



2015 Drought Management Plan

Revision 1 - Adopted 14 April 2016



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Overview & Purpose

The 2015 revision of the Drought Management Plan has been prepared as a major update to the previous Plan, which was originally prepared in 2007 and last updated in 2009. The Plan has been prepared based on a template that was prepared for the Namoi Water Alliance by Hunter H2O for the purpose of providing a consistent approach to drought management across the Namoi Region. The template was prepared following the adoption of a regional water restrictions policy (HWA, 2014) by Namoi Water Alliance member councils in late 2014.

The Drought Management Plan has been prepared in accordance with NSW Department of Primary Industries – Water (DPI Water) requirements as documented in their *Best Practice Management of Water Supply and Sewerage Guidelines* (DWE, 2007). With recent changes to best practice requirements, Drought Management can now be considered within Council’s Strategic Business Plan (SBP). However, Council considers it more practical to have a standalone Drought Management Plan that can be reviewed and updated as required, as updates may not necessarily line up with updates to SBPs (now required every 8 years).

The Plan outlines the various demand and supply side drought response actions that should be employed at various stages during an extended drought period. The Plan also outlines Council’s water restriction policy and documents various backup supply sources and emergency supply options. The fundamental objective of preparing and adopting a Drought Management Plan is to minimise the risk of the community running out of water and ensuring there is always sufficient water available to satisfy the basic needs of the community.

DROUGHT MANAGEMENT PLAN - DOCUMENT CONTROL TABLE

<i>Revision</i>	<i>Revision Date (from when Revision Applies)</i>	<i>Resolved by Council (date of Council Meeting)</i>
<i>Draft Report (for public exhibition)</i>	31 October 2015	27 October 2015
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1 Introduction

This Drought Management Plan has been prepared by Tamworth Regional Council (TRC) to ensure that a structured and transparent approach is taken for the management of drought impacts on Council's town water supply systems. The Plan outlines the various demand and supply side drought response actions that should be employed at various stages during an extended drought period. The Plan also outlines Council's water restriction policy and documents various backup supply sources and emergency supply options.

The fundamental objective of preparing and adopting a Drought Management Plan is to minimise the risk of the community running out of water and ensuring there is always sufficient water available to satisfy the basic needs of the community. The Plan is only applicable to customers connected to the reticulated water supply systems and some raw water pipelines operated by TRC, which includes systems operated in the following towns:

- Tamworth
- Moonbi / Kootingal
- Manilla
- Barraba
- Nundle
- Attunga
- Bendemeer

Management of water supply in NSW is administered by the *Water Management Act 2000*, *Water Act 1912* and *Local Government Act 1993*. Drought management planning is an essential component of the NSW Government's *Best Practice Management of Water Supply and Sewerage Guidelines* (DWE, 2007) for local water utilities. This Drought Management Plan has been prepared in accordance with these guidelines and the associated Drought Management Check List.

This Plan contains the following sections:

Section 2 contains a description of the water supply systems that are covered by the Plan, including a brief review of previous drought experience.

Section 3 contains an overview of the operating environment for the Plan, including consideration of climatic conditions, water resources and potential downstream impacts.

Section 4 contains a discussion on pre-drought planning measures, including consideration of demand management measures, system operating rules, data collection and long term supply strategies.

Section 5 contains the Drought Management Action Plans, which set out the actions to be taken during each drought response level, including the application of water restrictions.

Section 6 outlines the post-drought actions that should be undertaken, including regular review and updating of the Plan.

Section 7 contains the references to this report.

2 Water Supply Systems

This Drought Management Plan is applicable to the reticulated water supply systems (including raw water pipeline in some systems) that are owned and operated by TRC, as listed on Table 2.1 below and shown on Figure 1.

Table 2.1 Summary of TRC Water Supply Systems

Water Supply System	Approximate Population Served*	Number of Connections**	Average Daily Consumption (ML/d)	Average Annual Consumption (ML/yr)
Tamworth	38,735	17,740	23.5	8,560
Moonbi/Kootingal	2,040	977	1.0	360
Manilla	2,110	1,155	1.0	375
Barraba	1,150	745	0.52	190
Nundle	270	211	0.12	45
Attunga	340	150	0.12	45
Bendemeer	210	139	0.08	30

Notes: * Based on Census Data 2011

** Based on Council connection data 2013/14

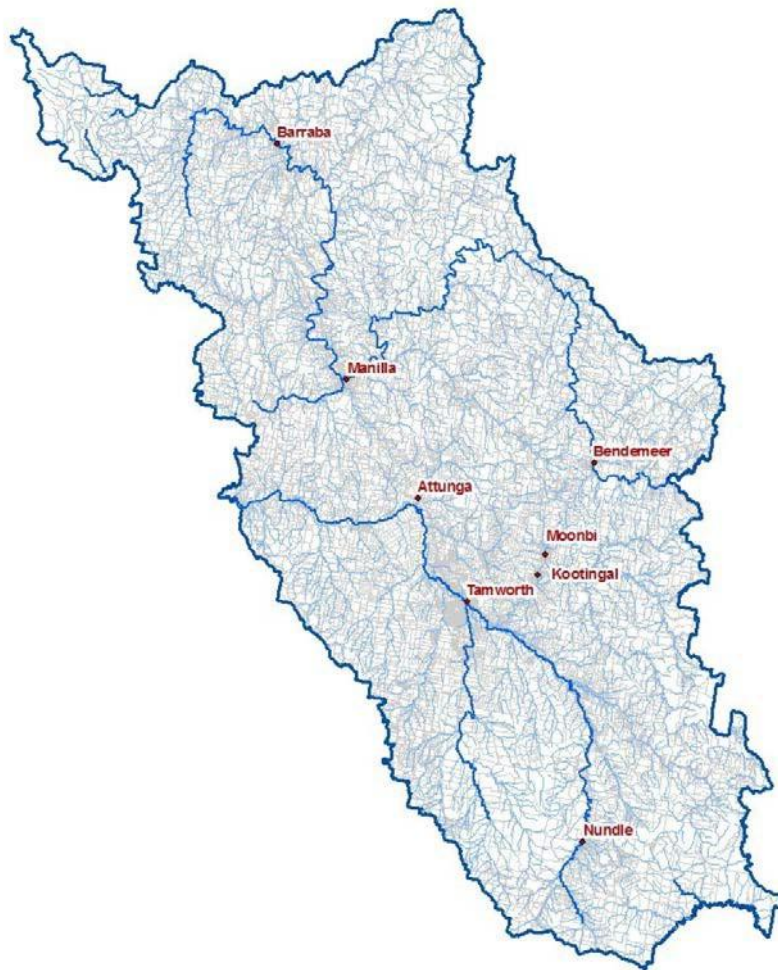


Figure 1 Locality Plan – Water Supply Systems

2.1 System Descriptions

An overview of each of the water supply systems is included on Table 2.2 below, including brief details for primary and backup supply sources. Further details on the water supply systems is included in Appendix C, including a discussion on system performance during previous droughts and any supply related problems.

Table 2.2 Overview of TRC Water Supply Systems

Water Supply Component	Description	Details
TAMWORTH WATER SUPPLY SYSTEM*		
Primary Source/s	Chaffey Dam (100,000 ML)	<ul style="list-style-type: none"> WaterNSW operated dam 16,400 ML/yr entitlement (<i>WAL20907</i>) Extraction from Peel River via intake pump station (80 ML/d)
	Dungowan Dam (6,300 ML)	<ul style="list-style-type: none"> TRC operated dam 5,600 ML/yr entitlement (<i>WAL20953</i>) Extraction from dam via Dungowan Pipeline (22 ML/d)
Backup Supply Source/s	Scott Road Drift Wells	<ul style="list-style-type: none"> 6 wells (10 ML/d total production capacity) Wells 3,4,5 & 6 have 10 ML high security & 108 units general security entitlements (Peel Alluvium) Wells 1 & 1A (located in bank of Peel River) able to extract 100 ML/mth or 1,200 ML/y with max daily pumping 5 ML/d using Chaffey Dam surface water license (local water utility) Raw water transferred to WTP via transfer pump station (10 ML/d)
MOONBI/KOOTINGAL WATER SUPPLY SYSTEM		
Primary Source/s	Cockburn River Well Fields	<ul style="list-style-type: none"> 4 wells (55 L/s total capacity) 400 ML/yr entitlement from Peel Alluvium (<i>WAL27812</i>) Directly supplies Kootingal Reservoirs
Backup Supply Source/s	Tamworth Water Supply System	<ul style="list-style-type: none"> Connection via DN375 trunkmain and 1 ML/d booster pump station
MANILLA WATER SUPPLY SYSTEM		
Primary Source/s	Namoi River Weir	<ul style="list-style-type: none"> Weir capacity is estimated to be around 36 ML Extraction from Namoi River via pump station at weir (4 ML/d) 564 ML/yr entitlement from Upper Namoi (<i>90SL004850</i>)
Backup Supply Source/s	Manilla River (Split Rock Dam)	<ul style="list-style-type: none"> 150 ML/yr entitlement from Split Rock Dam (<i>WAL6493</i>) Extraction from Manilla river via intake pump station (1.8 ML/d)
	Groundwater	<ul style="list-style-type: none"> 60 ML/yr entitlement from Manilla Alluvium (<i>90PT981281</i>) Test bores only

Water Supply Component	Description	Details
BARRABA WATER SUPPLY SYSTEM*		
Primary Source/s	Split Rock Dam	<ul style="list-style-type: none"> WaterNSW operated dam 365 ML/yr entitlement from Split Rock Dam (WAL24016) Extraction from dam via Split Rock pump station and pipeline (1 ML/d)
Backup Supply Source/s	Groundwater bores (James Street) Manilla River & Barraba Creek	<ul style="list-style-type: none"> 180 ML/yr entitlement (WAL28023) 2 bores with combined capacity of 1 ML/d 421 ML/yr entitlement from Upper Manilla (WAL37242)
NUNDLE WATER SUPPLY SYSTEM		
Primary Source/s	Peel River	<ul style="list-style-type: none"> 100 ML/yr entitlement from Peel Fractured Rock (WAL30075) Extraction from Peel River via pumping well adjacent to river (9 L/s)
Backup Supply Source/s	Groundwater bores (Crawney Road)	<ul style="list-style-type: none"> Capacity 11 L/s for maximum of 8 hours/day or 6 L/s continuously (90CA826933)
ATTUNGA WATER SUPPLY SYSTEM		
Primary Source/s	Groundwater bores	<ul style="list-style-type: none"> 2 bores (11 L/s total capacity) 120 ML/yr entitlement from Peel Alluvium (WAL30057) Directly supplies reservoir
Backup Supply Source/s	N/A	<ul style="list-style-type: none"> No backup supply currently available
BENDEMEER WATER SUPPLY SYSTEM		
Primary Source/s	Macdonald River	<ul style="list-style-type: none"> 84 ML/yr entitlement (Mid Macdonald River) Extraction from Macdonald River via intake pump station (capacity 7 L/s)
Backup Supply Source/s	Groundwater bores (Airlie Road)	<ul style="list-style-type: none"> 10 ML/yr entitlement (WAL31067) Capacity 3L/s

*Note: *Consumers along the Dungowan Pipeline (Tamworth) and Connor's Creek Pipeline (Barraba) should also comply with the Drought Management Plan's requirements for their local town water supply system.*

3 Operating Environment

Drought Management Plans need to be tailored to adequately consider the prevailing operating environment conditions that are relevant to each individual water supply system. While there is a need to have some level of uniformity across the region for some drought response actions (eg specific rules associated with water restrictions), there is also a need to have tailored drought management strategies that are specific to the individual water supply system and the surrounding environment that it operates within (eg triggers for activating water restrictions).

This section provides a brief summary of the various operating environment factors that need to be considered in both the preparation and operation of the Drought Management Plan, including:

- Location & Climate
- Water Resources
- Additional Demands During Drought Periods
- Potential Downstream / Environmental Impacts

3.1 Location & Climate

TRC serves a population of just over 60,000 and covers an area of 9,893 km² stretching from the Nandewar Range north of Barraba, south-east to the Peel and Great Dividing Ranges. In addition to the towns and villages that have reticulated water supply systems (refer to Table 2.1) there are several other villages located within the local government area that do not have formal water supply systems, including Dungowan, Woolomin, Duri, Somerton and Woolbrook. The nearest cities/towns outside of TRC are Armidale (which is located around 115 km to the northeast of Tamworth) and Gunnedah (which is located around 80km to the west).

The Tamworth Region experiences a dry sub-humid climate. Temperatures are warm to hot in summer with relatively low humidity, mild in autumn and spring and cool to mild in winter. Rainfall is generally lower over the autumn and winter months and highest in summer months due to a predominance of summer storms.

Median rainfall in Tamworth city is 634 mm per annum, however higher rainfall is experienced in more elevated areas (>800 mm pa in Nundle and Bendemeer). Average annual evaporation is 1971 mm per annum, and average 3pm relative humidity is 42%. Monthly climate statistics for Tamworth are included on the table below.

Table 3.1 Climate Statistics – Tamworth Airport (1992 – 2015)

Climate Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Rainfall (mm)	58.6	77.2	48.6	27.1	27.1	48.6	44.5	38.1	43.9	53.0	87.6	79.4	634
10%ile Rainfall (mm)	13.2	21.3	9.8	0.4	0.9	13.7	7.4	4.2	10.8	13.0	36.8	40.9	463
Mean Evap. (mm)	267	227	214	138	90	60	65	93	132	186	228	270	1971
Mean Max. Temp (°C)	32.6	31.3	29.1	25.3	20.7	17.0	16.3	18.4	21.9	25.4	28.3	30.2	24.7

It is widely accepted that future climate changes could impact water supply systems through changing frequency and duration of rainfall, as well as an increase in evaporation. While estimating the impacts associated with future climate change is very difficult and is an evolving science, recent studies have started to provide some indication of the potential climate impacts. However, modelling to-date has focused more on changes in average monthly or annual statistics and less on the duration and frequency of extreme events, which is more critical for drought management.

A summary of the estimated impacts of future climate change on maximum temperatures, rainfall and evaporation for the New England / North West region is shown on Table 3.2 below.

Table 3.2 Max Temp, Rainfall & Evap Predictions for New England / North West Region at 2050

Season	Maximum Temperatures	Rainfall	Evaporation
Spring	2 – 3°C warmer	5 – 10% increase	10 – 20% increase
Summer	1 – 1.5°C warmer	10 – 20% increase	10 – 20% increase
Autumn	1.5 – 2 °C warmer	5 – 10% increase	10 – 20% increase
Winter	2 – 3 °C warmer	10 – 20% decrease	5 – 10% increase

Source: NSW Climate Impact Profile (DECCW, 2010)

In general, temperatures are virtually certain to rise, rainfall is likely to increase in all seasons except winter and increased evaporation is likely in all seasons. The NSW Climate Impact Profile report (DECCW, 2010) also states that the impact of the El Nino Southern Oscillation (ENSO) is likely to become more extreme – with ENSO years continuing to be drier than average, but also becoming hotter, leading to more extreme impacts.

3.2 Water Resources

The TRC local government area lies almost wholly within the Namoi River catchment in North West NSW. The Namoi River catchment drains an area of 42,000 km² and is bounded by the Great Dividing Range in the east, the Liverpool and Warrumbungle Ranges in the south, and the Nandewar Ranges and Mt Kaputar to the North. Major tributaries of the Namoi River include Coxs Creek and the Mooki, Peel, Cockburn, Manilla, and Macdonald Rivers, all of which join the Namoi upstream of Boggabri.

The two major water catchments, which cover the TRC local government area, are the Peel Valley sub-catchment and the Namoi / Manilla sub-catchment (see Figure 2).

There are three Water Sharing Plans (WSP) which impact on the water resources available to urban areas within the TRC area:

- *Water Sharing Plan for the Peel Valley Regulated, Unregulated, Alluvial and Fractured Rock Water Sources 2010* covers all of the water extraction within the Peel Valley, including water supply sources for Tamworth, Moonbi/Kootingal, Attunga and Nundle (NOW, 2010).
- *Water Sharing Plan for the Upper Namoi and Lower Namoi Regulated River Water Sources 2003* includes Split Rock Dam, which supplies water to Barraba, and the Manilla River downstream of Split Rock Dam, which provides a backup supply to Manilla (DIPNR, 2004).

- *Water Sharing Plan for the Namoi Unregulated & Alluvial Water Sources 2013* covers extractions from unregulated rivers in the Upper Namoi including Bendemeer and Manilla water sources (NOW, 2013).

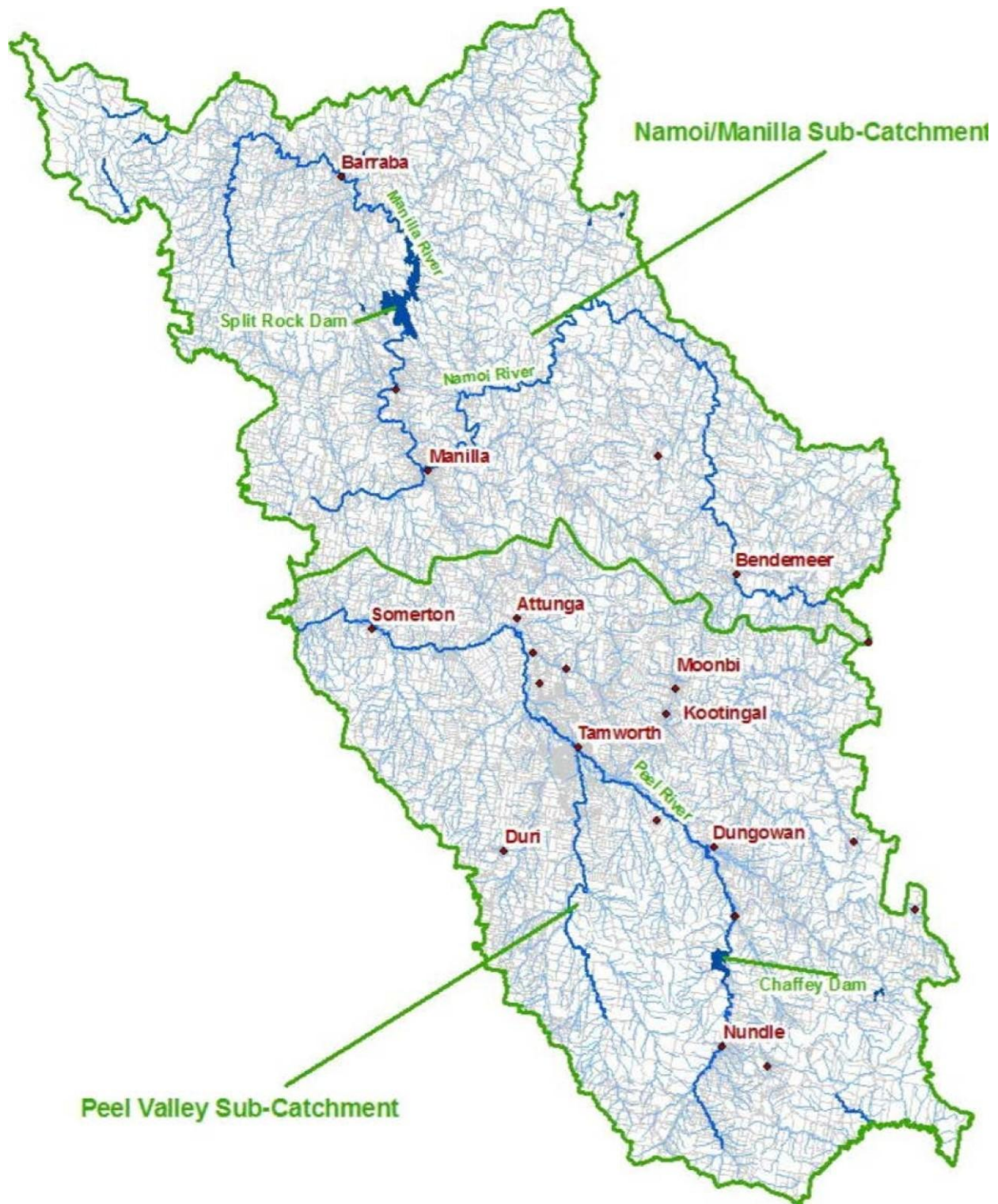


Figure 2 Major Water Catchments in the TRC Region

Peel Valley Catchment

In the TRC area the city of Tamworth, the towns of Kootingal and Nundle and the villages of Moonbi and Attunga lie within the Peel Valley sub-catchment. The total catchment area of the Peel Valley sub-catchment is around 4,670 km² and the key tributaries of the Peel River include: Duncans Creek, Dungowan Creek, Cockburn River, Goonoo Goonoo Creek, Moore Creek, Timbumburi Creek, Tangaratta Creek and Attunga Creek. In addition to the Peel River the Cockburn River, Goonoo Goonoo Creek and Dungowan Creek exhibit perennial flows in most years (NOW, 2010).

The Peel Valley sub-catchment has two storages, Chaffey Dam and Dungowan Dam, which regulate water supplies in the Peel River Valley. Chaffey Dam is a major headwater storage located on the Peel River approximately 40km upstream of Tamworth and Dungowan Dam is located on Dungowan Creek and is the second major water supply for Tamworth City.

The average annual discharge from the Peel River at Carroll Gap is 252,900 ML, with a large variability between wet and dry years. Variability in streamflows also occurs between seasons (with predominate rainfall and irrigation in summer) and across the valley. The Cockburn River sub-catchment contributes around 40% of the average annual streamflows at Carroll Gap, with Goonoo Goonoo Creek and Dungowan Creek both contributing around 10% of streamflows (NOW, 2010).

Chaffey Dam is the major in-stream structure in the Peel Valley, with a storage capacity of 100,000 ML (augmented from 62,000 ML in 2015/16) and a catchment area of around 420 km². The dam is owned by WaterNSW and is a major source of water for both local irrigators and Tamworth, capturing water during times of high flow and releasing it during periods when downstream flows are insufficient to satisfy demands.

Dungowan Dam is a town water supply dam owned by TRC, with a storage capacity of 6,300 ML and a catchment area of around 125 km². Although the dam is relatively small, it typically supplies around 40% of Tamworth's water supply. Dungowan Dam is operated by TRC according to licence conditions, which include maintaining a flow of 10 ML/day into Dungowan Creek when inflows exceed 10 ML/day, or passing all inflows as outflows when inflows are less than 10 ML/day.

Groundwater aquifers in the Peel Valley are primarily either fractured rock or alluvial – ie Peel Alluvial aquifer and Peel Fractured Rock aquifer. The alluvial aquifer is located adjacent to the Peel River and its major tributaries, predominately along the Peel Valley floor. The Peel Alluvium comprises unconsolidated sand, gravel and clay deposits, usually less than 1.5 km wide but ranging up to 3 km wide between Tamworth and Attunga. The thickness of the alluvial deposits is variable but is generally around 15 m, reaching 20 m near Tamworth. The Peel Alluvial is recharged by rainfall and streamflow and water quality is generally good, suitable for stock & domestic, irrigation and town water supply purposes.

The fractured rock aquifer is part of the bigger fractured rock aquifer system of the New England Fold Belt and comprises mainly shale, limestone, sandstone and mudstone rock formations. The fractured rock system contains water of variable yield and quality and is extensively developed for stock & domestic supplies, with some small scale commercial and irrigation development (NOW, 2010).

The alluvial groundwater and surface water in the Peel River and its major tributaries are intricately linked, with the Peel River losing water to the Peel Alluvium along most of its length, but gaining water from groundwater at the lower end of the valley. The general flow of groundwater is initially away from the river and then down gradients parallel to the river (NOW, 2010).

Namoi / Manilla Catchment

In the TRC area the towns of Manilla and Barraba and the village of Bendemeer lie within the Namoi/Manilla catchment. The total catchment area of the Namoi / Manilla sub-catchment (upstream of Keepit Dam) is around 5,700 km².

The headwaters of the Namoi River is the Macdonald River, which begins in the Great Dividing Range at an elevation of approximately 1,200 m above mean sea level. The river flows in a predominately westerly direction and drops quickly in elevation to 340 m near Manilla, some 200 river kilometres downstream. The river valley in this section is heavily constrained and has a small valley floor width. The river therefore has a high gradient as it flows through a gorge zone until it reaches Manilla where it joins with the Manilla River. From here, the river continues to flow in a westerly direction into Lake Keepit, a major storage just outside the TRC local government area.

The Manilla River drains a portion of the hill country on the western side of the New England highlands and the southern slopes of the Nandewar Range, including the Barraba district. It flows generally to the south and joins the Namoi River at the town of Manilla. There are a number of tributaries that contribute to the Namoi/Manilla River system including Barraba Creek, Ironbark Creek, Eumur Creek, Oakey Creek, Borah Creek, Warrabah and Watson's Creek as well as a number of other smaller tributaries. The Namoi/Manilla sub-catchment has one major storage, Split Rock Dam which regulates water supplies in the Manilla River, located approximately 28km upstream of Manilla.

The long term average annual discharge from the Namoi River at Manilla (30km upstream of Keepit Dam) is around 350,000 ML/yr, although this would have reduced somewhat since the construction of Split Rock Dam in 1988. The Macdonald River sub-catchment (including the Namoi River upstream of confluence with Manilla River) contributes around 70% of the average annual streamflows for the catchment.

Split Rock Dam, located on the Manilla River, is the major in-stream structure in the Namoi/Manilla catchment, with a storage capacity of 397,000 ML and a catchment area of around 1,650 km². The main use of water supply from the dam is for irrigation in the Lower Namoi. Split Rock Dam was constructed in order to meet irrigation demands for cotton crops in the Narrabri – Wee Waa area and to a lesser extent for the irrigation of other crops within the Namoi and Manilla valleys. The dam was constructed in 1988 to augment the supply to Keepit Dam (located 50km downstream) by an average of 53,000 ML per year. It also supplies water to users along the Manilla River.

There are limited groundwater supplies available in the Barraba and Manilla regions. Groundwater is generally absent as the drainage systems are entrenched and the development of alluvium is restricted in both depth and width. Small supplies of groundwater in the Barraba and Manilla regions are found in fractured rocks and in unconsolidated alluvium along the Namoi and Manilla Rivers, Barraba Creek and their tributaries.

3.3 Additional Demands during Drought Periods

Villages that may seek water during drought periods are listed on Table 3.3 below, along with an estimate of the potential demands during drought periods based on water carting.

Table 3.3 Villages with no Reticulated Water Supply

Village	Approx. Population*	Potential Demand During Drought ** (kL/d)
Somerton	550	44
Duri	500	40
Woolomin	300	24
Woolbrook	250	20
Piallamore	200	16

Notes: * Based on most recent Census Data

** Based on 80 L/person/day

In addition to the above villages, there are also sections within existing towns that do not have access to reticulated water supply, including:

- Properties on the Back Kootingal Road, Kootingal
- Moore Creek (village located 13km north of Tamworth on Moore Creek Road and currently on a community bore supply)
- Numerous private water supplies in the Daruka/Moore Creek area where grounds water is supplied by community bores.
- Loomberah (rural community located south-east of Tamworth off Calala Lane)
- Properties in Dungowan not connected to raw water supply
- Properties on the Nundle Road
- Other farms in the region

3.4 Potential Downstream / Environmental Impacts

It is important that Council liaise with relevant government agencies and other large users (eg. local irrigators) during drought periods to ensure that water resources are effectively managed at a whole of catchment level. Potential downstream impacts for each water supply system are included on the table below.

Table 3.4 Potential Downstream Impacts during Drought Periods

Water Supply System	Potential Downstream Impacts
Tamworth	<ul style="list-style-type: none"> Regulation of the Peel River (including environmental flow requirements) is controlled by WaterNSW. Potential impacts associated with temporary in-stream works at the Peel intake during low flow periods should be discussed with NSW Fisheries prior to work being undertaken. Extended use of the Scott Road Drift Wells has the potential to impact other groundwater users. Nearby monitoring bores should be checked regularly in association with DPI Water to monitor potential impacts.
Moonbi/Kootingal	<ul style="list-style-type: none"> Groundwater extractions may have some impact on streamflows in the Cockburn River Impacts are the same as Tamworth once this system is connected to Tamworth Water Supply.
Manilla	<ul style="list-style-type: none"> Negligible impacts as the primary extraction point on the Namoi River is close to the junction of Manilla River and the backup extraction point is on the Manilla River, which is regulated by WaterNSW between Split Rock Dam and Keepit Dam.
Barraba	<ul style="list-style-type: none"> Regulation of the Manilla River downstream of Split Rock Dam (including environmental flow requirements) is controlled by WaterNSW
Nundle	<ul style="list-style-type: none"> Extractions from the Peel River are relatively minor due to the small size of this system. Any impacts would only affect a small section of river between Nundle and Chaffey Dam.
Attunga	<ul style="list-style-type: none"> Negligible impacts as relatively minor extractions are sourced from a large aquifer.
Bendemeer	<ul style="list-style-type: none"> Relatively minor extractions from the Macdonald River. Flows are not disrupted, as there is no weir or storage structure at the extraction point.

4 Pre-Drought Planning

While this Drought Management Plan focuses primarily on the response actions to be undertaken during a drought, the extent of the various impacts of drought (including economic, social and environmental impacts) will be driven in part by the effectiveness of a range of pre-drought planning and management activities.

This section provides a brief summary of the key activities and strategies that should be in place prior to any drought period. The activities include:

- Implementation of demand management measures to ensure efficient management of water
- The adoption of appropriate system operating rules to ensure efficient operation of the system
- Regular system monitoring to provide baseline data for comparison during drought periods
- Adoption of long term supply strategies to ensure systems are capable of supplying future demands
- A funding strategy to assist in management of the costs associated with drought periods.

Each of these pre-drought planning activities is discussed further in the following sections.

4.1 Demand Management Program

TRC has had a formal Demand Management Program in place since 2007 and the overarching Demand Management Plan was recently subject to a major review and update. The Demand Management Program includes the following key measures:

1. Community awareness and education campaign
2. Residential rebates
3. Non-residential water audits
4. Permanent water conservation measures
5. Regular and planning controls – including supporting initiatives like BASIX and WELS
6. Water loss management
7. Water recycling

The Program includes permanent water conservation measures (see Appendix A) that encourage common sense water use practices to always be adopted and reinforces other demand management measures by developing a culture of water efficiency. The rules are easy to understand and act as the default water conservation measures when drought response levels are not in action.

4.2 System Operating Rules

Efficient operation of water supply systems, particularly systems with either surface or groundwater storages, is an important pre-emptive strategy for managing droughts. Due to the difficulty in predicting future drought conditions, it is important that system storages are not drawn down excessively during non-drought periods as a result of inefficient operation of the system, as this would reduce the security of a supply system in the event of a drought and consequently worsen the impacts of drought.

The most critical operating rules that impact TRC water supplies are associated with Chaffey Dam and Dungowan Dam. Chaffey Dam is owned and operated by WaterNSW and as such, TRC has limited ability to influence operation of the dam, particularly during non-drought periods. However, TRC should liaise with WaterNSW and DPI Water prior to the commencement of each water year to ensure that sufficient allocation (including carry over reserve) is made for town water supplies for the water year ahead.

Dungowan Dam is owned and operated by TRC and is generally used as the preferred supply source during non-drought periods. However, a key system operating rule is to stop extracting water from Dungowan Dam once the storage drops to around 65-70%. This storage is then maintained as an emergency backup in case water cannot be extracted from the Peel River for any reason.

4.3 System Monitoring

Regular monitoring of water supply sources, extractions, production, consumption and climate is critical to understanding how well a water supply system is operating and whether there are any problems or potential future problems. Regular data collection becomes even more critical during drought periods as supply sources are stressed and the water supply situation can deteriorate quickly due to the drought condition. Table 4.1 below includes a list of key monitoring sites and the minimum (or normal) data collection requirements.

There is a need to improve monitoring of water supply sources for the following towns and it is proposed to undertake the improvements listed during the life of the Plan:

- Manilla – install automated level gauge on Namoi River Weir to provide more accurate level and flow data
- Bendemeer – install automated level gauge on Macdonald River at Bendemeer to provide more accurate flow data at Bendemeer
- Moonbi-Kootingal – install automated level gauge on Cockburn River to provide more accurate flow data in the vicinity of the Moonbi-Kootingal groundwater bores

Table 4.1 Minimum Monitoring Requirements (Normal Operation)

Monitoring Type	Data Type/s	Frequency of Monitoring	Responsibility
Dams (WaterNSW)	- Water Level - Spills & Releases	Continuous	WaterNSW / DPI Water
Dams (TRC)	- Water Level - Spills & Releases	Continuous	TRC
Major Rivers	- Streamflows	Daily	DPI Water
Groundwater Bores	- Groundwater levels	Weekly	TRC
Intake Pump Stations	- Extractions	Daily	TRC
WTPs	- WTP Production	Daily	TRC
Customers	- Consumption (metered)	Quarterly	TRC
Climate	- Rainfall - Evaporation	Daily	BOM

4.4 Long Term Supply Strategies

All water supply systems should be designed to cope with at least a repeat of the worst drought on record. Larger systems (>1,000 people) should be designed to cope with more severe drought conditions than the worst on record, on the basis that it is reasonably expected that we could face in the future a more severe drought than the worst on record and these larger systems are very difficult – or in the case of Tamworth Water Supply System probably impossible – to support via emergency water carting from a nearby larger system.

Some water supply systems currently have fairly high supply security, including Manilla, Barraba and Attunga. Both Manilla and Barraba have either primary or backup supplies from Split Rock Dam and while this dam has been drawn down to around 5% storage in previous droughts, this still provides ample water for these two systems. Attunga is only a small system and historically has not had any issues with extracting sufficient groundwater from local bores.

Other systems have adequate supply security for small systems, including Nundle and Bendemeer. Both of these systems have had primary supply sources fail during previous drought periods; however, recent installation of backup supply groundwater bores has improved security which is now considered to be adequate.

Moonbi/Kootingal's primary water supply source (groundwater bores) frequently fails during drought periods and the system water supply security is ultimately linked to Tamworth which is used as a backup supply source.

Tamworth water supply security has recently increased with the augmentation of Chaffey Dam (to 100 GL). The bulk water supply system yield is around 18,000 ML/yr and could reduce to around 17,000 ML/yr within 20 to 30 years, taking into consideration median climate change impacts (based on current limited predictions).

4.5 Resource & Funding Strategy

The costs associated with managing drought can have a significant impact on Council's finances, due to a variety of factors, including:

- Reduced revenue due to water consumption reductions associated with enforcing restrictions, particularly in the mid to late stages of the drought. This would be partly offset by revenue from higher than average water consumption levels in the lead-up to the drought and in the early stages of the drought.
- Additional costs associated with Council activities, including running an ongoing community awareness campaign, increased frequency of supply and demand monitoring, liaison with government agencies and other stakeholders and policing of restrictions.
- Increased capital and operating expenditure associated with investigation, implementation and running of backup and emergency supply options.

When preparing budgets for the year ahead, TRC will need to ensure that if drought conditions are expected and/or existent, sufficient funds are set aside for drought management activities. In addition, all costs associated with managing the drought should be tracked and be available to report to Council, government regulators, DPI Water and the community (if required). These costs can then be used as a justification for further investment in long-term supply strategies and other drought management planning initiatives. Drought emergency funding may also be available through DPI Water to manage depleted supplies, investigate and implement emergency capital works or to cart water.

5 Drought Management Action Plans

Drought Management Actions Plans (DMAP) set out the actions to be taken during each drought response level. There are five Drought Response Levels (Levels 1 to 5), with each level having a set of suggested actions to be undertaken during that phase of the drought, including an associated set of water restrictions.

5.1 Overview

The “All Systems” DMAP (see Table 5.1) outlines the common actions that should be undertaken by Council at various drought response levels, including:

- The application of water restrictions and associated enforcement and issuing of fines
- Community awareness campaign and liaison with non-residential large water users
- Monitoring of water supply sources and town water demands
- Liaison with authorities and local irrigators
- Development and/or review of backup / emergency supply options

Specific DMAPs have also been prepared for each of the individual water supply systems (see Table 5.2 – Table 5.9), outlining additional specific actions to be undertaken in that system, generally related to the investigation and implementation of backup and emergency supply options. The specific DMAPs also nominate primary and secondary (or supplementary) supply sources for each of the drought response levels and triggers for moving between drought response levels.

Drought Response Levels

A general description of the five drought response levels is provided below. More details on the various actions and water restrictions that are relevant to each level are included in Sections 5.2 and 0 below.

Level 1 (Low) – This is the first level of water restrictions and is more focused on general awareness rather than trying to achieve significant reductions in usage. The key measure is to limit the hours that sprinklers can be used and generally the impact on residences and their gardens would be relatively minor. Actions are mainly preparatory measures that activate the Drought Management Plan and its various components.

Level 2 (Moderate) – This level includes a ban on sprinklers and a time limit for drippers and hoses. The focus is on reducing usage back below typical levels for that time of year and the measures are likely to cause a moderate level of inconvenience to the community, without necessarily having significant impacts on most lawns and gardens. Key actions include setting up more regular liaison with key government stakeholders and preparing backup supply sources.

Level 3 (High) – This level includes banning all forms of outdoor watering other than buckets for 2 hrs or hoses for 15 minutes per day (within the same 2 hr window) and will have a more significant impact on lawns and gardens and cause a fairly major inconvenience to most residences. The aim is to reduce usage well below typical levels while still allowing gardens to be maintained, albeit at a base level. Key actions include more focus on issuing warning and fines for violation of restrictions, stepping up the awareness campaign and notifying DPI Water of the intention to investigate and if necessary implement backup supply and/or emergency supply options.

Level 4 (Very High) – This severe level of water restrictions includes banning all outdoor watering in order to reduce usage to around winter levels and would have a major impact on lawns and gardens, including loss of gardens in many cases. The reestablishment of lawns and gardens after an extended period of severe restrictions would impose a relatively high cost on residences and therefore, the application of Level 4 restrictions or higher would only occur in very rare circumstances. Key actions include activating backup supply options, investigation / design emergency supply options, stepping up issuing of fines for violation of restrictions and recalling all Water Management Plans.

Level 5 (Emergency) – This extreme level of restrictions would involve an all-out campaign to reduce usage to absolute minimum levels by eliminating all non-essential usage and would have a major impact on nearly all residences and businesses. Residences may be asked to reduce shower times and limit washing machine loads. Business may be asked to restrict water usage to only essential services, with the possible shutting down of non-essential, water dependent services. Key actions include implementing emergency response / supply options and an all-out community water reduction appeal.

Triggers & Water Consumption Targets

The DMAPs for each of the water supply systems include primary triggers for initiating each drought response level, as well as total system water consumption targets for those levels. Secondary triggers such as water quality incidents and failure to achieve water consumption targets are also suggested. Water consumption targets are average annual consumptions and should be adjusted for seasonal patterns (where appropriate). Note that once outdoor usage is banned (Levels 4 & 5), consumption targets become fixed daily targets due to the lack of influence from seasonal factors. In considering the easing of water restrictions, TRC will take into consideration water supply demand, projected demand, level and security of bulk water sources, catchment parameters, seasonal conditions, and seasonal outlook.

The easing of water restrictions will generally not be implemented where it is likely that the revised restrictions will not be sustained for more than four weeks before tighter restrictions have to be re-imposed. Suggested timings for easing restrictions are included in the DMAPs.

Communication

A key aspect in ensuring the successful implementation of the Drought Management Plan is the communication strategy. A community awareness campaign is vital for ensuring the community is made aware of actions that directly impact them, such as water restrictions and any associated fines and exemptions, and the activation of backup or emergency supply sources and any associated changes in water quality.

The community also needs to be given advice on how to minimise the impact of various water restrictions (including options for household recycling of water) and advice on saving water around the home in general. It is important that the community is kept up-to-date with the status of water supply sources (including river flows and dam storage volumes) and are given some idea of the consequences of not achieving target reductions in water consumption.

Liaison with key government agencies is another important component of the communication strategy. Key agencies include DPI Water, Office of Environment and Heritage (OEH), EPA, NSW Health, North West Local Land Services and WaterNSW. It is particularly important that the relevant agencies be informed when significant impacts on the community, the environment or other stakeholders are expected as a result of actions arising from implementation of the plan.

In most systems, liaison with local irrigators is also important, to ensure they are aware of any impacts they may be having on the town water supplies and conversely, to make sure they are aware of the potential impacts that Council's actions, arising from the implementation of the plan, may have on them.

Monitoring

Regular monitoring of streamflows, dam / weir levels, groundwater bore levels, water extractions, water production and monitoring of actual water consumption compared to target are critical during drought periods. The data obtained from this monitoring provides important feedback on the effectiveness of the various drought response levels and will generally be the basis for moving between drought response levels. More frequent monitoring will generally be required as the drought progresses and the water supply situation deteriorates.

Backup / Emergency Supply Options

After each of the water supply system DMAPs, backup and emergency supply sources (referred to in the action plans) are listed in order of preference. Additional details on backup supply sources are included in Appendix C, while additional details on emergency supply sources are included in the Appendix D.

5.2 Action Plans

The Drought Management Action Plans (DMAPs) for “All Systems” is included in the table below, followed by more specific DMAPs for each individual water supply system.

Table 5.1 Drought Management Action Plan (All Systems)

Drought Response Level	Actions
1 Low	<ul style="list-style-type: none"> • Activation of Drought Management Plan • Implement Level 1 Water Restrictions • Review DMAP to ensure it is up-to-date, including a review of backup / emergency supply options • Prepare community awareness campaign (media advertising, internet & appropriate signage at town entrances) • Review major existing Water Management Plans and update where necessary • Weekly review of streamflows, dam levels, weir levels, groundwater bore levels, water extractions, WTP production, and monitoring of actual water consumption compared to target (monitor where applicable)
2 Moderate	<ul style="list-style-type: none"> • Implement Level 2 Water Restrictions • Implement community awareness campaign • Commence issuing warnings and fines for violation of restrictions • Establish a drought budget to track ongoing drought management costs • Weekly review of streamflows, dam levels, weir levels, groundwater bore levels, water extractions, WTP production, and monitoring of actual water consumption compared to target (monitor where applicable) • Review all existing Water Management Plans and update where necessary
3 High	<ul style="list-style-type: none"> • Implement Level 3 Water Restrictions • Apply more resources to the issuing of warnings and fines for violation of restrictions • Step-up community awareness campaign & meet with large non-residential users to discuss options for water reduction • Initiate regular liaison with key government agencies (DPI Water, WaterNSW) and local irrigators (where appropriate) • Twice-weekly review of streamflows, dam levels, weir levels, groundwater bore levels, water extractions, WTP production, and monitoring of actual water consumption compared to target (monitor where applicable) • Notify DPI Water of intention to investigate backup / emergency supply options and seek drought assistance • Assess appropriateness of exemptions allowed under existing Water Management Plans
4 Very High	<ul style="list-style-type: none"> • Implement Level 4 Water Restrictions • Step-up the issuing of warnings and fines for violation of restrictions • Step-up community awareness campaign, including non-residential water reduction appeal • Daily review of streamflows, dam levels, weir levels, groundwater bore levels, water extractions, WTP production, and monitoring of actual water consumption compared to target (monitor where applicable) • Regular liaison with key government agencies and local irrigators (where appropriate) • Recall all Water Management Plans
5 Emergency	<ul style="list-style-type: none"> • Implement Level 5 Water Restrictions • Strict issuing of warnings and fines for violation of restrictions • All-out community water reduction appeal – minimum essential usage only • Regular (fortnightly) meetings with large water users to discuss ongoing water reduction options • Consider temporary closure of non-essential, high water dependant services • Daily review of streamflows, dam levels, weir levels, groundwater bore levels, water extractions, WTP production, and monitoring of actual water consumption compared to target (monitor where applicable) • Regular liaison with key government agencies and local irrigators (where appropriate), including liaising with DPI Water re: emergency response options • Implementation of emergency response / supply options • Engage additional resources to enable water meter reading on a monthly basis and use this information to investigate action against high residential users

Tamworth Water Supply System

Table 5.2 Drought Management Action Plan – Tamworth (Chaffey Dam Storage 62 GL)

Drought Response Level	Primary Trigger* (Chaffey Dam Level for 62 GL Storage)		Water Usage Target** (ML/d)	Additional Actions
PWCM	n/a	60%	n/a	
1 Low	50%	45%	23.5 (95%)	<ul style="list-style-type: none"> • Maintain Dungowan Dam storage volume at around 60-65% (to provide ongoing supply to Dungowan pipeline users and emergency backup storage) with remainder of supply from Chaffey Dam • Use Scott Rd drift wells 1 & 1A to supplement primary supplies (up to 100ML/mth)
2 Moderate	40%	37.5%	22.2 (90%)	<ul style="list-style-type: none"> • Undertake a review of large users water savings plans in association with community awareness campaign (target 10% non-residential usage reduction) • Implement Council's Parks & Gardens Water Management Plan and target 30% consumption reduction
3 High	35%	32.5%	21.0 (85%)	<ul style="list-style-type: none"> • Target 15% non-residential usage reduction • Target 50% Parks and Gardens consumption reduction • Negotiate with DPI Water to activate remainder of Scott Rd drift wells by the time Level 4 restrictions are activated • Investigate emergency supply options
4 Very High	30%	32.5%	18.5 (75%)	<ul style="list-style-type: none"> • Target 20% non-residential usage reduction • Activate remainder of Scott Rd drift wells to supplement primary supplies (subject to approval from DPI Water) • Undertake design and seek approval to implement emergency supply options including making treated effluent available for industry & public parks watering, installing a temporary weir at Paradise Weir and expanding groundwater bores
5 Emergency	25%	n/a	16.1 (65%)	<ul style="list-style-type: none"> • Target 25% non-residential usage reduction • Continue to use Scott Rd drift wells to full capacity • Implementation of emergency supply options – treated effluent from Westdale STP, temporary weir at Paradise Weir and expanded groundwater bores – and use of any remaining storage in Chaffey Dam and Dungowan Dam
Backup Supply Options				
1. Scott Rd Drift Wells				
Emergency Supply Options				
1. Treated effluent from Westdale STP (for industrial use and high priority public parks & gardens) 2. Temporary weir at Paradise Weir (transfer via Scott Rd drift wells) 3. Expand groundwater borefield 4. Pipeline to Keepit Dam (if sufficient water is available)				

Notes: * Secondary triggers include failure to achieve consumption targets & major water quality incidents for tightening restrictions and forecast climatic conditions and announced general security irrigation allocation for easing restrictions

** Usage targets are average annual consumptions and should be adjusted for seasonal patterns

Table 5.3 Drought Management Action Plan – Tamworth (Chaffey Dam Storage 100 GL)

Drought Response Level	Primary Trigger* (Chaffey Dam Level for 100 GL Storage)		Water Usage Target** (ML/d)	Additional Actions
PWCM	n/a	50%	n/a	
1 Low	40%	40%	23.5 (95%)	<ul style="list-style-type: none"> • Maintain Dungowan Dam storage volume at around 60-65% (to provide ongoing supply to Dungowan pipeline users and emergency backup storage) with remainder of supply from Chaffey Dam • Use Scott Rd drift wells 1 & 1A to supplement primary supplies (up to 100ML/mth)
2 Moderate	35%	35%	22.2 (90%)	<ul style="list-style-type: none"> • Undertake a review of large users water savings plans in association with community awareness campaign (target 10% non-residential usage reduction) • Implement Council's Parks & Gardens Water Management Plan and target 30% consumption reduction
3 High	30%	30%	21.0 (85%)	<ul style="list-style-type: none"> • Target 15% non-residential usage reduction • Target 50% Parks and Gardens consumption reduction • Negotiate with DPI Water to activate remainder of Scott Rd drift wells by the time Level 4 restrictions are activated • Investigate emergency supply options
4 Very High	25%	25%	18.5 (75%)	<ul style="list-style-type: none"> • Target 20% non-residential usage reduction • Activate remainder of Scott Rd drift wells to supplement primary supplies (subject to approval from DPI Water) • Undertake design and seek approval to implement emergency supply options including making treated effluent available for industry & public parks watering, installing a temporary weir at Paradise Weir and expanding groundwater bores
5 Emergency	20%	n/a	16.1 (65%)	<ul style="list-style-type: none"> • Target 25% non-residential usage reduction • Continue to use Scott Rd drift wells to full capacity • Implementation of emergency supply options – treated effluent from Westdale STP, temporary weir at Paradise Weir and expanded groundwater bores – and use of any remaining storage in Chaffey Dam and Dungowan Dam
Backup Supply Options				
1. Scott Rd Drift Wells				
Emergency Supply Options				
1. Treated effluent from Westdale STP (for industrial use and high priority public parks & gardens) 2. Temporary weir at Paradise Weir (transfer via Scott Rd drift wells) 3. Expand groundwater borefield 4. Pipeline to Keepit Dam (if sufficient water is available)				

Notes: * Secondary triggers include failure to achieve consumption targets & major water quality incidents for tightening restrictions and forecast climatic conditions and announced general security irrigation allocation for easing restrictions

** Usage targets are average annual consumptions and should be adjusted for seasonal patterns

Moonbi/Kootingal Water Supply System

Table 5.4 Drought Management Action Plan - Moonbi/Kootingal

Drought Response Level	Primary Trigger* (Groundwater Bores as Primary Supply)		Water Usage Target** (ML/d)	Additional Actions
PWCM	n/a	Bore levels fully recovered for >1 month	n/a	
1 Low	Significant drop in bore levels	Bore levels fully recovered & all bores operational	0.95 (95%)	<ul style="list-style-type: none">Primary supply is from local bores and if required, supply supplemented from Tamworth water supply system via Nemingha pumping station to a maximum of 1 ML/d
2 Moderate	One or more bores failed	Bore levels partly recovered & at least 2 bores operational	0.90 (90%)	<ul style="list-style-type: none">Primary supply is from local bores with supply supplemented from Tamworth water supply system to a maximum of 1 ML/d
3 High	All bores failed – Refer to Secondary Triggers (Tamworth Triggers)		0.85 (85%)	<ul style="list-style-type: none">Primary supply from local bores has failed and all water is to be sourced from Tamworth water supply system to a maximum of 1 ML/d
4 Very High			0.75 (75%)	<ul style="list-style-type: none">Supply continues to be from Tamworth water supply system
5 Emergency			0.65 (65%)	<ul style="list-style-type: none">Supply continues to be from Tamworth water supply system
Backup Supply Options				
1. Tamworth Water Supply System (direct connection)				
Emergency Supply Options				
1. Same as Tamworth				

Notes: * Once backup supply from Tamworth Water Supply is activated, triggers for all levels are the same as Tamworth

** Usage targets are average annual consumptions and should be adjusted for seasonal patterns

Manilla Water Supply System

Table 5.5 Drought Management Action Plan - Manilla

Drought Response Level	Primary Trigger* (Namoi River Weir***)		Water Usage Target** (ML/d)	Additional Actions
PWCM	n/a	Namoi River weir flow >600ML/mth (20ML/d)	n/a	
1 Low	Namoi River weir flow <300ML/mth (10ML/d)	Namoi River weir flow >300ML/mth (10ML/d)	0.98 (95%)	<ul style="list-style-type: none"> All water requirements extracted from Namoi River Weir Review licensing requirements / conditions for backup supply extraction from Manilla River & discuss with DPI Water and WaterNSW
2 Moderate	Namoi River weir flow < 30ML/mth (1ML/d)	100% of supply sourced from Namoi River	0.93 (90%)	<ul style="list-style-type: none"> All water requirements extracted from Namoi River Weir Manilla River backup supply pumping station and rising main to be tested / prepared for use
3 High	Namoi River Weir level 100mm below crest level	50% of supply sourced from Namoi River	0.87 (85%)	<ul style="list-style-type: none"> Activate Manilla River pumping station – maintain Namoi River Weir level at 100mm below crest level and provide remainder of supply from Manilla River pumping station There is a historical (informal) agreement with irrigators immediately upstream of the weir that they will stop irrigating when flow over the weir has ceased
4 Very High	Namoi River Weir level 200mm below crest level & flows from Split Rock restricted	Backup supply from Split Rock Dam unrestricted	0.77 (75%)	<ul style="list-style-type: none"> Manilla River pumping station is primary supply with backup from Namoi River weir If sufficient supply cannot be guaranteed from Split Rock Dam, undertake investigation / field testing of potential groundwater bore locations
5 Emergency	Namoi River failed & flows from Split Rock restricted	n/a	0.67 (65%)	<ul style="list-style-type: none"> Fit out viable emergency bore/s and connect to WTP. Manilla River pumping station is primary supply (if water is still available from Split Rock Dam) and local emergency groundwater bores and/or carting from nearby system should be implemented as emergency supply options.
Backup Supply Options				
1. Manilla River Pumping Station (licence from Split Rock Dam)				
Emergency Supply Options				
1. Temporary licence/transfer from Split Rock Dam 2. Temporary groundwater bores 3. Water carting from nearby system (Barraba or Tamworth)				

Notes: * Secondary triggers include failure to achieve consumption targets & major water quality incidents

** Usage targets are average annual consumptions and should be adjusted for seasonal patterns

*** Namoi River @ North Cuerindi streamflow gauge to be used until gauge at weir has been established

Barraba Water Supply System

Table 5.6 Drought Management Action Plan - Barraba

Drought Response Level	Primary Trigger* (Split Rock Dam transfer system)		Water Usage Target** (ML/d)	Additional Actions
PWCM	n/a	Supply from Split Rock Dam fully restored	n/a	
1 Low	Split Rock Dam supply restricted (minor)	Split Rock Dam supply restricted (minor)	0.50 (95%)	<ul style="list-style-type: none"> • Activate James Street Bores as required
2 Moderate	Split Rock Dam supply restricted (moderate)	Split Rock Dam supply restricted (moderate)	0.47 (90%)	<ul style="list-style-type: none"> • Activate James Street Bores as required
3 High	Split Rock Dam supply restricted (severe)	Split Rock Dam supply restricted (severe)	0.44 (85%)	<ul style="list-style-type: none"> • Activate James Street bores
4 Very High	Split Rock Dam supply failed	James Street bores have recovered & can provide supply requirements	0.39 (75%)	<ul style="list-style-type: none"> • Continue to use James Street bores • If sufficient supply cannot be guaranteed from James Street Bores, undertake investigation / field testing of potential additional groundwater bore locations
5 Emergency	Groundwater supplies restricted	n/a	0.34 (65%)	<ul style="list-style-type: none"> • Continue to utilise James Street bores (if still available) and local emergency groundwater bores and/or carting from nearby system should be implemented as emergency supply options.
Backup Supply Options				
1. James Street groundwater bores				
Emergency Supply Options				
1. Temporary groundwater bores				
2. Water carting from nearby system (Manilla or Tamworth)				

Notes: * Secondary triggers include failure to achieve consumption targets & major water quality incidents

** Usage targets are average annual consumptions and should be adjusted for seasonal patterns

Nundle Water Supply System

Table 5.7 Drought Management Action Plan - Nundle

Drought Response Level	Primary Trigger* (Peel River @ Taroona)		Water Usage Target** (ML/d)	Additional Actions
PWCM	n/a	Peel River >150 ML/mth (5 ML/d)	n/a	
1 Low	Peel River <60 ML/mth (2 ML/d)	Peel River >60 ML/mth (2 ML/d)	0.12 (95%)	<ul style="list-style-type: none"> All water requirements extracted from Peel River
2 Moderate	Peel River <30 ML/mth (1 ML/d)	Peel River >30 ML/mth (1 ML/d)	0.11 (90%)	<ul style="list-style-type: none"> All water requirements extracted from Peel River Prepare / test Crawney Rd bore backup supply system, including any required remediation works
3 High	Peel River <15 ML/mth (0.5 ML/d)	Peel River >15 ML/mth (0.5 ML/d)	0.10 (85%)	<ul style="list-style-type: none"> Activate Crawney Rd bore backup supply system (supplementary supply only) Review / assess emergency supply options, including potential additional groundwater bore locations
4 Very High	Peel River failed	Backup supply bore has recovered & can provide supply requirements	0.09 (75%)	<ul style="list-style-type: none"> Use of Crawney Rd bore as primary supply (supplement from Peel River when available) Investigation / field testing of potential groundwater bore locations, including Oakenville bore (if required)
5 Emergency	Backup supply bore failed	n/a	0.08 (65%)	<ul style="list-style-type: none"> Continue to use Crawney Rd bore (if available) and local emergency groundwater bores and/or carting from nearby system should be implemented as emergency supply options.
Backup Supply Options				
1. Crawney Rd Bore				
Emergency Supply Options				
1. Oakenville Bore 2. Temporary groundwater bores 3. Water carting from nearby system (Tamworth or Manilla)				

Notes: * Secondary triggers include failure to achieve consumption targets & major water quality incidents

** Usage targets are average annual consumptions and should be adjusted for seasonal patterns

Attunga Water Supply System

Table 5.8 Drought Management Action Plan - Attunga

Drought Response Level	Primary Trigger* (Depth to Groundwater)		Water Usage Target** (ML/d)	Additional Actions
PWCM	n/a	<5.0m	n/a	
1 Low	>5.2m	<5.2m	0.12 (95%)	<ul style="list-style-type: none"> All water requirements to be extracted from Bores 1 & 2 near Peel River (when Bore 2 draws down impose tighter restrictions – Bore 2 operates at a lower level than Bore 1).
2 Moderate	>5.4m	<5.4m	0.11 (90%)	<ul style="list-style-type: none"> Liaison with Mine to discuss future water requirements and alternative supply options (other than town water) – request a reduction in town water usage Reduce pumping rate to try and maintain aquifer level
3 High	Both bores not recovering overnight	Both bores recovering overnight	0.10 (85%)	<ul style="list-style-type: none"> Review / assess emergency supply options, including assessing potential additional groundwater bore locations. Liaison with Mine to request that they minimise usage of town water to assist with achieving overall water usage target
4 Very High	Bore pumps & reservoir unable to meet demand	Bores operational but not recovering overnight	0.09 (75%)	<ul style="list-style-type: none"> Restrict supply of town water to Mine for domestic use only Field testing of potential groundwater bore locations, including testing for water quality and yields.
5 Emergency	Bores failed	n/a	0.08 (65%)	<ul style="list-style-type: none"> Use any viable groundwater bores as primary source, supplemented by carting
Backup Supply Options				
1. None				
Emergency Supply Options				
1. Temporary groundwater bores 2. Water carting from nearby system (Tamworth, Manilla or Barraba)				

Notes: * Secondary triggers include failure to achieve consumption targets & major water quality incidents

** Usage targets are average annual consumptions and should be adjusted for seasonal patterns

Bendemeer Water Supply System

Table 5.9 Drought Management Action Plan - Bendemeer

Drought Response Level	Primary Trigger* (MacDonald River)		Water Usage Target** (ML/d)	Additional Actions
PWCM	n/a	Macdonald R >150 ML/mth (5 ML/d)	n/a	
1 Low	Macdonald R <60 ML/mth (2 ML/d)	Macdonald R >60 ML/mth (2 ML/d)	0.080 (95%)	<ul style="list-style-type: none"> All water requirements extracted from Macdonald River
2 Moderate	Macdonald R <30 ML/mth (1 ML/d)	Macdonald R >30 ML/mth (1 ML/d)	0.075 (90%)	<ul style="list-style-type: none"> All water requirements extracted from Macdonald River Prepare / test Airlie Rd bore backup supply system, including any required remediation works
3 High	Macdonald R <15 ML/mth (0.5 ML/d)	Macdonald R >15 ML/mth (0.5 ML/d)	0.070 (85%)	<ul style="list-style-type: none"> Activate Airlie Rd bore backup supply system (supplementary supply only) Review / assess emergency supply options, including potential additional groundwater bore locations
4 Very High	Macdonald R failed	Backup supply bore has recovered & can provide supply requirements	0.060 (75%)	<ul style="list-style-type: none"> Use of Airlie Rd bore as primary supply (supplement from Macdonald River when available) Investigation / field testing of potential groundwater bore locations (if required)
5 Emergency	Backup supply bore failed	n/a	0.055 (65%)	<ul style="list-style-type: none"> Continue to use Airlie Rd bore (if available) and local emergency groundwater bores and/or carting from nearby system should be implemented as emergency supply options.
Backup Supply Options				
1. Airlie Rd bore				
Emergency Supply Options				
1. Temporary groundwater bore/s				
2. Water carting from nearby system (Tamworth, Manilla or Barraba)				

Notes: * Secondary triggers include failure to achieve consumption targets & major water quality incidents

** Usage targets are average annual consumptions and should be adjusted for seasonal patterns

5.3 Water Restrictions

Water restrictions are generally based on a common set of measures adopted by the Councils associated with the Namoi Water Alliance, summarised in the table below. The adoption of a common set of water restrictions across the Namoi Region allows for a relatively consistent and simplified communication process and reduces confusion in the community. However, Tamworth Regional Council's water restrictions differ slightly from those below and are outlined in detail in **Appendix A**.

Table 5.10 Summary of Water Restrictions

Category	1 Low	2 Moderate	3 High	4 Very High	5 Emergency
Residential Gardens & Lawns Watering	Sprinklers restricted to 2hrs per day.	No sprinklers. Drippers & hoses restricted to 2hrs per day.	No sprinklers or drippers. Buckets restricted to 2hrs per day. Hoses restricted to 15min per day (in a 2hr window)	No watering at any time	No watering at any time
Washing Down (including vehicles)	Wash down hard / paved surfaces with high pressure hose only.	Hoses restricted to 2hrs per day.	No hoses. Buckets restricted to 2hrs per day.	No washing down at any time	No washing down at any time
Swimming Pools & Spas	Permit required for filling pools over 2,000L.	Permit required for filling pools over 2,000L. Top up via hoses only 2hrs per day.	No filling of pools over 2,000L. Top up via buckets only 2hrs per day.	No filling or topping up pools	No filling or topping up pools
Residential Consumption Target (% reduction)	5%	15%	25%	35%	50%

Refer to **Appendix A** for a detailed list of water restrictions.

Compliance with Water Restrictions

Periods of water restrictions and use of appliances in accordance with water restrictions in place will be policed by Council officers.

Under the Local Government Act 1993 the maximum penalty that may be applied for a breach of imposed water restrictions is \$2,200 for corporations and \$220 for individuals.

5.4 Emergency Response Measures

In the event of a severe water shortage which has resulted in primary and backup supply sources failing or approaching failure, emergency response measures will need to be implemented. These measures may include supply side measures (emergency supplies) and/or demand side measures (emergency demand management) and they would be implemented in association with Level 5 Emergency water restrictions. Both supply side and demand side emergency response measures are outlined further below.

Emergency Supplies

Key emergency supply options have been identified for each system and are listed on the Drought Management Action Plans in Section 5.2, with further details included in Appendix D. Emergency supply options include groundwater bores (Manilla, Nundle, Attunga, Bendemeer), temporary weirs (Tamworth), use of treated effluent (Tamworth) and water carting (all systems except Tamworth).

Emergency supply options generally need to be implemented very quickly and any pre-construction planning and design work should generally be undertaken prior to reaching the Level 5 drought response level to ensure the emergency supply source can be activated expeditiously.

For all towns / village systems, water carting would be the last resort emergency supply option and due to the high costs involved, would only be implemented if all other emergency response measures failed (see below).

Water Carting

Carting of water to towns and villages may be necessary to provide basic town water needs during an emergency – in the event that all other emergency supply measures have failed. It is anticipated that such arrangements would only be required for a short period in conjunction with water rationing to allow the local water source to recover. For the larger towns (>2,000 people), it would be impractical to rely indefinitely upon carted water as an emergency water supply source due to the enormous costs associated with water carting. Water cartage is generally not considered to be a viable emergency supply options for very large towns / cities (>10,000 people) and therefore is not a viable option for Tamworth.

It is anticipated that water carting to Nundle, Attunga and Bendemeer could be achieved using a single truck (eg milk tanker), however Barraba and Manilla may require several large trucks or semi-trailers. An estimate of the quantities of water that may need to be carted is included in the following section on Table 5.11. Supplies would generally be sourced from the nearest water supply system that has sufficient spare capacity.

Government assistance towards the cost of water cartage has historically been available from the NSW Government via DPI Water, but is subject to quantities and cartage arrangements being agreed with DPI Water. If the security of a town supply appears to be threatened, the regional staff of DPI Water can assist Council with undertaking an initial assessment of the system and advise on the best cartage arrangements; however, Council will be required to seek quotations from contractors for the carting. An application to the DPI Water should contain the following:

- A copy of a technical report prepared by Council/DPI Water following the initial assessment
- Details of any consideration given to, or steps taken towards, establishing an emergency supply from another source

- The location of the new source of water to be used, the method of cartage proposed, the number of loads and frequency
- The cost of purchase and transportation of water
- Copies of all correspondence with transport contractors on the subject of cartage

Guidelines for determining minimum supply requirements are contained in the DPI Water document *Drought Relief for Country Towns* (NOW, 2009).

Emergency Demand Management

In the event of severe water shortage, external residential water use would be stopped altogether by way of restrictions and indoor water use would need to be reduced through persuasive advertising and community education campaigns. Emergency response strategies should only be considered when all other options have been exhausted, and should be applied in conjunction with Level 5 water restrictions.

Once Level 5 water restrictions are introduced, Council will consider a range of actions for implementation, including the following emergency response measures:

- More frequent water meter reading to facilitate the imposition and monitoring of targets / allowances for residential water use. It is envisaged that a residential usage target of around 150 L/person/day would initially be implemented and this could be reduced to as low as 100 L/person/day in the event of a severe water shortage
- The above measures would be implemented in conjunction with a major publicity campaign urging reductions in residential internal water use, with a focus on shorter showers, washing machines only being used for full loads and reduced operation of evaporative air conditioners. The campaign could also include mailing out shower timers to all residential properties in the affected area to encourage residents to reduce the period of time spent showering.
- Investigation of properties that are consistently exceeding usage targets and not showing a significant reduction in water usage over time.
- Introduce investigation of properties claiming the use of recycled or alternate sources of supply and, if the claims are valid, provide a Council approved sign at no cost to the property owner verifying the inspection and alternate use.
- Non-essential business asked to reduce consumption initially by 30% and then by 50% in the event of a severe water shortage.

Rationing

In the event that Level 5 Water Restrictions do not sufficiently reduce system demands to sustainable levels (based on the prevailing drought conditions), water rationing may need to be considered. The key objective of rationing would be to reduce water consumption to minimum essential supply requirements only. For residential properties, a minimum essential supply requirement of 100 L/p/day or less may be achievable. For non-residential properties, most businesses and industries would be required to reduce water consumption to minimum essential usage only and in some cases, non-essential businesses may be asked to temporarily cease operations until drought conditions improve.

An estimate of the minimum essential supply requirements for the each water supply system is included in Table 5.11 below. While the estimates included in the table are considered useful for initial emergency planning purposes, a more accurate assessment of minimum essential supply requirements should be undertaken as Council approaches Drought Response Level 5 based on the prevailing climatic conditions, achievements to-date with reducing water consumption and a reassessment of essential businesses and industries.

Table 5.11 Minimum Essential Supply Requirements

Water Supply System	Population Served	Residential Essential Supply Requirement (L/p/day)	Residential Essential Supply Requirement (ML/d)	Non-Residential Essential Supply Requirement* (ML/d)	MINIMUM ESSENTIAL SUPPLY REQUIREMENT (ML/d)
Tamworth	38,735	100	3.9	4.9	8.8
Moonbi/Kootingal	2,040	100	0.20	0.14	0.34
Manilla	2,110	100	0.21	0.14	0.35
Barraba	1,150	100	0.12	0.08	0.20
Nundle	270	100	0.03	0.03	0.06
Attunga	340	100	0.03	0.02	0.05
Bendemeer	210	100	0.02	0.01	0.03

Notes: * Non-residential essential supply requirement assumed to be around 50% of average requirements

6 Post-Drought Actions

6.1 Post-Drought Evaluation & Revision

Once the drought has broken and water supply systems return to normal operating conditions, a review needs to be undertaken of the effectiveness of the Drought Management Plan. The post-drought evaluation should include:

- A review of both supply side and demand side actions, including their effectiveness and timing, should be undertaken for each system and documented
- An assessment should be made of the impact of drought management actions (including water restrictions) on various stakeholders, including the community
- An assessment of the impact of drought management actions on Council should also be undertaken
- Community response to the imposition of various restrictions should be sought, including feedback on the effectiveness of the Community Awareness Campaign, how they managed the impacts of drought and any suggested changes / modifications to water restrictions
- Feedback should also be sought from various government agencies and other stakeholders, including local irrigators

Based on this review of the previous drought and any feedback received, the Drought Management Plan will need to be revised to include issues that were not previously considered and potentially modified to improve the future management of droughts.

6.2 Regular Review & Update of the Plan

In addition to evaluation and revision after each period of drought, regular reviews of the Drought Management Plan should be undertaken at least every 5 years. Plans should be updated with the latest information on water supply systems, including any augmentations that have occurred, changes to operating rules and up-to-date water consumption data and flow / level monitoring data for water sources. Plans should also be updated after any major changes / augmentations to water supply systems.

7 References

- DECCW. (2010). *NSW Climate Impact Profile: The impacts of climate change on the biophysical environment of New South Wales*. Sydney: Department of Environment, Climate Change and Water NSW.
- DIPNR. (2004). *Water Sharing Plan for the Upper Namoi & Lower Namoi Regulated River Water Sources*. NSW Dept Infrastructure, Planning & Resources.
- DWE. (2007). *Best-Practice Management of Water Supply & Sewerage*. Sydney: NSW Government - Dept of Water & Energy.
- HWA. (2014). *Namoi Councils - Review of Water Restrictions Policy*. Namoi Councils: Hunter Water Australia.
- NOW. (2009). *Drought Relief for Country Towns*. Sydney: NSW Office of Water.
- NOW. (2010). *Water Sharing Plan: Peel Valley Regulated, Unregulated, Alluvial and Fractured Rock Water Sources - Background Document*. NSW Office of Water.
- NOW. (2013). *Water Sharing Plan for the Namoi Unregulated and Alluvial Water Sources – Background document*. Sydney: NSW Department of Primary Industries, Office of Water.

Appendix A

Water Restrictions Guide

Tamworth Regional Council Drought Management Plan - Water Restrictions Guide – 2015 DMP revision													
Category	Activity	Permanent		Level 1		Level 2		Level 3		Level 4		Level 5	
				Low		Moderate		High		Very High		Emergency	
General Watering of Lawns & Gardens	Hand Held Hoses (with trigger nozzle)	✓		⌚	Not during heat of the day	⌚	2 hours	⌚	15 minutes of handheld hose watering per property within 2 hour window	✗		✗	
	Sprinkle /micro sprays/Fixed Hoses	⌚	Not during heat of the day	⌚	2 hours	✗		✗		✗		✗	
	Water Efficient Drip Irrigation	⌚	Not during heat of the day	⌚	Not during heat of the day	⌚	2 hours	✗		✗		✗	
	Watering of New Turf	⌚	Not during the heat of the day or with an approved 6 Week New Turf Watering Plan	⌚	Not during the heat of the day or with an approved 6 Week New Turf Watering Plan	⌚	Sprinklers for 2 hrs with an approved 6 Week New Turf Watering Plan	✗	All 6 week New Turf Watering Plans inactive	✗		✗	
	Buckets / Cans	✓		✓		✓		⌚	2 hours	✗	Greywater only	✗	Greywater only
Watering of Public Parks, Gardens & Facilities		⌚	Watering permitted for Cat 1,2,3,4 & 5 - see appendix	⌚	Watering permitted for Cat 1,2,3,4 & 5 – see appendix	⌚	Watering permitted for Cat 1 & 2 and garden beds only in Cat 3 – see appendix	⌚	Watering permitted for Cat 1 & 2 only – see appendix	✗	All irrigation ceases unless access to groundwater	✗	All irrigation ceases unless access to groundwater
Vehicle Washing	Buckets	✓		✓		✓		⌚	Not during heat of the day	✗	Clean windows only	✗	Clean windows only
	Hand Held Hoses (with trigger nozzle)	✓		⌚	Not during heat of the day Pressure cleaner any time	⌚	2 hours Pressure cleaner any time	✗		✗		✗	
Washing Down of Hard Surfaces	High Pressure Cleaner (limited to 9 L/min)	✓	Includes vehicles	✓	Includes vehicles	✓	Includes vehicles	✗		✗		✗	
	Hand Held Hoses (with trigger nozzle)	✗		✗		✗		✗		✗		✗	
Private Swimming Pools	Filling	✓		✓		✓		✗		✗		✗	
	Topping Up	✓		✓		✓		⌚	15 minutes of handheld hose per property within 2 hour window	✗		✗	
Motel & Guest House Swimming Pools	Filling	✓		✓		✓		✓		✗		✗	
	Topping Up	✓		✓		✓		✓		✗		✗	
Council Swimming Pools		✓	No restrictions	⌚	Grass areas watered in accordance with Level 1 Restrictions No other restrictions	⌚	Grass areas watered in accordance with Level 2 Restrictions No other restrictions	⌚	Grass areas watered in accordance with Level 3 Restrictions No other restrictions	⌚	Barraba, Manilla, Kootingal, Nundle & South Tamworth (see note below). Tamworth Olympic Pool closed	✗	
Hydrotherapy Pools		✓	No restrictions to health facilities	✓	No restrictions to health facilities	✓	No restrictions to health facilities	✓	No restrictions to health facilities	✓	No restrictions to health facilities	✓	No restrictions to health facilities
Evaporative Coolers	Use of Water Cooling	✓		✓		✓		✓		✓		✓	Summer community education campaign to limit use through optimised efficiency
Water Cartage	Treated water for stock and domestic consumption	✓		✓		✓		⌚	Internal domestic use only with Council Permit	⌚	Internal domestic use only with Council Permit	⌚	Internal domestic use only with Council Permit
	Treated water for all other uses	✓		✓		✓		✗		✗		✗	
Commercial and Industrial Use	General Use (excluding lawns and gardens)	✓		✓		✓		⌚	Target 15% reduction in water use	⌚	Target 20% reduction in water use	⌚	Target 25% reduction in water use
	Landscaping including Lawns & Gardens	⌚	Not during the heat of the day or with an Approved Special Watering Hours Plan	⌚	Not during the heat of the day or with an Approved Special Watering Hours Plan	✓	Hand Held hoses only for 2 hours including within Approved Special Watering Hours Plan	✗	All Approved Special Watering Hours Plans inactive	✗		✗	
	Irrigation of sports Areas	⌚	Water for 2 hours with Approved Special Watering Hours Plan during heat of the day	⌚	Water for 2 hours with Approved Special Watering Hours Plan during heat of the day	⌚	Water for 2 hours with Approved Special Watering Hours Plan during heat of the day	⌚	Review Approved Special Watering Hours Plan and allow if 50% reduction can be demonstrated for use in heat of day	✗		✗	
Longyard Precinct Recycled Water Scheme	Raw Water supplied to augment backwash supply	✓		✓		✓		✓		✗	Backwash water to be supplied when available	✗	Backwash water to be supplied when available
✓ Allowed at all times	NOTES:												
✗ Banned at all times	1. Restrictions apply to the use of treated water only including bulk raw water supplied from the Dungowan Dam Pipeline and Connors Creek Dam Pipeline.												
⌚ Restricted use only	2. Greywater can continue to be used anytime and rainwater can be used anytime (providing rainwater outlets are not topped or up or cross-connected to the treated supply) NB Certain health regulations apply to the use of grey water - please contact Council or NSW Health for further details.												
	3. An Approved Special Watering Hours Plan or 6 Week New Turf Watering Plan may be issued to allow the use of hoses or fixed sprinklers outside the nominated hours or conditions during Permanent, Level 1 and Leve 2 in particular circumstances.												
	4. Vehicles and hard surfaces may be washed down at any time for health and safety reasons using a high pressure, low-volume cleaner.												
	5. Any reference to 2 hours of restricted watering means between the hours of 6pm – 8pm during Daylight Saving and 5pm – 7pm at all other times.												
	6. During Level 4 restrictions the surrounds of Council Swimming Pools that remain open may be watered by handheld hoses only once per week between 6pm and 9pm. All pools closed during shoulder seasons under Level 4 Restrictions.												
	7. Periods of water restrictions will be policed by Council Officers. The maximum penalty under the Local Government Act 1993, to apply for a breach of imposed restrictions is \$2,200 for corporations and \$220 for individuals.												
	8. Not during the heat of the day means not between 8am and 6pm during daylight saving and 9am and 4pm at all other times.												

Definitions

Alternate Water Source: water from a bore, dam, stream, rainwater tank that is not connected to the Council reticulated water supply, or recycled water.

Approved Alternate Water Source: an approved alternate water source approved by Council.

Domestic Purposes: for internal household use.

Hand held hose: a hose fitted with a trigger nozzle that is only held by hand.

Fixed Sprinkler: sprinklers, micros rays, or misters fitted to a hose or pipe.

Drip irrigation system: an irrigation system that complies with the following requirements -

- Drippers must have a manufacturer's discharge rating of not greater than 8L/hour at a water pressure of 100kPa
- The maximum rate of the complete irrigation system per property is 5 L/minute
- The following devices must be those approved by Council and fitted at the appropriate locations in a drip irrigation system:
 1. Backflow prevention device
 2. Automatic timer; and
 3. 100kPa pressure reduction valve.

Use of Bucket or Can (when permitted under water restrictions): a bucket or can is to be of no more than 10L capacity, is to be filled directly from a tap (or a length of hose of not exceeding one metre in length connected directly to a tap) during the allocated watering time. The bucket or can must only be decanted by way of tipping directly onto the garden, lawn, pool or motor vehicle, and must not be decanted into another vessel or storage vessel prior to use. A limit of only one bucket or can may be used during the allocated hours of watering at each property or tenement (unit, villa or strata unit).

Water Restrictions: regulations introduced by Council to enforce restrictions of water consumption to ensure that water supply can be maintained at levels consistent with good management practices, considering volume.

Water Management Plan: includes 6 Week New Turf Watering plans and Approved Special Water Hours plans.

Council Approved Sign: a sign approved and supplied by Council.

Appendix B
Schedule of TRC Parks & Gardens
Watering Requirements During Restrictions

Appendix B – Schedule of TRC Parks & Gardens Watering Requirements During Restrictions

Park Name	Town Area	Method Of Operation					Water Source			Watered by		Water freq. p/w
		Auto	Manual	Taps & Monsoon	Pop-up Sprays	Drip Irrigation	Town Water	Bore Water	Recycled Water	Council Staff	Res. Assist	

Category 1

AELEC	Hillvue	√		√	√		√		√	√		
Anzac Park	E Tamworth	√		√	√		√			√		3
Barraba Rugby League Ground	Barraba			√			√				√	
Barraba Sports Ground	Barraba		√	√			√	√			√	
Barraba Swimming Pool	Barraba		√	√			√			√		
Belmore Park Oval	W Tamworth			√			√	√		√		3
Bendemeer Football Ground	Bendemeer			√			√				√	
Bicentennial Park	CBD	√	√	√	√		√	√		√		3
Chaffey Park	S Tamworth		√	√	√		√			√		3
Chaffey Park	Manilla		√	√				√		√		3
Chauvel Park Oval	S Tamworth		√		√		√			√		3
Chillingworth Oval	S Tamworth							√			√	
Cross Park	Peel River		√	√	√		√	√		√		3
Dungowan Recreation Reserve	Dungowan		√	√			√				√	
Gipps Street Ovals	Peel River	√			√		√	√		√		3
Granny Munro Park	Coledale	√			√		√			√		3
Jack Woolaston Oval	N Tamworth		√	√				√			√	
Kingswood Park Oval	Kingswood			√			√				√	
Kootingal Recreation Ground	Kootingal	√			√		√				√	
Kootingal Swimming Pool	Kootingal		√	√			√			√		
Lloma Park	Coledale		√	√	√		√			√	√	3
Manilla Showgrounds Oval	Manilla		√	√			√				√	
Manilla Swimming Pool	Manilla		√	√			√			√		
Marsupial Park	Oxley Park			√			√			√		
No 1 Oval	CBD	√			√		√			√		3
North Tamworth Oval - Soccer	N Tamworth		√	√	√		√	√		√		3
Nundle Swimming Pool	Nundle		√	√			√			√		
Olympic Swimming Pool	CBD		√	√	√		√	√		√		
Oxley Dog Training Centre	Oxley Park		√	√			√				√	
Plain Street	Peel River	√			√		√	√		√		3
Regional Sporting Complex (Athletics, Cricket & Hockey)	S Tamworth	√	√	√	√		√		√	√	√	3
Riverside Ovals	Peel River	√	√	√	√		√	√		√		3
Scully Park No 2.	S Tamworth	√		√	√		√	√			√	
South Tamworth Lions Rest Area	S Tamworth			√			√				√	
South Tamworth Swimming Pool	S Tamworth		√	√			√			√		
Sports Dome	Hillvue	√	√	√	√		√		√	√		
Tamworth Regional Botanic Gardens	Victoria Park		√		√		√			√		3
Tamworth Rugby Park	CBD		√		√			√		√		3
Viaduct Park	CBD	√	√	√	√		√	√		√		3

Appendix B – Schedule of TRC Parks & Gardens Watering Requirements During Restrictions

Park Name	Town Area	Method Of Operation					Water Source			Watered by		Water freq. p/w
		Auto	Manual	Taps & Monsoon	Pop-up Sprays	Drip Irrigation	Town Water	Bore Water	Recycled Water	Council Staff	Res. Assist.	

Category 2

Altona Park	S Tamworth	✓		✓	✓		✓			✓	✓	
Baringa Park	S Tamworth			✓			✓				✓	
Barraba Queen Street Mall	Barraba		✓				✓			✓		
Calala Cottage	W Tamworth		✓		✓		✓			✓		
Community Centre	CBD		✓		✓		✓			✓		
CWA Park	CBD			✓			✓			✓		2
Hyman Park	S Tamworth	✓		✓	✓		✓			✓	✓	3
Karuah Park	S Tamworth			✓			✓				✓	
Lawn Cemetery	Taminda		✓		✓		✓			✓		3
Levee Bank Eastern	CBD		✓		✓		✓			✓		2
Levee Bank Western	W Tamworth		✓		✓		✓			✓		
Lioness Park	W Tamworth	✓	✓	✓	✓		✓			✓	✓	
Moonbi Cemetery Lawn	Moonbi		✓		✓		✓			✓		3
O'Meara Park	Barraba		✓	✓			✓			✓		
Parry Park	Kootingal	✓			✓		✓				✓	
Peel Street Mall	CBD		✓		✓		✓			✓		2
Railway Park	CBD		✓	✓			✓			✓		2
Ray Walsh House Gardens	CBD	✓	✓		✓		✓			✓		
Rotary Park	Manilla		✓	✓			✓			✓		
Tamworth Lions Park	S Tamworth		✓	✓	✓		✓			✓	✓	
Tamworth Regional Entertainment Event Centre	S Tamworth		✓		✓		✓			✓		
Tamworth Croquet Club	E Tamworth		✓		✓		✓				✓	3
Town Hall Gardens	CBD			✓			✓			✓		
Truckies Memorial	S Tamworth		✓		✓		✓			✓		
Visitors Information Centre	CBD	✓			✓		✓			✓		2

ROUNDBOUTS

Armidale Road/Darling Street		✓				✓	✓			✓		2
Armidale Road/Murray Street		✓				✓	✓			✓		2
Armidale Road/White Street		✓				✓	✓			✓		2
Bridge Street/Belmore Street		✓				✓	✓			✓		2
Bridge Street/Dennison Street		✓				✓	✓			✓		2
Bridge Street/Hercules Street		✓				✓	✓			✓		2
Bridge Street/Mahony Street		✓				✓	✓			✓		2
Brisbane Street/Carthage Street		✓				✓	✓			✓		2
Brisbane Street/Napier Street		✓				✓	✓			✓		2
Darling Street/Carthage Street		✓				✓	✓			✓		2
Grant Street/Warwick Road		✓				✓	✓			✓		2
Greg Norman Dve/Edward Street		✓				✓	✓			✓		2
Greg Norman Dve/Ringers Road		✓				✓	✓			✓		2
Gunnedah Road/Edith Street		✓				✓	✓			✓		2
Kable Ave/White Street		✓				✓	✓			✓		2

Appendix B – Schedule of TRC Parks & Gardens Watering Requirements During Restrictions

Marius Street/Bligh Street		✓				✓	✓			✓		2
Marius Street/Darling Street		✓				✓	✓			✓		2
Marius Street/Jewry Street		✓				✓	✓			✓		2
Marius Street/Macquarie Street		✓				✓	✓			✓		2
Peel Street/Bourke Street		✓			✓		✓			✓		2
Peel Street/Darling Street		✓			✓		✓			✓		2
Peel Street/Jewry Street		✓			✓		✓			✓		2
Peel Street/Murray Street		✓			✓		✓			✓		2
Peel Street/Roderick Street		✓			✓		✓			✓		2
Peel Street/White Street		✓				✓	✓			✓		2
Robert Street/Werris Ck Road		✓				✓	✓			✓		2
Robert Street/Woodward Ave		✓				✓	✓			✓		2
Sydney Hwy/Calala Lane		✓				✓	✓			✓		2
Sydney Hwy/Greg Norman Dve		✓				✓	✓			✓		2
Sydney Hwy/Scotts Road		✓				✓	✓			✓		2
Sydney Hwy/Wilburtree Street		✓				✓	✓			✓		2
Warwick Road/Grant Road		✓				✓	✓			✓		3

Road Medians

Armidale Road		✓		✓	✓		✓			✓	✓	2
Goonoo Goonoo Road		✓			✓		✓			✓		2
Greg Norman Drive		✓				✓	✓			✓		2
Manilla Street		✓			✓		✓			✓		2
Marius Street		✓			✓		✓			✓		2
Queen Street		✓			✓		✓			✓		2
The Patio		✓				✓	✓					

Appendix B – Schedule of TRC Parks & Gardens Watering Requirements During Restrictions

Park Name	Town Area	Method Of Operation					Water Source			Watered by		Water freq. p/w
		Auto	Manual	Taps & Monsoon	Pop-up Sprays	Drip Irrigation	Town Water	Bore Water	Recycled Water	Council Staff	Res. Assist	

Category 3

Barraba Tennis Courts	Barraba			✓			✓				✓	
Burgess Park	N Tamworth		✓	✓	✓		✓			✓	✓	
Captain Cook Park	Nundle		✓	✓			✓				✓	
Centenary Park	Coledale	✓		✓	✓		✓			✓	✓	
Chauvel Park Reserve	S Tamworth		✓	✓			✓				✓	
Coronation Park	Manilla		✓	✓			✓			✓		3
Discovery Park	Westdale			✓			✓				✓	
Federation Park	Kootingal		✓		✓		✓				✓	
Garden Street Park	Kootingal	✓		✓	✓		✓				✓	
Kootingal Park	Kootingal			✓			✓				✓	
Lampada Park	Calala			✓			✓			✓		
Manilla Tennis Courts	Manilla			✓			✓				✓	
Monk Park	Calala			✓			✓				✓	
Oxely Park Lookout	Oxley Park	✓		✓	✓		✓			✓		3
Peak Park	Hillvue	✓			✓		✓				✓	
Pioneer Park	Manilla		✓	✓			✓			✓		3
Powerhouse Park	E Tamworth			✓			✓			✓	✓	3
Quota Park	S Tamworth			✓			✓				✓	
Redbank Estate Park	Calala			✓	✓		✓			✓		
Riding for Disabled	N Tamworth			✓			✓				✓	
Rotary Park	E Tamworth	✓			✓		✓			✓	✓	3
Rotary Park	Barraba		✓	✓			✓			✓		3
South Library	S Tamworth			✓			✓			✓	✓	3
The Boulevard Park	Hillvue	✓	✓	✓			✓			✓	✓	
The Grange Park	Hillvue			✓			✓			✓	✓	4
Thomas Mitchell Park	Westdale			✓			✓			✓	✓	
Treloar Park	E Tamworth			✓			✓			✓		3
Unnamed Park Boulevard Place	Hillvue						✓			✓		
Unnamed Park Cobb & Co Circuit	S Tamworth		✓		✓		✓				✓	
Unnamed Park Eureka Place	S Tamworth		✓		✓		✓				✓	
Unnamed Park Mahogany Street	Moore Creek											
Unnamed Park The Hermitage	Hillvue		✓		✓		✓			✓		3
Village Park	Calala			✓			✓				✓	
Wahroonga Park	S Tamworth			✓			✓				✓	
Zonta Park	W Tamworth	✓	✓	✓	✓		✓			✓	✓	3

Road Medians

Murray Street		✓			✓		✓			✓		3
Chelmsford Street		✓			✓		✓			✓		3
Gipps Street		✓			✓		✓			✓		3

Appendix B – Schedule of TRC Parks & Gardens Watering Requirements During Restrictions

Park Name	Town Area	Method Of Operation					Water Source			Watered by		Water freq. p/w
		Auto	Manual	Taps & Monsoon	Pop-up Sprays	Drip Irrigation	Town Water	Bore Water	Recycled Water	Council Staff	Res. Assist	

Category 4

Alanor Park	Calala			✓			✓				✓	
Arthur Emblem Park	E Tamworth			✓			✓				✓	
Attunga Recreation Ground	Attunga			✓			✓				✓	
Attunga War Memorial Park	Attunga			✓			✓				✓	
Barraba Showground	Barraba			✓			✓				✓	
Barsden Park	S Tamworth			✓			✓				✓	
Bendemeer Rodeo Ground	Bendemeer			✓			✓				✓	
Blaxland Way Park	Westdale			✓			✓				✓	
Boss Park	S Tamworth			✓			✓				✓	
Bradley Place	Oxley Vale			✓			✓				✓	
Cherry Street Park	Barraba			✓			✓				✓	
Fraser Park	Oxley Vale			✓			✓			✓	✓	
John Ives Memorial Park	Oxley Vale			✓			✓				✓	
Kamilaroi Park	S Tamworth			✓			✓				✓	
Kestral Park	S Tamworth			✓			✓				✓	
LEAP Park	S Tamworth			✓			✓				✓	
Lone Pine Park	N Tamworth			✓			✓				✓	
Long Gully Park	N Tamworth			✓			✓				✓	
Memory Park	Kootingal			✓			✓			✓		
Moonbi Park (Chook Park)	Moonbi		✓	✓			✓			✓		
Moonbi Recreation Ground	Moonbi			✓			✓				✓	
Nundle Recreation Ground	Nundle			✓			✓				✓	
Riverbank Park	Barraba			✓			✓				✓	
Unnamed Park Harrier Parade	Calala			✓			✓				✓	
Unnamed Park Orley Drive	Oxley Vale			✓			✓				✓	
Unnamed Park Peak Drive	Hillvue			✓			✓				✓	
Velodrome	CBD			✓			✓			✓		
War Memorial Park Bendemeer	Bendemeer			✓			✓			✓		

Appendix B – Schedule of TRC Parks & Gardens Watering Requirements During Restrictions

Park Name	Town Area	Method Of Operation					Water Source			Watered by		Water freq. p/w
		Auto	Manual	Taps & Monsoon	Pop-up Sprays	Drip Irrigation	Town Water	Bore Water	Recycled Water	Council Staff	Res. Assist	

Category 5

Acacia Park	Oxley Vale			✓			✓				✓	
Angora Park	N Tamworth			✓			✓				✓	
Attunga Camping Ground	Attunga			✓			✓			✓		
BMX Park	N Tamworth			✓			✓			✓		
Boorangii Park	Coledale			✓			✓				✓	
Brolga Park	Oxley Vale			✓			✓				✓	
Calool Park	S Tamworth			✓			✓				✓	
Cedar Park	S Tamworth			✓			✓				✓	
Chaffey Street Park	Kootingal			✓			✓				✓	
Chaoyang Friendship Park	N Tamworth		✓		✓		✓			✓		
Citriodora Park	Oxley Vale			✓			✓				✓	
Cockburn Retreat	Peel River			✓			✓				✓	
Coledale Community Park	Coledale		✓				✓			✓		
Community Park	Oxley Vale			✓			✓				✓	
Electra Park	S Tamworth		✓	✓	✓		✓			✓	✓	
Flinders Park	Westdale			✓			✓				✓	
Gunns Park	W Tamworth			✓			✓				✓	
Harrier Park	Calala			✓			✓			✓		
Hathway Park	Coledale			✓			✓				✓	
Herden Road Reserve	Kingswood			✓			✓				✓	
High Zone Park	E Tamworth			✓			✓				✓	
King George Avenue Reserve	Peel River			✓			✓			✓	✓	
Kings Hill Park	W Tamworth			✓			✓				✓	
Kurrawong Park	E Tamworth		✓	✓	✓		✓			✓		
Lawson Park	Westdale	✓	✓	✓	✓		✓	✓		✓	✓	
Leo Park	S Tamworth			✓			✓				✓	
Milburn Park	Oxley Vale			✓			✓				✓	
Myrl Park	Calala			✓			✓				✓	
Oak Park	S Tamworth			✓			✓				✓	
One Tree Hill Park	S Tamworth			✓			✓				✓	
Pages Park	Oxley Vale			✓			✓				✓	
Prentice Avenue Park	E Tamworth			✓			✓				✓	
Skillshare Park	S Tamworth			✓			✓				✓	
Stewart Park	Taminda			✓			✓				✓	
Tamworth Mountain Bike Park	E Tamworth			✓			✓				✓	
The Retreat Park	Hillvue			✓			✓				✓	
Ulmus Park	Oxley Vale			✓			✓				✓	
Unnamed Park Armidale Road	Mt Falcon			✓			✓			✓	✓	
Unnamed Park Bernice Place	N Tamworth			✓			✓				✓	
Unnamed Park Bradley Place	N Tamworth			✓	✓		✓			✓	✓	
Unnamed Park Bryan Street	S Tamworth			✓			✓				✓	

Appendix B – Schedule of TRC Parks & Gardens Watering Requirements During Restrictions

Unnamed Park Craigends Lane	S Tamworth			✓			✓				✓	
Unnamed Park Ernest Street	Oxley Vale			✓			✓				✓	
Unnamed Park Flynn Street	S Tamworth			✓			✓				✓	
Unnamed Park Kingswood	Kingswood			✓			✓				✓	
Unnamed Park Kingswood	Kingswood			✓			✓				✓	
Unnamed Park Kuloomba Street	S Tamworth	✓		✓	✓		✓			✓	✓	
Unnamed Park Kurrajong Street	S Tamworth			✓			✓				✓	
Unnamed Park Kurrajong Street	S Tamworth			✓			✓				✓	
Unnamed Park Milburn Road	Oxley Vale			✓			✓				✓	
Unnamed Park Mt Falcon	Mt Falcon		✓		✓		✓			✓	✓	
Unnamed Park Nirimba Close	S Tamworth			✓			✓				✓	
Unnamed Park Petra Avenue	S Tamworth			✓			✓				✓	
Unnamed Park Piper Street	N Tamworth			✓			✓				✓	
Unnamed Park Prentice Avenue	E Tamworth			✓			✓				✓	
Unnamed Park Somerset Place	Nemingha			✓			✓				✓	
Unnamed Park Sue Crescent	Coledale			✓			✓				✓	
Unnamed Park Susanne Street	Coledale			✓			✓				✓	
Unnamed Park The Retreat	Hillvue			✓			✓				✓	
Unnamed Park Valley Drive	E Tamworth			✓			✓				✓	
Unnamed Park Wentworth Place	S Tamworth			✓			✓				✓	
Unnamed Park Windhover Crescent	Calala			✓			✓				✓	
Unnamed Park Wylie Place	Westdale			✓			✓				✓	
Valley Park	E Tamworth			✓			✓				✓	
Waratah Park	Oxley Vale			✓			✓				✓	
Wattle Park	Oxley Vale			✓			✓				✓	
Wayamba Park	Hillvue			✓			✓				✓	
Wentworth Place Park	S Tamworth			✓			✓				✓	
Westdale Community Park	Westdale			✓			✓				✓	
Westdale Memorial Park	Westdale			✓			✓				✓	
Wilga Park	S Tamworth			✓			✓				✓	

Appendix C

Water Supply Systems Details

Tamworth Water Supply System

Bulk water for Tamworth is sourced from two major storages within the Peel Valley – Chaffey Dam on the Peel River and Dungowan Dam on Dungowan Creek. TRC also has access to a number of drift wells located along the Peel River in the vicinity of Paradise Weir.

Chaffey Dam is located near Bowling Alley Point on the Peel River approximately 40km upstream of Tamworth. It was constructed in 1979 by the former Department of Water Resources and is owned and operated by WaterNSW. The dam is an earth and rock-fill embankment 54m high and 430m long with a total storage volume of 62,000 ML prior to 2016 and a storage volume of 100,000 ML after augmentation in 2016. The dam has a catchment area of 420 km². Releases from the dam provide water for irrigators located on the Peel River and is a major source of supply for town water supply (TWS) which is extracted at the Peel River Intake Pumping Station located just outside Tamworth, approximately 35 km downstream of the dam.

The Peel River Intake Pumping Station is located approximately 1 km upstream from the confluence of the Peel and Cockburn Rivers. It was constructed in 1980 and has a capacity of 80 ML/day. Water is extracted from the Peel River and is pumped via dual parallel rising mains of 600mm diameter to Calala Lane Water Treatment Plant (WTP), located approximately 2.6 km away. The intake pumping station is prone to a build-up of sediments (generally sand and gravel) in high flow periods, due to the location of screen inlet on the river bed. Construction of Johnson screens with 6mm openings in the mid 1990s was only effective in reducing larger diameter sediments and the screens are prone to blockage in low flow times. An airlift pump was also installed in the grit chamber to allow frequent removal of material.

TRC has a high security entitlement of 16,400 ML/yr from Chaffey Dam. The entitlement from Chaffey Dam is based on the guaranteed supply volume to the town water extraction point, based on ordered releases (i.e. whether or not the water is taken). During drought periods, General Security users such as irrigators and other non-High Security users only receive small allocations from the Peel River. Chaffey Dam currently contributes approximately 60% (~5,100 ML/yr) of Tamworth's water supply.

Dungowan Dam is located on Dungowan Creek and is the second major water supply for Tamworth. It was constructed in 1958 by the former Tamworth City Council. The dam is an earth and rock fill embankment 24m high and 290m long with a total storage volume of 6,300 ML and catchment area of approximately 125 km². Water is supplied to Tamworth via a 54km long DN500/375 gravity pipeline directly to Calala Lane WTP following mostly along the route of Dungowan Creek and then the Peel River downstream of the confluence of the two streams. The pipeline has a capacity of around 22 ML/day and is chlorinated to minimise slime growth and provide some form of disinfection for the rural customers who use the pipeline for stock and non-potable uses. During periods of algal blooms in the storage, protocols exist to warn Dungowan Pipeline customers of the potential health impacts.

TRC holds a water licence for the extraction of water from Dungowan Dam of 5,600 ML/yr. Dungowan Dam currently contributes approximately 40% (~3,400 ML/yr) of Tamworth's water supply.

The severe drought experienced in Tamworth between 2003 and 2008 saw a number of drift wells along the Peel River (Scott Road) re-commissioned to mitigate falling storage levels in Chaffey Dam. These wells were originally used to supply water to Tamworth between 1931 and 1980 and are now used as a backup supply to Dungowan Dam and Chaffey Dam. The wells are located downstream of the confluence of Cockburn and Peel Rivers and source surface water from the Peel River as well as groundwater from the Cockburn and Peel alluviums. They supply water directly to the Calala Lane WTP.

An overview of the Tamworth bulk water supply system is shown below on Figure B1.

Appendix C – Water Supply Systems Details

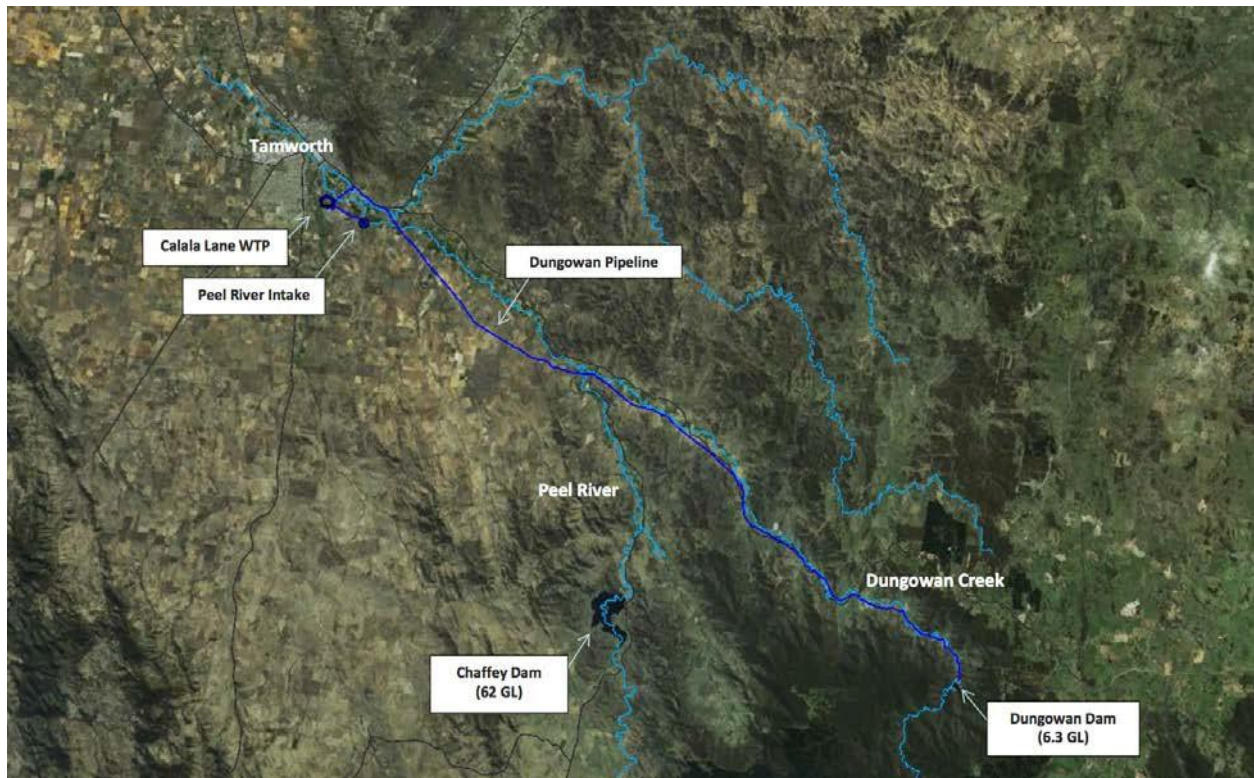


Figure B1 Tamworth Bulk Water Supply System Overview

Issues

- Ongoing issues with Peel Intake PS reliability due to siltation and river flows not matching extraction rates
- Frequent BGA outbreaks in Dungowan Dam result in supply being offline or higher treatment costs
- Dungowan Pipeline is subject to frequent failure due to age and poor construction
- Severe (Level 5) restrictions were imposed in 2007 due to record low dam levels
- Drift well system was re-commissioned as emergency supply source in 2007 (no licence for ongoing use)

Moonbi/Kootingal Water Supply System

Kootingal and Moonbi receive their primary water supply from groundwater wells adjacent to the Cockburn River. The wells include two town wells with a total output of 20 L/s, Shanahans Well with a capacity of 20 L/s and Chapmans Well with a capacity of 15 L/s.

Water from these wells is pumped via DN200 and DN250 rising mains to the twin reservoirs in Kootingal. A pumping station adjacent to the twin reservoirs delivers water via a DN150 diameter main to the Moonbi Reservoir to service Moonbi.

During drought periods, the supply from the wells is unable to meet the required system demand. The Moonbi/Kootingal water supply is connected to the Tamworth water supply systems at Nemingha to supplement the supply during the drought periods. TRC is planning to upgrade the water supply to Nemingha which will provide a more secure supply to the Nemingha and Moonbi/Kootingal area.

Appendix C – Water Supply Systems Details

Issues

- Existing primary surface supply source (groundwater) has failed on several occasions over past 5 years
- Severe (Level 5) restrictions were imposed in 2007 due to failure of surface supplies
- Backup supply source (Tamworth TWS) has been used to supplement surface supplies

Manilla Water Supply System

There are two water sources for the township of Manilla. The main source is the Namoi River, with the backup supply source being the Manilla River.

The primary water supply for Manilla is a weir on the Namoi River. Water is pumped via two rising mains to the aging Manilla WTP, located in Court St.

The backup water supply for Manilla is extracted from the Manilla River. The Manilla River intake and pumping station was installed in 1989 as part of augmentation works to provide an additional emergency backup source of water for the town. A concrete intake well is located adjacent the eastern river bank, with a screened cast iron intake pipe and two 150mm PVC radials located in the river. These intake lines can be exposed during periods of low flow. Water gravitates into the well and is then pumped to the upstream side of the Namoi River Weir via 2.9km of DN150 rising main. Water is then pumped from the weir to the WTP via the Namoi River pumping station. The Manilla River source has only been used a couple of times over the past 12 years.

The current primary supply source (Namoi River weir) has limited raw water storage and is prone to failure during extended drought periods, while the backup supply source (Manilla River) is prone to operational problems. However, the backup supply source is able to access water released from Split Rock Dam and is therefore very secure. The secure yield for the Namoi River weir is unknown and needs to be determined.

TRC has a high security licence for the release of flow from Split Rock Dam into the Manilla River of 150ML/yr for town water supply. A condition of the water licence is that Council contact WaterNSW in advance to order releases from Split Rock Dam to the Manilla River. These releases are then extracted at the Manilla River Intake.

TRC has recently experienced problems extracting water from the Manilla River intake, particularly at low flows. A recent study was undertaken to investigate options to improve efficiency of extractions from the Manilla River intake to improve the security of supply to the town. The outcomes of this study recommended that a self-priming pump be installed to access more water at lower flows in the Manilla River and to improve flows into the intake station (HWA, 2011).

Issues

- Existing primary surface supply source (Namoi River) has failed on several occasions over past 5 years, with limited storage being available behind the weir
- Moderate (Level 3) restrictions were imposed in 2007 due to failure of surface supplies
- Backup supply source (Manilla River) has been used to supplement surface supplies
- Both intake PS have limitations, impacting on operational reliability
- Future water supply security is unknown

Barraba Water Supply System

Historically, Barraba's three primary raw water supply sources (Barraba Creek, Manilla River & Connors Creek Dam) were unable to provide a sufficient level of TWS security, with frequent failures in supply (unable to supply unrestricted demands) occurring in the early 2000's during extended dry periods. Historically, moderate to severe restrictions were imposed during extended dry periods to reduce TWS demands to match available supplies.

In 2008, two emergency bores were commissioned in James Street. These bores were licensed to operate during periods of severe restrictions and are connected directly to the WTP (each has a maximum pumping rate of 5.5 L/s).

In 2013/14, TRC constructed a pipeline from Split Rock Dam to Barraba to provide long-term water supply security for the town. The transfer system consists of a 28 km pipeline (DN225), transfer pump stations (located at the dam) and 1.5 ML break pressure tank, and is capable of transferring up to 1 ML/d to Barraba WTP.

Nundle Water Supply System

Nundle is located on the Peel River upstream from Chaffey Dam and receives its water supply from two sources. Water supply is sourced primarily from the Peel River however there is a backup supply available from the Crawney Road bore, which replaced the previous backup bore known as Oakenville Bore.

The existing water supply is extracted from an intake on the Peel River and is pumped at 9 L/s to the Nundle WTP, which has a capacity of 0.9 ML/day.

The current primary supply source (Peel River) has very limited raw water storage within the river bed and is prone to failure during extended drought periods. The backup supply source (groundwater bore) has been called upon during previous drought periods and due to water quality concerns with the old backup supply bore, TRC has recently replaced the backup supply bore with a new bore off Crawney Road.

While the new bore will improve TWS security, the long-term TWS security for Nundle is still unknown and should be assessed at some point in the future.

Issues

- Existing primary supply source (Peel River) has failed on several occasions over past 10 years, with limited storage being available within the riverbed
- Backup supply source (groundwater) has been used to supplement surface supplies
- Intake pump station is prone to flooding
- Excavation of Peel River previously performed to extract subsurface flows and storage
- Long term TWS security of primary & backup supply sources has not been determined

Attunga Water Supply System

The Attunga water supply system is served by two bores that are located in close proximity to the Peel River. Each pump is capable of delivering 5.5 L/s and the quality of this water is quite hard. The water is pumped from the bores via a rising main to a single reservoir (0.7 ML) where disinfection with sodium hypochlorite occurs. There are around 135 residents serviced by around 6.3km of reticulation mains.

Appendix C – Water Supply Systems Details

The limestone mine at Attunga uses this water supply to supplement their own groundwater supplies during drought periods. The limestone mine at times can use a significant proportion of the town's water supply in this situation.

Many of the residential properties within Attunga have rainwater tanks to supplement their supply.

The current sustainable yield for the groundwater bores supplying Attunga is unknown, however the bores provided a reliable supply during the recent extended drought period and are therefore assumed to provide adequate TWS security. The sustainable yield of the groundwater bores needs to be determined in order to assess the long term supply security for Attunga.

The local mine at Attunga generally relies on its own groundwater supplies, but sometimes sources additional water from the Attunga TWS, placing additional demand on the TWS groundwater bores. There have been occasional peak periods when the combined demands from Attunga and the local mine have exceeded the capacity of the current bore pumps, resulting in the need to reduce supply to the mine to protect TWS.

Issues

- Current system yield is unknown but the system proved reliable during recent severe drought conditions
- Demand from local mine can impact system capacity in peak demand periods

Bendemeer Water Supply System

Bendemeer's water supply was installed in 1963 and extracts water from the Macdonald River. The Macdonald River flows in a northwesterly direction through the village of Bendemeer. The water supply system consists of an extraction weir pool created by naturally occurring rocks in the river bed connected by a pipeline to the village pumping station, which pumps the water to Bendemeer WTP.

Bendemeer TWS is almost entirely reliant on river flows in the Macdonald River, with only very limited raw water storage in a river pool adjacent to the river intake works and currently no backup groundwater sources. While the Macdonald River generally provides a reliable source of water most years, the river flows in extended drought period can fall below TWS demands, resulting in the need for moderate to severe restrictions to significantly reduce TWS demands.

During a severe drought period in 2006/07 TRC investigated and eventually commissioned a backup supply groundwater bore for Barraba. The bore is located off Airlie Road and has a capacity of 3 L/s.

Issues

- Existing surface supply source (Macdonald River) has failed on several occasions over past 10 years, with limited storage being available within the river
- Intake pump station is prone to erosion
- Flows in Macdonald River are unreliable. A hole has previously been excavated in river bed to source subsurface flows and storage
- Long term TWS security has not been determined

Appendix D

Emergency Supply Options

Emergency Supply Options

A summary of the emergency supply options that are available for each water supply system is included below.

Tamworth

1. *Treated effluent from Westdale STP (for industrial use and high priority public parks & gardens)*

Treated effluent from Westdale STP could be made available for controlled usage purposes such as high priority open space watering or industrial use (subject to water quality requirements). Additional treatment may be required depending on the intended use and this could be achieved relatively quickly by installing package treatment plants with up to 1 ML/d capacity (generally contained within a shipping container) either at the STP or at the point of use. Treated effluent would have to be transported either via water carting or potentially via disused watermains, depending on location of intended users.

2. *Temporary weir at Paradise Weir (transfer via Scott Rd drift wells)*

As the Peel Intake Works is located upstream of the confluence of the Peel River with the Cockburn River, there may be times during periods of drought when there are flows coming down the Cockburn River that cannot be extracted for TWS purposes. TRC should investigate that option of temporarily reinstating a weir at Paradise Weir for the purposes of capturing flows from the Cockburn River and potentially assisting with the recharge of groundwater in the vicinity of Paradise Weir. A short pipeline may be required to connect the weir into one of the nearby TWS drift wells and flows could then be transferred to the WTP via the Scott Rd drift wells scheme.

3. *Expand groundwater borefield*

During the severe drought period in the mid-2000s, TRC investigated and eventually recommissioned disused drift wells located adjacent to the Peel River in Scott Rd. There are more drift wells located along the Peel River that could be investigated to see if they may provide an additional source of water in times of severe water shortage. Alternatively, groundwater investigations upstream and downstream of Tamworth, in the vicinity of the Peel River, could be undertaken to identify other potential groundwater bore sites.

4. *Pipeline to Keepit Dam (if sufficient water is available)*

An alternative to sourcing emergency water supply from within the Peel Valley is to build a pipeline to Keepit Dam (around 62 km route from dam to Calala WTP). This option is dependent on the water available at the time within Keepit Dam and the upstream Split Rock Dam and whether that water could be put aside for emergency supply purposes. With a design and construction lead-time of at least 18 months, it is likely that other emergency supply options would need to be implemented during this period (see options 1 to 3 above).

Moonbi / Kootingal

1. *Tamworth Water Supply System (direct connection)*

As Moonbi / Kootingal backup supply is from Tamworth water supply, the emergency supply options for Moonbi / Kootingal are the same as Tamworth.

Appendix D – Emergency Supply Options

Manilla

1. *Temporary licence/transfer from Split Rock Dam*

Manilla already uses the Manilla River as a backup supply source and has an entitlement to 150 ML/a from Split Rock Dam. If this entitlement volume is not sufficient to satisfy TWS demands, TRC may need to seek additional entitlements or emergency releases.

2. *Temporary groundwater bores*

Temporary groundwater bores have previously been investigated in Manilla and TRC has a 60 ML/a entitlement for groundwater. However, these bores are only test bores and were never connected in to the water supply system. The bores would need to be subject to further investigation and testing prior to equipping for TWS purposes.

3. *Water carting from nearby system (Barraba or Tamworth)*

While water carting is considered very unlikely for Manilla, water could be transported from either Barraba or Tamworth in the event of a total water failure in Manilla. Note that if Split Rock Dam has failed, Barraba is unlikely to have sufficient spare capacity to supply water to Manilla.

Barraba

1. *Temporary groundwater bores*

Temporary bores have previously been investigated for Barraba and during the drought period in the mid-2000s, two bores were commissioned in James St for backup supply purposes. If Barraba was to be dependent on groundwater again during a drought period, additional bores could be investigated if the James St bores were not sufficient. Reference could be made to the investigations that were undertaken to identify the James St bore site.

2. *Water carting from nearby system (Manilla or Tamworth)*

While water carting is considered very unlikely for Barraba, water could be transported from either Manilla or Tamworth in the event of a total water failure in Barraba. Note that if Split Rock Dam has failed, Manilla is unlikely to have sufficient spare capacity to supply water to Barraba.

Nundle

1. *Oakenville Bore*

The Oakenville bore was a previous backup supply source for Nundle before it was replaced by the Crawney Road bores due to water quality concerns. While the bore is no longer the preferred backup supply source for Nundle, the bore could still be used for emergency supply purposes, subject to water quality.

2. *Temporary groundwater bores*

Additional groundwater bores could be investigated and tested if both the Crawney Rd and Oakenville bores were unavailable. Reference could be made to the investigations that were undertaken to identify the Crawney Rd bore site.

Appendix D – Emergency Supply Options

3. *Water carting from nearby system (Tamworth or Manilla)*

In the event of a total water failure in Nundle, water could be carted from Tamworth or Manilla.

Attunga

1. *Temporary groundwater bores*

Additional groundwater bores could be investigated and tested if the existing TWS bores were unavailable. Council has previously investigated other bore sites and drilled test bores; however, the location of these previous test bores is unknown.

2. *Water carting from nearby system (Tamworth, Manilla or Barraba)*

In the event of a total water failure in Attunga, water could be carted from Tamworth, Manilla or Barraba.

Bendemeer

1. *Temporary groundwater bore/s*

Temporary bores have previously been investigated for Bendemeer and during the drought period in the mid-2000s, a bore was commissioned in Airlie Rd for backup supply purposes. If Bendemeer was to be dependent on groundwater again during a drought period, additional bores could be investigated if the Airlie Rd bore was not sufficient. Reference could be made to the investigations that were undertaken to identify the Airlie Rd bore site.

2. *Water carting from nearby system (Tamworth, Manilla or Barraba)*

In the event of a total water failure in Nundle, water could be carted from Tamworth or Manilla.