding (MOU) to provide a foundation for developing a voluntary, cooperative partnership between the member Councils to deliver best practice water supply and sewerage services to the Northern Rivers region of New South Wales and to optimise shared resources (staff, equipment, materials, specialist knowledge and capabilities). A targeted objective under this MOU is the development of a long-term (50-year) regional water supply strategy incorporating integrated water cycle management approaches.

In recognition of the benefits of resource sharing, NOROC has resolved to prepare a Bulk Water Supply Strategy (BWSS) for the Northern Rivers Region. The Strategy is required to investigate and develop potential regional options for the future supply of water to the towns, villages and new development areas in the Local Government Areas (LGAs) of:

- Ballina Shire;
- Byron Shire;
- Kyogle;
- Lismore City;
- Richmond Valley; and
- Tweed Shire.

The study area is shown in Figure 2.

The Regional BWSS will consider the long term demand and water supply security of the existing serviced areas as well as the water supplies for the decentralised systems in rural areas. The major stages of the strategy development are shown in Figure 3.

The first stage of the project (this report) is to identify the status of the existing water resources and current demand for water. Data and information have been collected from the NOROC member councils to develop an understanding of:

- Existing water supply infrastructure;
- Existing number and type of water supply connections;
- Historical water extraction; and
- Historical water consumption (customer sales).

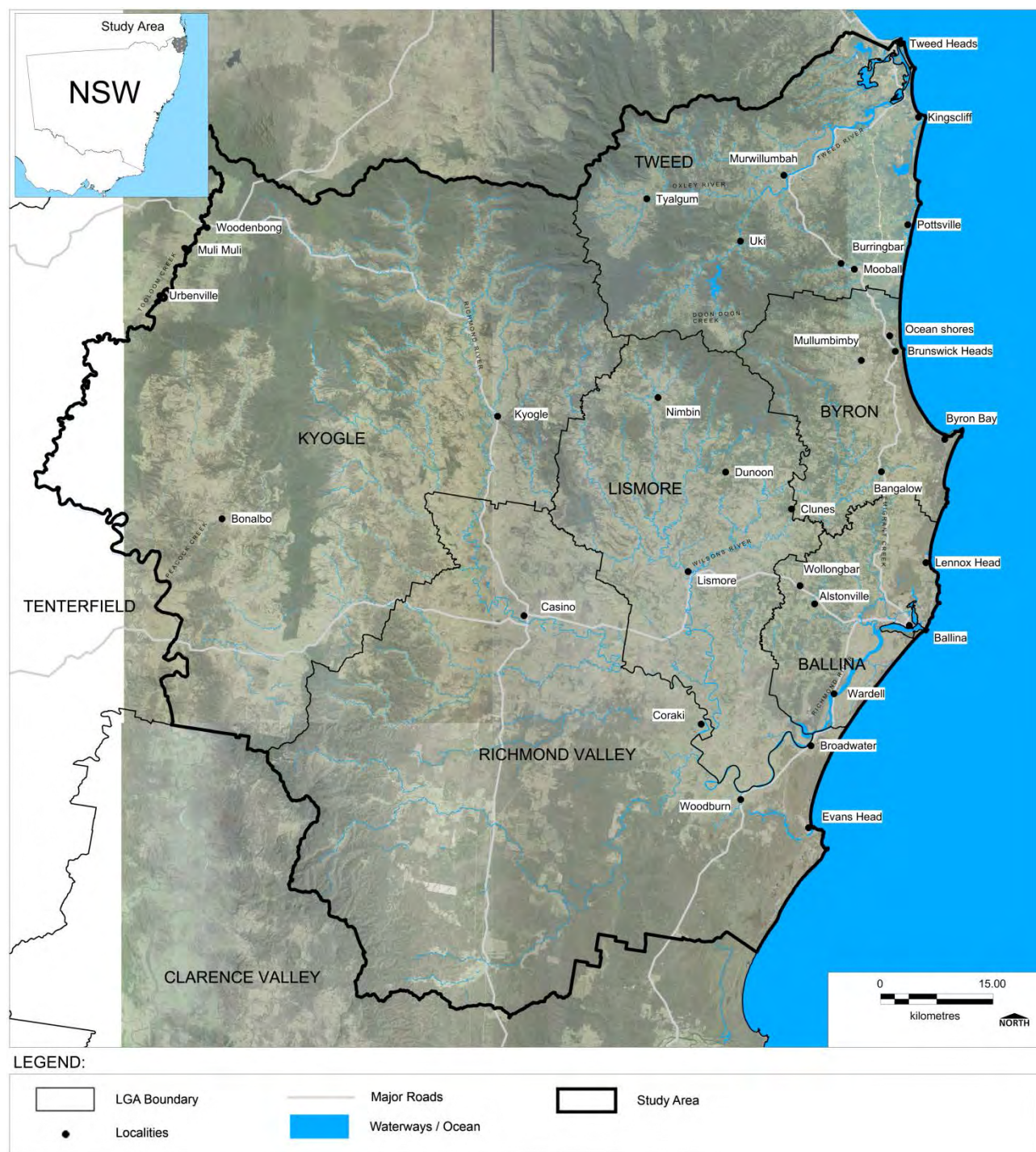


Figure 2: Northern Rivers Regional Bulk Water Supply Strategy Study Area

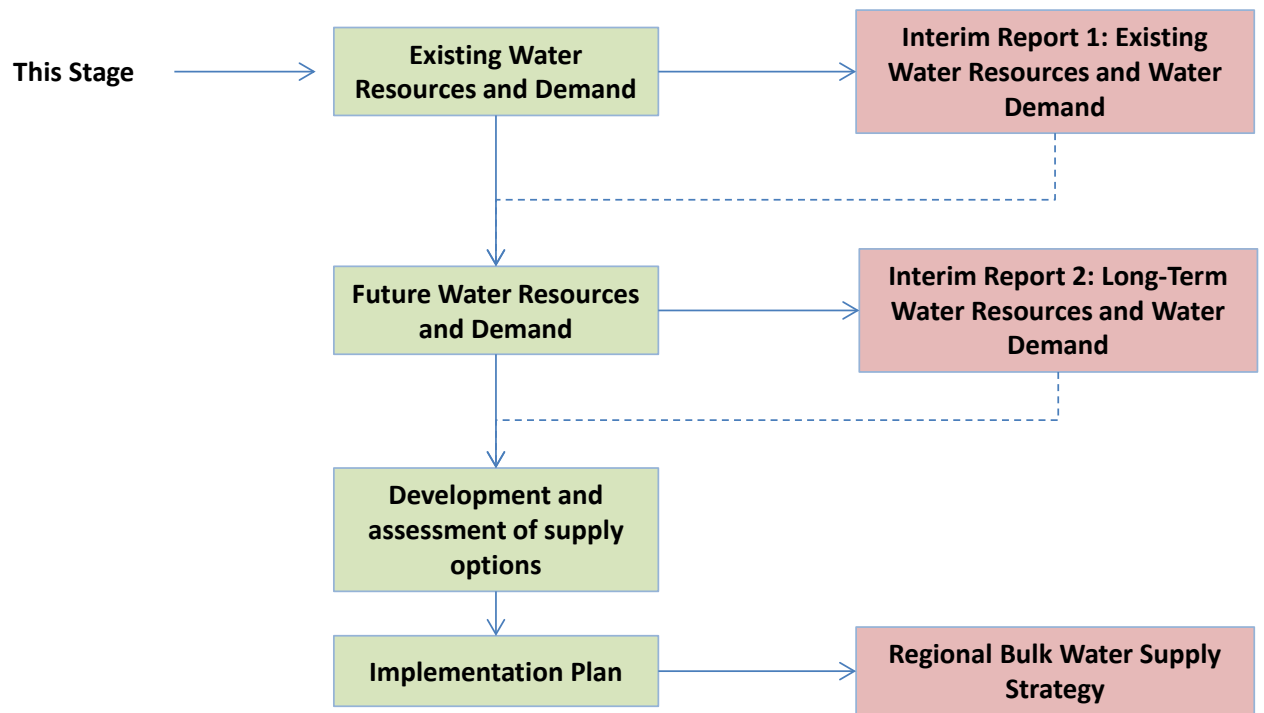


Figure 3: Regional BWSS Development Process

2. EXISTING WATER RESOURCES

The existing town water supplies in the study area are discussed in the following sections.

2.1 Rous Water

2.1.1 Potable Bulk Supply

Rous Water is a special purpose council under the Local Government Act (1993). Rous Water provides bulk water to four local water utilities (LWUs) on the far north coast of NSW, servicing the urban areas of the following LGAs:

- Ballina Shire Council, excluding Wardell;
- Byron Shire Council, excluding Mullumbimby;
- Lismore City Council, excluding Nimbin; and
- Richmond Valley Council, excluding Casino and all land west of Coraki.

These LWUs are referred to as Rous Water's Constituent Councils and are responsible for the distribution and reticulation services from the bulk water meters to customers within their own LGAs. Rous Water is responsible for the construction, extension, protection, maintenance, control and management of bulk water supply works within these areas as well as supply security planning.

Rous Water's bulk water supply network extends from Ocean Shores in the north and Byron Bay in the east, west to Lismore and south across the Richmond River near Woodburn to Evans Head as shown in Figure 4. The principal component of the Rous Water bulk supply network is Rocky Creek Dam, situated 25 km north of Lismore near the village of Dunoon.

Water from Rocky Creek Dam is treated at the Nightcap WTP and is distributed through three trunk mains owned and operated by Rous Water. One trunk main delivers water to Lismore and to the Richmond Valley area. The other two mains supply Byron Bay and Ballina Shires. Water from Emigrant Creek Dam is treated at the Emigrant Creek WTP and is distributed to supplement supplies to Ballina and Lennox Head (refer Figure 4).

Surface waters are the primary water resource utilised by Rous Water (refer Table 3 to Table 5) although there are also some groundwater sources available for use during dry periods. During periods of low rainfall, Rous Water also utilises Ballina Shire Council's plateau groundwater bores (refer Section 2.2.1).

As part of its Future Water Strategy, Rous Water is currently investigating the current and potential future secure yield of the Rous Water regional supply. The secure yield is defined as the highest annual water demand that can be supplied from a water supply headworks system whilst meeting the 5/10/20 rule (restrictions no more than 5% of the time with a frequency of no more than 1 in 10 years and on average a 20% reduction in consumption). The current estimate of the secure yield of the Rous Water supply system, using the 5/10/20 rule, is 14,600 ML/a (Rous Water, 2012b).

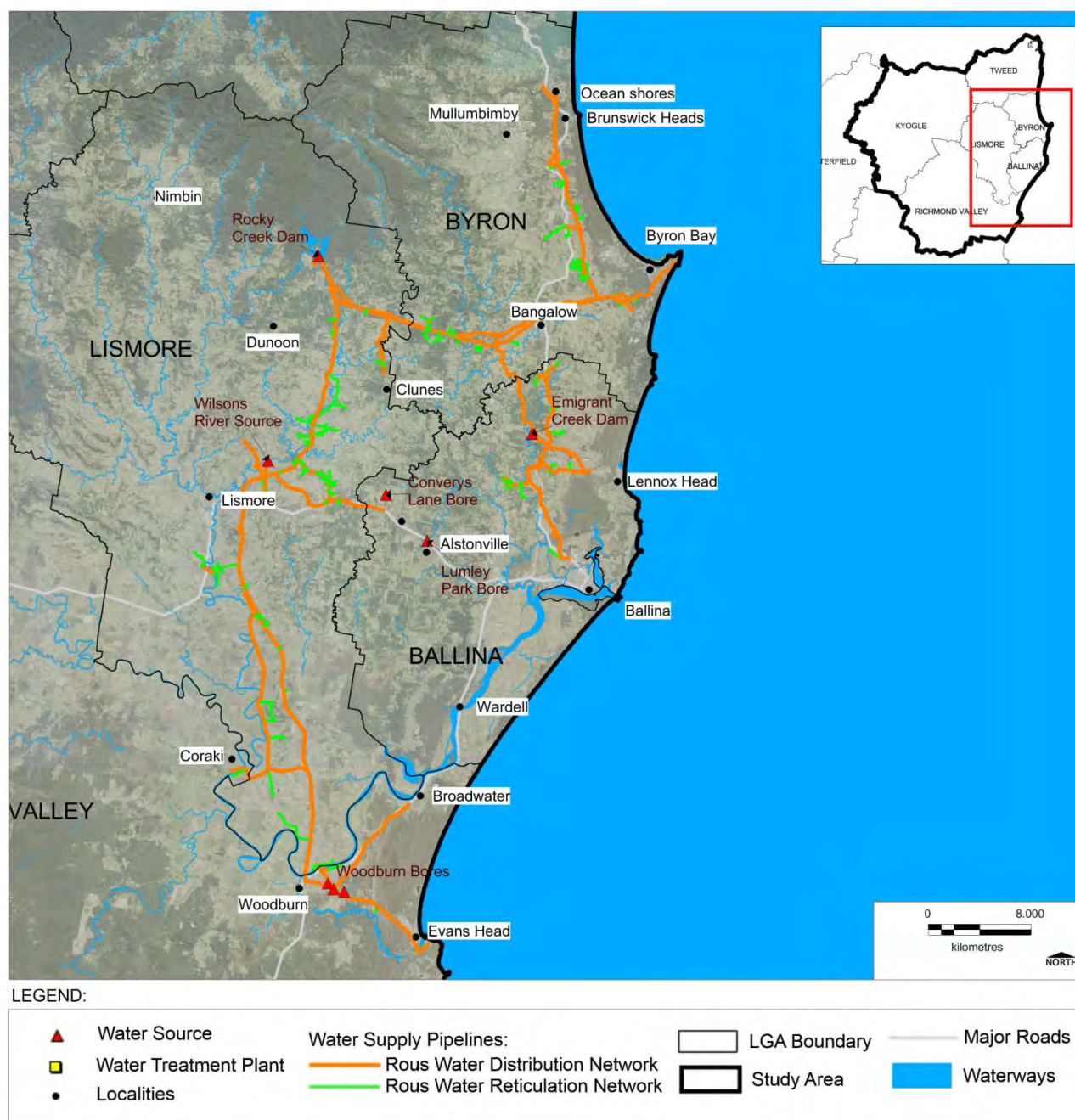


Figure 4: Rous Water Bulk Supply and Retail Supply System

Table 3: Rous Water Bulk Water Supplies

Details	Rocky Creek Dam	Emigrant Creek Dam	Wilsons River Source	Conveys Lane bore	Lumley Park bore	Woodburn bores	Prospect bores
Water Source ¹	Terania Creek	Alstonville Area	Wyrallah Area (Wilsons River)	Bangalow Groundwater	Alstonville Groundwater	Richmond Coastal Sands	Richmond Coastal Sands
Source Type	Large in-stream storage	Large in-stream storage	Run-of-river abstraction	Groundwater extraction	Groundwater extraction	Groundwater extraction	Groundwater extraction
Storage capacity	14,000 ML	820 ML	-	-	-	-	-

Details	Rocky Creek Dam	Emigrant Creek Dam	Wilsons River Source	Converys Lane bore	Lumley Park bore	Woodburn bores	Prospect bores
Area served	Lismore City, Richmond Valley, Ballina and Byron Shires	Ballina and Lennox Head	Lismore City, Richmond Valley, Ballina and Byron Shires	Alstonville, Wollongbar	Alstonville, Wollongbar (dry periods)	Woodburn, Evans Head, Broadwater (dry periods)	Not used
Water Treatment	Nightcap WTP (70 ML/d)	Emigrant Creek WTP (7.5 ML/d)	Nightcap WTP	Chlorination	Chlorination	Chlorination	Chlorination
Licence entitlement	12,358 ML/a ³	2,620 ML/a ³	5,400 ML/a ³	150 ML/a ⁴	530 ML/a ⁴	726 ML/a ^{2,3}	230 ML/a ^{2,3}
Secure Yield ⁵	14,600 ML/a						

1. As specified in the relevant Water Sharing Plan

2. Will be subject to Richmond River Coastal Sands Water Sharing Plan under preparation

3. Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources, 2010

4. Water Sharing Plan for the Alstonville Plateau Groundwater Sources, 2003

5. Combined yield. Source: Rous Water (2012b)

The operating rules for the Rous Water regional supply are shown in Table 4.

Table 4: Rous Water Bulk Water Supply Operating Rules

Rocky Creek Dam Supply Level	Status	Source Usage
100%	Normal Operation	Rocky Creek Dam only
95%		Start Wilsons River Source and Emigrant Creek Dam
60%	Dry Period Operation	Start Woodburn bores, Converys Lane bore
50%		
40%		Start Ballina Shire Council's plateau bores
30%		
20%	Emergency Operation	Start Wilson's River emergency extraction ¹
15%		
10%		

1. If an emergency operation regime needs to be started when Rocky Creek Dam is 20% full, permission would be requested to operate the Wilson's River Source out of its normal licensing conditions.

The water supplied by each source for the previous five years is given in Table 5.

Table 5: Rous Water Bulk Water Sources

Details	2007/08	2008/09	2009/10	2010/11	2011/12	Average (% of total sourced)
Rocky Creek Dam	9,077	10,341	10,732	11,066	10,987	96.1%
Emigrant Creek Dam	868	114	446	7	8	2.7%
Wilsons River Source	-	-	534	12	-	0.9%
Converys Lane bore	-	-	-	-	-	-

Details	2007/08	2008/09	2009/10	2010/11	2011/12	Average (% of total sourced)
Lumley Park bore	86	-	-	-	-	0.2%
Woodburn bores	46	-	-	-	-	0.1%
Total Sources	10,076	10,455	11,712	11,086	10,994	100%

2.1.2 Retail Supply

Rous Water also provides water supply services to approximately 2,000 rural and urban connections direct from the bulk supply system as shown on Figure 4.

2.1.3 Non-potable Supply

Rous Water commenced the development of a recycled water urban reuse facility at Perradenya near Caniaba in the Lismore City Council area. It was originally planned to include a water reclamation plant to treat all sewage generated within the village for non-potable reuse via dual reticulation. The properties in Perradenya/Caniaba have dual meters with the potential for future connection to a recycled water supply. Due to the cost of provision of recycled water, it is no longer Rous Water's intention to supply properties in Perradenya with recycled water for dual reticulation.

2.2 Ballina Shire Council

2.2.1 Potable Supply

Ballina Shire Council operates a potable water supply system for the Wardell area and is supplied with bulk water by Rous Water for the remainder of the water supply areas in the Shire (refer Table 6 and Figure 5). Ballina Shire Council is responsible for the distribution and reticulation systems from the bulk supply meters and Bicentennial Gardens water wheels to consumers' taps.

Rous Water also supplies water directly to rural customers along its trunk mains within the LGA (refer Section 2.1.2).

Table 6: Ballina Shire Council Potable Water Supplies

Details	Rous Water bulk supply – Knockrow Reservoir	Rous Water bulk supply – Wollongbar/ Alstonville Reservoir	Wardell/ Cabbage Tree Island	Lindendale bore	Ellis Road bore
Water Source ¹	Refer Table 3	Refer Table 3	Tuckean Area	Tuckean Groundwater	Alstonville Groundwater
Source Type	Bulk supply	Bulk supply	Weir pool	Groundwater extraction	Groundwater extraction
Storage capacity	Refer Table 3	Refer Table 3	Marom Creek Weir (unknown)	-	-
Area served	Ballina Heights, North Ballina, West Ballina, Ballina Island, East Ballina, Lennox Head as well as some rural connections	Wollongbar, Russellton and Alstonville as well as some rural connections	Meerschaum Vale, Wardell, Cabbage Tree Island and some rural customers	Meerschaum Vale, Wardell, Cabbage Tree Island and some rural customers (drought supply)	Meerschaum Vale, Wardell, Cabbage Tree Island and some rural customers (drought supply)

Details	Rous Water bulk supply – Knockrow Reservoir	Rous Water bulk supply – Wollongbar/ Alstonville Reservoir	Wardell/ Cabbage Tree Island	Lindendale bore	Ellis Road bore
Water Treatment	Refer Table 3	Refer Table 3	Marom Creek WTP (unknown capacity)	Chlorination	Chlorination
Licence entitlement	Refer Table 3	Refer Table 3	320 ML/a ²	200 ML/a ³	350 ML/a ³
Current Secure Yield	Refer Table 3	Refer Table 3	Unknown	Unknown	Unknown

1. As specified in the relevant Water Sharing Plan

2. Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources, 2010

3. Water Sharing Plan for the Alstonville Plateau Groundwater Sources, 2003

Ballina Shire Council also holds extraction licences for two investigation bores near Lennox Head which produce brackish water licensed for extraction of 388 ML/a each (NSW Office of Water pers. comm.).

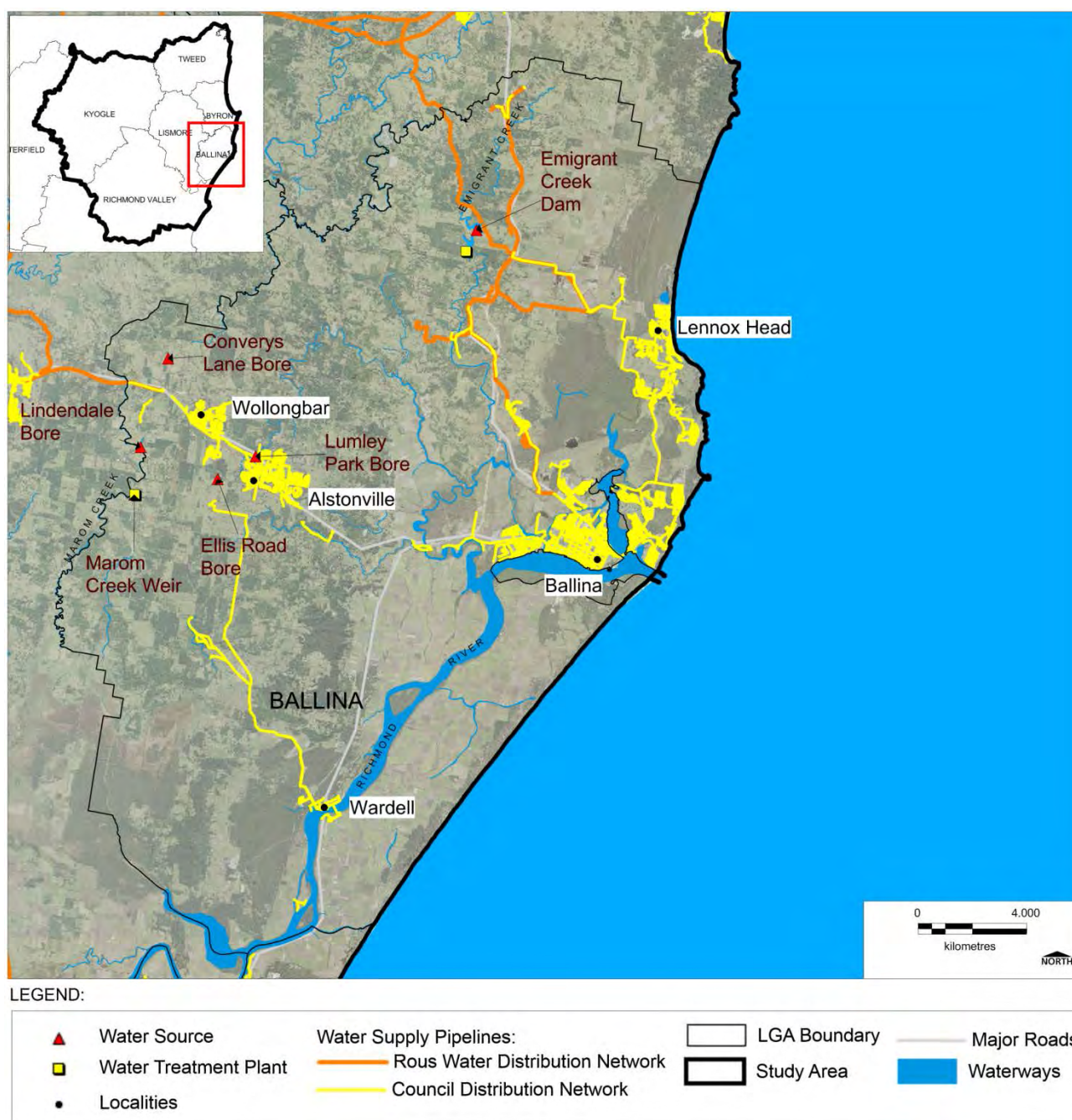


Figure 5: Ballina Shire Potable Water Supply Systems

2.2.2 Non-potable Supply

The Ballina Shire Urban Water Management Strategy (UWMS) outlines the long-term direction for the policies, planning and infrastructure required to support the integrated urban water cycle management objectives for Ballina Shire. A major component of the UWMS is currently being implemented through the Ballina-Lennox Head Recycled Water Master Plan. The Master Plan includes initiatives for long-term management of wastewater from existing and projected future urban developments in the Ballina-Lennox Head area. The Master Plan includes the following water supply elements:

- Recycled Water Treatment Plants to further treat the water coming from the upgraded Ballina and Lennox Head Wastewater Treatment Plants to a very high standard suitable for residential and open public space reuse;
- Urban dual reticulation for most new development areas to supply toilet flushing, cold water machine washing, car washing and garden watering demands; and

- Expansion of Council's existing urban open space irrigation from 36 hectares to an estimated 170 hectares by the year 2026.

All houses in new developments in the Ballina and Lennox Head area since 2003 have a dual water supply system or dual reticulation in place (refer Figure 6). At present the water in the second water supply (lilac piping and taps) has drinking water supplied to it. Recycled water is expected to be supplied through the system, to homes with dual water supplies in mid-2013, reducing the demand on the potable water supply.

In 2010/11, 2% of treated effluent (123 ML) was recycled for irrigation of public open space and a turf farm (NSW Office of Water, 2012). These effluent reuse opportunities do not contribute to potable water demand reduction apart from during periods of prolonged dry weather.

Urban stormwater is not reused in Ballina Shire apart from household rainwater tanks.

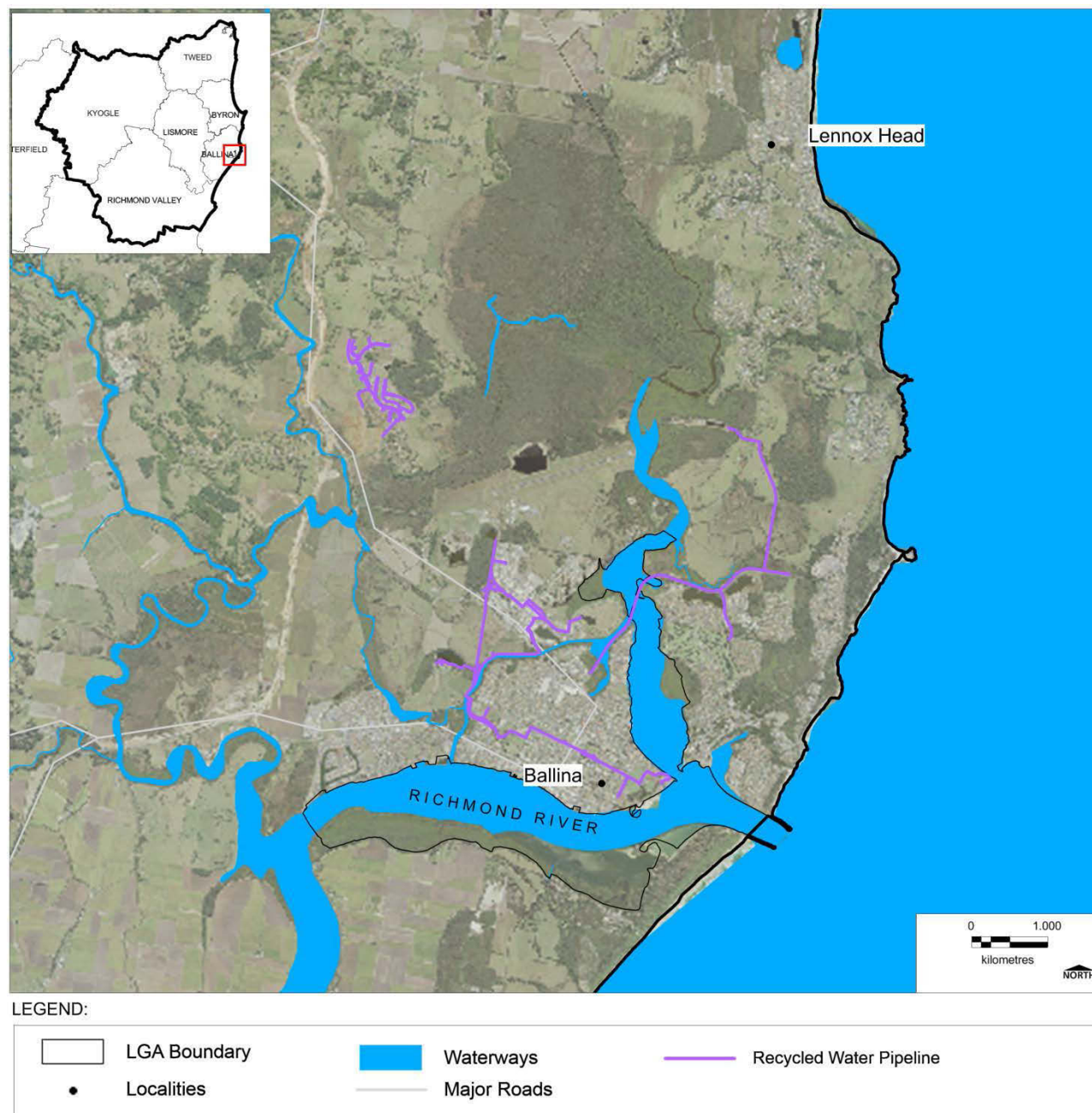


Figure 6: Ballina Shire Recycled Water Supply System

2.3 Byron Shire Council

2.3.1 Potable Supply

The Byron Shire water supply is comprised of five separate water supply systems serving the urban areas of the LGA (refer Table 7 and Figure 7). Byron Shire Council distributes water purchased from Rous Water through four separate distribution systems:

- Bangalow;
- Brunswick Heads;
- Byron Bay; and
- Ocean Shores.

The water supply for Mullumbimby is sourced from Lavertys Gap Weir in the Wilsons River sub-catchment of the Richmond River and treated at the Mullumbimby WTP. A pipeline also connects the Mullumbimby distribution system with the Rous Water bulk supply for emergency drought supply.

Rous Water also supplies water directly to rural customers along its trunk mains within the LGA (refer Section 2.1.2).

Table 7: Byron Shire Council Water Supplies

Details	Rous Water bulk supply	Mullumbimby	Rous Water bulk supply
Water Source ¹	Refer Table 3	Bangalow Area	Refer Table 3
Source Type	Bulk supply	Weir pool	Bulk supply
Storage capacity	Refer Table 3	Laverty's Gap Weir (136 ML) ³	Refer Table 3
Area served	Bangalow, Brunswick Heads, Byron Bay, Suffolk Park, Ocean Shores	Mullumbimby	Mullumbimby (emergency drought supply)
Water Treatment	Refer Table 3	Mullumbimby WTP (3.9 ML/d)	Refer Table 3
Licence entitlement	Refer Table 3	545 ML/a ²	Refer Table 3
Current Secure Yield	Refer Table 3	480 ML/a ⁴	Refer Table 3

1. As specified in the relevant Water Sharing Plan

2. Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources, 2010

3. Source: DPWS (1998a)

4. Source: JWP (2005) – using the 5/10/20 rule

2.3.2 Non-potable Supply

In 2010/11, 15% of treated effluent (489 ML) was recycled for agricultural uses and irrigation of playing fields and the Byron bowling club (NSW Office of Water, 2012). These users would be unlikely to irrigate with potable water during normal climate periods, but would rely on rainfall for irrigation. However, in prolonged dry weather, irrigation with town water may be required. Therefore, these effluent reuse opportunities do not contribute to significant potable water demand reduction apart from periods of prolonged dry weather.

Urban stormwater is not reused in Byron Shire apart from household rainwater tanks.

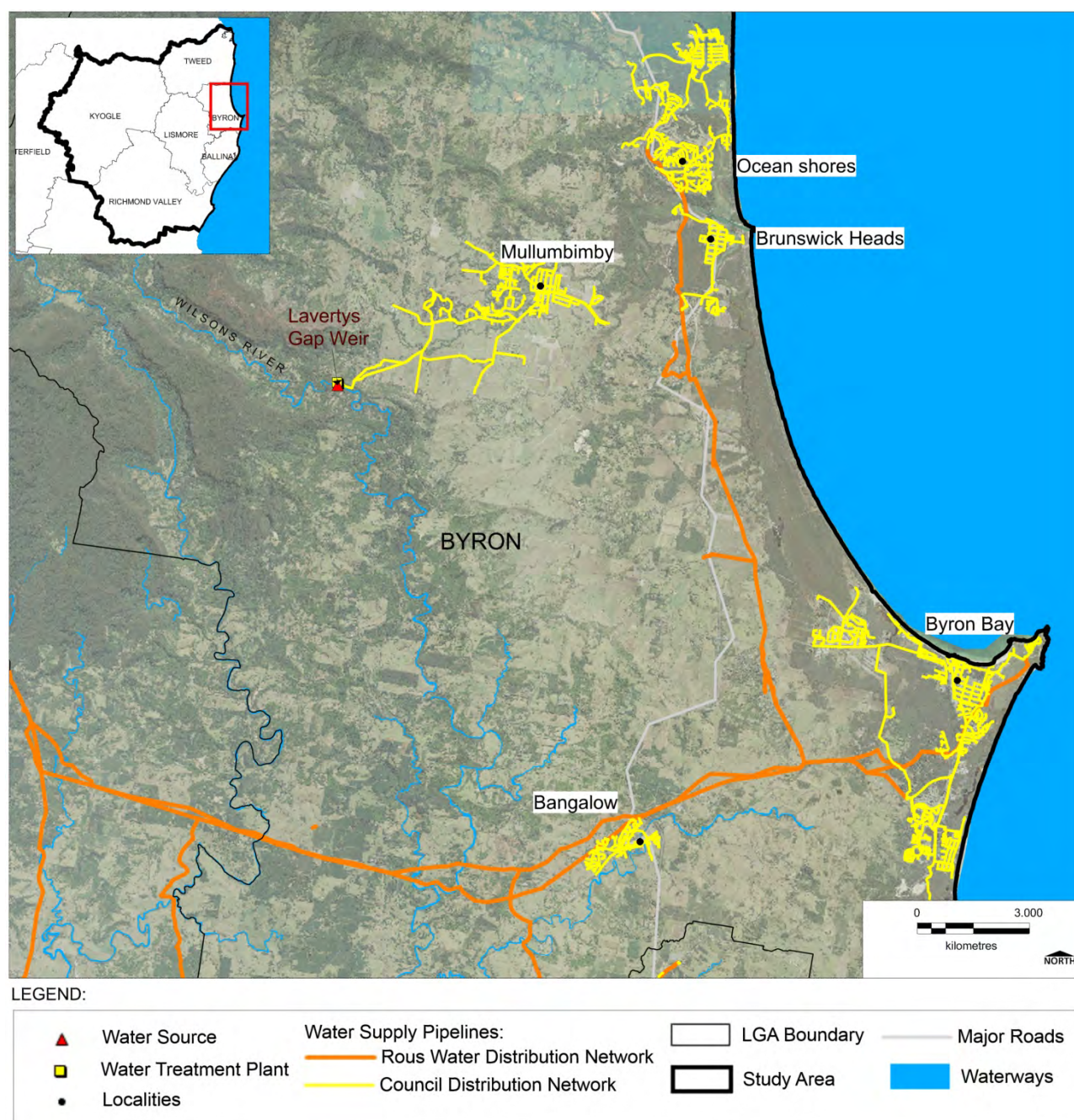


Figure 7: Byron Shire Water Supply Systems

2.4 Kyogle Council

2.4.1 Town Water Supply

Kyogle Council operates three water supply systems in Kyogle, Bonalbo, Woodenbong and the Aboriginal community of Muli Muli (refer Table 8 to Table 10, and Figure 8 to Figure 10). Bulk water is supplied by Tenterfield Shire Council for Woodenbong and Muli Muli.

Table 8: Kyogle Water Supplies

Details	Kyogle Weir	Kyogle bores	Toonumbar Dam
Water Source ¹	Kyogle Area (Richmond River)	Groundwater ²	Dead storage
Source Type	Weir pool	Groundwater	Large in-stream storage
Storage capacity	Kyogle weir (20 ML)	-	N/A ³
Area served	Kyogle	Kyogle (emergency supply)	Kyogle (emergency supply)
Water Treatment	Kyogle WTP (3.0 ML/d)		
Licence entitlement	564 ML/a ⁴	60 ML/a	N/A
Current Secure Yield	320 ML/a ⁵	-	N/A

1. As specified in the relevant Water Sharing Plan

2. Not subject to a Water Sharing Plan

3. Kyogle Council has approval to access the 240 ML of dead storage (that cannot be released from the dam) in the event of prolonged drought.

4. Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources, 2010

5. Source: DPWS (1999) using 5/10/20 rule

Table 9: Bonalbo Water Supplies

Details	Peacock Creek	Bonalbo Bores
Water Source ¹	Peacock Creek weir pool and Petrochilos Dam catchment	Groundwater
Storage capacity	Petrochilos Dam (45 ML)	-
Area served	Bonalbo	Bonalbo
Water Treatment	Bonalbo WTP (0.3 ML/d)	
Licence entitlement	85 ML/a	31 ML/a
Current Secure Yield	25 ML/a ²	27 ML/a ²

1. Not subject to a Water Sharing Plan

2. Source: Commerce (2005) – using 5/10/20 rule

Table 10: Woodenbong and Muli Muli Water Supplies

Details	Woodenbong and Muli Muli
Water Source ¹	Tooloom Creek
Storage capacity	Tooloom Creek weir pool (240 ML)
Area served	Woodenbong, Muli Muli and Urbenville ²
Water Treatment	Urbenville WTP (0.725 ML/d)
Licence entitlement ³	181 ML/a

Details	Woodenbong and Muli Muli
Current Secure Yield ⁴	83 ML/a

1. Not subject to a Water Sharing Plan
2. Joint water supply with Tenterfield Council
3. Total extraction licence entitlement held by Tenterfield Shire Council
4. The total secure yield of the Urbenville, Woodenbong and Muli Muli water supply scheme is 150 ML/a (using 5/10/20 rule, Source: DPWS, 1998b). The Kyogle Council (Woodenbong and Muli Muli) proportion is estimated at 83 ML/a (55%)

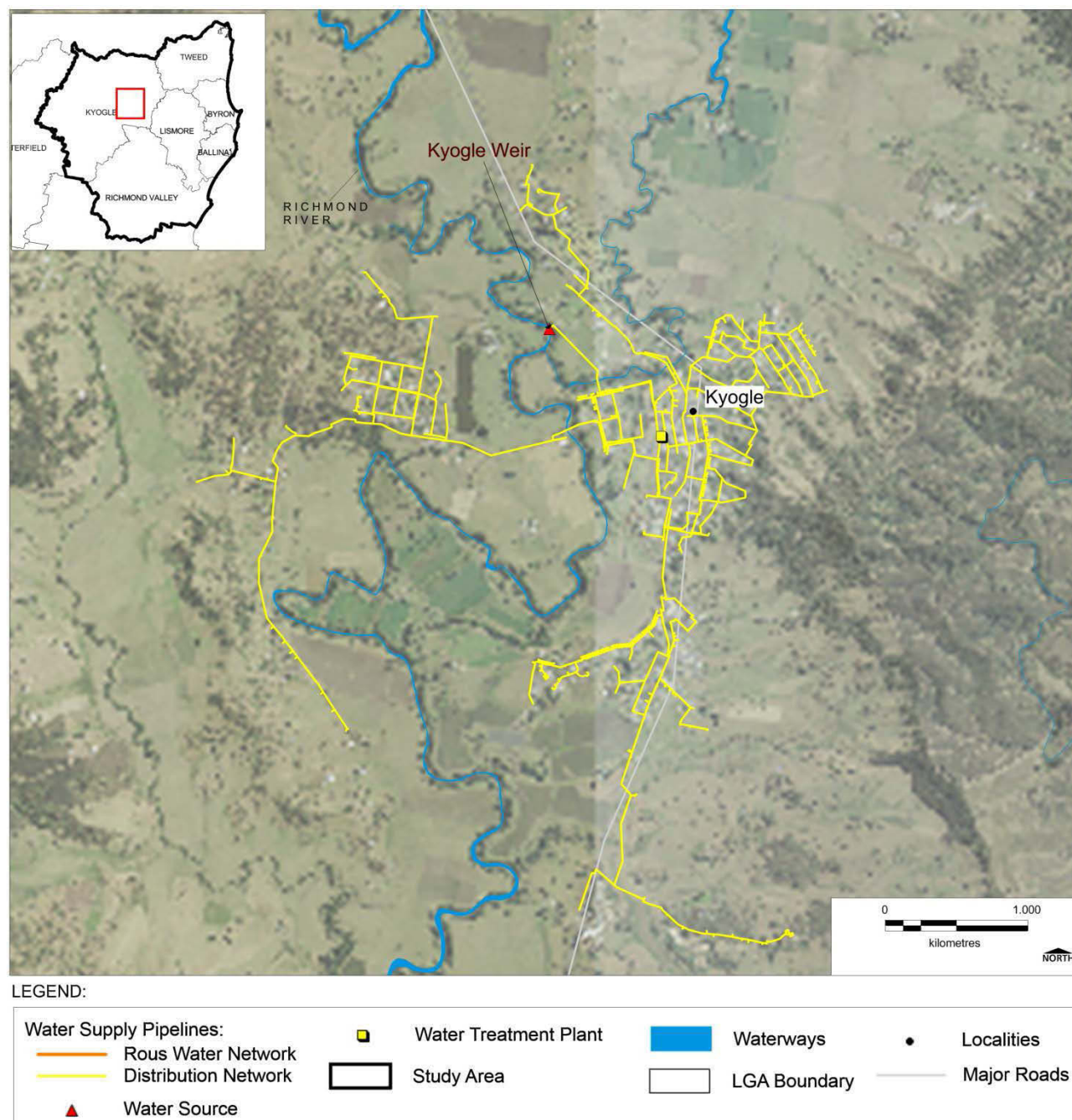


Figure 8: Kyogle Water Supply System

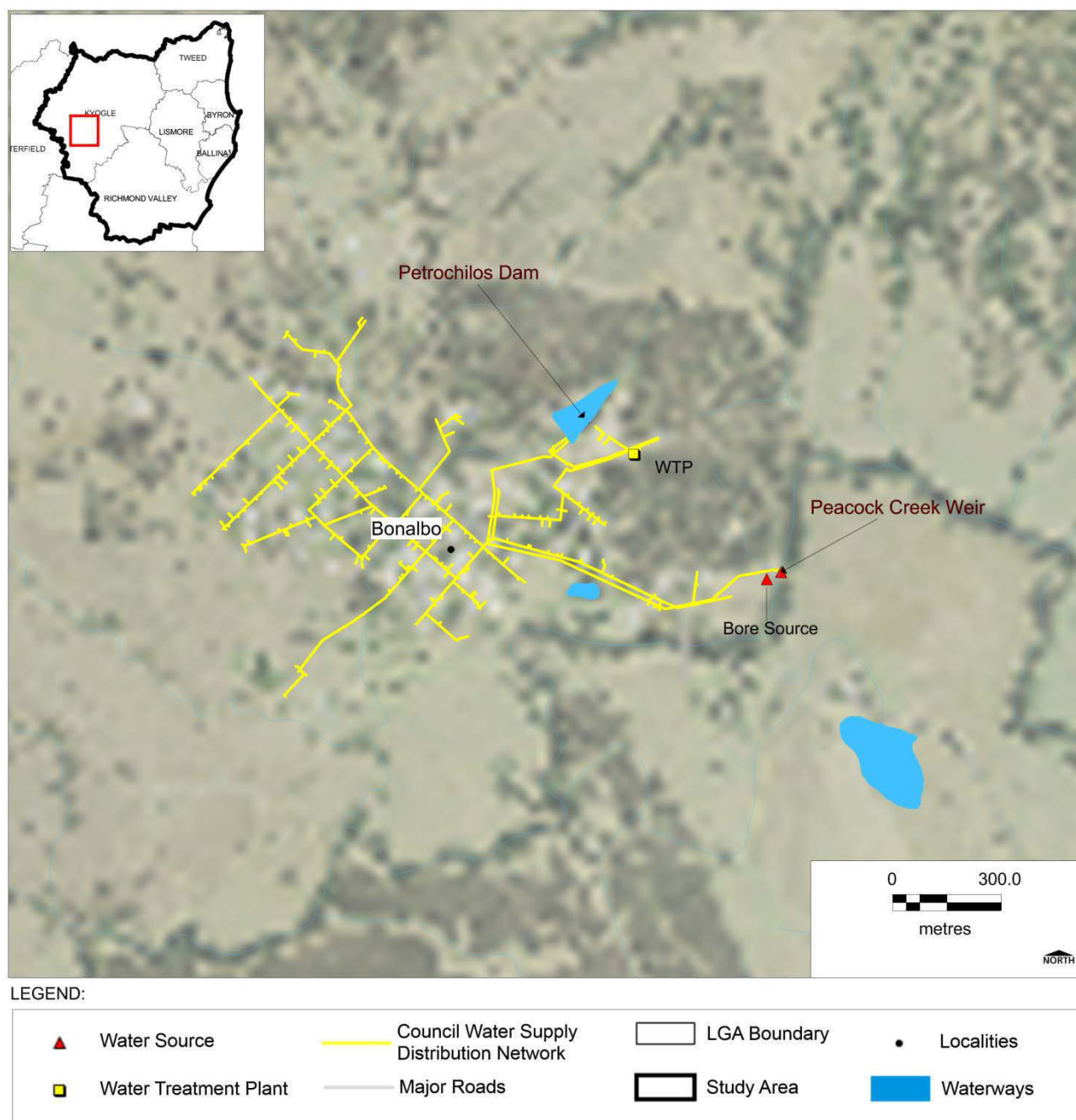


Figure 9: Bonalbo Water Supply System

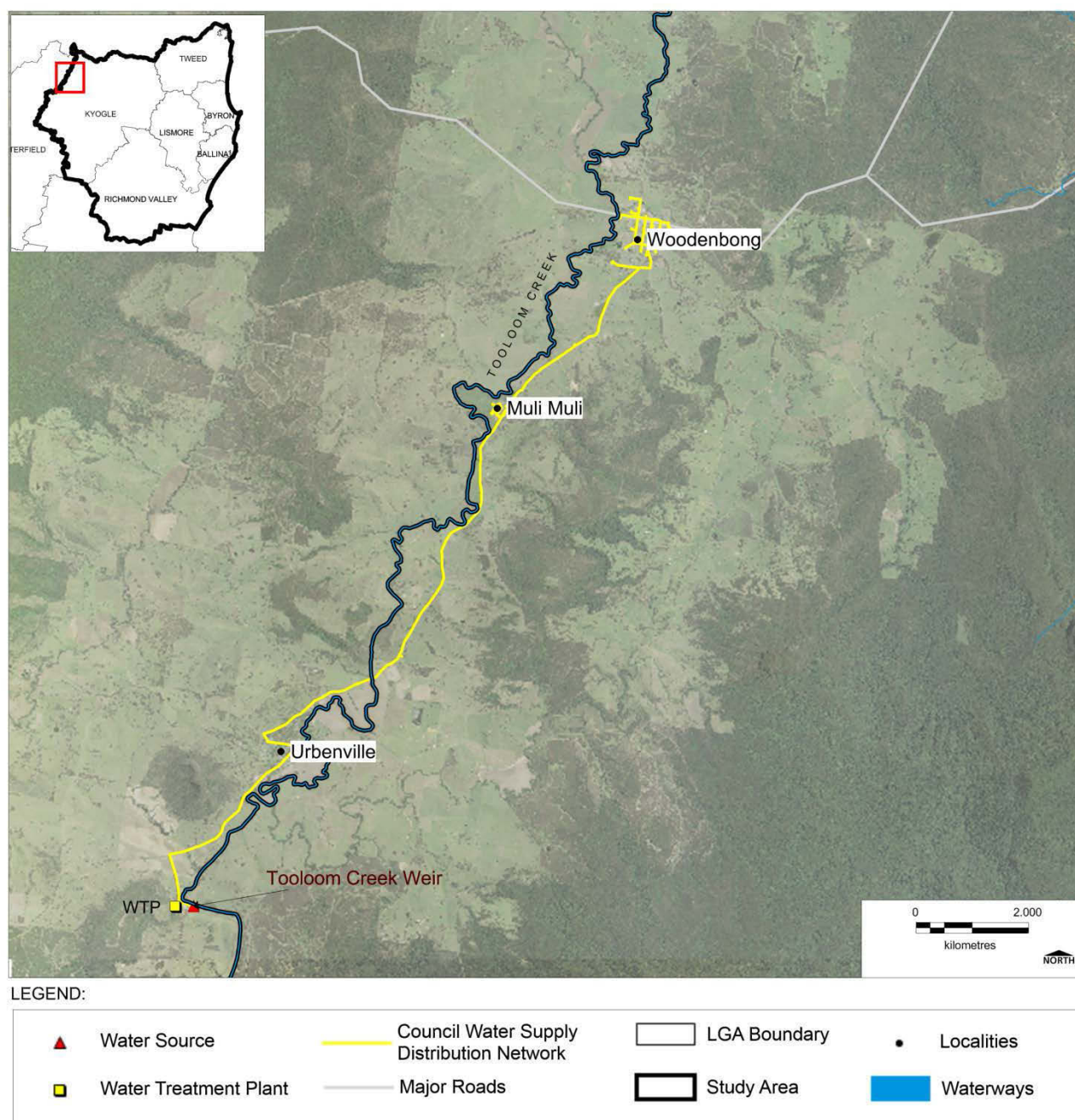


Figure 10: Urbenville, Woodenbong and Muli Muli Water Supply System

2.4.2 Non-potable Supply

In 2010/11, 3% of treated effluent (19 ML) was recycled (NSW Office of Water, 2012).

Treated effluent from the Kyogle STP is partially reused via a hydroponic wetland and the discharge is via a storage dam on the adjacent property where it is used to irrigate grazing pasture and crops when required. This same dam also provides stormwater detention and reuse from a small portion of the Kyogle urban area, as well as currently undeveloped land which is the site of a future industrial estate.

Tertiary treated effluent from both the Woodenbong and Bonalbo STPs is reticulated to the adjoining school agricultural plots and golf courses where it is used to irrigate both fairways and tees. These sites reuse 100% of the treated effluent during drier times, with limited reuse during periods of extended wet weather. These users would be unlikely to irrigate with potable water during normal climate periods where rainfall would be sufficient. In prolonged dry weather, it is likely that restrictions would prohibit the use of town water for irrigation.

These effluent reuse opportunities do not contribute to significant potable water demand reduction apart from periods of dry weather.

Urban stormwater is also used to irrigate parts of the Bonalbo golf course and adjoining sports field and there are a significant number of household rainwater tanks, particularly in the villages of Bonalbo and Woodenbong.

2.5 Lismore City Council

2.5.1 Potable Supply

Reticulated water is available in all urban centres within Lismore LGA. LCC is responsible for five water supply systems (refer Table 11, Figure 12 and Figure 12):

- Lismore City;
- Dunoon / Modanville / The Channon / Dunoon Road;
- Clunes;
- North Woodburn; and
- Nimbin.

Rous Water is the bulk water supplier to each of the towns within Lismore LGA except for Nimbin, which has its own supply from Mulgum Creek weir. Rous Water also supplies water directly to rural customers along its trunk mains within the LGA (refer Section 2.1.2).

Approximately 80 rural customers are connected to LCC's trunk main between the Mulgum Creek weir and DE Williams dam. To improve dam turnover and water quality, water from the weir is recycled through the dam. Approximately 220 town customers in Nimbin receive water from the dam that has been re-chlorinated.

Table 11: Lismore City Council Water Supplies

Details	Rous Water bulk supply	Nimbin
Water Source ¹	Refer Table 3	Terania Creek
Source Type	Bulk supply	Weir pool and off-stream storage
Storage capacity	Refer Table 3	Mulgum Creek Weir (0.7 ML) and DE Williams dam (25 ML)
Area served	Lismore City, Dunoon, Modanville, The Channon, Dunoon Road, Clunes, North Woodburn	Nimbin
Water Treatment	Refer Table 3	Chlorination
Licence entitlement	Refer Table 3	133 ML/a ²
Current Secure Yield	Refer Table 3	63-157 ML/a ³

1. As specified in the relevant Water Sharing Plan

2. Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources, 2010

3. Source: DPWS, 2002. Secure yield scenarios are provided for existing operation, 6L/s riparian release and calibrated flow sequences. Assumes 5/10/20 rule.

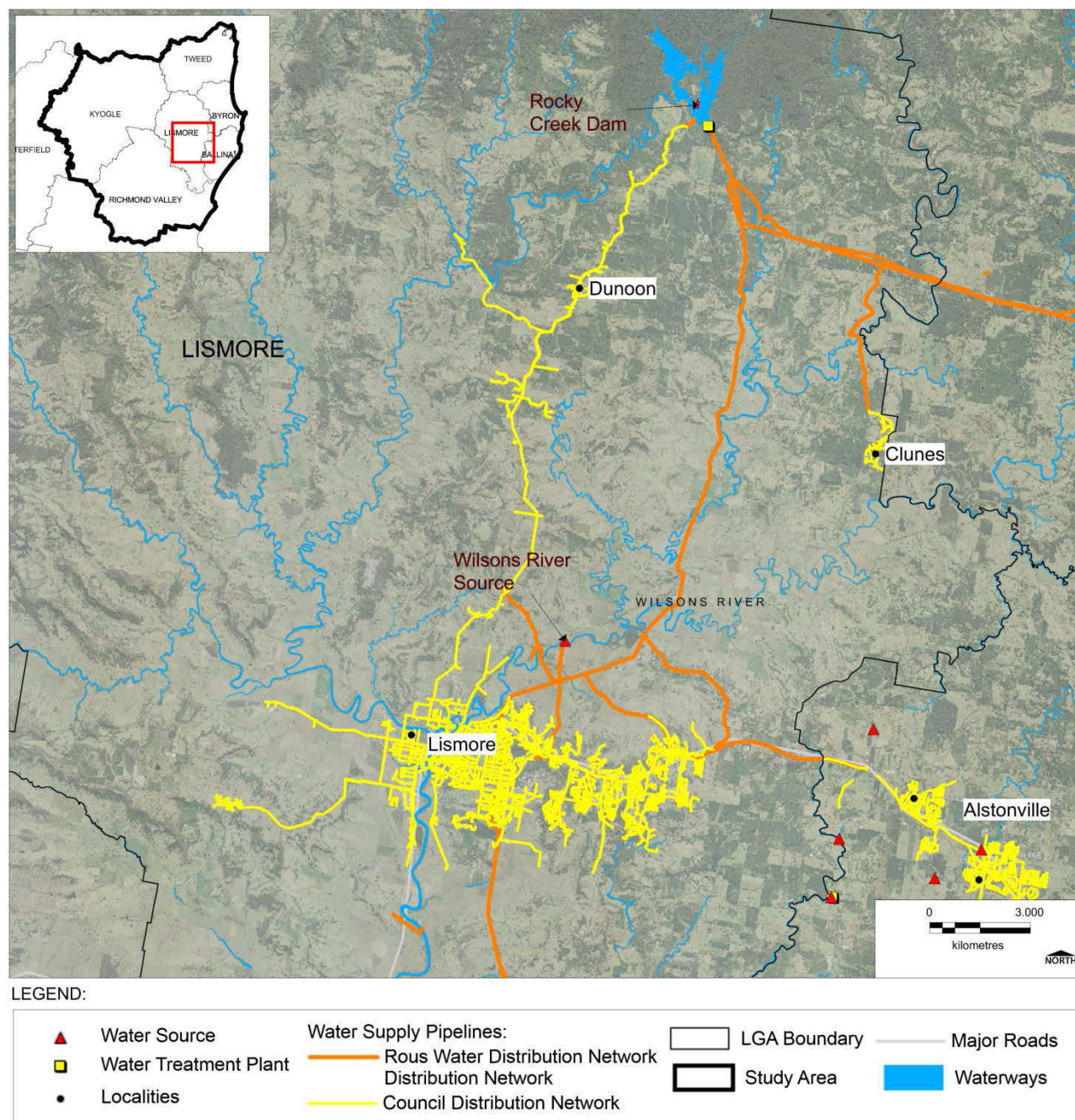


Figure 11: Lismore (Rous Water Bulk Supply) Water Supply System

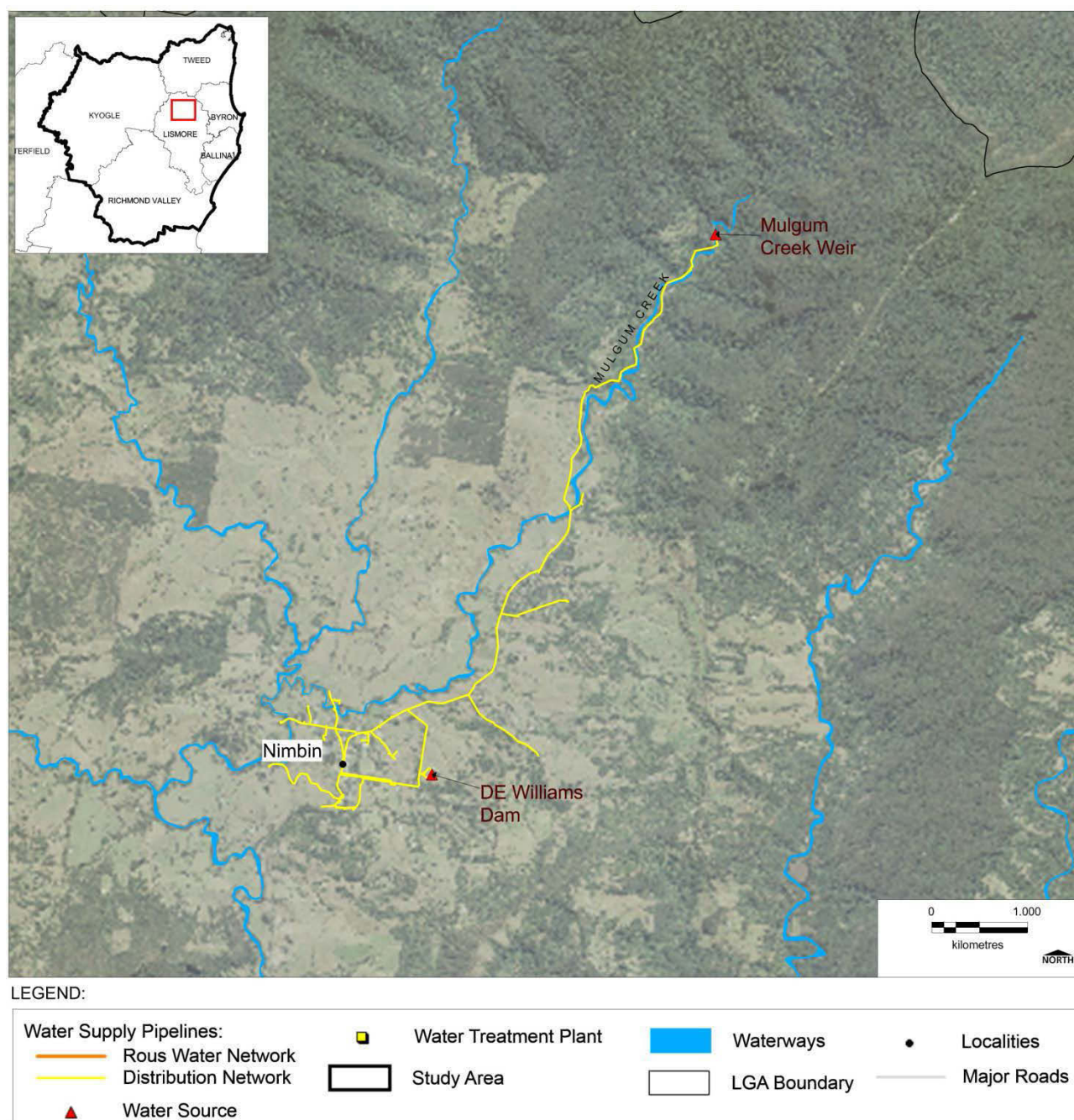


Figure 12: Nimbin Water Supply System

2.5.2 Non-potable Supply

In 2010/11, 1% of treated effluent was recycled for irrigation of a tea tree plantation and other agricultural uses (NSW Office of Water, 2012). These users would be unlikely to irrigate with potable water during normal climate periods, but would rely on rainfall for irrigation. However, in prolonged dry weather, irrigation with town water may be required. Therefore, these effluent reuse opportunities do not contribute to significant potable water demand reduction apart from periods of prolonged dry weather.

Urban stormwater is not reused in Lismore LGA apart from household rainwater tanks.

2.6 Richmond Valley Council

2.6.1 Potable Supply

Richmond Valley water supply is comprised of two separate water supply systems – Casino and the Mid and Lower Richmond River (MLRR) serving the urban areas of the LGA (refer Table 12, Figure 14 and Figure 14). The MLRR system distributes water purchased from Rous Water through four separate distribution systems.

Rous Water also supplies water directly to rural customers along its trunk mains within the LGA (refer Section 2.1.2).

Table 12: Richmond Valley Council Water Supplies

Details	Rous Water bulk supply (MLRR)	Casino
Water Source ¹	Refer Table 3	Kyogle Area
Source Type	Bulk supply	Weir pool
Storage capacity	Refer Table 3	Jabour Weir (1,719 ML)
Area served	Evans Head, Woodburn, Broadwater and Rileys Hill and Coraki	Casino
Water Treatment	Refer Table 3	Casino WTP (23 ML/d)
Licence entitlement	Refer Table 3	3,427 ML/a ²
Current Secure Yield	Refer Table 3	2,450-2,600 ML/a ³

1. As specified in the relevant Water Sharing Plan

2. Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources, 2010

3. Source: Rous Water (2012a) – using 5/10/20 rule.

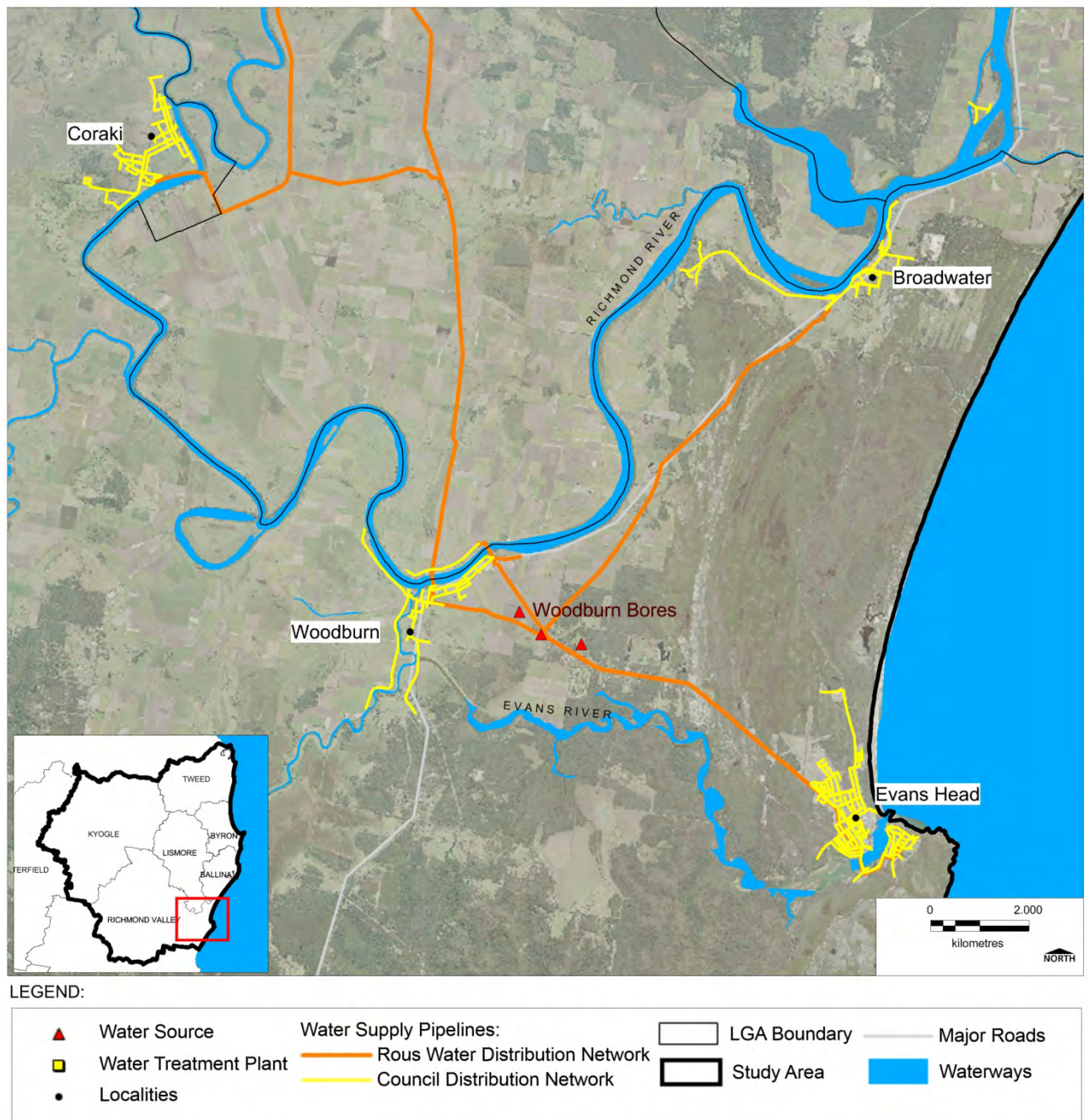


Figure 13: MLRR (Rous Water Bulk Supply) Water Supply Systems

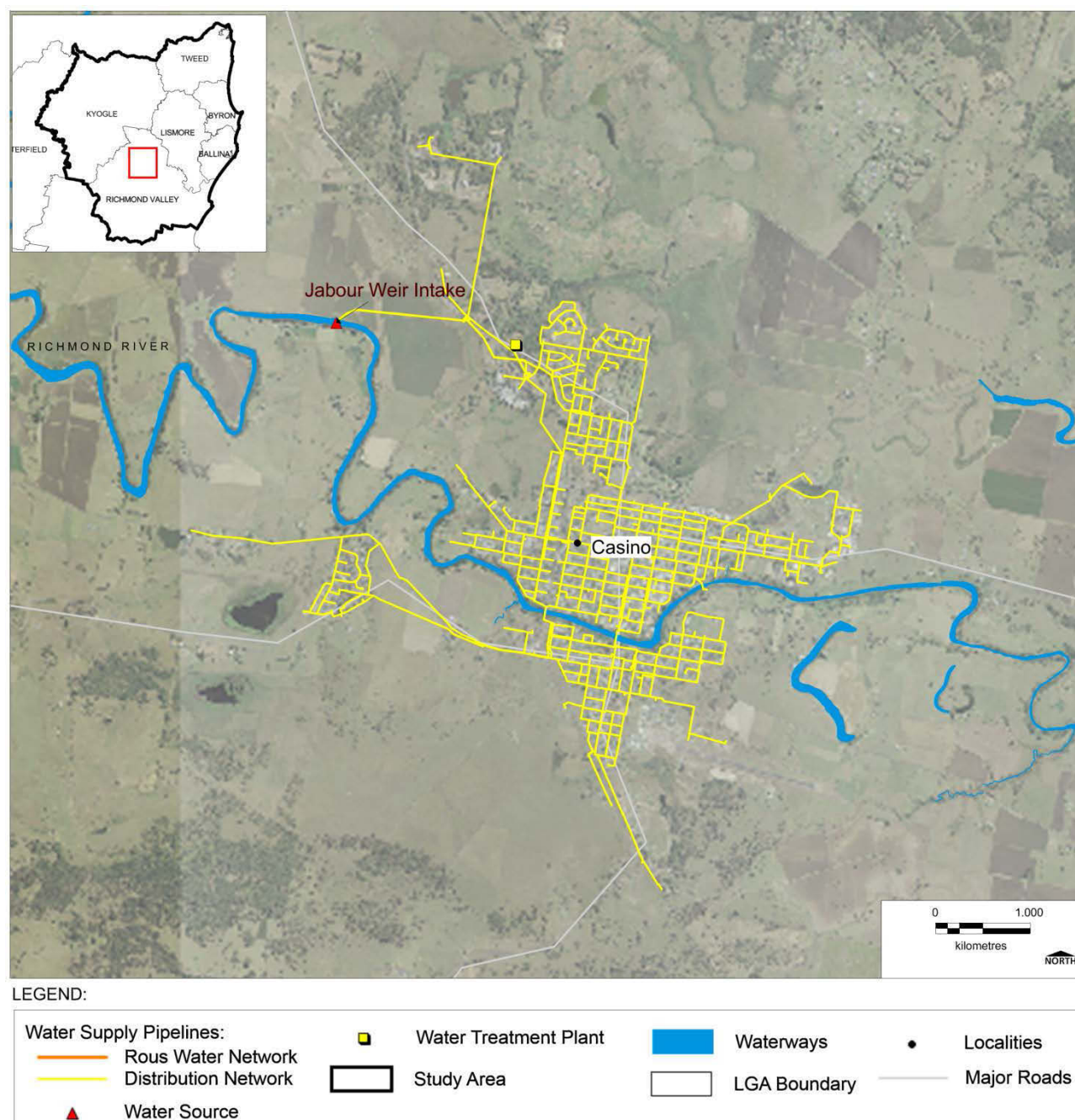


Figure 14: Casino Water Supply System

2.6.2 Non-potable Supply

In 2010/11, 6% of treated effluent (136 ML) was recycled for irrigation of golf courses and agricultural uses (NSW Office of Water, 2012). These users would be unlikely to irrigate with potable water during normal climate periods, but would rely on rainfall for irrigation. However, in prolonged dry weather, irrigation with town water may be required. Therefore, these effluent reuse opportunities do not contribute to significant potable water demand reduction apart from periods of prolonged dry weather.

Urban stormwater is not reused in Richmond Valley apart from household rainwater tanks.

2.7 Tweed Shire Council

2.7.1 Potable Supply

Tweed Shire Council water supply is comprised of three separate water supply systems (refer Table 13, Figure 16 and Figure 16). Council also has a minor connection to the south-east Queensland water grid for emergency drought supply.

Table 13: Tweed Shire Council Water Supplies

Details	Tweed District	Uki	Tyalgum	SEQ Water Grid
Water Source ¹	Doon Doon Creek	Doon Doon Creek	Upper Oxley River	Seqwater Dams/ Desalination
Source Type	Surface water storage and weir pool	Large in-stream storage and run-of-river abstraction	Weir pool	Bulk supply
Storage capacity	Clarrie Hall Dam (15,000 ML), Bray Park Weir (840 ML)	Clarrie Hall Dam (15,000 ML)	Tyalgum weir pool (7.52ML)	N/R
Area served	Murwillumbah, Tweed Heads, the coastal strip from Kingscliff to Pottsville and the villages of Mooball and Burringbar	Uki	Tyalgum	Tweed Heads (minor emergency supply only) ⁶
Water Treatment	Bray Park WTP (100 ML/d)	Uki WTP (0.44 ML/d)	Tyalgum WTP (0.25 ML/d)	N/R
Licence entitlement	27,500 ML/a ³	67 ML/a ³	46 ML/a ³	N/R
Current Secure Yield	13,750 ML/a ⁴		120 ML/a ⁵	3 ML/d

1. As specified in the relevant Water Sharing Plan

2. Not subject to a Water Sharing Plan

3. Water Sharing Plan for the Tweed River Area Unregulated, Regulated and Alluvial Water Sources, 2010

4. Source: SunWater (2006)

5. Source: SunWater (2003)

6. A small pipe exists but there is no agreement in place with SEQ Water and it is unlikely that water would be provided during a drought situation given that SEQ would probably be experiencing similar climatic conditions

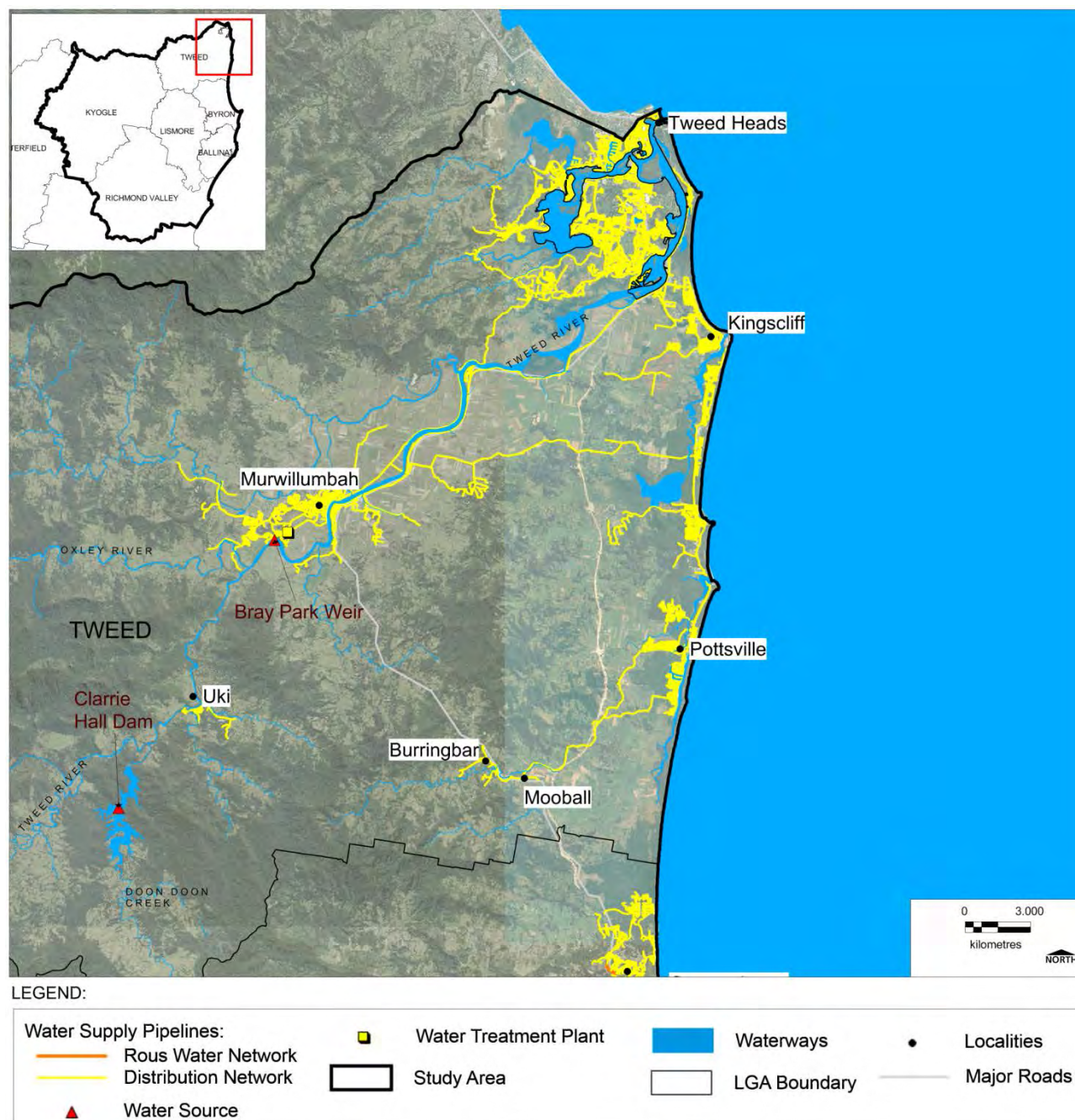


Figure 15: Tweed District and Uki Water Supply Systems



Figure 16: Tyalgum Water Supply System

2.7.2 Non-potable Supply

In 2010/11, 5% of treated effluent (436 ML) was recycled for agricultural uses, sugar mill cooling water and irrigation of playing fields and golf courses (NSW Office of Water, 2012). These irrigation users would be unlikely to irrigate with potable water during normal climate periods, but would rely on rainfall for irrigation. However, in prolonged dry weather, irrigation with town water may be required. Therefore, apart from the sugar mill, these effluent reuse opportunities do not contribute to significant potable water demand reduction apart from periods of prolonged dry weather.

3. EXISTING WATER DEMAND

3.1 Terminology

For the purposes of this report, the follow definitions apply:

- Connections – in accordance with the National Performance Framework definitions (NWC, 2010), a connections is any property which is connected to the water system and is separately billed for the water services including non-rateable and non-metered properties (not including vacant lots). Multi-residential properties are counted on the basis of each unit. In most cases, the number of water supply assessments will approximate the number of connections. However, allowance has been made for multi-residential properties with a single master meter;
- Consumption – the water used by customers (for each connection type) is determined from the metered sales measured at the customer meter.
- Raw water extraction – the volume of water abstracted from rivers or groundwater;
- Rous Water bulk water supply – the total volume of potable water supplied to each Constituent Council;
- Unmetered water – the difference between raw water extraction (or Rous Water bulk supply) and consumption; and
- Demand – the water required by each customer. For individual connections, the demand is equivalent to the consumption. For Rous Water's Constituent Councils, the demand is equivalent to the bulk water supply. For each water supply system, the demand is equivalent to the raw water extraction (consumption plus unmetered water). The regional bulk water demand is the total demand for each water supply system (consumption plus unmetered water).

3.2 Data Sources

Rous Water has developed a demand forecast for the Rous Water supply area from the present to 2060 (Hydrosphere Consulting, 2012b) that incorporates a range of information including:

- Water consumption;
- Regional growth predictions;
- Demand management/water efficiency; and
- Information from Rous Water and its Constituent Councils.

Data on existing connections and consumption for the Rous Water supply areas from 2006/07 to 2009/10 and predicted future connections and consumption beyond 2009/10 are available from this report. The consumption, connections and bulk water supply data for the years 2007/08 to 2011/12 have been reported in the following sections for the Rous Water supply areas.

Data have been provided by the Councils for the remaining water supply systems.

3.3 Ballina Shire Council

3.3.1 Number of Connections

Rous Water Bulk Supply Area

Table 14: Water Supply Connections – Rous Water Bulk Supply to Ballina LGA (excluding Wardell)

Connection Type	2007/08	2008/09	2009/10	2010/11	2011/12
Multi-residential	3,860	3,868	3,884	3,940	4,044
Single residential	8,162	8,170	8,187	8,216	8,197
Dual reticulated single residential ¹	202	227	264	359	453
Dual reticulated multi- residential ¹	98	98	108	199	273
Total Residential	12,367	12,408	12,461	12,715	12,967
Total Non-Residential	1,346	1,353	1,365	1,427	1,489
Total Rous Water supply area	13,713	13,761	13,826	14,142	14,456
Rous Water supply area growth % p.a.	0.87%	0.35%	0.47%	2.3% ²	2.2% ²

1. To be connected to recycled water supply in mid-2013.

2. Council's dwelling projections provided for the FWS Demand Forecast suggest significantly higher growth than recent years.

Source: Hydrosphere Consulting (2012b)

Wardell

Ballina Shire Council has provided data on existing connections for 2011/12.

Table 15: Water Supply Connections – Wardell

Connection Type	2011/2012
Multi-residential	4
Single residential	280
Non-residential	28
<i>Total connections</i>	312

3.3.2 Consumption

Rous Water Bulk Supply Area

Table 16: Rous Water Bulk Supply to Ballina LGA and Consumption by Connection Type (kL/a)

Connection Type	2007/08	2008/09	2009/10	2010/11	2011/12
Multi-residential	532,403	479,572	525,325	532,839	546,833
Single residential	1,643,553	1,474,909	1,602,920	1,608,782	1,605,065
Dual reticulated ¹	55,332	55,475	69,948	100,080	130,212
Total Residential	2,231,132	2,009,826	2,198,193	2,241,701	2,282,110
Total Non-Residential	469,405	394,037	464,894	472,392	492,978
<i>Total LGA</i>	<i>2,700,537</i>	<i>2,403,864</i>	<i>3,127,981</i>	<i>2,714,092</i>	<i>2,775,088</i>
<i>Bulk water supplied by Rous Water</i>	<i>3,299,106</i>	<i>3,342,909</i>	<i>3,842,893</i>	<i>3,531,311</i>	<i>3,272,415</i>
Unmetered water	598,569	939,045	1,172,540	817,219	497,327
% unmetered water	18%	28%	31%	23%	15%

1. To be connected to recycled water supply in mid-2013.

Source: Hydrosphere Consulting (2012b)

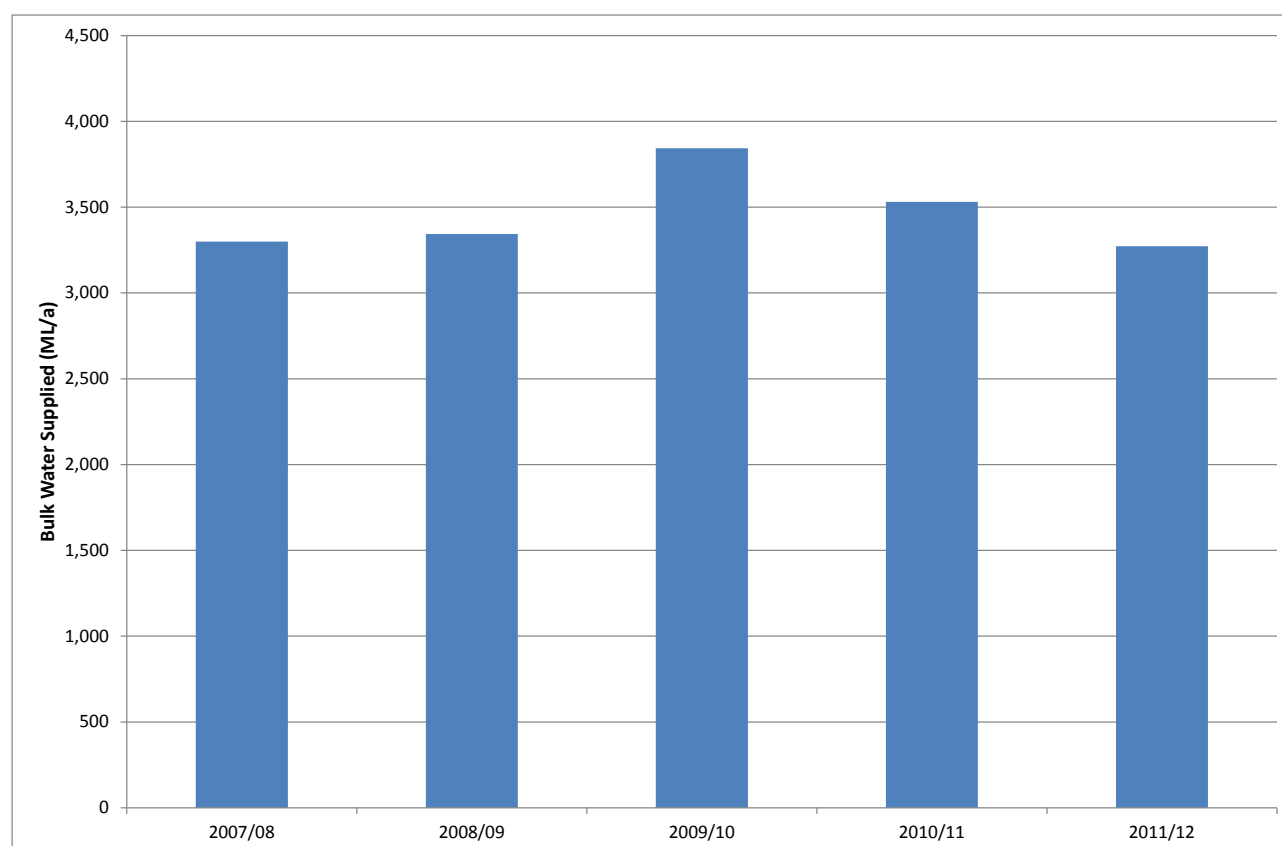


Figure 17: Rous Water Bulk Supply to Ballina LGA

Wardell

Ballina Shire Council is not able to supply consumption (customer sales) data for Wardell customers due to limitations of its customer database. Raw water extraction data is given in Table 17.

Table 17: Raw Water Extraction - Wardell (kL/a)

Connection Type	2006/07	2007/08	2008/09	2009/10	2011/2012
Raw water extracted	122,654	132,467	129,692	112,302	119,298

3.4 Byron Shire Council

3.4.1 Number of Connections

Rous Water Bulk Supply Area

Table 18: Water Supply Connections - Rous Water Bulk Supply to Byron LGA (excluding Mullumbimby)

Connection Type	2007/08	2008/09	2009/10	2010/11	2011/12
Multi-residential	1,475	1,548	1,635	1,745	1,846
Single residential	7,004	6,942	6,939	6,969	7,007
Total Residential	8,479	8,490	8,574	8,713	8,853
Total Non-Residential	918	1,047	1,088	1,111	1,134
Total Rous Water supply area	9,397	9,537	9,662	9,824	9,986
Rous Water supply area growth % p.a.	0.8%	1.5%	1.3%	1.7% ¹	1.7% ¹

1. Council's dwelling projections provided for the FWS Demand Forecast suggest higher growth than recent years.

Source: Hydrosphere Consulting (2012b)

Mullumbimby

Table 19: Water Supply Connections – Mullumbimby

Connection Type	2007/08	2008/09	2009/10	2010/11	2011/12
Residential	1,371	1,375	1,384	1,378	1,482
Non-Residential	175	179	176	189	197
Total Connections	1,546	1,554	1,560	1,567	1,679
Growth (% p.a.)	N/A	0.5%	0.4%	0.4%	7.1%

3.4.2 Consumption

Rous Water Bulk Supply Area

Table 20: Rous Water Bulk Supply to Byron LGA and Consumption by Connection Type (kL/a)

Connection Type	2007/08	2008/09	2009/10	2010/11	2011/12
Multi-residential	207,472	210,346	224,268	247,258	261,587
Single residential	1,260,184	1,277,707	1,362,812	1,293,773	1,300,868
Total Residential	1,467,656	1,488,053	1,587,080	1,541,030	1,562,455
Total Non-Residential	605,122	718,910	654,387	762,968	778,699
<i>Total LGA</i>	<i>2,072,778</i>	<i>2,153,492</i>	<i>2,241,467</i>	<i>2,303,998</i>	<i>2,341,155</i>
<i>Bulk water supplied by Rous Water</i>	<i>2,189,323</i>	<i>2,277,759</i>	<i>2,616,548</i>	<i>2,434,035</i>	<i>2,355,586</i>
Unmetered water	116,545	70,796	375,081	130,037	14,431
% unmetered water	5.3%	5.5%	14.3%	5.3%	0.6%

Source: Hydrosphere Consulting (2012b)

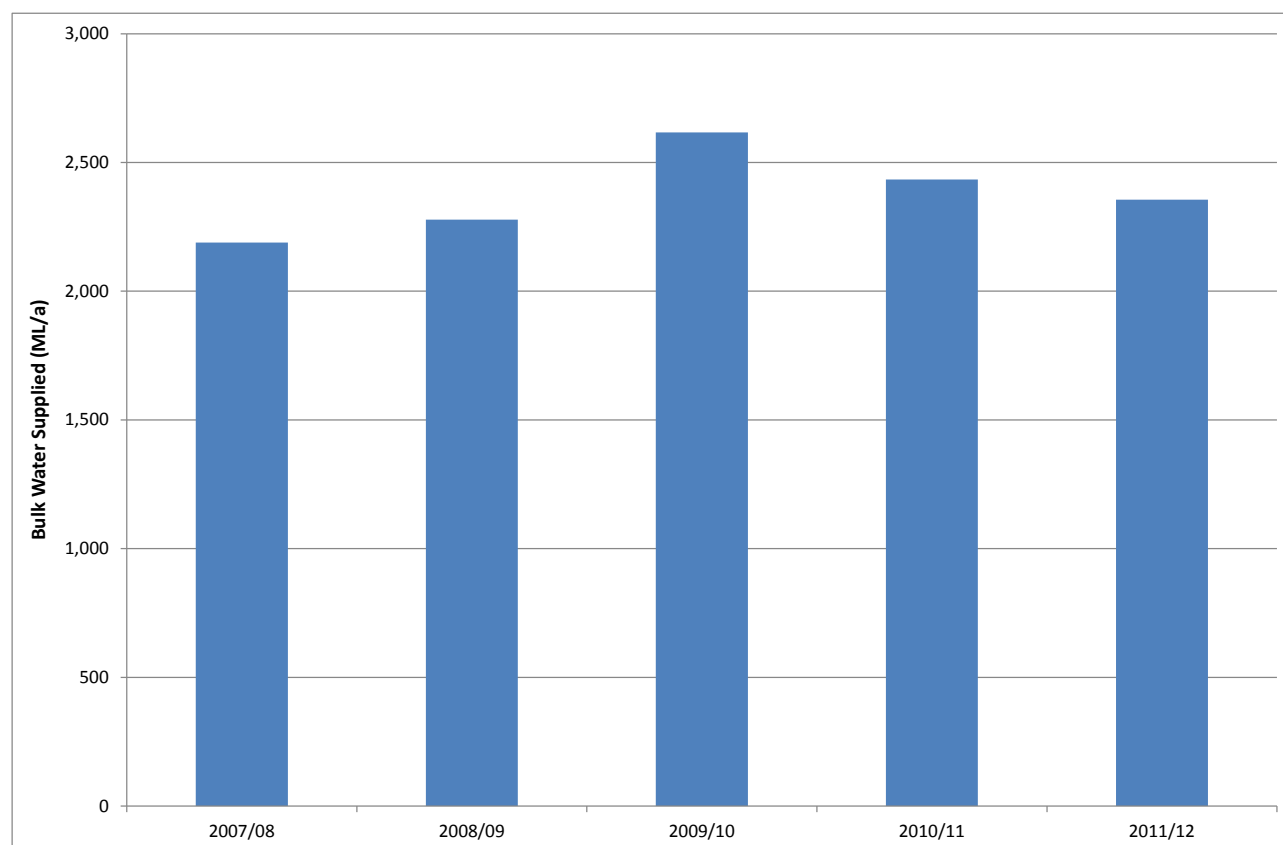


Figure 18: Rous Water Bulk Supply to Byron LGA

Mullumbimby

Table 21: Raw Water Extraction and Customer Consumption - Mullumbimby (kL/a)

Data	2006/07	2007/08	2008/09	2009/10	2011/2012
Raw water extracted	363,828	330,838	390,247	329,685	357,949
Residential consumption	239,344	223,947	267,920	183,196	228,948
Non-residential consumption	67,878	72,090	68,613	72,397	70,890
Total Metered Consumption	307,222	296,037	336,533	255,593	299,838
Unmetered water	56,606	34,800	53,714	74,092	58,111
Unmetered water (%)	15.6%	10.5%	13.8%	22.5%	16%

3.5 Kyogle Council

3.5.1 Number of Connections

Kyogle Council has provided data on existing connections for 2011/12.

Table 22: Water Supply Connections 2011/12 – Kyogle LGA

Connection Type	Kyogle	Bonalbo	Woodenbong and Muli Muli
Residential connections	1,182	148	189
Non-residential connections	203	44	47
Total Connections	1,385	192	236

3.5.2 Consumption

The available data for each water supply systems is given in Table 23 and Figure 19.

Table 23: Raw Water Extraction and Customer Consumption – Kyogle LGA (kL/a)

Data	2007/08	2008/09	2009/10	2010/11	2011/12
<i>Kyogle</i>					
WTP Production	290,000	297,000	325,000	285,600	281,200
Estimated WTP losses ¹	8,700	8,910	9,750	8,568	8,436
Estimated raw water extraction from Kyogle weir	298,700	305,910	334,750	294,168	289,636
Residential consumption	162,986	N/A	199,295	186,900	215,600
Non-residential consumption	112,154	N/A	112,154	75,900	65,300
Total Metered Consumption	275,140	N/A	311,449	262,800	280,900
Unmetered water	23,560	N/A	23,301	31,368	8,736
Unmetered water (%)	8%	N/A	7%	11%	3%

Data	2007/08	2008/09	2009/10	2010/11	2011/12
<i>Bonalbo</i>					
Raw water extraction from weir pool and groundwater sources ²	33,000	35,000	N/A	38,885	33,126
WTP Production ³	33,000	35,000	39,000	32,600	30,000
Residential consumption	14,624	19,474	17,882	17,100	16,800
Non-residential consumption	10,063	8,470	10,063	7,500	7,300
Total Metered Consumption	24,687	27,945	27,945	24,600	24,100
<i>Woodenbong and Muli Muli</i>					
Bulk supply from Tenterfield Shire Council	52,000	53,000	71,000 ⁵	48,400	51,700
Residential consumption ⁴	24,390	32,480	29,823	28,000	36,700
Non-residential consumption ⁴	16,783	14,127	16,783	8,400	8,500
Total Metered Consumption	41,173	46,606	46,606	36,400	45,200
Unmetered water	10,827	6,394	24,394	12,000	6,500
Unmetered water (%)	21%	12%	34%	27%	15%

1. Assumed to be 3% of WTP production. Data on raw water extraction is not available.
2. Raw water is pumped to Petrochilos Dam from both Peacock Creek Weir and Bonalbo bores.
3. Bonalbo WTP was commissioned in 2010/11.
4. Consumption data are for Woodenbong and Muli Muli only.
5. A landslip in 2009/10 caused a main break and significant losses.

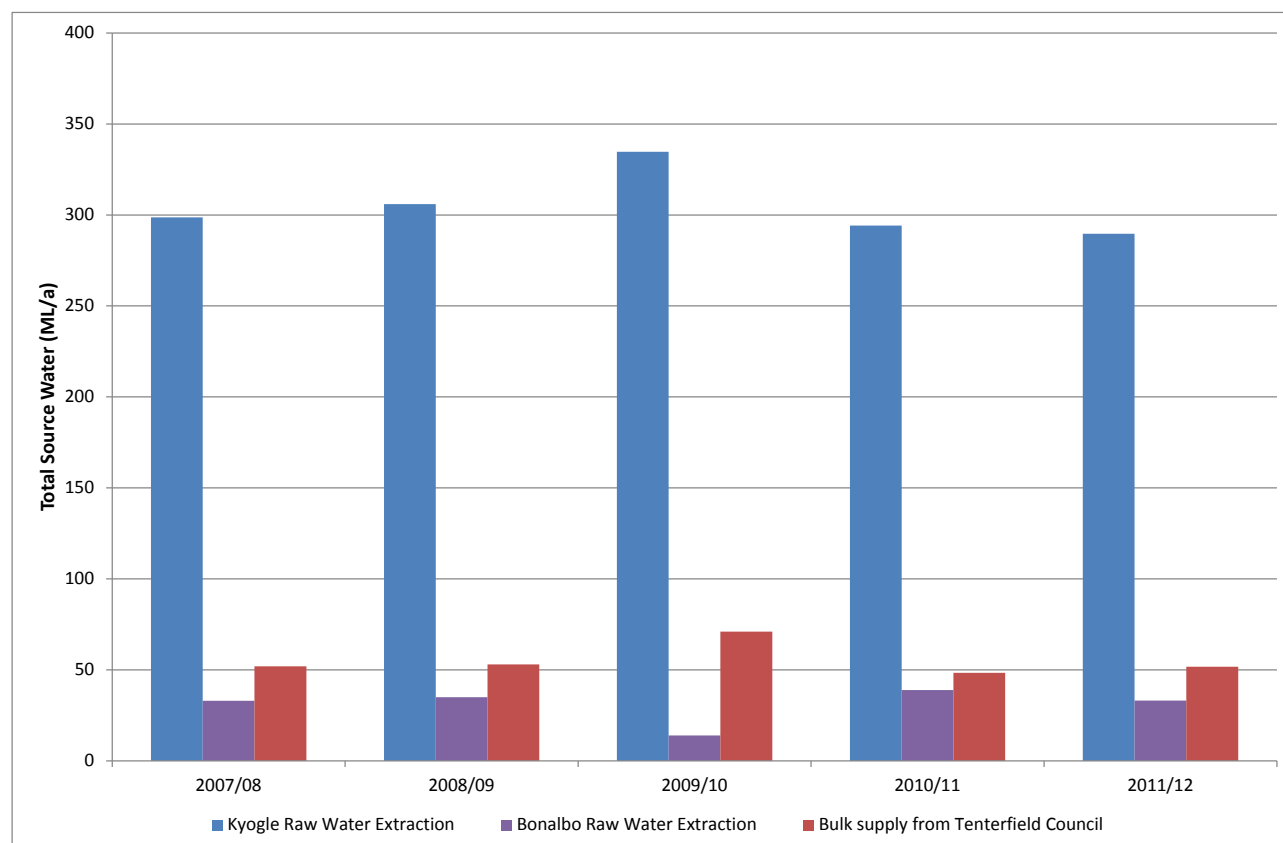


Figure 19: Raw water extraction – Kyogle LGA

3.6 Lismore City Council

3.6.1 Number of Connections

Rous Water Bulk Supply Area

Table 24: Water Supply Connections – Rous Water Bulk Supply to Lismore LGA (excluding Nimbin)

Connection Type	2007/08	2008/09	2009/10	2010/11	2011/12
Multi-Residential	1,175	1,183	1,192	1,409	1,524
Single Residential	10,894	10,965	11,053	11,240	11,476
Total Residential	12,069	12,147	12,245	12,649	13,000
Total Non-Residential	1,172	1,180	1,190	1,229	1,268
Total Rous Water supply area	13,241	13,327	13,435	13,878	14,269
Rous Water supply area growth % p.a.	0.9%	0.6%	0.8%	3.3% ¹	2.8% ¹

1. Council's dwelling projections provided for the FWS Demand Forecast suggest significantly higher growth than recent years.

Source: Hydrosphere Consulting (2012b)

Nimbin

LCC has provided data on existing connections for 2011/12.

Table 25: Connections – Nimbin

Connection Type	2011/2012
Rural residential	75
Rural non-residential	2
Urban residential	172
Urban non-residential	66
<i>Total connections</i>	<i>315</i>

3.6.2 Consumption

Rous Water Bulk Supply Area

Table 26: Rous Water Bulk Supply to Lismore LGA and Consumption by Connection Type (kL/a)

Connection Type	2007/08	2008/09	2009/10	2010/11	2011/12
Multi-Residential	184,662	179,569	183,010	217,670	235,434
Single Residential	1,956,069	1,908,115	2,056,757	2,052,160	2,095,285
<i>Total Residential</i>	<i>2,140,731</i>	<i>2,087,684</i>	<i>2,239,767</i>	<i>2,269,830</i>	<i>2,330,719</i>
Total Non-Residential	792,840	779,731	819,166	826,205	852,497
<i>Total LGA</i>	<i>2,933,571</i>	<i>2,867,415</i>	<i>3,058,933</i>	<i>3,096,036</i>	<i>3,183,216</i>
<i>Bulk water supplied by Rous Water</i>	<i>3,201,963</i>	<i>3,406,746</i>	<i>3,622,904</i>	<i>3,128,710</i>	<i>3,083,542</i>
Unmetered water	268,392	539,331	563,971	32,674	-99,674

Connection Type	2007/08	2008/09	2009/10	2010/11	2011/12
% unmetered water	8%	16%	16%	1.0% ¹	-3.2% ¹

1. The predicted consumption for 2010/11 and 2011/12 estimated from the Council growth projections appears to be over-estimated. The data on bulk water supplied suggest that the expected connection and consumption growth documented in Council's growth management strategy has not been realised.

Source: Hydrosphere Consulting (2012b)

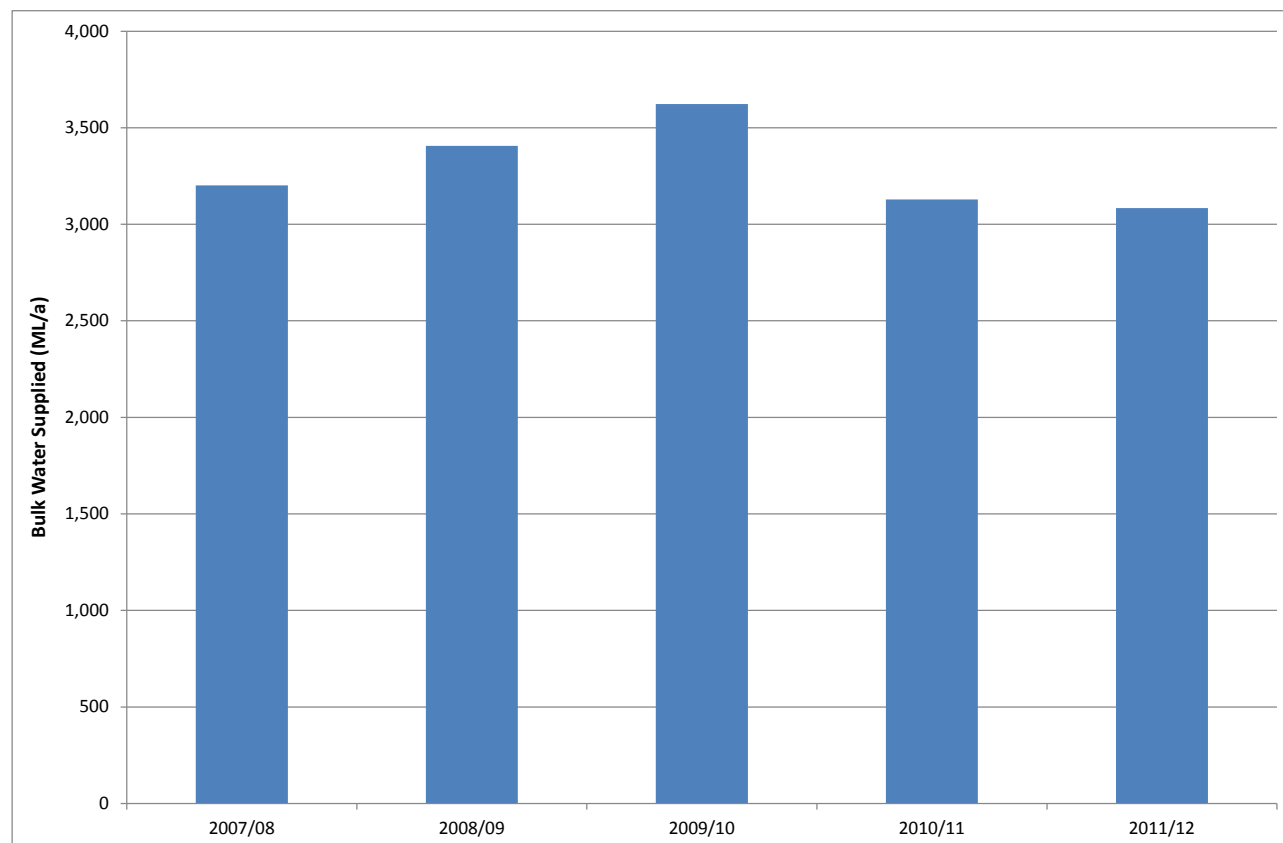


Figure 20: Rous Water Bulk Supply to Lismore LGA (excluding Nimbin)

Nimbin

Table 27: Raw Water Extraction and Consumption – Nimbin (kL/a)

Connection Type	2006/07	2007/08	2008/09	2009/10	2011/2012
Raw water extracted ¹	faulty meter			176,000	178,000
Consumption (ML/a)					
Rural residential	9,651	9,546	14,717	11,301	17,116
Rural non-residential	9	390	106	76	186
Urban residential	24,282	23,159	27,452	26,916	24,210
Urban non-residential	17,583	21,549	20,887	24,038	21,793
Total	51,525	54,644	63,162	62,331	63,305

1. Raw water flows from the river to DE Williams dam and is recycled through the dam to improve dam turnover. Raw water extraction is significantly higher than customer demand.

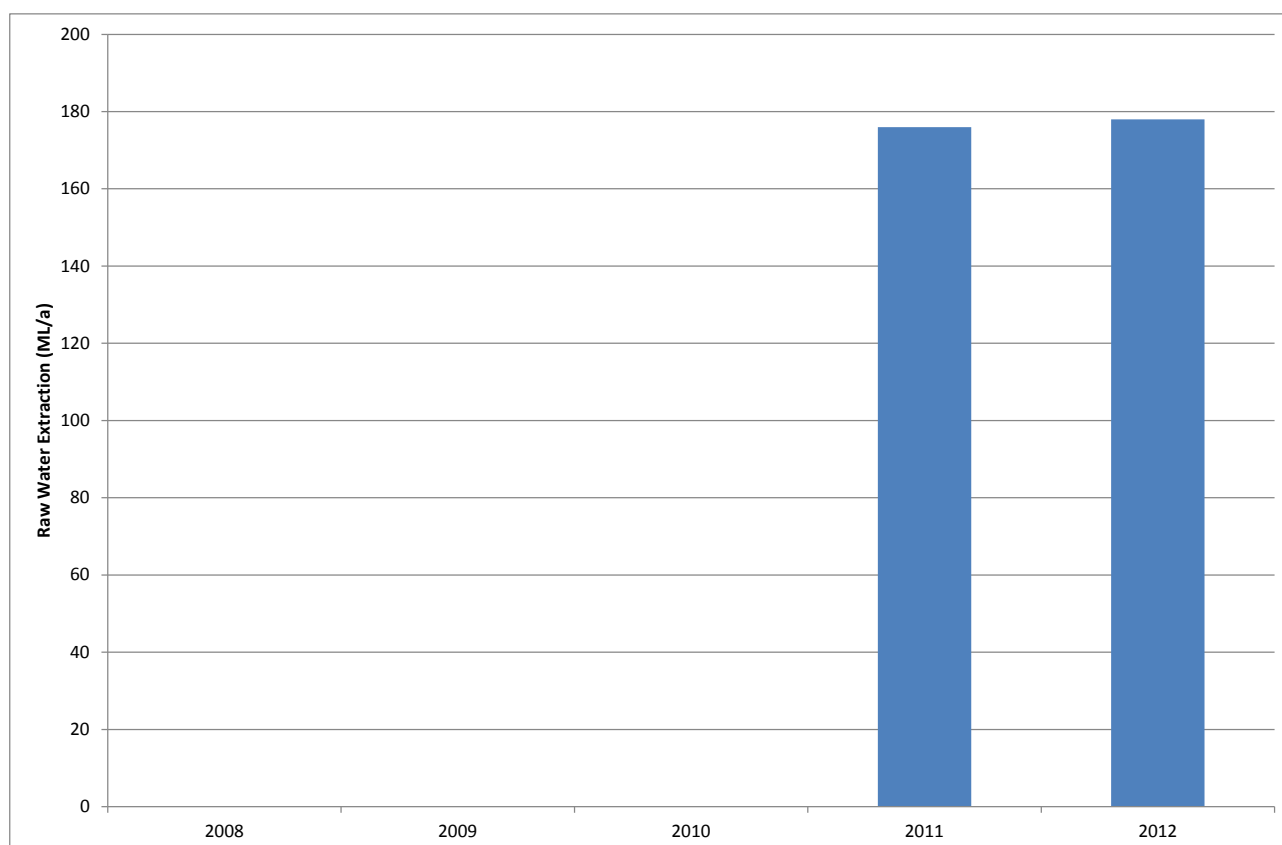


Figure 21: Raw water extraction – Nimbin

3.7 Richmond Valley Council

3.7.1 Number of Connections

Rous Water Bulk Supply Area

Table 28: Water Supply Connections – Rous Water Bulk Supply to Richmond Valley LGA (excluding Casino)

Connection Type	2007/08	2008/09	2009/10	2010/11	2011/12
Multi-residential	633	637	642	653	672
Single residential	1,654	1,653	1,658	1,659	1,651
Total Residential	2,287	2,290	2,300	2,312	2,323
Total Non-Residential	264	266	267	270	274
Total Rous Water supply area	2,551	2,556	2,567	2,582	2,597
Rous Water supply area growth % p.a.	1.6%	0.2%	0.4%	0.6%	0.6%

Source: Hydrosphere Consulting (2012b)

Casino

Table 29: Water Supply Connections – Casino

Connection Type	2007/08	2008/09	2009/10	2010/11	2011/12
Single residential	3,538	3,590	3,577	3,608	3,621
Multi residential	335	363	389	435	449
Total residential	3,873	3,953	3,966	4,043	4,070
Food Producers ¹	5	5	5	5	5
Other Non-residential	502	454	454	457	448
Total	4,380	4,408	4,420	4,500	4,518

1. The Food Producer customer category currently applies to the following customers - Northern Co-operative Meat Company Ltd (the 'Meatworks'), Broadwater Sugar Mill, Richmond Dairies and Seine (Noodle Flavouring Factory).

3.7.2 Consumption

Rous Water Bulk Supply Area

Table 30: Rous Water Bulk Supply to Richmond Valley LGA and Consumption by Connection Type (kL/a)

Connection Type	2007/08	2008/09	2009/10	2010/11	2011/12
Multi-Residential	77,545	81,142	83,030	83,743	86,199
Single Residential	276,268	276,328	314,352	289,974	288,663
<i>Total Residential</i>	<i>353,813</i>	<i>357,470</i>	<i>397,382</i>	<i>373,716</i>	<i>374,862</i>
Total Non-Residential	165,856	165,498	187,104	176,467	178,645
<i>Total LGA</i>	<i>519,669</i>	<i>522,968</i>	<i>584,486</i>	<i>550,183</i>	<i>553,507</i>
<i>Bulk water supplied by Rous Water</i>	<i>626,334</i>	<i>635,603</i>	<i>706,628</i>	<i>583,262</i>	<i>581,578</i>
Unmetered water	106,665	112,635	122,142	33,079	28,071
% unmetered water	17%	18%	17%	6% ¹	5% ¹

1. The data on bulk water supplied suggest that the expected connection and consumption growth has not been realised in the MLRR area.

Source: Hydrosphere Consulting (2012b)

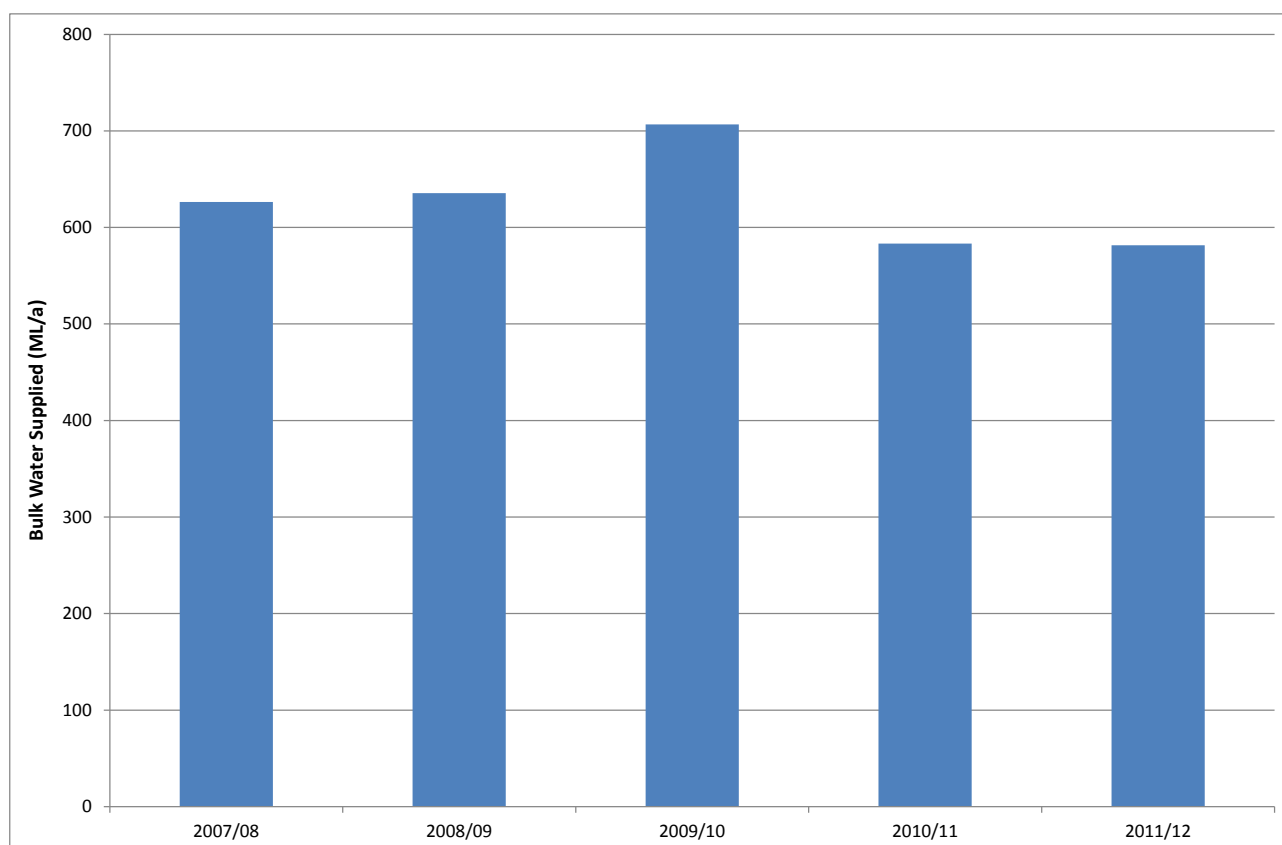


Figure 22: Rous Water Bulk Supply to Richmond Valley LGA (excluding Casino)

Casino

Table 31: Raw Water Extraction and Consumption – Casino

Connection Type	2006/07	2007/08	2008/09	2009/10	2011/2012
Raw water extracted (ML/a)	2,354	2,406	2,460	2,249	2,180
<i>Consumption (ML/a)</i>					
Single residential	687	679	763	650	634
Multi residential	66	72	76	74	74
Food Producers	1,056	1,083	1,038	1,053	943
Other Non-residential	341	338	330	275	258
<i>Total</i>	<i>2,148</i>	<i>2,172</i>	<i>2,207</i>	<i>2,051</i>	<i>1,908</i>

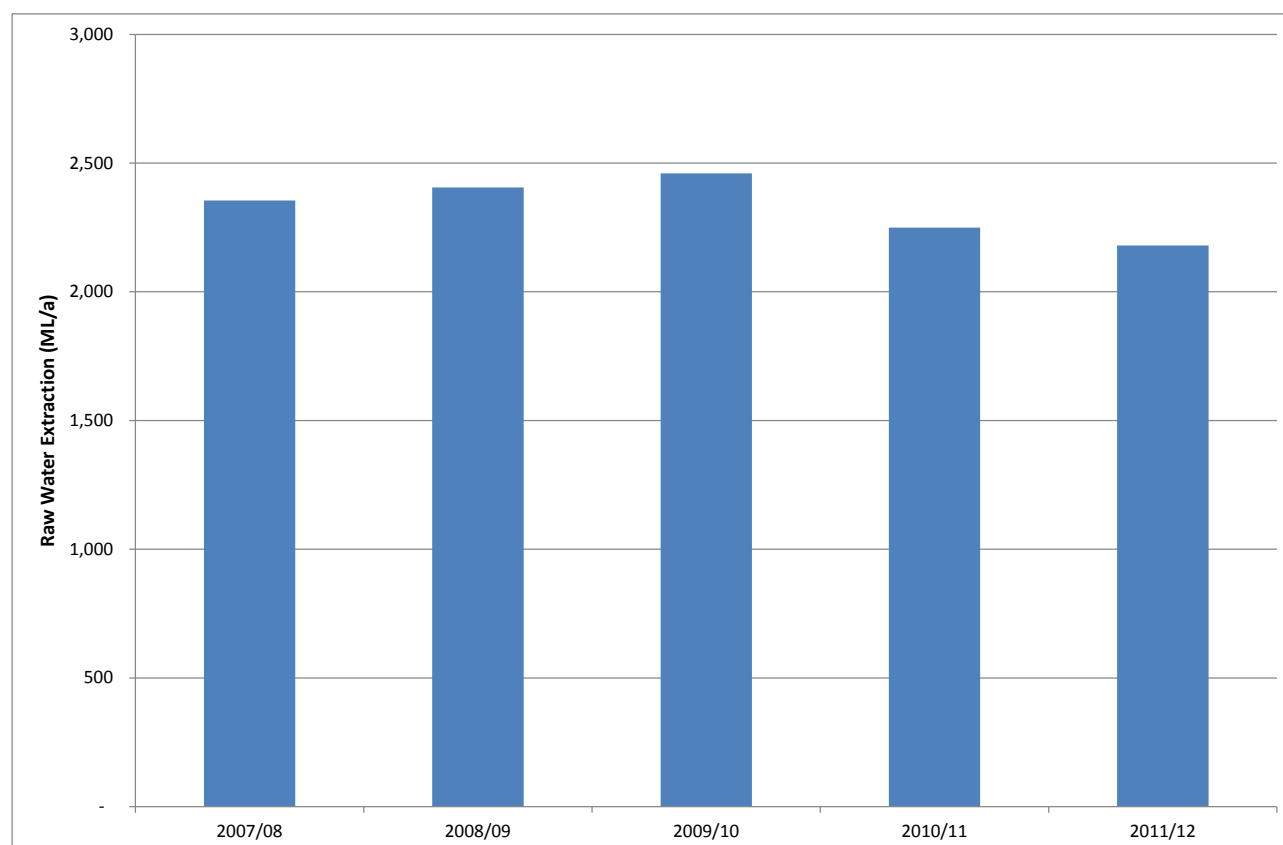


Figure 23: Raw water extraction – Casino

3.8 Tweed Shire Council

3.8.1 Number of Connections

Tweed Shire Council has provided data on existing connections types for each water supply system for 2011/12 as well as data for the whole shire for the previous 5 years as shown in the following tables.

Table 32: Water Supply Connections – Tweed Shire Water Supply Systems

Connection Type	2011/12 Connections
<i>Tweed District</i>	
Residential	32,471
Non-residential	1,701
<i>Total Tweed District</i>	<i>34,172</i>
<i>Uki</i>	
Commercial	5
Municipal - Excluding Public Parks	2
Residential	173
<i>Total Uki</i>	<i>180</i>
<i>Tyalgum</i>	
Commercial	9
Municipal - Excluding Public Parks	3

Connection Type	2011/12 Connections
Residential	99
Rural	3
<i>Total Tyalgum</i>	<i>114</i>

Table 33: Water Supply Connections – Tweed Shire

Connection Type	2007/08	2008/09	2009/10	2010/11	2011/12
Residential	30,193	31,106	31,180	33,018	32,743
Non-residential	1,688	1,818	1,948	1,968	1,723
<i>Total</i>	<i>31,881</i>	<i>32,924</i>	<i>33,128</i>	<i>34,986</i>	<i>34,466</i>
Growth (% p.a.)	N/A	3.3%	0.6%	5.6%	-1.5%

3.8.2 Consumption

Tweed Shire Council has provided data on consumption for Tweed and Uki water supply systems in 2011/12 as well as data for the whole shire for the previous 5 years as shown in Table 35 and Table 34.

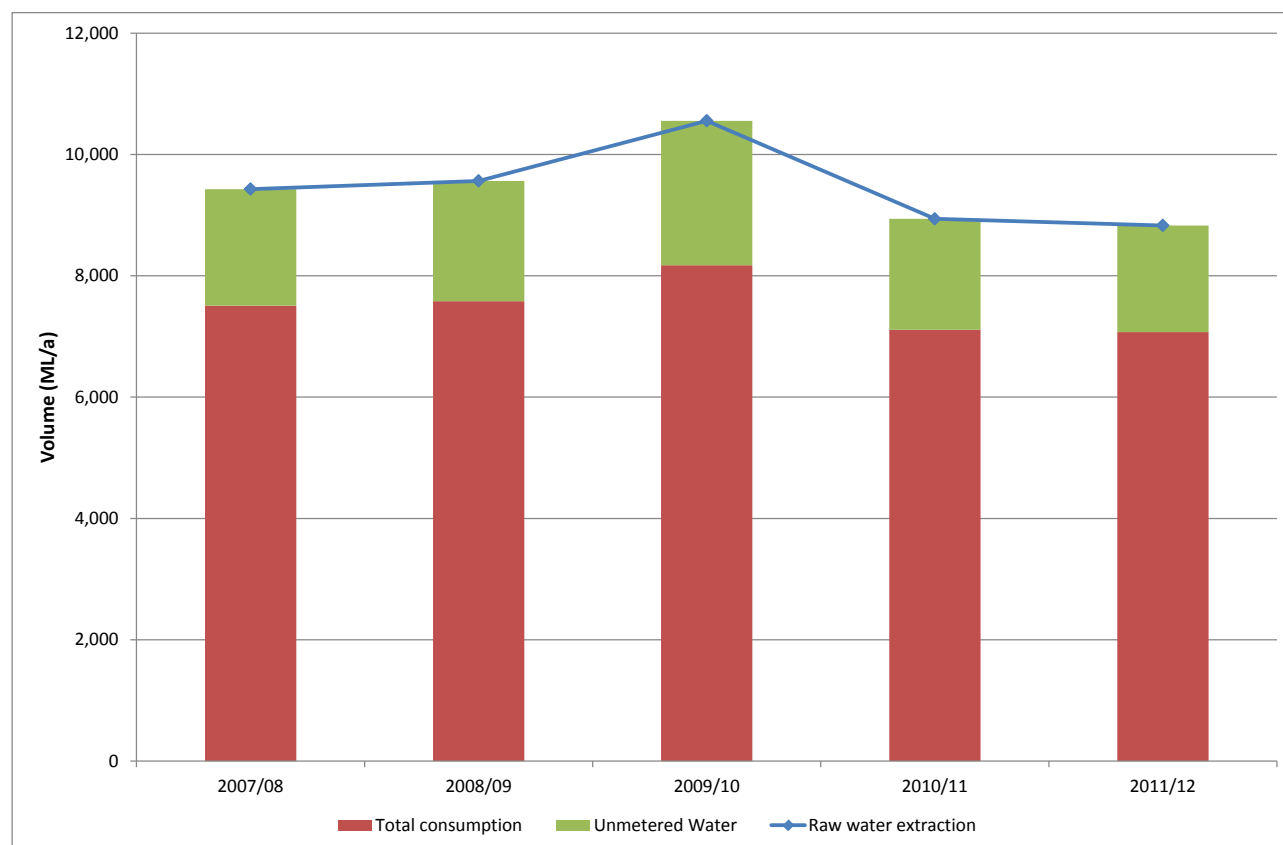
Table 34: Raw Water Extraction and Consumption – 2011/12 (kL/a)

Connection Type	2011/12
<i>Tweed District</i>	
Raw Water Extraction	8,751,200
Residential Consumption	4,923,715
Non-residential Consumption	2,078,471
<i>Total Consumption</i>	<i>7,002,186</i>
<i>Unmetered Water</i>	<i>1,749,014</i>
<i>Unmetered Water (%)</i>	<i>20%</i>
<i>Uki</i>	
Raw Water Extraction	57,030
Residential Consumption	28,110
Non-residential Consumption	19,408
<i>Total Consumption</i>	<i>47,518</i>
<i>Unmetered Water</i>	<i>9,512</i>
<i>Unmetered Water (%)</i>	<i>17%</i>
<i>Tyalgum ¹</i>	
Raw Water Extraction	21,820

1. Tyalgum WTP production and consumption figures are unreliable.

Table 35: Raw Water Extraction and Consumption – Tweed Shire (kL/a)

Connection Type	2007/08	2008/09	2009/10	2010/11	2011/12
Raw Water Extraction	9,428,780	9,564,087	10,554,955	8,937,765	8,830,050
Total Consumption	7,509,000	7,582,000	8,175,000	7,109,000	7,071,301
Unmetered Water	1,919,780	1,982,087	2,379,955	1,828,765	1,758,749
<i>Unmetered Water (%)</i>	20%	21%	23%	20%	20%

**Figure 24: Raw water extraction – Tweed Shire**

3.9 Rous Water Retail

3.9.1 Number of Connections

Table 36: Water Supply Connections – Rous Water Retail

Connection Type	2007/08	2008/09	2009/10	2010/11	2011/12
Rous Retail	2,204	2,127	2,180	2,205	2,229
Rous Water supply area growth % p.a.	5.6%	-3.5%	2.5%	1.1%	1.1%

Source: Hydrosphere Consulting (2012b)

3.9.2 Consumption

Table 37: Consumption – Rous Water Retail and Bulk Supply Unmetered Water (kL/a)

Connection Type	2007/08	2008/09	2009/10	2010/11	2011/12
Raw Water Extraction	10,201,573	10,525,219	11,782,336	11,142,257	11,127,485
Bulk Sales	9,316,726	9,663,017	10,788,973	9,677,318	9,293,121
Retail Sales	686,191	721,149	758,912	747,472	755,779
Unmetered Water	198,656	141,053	234,451	717,467	1,078,585
Unmetered water as % of Bulk Water	1.9%	1.3%	2.0%	6% ¹	10% ¹

1. Rous Water identified major leaks in 2010 and 2011

Source: Hydrosphere Consulting (2012b)

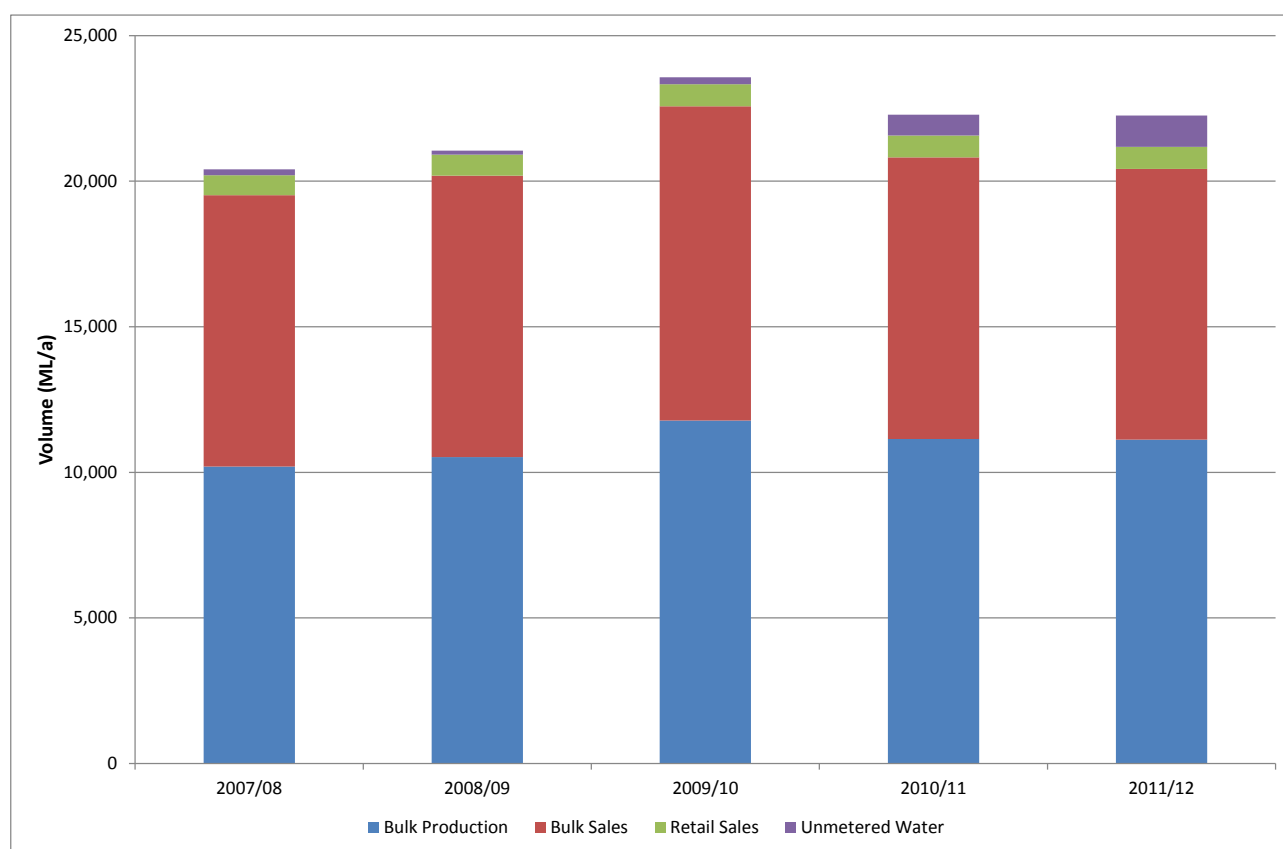


Figure 25: Rous Water Retail Consumption and Unmetered Water

3.10 Private Water Supplies

Within the study area, properties not connected to town water supplies rely on household rainwater tanks, bore water or direct river extraction. In times of prolonged drought, rainwater tanks may be depleted or groundwater/surface water extraction may be restricted and these private water supplies may purchase potable water from town water supplies via water carters. The historical bulk water sales (to carters as well as maintenance and construction activities) are included in the consumption data provided in Section 3.

Water carters can access filling stations within the study area as discussed below:

- Rous Water - The potable water carters using the Rous filling station network are licensed by Rous Water and registered as a food industry by NSW Health. There are 13 tankers who deliver potable water with average tanker size of 12,000 L. There are also nine other non-potable users (e.g. under-boring, vacuum excavation, Council maintenance) with average tanker size between 1,000 - 2,000 L. There are 11 filling stations connected to the Rous Water network and one in Casino, Wardell and Nimbin, all operated by Rous Water. Rous Water has provided data on water carter usage indicating the average filling station demand (since 2006 when the system commenced) is 33 ML/a with a maximum of 60 ML in 2009/10;
- RVC has provided data on usage by the water carter operating in Casino indicating the average demand was 13 ML/a with a maximum of 18 ML in 2009/10. This carter has a private standpipe and three 20,000 L tankers;
- Ballina Shire Council has recently revised its Backflow Prevention Policy to require all users purchasing water from Council's water supply to provide their own metered standpipe with appropriate backflow prevention suitable to the risk/usage. No approvals have been issued to date. All water carters source water from Rous Water filling stations;
- The Drought Restriction Policy for Kyogle Shire allows registered water carters to fill domestic tanks from approved filling stations up to Level 3 restrictions. The use of town water by water carters is banned beyond level 3 restrictions. There is currently one registered water carter operating in Kyogle Shire although data on historical demand is not available;
- All water carters in the Byron Shire use the Rous Water filling stations. Council has developed a draft policy to prevent bulk water supply from Council's network (including Mullumbimby and Billinudgel); and
- Tweed Shire Council is not able to provide accurate data on external bulk water sales as the data includes water stolen from Council standpipes, water used for major construction and Council carting to Tyalgum during droughts. External sales of water are banned when Level 1 water restrictions are imposed. However, it is expected that water carters from south-east Queensland would also service the Tweed Shire properties with no impact on the Tweed Council water supplies.

Of the total potable water demand discussed in Section 3, the average external bulk sales in the study area is estimated to be less than 100 ML/a. The maximum demand (experienced in 2009/10) is expected to be less than 150 ML/a.

The potential for increased demand from private water supplies during prolonged droughts will be determined as part of the future water demand stage of this project (Interim Report 2).

4. REGIONAL BULK WATER DEMAND

4.1 Regional Demand

The total bulk water demand is represented by the total raw water extraction or bulk water supplied to each water supply system. Demand data summarised from Section 3 and the current average demand (calculated from the number of connections in 2012 and the average consumption per connection over the previous 5 years) are given in Table 38. Figure 26 presents the data from Table 38 graphically.

Table 38: Regional Demand (ML/a)

Water Supply	2007/08	2008/09	2009/10	2010/11	2011/12	Average
<i>Rous Water</i>						
Ballina Bulk Supply	3,299	3,343	3,843	3,531	3,272	3,325
Byron Bulk Supply	2,189	2,278	2,617	2,434	2,356	2,429
Lismore Bulk Supply	3,202	3,407	3,623	3,129	3,084	3,543
Richmond Valley Bulk Supply	626	636	707	583	582	657
Retail Supply	686	721	759	747	756	756
Rous Water Unmetered Water ¹	199	141	234	717	1,079	193
<i>Total Rous Water</i>	<i>10,202</i>	<i>10,525</i>	<i>11,782</i>	<i>11,142</i>	<i>11,127</i>	<i>10,903</i>
<i>Kyogle Council</i>						
Kyogle raw water extraction	299	306	335	294	290	304
Bonalbo raw water extraction	33	35	14	39	33	34
Bulk supply from Tenterfield Council ²	52	53	71	48	52	52
<i>Total Kyogle</i>	<i>384</i>	<i>394</i>	<i>420</i>	<i>381</i>	<i>374</i>	<i>391</i>
<i>Tweed Shire Council</i>						
Tweed District raw water extraction	9,351	9,489	10,472	8,843	8,751	9,062
Uki raw water extraction	51	49	50	49	57	52
Tyalgum raw water extraction	28	26	34	45	22	31
<i>Total Tweed</i>	<i>9,429</i>	<i>9,564</i>	<i>10,555</i>	<i>8,938</i>	<i>8,830</i>	<i>9,145</i>
Mullumbimby raw water extraction	364	331	390	330	358	378
Wardell raw water extraction	123	132	130	112	119	123
Nimbin raw water demand ³	57	55	63	62	63	66
Casino raw water extraction	2,354	2,406	2,460	2,249	2,180	2,338
<i>Total Region Demand</i>	<i>22,912</i>	<i>23,407</i>	<i>25,800</i>	<i>23,215</i>	<i>23,052</i>	<i>23,344</i>
<i>Variation from average demand</i>	<i>-2.9%</i>	<i>-0.8%</i>	<i>9.3%</i>	<i>-1.6%</i>	<i>-2.3%</i>	<i>-</i>

1. Unmetered water for the Rous Water bulk supply is from 2007/08 – 2009/10 as high losses experienced in 2011 and 2012 are not considered to be representative of an average year.

2. Data are for Woodenbong and Muli Muli in Kyogle Council area only.

3. Raw water flows from the river to DE Williams dam and is recycled through the dam to improve dam turnover. Raw water extraction is significantly higher than customer demand.

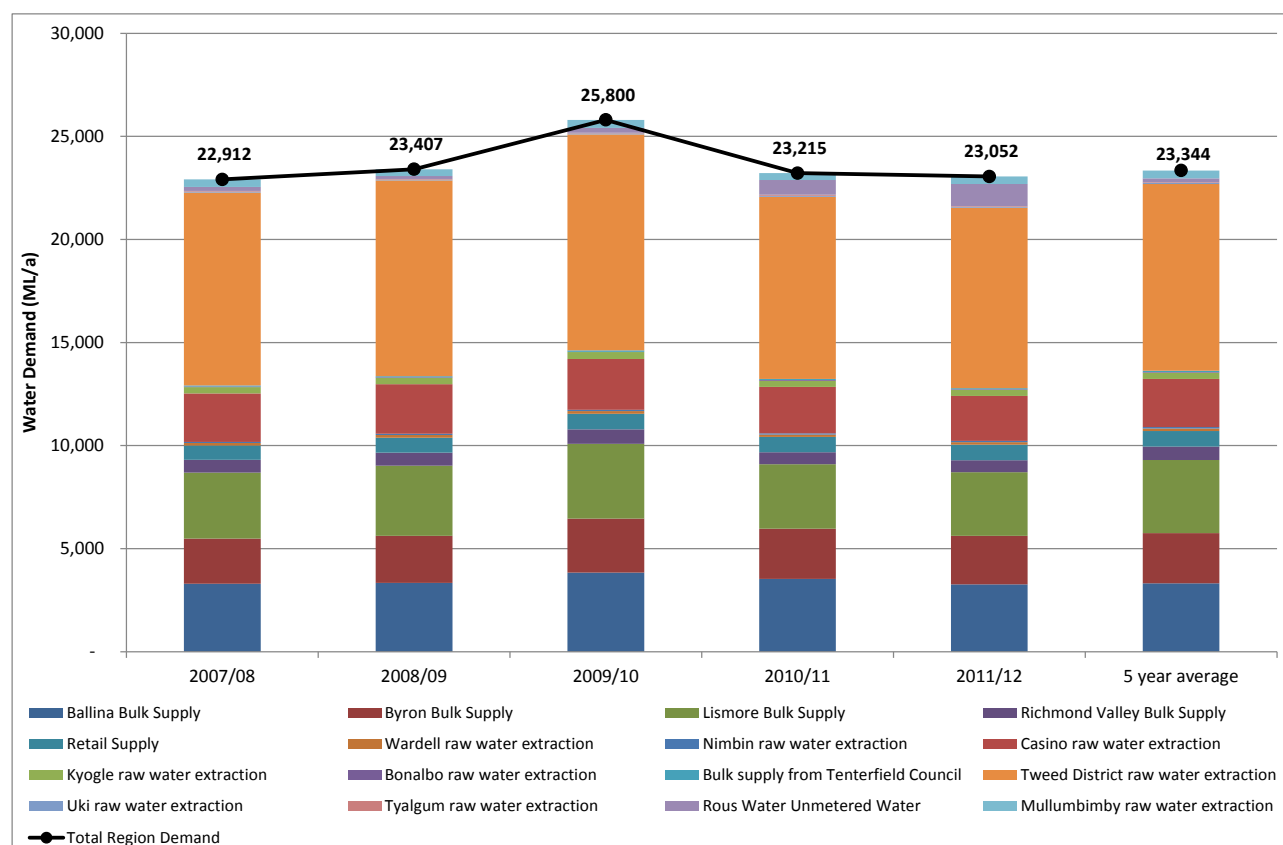


Figure 26: Regional Water Supply Demand

4.2 Current Baseline Regional Demand

It is necessary to determine whether the current average demand is an appropriate starting point for extrapolation of water demand into the future.

Long-term production data reported for Rous Water (Hydrosphere Consulting, 2012b), Tweed Shire Council (Hydrosphere Consulting, 2012a) and Casino water supply (Hydrosphere Consulting, 2010) show that production is variable, with large deviations in production from month to month, between the same month from year to year and in terms of seasonal and annual totals. However, the causes of this variation have not been fully established.

Rous Water and the Councils have implemented demand management programs and user pays pricing which have been successful in progressively reducing demand despite an increase in population (Hydrosphere Consulting, 2010, 2012a, 2012b). In addition, Rous Water demand patterns, in particular, seasonal variability, altered significantly following the 2002/03 restrictions and this indicates that behavioural changes (in association with other demand management measures) have had a long-lasting influence which is likely to continue into the future (Hydrosphere Consulting, 2012a). It is therefore considered appropriate to consider the recent (5 years) historical demand as representative of current consumption patterns.

The regional demand in 2009/10 is approximately 10% higher than the average demand. As discussed in the *Rous Water Future Water Strategy Demand Forecast* (Hydrosphere Consulting, 2012b), the Council unmetered water in 2009/10 was 21% of bulk water supplies, compared to an average of 15% for 2006/07 to 2008/09. Rous Water has also experienced significantly higher bulk water losses in 2010/11 and 2011/12 (6% and 10% of bulk water production respectively compared to the previous average of 1 - 2%). The causes of the increased level of unmetered water are not fully understood, however these high levels of losses are not considered to be representative of a normal year.

Figure 27 shows the regional demand (water sales) and unmetered water. Data on unmetered water for all water supply systems is sourced from Section 3. Where data on unmetered water for the smaller systems are not available, 10% unmetered water has been assumed.

The average regional demand (excluding unmetered water) for the five years was 19,300 ML. The demand (excluding unmetered water) in 2009/10 was 6.6% higher than the 5 year average.

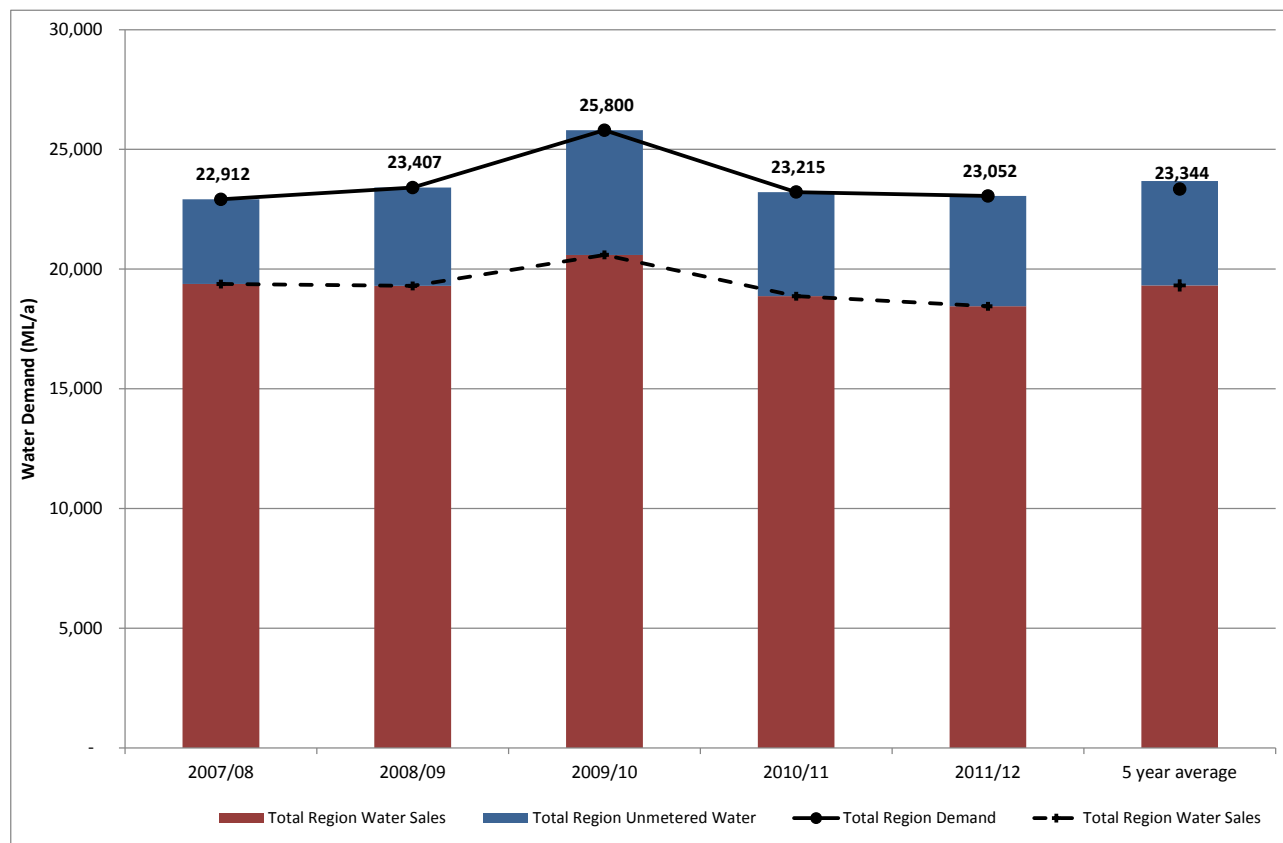


Figure 27: Regional Water Supply Demand and Unmetered Water

Variations in climate are often suspected as being a major driver for demand variability as there are intuitive linkages between household water use and the weather. A summary of climate data from the bureau of meteorology for the major population/demand centres of Ballina, Lismore and Tweed Valley is given in Table 39.

Table 39: Regional Climate Data

Location	Ballina	Lismore	Tweed Valley
Weather Station	58198 Ballina Airport AWS (1993/94 – 2011/12)	58214 Lismore Airport AWS (2002/03 – 2011/12)	58158 Murwillumbah (Bray Park) (2001/02 – 2011/12)
Average Annual Rainfall (mm) for available record	1,754	1,146	1,595
Average Annual Rainfall (mm) for 2007/08 – 2011/12	2,109	1,334	1,863
Maximum Annual Rainfall (mm) for available record	2,575 (2007/08)	1,517 (2010/11)	3,189 (1973/74)
Minimum Annual Rainfall (mm) for available record	859 (2005/06)	776 (2005/06)	738 (2001/02)

Location	Ballina	Lismore	Tweed Valley
Average Maximum Temperature (° C) for available record	24.4	25.8	25.8
Average Maximum Temperature (° C) for 2007/08 – 2011/12	24.5	24.7	25.4
Maximum Temperature (° C) for available record	25.8 (2009/10)	27.0 (2009/10)	27.6 (1990/91)

Source: BOM (2012)

At all locations, 2009/10 was hotter and drier than the average year. The five year period 2007/08 – 2011/12 was wetter than the long term average with similar maximum temperatures.

Some Council demand management studies have utilised a climate correction water production trend tracking model (Water Demand Trend Tracking and Climate Correction Model developed by the NSW Office of Water) to analyse historic trends in order to understand the underlying drivers and timing of trend changes. The aim of climate correction is to adjust or normalise the observed consumption on the basis of the climate factors experienced in that period.

Previous work for Rous Water by AWT (reported in Hydrosphere Consulting, 2012b) found significant error in the attempted correlation between climate variables and demand. Hydrosphere Consulting (2012b) provided a review of the influence of climatic variables to determine if there was a quantifiable linkage to Rous Water production, and whether these climatic variables during the 2006/07 – 2009/10 period were representative of a 'normal' period. It was found that:

- Higher temperature may be a key driver of higher demand however, the corresponding decrease for abnormally cool conditions was not apparent;
- 2007-2010 temperatures are "typical" of the post-2003 restriction period; and
- There was no clear relationship between production and other climate variables.

For that report, Hydrosphere Consulting used the current number of connections and the 4 years of consumption data to estimate the average demand for each connection type in an average (baseline) year. Hydrosphere Consulting (2012a) also reported anomalies in the climate correction approach for Tweed Shire demand.

Any relationship between climatic factors and demand variability is blurred by many other factors such as tourism, consumption behaviour, land development or water losses. No definitive relationship between the range of variables and demand has been identified that would be appropriate for predictive studies.

The demand in 2009/10 (a hotter and drier year) was approximately 6.6% higher than the 5 year average. Although sustained high rainfall may have an influence on total demand, the increase in demand experienced is not considered to be significant. Further analysis of water demand (by location and connection type), climate variables and other potential influences on demand would be required to fully explain the year-to-year variation in demand. For the purposes of this report, it is considered appropriate to use the current number of connections and the 5 years of consumption data to estimate the average demand for each water supply system in an average year.

In accordance with the findings of Hydrosphere Consulting (2012b), the unmetered water in the Rous Water system is assumed to be the average of the 2006/07 – 2008/09 unmetered water for each system (on average 15% of the total Rous Water production) i.e. excluding the high levels recorded in 2009/10 – 2011/12. Unmetered water for the other systems is estimated to be the average of the 5 years of data. Where data on unmetered water for the smaller systems are not available, 10% unmetered water has been assumed.

Table 40 presents the current number of connections, per connection demand, unmetered water and total demand for each water supply system.

Table 40: Current (average) demand in each system

Water Supply	Residential connections (2012)		Non-residential connections (2012)		Unmetered Water (% of total demand)	Total Current Demand (ML/a)
	Total Number	Average per connection demand (kL/a)	Total Number	Average per connection demand (kL/a)		
Ballina bulk supply	12,967	174	1,489	330	26% ¹	3,325
Byron bulk supply	8,853	177	1,134	664	8% ¹	2,429
Lismore bulk supply	13,000	178	1,268	674	13% ¹	3,543
RVC bulk supply (MLRR)	2,323	161	274	651	17% ¹	657
Rous Water retail	2,229	335	-	-	-	756
Rous Water unmetered water	-	-	-	-	2% ²	193
Kyogle	1,182	162	203	450	7%	304
Bonalbo ³	148	116	44	197	N/A	34
Woodenbong and Muli Muli ⁴	189	160	47	275	16%	52
Tweed District ⁵	32,471	165	1,701	1,245	21%	9,062
Uki ⁵	173		7			52
Tyalgum ⁵	99		15			31
Mullumbimby	1,482	164	197	385	10%	378
Wardell	284	N/A	28	N/A	10% ⁸	123
Nimbin ⁶	247	153	68	314	10% ⁸	60
Casino ⁷	4,070	190	453	2,871	10%	2,338
Total Region	79,717	-	6,928	-	19%	23,344

1. Unmetered water for the Rous Water Constituent Councils is from 2007/08 – 2009/10. The unmetered water for the Rous Water supply area is assumed to be 15% for the average year.

2. Unmetered water for the Rous Water bulk supply is from 2007/08 – 2009/10 as high losses experienced in 2011 and 2012 are not considered to be representative of an average year.

3. As raw water is pumped into an off-stream storage, total unmetered water is not available. Total demand is reported as the total raw water extraction from the river.

4. The high losses experienced in 2009/10 due to a main break have not been included here.

5. The Tweed IWC Strategy Review Background Paper (Hydrosphere Consulting, 2012a) presents the current (2012) total shire demand as 324 L/p/d (9,617 ML/a).

6. As water is recycled through the dam for operational reasons, the demand is presented as the customer demand plus unmetered water.

7. The average per connection demand includes Food Producers. Non-residential demand excluding Food Producers is 666 kL/a.

8. In the absence of data, unmetered water has been estimated as 10% of raw water extraction.

As with any data, the predicted level of error should be considered in the application of the data. The major causes of variation in the estimate of current demand are:

- House meter errors;
- Bulk meter errors;
- Differences in time periods (meter reading etc.);
- Unbilled water (including water used for maintenance or construction);
- Leakage or pipe bursts and time taken to locate and repair;
- Unauthorised consumption;
- Influences of climate - the demand in 2009/10, a hot, dry year is slightly higher than the average demand (6.5%);
- Other influences on residential demand e.g. tourism; and
- Non-residential production rates and associated demand.

4.3 Comparison with Secure Yield

The demand in each supply system is compared to the secure yield in Table 41. Secure yield estimates have been determined using the 5/10/20 rule (refer Section 2). The impacts of demand hardening, future environmental flow requirements and climate change have not been considered.

Table 41: Comparison of Demand and Supply Yield

Water Supply	Total Current Demand (ML/a) ¹	Current Secure Yield (ML/a)	Current Supply Surplus (ML/a)	Current Supply Surplus (%)
Ballina bulk supply	3,325	14,600	3,697	25%
Byron bulk supply	2,429			
Lismore bulk supply	3,543			
RVC bulk supply (MLRR)	657			
Rous Water retail	756			
Rous Water unmetered water	193			
Kyogle	304	320	16	5%
Bonalbo	34	52	18	35%
Woodenbong and Muli Muli	52	83	31	37%
Tweed District	9,062	13,750	4,636	34%
Uki	52			
Tyalgum	31	120	89	74%
Mullumbimby	378	435	57	13%
Wardell	123	N/A	N/A	N/A
Nimbin ²	60	101	35	35%
Casino	2,338	2,525	187	7%
Total Region	23,344	Approx. 32,000	Approx. 8,800	27%

1. From Table 40: Current (average) demand in each system.

2. Yield scenario is ungauged flow sequence with 6L/s riparian release (DPWS, 2002). Yield scenario with calibrated flow sequence is 63 ML/a. Demand is customer sales plus 10% unmetered water.

4.4 Water Sources

The contribution of each water source to the region's water supply in 2011/12 is given in Table 42. The regional water sources and current demand are shown on Figure 28.

Table 42: Regional Water Sources

Water Supply System	Water Source	Water Sourced in 2011/12 (ML/a)	% of total study area
<i>Rous Water</i>			
Rous Water bulk supply	Rocky Creek Dam	11,121	48.2 %
	Emigrant Creek Dam	6	0.03 %
	Wilsons River Source	-	-
	Converys Lane bore	-	-
	Lumley Park bore	-	-
	Woodburn bores	-	-
<i>Total Rous Water Sources</i>		<i>11,127</i>	<i>48.3%</i>
<i>Kyogle Council</i>			
Kyogle	Kyogle weir	290	1.26%
Bonalbo	Peacock Creek weir	28	0.12%
	Bonalbo bores	6	0.02%
Woodenbong/Muli Muli	Tooloom Creek weir (bulk supply from Tenterfield Shire Council)	52	0.22%
<i>Total Kyogle Council sources</i>		<i>374</i>	<i>1.62%</i>
Nimbin	Mulgum Creek weir	63	0.77%
Casino	Jabour weir	2,180	9.46%
Wardell	Marom Creek Weir	119	0.52%
Mullumbimby	Lavertys Gap Weir	358	1.55%
<i>Tweed Shire Council</i>			
Tweed District/Uki	Clarrie Hall Dam/Bray Park weir	8,808	38.2%
Tyalgum	Tyalgum weir	22	0.10%
<i>Total Tweed Shire Council sources</i>		<i>8,830</i>	<i>38.3%</i>
Total Study Area		23,052	100%

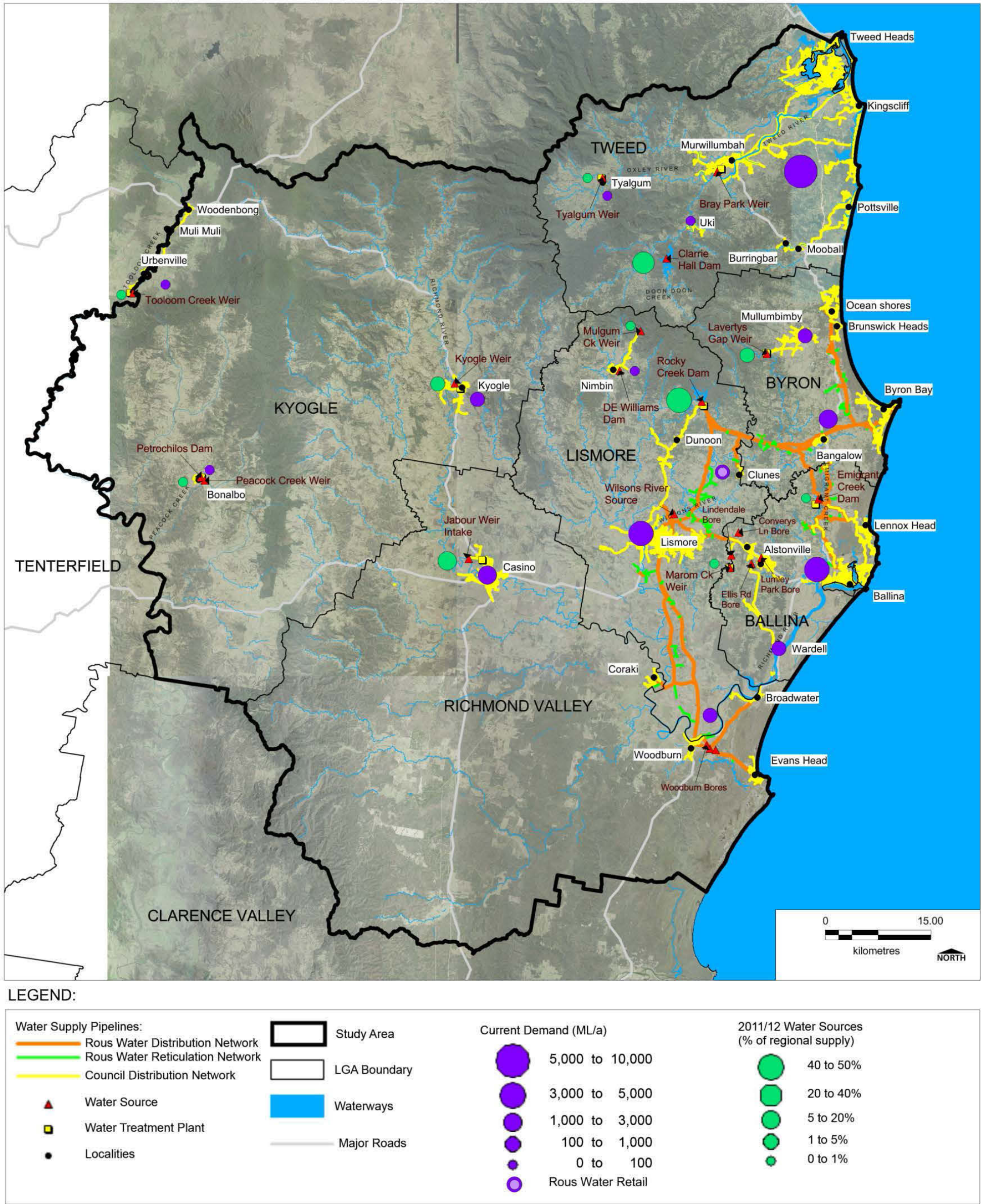


Figure 28: Regional Water Sources and Current Supply and Demand

5. CONCLUSIONS

5.1 Key Findings

The Northern Rivers water supplies serve approximately 80,000 residential properties and 7,000 non-residential connections with a current regional demand of approximately 23,300 ML/a.

The major sources of water are Rocky Creek Dam and Clarrie Hall Dam providing 48% and 38% of the region's water supply respectively. These larger centralised water sources also serve the majority of the study area population over the longest distribution systems. There are also many smaller water sources serving the towns and villages within the study area.

Some data on water supply secure yield exists for the region although there are significant uncertainties regarding environmental flow requirements, water demand and the impact of restrictions as well as modelling methodologies. The current secure yield of the region's water sources is estimated to be 32,000 ML/a, indicating a significant supply surplus when considering the total study area. The supply availability will need to be considered for each water source with consideration of future impacts on secure yield such as climate change, environmental flow requirements and demand hardening.

This Interim Report has generally provided good data as the basis for the next steps in the development of the regional BWSS. Short-term variations in climate appear to contribute to the variability in demand, however as the major climatic and non-climatic influences on demand variability have not been established, it will be necessary to consider the potential demand variability in the prediction of long-term demand.

5.2 Next Steps

The next stage of the Regional BWSS will involve the development of a long-term (50 year) demand forecast for the region from the available data on predicted growth for each connection type and per connection consumption.

The forecast demand will then be compared to the expected future secure yield. The Regional BWSS will consider potential options for meeting the long-term regional demand with particular consideration of potential regional integration scenarios.

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