Warrumbungle Shire Council

Draft

Drought Management Plan

warrumbungle
SHIRE COUNCIL

Table of Contents

1 EXECUTIVE SUMMARY

1.1 Introduction

The purpose of this Drought Management Plan is to provide guidance on how best to provide the maximum degree of security for the supply of water to the towns, villages and rural residents in the Warrumbungle Shire during drought conditions.

This plan provides guidance by looking at the history of measures taken during past droughts and in particular the drought of 2000-2003 and now. Additionally it considers how past measures can be improved. Furthermore, the plan analyses the impact of a drought worse than that already experienced and what reasonable steps can be taken to identify additional water supply sources.

1.2 Operating Environment

Council's raw water supplies appeared reasonably secure until recently. However based on previous recent droughts the towns and villages within the Shire have had to endure Level 4 water restrictions for up to six months during the 2000-2003 drought and Coonabarabran is currently on Level 6.

User pays has reduced the amount of water consumed by approximately 40% across the Shire since 1996 (based on Coonabarabran treated water records). Consequently all water treatment facilities have sufficient capacity to meet maximum daily demand.

In 2007 CSIRO reported on climate change predictions in Central West NSW. The report included most of the Warrumbungle Shire. According to the report, since 1950, the region has experienced warming of around 0.8ºC. The catchment has also experienced significant change in annual rainfall, with a trend toward increasing rainfall of approximately 5 mm per decade in the north of the catchment (ie in the Warrumbungle Shire). However, the increased evaporation resulting from the increased temperatures is likely to result in less runoff in future.

The extraction of raw water within the Shire is governed by 4 Water Sharing Plans under the jurisdiction of the NSW Office of Water.

1.3 History of Past Droughts

During past droughts it has been necessary to introduce restrictions on an average of once every 2 years and 3 months.

Furthermore there have been worse droughts in the past and notably the drought of 1918-1920 where rainfall was 370 mm annually, compared to 560 mm in the 2000-2003 drought.

While no supply ran out of raw water, levels in the intakes at Binnaway, Mendooran and Merrygoen were very low during the 2000-2003 drought and the Dunedoo aquifer reached low levels in late 2009 before the drought broke.

1.4 Drought Management Plans

A Drought Management Plan that applies across the Shire is included in this section along with specific plans for each water supply. Council's current Water Restrictions Policy is detailed as part of the Shire wide plan.

1.5 Recommendations

In summary this plan makes the following recommendations in order to be better prepared for the next drought:

- **Further development of the Water Restrictions Policy. Given that droughts in the past have been more severe than the 2000-2003 drought and current drought, consideration should be given to implementing restrictions earlier than is the current policy. Long term weather predictions of El Nino events and the time of year should be considered in implementing restrictions.**
- **Improvements in demand management that consider how water consumption can be reasonably reduced. This can be achieved by several measures including an effective communications strategy and incentives to install water saving devices. Council's Water Demand Management Plan provides more detail in this area.**
- **Reduction in water losses in the current water reticulation network by analysing where significant pipe leakages are occurring and carrying out necessary repairs. Reservoir drop tests in winter are a recommended first step in identifying which systems are leaking at unacceptably high levels.**
- **Implement monitoring of ground water levels in all bores/inlet wells on a regular basis and increase monitoring as drought conditions set in. It is necessary to understand the reliability of all water sources in order to implement suitable restrictions where necessary for each supply.**
- **Liaise with Office of Water and Irrigators regarding overall behaviour of aquifers particularly as drought conditions develop.**
- **Undertake plant upgrades to improve the water quality in Coonabarabran during the operation of powder activated carbon plant when blue green algae is present.**
- **Ensure that the 'dead' water in Timor Dam is regularly flushed when the dam is overflowing to ensure the quality of the dead water is maintained for when it is needed.**
- **Minimise the use of 'dead' water in Timor Dam so as to maintain certainty of supply should the aquifers become unreliable as a source of supply.**
- **Proceed to examine the cost / benefits of raising the Timor Dam wall.**

2 OPERATING ENVIRONMENT

2.1 Summary of Council Operated Water Supplies

Currently there are eight (8) individual potable water supplies in the Warrumbungle Shire. These are located at Baradine, Bugaldie, Binnaway, Coolah, Coonabarabran, Dunedoo, Kenebri and Mendooran. There is one non potable supply at Merrygoen and Council also supplies non potable bulk water from Timor Dam for treatment by the Australian Astronomical Observatory.

The water sources and treatment methods at each location are summarised below:

Location	Number of Connections	Water Source	Type of Treatment	Reservoir Capacity
Baradine	349	2 town bores	Fully Treated & Fluoridated	1X0.95MgL Concrete
Binnaway	287	Castlereagh River well	Fully Treated & Fluoridated	1X1MgL Concrete
Bugaldie	14	1 Town bore	Chlorination only	1X0.02MgL Poly Tank
Coolah	440	2 Bores	Chlorination	1x1.14MgL+2x0.11MgL Concrete Total 1.36MgL
Coonabarabran	1320	Timor Dam-upper catchment of Castlereagh River plus 12 bores	Fully Treated	1x4.0MgL+1x1.1mGl+1X2.0MgL Concrete Total 7.1 MgL
Dunedoo	450	1 Bore	Chlorination only (natural fluoride present)	1x0.85 MgL +2x0.23 MgL Concrete Total 1.33 MgL
Kenebri	13	1 Bore	Chlorination only	2x .012 MgL galv Total .024 MgL
Mendooran	225	Castlereagh River Well	Fully Treated	1x0.6MgL steel+2x.05MgL concrete+1x0.35MgL concrete Total 1.4MgL
Merrygoen non-potable	25	Castlereagh River well	No treatment	Old Railway steel storage tank Approx .2 MgL
Australian Astronomical Observatory	1	Timor Dam	No treatment. Water treated privately by Observatory	NA
Total	**3123**			**12.02 MgL**

Plans of the individual water supply systems are included in Appendix 1.

2.2 Villages and Properties without a Council Water Supply

Villages in the Warrumbungle Council area that have no Council supplied water service are:

Village	Population *	Current Source of Water
Cobbora	30	Tank water, private bores
Leadville	60	Private bore scheme operated by residents and tank water
Neilrex	20	Tank water, private bores
Purlewaugh	10	Tank water, private bores
Uarbry	15	Tank water private bores
Ulamambri	50	Tank water, private bores
Weetaliba	10	Tank water, private bores
Yearinan	10	Tank water, private bores
Total	**205**	

**-estimated figures for population in the village proper as distinct from the ABS census area.*

All the villages without Council water supplies are too small to economically justify provision of such water services.

Warrumbungle Council is a rural Council and had a population of 9,251 in 2016 according to the ABS Census Data. There are approximately 3,200 rural residents that rely on rainwater tanks and bores.

During Droughts all residents without a Council water supply may require water from a nearby Council Water supply. Typically water carts access water from a Council standpipe and deliver potable water on a fee for delivery basis.

Historically in times of extreme droughts the State government subsidises the delivery of water to affected residences.

2.3 Essential Service Customers

The following organisations require water in all circumstances:

Town/Village	Organisation
Baradine	Medical Centre
	Baradine Public School
Coolah	Coolah Hospital
	Coolah Public School
	Aged care hostel
	Preschool
	Hotels, Motels, Caravan Park
Coonabarabran	Coonabarabran Hospital
	Coonabarabran Public School
	Coonabarabran High School
	Aged care hostels
	Preschool
	Hotels, Motels, Caravan Park
Dunedoo	Dunedoo Hospital
	Dunedoo Public School
	Dunedoo High School
	Aged care hostel
	Preschool
	Hotels, Motels, Caravan Park
Mendooran	Mendooran Community Health Centre
	Mendooran Central School
	Mendooran Hotel
	Mendooran Caravan Park

2.4 Businesses Relying on Water Supply for production purposes

Name of Business	Minimum normal demand (Kl/annum)
Shady Rock Nursery	

2.5 Water Demands

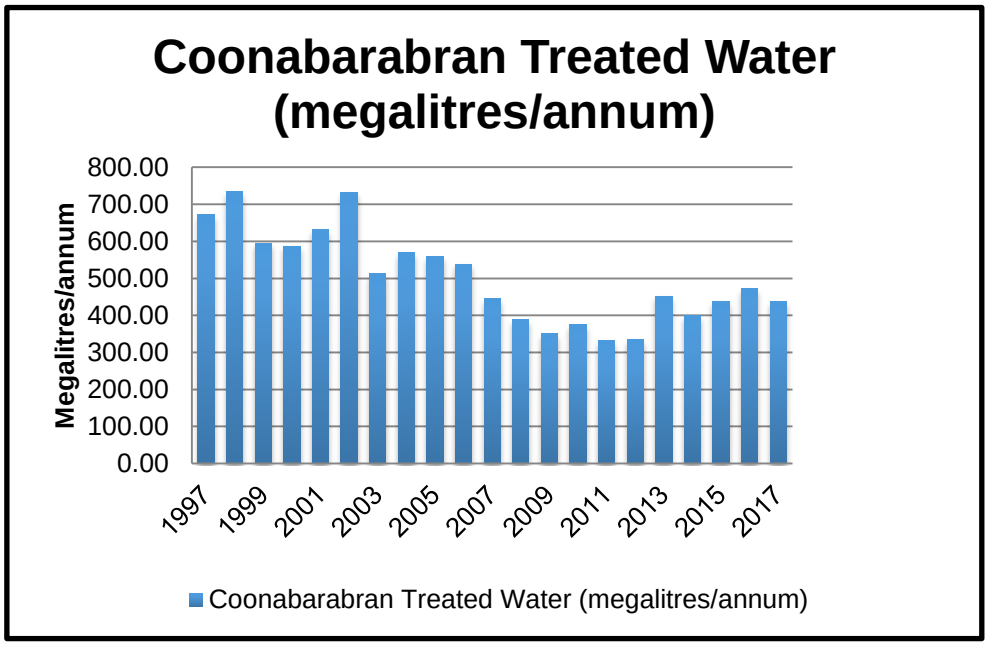
2.5.1 History of Treated Water

Treated Water (MgL)											
Location	**2006/ 2007**	**2007/ 2008**	**2008/ 2009**	**2009/ 2010**	**2010/ 2011**	**2011/ 2012**	**2012/ 2013**	**2013/ 2014**	**2014/ 2015**	**2015/ 2016**	**2016 2017**
Coonabarabran	452	383	352	375	333	335	452	400	437	473	437
Coolah	180	128	131	136	114	129	135	151	128	151	154
Dunedoo	217	175	208	238	258	206	241	257	195	199	237
Baradine	171	153	166	166	110	100	155	141	166	237	141
Binnaway	87	67	85	85	84	76	85	141	147	99	91
Mendooran	77	84	110	100	90	85	46*	40	56	61	64
Bugaldie	4	4	3	3	3	3	3	3	5	3	3
Kenebri	3	3	3	4	2	3	7	5	5	4	3
Merrygoen	8	5	5	5	3	3	3	3	5	13	10
Total	1,119	1,002	995	1,052	937	882	1,133	1,141	1,144	1,240	1,140

**estimated*

History of Treated Water in Coonabarabran

Based on the treated water history for Coonabarabran the consumption has generally declined by approximately 40% since the introduction of user pays.



User pays was fully implemented across the Shire in 2007 when metering was completed and the average annual metered consumption per connection over the last five (5) years has been 226 Kilolitres. While the consumption declined in 2010/11 and 2011/12 it is considered that the relatively wet summers were the main reason.

This conclusion is supported by the jump in consumption in 2012/13 when the summer months were very dry resulting in an average annual consumption of 266Kl per connection. It is expected that the price shock of the increased bills for 2012/13 will result in lower consumption even in future dry summers.

2.5.2 Comparison of Treated and Metered Water Volumes.

	Treated Water (MgL)	Metered MgL's	% of Unaccounted Water	Avge KL's per Connection	Number of Connections 2016
	2016/17	**2016/17**	**2016/17**	**2016/17**	**2016/17**
Coonabarabran	437	309	29.29%	227.20	1360
Coolah	154	92.5	39.94%	190.72	485
Dunedoo	237	115	51.48%	239.58	480
Baradine	141	102	27.66%	281.76	362
Binnaway	91	51.8	43.08%	176.79	293
Mendooran *	64	34	46.88%	137.10	248
Bugaldie *	3	1.6	46.67%	133.33	12
Kenebri *	3	1.5	50%	107.14	14
Merrygoen *	10	2.7	73.00%	108.00	25
Total	**1,125**	**710**	**37.71%**	**216.53**	**3279**

**estimated*

The main reasons for unaccounted water are:

- Leaks in the pipe network
- Faulty meters
- Mains breaks
- Flushing
- Illegal connections

The amount of unaccounted water in Dunedoo and Binnaway indicates that further investigation of the reasons needs to be undertaken.

Initial investigation of the reasons can be carried out by firstly checking meter readout reports for faulty meters and replacing these.

Any meters over 10 years of age should be replaced by implementing a meter replacement program. This action has now commenced.

These first two measures do not actually save water but do provide equity to customers.
In order to establish an appreciation of the amount of water lost through leaks in the network a first step is to carry out reservoir "drop tests" in the middle of winter and late at night when consumption is at its lowest. A drop test involves measuring the drop in water levels in each reservoir over a two hour period. Having carried out these tests it may be necessary to carry out a leak detection program to identify the location of specific leaks and following up with a repair program.

2.5.3 Minimum Requirements during Extreme Drought

Having imposed Level 6 restrictions now reserves are low, the minimum requirements are generally in the order of 95 litres per person per day.

When country town and village supplies are threatened by drought the NSW Government will help Councils maintain a basic supply to their consumers. The NSW Office of Water has provided technical assistance and aid to Councils in applying for financial assistance from the government. The Government has provided three tranches of financial assistance amounting to $975,000 with Council contributing $325,000 for supply augmentation in Coonabarabran.

Council has sought further assistance of $550,000 to fully fund the completion of the current strategy to provide a fully integrated supply for Coonabarabran from bores and the Castlereagh River without relying on the Timor Dam at all. Water cartage is generally only cost effective for small towns.

Emergency capital works have been recommended as the best solution to the problem. In the case of Warrumbungle Shire these include emergency bore supplies.

Minimum quantities required for each centre during an emergency are detailed below.

It is evident that supplying water to the larger centres by tanker would not be feasible both from a cost viewpoint and the logistics of sourcing sufficient tankers.

Urban area	Population	Minimum requirement (litres/person per day)	Total quantity Required (KL/day	Number of 15,000 litre Tankers/day
Baradine	680	95	78	6
Binnaway	400	95	45	3
Coolah	910	95	104	7
Coonabarabran	2500	95	285	19
Dunedoo	840	95	95	7
Mendooran	400	95	45	3
Bugaldie	29	95	3.3	1 every 4 days
Kenebri	68	95	7.8	1 every 2 days
Merrygoen	33	95	3.8	1 every 4 days
Neilrex	19	80	1.8	1 every 6 days
Leadville	62	80	6	11 every 2 days
Ulamambri	50	80	4.8	1 every 3 days

With the funds provided by Government Council is also constructing an additional bore and connection to supply a ‘back-up’ bore and emergency supply at Binnaway, Coolah and Mendooran. These bores have been sunk and will be available by August this year.

2.5.4 Additional Water Sources

Possible additional water security for Coonabarabran includes raising the wall of Timor Dam which would also serve the purpose of reducing periods of water restrictions. For example lifting the Dam wall one metre would increase the capacity by approximately 20% or 225 Megalitres.

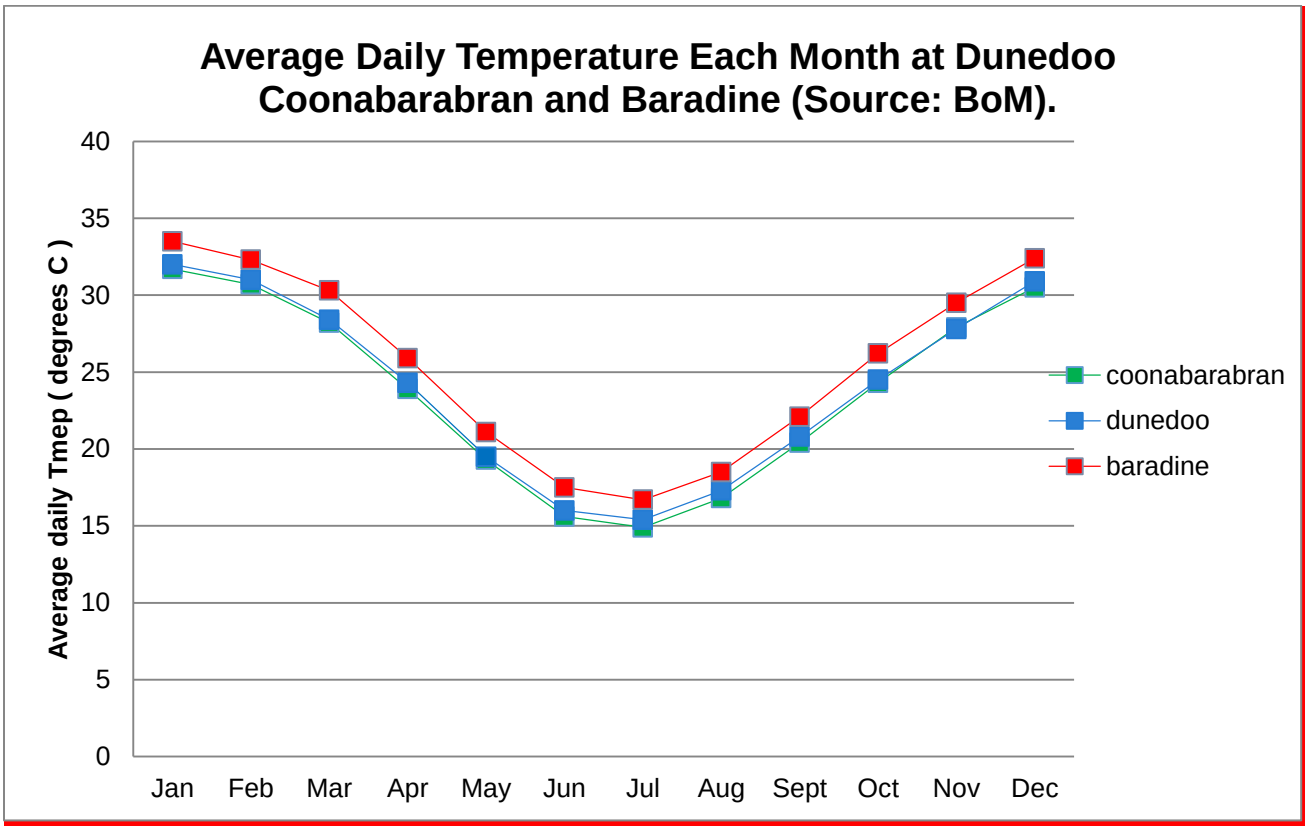
However consideration must be given to the cost / benefit of this approach, requirements for environmental flows would be introduced and other environmental factors that need to be taken into account. There has been little or no exploration of other dam sites in the area.

Accessing the Great Artesian Basin has now been adopted.

2.6 Climate

2.6.1 Temperatures

Warrumbungle Shire has three official meteorological stations in its LGA. The graph shows that Baradine has the highest average temperature each month while Coonabarabran has the lowest temperature.



(Graph sourced from Integrated Water Cycle Management Evaluation Study – May 2017)

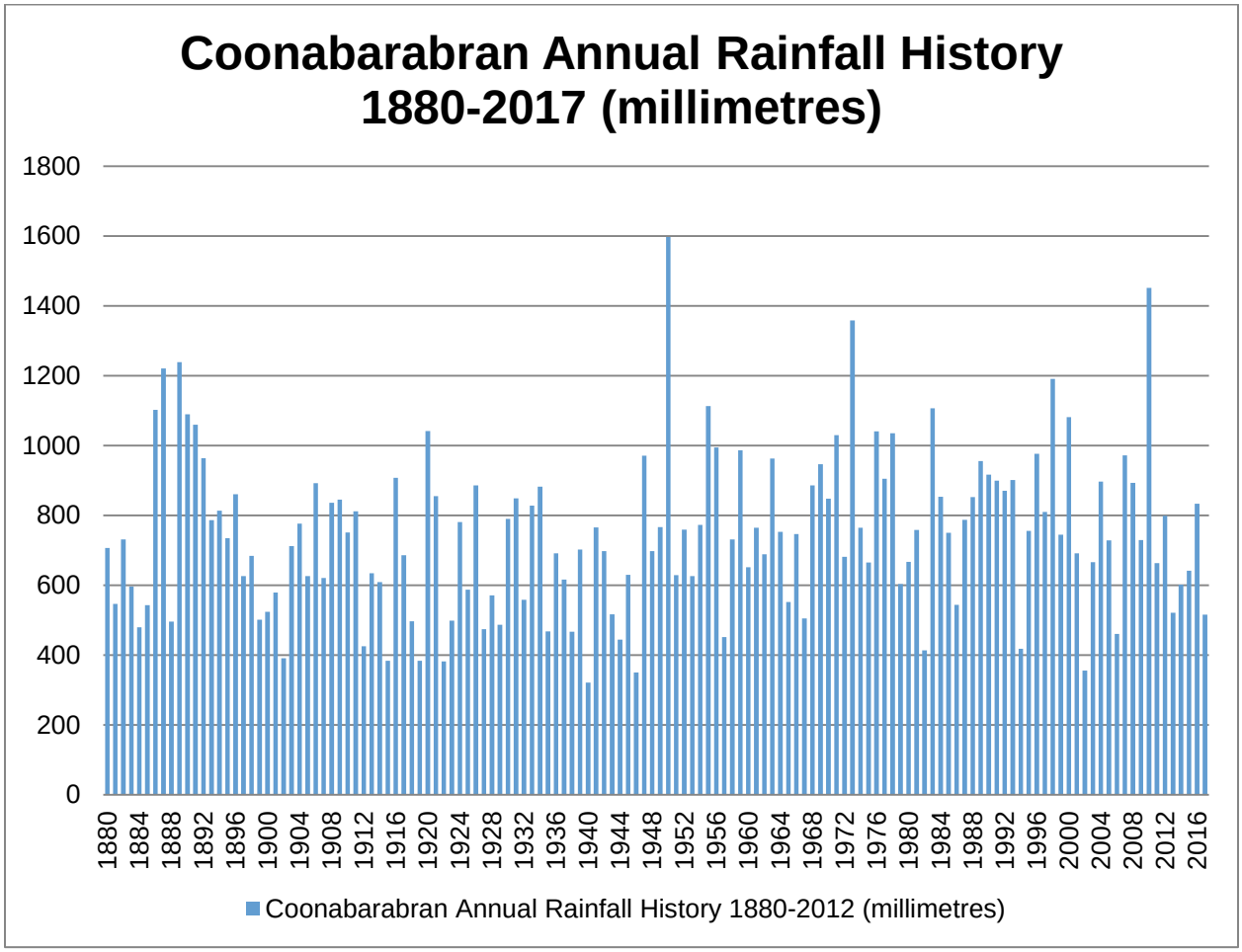
The difference in temperature largely reflects the difference in altitude, with Coonabarabran at 606m while Dunedoo and Baradine are at 388m and 302m respectively.

In 2007 CSIRO reported on climate change predictions in Central West NSW. The report included most of the Warrumbungle Shire. According to the report, since 1950, the region has experienced warming of around 0.8ºC. The catchment has also experienced significant change in annual rainfall, with a trend toward increasing rainfall of approximately 5 mm per decade in the north of the catchment (i.e. in the Warrumbungle Shire). However the increased evaporation resulting from the increased temperatures is likely to result in less runoff in future.

The monitoring of the groundwater reliability has shown that the provision of 'back-up' bores mentioned above in these towns is a viable means of ensuring supply. With Government assistance of $395,000 for Binnaway, $370,000 for Coolah and $342,600 for Mendooran bores have been sunk and will be completed by September 2018

January is the warmest month with the highest mean maximum temperature. In Coonabarabran the highest mean maximum temperature for January over the last 20 years was 34.7 degrees in 1993 while the highest on record was 40.6 degrees in 1882 and most recently 36.6 degrees in 1952.

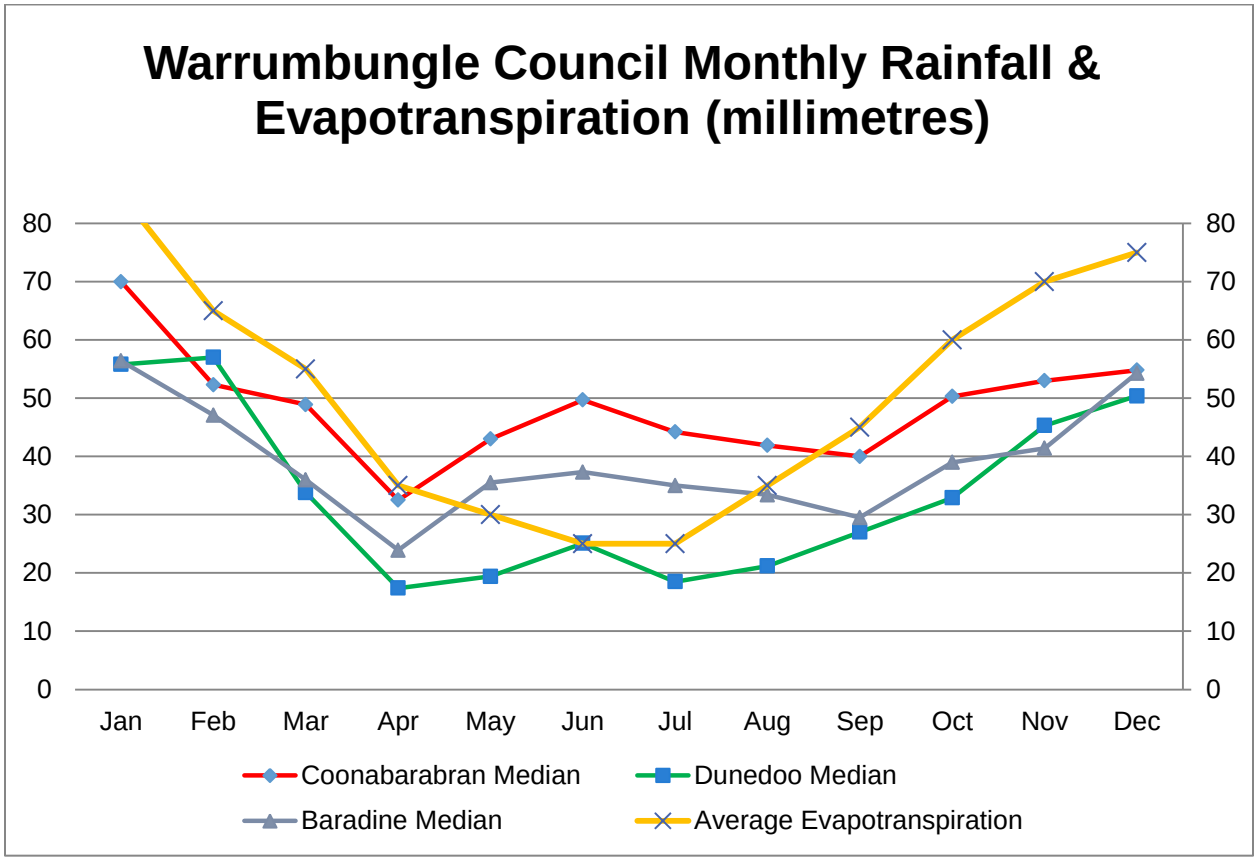
2.6.2 Rainfall



The mean rainfall for the last 140 years is 737 mm.

The mean rainfall over the last 20 years is 739 mm.

Monthly Rainfall and Evapotranspiration



The above graph shows the median rainfall each month for Coonabarabran, Baradine and Dunedoo. The annual rainfall pattern is similar at all three sites. The highest median rainfall occurs in mid to late summer while the lowest median rainfall occurs in the autumn to spring period. Baradine has the lowest median rainfall in most months while Coonabarabran has the highest median rainfall in 10 months of the year. Median annual rainfall was 737 mm in Coonabarabran, 646 mm in Dunedoo and 585 mm in Baradine.

The total rainfall is higher than much of inland NSW and suggests water runoff is likely to be reasonably reliable. The exception to this is Baradine which has sandy soils where runoff would be minimal however Baradine sources its water from a sub artesian supply that has been reliable in the past.

The graph also shows the potential evapotranspiration rate for each month. This exceeds median rainfall in all seasons but mid winter. In summer the median rainfall is less than a third of the potential evapotranspiration. The results indicate that water deficit is a major constraint and that the constraint is greatest in the northern portion of the Shire. The recharge of aquifers before evaporation occurs is critical to the supply of water for most of the Shire and this has been occurring.

Whilst the above graph shows the median rainfall the current situation is that Coonabarabran had a total rainfall in the last six (6) months of 2017 of 216 mm and only 121mm in the five (5) months of 2018.

2.6.3 Possible Impacts of Future Climate Change

Council's Integrated Water Cycle Management Evaluation Study (2011) indicates that climate change means that the Shire is likely to be warmer and drier with less runoff and some depletion of groundwater. Water quality may also be impacted.

Climate is essentially a long term description of weather components such as rain, wind, temperature and sunshine. Climate change is the gradual change of some or all of these components. In recent years there is increasing evidence that the climate is changing. In 2016 the CSIRO and Bureau of Meteorology released the technical report Climate Change in Australia. This report provides an assessment of climate change in Australia, and includes information from the Intergovernmental Panel on Climate Change (IPCC) reports and other information sources.

There have been a number of changes observed in Australia, including:

- average temperatures in Australia rose 0.9 degrees Celsius from 1910 to 2014
- there have been more heatwaves and fewer frosts
- since 1950, annual rainfall has declined on the eastern seaboard and the south of the continent, but increased in the northwest
- since 1973, droughts have become more intense
- since 1973 extreme rainfall events have increased in the northeast and southwest.

In 2016 CSIRO update reported on climate change predictions in Central West NSW. The report included most of the Warrumbungle Shire. According to the report, since 1950, the region has experienced warming of around 0.8ºC. The catchment has also experienced significant change in annual rainfall, with a trend toward increasing rainfall of approximately 5 mm per decade in the north of the catchment (i.e. in the Warrumbungle Shire). However the increased evaporation resulting from the increased temperatures is likely to result in less runoff in future.

The future climate of the shire is likely to be warmer. The catchment is also likely to be drier. Such climate changes would also increase heat waves, extreme winds and fire risk. There is also potential for increases in seasonal extreme rainfall events.

Various studies of stream flows in NSW indicate that climate change is likely to further reduce flows, with subsequent consequences for storages, water use and costs (Hassall and Associates, 1998; Jones and Page, 2001; Beare and Heaney, 2002; Bates et al., 2003).

The quality of water available for urban usage may decline (CSIRO, 2006). For example, low flows, higher temperatures, and elevated nutrients create a more favourable environment for potentially harmful algal blooms. Salinity problems in the catchment may be exacerbated by changes in rainfall, temperature and stream flows (Beare and Heaney, 2003).

DWE (2008) provides a list of impacts that climate change could have on water service planning together with options for addressing the risks.

Potential Climate Change Induced Impacts, their Impacts on Warrumbungle Shire and Options to Address the Impacts.

External impacts	Impacts on Warrumbungle Shire	Options to Address Impacts
Reduced annual runoff (catchment, urban and roof)	Less flow into Timor Dam	Consider raising the height of the dam wall Reduce demand (pricing, provide information on water savings and efficiency, water use restrictions) Find alternative water sources (e.g. bores adjacent to the Castlereagh River) Substitute tank water
	Less flow in rivers from which towns draw their water.	Reduce total demand (pricing, provide information on water savings and efficiency, water use restrictions) Find alternative water sources (e.g. bores adjacent to the Castlereagh River) Substitute tank water
	Increased salinisation and reduction in water quality leading to increase production costs	Reduce demand as discussed above. Increase treatment of raw water, e.g. via reverse osmosis Increase depth and number of bores
Increased variability in rainfall	Storage capacity may be insufficient for increased periods of drought	Increase buffer storages, e.g. increase Timor Dam capacity. Reduce demand (see above) Seek alternative sources
Increased maximum temperature	Increased demand for potable water to operate evaporative cooler waters	Encourage use of tank water

External impacts	Impacts on Warrumbungle Shire	Options to Address Impacts
Increased evaporation	Increased garden watering	Enforce drought restriction while encouraging installation of tanks and use of grey water. Encourage native veg plantings
	Increased use of evaporative coolers	Encourage use of tank water
	Increased loss from open storages	Increase reliance on bore water
Greater competition for existing water sources	Could lose some water allocation to other users.	Lobby to ensure urban water needs and stock and domestic users have first priority
Lowered water table	Increased depth to water table increases cost of pumping. Drawdown may exceed maximum depth of the bore	Develop reserve supply strategy options as part of Drought Management Plan.
Changed water access licence conditions (eg less access to low flows)	Council has Class A licenses to extract up to 3.5 ML/day for Coonabarabran and up to 1 ML/day for Binnaway. Table 2.3 shows the flows above which Council can extract water	Seek agreement to enable at least some extraction for essential use very low flows. Establish bores further away from stream lines so that there is increased reliance on regional groundwater.
Greater uncertainty about sustainable yield from existing water sources	Timor Dam may be too small Bores adjacent to rivers may have lower water levels or even dry up	Reduce demand Increase Timor Dam capacity Increase number of bores
Greater damage to underground infrastructure due to ground movement	Damage to bore casing Collapse of bores	Ensure new bores have strengthened casing
	Damage to Timor Dam	Check with Dam Safety Committee re risks and how to address them.
	Damage to water storage, treatment and conveyance infrastructure	Ensure new or renovated pipes and infrastructure have foundations / bedding designed to allow for some soil movement.

External impacts	Impacts on Warrumbungle Shire	Options to Address Impacts
Increased interest in rainwater tanks, stormwater harvesting and use of recycled water	Less demand on Council's water supply system Potentially less income from water sales Increased community pressure on Council to not be seen to be wasting water	Adjust pricing Take initiative to recycle water where practical. Reduce waste, e.g. using triggers on wash-down hoses, etc.
Changing related technology and legislation	May require Council to spend money to reduce contaminant load on rivers. Technology may reduce treatment costs	Increase proportion of effluent recycling Reduce wastage of potable water
Increased customer total or seasonal water usage demand	Increased demand on town water supplies	Encourage tanks Encourage conservation of water
Greater grey water use because of reduced supply of potable water	Reduced demand for potable water.	Ensure Council policies are consistent with State Gov. Regarding greywater use. Adjust pricing to compensate for less demand for potable water.
Greater external and evaporative cooler water demand	Increased demand on town water supplies	Encourage tanks, especially connection via pressurised line to cooler system Encourage conservation of water
Movement of people and industry from areas of water shortage	May result in increased loss of people form the shire. This would reduce rate base	Reduce water supply costs where practical.

2.6.4 Future climate and runoff projections (~2030) for New South Wales and Australian Capital Territory CSIRO Study.

The study published by DWE (now Office of Water) in 2008 has analysed 15 Global Climate Models (GCMs) with regard to rainfall and runoff and estimates variations out to 2030.
The study concludes:

"There is considerable uncertainty in the estimates and the modelled mean annual runoff using the climate change projections from the 15 GCMs range from a 20 percent decrease to a 20 percent increase in the eastern parts of the region, a 30 percent decrease to a 10 percent increase in the southern parts of the region and a 30 percent decrease to a 30 percent increase in the northwest corner. Averaged over the entire region, the extreme estimates range from a 14 percent decrease to a 10 percent increase in mean annual runoff."

2.7 Catchment Characteristics and Environmental Considerations

According to CSIRO (2008), the Castlereagh River is a gaining stream at least to Mendooran. Similarly the Talbragar River is a gaining river. This means that under normal conditions groundwater and surface water inflows exceed any loss through the river bed. Inflows into the groundwater after rainfall helps maintain flow, and the inflow ensures retention of flow during dry periods. Saline influx can be an issue, especially in dry periods.

The impacts of extraction of water from the four catchments in the Shire are formally addressed in the Water Sharing Plans for each catchment by limiting extractions to meet the sustainable yield for given climate conditions.

However the possible effects of increased salinity caused by stressing aquifers will need to be monitored along with the impact on vegetation that relies on water tables not being drawn down too far.

2.8 Water Sharing Plans

2.8.1 Castlereagh River – Upstream of Binnaway

Extractions from the Castlereagh upstream of Binnaway are governed by the **Water Sharing Plan for the Castlereagh River, Unregulated Supply and Alluvial Water Sources.**

The Plan is made under section 50 of the Water Management Act 2000 as amended and came into effect in 2016.

The plan governs extractions for the Coonabarabran and Binnaway water supplies.

Details of the plan are available on the Office of Water website.

The plan also governs extractions for Merrygoen and Mendooran water supplies.

The plan estimates extractions of 175 MgL per year between Binnaway and Gilgandra.

Details of the plan are available on the Office of Water website.

2.8.2 Talbragar River

Extractions from the Talbragar River and its tributaries are governed by the **Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2016.**

The plan governs extractions from the alluvial sources of the Upper Talbragar River and governs extractions for Coolah and Dunedoo water supplies. Extractions for both townships is limited to 656 Megalitres per annum. Current maximum extractions are 400 Megalitres per annum and are expected to decrease in the long term.

Details of the plan are available on the Office of Water website

2.8.3 Namoi Catchment

Extractions from Namoi Catchment Area are governed by the **Water Sharing Plan for the Namoi Unregulated and Alluvial Water Sources 2016.**

The plan governs extractions from the alluvial sources for Baradine, Kenebri and Bugaldie water supplies. The plan makes no reference to extractions for these village supplies.

Details of the plan are available on the Office of Water website.

2.9 Water Licences

2.9.1 Groundwater Licences

Groundwater Access Licences for Management of Urban Water Supplies (Source NSW Office of Water).

Property Location	Licence No	Type of Supply
Baradine Lot 16, DP750294	90AL833297	Groundwater
Baradine Lot 2, DP873702	90AL811512	Monitoring Bore
Coolah Town Water Supply Lot 1, DP653078	80AL707476	Groundwater
Dunedoo Town Water Supply	80AL716937	Groundwater
Mendooran Town Water Supply River Street, Mendooran	80AL705025	Unregulated Town
Merrygoen Location of work near Beni Bridge	80AL705031	Unregulated Town
Recreation - Bowen Oval Coolah Lot 1, DP155515	80AL706121	Groundwater
Ulamambri Town Water Supply	80AL707473	Groundwater
Bore No 1 - Robertson Street-Coonabarabran	80AL716103	Groundwater
Bore No 2 - Coonabarabran - Namoi Street-Coonabarabran	80AL716103	Groundwater
Bore No 3 - Immediately North of Castlereagh River Weir-Coonabarabran	80AL716103	Groundwater
Bore No 4 - Namoi Street - Adjacent Rail Line-Coonabarabran	80AL716103	Groundwater
Bore No 5 - Coonabarabran Water Treatment Plant-Coonabarabran	80AL716103	Groundwater

2.9.2 Surface Licences

Surface Water Access Licences (Source DNR, accessed 2008). The zones refer to the water sharing plan zones shown in figure 2.4.

Water Access Licences	Approvals	Water Access Licence No	Extraction From	Extraction Zone	Former Licence	Expiry Date
80AL700000	80WA700001 80UA700002	6424	River, Lake or Surface Water Runoff	Castlereagh River - Timor Dam to Pound Yard Weir	80SL020881	01-Jul-24
80AL700000	80WA700001 80UA700002	6424	River, Lake or Surface Water Runoff	Castlereagh River - Timor Dam to Pound Yard Weir	80SL044638	01-Jul-24
80AL700003	80WA700004 80UA700005	6425	River, Lake or Surface Water Runoff	Castlereagh River - Belar Creek Confluence to New Mollyan Road	80SL040837	01-Jul-24
80AL700060	80WA700061	111	Castlereagh River above Binnaway Water Source	Castlereagh River - Pound Yard Weir to Merryula Road Crossing	80SL040963	01-Jul-06

Licensed water allocations include 18ML for stock and domestic and 959 ML for Council. Unregulated river licences comprise 4,110 unit shares (DNR website, accessed 4.2008).

The location of Baradine and Baradine Creek is shown in the Namoi Water Sharing Plan Appendix 2 (DIPNR, 2004), but there is no specific reference to water sharing from Baradine Creek.

3 HISTORY OF PAST DROUGHTS

3.1 Overview

There is no history of any centres running out of water, however water table levels in some centres were low during past droughts. There has been a regular need to implement water restrictions in the Warrumbungle Council area. Restrictions are normally triggered by levels in Timor Dam. The policy was to generally impose uniform restrictions across the Shire based on what is required in Coonabarabran. However there have been instances where local circumstances in other supply areas have required local water restrictions, such as Coonabarabran in the current drought where Level 6 restrictions have been implemented.

3.2 Baradine

Historically there have been no problems with supply from the bores.

The bores are approximately 220 metres deep and access sub artesian aquifers.

3.3 Binnaway

Historically there have been no problems with supply from the Castlereagh River however it is reported that levels in the well were very low during the earlier drought.

3.4 Bugaldie

Historically there have been no problems with supply from the bore.

The bore is approx.100 metres deep.

3.5 Coolah

Historically there have been no problems with supply from the bore adjacent to the Coolaburragundy Creek.

The bore accesses the creek aquifer.

3.6 Coonabarabran

Coonabarabran until recently has relied on Timor Dam for the majority of its raw water supply. The dam is dedicated to the supply of water for the township. When the dam falls to approximately 60%, water was sourced from the town weir and four (4) back up bores in the township. The weir typically supplies up to 50% (1.5MgL/day) of the town's requirements when pumping commences provided there is inflow to the weir. The bores can supply up to 0.5 MgL /day or nearly 50% of the town's requirements under Level 4 water restrictions and more than emergency requirements of 0.3 MgL/day. It has been assumed the bores will continue to yield during extreme droughts and this can only be verified when such a drought occurs.

The worst historic drought since the installation of Timor Dam in 1962 was the 2 years and 8 months period between December 2000 and August 2003. During this period the average annual rainfall was 560 mm/annum. However there have been four worse drought periods before the *construction of Timor Dam.*

Drought Period	Length of drought	Average Rainfall /annum
Aug 1900-Dec 1902	2 years 5 months	400 mm
Feb 1918- Jun 1920	2 years 4 months	370 mm
Aug 1919-Nov 1923	2 years 4 months	409 mm
Sep 1944-Feb 1947	2 years 5 months	438 mm
Dec 2000-Aug 2003	2 years 9 months	560 mm

The current situation is proving worse than those occurrences in that the rainfall till 31 May 2018 is 121 mm. This is 64.2% lower than average and if the current trend continues will mean that the annual rainfall in 2018 will be of the order of 265 mm.

Early records indicate that the first restrictions since the construction of Timor Dam commenced in 1964 and continued on a regular basis thereafter. Before user pays and installation of meters usage was as high as 1600 Litres/day/person compared to today's maximum of 500litres/day/person (over a three day period) when restrictions are not in place.
From the completion of Timor Dam in 1962 up to 2007 Council's records indicate restrictions being imposed 20 times or an average of once every 2.3 years. However restrictions were effectively continuously in place for seven and a half years during the 2002-2010 dry years.

History of restrictions since 2002

Dates	Level of Restrictions	Timor Dam % Capacity when restrictions were introduced
August 2002 - October 2002	Level 2	60%
October 2002 - November 2002	Level 3	52%
November 2002 - May 2003	Level 4	48%
May 2003 - Aug 2003	Level 2	43% (pontoon pump installed to access dead water storage)
August 2003 - June 2005	Level 1	91%
June 2005 - November 2005	Level 2	42%
November 2005 - January 2007	Level 1	69%
January 2007 - February 2007	Level 2	53%
February 2007 - March 2007	Level 3	52%
March 2007- October 2007	Level 2	51%
October 2007- January 2010	Level 1	95%
Jan 2010	Voluntary	95.5%
March 2016- April 2016	Level 2	57%
April 2016 – July 2016	Level 3	50%
September 2017 - November 2017	Level 1	53%
November 2017 – December 2017	Level 3	41%
December 2017 - January 2018	Level 4	38%
January 2018 – March 2018	Level 5	33%
March 2018 – current	Level 6	28%

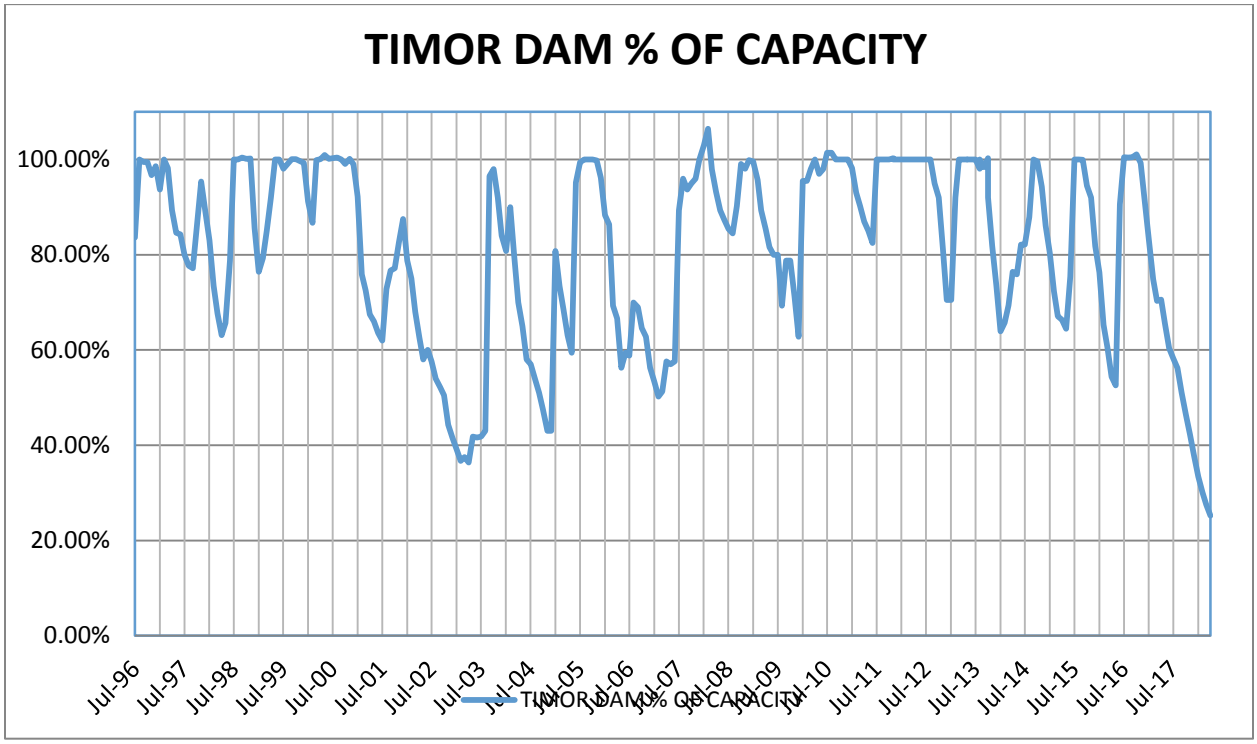
In August 2002 Council resolved that "the General Manager be delegated the responsibility to impose restrictions at a level necessary to limit daily drawdown in Timor Dam to 520 kilolitres per day or if the capacity of the dam reaches the threshold levels shown in Table 2"

Timor Dam –Usable Water Level (% full)	Volume of Usable Water Remaining (MgL)	Proposed Water Restriction Level
50	460	1
40	368	2
30	276	3
20	184	4
15	138	5
10	92	6

The amount of sedimentation since construction of the dam is not known. A 'dead' water pump and associated pipework was installed in March 2018 to access the water in Timor Dam below the gravity outlet. This pump allows access to up to an extra 15% or 220 MgL.

The level of water in Timor Dam has progressively fallen over the last eighteen months to a point where it stands at 31 May 2018 at 23%. Water restrictions as a result of the current drought were introduced as follows.

Water Levels in Timor Dam since 1996



The detailed daily records of water levels in Timor Dam since 1996 and the corresponding raw water treated in Coonabarabran provides useful information relating to the behaviour of the dam and water consumption. Some relevant observations for analysis are:

- During the drought of 2001-2003 the drawdown of Timor Dam was 1700 Kl/day in November 2002 while **Level 3 restrictions** were in place. During this time the town weir was supplying an average of 840 Kl/day. The treatment plant produced an average of **1760 Kl/day**. Based on the fact that there was minimal inflow into the dam during November the losses due to evaporation and seepage were **780** Kl/day.

- On November 26 2002 **Level 4 restrictions** were introduced and over the ensuing 80 days the drawdown reduced to 1060 Kl/day which is still double the required 520 Kl/day in Council's resolution. During this time the town weir was supplying an average of 760 Kl/day. The treatment plant produced an average of **1435 Kl/day** or **575litres/day/person**.
- The draw down during the dry winter months of 2006 under Level 1 restrictions, before the rain in mid July 2006, was 1400Kl per day. The weir was not operating and the treatment plant produced an average of 1180 Kl/day.
- During the **Level 3** restrictions in Feb /March 2007 the drawdown of Timor Dam was 1,140 Kl/day. During this time the town weir was supplying an average of 600 Kl/day. The treatment plant produced an average of **1,150 Kl/day.**
- In 2009 between 1 April and 1 July the drawdown was 1100 Kl/day with Level 1 restrictions in place. During this time the town weir was not operating but there was some inflow.
- In the summer months between November 1 and December 25 2009 the drawdown was **3,300Kl /day** with **Level 1 restrictions** in place. The town weir was not operating during this time. The treatment plant produced an average **of 1,430 Kl/day**. Based on the fact that there was minimal inflow into the dam during November and most of December the losses due to evaporation and seepage were **1,870** Kl/day. The high level of calculated losses raises some doubt regarding the accuracy of the produced water quantities.
- In the dry months of October through to December 2012 the drawdown rate was **2,750 Kl/day** without restrictions. The treatment plant produced an average of **1,720 Kl/day** Based on the fact that there was minimal inflow into the dam during October, November and most of December the losses due to evaporation and seepage were **1,030** Kl/day.
- In 7 out of the last 9 occasions that Timor Dam has fallen below 80% the level has gone on to fall below 70%.

From the above observations and considering the amount of treated water the following conclusions can be drawn:

- During the dry Summer in 2012, when the dam was near full, there were losses of 40MgL over a three month period (or 0.5 MgL/day) due to seepage with an estimated similar amount due to evaporation totalling 80 MgL over three months (or 1.0 MgL /day) assuming there was no inflow in this time. **This means that seepage and evaporation of 1000 Kl/day in summer exceeds the 520Kl/day in Council's resolution without any drawdown for town consumption.**
- During summer months Level 1 restrictions have had no reliable impact on consumption.
- During summer months Level 3 restrictions are effective in reducing consumption by approximately 40% compared to when no restrictions are in place.
- During summer months Level 4 restrictions are effective in reducing consumption by 60 % compared to when no restrictions are in place.
- By analysing rainfall data in the 1918-1920 period and taking a conservative approach to inflows into the Timor Dam it is estimated the dam would reach a low of 30-35% with Level 4 restrictions in place for the last 5-6 months of the drought. It is assumed that pumping from the town weir can occur once the dam reaches 60% of capacity and that the bore aquifers will continue to yield their full capacity. In this scenario the dam could reach levels 5-6% lower than in 2003 and restrictions last an extra month.

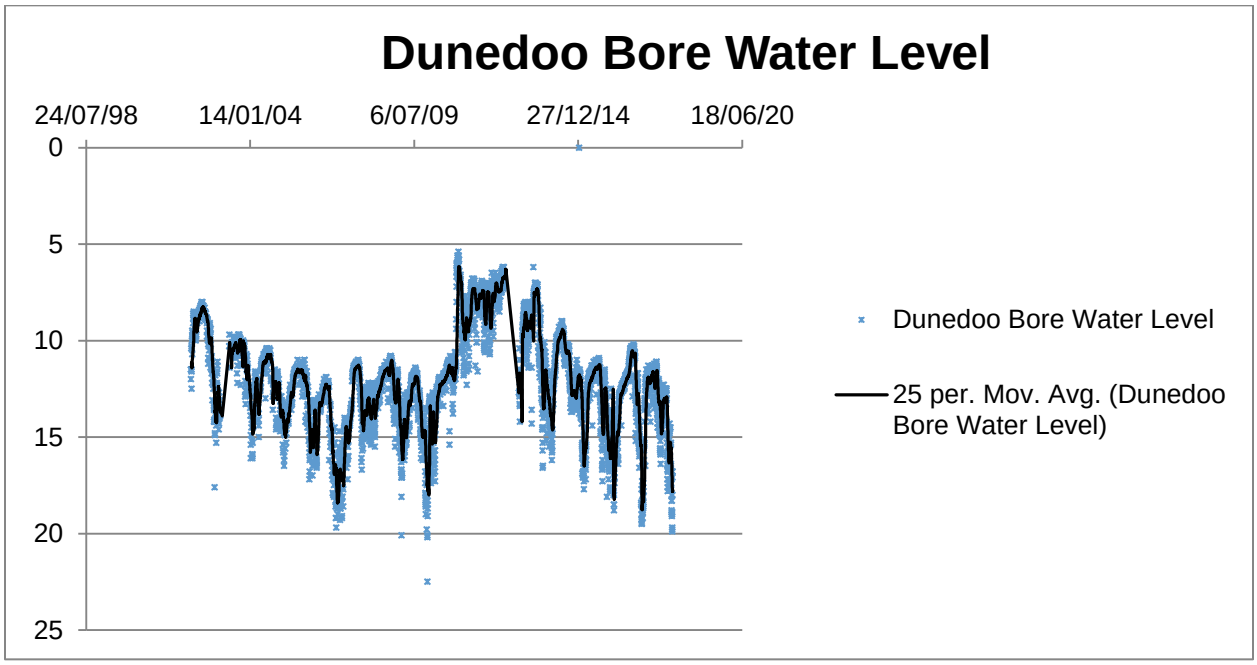
It could be argued that from a risk management point of view it would be best to implement restrictions when the dam reaches 75% or 80% instead of 70 % as per the current policy.

3.7 Dunedoo

Historically there have been no problems with supply from the bore adjacent to the Talbragar River. However there was evidence of a downward trend in ground water table levels up until the breaking of the 2000-2009 drought years.

The graph demonstrates that the water table is dependent on the average rainfall over about 10 years or maybe longer. Over the nine years of relatively dry years between 2000 and 2010 the average rainfall in the Dunedoo area was 600 mm/annum and 572mm/annum in Coolah. By reviewing the rainfall records of Dunedoo and Coolah since 1915 it can be seen that the driest ten year period was from 1935-1944 when the average rainfall was 484 mm/annum in Dunedoo and 543mm/annum in Coolah. The impact of such a dry series of years on the water table in Dunedoo is difficult to calculate but the 20% less rainfall in the Dunedoo region would have some adverse impact.

More information regarding the impact of irrigation during dry years is required.
Water restrictions have generally been implemented in line with those in Coonabarabran.



3.8 Kenebri

Historically there have been no problems with supply from the bore. The bore is approximately 40 metres deep.

Water restrictions have generally been implemented in line with those in Coonabarabran.

3.9 Mendooran

Historically there have been no problems with supply from the Castlereagh River, however it is reported that levels in the old well were very low during the 2002-2003 drought.

Water restrictions have generally been implemented in line with those in Coonabarabran.

3.10 Merrygoen

Historically there have been no problems with supply from the Castlereagh River however it is reported that levels in the old well were very low during the 2002-2003 drought.

Water restrictions have generally been implemented in line with those in Coonabarabran.

4 DROUGHT MANAGEMENT PLANS

4.1 Restrictions and Management Actions across all Water Supplies

Water Restriction Level	Management Actions
1	1. Advertise Level 1 restrictions in local media with explanation
	2. Implement Drought Action Plans for individual supply areas
	3. Advise Government agencies of restrictions
	4. Commence close monitoring of water usage, river flows and bore levels
2	1. Advertise Level 2 restrictions in local media with explanation
	2. Commence regular reminders in local media regarding water restrictions and need to save water.
	3. Advise Government agencies of new level of restrictions.
	4. Continue close monitoring of water usage, river flows and bore levels
3	1. Advertise Level 3 restrictions in local media with explanation
	2. Increase regular reminders in local media regarding water restrictions and the need to save water.
	3. Commence patrols to audit implementation of restrictions and issue warning if necessary.
	4. Meet with Government agencies regarding status of water supplies and discuss any required measure to assist the situation.
	5. Continue close monitoring of water usage, river flows and bore levels and make predictions of duration of reliable water supplies
4	1. Advertise Level 4 restrictions in local media with explanation
	2. Weekly reminders in local media regarding water restrictions and the need to save water.
	3. Continue patrols to audit implementation of restrictions, issue warning if necessary and fine any repeat offenders.
	4. Meet with Government agencies regarding status of water supplies and discuss any required measure to assist the situation.
	5. Continue daily monitoring of water usage, river flows and bore levels and make predictions of duration of reliable water supplies
	6. Make contact with irrigators regarding restrictions and discuss measures that can be taken by irrigators to improve water supply situation. Request assistance from Office of Water if necessary
5	1. Advertise Level 5 restrictions in local media with explanation
	2. Weekly reminders in local media regarding water restrictions and the need to save water.
	3. Continue patrols to audit implementation of restrictions, issue warning if necessary and fine any repeat offenders.
	4. Meet with Government agencies regarding status of water supplies and discuss any required measures to assist the situation.
	5. Continue daily monitoring of water usage, river flows and bore levels and make predictions of duration of reliable water supplies
	6. Continue contact with irrigators regarding restrictions and discuss measures that can be taken by irrigators to improve water supply situation. Request assistance from Office of Water if necessary

6	1. Advertise Level 6 restrictions in local media with explanation
	2. Weekly reminders in local media regarding water restrictions and the need to save water.
	3. Continue patrols to audit implementation of restrictions, issue warning if necessary and fine any repeat offenders.
	4. Meet with Government agencies regarding status of water supplies and discuss any required measured to assist the situation.
	5. Continue daily monitoring of water usage, river flows and bore levels and make predictions of duration of reliable water supplies
	6. Continue discussions with irrigators regarding restrictions and discuss measures that can be taken by irrigators to improve water supply situation. Request assistance from Office of Water if necessary

4.2 Restrictions Policy

Type of Consumer	Level 1 Restrictions	Level 2 Restrictions	Level 3 Restrictions	Level 4 Restrictions	Level 5 Restrictions	Level 6 Restrictions
Domestic **TARGET WATER CONSUMPTION**	**260 litres/person/day**	**240 litres/person/day**	**220 litres/person/day**	**200 litres/person/day**	**160 litres/person/day**	**120 litres/person/day**
Watering of Lawns, ***Note: Subject to varying Summer and Winter Times***	Watering systems, microsprays, drip systems, soaker hoses, non fixed sprinklers hand held hoses only. **Summer Time** between 1800-0900 hrs only daily. **Winter Time** 0600-1000 hrs and 1600-2200 hrs daily	Watering systems, non fixed sprinklers, hand held hoses, microsprays, drip systems, soaker hoses, only. **Summer Time** between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. **Winter Time** between 0700-1000 hrs and between 1600-1900 hrs every second day as per odds and evens system.	Watering systems, non fixed sprinklers, hand held hoses not permitted at any time. Microsprays, drip systems, soaker hoses, only. **Summer Time** between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. **Winter Time** between 0700-1000 hrs and between 1600-1900 hrs every second day as per odds and evens system.	Not permitted	Not permitted	Not permitted

4.2 Restrictions Policy

Type of Consumer	Level 1 Restrictions	Level 2 Restrictions	Level 3 Restrictions	Level 4 Restrictions	Level 5 Restrictions	Level 6 Restrictions
Domestic **TARGET WATER CONSUMPTION**	**260 litres/person/day**	**240 litres/person/day**	**220 litres/person/day**	**200 litres/person/day**	**160 litres/person/day**	**120 litres/person/day**
Watering of Residential Gardens ***Note: Subject to varying Summer and Winter times***	Watering systems, microsprays, drip systems, soaker hoses, non fixed sprinklers hand held hoses only. **Summer Time** between 1800-0900 hrs only daily. **Winter Time** 0600-1000 hrs and 1600-2200 hrs daily.	Watering systems, non fixed sprinklers, hand held hoses, microsprays, drip systems, soaker hoses, only. **Summer Time** between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. **Winter Time** between 0700-1000 hrs and between 1600-1900 hrs every second day as per odds and evens system.	Watering systems, non fixed sprinklers, hand held hoses not permitted at any time. Microsprays, drip systems, soaker hoses, only. **Summer Time** between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. **Winter Time** between 0700-1000 hrs and between 1600-1900 hrs every second day as per odds and evens system.	Watering systems, non fixed sprinklers, hand held hoses not permitted at any time. Microsprays, drip systems, soaker hoses, only. **Summer Time** between 1800-2000 hrs only on each Wednesday and Sunday. **Winter Time** 1600-1800 hrs on each Wednesday and Sunday.	Watering systems, non fixed sprinklers, hand held hoses, microsprays, drip systems, soaker hoses, not permitted at any time. Bucket / watering can only. **Summer Time** between 1800-2000 hrs on Sunday only. **Winter Time** between 1300-1500 hrs on Sunday only.	Not permitted
Topping up, filling garden water features	Permitted	Permitted	Permitted	Permitted	Not to be topped up or filled	Not to be topped up or filled

4.2 Restrictions Policy

Type of Consumer	Level 1 Restrictions	Level 2 Restrictions	Level 3 Restrictions	Level 4 Restrictions	Level 5 Restrictions	Level 6 Restrictions
Domestic **TARGET WATER CONSUMPTION**	**260 litres/person/day**	**240 litres/person/day**	**220 litres/person/day**	**200 litres/person/day**	**160 litres/person/day**	**120 litres/person/day**
Irrigation of new turf	Permitted for one week after laying after which level 1 restriction on watering lawns applies	Permitted for one week after laying after which level 2 restriction on watering lawns applies	Permitted for one week after laying after which level 3 restriction on watering lawns applies	Not permitted	Not permitted	Not permitted
Washing down walls or paved surfaces	Not permitted	Not permitted	Not permitted	Not permitted	Not permitted	Not permitted
Topping up private swimming pools/spas	Permitted	Only between hours of 0700-0900 and between 1800-2000 hrs, every day	Only between hours of 0700-0900 and between 1800-2000 hrs, every day provided pool covers are used	Only between hours of 0700-0900 and between 1800-2000 hrs, every day. Pool covers must be used	Not permitted	Not permitted
First fill of private swimming pools	Permitted	Only between hours of 0700-0900 and between 1800-2000 hrs, every day	Only with Council permission and provided pool covers are used	Only with Council permission and after water savings elsewhere within property. Covers must be used	Not permitted	Not permitted
Washing cars at home	Permitted with bucket and rinse with trigger hose on lawn at any time	Permitted with bucket and rinse with trigger hose on lawn between 0900-1200 hrs any day	Permitted with bucket only on lawn between 0900-1200 hrs any day	Permitted with bucket only on lawn between 0900-1200 hrs any day	Not permitted	Not permitted

4.2 Restrictions Policy

Type of Consumer	Level 1 Restrictions	Level 2 Restrictions	Level 3 Restrictions	Level 4 Restrictions	Level 5 Restrictions	Level 6 Restrictions
Domestic **TARGET WATER CONSUMPTION**	**260 litres/person/day**	**240 litres/person/day**	**220 litres/person/day**	**200 litres/person/day**	**160 litres/person/day**	**120 litres/person/day**
Baths, showers	Permitted	Permitted	Permitted	Five (5) minute showers, one bath per person per day	Three (3) minute showers, one bath (100 mm depth) per person per day	Three (3) minute showers, one bath (100 mm depth) per person per day
Washing of clothes	Permitted	Permitted	Full loads only encouraged	Full loads only permitted	Full loads only permitted	Two full loads of clothes per week
Use of evaporative air conditioners	Permitted	Permitted	Permitted	Permitted only 0700-2400 hrs daily	Permitted only 0700-2400 hrs daily, exemptions may be granted to aged accommodation or nursing homes	Permitted only 1800-2200 hrs daily, exemptions may be granted to aged accommodation or nursing homes
Inflatable or temporary children's pools	Permitted	Permitted	Permitted	Permitted	Not permitted	Not permitted

4.2 Restrictions Policy

Type of Consumer	Level 1 Restrictions	Level 2 Restrictions	Level 3 Restrictions	Level 4 Restrictions	Level 5 Restrictions	Level 6 Restrictions
Commercial / Non-Residential Water Use						
Watering of Lawns ***Note: Subject to varying Summer and Winter times***	Watering systems, microsprays, drip systems, soaker hoses, non fixed sprinklers hand held hoses only **Summer Time** between 1800-0900 hrs only daily. **Winter Time** 0600-1000 hrs and 1600-2200 hrs daily	Watering systems, non fixed sprinklers, hand held hoses, microsprays, drip systems, soaker hoses, only **Summer Time** between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. **Winter Time** between 0700-1000 hrs and between 1600-1900 hrs every second day as per odds and evens system	Watering systems, non fixed sprinklers, hand held hoses not permitted at any time. Microsprays, drip systems, soaker hoses, only. **Summer Time** between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. **Winter Time** between 0700-1000 hrs and between 1600-1900 hrs every second day as per odds and evens system	Not permitted	Not permitted	Not permitted

4.2 Restrictions Policy

Type of Consumer	Level 1 Restrictions	Level 2 Restrictions	Level 3 Restrictions	Level 4 Restrictions	Level 5 Restrictions	Level 6 Restrictions
Commercial / Non-Residential Water Use						
Watering of Gardens ***Note: Subject to varying Summer and Winter times***	Watering systems, microsprays, drip systems, soaker hoses, non fixed sprinklers hand held hoses only **Summer Time** between 1800-0900 hrs only daily. **Winter Time** 0600-1000 hrs and 1600-2200 hrs daily	Watering systems, non fixed sprinklers, hand held hoses, microsprays, drip systems, soaker hoses, only **Summer Time** between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. **Winter Time** between 0700-1000 hrs and between 1600-1900 hrs every second day as per odds and evens system	Watering systems, non fixed sprinklers, hand held hoses not permitted at any time. Microsprays, drip systems, soaker hoses, only. **Summer Time** between 0600-0900 hrs and between 1800-2100 hrs every second day as per odds and evens system. **Winter Time** between 0700-1000 hrs and between 1600-1900 hrs every second day as per odds and evens system	Watering systems, non fixed sprinklers, hand held hoses not permitted at any time. Microsprays, drip systems, soaker hoses, only. **Summer Time** between 1800-2000 hrs only on each Wednesday and Sunday. **Winter Time** 1600-1800 hrs on each Wednesday and Sunday	Watering systems, non fixed sprinklers, hand held hoses, microsprays, drip systems, soaker hoses, not permitted at any time. Bucket / watering can only. **Summer Time** between 1800-2000 hrs on Sunday only. **Winter Time** between 1300-1500 hrs on Sunday only	Not permitted
Topping up public swimming pools/spas, including those in motels etc	Permitted	Only between hours of 0700-0900 and between 1800-2000 hrs, every day	Only between hours of 0700-0900 and between 1800-2000 hrs, every day provided pool covers are used	Only between hours of 0700-0900 and between 1800-2000 hrs, every day. Pool covers must be used	Not permitted	Not permitted

4.2 Restrictions Policy

Type of Consumer	Level 1 Restrictions	Level 2 Restrictions	Level 3 Restrictions	Level 4 Restrictions	Level 5 Restrictions	Level 6 Restrictions
Commercial / Non-Residential Water Use						
First fill of public swimming pools/spas, including those in motels etc	Permitted	Only between hours of 0700-0900 and between 1800-2000 hrs, every day	Only with Council permission	Only with Council permission and after water savings elsewhere within property. Covers must be used	Not permitted	Not permitted
Turf farm irrigation, market gardens	Permitted	Permitted	Irrigation only between 2000-0800 hrs. Business must prepare WSAP	Business must implement and comply with WSAP	Not permitted	Not permitted
Irrigation of new turf on non-residential premises	Permitted for one week after laying after which level 1 restriction on watering lawns applies	Permitted for one week after laying after which level 2 restriction on watering lawns applies	Permitted for one week after laying after which level 3 restriction on watering lawns applies	Not permitted	Not permitted	Not permitted
Public car and truck wash facilities	Permitted	Permitted	Permitted, but business must prepare WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Not permitted
Construction industry eg mortar or concrete mix	Permitted	Permitted	Permitted	Permitted	Permitted	Not permitted

4.2 Restrictions Policy

Type of Consumer	Level 1 Restrictions	Level 2 Restrictions	Level 3 Restrictions	Level 4 Restrictions	Level 5 Restrictions	Level 6 Restrictions
Commercial / Non-Residential Water Use						
Construction - wash down, paint prep, curing	Permitted	Permitted	Permitted, but business must prepare WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Not permitted
Cleaning - exterior	Permitted with trigger hoses, any time	Permitted with pressure trigger hoses, any time	Permitted, but business must prepare WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Not permitted
Commercial or Government nurseries	Permitted	Permitted	Permitted, but business must prepare WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Not permitted
Abattoirs / Food or pet food production / Canneries	Permitted	Permitted	Permitted, but business must prepare WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Not permitted
Pet care	Permitted	Permitted	Permitted, but business must prepare WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP
Public water features	Permitted	Permitted	Permitted, but WSAP must be prepared	WSAP must be implemented	Business must implement and comply with WSAP	Not permitted
Child care	Permitted	Permitted	Permitted, but business must prepare WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP

4.2 Restrictions Policy

Type of Consumer	Level 1 Restrictions	Level 2 Restrictions	Level 3 Restrictions	Level 4 Restrictions	Level 5 Restrictions	Level 6 Restrictions
Commercial / Non-Residential Water Use						
Public parks, gardens, aviaries, plant houses, zoos	Permitted	Permitted	Permitted, but business must prepare WSAP	Business must implement and	Permitted, but business must prepare WSAP	Not permitted
Schools, technical colleges, colleges, universities	Permitted	Permitted	Permitted, but business must prepare WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Not permitted
Hospitals, hospices, nursing homes, rehab centres, Aged accommodation	Permitted	Permitted	Permitted, but business must prepare WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP
Motels, caravan parks, cabins	Permitted	Permitted	Permitted, but business must prepare WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Not permitted
Hotels, registered clubs	Permitted	Permitted	Permitted, but business must prepare WSAP	Business must implement and comply with WSAP	Business must implement and comply with WSAP	Not permitted
Businesses with cooling towers	Permitted	Permitted	Permitted, but WSAP must be prepared	WSAP must be implemented	Business must implement and comply with WSAP	Not permitted

4.3 Drought Management Plans—Site Specific

4.3.1 Baradine

Baradine's water supply is sourced from two bores drawing from a sub artesian supply. Historically there have been no problems with supply from the bores. However in order to preserve supplies from the aquifer, restrictions in Coonabarabran will trigger the same restrictions in Baradine until such time as monitoring of the water levels is implemented.

Furthermore it is important to implement monitoring the level of the water table as dry conditions prevail in order to establish if water restrictions in Baradine need to be tighter than in Coonabarabran.

There are no emergency supplies in Baradine and it would be necessary to truck in water should the bore supply fail.

4.3.2 Binnaway

Binnaway's water supply is sourced from a well in the Castlereagh River. Historically there have been no problems with supply from the river however it is reported that levels in the well were very low during the 2002-2003 drought. In order to preserve supplies from the river alluvials, restrictions in Coonabarabran will trigger the same restrictions in Binnaway.

Furthermore it is important to implement monitoring the level of the water table when dry conditions prevail in order to establish if water restrictions in Binnaway need to be tighter than in Coonabarabran. The impact of extraction by irrigators upstream during droughts should be established.

Emergency supplies in Binnaway can be catered for with the additional bore now being set up and which will be available for operation in September 2018.

4.3.3 Bugaldie

Bugaldie's water supply is sourced from a bore drawing from an aquifer approximately 100 metres deep. Historically there have been no problems with supply from the bore. However it is important to implement monitoring of the level of the water table as dry conditions prevail in order to establish if water restrictions in Bugaldie need to be tighter than in Coonabarabran.

However in order to preserve supplies from the aquifer, restrictions in Coonabarabran will trigger the same restrictions in Bugaldie.

Furthermore it is important to implement monitoring the level of the water table as dry conditions prevail in order to establish if water restrictions in Bugaldie need to be tighter than in Coonabarabran.

There are no emergency supplies in Bugaldie and it would be necessary to truck in water should the bore supply fail.

4.3.4 Coolah

Coolah's water supply comes from a bore drawing from the upper Talbragar alluvials next to Coolaburrugundy Creek. Historically there has been no problems with supply from the bore. However in order to preserve supplies from the aquifer, restrictions in Coonabarabran will trigger the same restrictions in Coolah.

Furthermore it is important to implement monitoring the level of the water table as dry conditions prevail in order to establish if water restrictions in Coolah need to be tighter than in Coonabarabran

Emergency supplies in Coolah are being catered for with the additional bore now being installed.

4.3.5 Coonabarabran

Implementing Restrictions based on Falling Dam Levels

Timor Dam % of Capacity	Level of Restriction	Target Drawdown MgL/day Summer months	Target Drawdown MgL/day Winter months	Additional Actions Required
70%	1	2	1.4	Commence pumping from town weir. Pump from bores as flow in river slows
				Target reduction of Parks and Gardens usage
60%	2	1.8	1.2	Target reduction of major users by analysing water bills
50%	3	1.6	1.1	Ensure dead water pumping system is operational and tested
40%	4	1.3	1	
35%	5	0.8	0.6	
30%	6	0.7	0.6	
20%				Combination of bore and dead water
0%	Emergency	0	0	Bore supply only

Emergency Supplies

Council's emergency supplies will be catered for come from the eleven (11) bores that draw from the Castlereagh River alluvials and artesian basin. The maximum available from the bores is at least 1.45 MgL/day. Provided the bores continue to yield during extreme drought they should be sufficient to provide emergency requirements.

Easing of restrictions –during a rising reservoir

Timor Dam % of Capacity	Level of Restriction	Target Drawdown MgL/day Summer months	Target Drawdown MgL/day Winter months	Additional Actions Required
38%	5	0.8	0.6	Continue pumping from all bores
				Target reduction of Parks and Gardens usage
43%	4	1.3	1.0	Continue to target reduction of major users by analyzing water bills
53%	3	1.6	1.1	.
60%	2	1.8	1.2	
70%	1	2.0	1.4	

Water Quality
During the summer months there is a high likelihood of Blue Green Algae growing in Timor Dam. Council has a Powder Activated Carbon (PAC) Plant installed at the Water Treatment Plant, however dosing with PAC interferes with the removal of Iron and Manganese from the water and Council will need to monitor this aspect of the supply.

4.3.6 Dunedoo
Dunedoo's water supply comes from a bore drawing from the upper Talbragar alluvials next to the Talbragar River. Historically there has been no problems with supply from the bore. However in order to preserve supplies from the aquifer, restrictions in Coonabarabran will trigger the same restrictions in Coolah.

Furthermore it is important to continue monitoring the level of the water table as dry conditions prevail in order to establish if water restrictions in Dunedoo need to be tighter than in Coonabarabran. Liaise with Office of Water and Irrigators in order to establish protocols regarding reduction in irrigation allocations during drought conditions.

4.3.7 Kenebri
Kenebri's water supply comes from a bore drawing from a shallow aquifer supply. Historically there has been no problems with supply from the bore. However it is important to implement monitoring the level of the water table as dry conditions prevail in order to establish if water restrictions in Kenebri need to be tighter than in Coonabarabran. In order to preserve supplies from the aquifer, restrictions in Coonabarabran will trigger the same restrictions in Kenebri.

There are no emergency supplies in Kenebri and it would be necessary to truck in water should the bore supply fail.

4.3.8 Mendooran
Mendooran's water supply is sourced from a well in the Castlereagh River. Historically there have been no problems with supply from the bore, however it is reported the levels in the old well were very low during the 2002-2003 drought. In order to preserve supplies from the river alluvials, restrictions in Coonabarabran will trigger the same restrictions in Mendooran.

Furthermore it is important to implement monitoring the level of the water table as dry conditions prevail in order to establish if water restrictions in Mendooran need to be tighter than in Coonabarabran.

Emergency supplies in Mendooran can be catered for with the additional bore now being set up and which will be available in August / September 2018.

4.3.9 Merrygoen

Merrygoen's water supply is sourced from a well in the Castlereagh River. Historically there have been no problems with supply from the bore however it is reported that levels in the well were very low during the 2002-2003 drought. In order to preserve supplies from the river alluvials restrictions in Coonabarabran will trigger the same restrictions in Merrygoen.

Furthermore it is important to implement monitoring the level of the water table as dry conditions prevail in order to establish if water restrictions in Merrygoen need to be tighter than in Coonabarabran. There are no emergency supplies in Merrygoen and it would be necessary to truck in water should the bore supply fail.

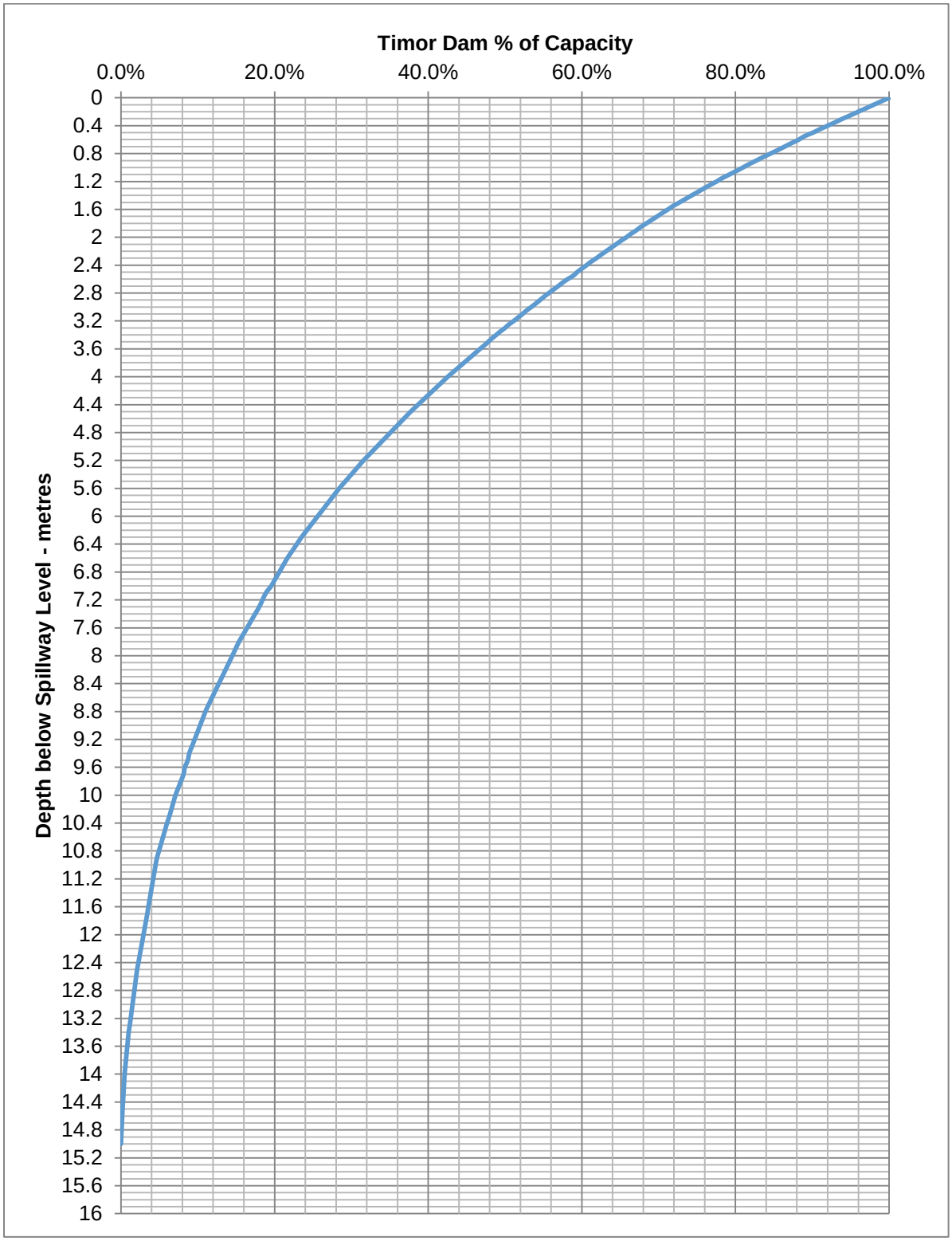
APPENDIX 1 GLOSSARY OF TERMS

ABS	Australian Bureau of Statistics
EPA	Environmental Protection Agency
Kl	Kilolitre - 1000 litres
MgL	Megalitre - 1 million litres
NA	Not available
STP	Sewage Treatment Plant
WTP	Water Treatment Plant

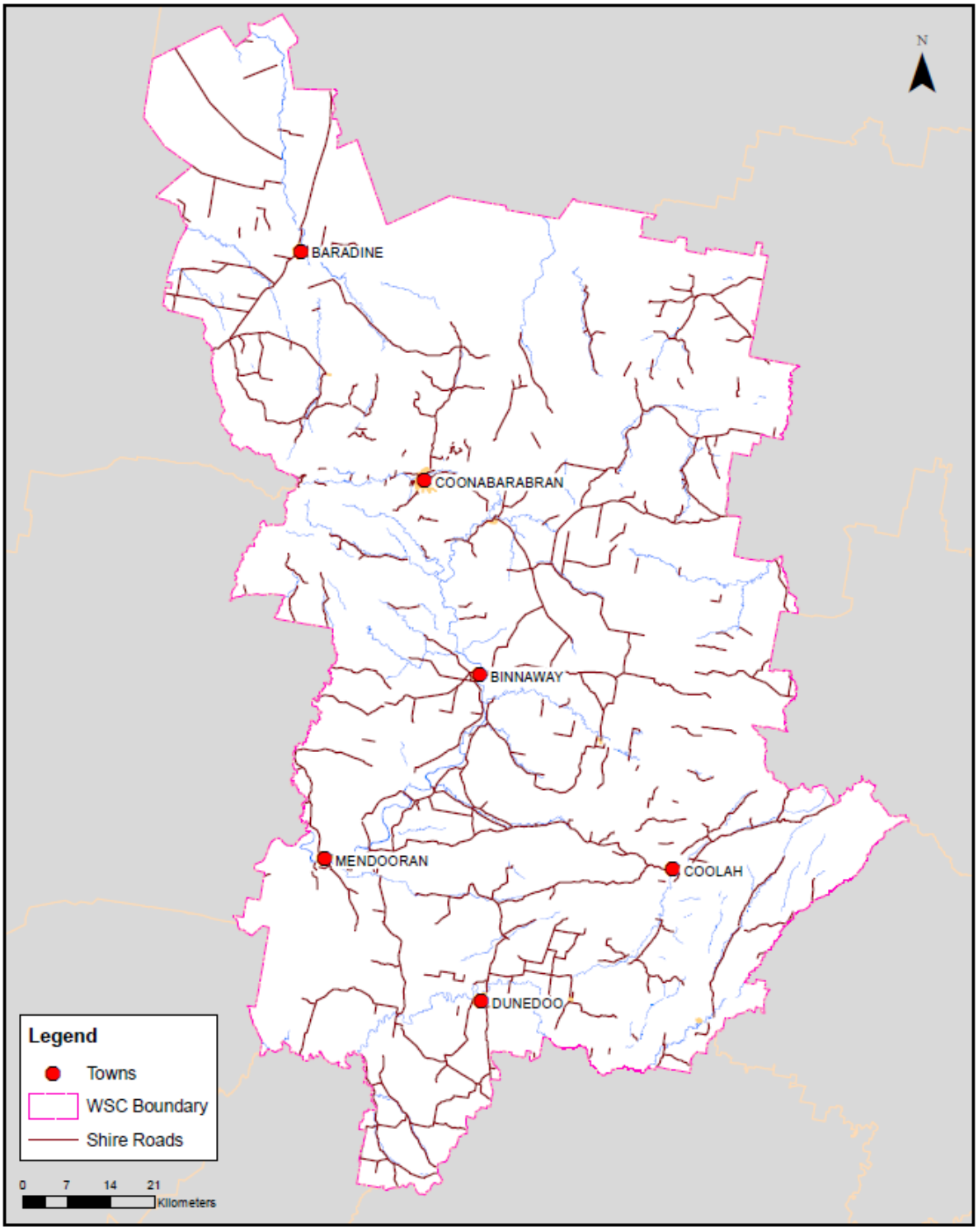
APPENDIX 2 REFERENCES

1) Department of Primary Industry – Water – Best-Practice Management of Water Supply and Sewerage Guidelines, 2015
2) Bureau of Meteorology Website — Historical Temperature and Rainfall Data
3) Integrated Water Cycle Management Evaluation Study, May 2011
4) Water Sharing Plan for the Castlereagh River (DPI Water 2012).
5) Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012
6) Water Sharing Plan for the Namoi Unregulated and Alluvial Water Sources 2012

APPENDIX 3 TIMOR DAM CAPACITY



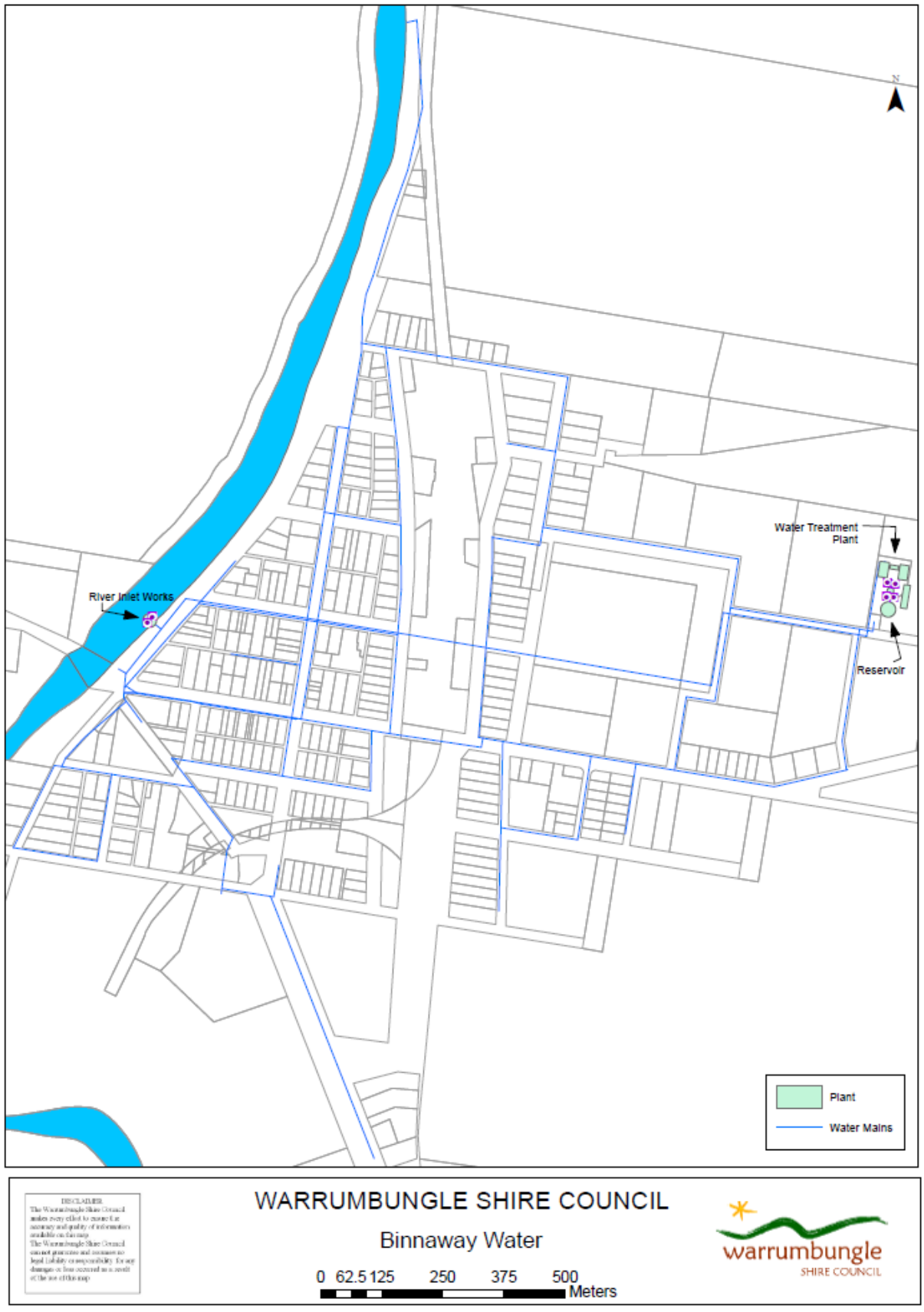
APPENDIX 4 MAPS OF SERVICE AREAS

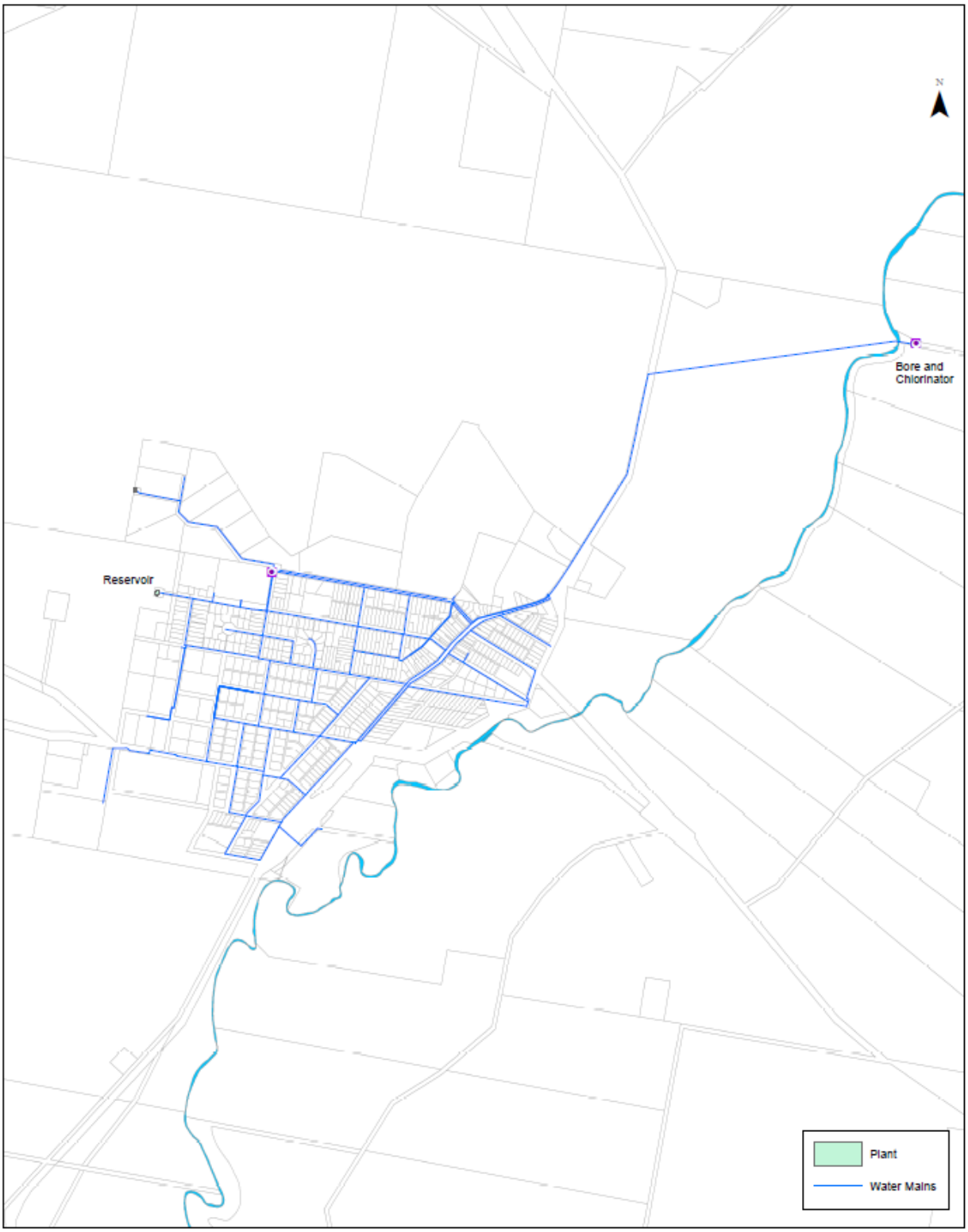

N
BARADINE
COONABARABRAN
BINNAWAY
MENDOORAN
COOLAH
DUNEDOO
Legend
Towns
WSC Boundary
Shire Roads
0 7 14 21
Kilometers
WARRUMBUNGLE SHIRE COUNCIL
Shire Overview
warrumbungle
SHIRE COUNCIL

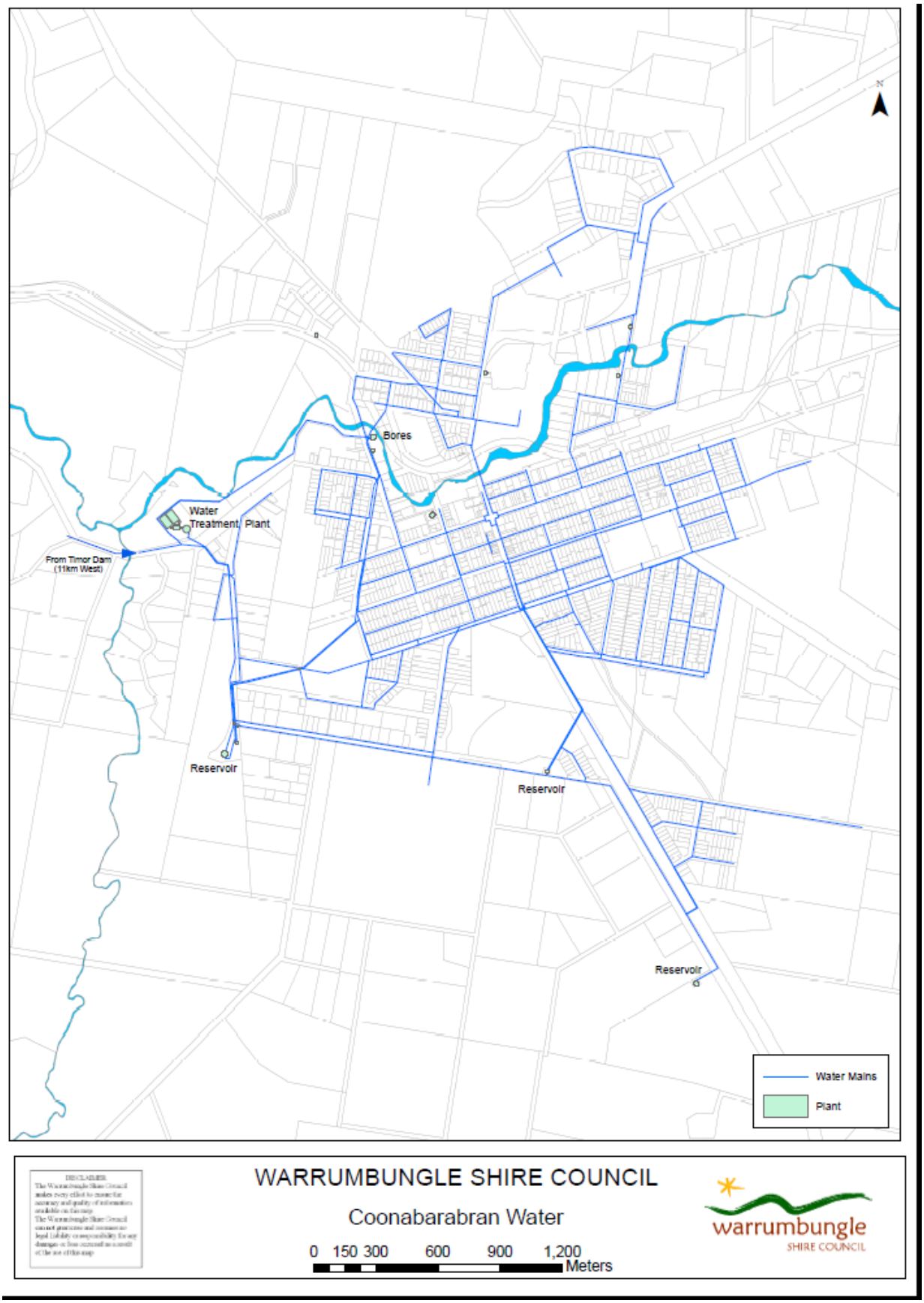
WARRUMBUNGLE SHIRE COUNCIL

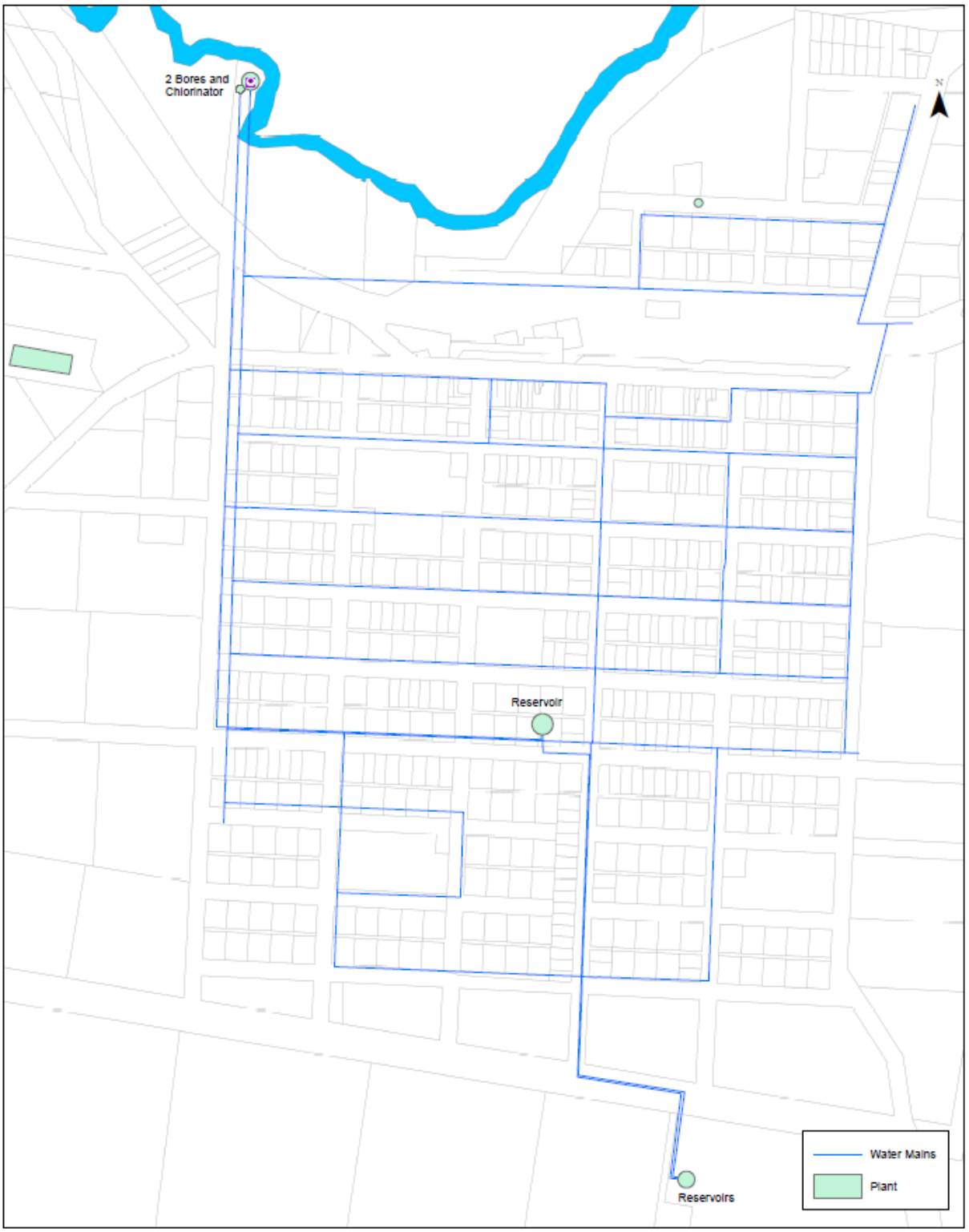
Baradine Water

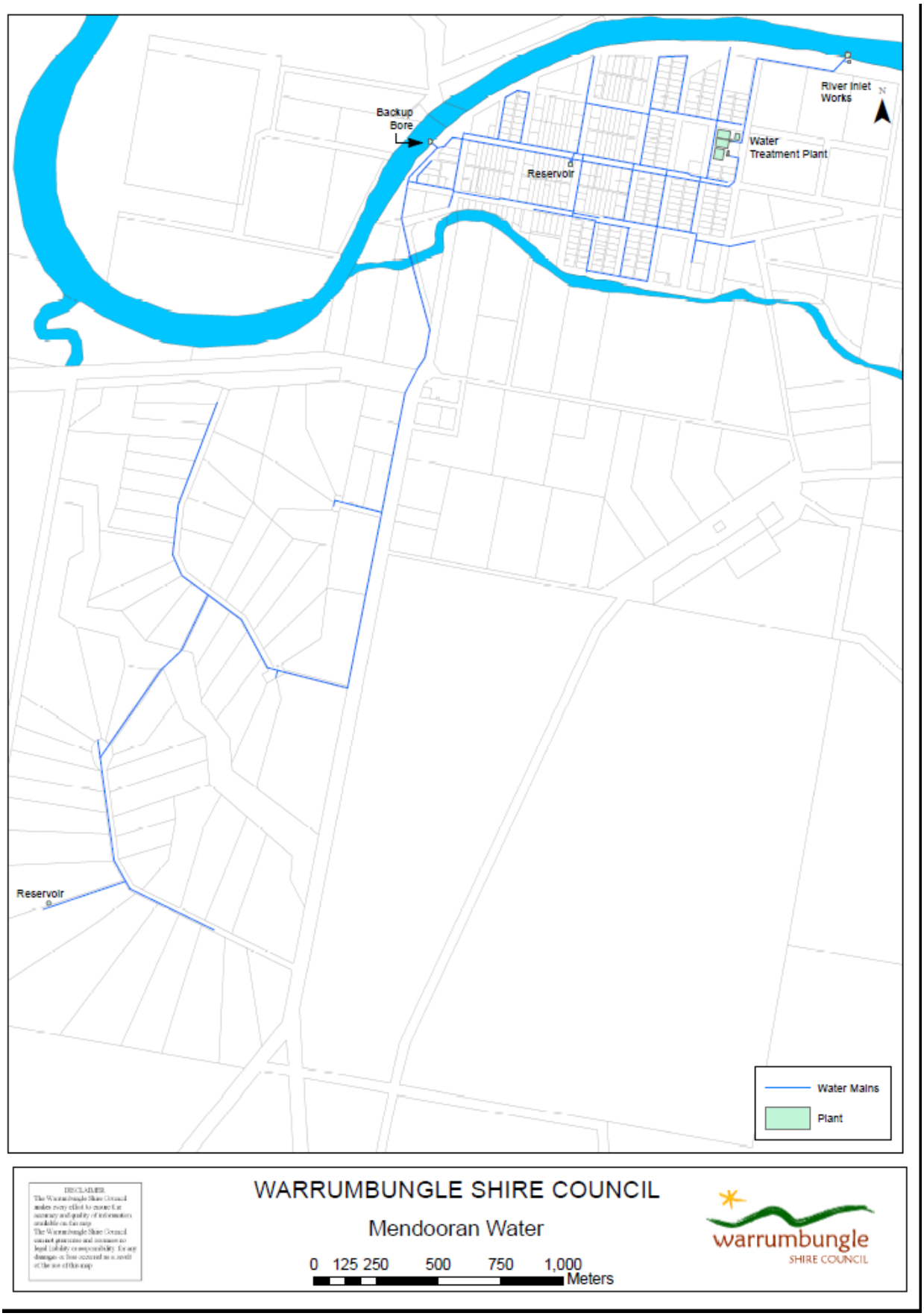
0 80 160 320 480 640 Meters


N
Water Treatment Plant
River Inlet Works
Reservoir
Plant
Water Mains
WARRUMBUNGLE SHIRE COUNCIL
Binnaway Water
0 62.5 125 250 375 500
Meters
warrumbungle
SHIRE COUNCIL


N
Bore and Chlorinator
Reservoir
Plant
Water Mains
WARRUMBUNGLE SHIRE COUNCIL
Coolah Water
0 150 300 600 900 1,200
Meters
warrumbungle
SHIRE COUNCIL


Bores
Water Treatment Plant
From Timor Dam (11km West)
Reservoir
Reservoir
Reservoir
Water Mains
Plant
WARRUMBUNGLE SHIRE COUNCIL
Coonabarabran Water
0 150 300 600 900 1,200
Meters
warrumbungle
SHIRE COUNCIL


2 Bores and Chlorinator
N
Reservoir
Reservoirs
Water Mains
Plant
WARRUMBUNGLE SHIRE COUNCIL
Dunedoo Water
0 60 120 240 360 480
Meters
warrumbungle
SHIRE COUNCIL


River Inlet Works
Backup Bore
Water Treatment Plant
Reservoir
Reservoir
N
Water Mains
Plant
WARRUMBUNGLE SHIRE COUNCIL
Mendooran Water
0 125 250 500 750 1,000
Meters
warrumbungle
SHIRE COUNCIL