Tweed Shire Council:

Integrated Water Cycle Management Strategy

2014

Final (For Council Adoption)

May 2014

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PROJECT 12-020– TSC SIX YEAR IWCM REVIEW

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EXECUTIVE SUMMARY

Introduction

The Integrated Water Cycle Management (IWCM) Strategy adopted by Tweed Shire Council (TSC) in 2006 and reviewed in 2009 and in 2011 is the strategic plan which has guided and prioritised actions regarding Council's management of the urban water supply, sewerage and stormwater systems for the last 6 years. This 2013 revision of the IWCM Strategy is the result of an evaluation of Council's IWCM process which was undertaken to:

- Ensure the long-term future direction is appropriate, considering the current or emerging challenges facing Council and the community desires for future water cycle management;
- Ensure consistency with the *NSW Best-Practice Management of Water Supply and Sewerage Guidelines* (DWE, 2007) which requires a major review every 6 - 8 years;
- Identify opportunities to enhance IWCM implementation across all relevant Council functions;
- Maximise the benefit of the IWCM process by ensuring the strategy is appropriate and cost-effective, the community are fully engaged and that all aspects of the Shire's water resources are considered; and
- Ensure that Council policy keeps pace with changing circumstances and new information through a process of continual improvement.

IWCM Objectives

The Tweed community and Council have expressed a desire for an IWCM approach that is broader than the original urban water focus. This recognises that all elements of the water cycle are interdependent and all aspects of land use and infrastructure planning should be integrated with the water cycle considerations. The key considerations for implementation of a broader water cycle approach are:

- Implementation of a Total Water Cycle Management (TWCM) approach through better integration of urban water supply, wastewater, stormwater and catchment management activities;
- Identification and incorporation of community priorities;
- Provision of mechanisms for integration between the activities of the Council units that have relevance to water cycle management; and
- Compliance with the NSW Office of Water best-practice guidelines (DWE, 2007).

Community Consultation

Consultation activities undertaken as part of the IWCM review built on the activities already undertaken by Council as part of the implementation of existing IWCM actions. The objectives were to engage the wider community in the IWCM review and establish the community priorities for water cycle management. The key findings of the consultation process are:

- Council should implement a balanced approach to reducing water usage and increasing water availability. However there is significant support for continuation of demand management initiatives;
- A continuous supply of drinking water is a priority but also important to the community are maximising stormwater and wastewater re-use, maintaining the natural environment in river and catchment areas and encouraging households to reduce their water consumption;
- Maintaining clean water in the Tweed River system is a high priority;
- Council should be most supportive of protection of the water supply, followed by natural habitat and water quality protection and improving the quality of treated wastewater/urban stormwater runoff;

- There is no clear mandate on a preferred approach to augmenting future water supply with the community evenly divided between four suggested approaches (more household rebates for water saving devices, construction of another drinking water supply, greater use of recycled water and behavioural change/further education). Approximately half the community supports the use of alternative water sources (rainwater tanks, stormwater reuse and treated wastewater);
- The responsibility for maintaining the health of rivers should be shared by all ratepayers; and
- Many respondents were supportive of the implementation of integrated water management solutions and the need for increased inter-departmental cooperation within Council.

IWCM Issues

The review of the IWCM Strategy identified current and emerging IWCM issues that Council and the community will face over the next 30 years. A number of the issues are related to Council's desire to pursue greater integration of water cycle management responsibilities and inter-departmental cooperation. Some issues would not have been identified in a traditional (urban only) IWCM approach but are underlying factors that logically influence Council's approach to water management. A number of the issues also relate to future or emerging issues such as climate change and increasing regulation where information has become more available since previous IWCM reviews were undertaken.

The key challenges that Council faces in addressing these issues are:

- Finding cost effective ways to deal with the issues;
- Assigning priorities, given the different perspectives and perceptions of the issues and competing demands for funds in an environment where costs need to be fully justified to a broad spectrum of interest groups;
- Ensuring continuity of business through changing circumstances such as climate change; and
- Increasing regulatory requirements.

The key issues identified are presented in five broad categories:

1. **Administration and Governance:**

   Issue 1: IWCM principles, responsibilities and priorities are not fully implemented across all Council units

   Issue 2: There is a need for informed and transparent decision-making and better management of community expectations

   Issue 3: There is a need for defendable and robust population forecasts

   Issue 4: Uncertainty regarding the preferred Tweed district water supply augmentation option creates confusion regarding land use planning

   Issue 5: The implications of private industry involvement in town water supply and wastewater management are unclear, particularly with regard to regulation and Council responsibilities

   Issue 6: Asset management planning

   Issue 7: Climate change implications need to be integrated into planning for urban water services, catchment management and natural resource management

   Issue 8: High energy consumption and greenhouse gas emissions

   Issue 9: Best-Practice Compliance

   Issue 10: Improved data collection and reporting procedures would facilitate adaptive forecasting of demand and assist with community education

2. **Urban Town Water Supply:**

   Issue 11: There is currently no mechanism to promote retrofit of rain water tanks or installation of large rainwater tanks in new development

   Issue 12: Council's 2013 target for non-revenue water was not achieved

   Issue 13: Augmentation of the Tweed District Water Supply will be required in future due to population growth although the timing and additional supply required are unclear

   Issue 14: The drinking water catchments are impacted by current and historical land use and development

   Issue 15: As a precaution the Uki WTP is shut down during dirty water events

   Issue 16: Drought contingency and water supply emergency management measures need to be further developed

3. **Urban Wastewater Management**

   Issue 17: The opportunities for development (urban expansion) outside of the wastewater service areas is limited by the capacity of Council's infrastructure and the environment

   Issue 18: Licence requirements for pH and suspended solids at Uki WWTP need to be reviewed.

   Issue 19: Council and the community have a desire for increased water recycling but there are significant barriers to implementation of recycled water schemes within the Tweed Shire

   Issue 20: There is a high cost of sustainable biosolids management

4. **Urban Stormwater Management**

   Issue 21: Increased emphasis on water sensitive urban design will require more integrated Council responsibilities, increased community education and increased staff capabilities and funding

   Issue 22: Existing Council development controls do not fully address the residual load of urban stormwater on downstream sensitive waterways

   Issue 23: Existing subdivision erosion and stormwater controls and resources are not adequate for the rainfall and rate of development experienced in the Tweed.

5. **Catchment Management**

   Issue 24: There is a need for a holistic catchment management strategy for the Shire

   Issue 25: There is limited integration between urban and rural strategic land use planning

   Issue 26: The effective management of on-site sewerage systems within the Shire is limited by the available resources

Management Approaches

A broad range of management options were identified to address the IWCM issues. The options are based on the nature of the problem, its location and extent and consideration of the work that has already been undertaken to address the issue. Options have been bundled together into IWCM scenarios which represent the current strategy (Level 1), an increasing level of urban water cycle integration (Level 2) progressing to a Total Water Cycle Management (TWCM) approach where catchment and urban water cycle management are fully integrated (Level 3).

Level 3 (the TWCM Scenario) requires significant additional investment but would enable TSC's IWCM objectives to be achieved. The greatest environmental benefit and community support are also expected to be achieved with Level 3. However, the increased benefits with the Level 3 approach come at significantly increased cost compared to Level 2. In recognition of this, it is recommended that a TWCM approach is adopted but with progressive implementation of Level 2 and Level 3 actions over time. Implementation of the

Level 2 actions will achieve full compliance with Office of Water guidelines, and provides a strong basis for further broadening the scope of Council's decision making to encompass the full water cycle. The aspirational target would be to achieve the TWCM approach in the medium-term (within 5 to 10 years), however, this will not be achieved until funding sources are identified.

IWCM Implementation

The management options have been compiled into a proposed ten year implementation program, including cost estimates, timing, TSC responsibilities and potential funding sources (Table 1).

The implementation program identifies existing and new actions that are recommended to achieve the desired IWCM outcomes. Level 1 actions are already funded and being implemented by TSC and these are considered to remain an integral component of the future strategy. The Level 1 strategic planning initiatives that should be continued are:

- Community engagement;
- Asset management planning (as part of the Integrated Planning and Reporting Framework);
- Best-practice management (compliance with the NSW Office of Water best-practice guidelines);
- Implementation of the Demand Management Strategy;
- Drinking water quality management;
- Development of WSUD Policies (including urban stormwater quality management planning and review of development controls);
- Coastline management and floodplain management;
- Catchment and natural resource management;
- Water Supply Catchment Stream Bank Protection Policy (river health grants scheme);
- Environmental monitoring programs;
- Development of Sustainable Agriculture Strategy; and
- Review of the On-site Sewerage Management Strategy.

The Level 2 and 3 actions complement the existing actions but broaden the focus to include the TWCM approach.

None of the IWCM issues identified directly require investment in capital works within the next ten years. However, the outcomes of these actions may result in the identification of future expenditure requirements that have not been documented in this Strategy. Expenditure for Council's asset renewal program and provision of infrastructure to service new growth areas is additional to the IWCM implementation program and will be directed by many of the outcomes of the IWCM actions, particularly climate change adaptation, sewer overflow abatement strategy, biosolids management strategy, integrated servicing strategies and recycled water opportunities.

Success of the IWCM Strategy relies on the improved administration and coordination of water cycle related activities. It is suggested that integration would be best achieved through the introduction of a new IWCM Program Leader role that will facilitate TWCM across TSC (as part of the Level 3 approach). Until this new position is able to be filled, the TSC IWCM Stakeholder Group should continue to coordinate the implementation of the adopted IWCM Strategy. The priority tasks for this position (or committee) are the implementation of this IWCM Strategy and integration with TSC's other strategic priorities.

The timing for implementation of the other proposed IWCM actions is dependent on the availability of financial and human resources. This Strategy assigns priorities with consideration of the limited internal resources available and is designed to remain flexible to access potential sources of external funding which

may become available in future. It has been assumed that the first 2 years of the program would follow the Level 2 approach (urban water cycle management improvements) with transition to Level 3 (TWCM approach) commencing from year 3.

In reality, only the Level 1 and Level 2 actions that Council is able to fund will form the basis of IWCM actions in the short to medium term. To achieve full IWCM implementation, the remaining unfunded Level 2 and Level 3 actions would be the focus of a medium to longer term program. However these would need to be tied in to development of Council's Environmental Sustainability Strategy (ESS) and the overall resourcing, funding and priorities set by this program. The ESS is in the early stages of development and an initial framework is expected to be completed in 2014. It is envisaged this would allow priorities to be set in 2015, which in turn would provide direction on the feasibility of unfunded IWCM Level 2 and Level 3 actions.

The ten year implementation program has a total budget cost of $9.07 million (current dollars) with approximately $1.97 million required in the first three years (refer Table 1).

Table 1: IWCM Strategy Implementation Program

	Options	Action	10 year total ($'000) Note 1	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Administration and Governance	1b	Integrated Council-Wide IWCM Delivery	**1,200**	Committee		150	150	150	150	150	150	150	150
	2a, 2b, 2c, 7b	Community engagement	**265**	40	25	25	25	25	25	25	25	25	25
	3a, 3b, 3c	Data collection	**360**	60	60	30	30	30	30	30	30	30	30
	4a, 4b	Strengthened IWCM policies (under *Water Industry Competition Act*)	**50**			50							
	5b, 5c, 12a	Best-practice compliance	**20**	10	10								
	9c, 5e	Business Continuity Planning	**150**		30	10	10	10	30	10	10	10	30
	6b, 6e	Reduction in energy consumption and greenhouse gas emissions	**-**	Included in Council's broader sustainability initiatives									
Urban Town Water Supply	6d, 8a	Climate change adaptation – surface water availability	**250**	100	50				50				50
	7a, 7c	Targets for non-residential consumption	**-**	Minimal									
	7g	Permanent water conservation measures	**30**		10	10			5			5	
	7a, 7d	Water Loss Management Program	**150**	50	50	50							
	7e, 7f	Rainwater tank rebate	**735**	20	5	5	5	140	140	140	140	140	
	9a, 9b, 9d	Drinking water catchment planning	**100**		50	50							
	10a, 10b	Review and update Drought Management Strategy	**150**		50				50				50
Urban Wastewater Management	5d	Review and Update Sewer Overflow Abatement Strategy	**50**	50									
	13a, 13b	Biosolids Management Strategy	**150**		50				50				50
	7a, 11a, 11b, 11c	Integrated servicing strategies and recycled water opportunities	**410**		50	70	120	70	20	20	20	20	20
Urban Stormwater Management	14a, 14b, 15a, 15b, 16a, 16b	Implement water sensitive urban design framework	**2,080**	50	150	100	260	250	250	260	250	250	260
Catchment Management	5a, 5f	Drinking water catchment natural asset management	**100**		50	50							
	6a, 6c, 17c	Climate change adaptation – flooding and tidal inundation	**150**		50				50				50
	17g, 18c, 4b, 5f, 9d, 11b, 11c, 14b	Total water cycle management framework and sub-catchment plans	**450**			150	100	20	20	20	20	20	20
	17d, 17f	Review of Streambank Protection Policy	**20**	20									
	17e, 17i	Monitoring, evaluation and reporting	**400**			50	50	50	50	50	50	50	50
	17b, 17h	Upper catchment floodplain planning	**400**			80	80	80	80	80			
	18a, 18b, 18c	On-site sewage management (additional resources)	**1,400**				200	200	200	200	200	200	200
Total 10 year IWCM Strategy			**9,070**	**400**	**690**	**880**	**1,030**	**1,105**	**1,200**	**985**	**895**	**900**	**980**

Fundamental actions	Priority Actions	Actions relying on prerequisite (priority) actions	Level 3 (TWCM) components

Note 1: Level 1 actions are already funded and being implemented by TSC and these are considered to remain an integral component of the future strategy. The actions in the Implementation Program are additional to the Level 1 actions and are new strategic planning actions that are recommended to achieve the desired IWCM outcomes. None of the IWCM issues identified directly require investment in capital works within the next ten years that have not been documented in this Strategy. However, the outcomes of these actions may result in the identification of additional future expenditure requirements. Expenditure for Council's asset renewal program and provision of infrastructure to service new growth areas is additional to the IWCM implementation program and will be directed by many of the outcomes of the IWCM actions, particularly climate change adaptation, sewer overflow abatement strategy, biosolids management strategy, integrated servicing strategies and recycled water opportunities..

Years correspond to end of financial year i.e. 2015 is year 1 (start 1st July 2014, end 30th June 2015), etc.

CONTENTS

FIGURES

TABLES

1. INTRODUCTION

1.1 Six Year IWCM Strategy Review

The NSW Government introduced the Integrated Water Cycle Management (IWCM) process in 2004 to assist local water utilities to sustainably manage their water systems, maximise benefits to the community and environment and achieve improved communication between local water utilities, water users and water managers. IWCM is a key component of the NSW Office of Water's *NSW Best-Practice Management of Water Supply and Sewerage Guidelines* (DWE, 2007). Within this framework, IWCM is the process of balancing water needs with the sustainable use of available water resources. The IWCM process identifies the appropriate water cycle management options in an urban context to efficiently provide water supply, sewerage and stormwater services, while sustainably managing the available water resources.

The IWCM Strategy adopted by Tweed Shire Council (TSC) in 2006 and reviewed in 2009 and 2011 is the strategic plan which has guided and prioritised actions regarding Council's management of the urban water supply, sewerage and stormwater systems for the last 6 years. TSC has committed significant time and effort in the regular reviews and updates of its IWCM strategy including detailed specialist studies and ongoing consultation activities. This major review of the IWCM Strategy has been undertaken to:

- Ensure the long-term future direction is appropriate, considering the current or emerging challenges facing Council and the community desires for future water cycle management;
- Ensure consistency with the best-practice management framework which requires a major review every 6-8 years;
- Identify opportunities to enhance IWCM implementation across all relevant Council functions;
- Maximise the benefit of the IWCM process by ensuring the strategy is appropriate and cost-effective, the community are fully engaged and that all aspects of the Shire's water resources are considered; and
- Ensure that Council policy keeps pace with changing circumstances and new information through a process of continual improvement.

1.2 Scope of the Review

The review involves revisiting and updating the original assumptions used to develop the current IWCM Strategy such as population growth, water demand, community preferences and waterway health, confirming if the planning targets are being met and whether data gaps from the original study are being addressed. Some of these steps have already been undertaken by TSC as part of its biennial IWCM reviews. This current review will evaluate implementation progress, consider and where necessary, modify overall objectives and determine the scope of new actions that should be considered.

Whereas the State Government IWCM approach is focussed on the management of urban water services, Council has indicated a desire to broaden the traditional IWCM scope to consider Council's full range of activities that impact on the water cycle within the Tweed Shire. This review is therefore able to provide a revised strategy that covers the broader responsibilities of Council and provide efficiencies and improved outcomes. It is intended that the outcomes from this process are highly specific to priority issues, local constraints and stakeholder expectations.

The review process including stakeholder engagement activities is illustrated in Figure 1.

The IWCM Strategy Review Background Paper (included in Appendix 1) was a key step in documenting the current status and issues relating to TSC's water management. It focuses on describing the current IWCM

Strategy (and its evolution), the actions already undertaken and the degree of success. This IWCM Strategy document develops and assesses potential solutions to the management issues.

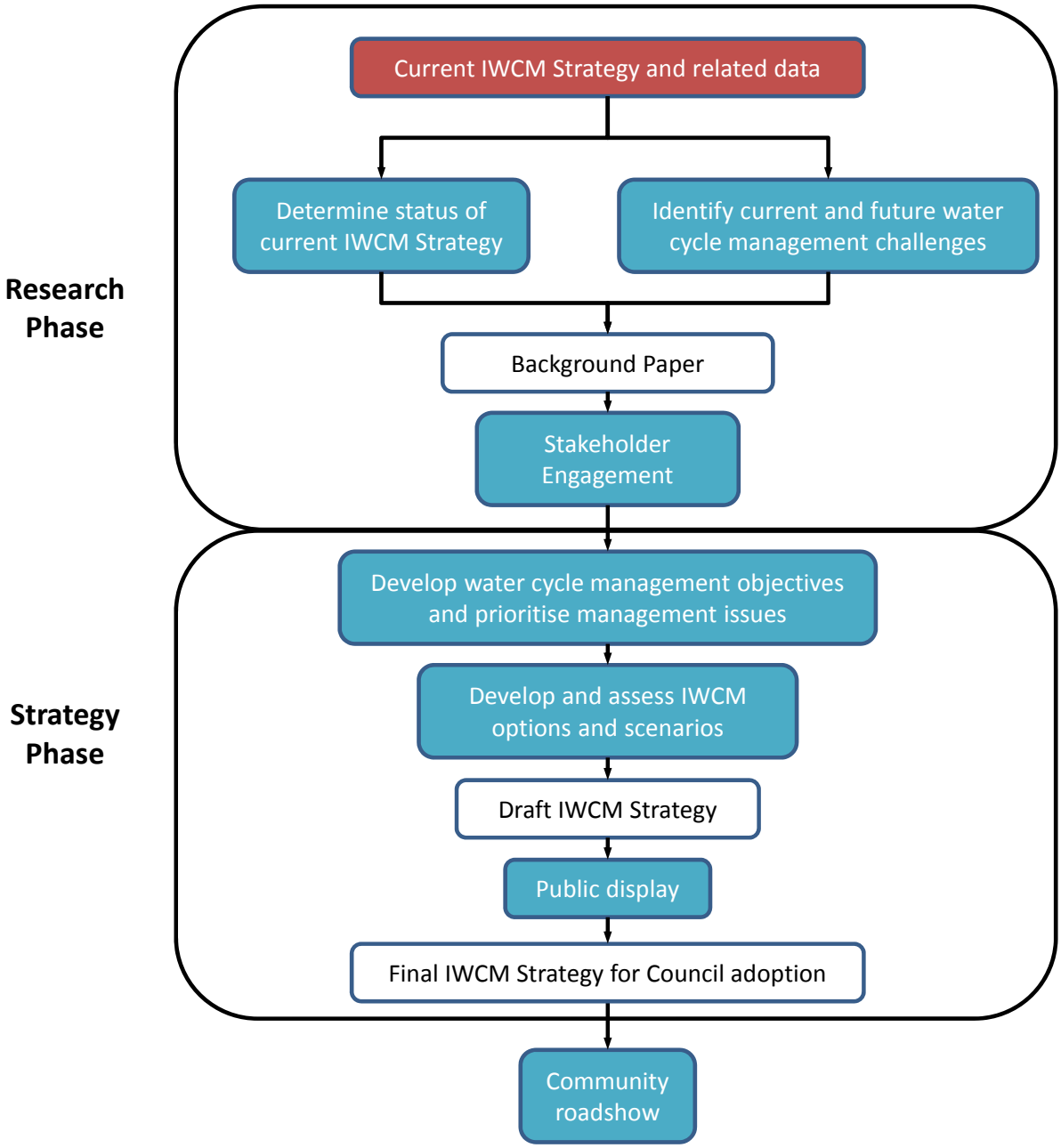

Figure 1: Six Year IWCM Review Process

2. OVERVIEW OF TWEED SHIRE

2.1 Topography

Figure 2 provides an overview of the Shire's localities, topography and main waterways. The Tweed Shire sits within one of the largest erosion calderas in the world, which formed following eruptions of the Mt Warning Volcano around 20-23 million years ago. The Shire is bordered by the Nightcap Ranges to the south, the Border Ranges to the west and the McPherson Ranges to the north. The centre of the caldera, Mt Warning, is located south west of Murwillumbah. The Burringbar Range is situated to the east of Murwillumbah. Running east from the Burringbar Range are the Tweed coastal creeks - Cudgen, Cudgera and Mooball Creeks, their tributaries and associated floodplains.

Another major topographic feature of the Tweed Shire is the large coastal floodplain associated with the Tweed River. The region's major urban centre, Murwillumbah, is situated on this floodplain along with several of the regions villages such as Tumbulgum, Condong and Chinderah.

A significant coastal dune system is associated with the coastline where the towns and villages of Fingal Head, Kingscliff, Casuarina, Cabarita, Hastings Point and Pottsville are situated.

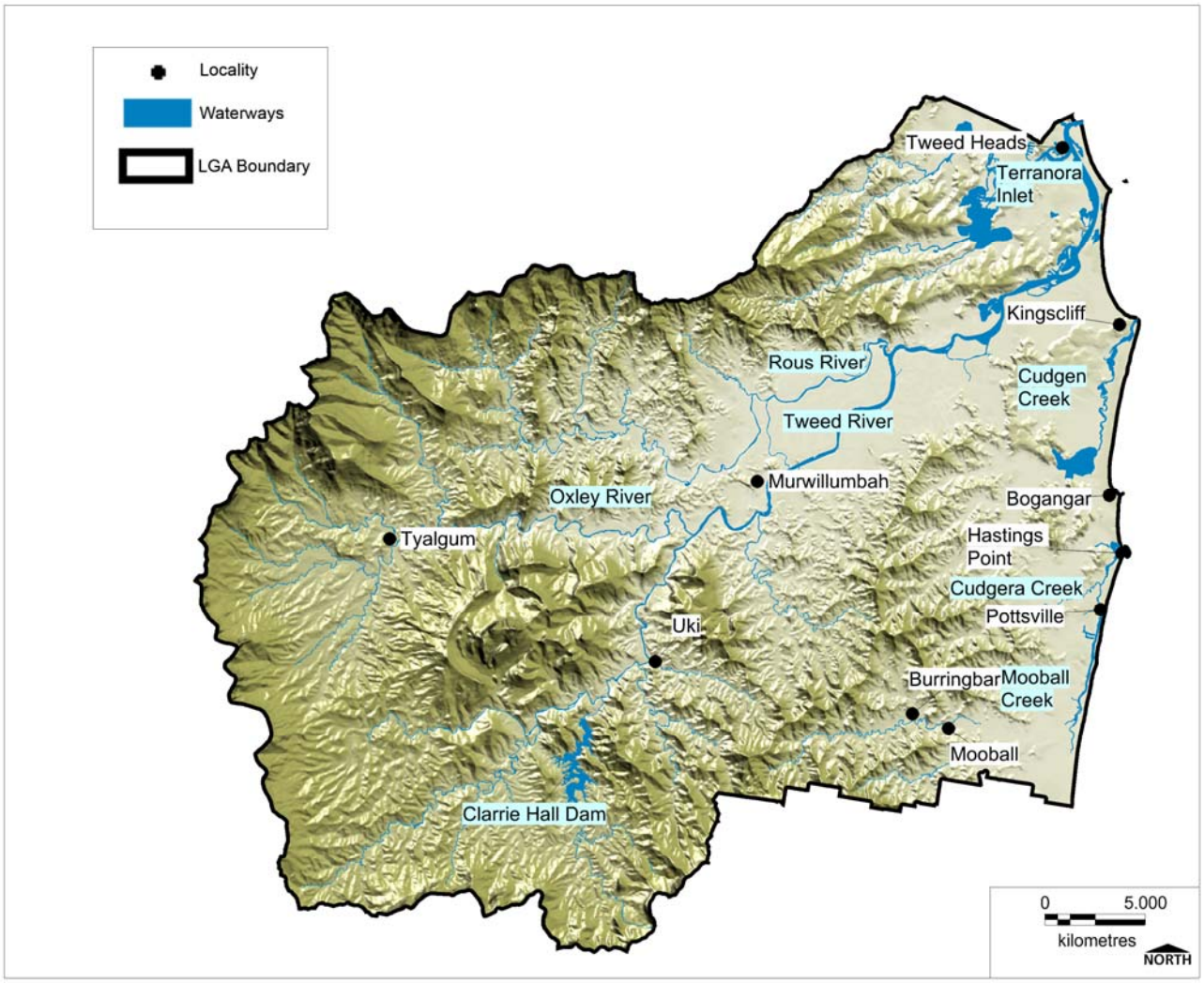

Figure 2: Location of towns, villages and waterways and general topography of the Tweed Shire

2.2 Climate

2.2.1 Historical and Current Climate Data

Tweed Shire experiences a subtropical climate, with warm humid summers and mild winters. Within the Shire, climate varies with distance from the ocean. In general, the coastal zone receives higher rainfall and experiences milder temperatures. Average annual rainfall ranges from a high of 1,800 mm per annum on the coast to 1,600 mm per annum in the west of the Shire. Table 2 presents rainfall and evaporation data for locations across the Shire averaged from 1970-2012.

Table 2: Rainfall and evaporation data at various locations across Tweed Shire (1970-2012)

Location	Average Annual Rainfall (mm)	Average Annual Pan Evaporation (mm)	Latitude (degrees)	Longitude (degrees)	General Location within LGA	Elevation (m)
Murwillumbah	1,611	1,500	-28.34	153.38	Central	8
Tyalgum	1,562	1,434	-28.36	153.21	West	120
Kingscliff	1,789	1,501	-28.26	153.58	East	5
Pottsville	1,710	1,531	-28.38	153.57	South East	5

Source: SILO (2013) from 1970-2012 (data prior to 1970 are considered unreliable for evaporation)

Seasonal variability in rainfall and evaporation at Murwillumbah is shown in Figure 3. There is a high degree of monthly variation in rainfall demonstrating a clear wet-dry season pattern, which is typical of a subtropical environment. The highest rainfall typically occurs during summer (a maximum monthly average of 239 mm in February) and in early autumn. The lowest rainfall typically occurs in late winter / early spring with a minimum monthly average of 43 mm in September. During the first six months of the year rainfall typically exceeds evaporation and in the second half of the year the opposite occurs, where evaporation exceeds rainfall.

Long-term annual rainfall for Murwillumbah (1970-2012) is shown in Figure 4. Annual rainfall at Murwillumbah has ranged from 810 mm during the driest year (2002) to 2,930 mm during the wettest year (1974).

Average temperatures vary throughout the year with a summer average of 29°C and a winter average of 22°C. Extreme temperatures range from an average maximum of 32°C in summer to an average minimum of 6°C in winter.

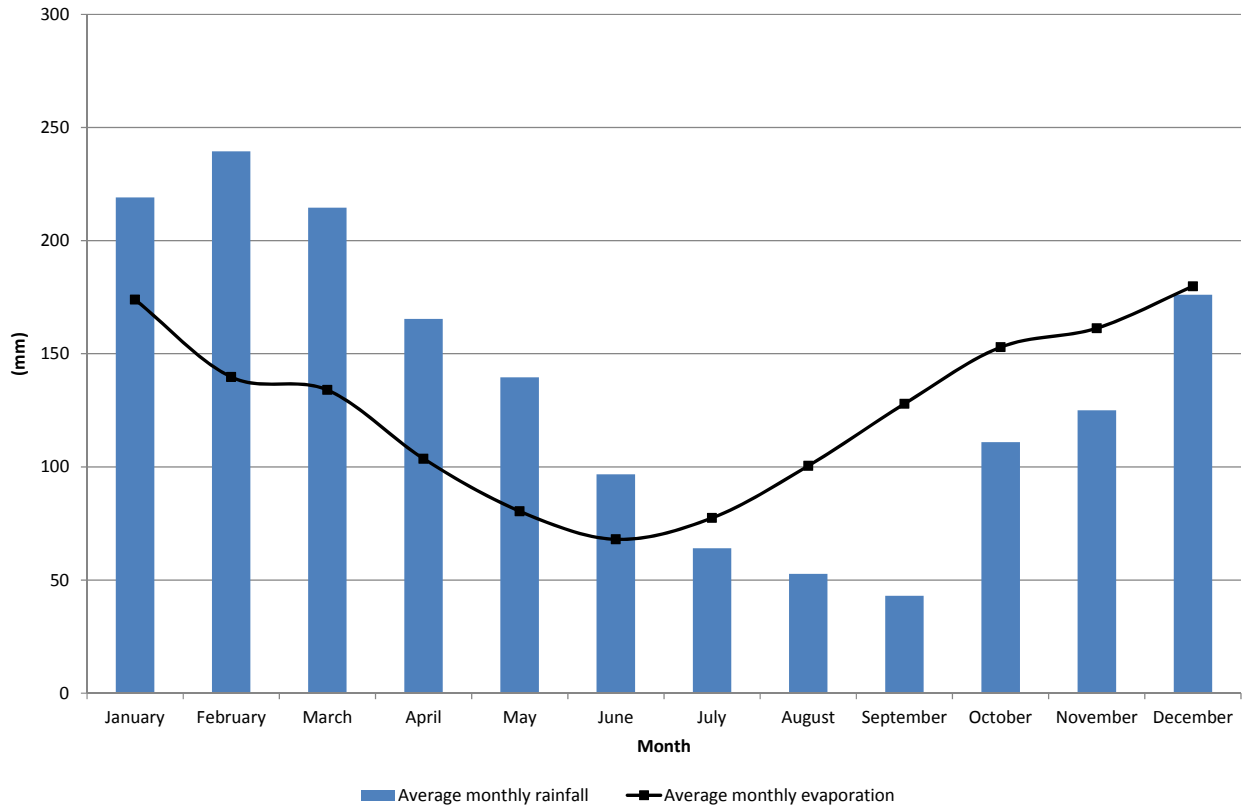

Figure 3: Mean Monthly Rainfall and Evaporation at Murwillumbah (1970-2010)

Source: SILO (2013) from 1970-2012

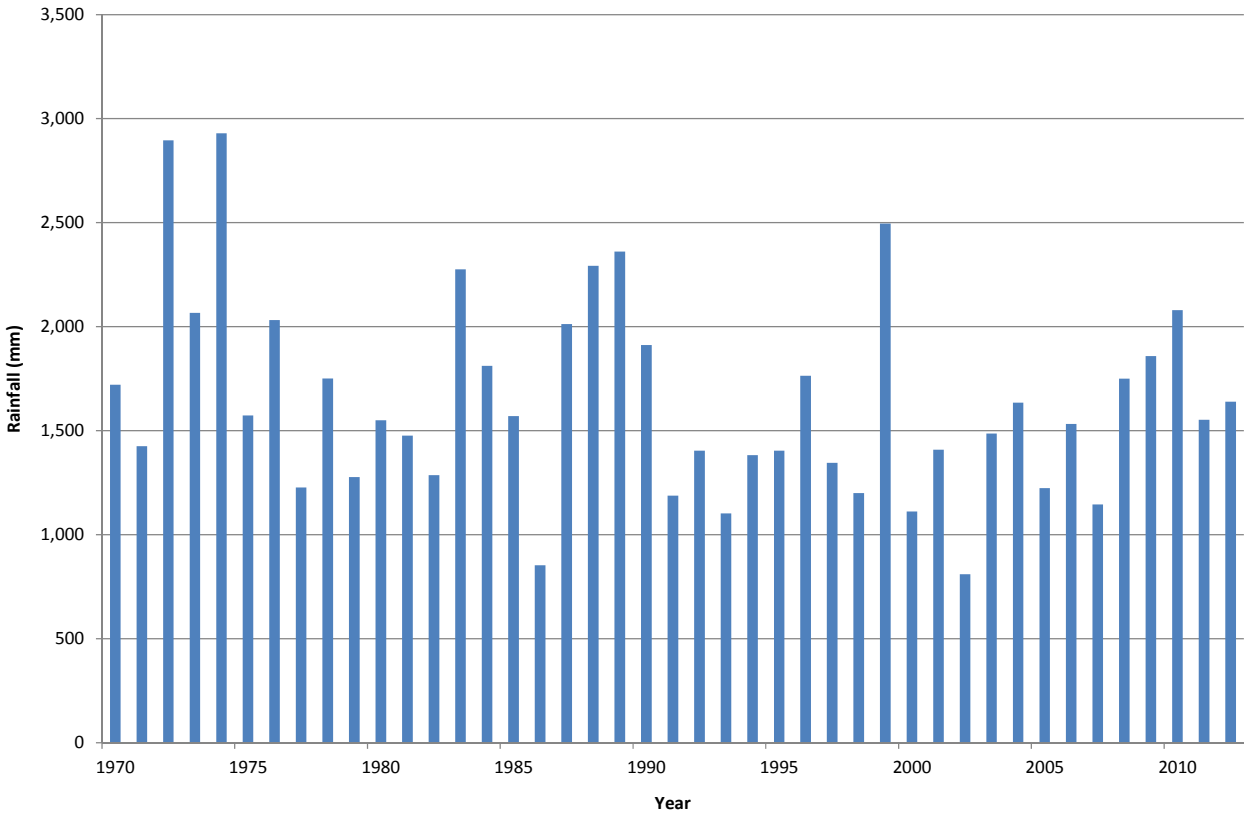

Figure 4: Historical Annual Rainfall at Murwillumbah (1970-2012)

Source: SILO (2013) from 1970-2012

2.2.2 Climate Change

Global climate change, caused by an enhanced greenhouse effect, will significantly affect the natural environment throughout the world. The *NSW Climate Impact Profile* (DECCW, 2010) provides projections of climate change and impacts of these changes on settlements, land and ecosystems of NSW. The Profile outlines some of the risks NSW faces to help decision makers develop their planning and response strategies. Expected regional climatic changes in the north coast region are:

- Rising temperatures;
- Increasing rainfall in summer and autumn;
- Increasing evaporation; and
- El Nino-Southern Oscillation (ENSO) years will continue to be drier than average but also become hotter, leading to more extreme impacts. La Niña years are likely to continue to be wetter than average but will also become warmer. During El Niño events, water stress is likely to be more pronounced because of higher temperatures.

Changes in rainfall and higher evaporation rates are likely to lead to less water for streams and rivers in the Northern Rivers, which will have downstream consequences for storages and place pressure on the area's water resources. Lower flows and higher temperatures may also reduce water quality. For example, low flows, higher temperatures and elevated nutrients create a more favourable environment for potentially harmful algal blooms (CSIRO, 2007).

The secure yield of a water supply system is expected to be impacted by the effects of climate change which are considered likely to reduce water supply through changes in local rainfall, evaporation, rainfall-runoff and stream-flows. When forecasting future supply availability, it is necessary to modify supply yields based on the expected impact of these factors.

It is now a common consensus amongst, scientists, managers and planning authorities that sea level rise is virtually inevitable due to thermal expansion of the oceans and melting of ice sheets and glaciers as well as local changes in ocean currents, wind regimes and atmospheric pressure. Key impacts of sea level rise in regards to integrated water cycle management in the Tweed Shire are reported by DECCW (2010) as:

- Coastal recession - increase in coastal inundation and erosion;
- Flooding of community assets, residential property and associated infrastructure; and
- Water supply, wastewater and stormwater infrastructure are at risk due to increased flooding and potential asset failure.

2.3 Population

Council's population and demographic data and forecasts are developed by Forecast.ID (.id Consulting, 2011), based on census data and expected population trends. Forecast.ID is currently updating the long-term population forecasts for the Tweed LGA although these will not be available for this IWCM review.

A range of potential forecasts of population served with water supply is provided in Figure 5. This figure shows:

- The historical population served with water supply (the blue line);
- Council's current 30 year forecast based on a detailed build-up of probable growth in individual developments (average 2.2% p.a. over 30 years) which assumes the 2031 population currently predicted by Forecast.ID will still be realised (the green line);
- A 30 year forecast based on a continuation of the low rate of growth experienced between 2006 and 2011 (1.3 % p.a.) (the red line); and

- The population forecasts assumed in the TSC's Demand Management Strategy (MWH, 2009a; the purple line).

For this IWCM Strategy review, TSC has adopted the population forecast represented by the green line. While the current downturn in population growth may or may not continue into the future, it is prudent to take a balanced approach to population projections when planning, while also recognising the inherent limitations of any projection and the need for ongoing and regular revisions. The NOROC Regional Water Supply Strategy (refer Section 2.7.4) extended this to a 50 year population forecast assuming the ultimate Shire population of 180,000 people (or approximately 172,000 people served by the Bray Park water supply) is reached at 2060. The resulting number of residential and non-residential water supply connections is given in Table 3. The number of future residential water supply connections has been calculated from the average historical occupancy ratio for 2008 to 2012. The number of non-residential water supply connections is assumed to grow at the same rate as the population growth.

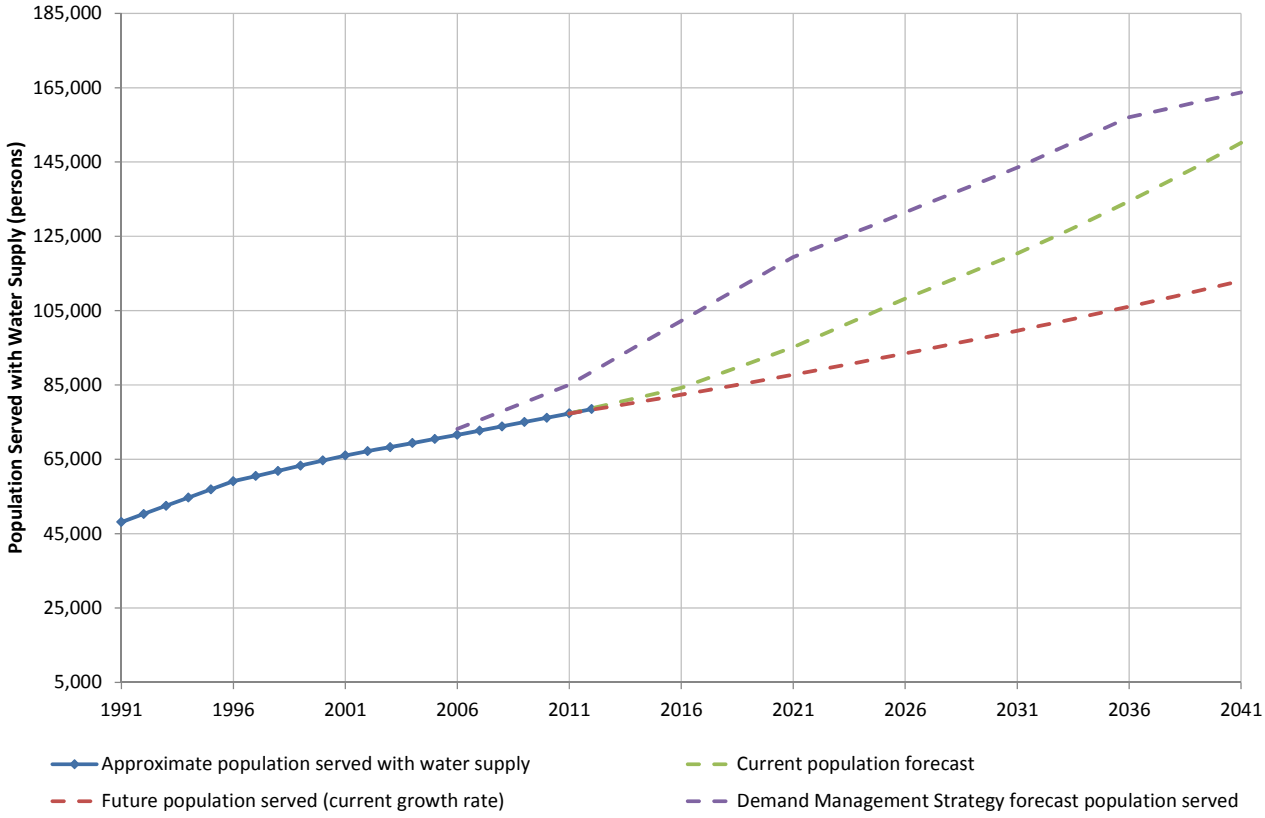

Figure 5: Comparison of forecast population served by TSC water supplies

Table 3: Future Water Supply Connections – Tweed District

Connection Type	2010	2020	2030	2040	2050	2060
Residential connections	31,007	38,312	48,662	60,661	66,345	71,147
Non-Residential connections	1,941	2,016	2,560	3,191	3,489	3,734
Total Connections	32,948	40,327	51,222	63,852	69,831	74,881
Water supply area growth (total connections) % p.a.	0.6%	2.4%	2.1%	2.2%	0.7%	0.7%

Source: Hydrosphere Consulting (2013a)

The population served by a reticulated sewerage system is slightly lower that the population served by town water supply.

2.4 Water Resources

The raw water resources in the study area can be divided into surface water, groundwater and seawater. The Tweed Shire town water supply is currently sourced entirely from surface water resources.

2.4.1 Surface Water

Major Catchments and Waterways

The Tweed Shire can be divided into three major catchments: the Tweed River catchment, the Cobaki/ Terranora Broadwater catchment and the Tweed Coastal Creeks catchment. The main river system in the Tweed Shire is the Tweed River. All tributaries in the Shire drain into the Tweed River and eventually the Pacific Ocean with the exception of the Tweed coast estuaries of Cudgen, Cudgera and Mooball Creek which have discrete catchment areas that drain directly into the Pacific Ocean (refer Figure 6).

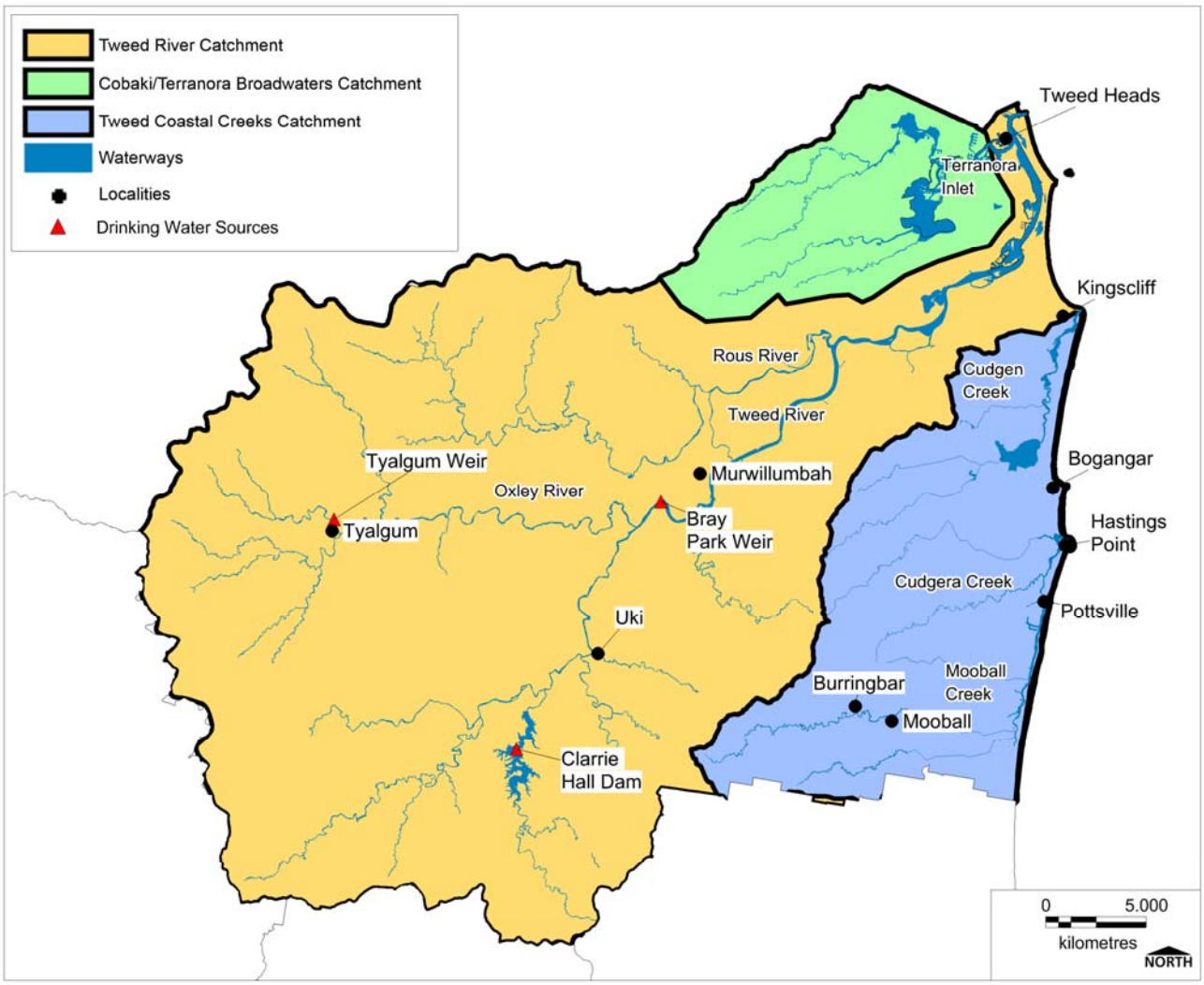

Figure 6: Tweed Shire catchments and waterways

The Tweed River catchment covers an area of approximately 1,080 km^2. Major tributaries are the Rous and Oxley Rivers. Streams in the Tweed catchment are heavily influenced by seasonal climatic variability. Generally high flows occur in all water sources during the periods from January through to July with peak flows typically occurring during January to March.

The major in-stream water storage structure in the Tweed River catchment is Clarrie Hall Dam, which is managed by TSC. Releases from the dam flow to Bray Park Weir (upstream of Murwillumbah) where water

is extracted for town supply. The total annual volume of surface water licensed for extraction (at February 2009) under the *Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources* is 35,207 ML per year compared to an annual average flow of approximately 365,000 ML for the Tweed River at Bray Park Weir. In addition, there is 780 ML per year of authorised private groundwater extraction from the 'upriver' alluvial aquifers and the 'coastal floodplain' alluvial aquifers within the plan area. This volume has been included in the plan due to the significant degree of connectivity of these aquifers with their parent streams (Office of Water, 2010b).

The licensed extraction is separated into three extraction management units (EMU). For the Tweed River Catchment EMU, the total volume of surface water licensed for extraction is 33,197 ML, including up to 27,567 ML (about 83%) for town water supply from the Mid Tweed water source (Uki and Bray Park town water supplies) (Office of Water, 2010b).

TSC holds water access licences (WAL) for Bray Park, Uki and Tyalgum water sources. The share components of TSC local water utility access licences authorised to take water from these water sources are 27,567 ML/year in the Mid Tweed River Water Source (Tweed – 27,500 ML/a, Uki – 67 ML/a) and 46 ML/a in the Upper Oxley River Water Source (Tyalgum system). For the Tweed River Catchment EMU, the total volume of surface water licensed for extraction is 33,197 ML with about 83% for town water supply (Office of Water, 2010b).

The WSP specifies operational rules for local water utility storages including environmental flow releases from Clarrie Hall Dam and Bray Park weir.

The Tweed Coastal Creeks catchment covers a total area of approximately 260 km^2, divided into Cudgen, Cudgera and Mooball sub catchments. There is currently no raw water extraction for town water supply within these catchments.

Water Quality

Tweed River Estuary

TSC has undertaken comprehensive estuarine water quality monitoring since 2007. There are ten sampling sites throughout the Tweed estuary and three in the Rous River estuary which are sampled monthly. ABER (2012) conducted a review of the water quality data collected between 2007 and 2011. The report concluded that water quality in the Tweed estuary failed to comply with ANZECC guidelines for the maintenance of aquatic ecosystems for a significant amount of the time. In particular, the middle to upper reaches of the Tweed estuary experience moderate hypoxia (low dissolved oxygen), which can be directly linked to phytoplankton blooms caused by excessive nutrient loadings. The major estuarine water quality issues identified by ABER (2012) are:

- High nutrient concentrations - Nitrogen and phosphorous both exceeded ANZECC Guidelines for >50% of the time. Elevated catchment nutrient inputs dominated nutrient concentrations during high flow and post high flow conditions and Wastewater Treatment Plant (WWTP) nutrient inputs were the major source during median and low flow conditions;
- Phytoplankton blooms - The middle and upper estuary experienced moderately severe phytoplankton blooms that were driven by high nutrient concentrations;
- Low dissolved oxygen (DO) - Low DO occurred in the transition, middle, upper and Rous sections of the estuary. During low flow conditions low DO was driven by phytoplankton blooms and during flood conditions, oxygen-poor swamp water draining from the low lying floodplain was the main driver; and
- Poor water clarity - A combination of inorganic total suspended solids (TSS) and phytoplankton resulted in poor water quality throughout the middle and upper estuary. TSS was driven by turbid catchment runoff during and post, high flow conditions.

Tweed River Catchment

TSC undertakes an extensive water quality monitoring program to identify and understand sources of contamination to the raw and bulk water supplies. Thirteen water quality monitoring sites are established within the Tweed Catchment area to monitor major water quality parameters and algal concentrations. A review of the Tweed Catchment water quality data (six representative sites) is summarised below (Hunter Water Australia, 2011):

- Physico-chemical water quality parameters - Conductivity, turbidity and pH was generally good across the catchment. Concentrations complied with ANZECC guidelines except for turbidity during periods of high rainfall;
- Nutrients - Generally there is a trend of high of nutrients across the catchment. Of the six sites reviewed, median values of total phosphorous (TP) exceeded ANZECC guidelines at all sites, total nitrogen (TN) at three sites, total ammonia at four sites and nitrate at five sites;
- Cyanobacteria concentrations - typically low to moderate with high concentrations recorded 11% of the time; and
- Elevated manganese concentrations in Clarrie Hall Dam - Elevated manganese concentrations can discolour the water. Concentrations did not exceed guideline values however discolouration of drinking water was observed.

Tweed Coast Estuaries

TSC has been undertaking long-term water quality monitoring at a number of sites within the estuaries since 1999. The testing is carried out at fortnightly to six-weekly intervals at set monitoring sites along the three estuaries. Hydrosphere Consulting (2012a) reviewed the available water quality data and conducted additional water quality sampling on the three estuaries as a part of the Coastal Zone Management Plan for the Tweed Coast Estuaries which identified the following issues:

- Cudgen Creek - The middle and upper estuary of Cudgen Creek is periodically affected by low pH, particularly following rainfall events. There are known issues associated with acid sulphate soils in the catchment and this result is attributable to acid runoff from these areas. TN was elevated in the mid and upper estuary. Diffuse nutrient sources related to agricultural and urban land uses are likely to contribute to the TN load in the estuary;
- Cudgera Creek - Dissolved oxygen results for sites in the mid and upper estuary were below what is considered the level of a healthy functioning ecosystem. Low dissolved oxygen had been observed at sites directly upstream of the estuary (cane drains) and this is likely to be contributing to low DO downstream. TN was also elevated in the mid and upper estuary sites, and this indicates potential for nuisance plant growth and/or algal blooms. Chlorophyll *a* and turbidity were also elevated at one site on Christies Creek. Thermo-tolerant coliforms were persistently elevated at a site located 150 m upstream from Koala Beach residential area; and
- Mooball Creek and Burringbar Creek - All of the Burringbar Creek sites showed high levels of thermo-tolerant coliforms and there was a clear trend identified where spikes in faecal indicators followed rainfall events. The two likely sources of faecal contamination were identified as surface runoff transporting animal faeces (livestock, pets and native animals), and potentially failing (or surcharging) on-site sewage management systems (OSSM) in this area. The villages of Burringbar and Mooball are in the process of becoming sewered, and this is likely to reduce water quality risk in years following these improvements. A site downstream of the town of Mooball and Burringbar showed slightly lowered dissolved oxygen levels, pH was slightly acidic (pH 5.6) and TN was slightly elevated.

Tidal Regime

Current tidal limits in the Tweed River and its associated tributaries and the Tweed coast estuaries are outlined in Table 4. The tidal range at the mouth of the Tweed River is approximately 1.5 m (Macdonald *et al*., 2007).

Table 4: Tidal limits of the main Tweed Shire waterways

Catchment	Creek/River	Location	Distance from ocean (km)
Tweed	Tweed River	Bray Park Weir	35.5
	Rous River	1.7 km upstream of Boat Harbour Bridge	42.0
	Cobaki Creek	75 m downstream of road bridge	14.3
Cudgen	Reserve Creek	Clothiers Creek Rd	13.9
Cudgera	Christies Creek	200 m upstream from Kanes Road	5.8
Mooball	Burringbar Creek	500m downstream from Cowell Park farm	11.1

Source: MHL (2006)

Flooding

The Tweed River is well known for its floods with the townships of Murwillumbah, Condong, Tumbulgum, Chinderah, Tweed Heads and Tweed Heads South all having experienced inundation from floodwaters. A system of levees currently protects the main townships of Murwillumbah and Tweed Heads South from the more frequent floods (BMT WBM, 2009). There are large expanses of flood prone land on the Tweed River floodplain between the major urban centres as illustrated in Figure 7. Flooding also occurs on the floodplains of the Tweed coast estuaries. As discussed previously, the area of flood prone land is predicted to increase with the effects of sea level rise.

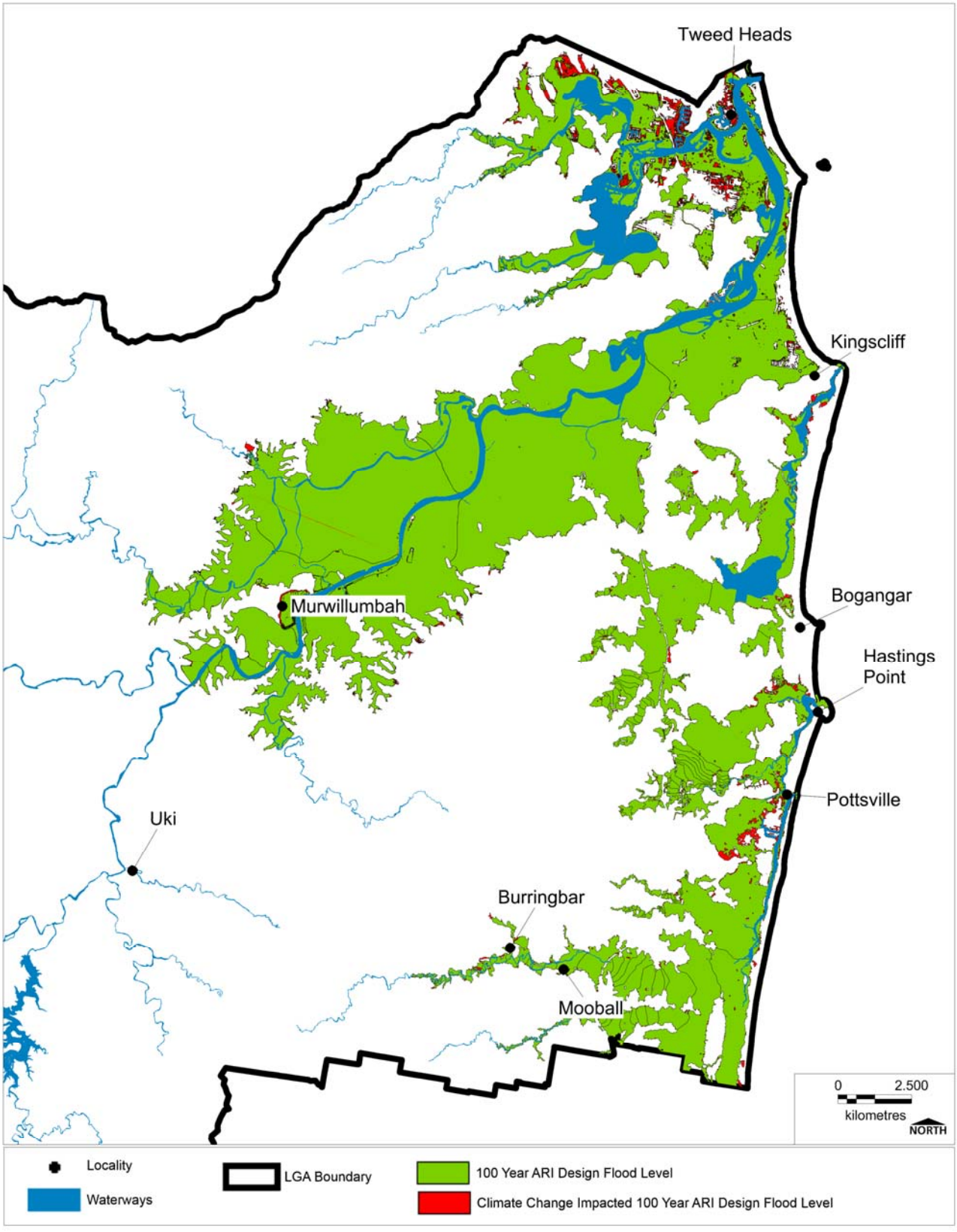

Figure 7: Flood prone land within the Tweed Shire and land predicted to be further affected by climate change impacts

Source: BMT WBM, 2009

2.4.2 Groundwater

A number of groundwater sources exist in the study area. The NSW Office of Water (2010a) groups the aquifer types into four basic categories:

1. Fractured rock aquifers found in rock formations such as granite or basalt. Groundwater in these rocks occurs mainly within the fractures and joints. The North Coast Fractured Rocks and New England Fold Belt make up the fractured rock aquifers in the study area;
2. Coastal sand aquifers, where groundwater is contained in the pore spaces in the unconsolidated sand sediments;
3. Porous rock aquifers found in rock formations such as sandstone or limestone. Groundwater occurs within the pore space in the rock matrix; and
4. Alluvial aquifers, where groundwater is contained in the pore spaces in the unconsolidated floodplain material.

Figure 8 shows the location of groundwater sources in the Tweed Shire. Table 5 collates information on local aquifers from various sources including basic geology, yield and salinity characteristics, connection to surface water, DLWC's aquifer risk assessment rating and whether a Water Sharing Plan (WSP) exists for the aquifer.

Table 5: Characteristics of aquifers in the Study Area

Aquifer	Geology	Level of connection between surface and groundwater	Bore Yields (L/s)	*Salinity (mg/L)	DLWC Risk Assess	WSP
North Coast Fractured Rocks	Fractured Basalt with vesicular zones and interlayered sediments	Low-Moderate	Typical: 1-15 Max: 30	<500	High	No
New England Fold Belt (NEFB)	Fractured and weathered granite	Low-Moderate	Typical: 0.1-0.5 Max: 19	<500	Medium-High	No
Tweed Coastal Sands	Beach and dune sands	Significant (tidal section only)	Typical: 0.5-6 Max: 40	<500	Medium	No – currently being developed
Porous Rocks of Clarence Moreton Basin	Sedimentary rocks- Quartz Sandstone, Conglomerate, Siltstone, Claystone, Coal	Low-Moderate	Typical: 0.3-1.5 Max: 10	<300	Low	No – currently being developed
Estuarine and Fluvial River Alluvium - Tweed River	Unconsolidated cobbles, gravels, sands, silts, muds and clays	Significant	Typical: 0.5-2.0 Max: 15	200-3,500	High	Yes

Sources: DLWC (1998), DLWC (2001), McKibbin (1995), Sinclair Knight Merz (2006).

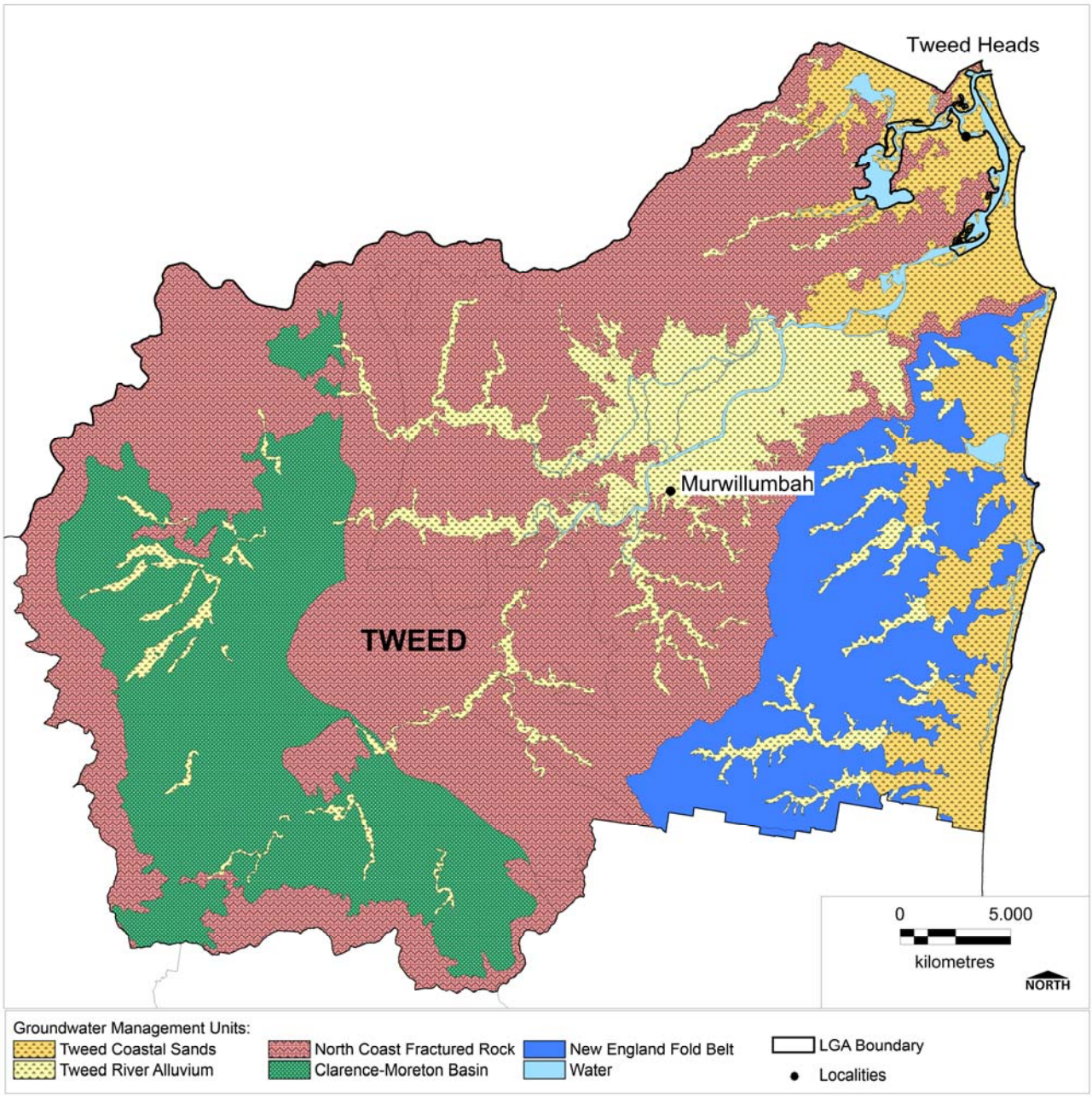

Figure 8: Groundwater Resources in the Tweed Shire LGA

Groundwater Management Units mapping layers provided by NSW Office of Water, Jan 2013

2.4.3 Seawater

Seawater accounts for 97% of the water on earth. Saline waters can be sourced from marine or estuarine locations. Desalination of seawater can augment available water resources and can be a virtually unlimited, reliable source of water in coastal regions. Brackish water from estuaries or coastal groundwater can also be used as feed water in desalination processes. Major brackish water sources in the study area are the Tweed River estuaries along with saline/brackish coastal groundwater aquifers.

2.5 Flora and Fauna

The Tweed region is regarded nationally and internationally as a centre for biodiversity. About half the region is covered by bushland with approximately 80% with a high or very high conservation status (TSC, 2010c). The Shire supports over 200 significant plant species (under the *Threatened Species Conservation Act, 1995*), one is thought to be extinct, 25 are endangered and 29 are vulnerable to extinction. Of the 100 significant animal species (under the *Threatened Species Conservation Act,1995*), 17 are listed as endangered and 88 are considered vulnerable (TSC, 2010c).

2.5.1 Estuarine/Coastal

The Tweed River estuary is a significant contributor to the Australian East Coast Fishery through a range of mechanisms including direct contribution to catches, provision of nursery habitats, spawning stock and nutrients for offshore fisheries.

Estuarine vegetation (mangrove, saltmarsh and seagrass) occurs primarily in the lower reaches of the Tweed River and Tweed Coast estuaries. Many of these areas are conserved as SEPP 14 Wetlands and provide habitat and nursery grounds for a variety of aquatic and terrestrial species. These estuarine wetlands provide habitat for a large number of migratory waders including federally listed threatened species.

The Tweed River estuary and Tweed Coast estuaries support a range of species, habitats and communities of conservation concern. These include:

- 10 endangered ecological communities including (NSW Department of Environment & Heritage, 2012):
    - Coastal Cypress Pine Forest;
    - Coastal Saltmarsh;
    - Freshwater Wetlands on Coastal Floodplains;
    - Littoral Rainforest;
    - Lowland Rainforest;
    - Subtropical Coastal Floodplain Forest; and
    - Swamp Sclerophyll Forest on Coastal Floodplain.

- SEPP 14 Coastal Wetlands- associated with the lower floodplains and estuaries of the Tweed River and Tweed coast estuaries, particularly surrounding the Cobaki and Terranora Broadwaters, Cudgen Lake and Pottsville.
- SEPP 26 Littoral Rainforest- located sporadically along the Tweed Coast from Wooyung to Tweed Heads.
- Endangered or vulnerable shorebird species listed under the *Threatened Species Conservation Act,* 1995 - most species are migratory and frequent the Tweed River and Tweed Coast estuaries.

2.5.2 Riparian and Foreshore Vegetation

Riparian land is any land that is next to, or directly influences a body of water. It includes areas adjacent to creeks and rivers, ephemeral streams, wetlands or areas surrounding dams and lakes. Riparian and foreshore vegetation provides a number of important ecological functions including fisheries habitat, terrestrial habitat, bank stability and maintenance of soil structural integrity, land use buffering, water quality filtering, lowering water temperature and reducing aquatic weeds as well as providing scenic amenity. There

are some notable areas of good quality riparian vegetation within the Tweed Shire that have been protected by environmental zoning, National Parks or nature reserves including:

- Stotts Island Nature Reserve in the mid Tweed River estuary;
- Cudgen Nature Reserve on Cudgen Creek;
- Environmental Park on Cudgera Creek; and
- Mt Warning, Mt Jerusalem, Nightcap and Border Ranges National Parks in the upper catchments of the Tweed River.

However, there are many riparian areas throughout the Tweed River and Tweed Coast estuaries catchments that are degraded as a result of clearing, development, weed encroachment and disturbance.

2.6 Land Use

Rural land use is the dominant activity in the Shire, comprising over 68% (845 km^2) of the total Shire area. Nutrient-rich soils combined with high rainfall and a sub-tropical climate provides conditions suitable for a diverse range of rural land uses. Major primary industries within the Shire include:

- Sugar cane;
- Cattle grazing (predominantly beef and some dairy);
- Horticultural crops (macadamias, bananas, vegetables, etc.);
- Tea tree;
- Aquaculture (oysters and prawns); and
- Quarries.

Environmental zoning accounts for approximately 27% (329 km^2) of the total Shire land area use (TSC, 2000). This is comprised of:

- 3 km^2 of Coastal Lands,
- 57 km^2 of Habitat,
- 58 km^2 of Scenic/Escarpment,
- 21 km^2 of Wetlands and Littoral Rainforest and
- 190 km^2 of National Parks and nature reserves.

Urban land use or land zoned for urban use in the TSC LEP (2000) accounts for just 5% (57 km^2) of the Shire. The major residential areas within the Shire are along the coast around the mouth of the Tweed River at Tweed Heads, Banora Point, Terranora the coastal strip around Kingscliff, Casuarina, Cabarita and Pottsville and further west at Murwillumbah.

The two main commercial precincts in the Tweed Shire are located in the Murwillumbah CBD (Murwillumbah Street and Wollumbin Street) and South Tweed Heads (Minjungbal Drive) with smaller commercial areas located at Kingscliff, Cabarita and Pottsville. Industrial land in the Tweed Shire is concentrated in three major areas - the Airfield Industrial Estate in South Murwillumbah off Lundberg Drive, the industrial estate at Chinderah on Ozone Street, and the industrial/commercial precinct at South Tweed Heads off Minjungbal Drive. Smaller industrial areas are situated at Tweed Heads (Ourimbah Road) and at Condong.

In recent years new residential developments have proceeded near Kingscliff, Cabarita, Casuarina and South of Pottsville at Black Rocks. Future areas that have been approved for residential development include Cobaki Lakes, a 350 ha 12,000 person development situated west of the Cobaki Broadwater, an 8

ha 290 person development at Cudgen heights and a development at West Murwillumbah of 10 ha and 200 persons. Other residentially zoned land that in 2009 was yet to be subdivided are 78 ha at Tanglewood, 495 ha at Kings Forest, 370 ha at Bilambil Heights and 170 ha at West Murwillumbah (GHD, 2009).

Figure 9 is an illustration of the land use zone groups and locations of SEPP 14 Coastal Wetlands and SEPP 26 Littoral Rainforest communities within the Shire.

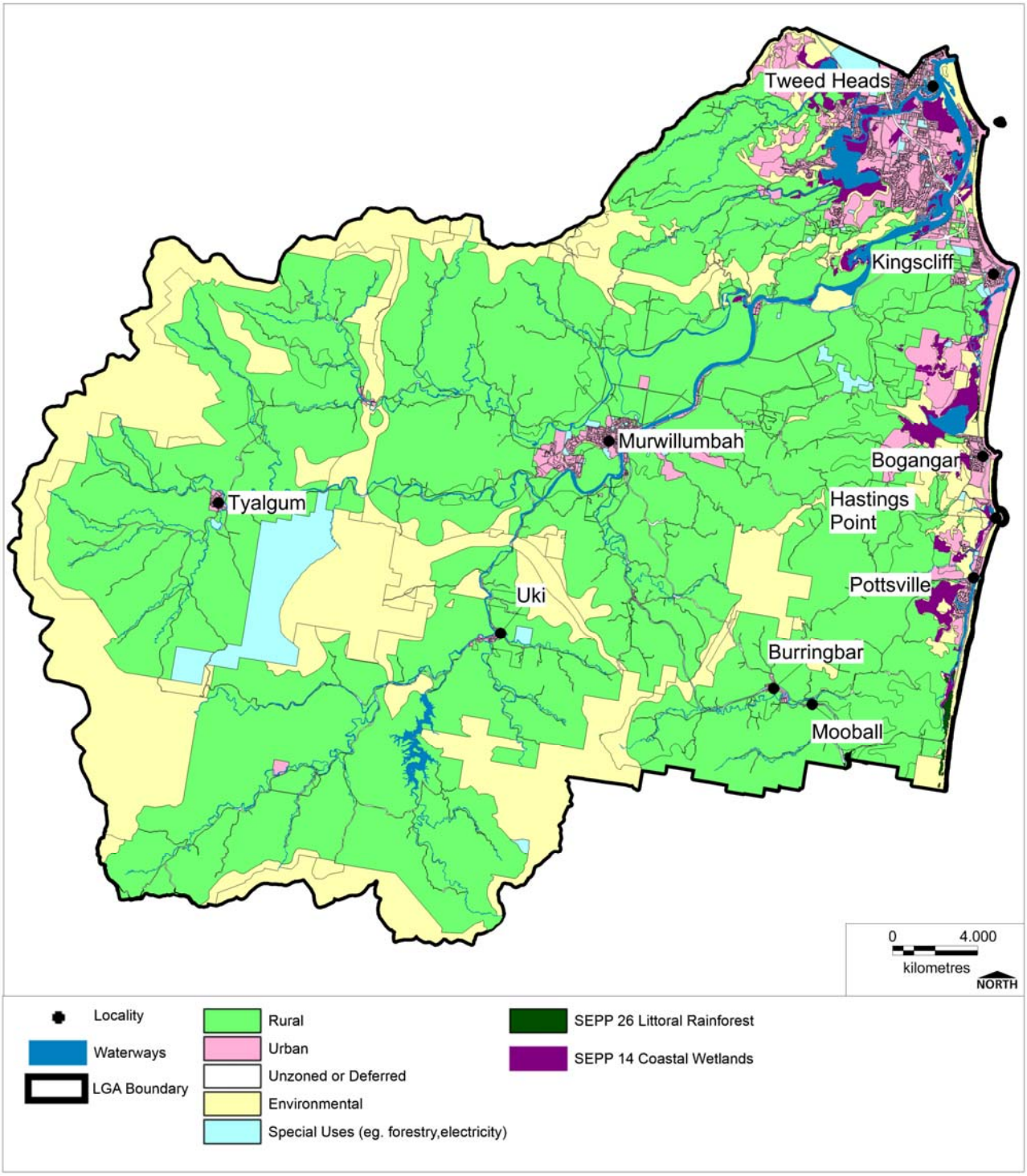

Figure 9: General land uses in the Tweed Shire

2.7 Water Supply

2.7.1 Town Water Supply

Water Supply Systems

Water is supplied to customers in the LGA through three water supply systems. Key features and operational aspects of the systems are provided in the following sections and summarised in Table 6. Figure 10 shows the location and layout of the water supply systems.

Table 6: Key features of Tweed Shire Water Supply Schemes

System	Tweed District	Uki	Tyalgum
Water Source [1]	Doon Doon Creek	Doon Doon Creek	Upper Oxley River
Source Type	Surface water storage and weir pool	Large in-stream storage and run-of-river abstraction	Weir pool
Storage capacity	Clarrie Hall Dam (15,000 ML), Bray Park Weir (840 ML)	Clarrie Hall Dam (15,000 ML)	Tyalgum weir pool (7.52ML)
Towns/villages served	Murwillumbah, Tweed Heads, the coastal strip from Kingscliff to Pottsville and the villages of Mooball and Burringbar	Uki	Tyalgum
Population Served (2012)	78,500		225
Estimated future population served (2042)	151,000 [4]		350
Average annual water demand (ML/a)	9,400		50
Licence entitlement (ML/a)	27,500 [1]	67 [1]	46 [1]
Current Secure Yield (ML/a)	13,750 [2]		120 [3]
Estimated future water demand 2042 (ML/a)	17,500 [4]		52
Treatment Facilities	Bray Park WTP (100 ML/d)	Uki WTP (0.44 ML/d)	Tyalgum WTP (0.25 ML/d)

1. As specified in the *Water Sharing Plan for the Tweed River Area Unregulated, Regulated and Alluvial Water Sources* (Office of Water, 2010b)

2. Source: SunWater (2006)

3. Source: SunWater (2003)

4. Various demand projections were presented in the Background Paper, based on possible population growth scenarios. Council will continue to review and update its forecast population growth.

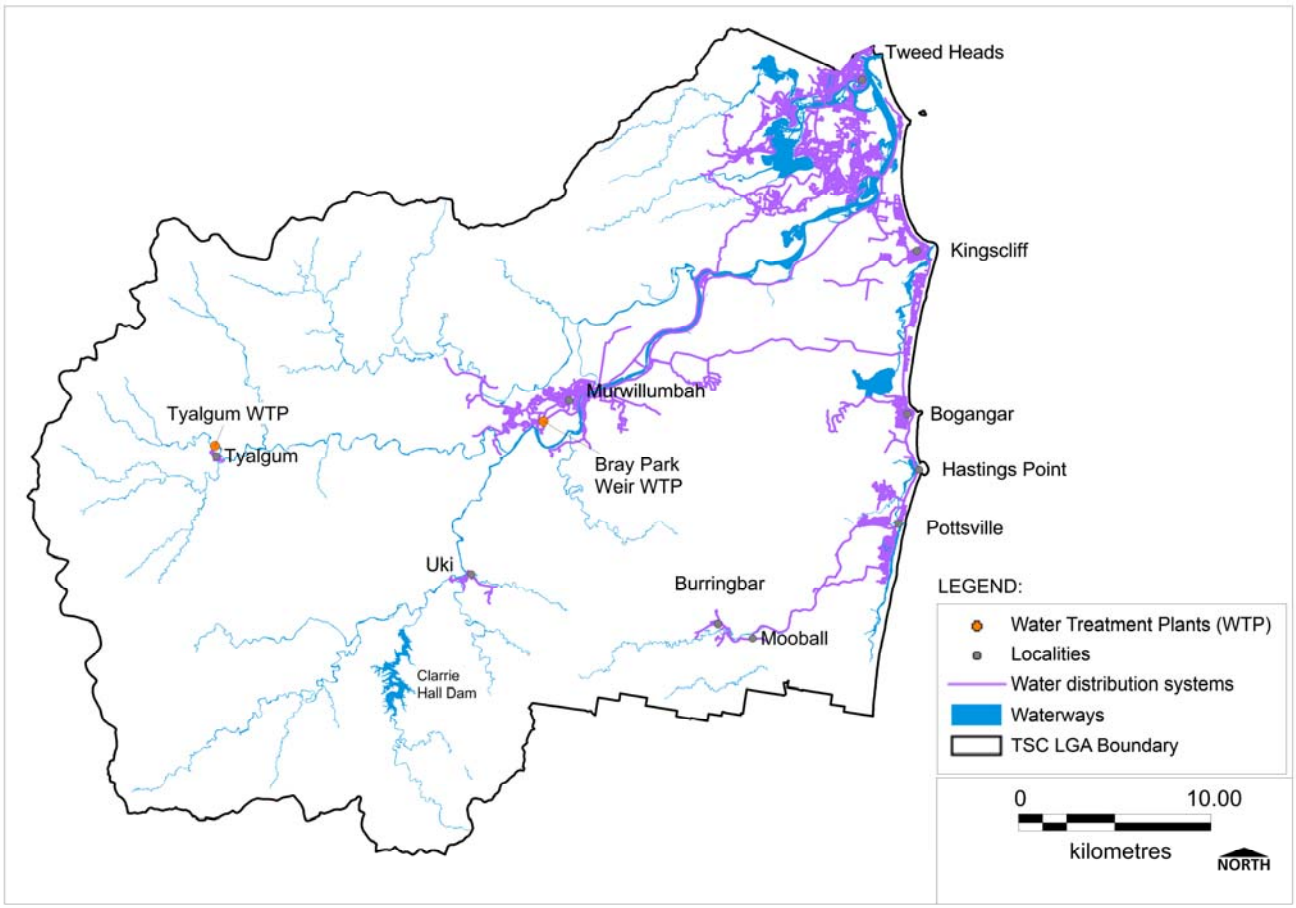

Figure 10: TSC Water Supply Systems

Drought and Emergency Management

The TSC Drought Management Strategy was adopted in 2009 as part of the current IWCM Strategy for all water supply systems. Restriction levels and demand targets for the Bray Park and Uki water supply schemes were reviewed in 2012. The adopted restrictions regime is shown in Table 7.

Table 7: Drought Restriction Levels and Target Demand Reduction

Restriction Trigger Levels	Demand Reduction Target (%)	Bray Park/Uki (% of Clarrie Hall Dam Full Capacity)	Tyalgum Water Supply
External sales banned and pre-activation activities	0	90	Not used
Level 2 restrictions	15	75	Water stops flowing over the weir
Level 4 restrictions	20	60	Water-carting required to supply the system
Level 6 restrictions	25	50	Not used
Level 7 restrictions	30	40	Not used

A small emergency connection (approximately 3 ML/d) to the South-East Queensland water grid is in place at Tweed Heads but there is no water use agreement in place with SEQ Water and TSC believes it is unlikely that water would be provided during a drought situation given that SEQ would probably be experiencing similar climatic conditions. Other emergency supply and drought management options have been considered but require further investigation (refer Section 4.2.4).

2.7.2 Private Water Supplies

The current number of residential properties and population not connected to a town water supply within the Tweed Shire is 7,300 (estimated from the number of dwellings reported in the 2011 Census) (Hydrosphere Consulting, 2013a). The properties rely on household rainwater tanks, bore water or direct river extraction. In times of prolonged drought, rainwater tanks may be depleted or groundwater/surface water extraction may be restricted and these private water supplies may purchase potable water from town water supplies via water carters.

2.7.3 Rainwater Tanks

Council's policy for rainwater tanks in urban areas adopted in 2011 encourages the installation of rainwater tanks to provide non-potable water for outdoor uses, flushing toilets and washing machines. Customers are encouraged to install the largest tank they can. The policy requires dual supply rainwater tanks in single residential premises to have a minimum storage capacity of 5,000 L and a minimum roof area catchment of 160 m^2. For multi-residential dwellings, it is recommended that the rainwater tank volume is maximised with 80% to 90% of the roof area connected.

All new residential development must comply with the State Government's Building Sustainability Index (BASIX) which requires 40% reduction in potable water use per household through a combination of rainwater tanks, water efficient appliances, garden design or recycled water reuse.

2.7.4 Regional Approach to Water Management

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

The NOROC member Councils (including Tweed) have identified the need for a cooperative approach and innovative resource sharing initiatives to ensuring long-term future water demands will be met. The NOROC Water Managers Group has developed a Memorandum of Understanding (MOU) to provide a foundation for developing a voluntary, cooperative partnership between the member Councils to deliver best-practice water supply and sewerage services to the Northern Rivers region of New South Wales and to optimise shared resources (staff, equipment, materials, specialist knowledge and capabilities).

Objectives of this MOU are:

- Development of a regional water supply strategy incorporating integrated water cycle management criteria, based on a 50-year planning horizon - a Bulk Water Supply Strategy (BWSS) for the Northern Rivers Region is currently being prepared by NOROC. The outcomes of this strategy will be considered by TSC in planning for water supply security;
- Development of a regional drinking water quality management plan incorporating an implementation strategy – TSC is preparing its drinking water quality management plan independently of the other NOROC member councils;
- Development of a regional approach to water supply demand management – not yet commenced apart from the initiatives of Rous Water and its member Councils;
- Development of agreed protocols and processes for the effective sharing of resources recognising the opportunistic nature of resource sharing – not yet commenced;
- Development of a regional best-practice pricing strategy – not yet commenced; and

- Development of operational objectives and methodologies for benchmarking across the region and across regional water utilities in NSW and across Australia – not yet commenced.

The common objectives of the group were agreed as follows:

- Water security and water quality;
- Regional integrated water cycle management and water resource sharing;
- Demand management;
- Resource sharing – expertise; training; specialist staff; specialist equipment; staff retention; career development;
- Financial capacity and sustainability;
- Managing growth and development;
- Joint lobby / access to funding;
- Funding options;
- Centres of excellence;
- Regional pricing setting parameters;
- Benchmarking / performance indicators;
- Joint standards; and
- Government compliance / performance reporting.

2.8 Wastewater Management

2.8.1 Council Wastewater Systems

The main population centres in the Tweed Shire each have conventional gravity reticulated wastewater systems, with some low pressure pump systems used in some areas. The wastewater systems are described in Table 8 and illustrated in Figure 11.

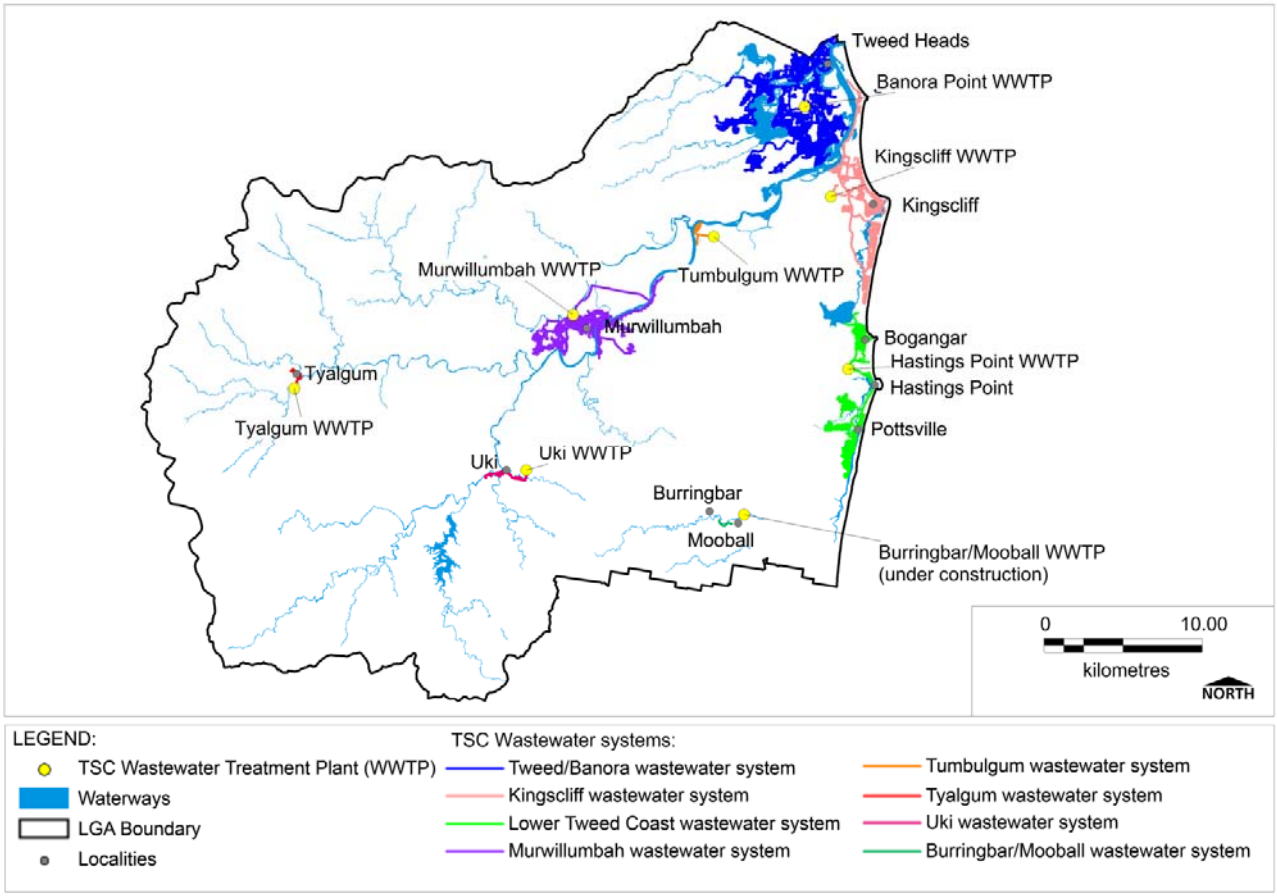

Figure 11: Tweed Shire Council Wastewater Management Systems

2.8.2 Private Wastewater Systems

The On-site Sewage Management (OSSM) Strategy details Council's approach to the supervision of sewage management systems in the Tweed Shire (TSC, undated a). There are approximately 6,000 properties not connected to a town sewerage system within the Tweed Shire. These properties rely on on-site sewerage systems including septic tanks, aerated wastewater treatment systems, waterless composting toilets and greywater systems.

Table 8: Existing Council Wastewater Management Systems

System	Areas Serviced	WWTP capacity (EP)	Treatment Process	Effluent Management	EPA Licensed Discharge (ML/d)	2011/12 STP Inflows	
						Average Dry Weather Flow (ML/d)	Peak Wet Weather Flow (ML/d)
Tweed Heads	Currently decommissioned but Council has approval to redevelop to 10,000 EP if and when required.	-	-	-	-	-	-
Banora Point	Tweed heads, Cobaki Lakes, Bilambil Heights, Banora Point, and Terranora.	62,500[1]	5-stage Bardenpho process with tertiary filtration	Irrigation of golf course and planned for sports fields. Tertiary treated wastewater discharged to Terranora Inlet.	75	11.1	67.5
Kingscliff	Kingscliff, Fingal Head, Salt, Casuarina and Kings Forest	25,000	Chemically enhanced biological nutrient removal (CEBNR) process	Irrigation of Chinderah Golf course and used on site. Tertiary treated wastewater discharged into the Tweed River.	24	2.6	5.5
Hastings Point	Tanglewood, Bogangar, Cabarita Beach, Hastings Point Pottsville, Koala Beach and Seabreeze.	16,000	Activated sludge process with phosphorus removal, intermittently decanting extended aeration tanks (IDEAT), deodorisation, tertiary filtration	Tertiary treated wastewater discharged to an exfiltration zone in the beach dunes east of the plant.	12.96	2.45	8.2
Murwillumbah	Condong, Murwillumbah, South Murwillumbah, Bray Park	16,000	IDEAT, phosphorus removal, pH correction, UV disinfection, deodorisation, tertiary filtration.	Reuse at Condong Sugar Mill in cooling towers. Tertiary treated wastewater discharged into Rous River.	14	3.19	25.7
Tumbulgum	Tumbulgum	700	Activated sludge process with phosphorus removal, UV disinfection.	Tertiary treated wastewater discharged into Tweed River.	0.756	0.087	0.3

System	Areas Serviced	WWTP capacity (EP)	Treatment Process	Effluent Management	EPA Licensed Discharge (ML/d)	2011/12 STP Inflows	
						Average Dry Weather Flow (ML/d)	Peak Wet Weather Flow (ML/d)
Tyalgum	Tyalgum	500	Continuous activated sludge process.	Wastewater is treated to secondary standards and discharged via on-site pasture irrigation.	0.48	0.06	0.5
Uki	Uki	600	Continuous activated sludge process	100% of dry weather flows reused to irrigate Koala food trees grown for Currumbin Sanctuary	0.7	0.046	0.06
Burringbar Mooball	Burringbar, Mooball	750[3]		A number of reuse options for irrigation have been identified.	n/a	0.135[2]	n/a

[1]Capacity in 2011/12 (TSC performance indicators report, 2012). Banora Point WWTP has been designed to be upgraded in stage s to keep pace with development. Following completion of Stage 2 upgrade at Banora Point WWTP, the plant has a capacity of 75,000 EP. Stage 3 will provide capacity to serve 125,000 EP (GHD, 2005)

[3] Design parameters provided by TSC as the WWTP is not yet operational

2.9 Urban Stormwater

Tweed Shire urban areas are serviced by stormwater drainage assets, which aim to prevent flooding by conveying stormwater to receiving waterways. Some stormwater assets also aim to provide treatment of stormwater to improve the quality of discharges. The TSC Drainage Assets Management Plan (TSC, 2010b) describes the different asset types as follows:

- Underground Drain:
    - Pipes – located underground within the roadway or nature strip generally range in size from 225 mm in diameter to greater than 1,200 mm in diameter;
    - Pits - provide points of entry for stormwater from the above ground drainage system to the underground drainage system;
    - Pumping stations provide for situations where the stormwater in parts of the underground drainage system cannot flow freely by gravity to the receiving waterways. Pumping stations are also used to increase the rate of stormwater discharge to receiving waterways during significant storm events or when the receiving waterways (being the local creeks) break their banks, thereby minimising incidences of flooding;
- Above Ground Drain:
    - Open channels (such as kerb and channel, spoon drains and swale drains) acts as a drainage channel, directing stormwater road surface flows into the underground stormwater drainage network via drainage pits;
    - Retarding basins are constructed to provide temporary stormwater storage and thus ease stormwater runoff peaks that are generated by significant storm events for flood protection of downstream urban areas. Retarding basins can also provide additional purposes such as water quality treatment and landscape amenity;
- Water Quality Devices:
    - Gross Pollutant Traps (GPT) capture litter and other rubbish left in the streets that can be washed down stormwater drains prior to entering the receiving waterways;
    - Wetlands are an area that is regularly wet or flooded and has a water table that stands at or above the land surface for at least part of the year; and
    - Sedimentation ponds are constructed to provide for treating stormwater prior to its disposal into receiving waterways.

Table 9: Tweed Shire Council drainage assets

Drainage Asset Type	Quantity
Stormwater Pipes	316,467 m
Stormwater Nodes	15,379
Stormwater Culverts	238
Stormwater Channels	32,013 m
Flood Gates	209

Source: TSC (2010c)

TSC recognises that many waterways in the Tweed are currently under stress as a result of historical urban development without due consideration to stormwater impacts on receiving environments (Australian Wetlands, 2012). In more recent years there have been a range of stormwater treatment devices installed throughout the Tweed to address hotspots within existing urban areas. These include:

- Gross pollutant traps – e.g. Ukerebagh Passage;
- Gross pollution interceptor, sediment basin and artificial wetland – e.g. Duffy St Drain;
- Constructed wetland – e.g. Knox Park;
- CDS unit – e.g. Kingscliff East;
- Stormwater treatment device- e.g. Cabarita Beach outfall; and
- Sediment pond – e.g. Koala Beach Estate.

3. IWCM FRAMEWORK

3.1 Current IWCM Strategy

3.1.1 2006 IWCM Strategy

TSC commenced the IWCM process in 2004. The critical drivers at that time were:

- Uncertainty about the ability of existing surface water sources to adequately service future populations - driven by a number of factors including predicted ongoing high population growth rates, a reduction in the estimate of safe yield of its water supply sources and the possibility of a reduced entitlement to water in the future (as a result of the proposed water sharing plan process);
- The impacts of urban stormwater on the Lower Tweed River estuary - driven by high population growth, high urban runoff rates and the minimal use of stormwater quality improvement devices;
- The impacts of effluent on the Lower Tweed River estuary - driven by high population growth, low effluent reuse and effluent from the four major wastewater treatment plants (WWTPs) discharging directly into the Lower Tweed River estuary; and
- The impacts of agricultural runoff on the upper Tweed River and Bray Park Weir - driven by the high proportion of agricultural land in the catchment, past land management practices that led to loss of vegetation (including riparian vegetation) and past and existing agricultural practices.

To manage the above issues, Council committed to an IWCM process involving the integrated management of the water supply, sewerage and stormwater services within a whole of catchment strategic framework. The objectives of the (Hunter Water Australia, 2006) were to:

- Develop guiding principles and objectives for urban water services that are consistent with the broader catchment and triple bottom line requirement;
- Evaluate and short-list IWCM options for water service delivery that address these objectives and requirements;
- Provide a forum for community and other stakeholder involvement in the ongoing development of an IWCM strategy for urban water services;
- Provide the strategic framework for the future development of the urban water services; and
- Deliver sustainable urban water services within a sound business planning context.

3.1.2 Interim IWCM Strategy Reviews in 2009 and 2011

Following adoption of the IWCM Strategy in 2006, progress was monitored and strategy actions were revised to enable ongoing implementation. The progress of the IWCM Strategy was reported to Council in 2009 and 2011 and the strategy actions were revised at each stage with the current set of 18 actions adopted by Council in February 2011. Further information on each initiative is included in the Background Paper (Appendix 1). Many of the actions have been completed or substantially progressed.

3.2 Development of this IWCM Strategy

This IWCM Strategy has been developed through a structured process consisting of:

- Review and update of the drivers for IWCM in the Tweed (as documented in the 2006 IWCM Strategy and summarised in Section 3.1.1);

- Incorporation of community objectives and priorities (Section 3.3.1);
- Identification of stakeholder values that help define the future direction for IWCM in the Tweed (Section 3.3.2);
- Development of IWCM management objectives which incorporate the community objectives and stakeholder values (Section 3.3.3). and which can be used to guide the development of management options;
- Identification of IWCM targets - urban water service targets, legal obligations and agreed levels of service identified in the Background Paper (Appendix 1) and summarised in Section 3.4;
- Identification of IWCM issues - defined by non-compliance with IWCM targets or non-achievement of management objectives (refer Section 3.5); and
- Development of management options to address the IWCM issues (Section 4) and IWCM scenarios (bundles of management options) with varying resourcing and funding requirements to achieve the IWCM management objectives (Section 5).

3.3 IWCM Values and Objectives

3.3.1 Community Strategic Objectives

While the key drivers for IWCM have not significantly changed since Council commenced the IWCM process in 2004 (refer Section 3.1), the community and Council have expressed a desire for an IWCM approach that is broader than the original urban water focus. Community objectives such as protecting biodiversity and water management are highlighted in the Community Strategic Plan 2011/21 (TSC, 2011a) as the Tweed region deals with increasing population and the need to preserve the natural environment. The relevant priorities identified in the Community Strategic Plan 2011/21 are:

- Making decisions based on sustainability;
- Pursuing sustainable population;
- Undertaking effective and transparent consultation;
- Responding to community input; and
- Providing high quality services and maintaining assets.
- Protecting biodiversity / natural attributes;
- Enhancing water management;
- Promoting sustainable development; and
- Encouraging sustainable housing / urban design

The desire for implementation of a total water cycle approach is driven by population growth, environmental impacts, community values, climate change and the increased consideration of stormwater and wastewater as a resource. This approach recognises that all elements of the water cycle are interdependent and all aspects of land use and infrastructure planning should be integrated with the water cycle considerations.

In developing its IWCM Strategy, the key challenges that Council faces are:

- Identifying the issues that have the greatest impact on Council and the community;
- Finding cost effective ways to deal with the issues;

- Assigning priorities, given the different perspectives and perceptions of the issues and competing demands for funds in an environment where costs need to be fully justified to a broad spectrum of interest groups;
- Ensuring continuity of business through changing circumstances such as climate change; and
- Increasing regulatory requirements.

3.3.2 Values Identified through Stakeholder Consultation

Consultation activities undertaken as part of this IWCM Review built on the activities already undertaken by Council as part of the IWCM implementation actions. The objectives were to engage the wider community in the IWCM review and establish the community priorities for water cycle management. The community engagement activities focused on:

- Provision of information on the current status of the IWCM Strategy and the issues to be addressed in the IWCM review (the Background Paper, Appendix 1). 28 submissions from government agencies, community groups and individual community members were received;
- A community survey (random telephone survey of 616 adult residents during November 2012 and a parallel on-line and paper survey with 441 valid surveys received); and
- Promotion of the project and engagement activities to the wider community and interest groups.

A detailed description of the stakeholder consultation activities and outcomes is included in Appendix 2. The feedback from the community and other stakeholders has been used to develop water cycle management objectives and priorities as discussed below.

The mechanisms used to establish current stakeholder values and priorities were the telephone survey, the online/hard copy survey and the written submissions. The selection of residents for the telephone survey was entirely random, other than ensuring an adequate representation across each of three geographic areas within the Tweed Shire. Random sampling error (RSE) for a survey of 616 households is +/- 3.9 % at the 95 % confidence level. Effectively this means that were the same random survey to be conducted 20 times, results should be representative of the overall adult Tweed Shire population to within +/- 3.9 % in 19 of those 20 surveys. Although, the online survey and written submissions cannot necessarily be used to make reliable inferences about the overall population of the Tweed Shire due to the self-selecting nature of the responses, they are a useful snapshot of community opinion and reflect the views of those who chose to participate in the survey. Further detail is provided in Appendix 2.

The key findings of the consultation process are:

- Council should implement a balanced approach to reducing water usage and increasing water availability. However there is significant support for continuation of demand management initiatives;
- A continuous supply of drinking water is a priority but also important to the community are maximising stormwater and wastewater re-use, maintaining the natural environment in river and catchment areas and encouraging households to reduce their water consumption;
- Maintaining clean water in the Tweed River system is a high priority;
- Council should be most supportive of protection of the water supply, followed by natural habitat and water quality protection and improving the quality of treated wastewater/urban stormwater runoff;
- There is no clear mandate on a preferred approach to augmenting future water supply with the community evenly divided between four suggested approaches (more household rebates for water saving devices, construction of another drinking water supply, greater use of recycled water and behavioural change/further education). Approximately half the community supports the use of alternative water sources (rainwater tanks, stormwater reuse and treated wastewater); and

- The responsibility for maintaining the health of rivers should be shared by all ratepayers.

The written submissions identified the need for a review of the key assumptions of the IWCM strategy including population projections, demand forecasts and the impacts of climate change. Many respondents were supportive of the implementation of integrated water management solutions and the need for increased inter-departmental cooperation within Council.

A contentious issue within the community is the approach to future water supplies and whether that should be met by a new potable water source, demand management or source substitution. The results of this current consultation process suggest the community is divided about this issue with some survey respondents identifying the need for a new dam and some stating their opposition to a new dam.

3.3.3 IWCM Management Objectives

Based on the community strategic objectives and the stakeholder values, the key management objectives for IWCM in Tweed Shire are:

- Implementation of a Total Water Cycle Management (TWCM) approach through better integration of urban water supply, wastewater, stormwater and catchment management activities;
- Identification and incorporation of community priorities;
- Provision of mechanisms for integration between the activities of the Council units that have relevance to water cycle management; and
- Compliance with the NSW Office of Water best-practice guidelines (DWE, 2007) as a minimum.

3.4 IWCM Targets

The IWCM process is about addressing water cycle management problems. The issues are defined by non-compliance with urban water service targets, both legal obligations and agreed levels of service or non-achievement of water cycle management objectives.

All councils have targets which relate to legislation, contracts, standards and agreed levels of service. Some targets relate to regulatory requirements (for example water extraction, water processing, water discharge and waste disposal) and cannot be varied. These targets are mandatory and non-compliances are therefore described as IWCM issues. For the purposes of this IWCM review, targets also include formal guidelines and objectives which Council intends to meet.

The targets and objectives that are relevant to this IWCM Review are discussed in the Background Paper (Appendix 1) and summarised in the following table.

Table 10: IWCM Targets

Source	Target	Summary of Objectives Related to IWCM
Council's Integrated Planning and Reporting Framework	Community Strategic Plan (CSP)	Identifies the long-term aspirations of the community, key directions, outcomes and key result areas
	Delivery Program	Interprets the long-term strategic plan into 4 year strategic actions
	Operational Plan	Annual Operational Plan for the budget year
	Resourcing Strategy	Includes the Financial Plan, Workforce Management Plan and Asset Management Strategy (TSC, 2011b)
	State of the Environment Report	Identifies pressures, responses and priorities for the Tweed Shire environment and natural resources.

Source	Target	Summary of Objectives Related to IWCM
Legislation	*Local Government Act, 1993*, and *Local Government (General) Regulation 2005*	Best-practice management, on-site sewage management, regulation of private sewer systems, pricing.
	Local Government (Water Services) Regulation,1999	Water restrictions, trade waste.
	Public Health Act, 2010	Framework for Management of Drinking Water Quality (Australian Drinking Water Guidelines)
	Protection of the Environment Operations (POEO) Act, 1997	Environmental Protection Licences (refer below).
	Water Management Act, 2000	Water Sharing Plans and Water Access Licences and Developer Charges.
	Catchment Management Authorities Act, 2003	Northern Rivers Catchment Action Plan objectives.
	Environmental Planning and Assessment (EP&A) Act, 1979	Environmental impact assessment and planning and relevant planning instruments.
	Occupational Health and Safety Act 2000 and Rehabilitation Act 1987	Provision of safe working environment.
	Independent Pricing and Regulatory Tribunal (IPART) Act, 1992	Determination and advice on prices and pricing policy for government monopoly services.
	Competition Policy including Competition Policy Reform Act, 1995	Prohibition on anti-competitive behaviour.
	Water Industry Competition Act, 2006	Encourage competition in the water industry and to foster innovative recycling projects and dynamic efficiency in the provision of water and wastewater services.
Environmental Planning Instruments	*SEPP Building Sustainability Index (BASIX), 2004*	BASIX was mandatory for regional NSW from 2005/06.
	State and Regional Development SEPP, 2011	The system establishes two separate assessment frameworks for State Significant Development (SSD) and State Significant Infrastructure (SSI). Projects that fall within these categories will be assessed by the Department of Planning and Infrastructure and determined by the Minister, the Planning Assessment Commission or senior departmental staff. The SSD assessment system has been established to guide planning decisions on: • Large-scale industrial, resource and other proposals in 24 different development classes; or • Development in precincts identified as important for the State by the NSW Government. The SSI assessment system has been established to allow planning decisions on major infrastructure proposals, in particular linear infrastructure (such as roads, railway lines or pipes which often cross a number of council boundaries) or development which doesn't require consent but which could have a significant environmental impact (such as a port facility).

Source	Target	Summary of Objectives Related to IWCM
	SEPP Infrastructure, 2007	Provides a consistent planning regime for infrastructure and the provision of services across NSW, along with providing for consultation with relevant public authorities during the assessment process.
	SEPP Coastal Protection	Development in the NSW coastal zone is appropriate and suitably located.
	North Coast REP, deemed SEPP (1988)	This plan covers all of the North Coast LGAs. It identifies environmental features that are important to the region and provides a basis for new urban and rural development.
	Tweed LEP	Tweed LEP 2000 currently zones a range of areas for various urban land uses. It provides the main statutory basis for future development and is the statutory instrument that has been used to implement the existing Residential Development Strategy, 1992 (through the rezoning process). It sets the basis for the existing stock of zoned and developed or undeveloped land that needs to be considered in assessing the long-term requirements for urban land in Tweed Shire.
	Tweed DCP	DCPs indicate to developers what level of detail is required with certain types of applications and what standards are sought with the design of certain developments.
Water Sharing Plans and Licences	*Water Sharing Plan Tweed River Area Unregulated and Alluvial Water Sources*	Rules for sharing water.
Environment Protection Licences (under POEO Act)	Banora Point WWTP	TSC is required to comply with load limits and concentration and volume limits are specified for the effluent quality monitoring point. The STP licences also require TSC to monitor and record pollution complaints, STP bypasses, biosolids and sewer overflows to the environment.
	Hastings Point WWTP	
	Kingscliff WWTP	
	Murwillumbah WWTP	
	Tumbulgum WWTP	
	Tweed Heads WWTP	
	Tyalgum WWTP	
	Uki WWTP	
Water Supply and Wastewater Activity Management Plans	Demonstrates the link between the community's needs, the agreed levels of service and management of the services.	
Water and Sewerage Levels of Service	Define the standards required from the water and wastewater systems.	

Source	Target	Summary of Objectives Related to IWCM
National Water Initiative and Best-Practice Management	The NWI provides objectives, outcomes and agreed actions to be undertaken by state and local governments across all aspects of water management. TSC is required to demonstrate compliance with the NWI by encouraging best-practice through effective, efficient and sustainable water supply and wastewater businesses. Substantial compliance with the Best-Practice Guidelines is also a pre-requisite for State Government financial assistance towards the capital cost of backlog water supply and wastewater infrastructure and for payment of a dividend from the surplus of the water supply or wastewater business to the council's general revenue. Compliance with the Best-Practice Management Guidelines is also a requirement of the Division of Local Government's Planning and Reporting Manual.	
Northern Rivers Catchment Action Plan (CAP)	The CAP outlines targets that are aimed at improving and protecting natural assets, such as water, soil, native vegetation, cultural heritage, biodiversity, and the adjoining assets in the coastal and marine environment. The CAP also has a variety of targets relating to water management, some of which include water supply and waste water management, water conservation management, water quality management and water sharing. The CAP also promotes the value of people and communities in the catchment.	
Recycled Water Agreements	Council has agreements with Currumbin Wildlife Sanctuary, Tweed Golf Course and Chinderah Golf Course for supply of recycled water.	
Guidelines, Standards and Codes	*Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (2006)*	Adopt a risk management approach to managing risks to human health and the environment from recycling of water from greywater and treated sewage.
	National Water Quality Management Strategy - Guidelines for Sewerage Systems - Use of Reclaimed Water (2000)	Provide advice on reclaimed water quality, level of treatment, safeguards and controls and monitoring.
	NSW Interim Guidelines for Management of Private Recycle Schemes (2008)	Provides advice, for obtaining approval to install and operate a private recycled water scheme.
	NSW Guidelines for Greywater Reuse in Sewered, Single Household Residential Premises (2008)	Guidelines for approval of greywater treatment systems in accordance with Item C6, Section 68, *Local Government Act, 1993.*
	Environmental Guidelines: Use of Effluent by Irrigation (DECC, 2004)	Guidelines for use of treated effluent in landscape watering, irrigation of pasture, crops, orchards, vineyards, plantation forests or rehabilitated sites and irrigation of golf courses, racecourses and other recreation grounds.
	Environmental Guidelines: Use and Disposal of Biosolids Products (EPA, 2000)	Guidelines related to the beneficial use and disposal of biosolids.
	Environment and Health Protection Guidelines: Onsite Sewage Management for Single Households (known as the 'Silver Book'), 1998	Guidelines to assist with the assessment, regulation and management of single household on-site sewage management systems.
On-site Sewage Management (OSSM) Policy	Promotes sustainable on-site sewage management and to guide landholders or developers towards best-practice.	

3.5 IWCM Issues

The review of the adopted IWCM Strategy identified current and emerging issues and determined if the existing direction is adequate to address these issues. Based on the review of the current IWCM strategy, the progress of the actions and data collected as part of this IWCM review, a current set of IWCM issues has been developed.

In particular, this IWCM review considered Council's strategic aim to provide a broader whole-of-catchment management approach. This differs from the adopted 2006 IWCM Strategy which focussed on and successfully implemented urban water cycle actions (particularly water and wastewater services) which were largely supported by staff and resources from Council's Water Unit.

The Background Paper (Appendix 1) identified a broad spread of IWCM issues to be addressed as part of this IWCM Strategy. A number of the issues are related to Council's desire to pursue greater integration of water cycle management responsibilities and cross-divisional cooperation. It is worth noting, these issues would not have been identified in a traditional (urban only) IWCM approach but are underlying factors that logically influence Council's approach to water management. Some of the issues also relate to future or emerging issues such as climate change and increasing regulation where information has become more available since previous IWCM reviews were undertaken.

The current issues identified as part of this review are presented in the broad categories of:

- Administration and Governance;
- Urban Town Water Supply;
- Urban Wastewater Management;
- Urban Stormwater Management; and
- Catchment Management.

The Background Paper in Appendix 1 provides detailed explanation of these issues.

3.5.1 Administration and Governance

Issue 1: IWCM principles, responsibilities and priorities are not fully implemented across all Council units – The current IWCM Strategy largely follows the traditional IWCM approach which is based on delivery of integrated urban water services by a local water utility. While Council has already implemented some improvements in integration and inter-departmental cooperation, increased integration may lead to increased opportunities for gains in efficiency and/or better IWCM outcomes.

Issue 2: There is a need for informed and transparent decision-making and better management of community expectations - Council does not have unlimited resources to meet the demand for infrastructure and services as well as address all community desires for prosperity and environment protection. This highlights the need for informed and transparent decision-making as well as effective communication with the community in order for rate payers to have faith in the decision-making process. Given the finite level of Council resources and the capital-intensive nature of urban water services, Council needs to provide leadership and justification for its decisions based on the best available information.

Issue 3: There is a need for defendable and robust population forecasts - Population forecasts are inherently difficult as they rely on assumptions regarding demand for land sales, the capacity of urban release areas, community preferences for settlement, the future types of housing and the planning approvals process. The 2011 census data indicate that there is a lower rate of population growth than was assumed in the current

IWCM Strategy. If this lower growth rate continues, there could be implications for the selection and timing of water and wastewater infrastructure.

Issue 4: Uncertainty regarding the preferred Tweed district water supply augmentation option creates confusion regarding land use planning **–** Council has been progressively purchasing land to cater for the inundation areas (and buffer zones) of the proposed Byrrill Creek Dam and potential raising of Clarrie Hall Dam. The absence of a firm direction regarding the future water supply is likely to cause anxiety amongst affected land holders as well as difficulties implementing land use planning and development controls.

Issue 5: The implications of private industry involvement in town water supply and wastewater management are unclear, particularly with regard to regulation and Council responsibilities - *The Water Industry Competition (WIC) Act, 2006* allows private utility operators to develop and operate water and wastewater schemes under licence from the Independent Pricing and Regulatory Tribunal (IPART). Council's role and responsibilities regarding private schemes are unclear. In addition, there is a need to ensure the private schemes implement Council's IWCM objectives.

Issue 6: Asset management planning - The current IWCM Strategy includes an action to implement the water supply and sewerage asset management plans. Whilst these plans were prepared in 2010, implementation is an ongoing process and there is a need to continuously improve asset management planning.

Issue 7: Climate change implications need to be integrated into planning for urban water services, catchment management and natural resource management - Future sea level rise and climate variations will affect water cycle management infrastructure and activities. This impact needs to be considered in future water supply and wastewater planning, demand management and risk management.

Issue 8: High energy consumption and greenhouse gas emissions – Council's water supply and wastewater infrastructure consumes high levels of energy, which is currently sourced from non-renewable sources. There are opportunities to reduce energy consumption and greenhouse gas emissions and develop energy and greenhouse gas emission targets.

Issue 9: Best-Practice Compliance - While Council currently substantially complies with the NSW government best-practice requirements, the Strategic Business Plans and Development Servicing Plans require regular review to remain compliant. In addition, water usage patterns for existing multi-residential properties needs to be better understood.

Issue 10: Improved data collection and reporting procedures would facilitate adaptive forecasting of demand and assist with community education - The demand management implementation plan is focussed around a campaign of target residential demand per person but current reporting of performance has created some confusion and inconsistencies. In addition, Council has implemented a new customer management system with revised data and reporting requirements and until staff members become familiar with the new system, retrieval of accurate data relating to customer types and water demand will be problematic. Despite this, the current targets for residential demand are considered to be achievable.

3.5.2 Urban Town Water Supply

Issue 11: There is currently no mechanism to promote retrofit of rain water tanks or installation of large rainwater tanks in new development - Council's policy for rainwater tanks in urban areas encourages the installation of rainwater tanks to provide non-potable water for outdoor uses, flushing toilets and washing machines. However there is no incentive to install tanks larger than required by BASIX or to retrofit existing properties. Continuing and expanding the existing rebate program and introduction of innovative education and incentive programs are well supported by the community but will require significant additional investment.

Issue 12: Council's 2013 target for non-revenue water was not achieved - Council's target of 10% non-revenue water (NRW) by 2013 was not achieved - 5 year average is 13.7%. However it is expected that the implementation of projects to reduce leakage and unauthorised use of standpipes will reduce the level of NRW over time. These "real losses" represent a wasted resource, reduce the effective capacity of a water supply system and may result in unnecessary operating costs, and so a long-term water loss reduction program needs to be developed and included in Council budgets.

Issue 13: Augmentation of the Tweed District Water Supply will be required in future due to population growth although the timing and additional supply required are unclear – Data on current population growth rates suggest that augmentation of the Tweed district water supply will not be required until approximately 2030 and possibly beyond that time frame. However there are uncertainties regarding future population and demand as well as climate change implications and secure yield, and it is important to continually review available data to optimise the timing of the significant investment that will be required.

Issue 14: The drinking water catchments are impacted by current and historical land use and development - The catchments for Clarrie Hall Dam and Bray Park Weir are impacted by historical and current agricultural land management practices as well as the impacts of on-site sewerage management systems. While treatment facilities at Bray Park and Tyalgum have been upgraded to provide additional treatment reliability, there are opportunities for improved catchment management activities to control pollution at the source including agricultural land management, urban stormwater quality improvements, riparian management, point source pollution controls, education and catchment development controls.

Issue 15: As a precaution the Uki WTP is shut down during dirty water events - The need for consideration of the adequacy of treatment facilities at Uki was raised in the 2011 review of the IWCM Strategy. However, the appropriate management actions (e.g. operational controls, WTP modifications or upgrade) have not yet been determined.

Issue 16: Drought contingency and water supply emergency management measures need to be further developed - Given the predicted delay until augmentation of the Tweed District water source is required, it is considered appropriate to reassess the water supply failure scenarios including normal, restricted and emergency demand requirements. This assessment should consider the impacts of water sharing plan rules, potential fish passage requirements, proposed catchment management measures and effectiveness of the upgraded Bray Park WTP. Feasible contingency measures to cater for emergency scenarios (e.g. drought, infrastructure failure, raw water contamination) will also need to be developed.

3.5.3 Urban Wastewater Management

Issue 17: The opportunities for development (urban expansion) outside of the wastewater service areas is limited by the capacity of Council's infrastructure and the environment - Estuary management planning in the Tweed has identified issues relating to the impacts of wastewater discharges and urban runoff and the nutrient assimilation capacity of the waterways. The sustainable servicing of new development areas will require consideration of the sensitivity of the receiving waterways, increasing regulations, treatment requirements and costs as well as the development of policies to translate the IWCM objectives into development controls.

Issue 18: Licence requirements for pH and suspended solids at Uki WWTP need to be reviewed - As all effluent is used for irrigation of a koala feed tree eucalyptus plantation, high levels of suspended solids and pH in the irrigation dam are not a concern from an environmental protection point of view. However the environment protection licence requirements are mandatory targets and liaison with the NSW EPA is required to establish more appropriate targets for this situation.

Issue 19: Council and the community have a desire for increased water recycling but there are significant barriers to implementation of recycled water schemes within the Tweed Shire - Council has a target for 15%

of treated effluent to be reused by 2013, however, this timeframe has not been met, with between 5% and 9% of wastewater currently being recycled. Increasing regulations, treatment requirements and cost associated with use of recycled water contribute to this issue. With the current Council direction and policy relating to recycled water use, the initiative to implement recycling is left to the developer which provides little incentive for recycling. Nonetheless, future planning and assessment of recycled water schemes must weigh up the high cost to the community.

Issue 20: There is a high cost of sustainable biosolids management - The challenges with biosolids management include the high cost and energy consumption of treatment options for beneficial reuse, odour impacts, potential changes to auditing and regulation requirements and land availability for storage and treatment. There are potential synergies between biosolids reuse and Council's Agriculture Strategy and increased integration between these strategic planning processes may provide additional benefits for farm management as well as wastewater management.

3.5.4 Urban Stormwater Management

Issue 21: Increased emphasis on water sensitive urban design will require more integrated Council responsibilities, increased community education and increased staff capabilities and funding - The draft *Tweed Urban Stormwater Quality Management Plan* (Australian Wetlands, 2011) has a strong emphasis on achieving water quality objectives for downstream waterways. The Plan refers to guidelines, resources and tools that should be used to implement best-practice stormwater management, many of which have been developed by the Water By Design program for the South East Queensland Health Waterways Partnership. Implementation of the WSUD framework will require significant strategic planning, community education and additional resources to be effective.

Issue 22: Existing Council development controls do not fully address the residual load of urban stormwater on downstream sensitive waterways - For some developments, existing Council development controls (e.g. D7) can be satisfied through design of stormwater pollutant reduction systems yet residual loads may be detrimental to downstream sensitive waterways. In these cases, compensatory activities to offset residual and cumulative impacts of stormwater discharge into waterways may be considered, however, guidelines and policy mechanisms are required to enforce offsets and address the residual impacts.

Issue 23: Existing subdivision erosion and stormwater controls and resources are not adequate for the rainfall and rate of development experienced in the Tweed - Resources for inspection and/or enforcement of Council's erosion and sediment control requirements for new developments are limited and Council relies on complaints or inspections to highlight inadequacies in control systems.

3.5.5 Catchment Management

Issue 24: There is a need for a holistic catchment management strategy for the Shire - There is currently no framework for coordinating catchment management activities across the Shire. Existing estuary management plans and coastal zone management plans for estuaries have been developed through the state government's planning process. While the more recently updated plans have acknowledged the upstream catchment areas as affecting the health of estuaries, the main focus is on the health of the estuarine reaches. If a total catchment approach to water cycle management is desired, there is a need to strengthen the linkages between existing catchment management, plans for estuary management, agricultural management and IWCM programs and activities.

Issue 25: There is limited integration between urban and rural strategic land use planning - There is a need to protect the agricultural values and limit encroachment and cumulative impacts of urban development on farming land. Integration of rural strategic planning with the urban area planning is required to achieve the aims of the IWCM Strategy.

Issue 26: The effective management of on-site sewerage systems within the Shire is limited by the available resources - Although there are some on-site sewerage (OSS) systems that are failing there is limited opportunity to cost-effectively connect to Council reticulated wastewater systems due to transfer costs and capacity limitations. Additional financial and human resources would be required to adequately regulate, inspect OSS and educate residents.

4. MANAGEMENT OPTIONS

Potential options to address the identified management issues are described in the following sections. These have been presented as:

- Current Strategy – adopted by TSC as part of the IWCM Strategy and 2009 and 2011 reviews; and
- Other Options which would assist in better achieving the IWCM objectives. In some cases, these have previously been identified by TSC but not yet implemented.

The options represent a varying level of water cycle management integration as follows:

- Level 1: The current strategy – ongoing strategic planning with progressive implementation of high priority actions. Funding for these actions has already been allocated by Council;
- Level 2: Urban water cycle management improvements - Increased urban water cycle integration to resolve current issues and address urban water related objectives. Achieves full compliance with NSW Office of Water best-practice guidelines; or
- Level 3: Total water cycle management approach - Full achievement of all identified objectives over the long-term. Achieves full compliance with NSW Office of Water best-practice guidelines with increased focus on total water cycle management.

For each management option in Level 2 and Level 3, the estimated ten year implementation cost (in current dollars) is also provided.

4.1 Administration and Governance

4.1.1 Integration of Council Water Cycle Management Activities

Issues to be addressed:

Issue 1: IWCM principles, responsibilities and priorities are not fully implemented across all Council units – The current IWCM Strategy largely follows the traditional IWCM approach which is based on delivery of integrated urban water services by a local water utility. While Council has already implemented some improvements in integration and inter-departmental cooperation, increased integration may lead to increased opportunities for gains in efficiency and/or better IWCM outcomes.

Current Strategy – Level 1

Management Option 1a – Urban Water Focus

Historically, water supply, wastewater, urban stormwater and natural resources have been managed by different parts of TSC and State Government regulators (e.g. Office of Environment and Heritage and Office of Water). This has created a departmentalised focus across government on the discrete parts of the water cycle. Due to the primarily urban water focus of the current IWCM Strategy, IWCM activities are currently implemented through the TSC water unit with input from other functional areas into key aspects such as this IWCM review.

The current structure and functions of Council, with the Community and Natural Resources directorate including the Water Unit and the Natural Resource Management Unit, allow direct coordination between some of these functional areas and activities. This in turn facilitates coordinated development of priorities for funding (for example, the dividends from the water supply and wastewater businesses are used to fund stream bank protection works, refer Section 4.5).

Since adoption of the current IWCM Strategy, TSC has been implementing opportunities for increased cooperation across TSC departments such as the IWCM Stakeholder Group and the new lateral roles of Demand Management Program Leader and Sustainability Program Leader. The adopted Demand Management Strategy also provides an opportunity to consider TSC activities in relation to water usage through the top water users program.

Other Potential Options – Level 2

No additional options have been identified as part of an urban water cycle management approach as this is TSC's current focus.

Other Potential Options – Level 3

A successful IWCM strategy requires a coordinated approach across Council with long-term support and clear responsibilities for implementation. The IWCM program creates an opportunity to implement a Council-wide total water cycle approach which is broader than the traditional urban water focus. Providing a more holistic management approach and a shared vision for the Shire would involve enhanced integration of the related TSC functions including:

- The Waterways Program (estuary and river health);
- Drinking water supply;
- Wastewater management;
- Stormwater management;
- Land use planning;
- Urban development;
- Economic development;
- Agricultural services; and
- Recreation Services.

TWCM approaches are discussed in Section 4.5. These approaches need to be supported by improved governance models for IWCM that will enhance IWCM outcomes and result in cost efficiencies as well as appropriate knowledge, recognition and continued support from TSC Councillors and senior management.

Management Option 1b – Integrated Council-Wide IWCM Delivery

Ten year implementation cost: $1,200,000 ($150,000 p.a. from year 3)

Integration of departmental actions is considered to be a key step that will improve the coordination and delivery of water cycle management services and the success of water cycle management initiatives. This may be achieved through a range of methods including departmental restructure or creation of a strategic IWCM framework managed through a new cross-departmental coordination role.

Structural integration of the water cycle management activities of the Planning and Regulation and Engineering and Operations directorates would strengthen linkages between the related water, wastewater, stormwater and ecosystem health aspects of land use planning and urban development and avoid duplication in planning and decision making. While it is beyond the scope of this IWCM Strategy to consider full Council restructure, if future restructuring is undertaken (for other reasons) then the need for IWCM integration should be taken into account.

It is suggested that integration could be achieved through the creation of a cross-departmental coordination position (the IWCM Program Leader). Figure 12 illustrates conceptually the broad role of the IWCM Program Leader with obligations spanning across most TSC functional areas.

The position would involve coordination of the planning and delivery of the various components of the IWCM Strategy, ensuring inclusion in Council's Delivery Plans, hands-on delivery of administrative and documentation tasks, assistance with the identification of external funding for related environmental and engineering works and would relieve the burden on existing staff for these tasks. This would preserve the functions and focus of the current structure and personnel roles, but would also achieve the desired integration to achieve effective TWCM.

Alternative delivery methods (such as steering committees) are a possibility but are unlikely to have the power to influence Council decision-making or prioritise funding and resources to implement the committee's goals. Without increased integration, history has shown that other functions and responsibilities are more likely to be prioritised and therefore TSC's performance in water cycle management is not likely to improve dramatically.

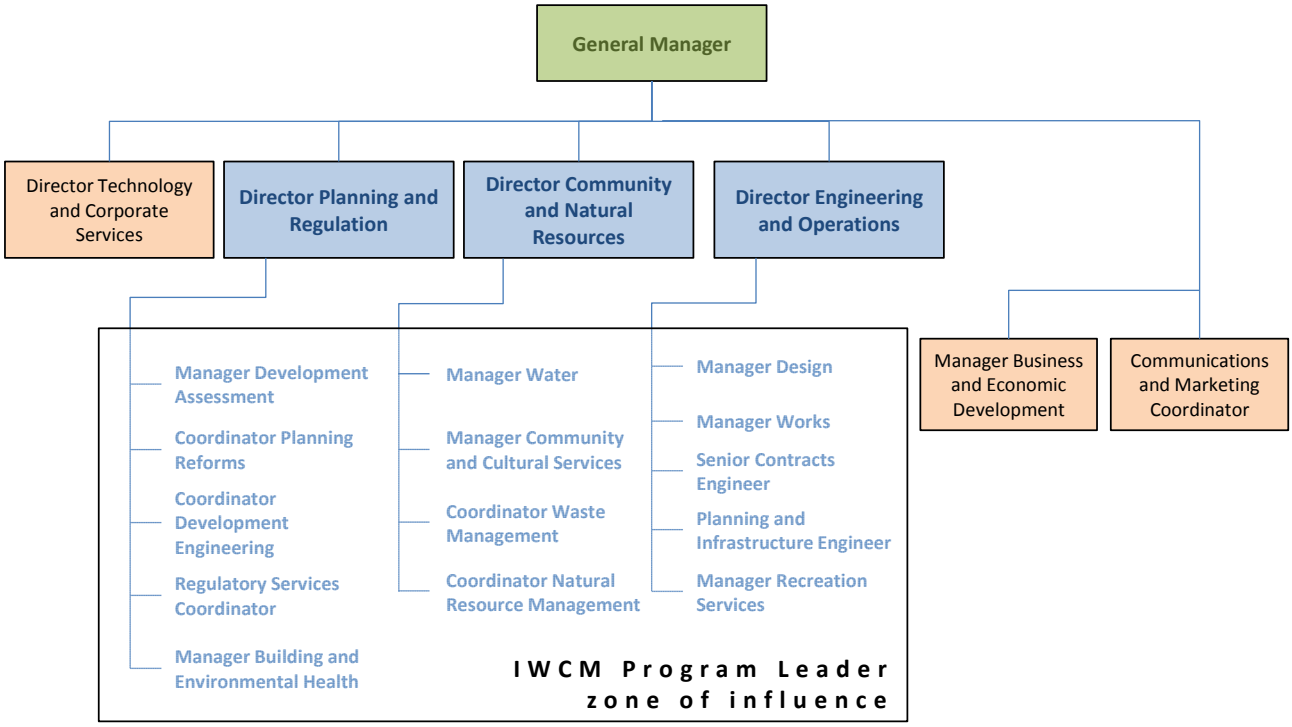

Figure 12: Integration of existing Council organisation structure and functions related to water cycle management

Over and above the resourcing issues, significant integration of IWCM objectives would be required across Council's activities to ensure successful implementation. The major components of the integration option would include:

- Integration into existing Council policy and monitoring, evaluation and reporting frameworks including the Integrated Planning and Reporting Frameworks and State of Environment Reporting to ensure a focus for decision making, accountability, rigour and continued improvement;
- Coordination of water cycle management activities, particularly IWCM Strategy actions and integration of those into the Community Strategic Plan and Council's four year Delivery Plan;
- Identification of funding requirements and opportunities to implement management initiatives as well as access to those funds;

- Improved direction and guidance for TSC staff and developers regarding water cycle management considerations for:
    - land use planning and land release strategies,
    - economic development,
    - development servicing,
    - asset management,
    - climate change adaptation, and
    - protection of ecosystem health (protected vegetation, habitat, waterway impacts);
- Community education and consultation;
- Monitoring and evaluation:
    - Strategy implementation;
    - Improvements and synergies;
    - Enforcing regulations, development conditions, and policies;
    - Closing the loop to inform future decisions; and
- Strategic planning and review.

The priority tasks are the implementation of the IWCM Strategy and integration with TSC's other related functional areas and strategic priorities.

4.1.2 Community Engagement

Issues to be addressed:

Issue 2: There is a need for informed and transparent decision-making and better management of community expectations - Council does not have unlimited resources to meet the demand for infrastructure and services as well as address all community desires for prosperity and environment protection. This highlights the need for informed and transparent decision-making as well as effective communication with the community in order for rate payers to have faith in the decision-making process. Given the finite level of Council resources and the capital-intensive nature of urban water services, Council needs to provide leadership and justification for its decisions based on the best available information.

Issue 4: Uncertainty regarding the preferred Tweed district water supply augmentation option creates confusion regarding land use planning – Council has been progressively purchasing land to cater for the inundation areas (and buffer zones) of the proposed Byrrill Creek Dam and potential raising of Clarrie Hall Dam. The absence of a firm direction regarding the future water supply is likely to cause anxiety amongst affected land holders as well as difficulties implementing land use planning and development controls.

Current Strategy – Level 1

Management Option 2a – Community engagement in IWCM decision-making

TSC's Community Engagement Strategy outlines the process for involving the Tweed community in TSC's strategic planning and decision-making processes. While Councillors as elected representatives are empowered to make decisions on behalf of the community, the strategy recognises the importance of community involvement in this decision-making and assisting TSC in making better informed decisions.

TSC has undertaken extensive community engagement as part of the development and ongoing implementation of IWCM Strategy components (refer Appendix 1). The regular reviews of the IWCM Strategy in 2009, 2011 and this major review, indicates a strong commitment to ongoing implementation, alignment with community values and continuous improvement of the adopted approach to IWCM. However, the wide range of competing community expectations is difficult to balance with the provision of value-for-money services. Despite the continued consultation and investigations, key decisions such as water supply augmentation have created considerable community angst, are not yet resolved and will continue to be contentious given the competing community desires.

The stakeholder consultation undertaken for the IWCM review has identified community priorities but also confirmed that the wide range of competing community expectations still exists.

Other Potential Options – Level 2

Management Option 2b – Strengthened community engagement process

Ten year implementation cost: $110,000 ($20,000 in year 1 then $10,000 p.a.)

Various community engagement tools have been used as part of the IWCM implementation including a Community Working Group (CWG) established with the aim of assisting TSC to select a preferred option from four shortlisted water supply augmentation options. While the CWG was a consultative body and TSC retained the authority for decision-making, feedback from the CWG suggested there were different expectations regarding their role. One of the desirable outcomes of the IWCM Strategy is community acceptance of the final adopted outcomes. While this is not always achievable given the range of competing community expectations, engagement processes should focus on ensuring ongoing provision of accurate and timely information, ongoing consultation to review and establish community values and transparent decision-making. Clear expectations also need to be given to the stakeholders regarding the decision-making process and the way their input will be used. The adopted decision also needs to be justified in terms of the process followed as well as technical factors influencing the decision. Similarly, any constraints to implementation (e.g. financial, human resources or pre-requisite actions) need to be clearly explained.

The consultation activities undertaken for this IWCM review have established community priorities and provided input into the future direction of the strategy. It is clear that the community is divided about key decisions such as water augmentation and dual reticulation and it is unlikely that a general consensus will be achieved. TSC should aim to ensure future engagement activities are focussed, transparent and appropriately considered. This could be achieved by a structured program of regular follow-up community surveys, targeted information-gathering, provision of accurate and timely information and community engagement tools that are focussed on the adopted strategy.

Other Potential Options – Level 3

Management Option 2c – Community engagement covering the full water cycle

Ten year implementation cost: $100,000 ($10,000 p.a.) in addition to Option 2b

Community engagement is also a key component of the total water cycle approach. TSC currently engages with the community on a regular basis as part of the delivery of different Council service areas including:

- Water Supply Services (e.g. water supply and water treatment education, demand management education programs, targeted consultation as part of IWCM development etc.);

- Wastewater Services (e.g. WWTP fact sheets, septic system information, Water Matters newsletters highlighting services and incentives offered by the TSC Water Unit and water and wastewater projects underway etc.); and
- Natural Resource Management (e.g. River Management educational resources, consultation and education as part of Estuary Management and Coastal Zone Management Plan development and implementation works, River Health Grants fact sheets, stormwater education programs etc.).

The aim of community engagement as part of total water cycle management is communicating the linkages between natural systems and land use practices and to better manage and influence key water cycle services for the communities and the environment. Engagement would be complimentary to existing TSC programs and focus on the interactions between the different service areas in Council and particularly the links between the urban water cycle and natural waterway health. Much of the content of community engagement programs will be governed by the total water cycle management framework discussed in Section 4.5.1 (Management Option 17g – Total water cycle management). However, general examples include the impacts of catchment management and land use on water supply and waterway health, water supply extraction impacts on environmental water requirements, wastewater and stormwater discharges affecting downstream waterways and aquatic habitats etc.

4.1.3 Data Collection and Review

Issues to be addressed:

Issue 3: There is a need for defendable and robust population forecasts - Population forecasts are inherently difficult as they rely on assumptions regarding demand for land sales, the capacity of urban release areas, community preferences for settlement, the future types of housing and the planning approvals process. The 2011 census data indicate that there is a lower rate of population growth than was assumed in the current IWCM Strategy. If this lower growth rate continues, there could be implications for the selection and timing of water and wastewater infrastructure.

Issue 10: Improved data collection and reporting procedures would facilitate adaptive forecasting of demand and assist with community education - The demand management implementation plan is focussed around a campaign of target residential demand per person but current reporting of performance has created some confusion and inconsistencies. In addition, Council has implemented a new customer management system with revised data and reporting requirements and until staff members become familiar with the new system, retrieval of accurate data relating to customer types and water demand will be problematic. Despite this, the current targets for residential demand are considered to be achievable.

Current Strategy – Level 1

Management Option 3a – Ongoing data collection and review

Data on the water supply and sewerage services are collated and reported annually by the Water Unit as part of TSC's regulatory reporting requirements. These data are used to benchmark TSC's services against the other NSW local water utilities.

Since the original IWCM Strategy was adopted, TSC has utilised external consultants (Forecast.ID) to provide population forecasts. The current forecast is based on a 30 year forecast based on 2006 Census data and partially updated using 2011 Census data. A revised projection based on 2011 Census data and revised development projections is expected to be completed during 2013 and will be a key input into the future IWCM process. Infrastructure planning is based on the available information regarding population growth and demand for services.

Monitoring of waterway health aspects is undertaken by the Natural Resources Management Unit of TSC as part of existing environmental management programs (refer Section 4.5).

Other Potential Options – Level 2

Management Option 3b – Improved collection and management of population and demand data

Ten year implementation cost: $260,000 ($50,000 in year 1 and 2 then $20,000 p.a.)

The challenge for TSC is to implement an IWCM Strategy that can be adapted to key drivers of change such as population growth whilst balancing competing factors of sustainability, financial control and community expectations.

A key data input into the IWCM process is the future population forecasts and resulting water cycle demands. The predicted demands of the future population will influence key decisions in relation to land use planning, water demand, water supplies and timing of augmentation, development servicing, financial management and debt servicing, sizing of infrastructure and the capacity of the environment to cater for growth.

The data used in the current IWCM Strategy (particularly population and water demand forecasts) are perceived by sections of the community to be out-dated and erroneous (refer Section 3.3.2 and Appendix 2). The original IWCM Strategy actions relied upon population forecasts updated every five years, making it difficult to adequately account for changes in development capacity, community preferences for settlement, the future types of housing and the planning approvals process or the impact of market forces.

It should be made clear to the community that accurate population forecasts are inherently difficult. The best way to counter these difficulties is through increased emphasis on data collection and more regular reviews. This would provide greater understanding of water cycle management issues and pressures and increased certainty in these key decision-making factors. As discussed later in Section 4.2.2, the immediate urgency in water supply augmentation appears to have diminished with lower than expected population growth. However increasing pressures such as climate change and population growth require that the short-term focus should be on improved understanding of these factors.

As part of this option, it is recommended that increased emphasis is placed on the collection and review of data including:

- Existing customer numbers and types (single and multi-residential, non-residential, etc.) within the water supply and sewerage service areas – currently population served with water supply and sewerage services is determined from the 5 year census data and the estimated population change each year. More accurate data may be obtained using customer billing information. However, this would require better data relating to multi-residential customers which are not currently metered separately and may require modifications to the existing customer billing database;
- Existing water consumption for each customer type and predicted impact of demand management programs on customer demand – consumption is currently reported on a Shire wide basis with estimates of water losses. Useful information can be obtained from customer billing information and an analysis of historical consumption patterns. It may also be appropriate to more accurately estimate the components of water loss (refer Section 4.2.1); and
- Long-term (40 - 50 year) population, servicing and demand forecasts – More regular (2 - 3 year) review of population forecasts (using customer data and information on development approvals and the expected development capacity and type for urban expansion areas and infill will facilitate better adaptation to population growth. Improved understanding of population forecasts will assist with

predicting future demand for water supply and wastewater services. This would assist with more integrated Council planning, development policies and infrastructure service provision. Climate impacts in relation to modified demand patterns also need to be reviewed as more detailed information becomes available.

Consistent with the whole-of-Council approach, data should be collected and utilised consistently across TSC so that key decisions are formulated using the same basis.

Other Potential Options – Level 3

Management Option 3c – Increased understanding of total water cycle

Ten year implementation cost: $100,000 ($10,000 p.a.) in addition to Option 3b

Data collection is also a key component of the total water cycle approach focussing on the integration of data from different parts of the water cycle to assist in catchment-based decision making. This is addressed in Management Option: 17g – Total water cycle management (Section 4.5.1).

4.1.4 Private Water Utility Regulation

Issues to be addressed:

Issue 5: The implications of private industry involvement in town water supply and wastewater management are unclear, particularly with regard to regulation and Council responsibilities - The Water Industry Competition (WIC) Act, 2006 allows private utility operators to develop and operate water and wastewater schemes under licence from the Independent Pricing and Regulatory Tribunal (IPART). Council's role and responsibilities regarding private schemes are unclear. In addition, there is a need to ensure the private schemes implement Council's IWCM objectives.

Current Strategy

Management Option 4a – Participate in Water Industry Competition Act licensing for private water utility schemes

Private water utilities may apply for a licence under the *Water Industry Competition (WIC) Act, 2006* to provide water supply and sewerage services. These schemes may create opportunities for servicing areas not currently or not able to be supplied by TSC. They may also allow redirection of existing served areas to increase capacity in existing infrastructure and improve operation. Such schemes have been considered by TSC as part of rezoning proposals for Tanglewood and Dunloe Park.

Adoption of the service delivery model using a private water utility would relieve TSC of the responsibilities associated with development of water supply and wastewater infrastructure in anticipation of development. However, there is concern among NSW water utilities regarding the consequences of failure of a private utility system ("last resort arrangements") and TSC's role in this regard. The WIC Act includes provisions that ensure the continued supply of water and sewerage services in the event that a licensed retail supplier fails or becomes unviable. These provisions, referred to as retailer of last resort arrangements, are designed to protect customers and are similar to those that apply in the energy industry. The NSW Department of Finance and Services is currently reviewing the adequacy of the "retailer of last resort arrangements" under the WIC Act. While there are broad provisions for a retail supplier licensee failure, the WIC Act does not have any arrangements in place that would respond to a licensed network operator failure – operator of last resort arrangements. Therefore the review will also consider arrangements that should be in place to address a licensed network operator failure. TSC has provided a submission to the review addressing a wide range of considerations.

Assuming satisfactory resolution of the last resort arrangements, private utility schemes have the potential to assist TSC in servicing new development. These schemes may also provide opportunities for local wastewater recycling initiatives. The scheme currently being proposed for future urban development in West Pottsville includes dual reticulation (for toilet flushing, clothes washing and outdoor uses) replacing an estimated 53% of total water demand as well as recycled water for irrigation supply and fire-fighting. This approach is supported by TSC's current policy of encouraging effluent reuse schemes and other integrated water solutions proposed by developers of greenfield sites that are sustainable in the long-term.

Other Potential Options – Level 2

No additional options have been identified as part of an urban water cycle management approach as this is TSC's current focus.

Other Potential Options – Level 3

Management Option 4b - Strengthened IWCM Policies (under Water Industry Competition Act)

Ten year implementation cost: $50,000 (in year 3)

Currently water supply and wastewater servicing planning is undertaken for land identified for rezoning with limited consideration of servicing of greenfield developments. While TSC's IWCM Strategy can provide objectives for water cycle management across the Shire, it is not directly applicable to private utility schemes. There is concern among Council stakeholders that private utilities may not be required to meet IWCM objectives consistent with those of Council.

As part of a total water cycle approach (refer Section 4.5.1), increased emphasis on water supply and sewerage requirements as part of land use planning would assist with infrastructure planning, identification of limitations with TSC's water supply and sewerage systems and achievement of ecosystem health objectives. Increased understanding of development servicing requirements and strengthened water cycle management policies will improve TSC's ability to apply IWCM objectives to private water utility schemes and developments approved by the State Government (state significant development and infrastructure). Key outcomes would be:

- The establishment of water cycle management priorities that direct the development of policies that Council can apply when requested to provide input into private schemes; and
- Development of mechanisms to ensure policies are applied e.g. through regulation, grant funding, offsets or other incentives.

4.1.5 Asset Management

Issues to be addressed:

Issue 6: Asset management planning - The current IWCM Strategy includes an action to implement the water supply and sewerage asset management plans. Whilst these plans were prepared in 2010, implementation is an ongoing process and there is a need to continuously improve asset management planning.

Issue 9: Best-Practice Compliance - While Council currently substantially complies with the NSW government best-practice requirements, the Strategic Business Plans and Development Servicing Plans require regular review to remain compliant. In addition, water usage patterns for existing multi-residential properties needs to be better understood.

Current Strategy – Level 1

Management Option 5a – Asset management planning as part of Integrated Planning and Reporting Framework

While IWCM principles will continue to assist in prioritising infrastructure actions, asset management planning is being undertaken as part of the State Government water utility best-practice requirements as well as the Integrated Planning and Reporting Framework.

Management Option 5b – Substantial compliance with best-practice guidelines

The outcome of a local water utility (LWU) complying with the *Best-Practice Management Guidelines* is appropriate, affordable and cost-effective services to meet community needs while protecting public health and the environment and making best use of regional resources. There are six criteria TSC needs to complete to demonstrate best-practice management of water and sewerage businesses. Substantial compliance has been achieved as indicated in Table 11.

Table 11: Compliance with Best-Practice Management Requirements

Criteria	Current Status – Water Supply	Current Status – Sewerage
Strategic Business Planning	The 2006 Activity Management Plans are currently being updated	
Pricing (including Developer Charges, Liquid Trade Waste Policy and Approvals)	Substantially compliant. The DSP was adopted in 2007 and will be updated in 2013. Each unit in a multi-residential property is required to have a 20mm service connection. For non-potable component the usage charge is to be based on long-run marginal cost and access charge to be relative to a customer's capacity requirements with at least 50% of residential revenue generated through usage charges.	Council will adopt a Trade Waste Policy with sewage discharge allowance phased-out over 3 years. The DSP was adopted in 2007 and will be updated in 2013
Water Conservation	Compliant.	N/A
Drought Management	Compliant.	N/A
Performance Monitoring	Compliant.	
Integrated Water Cycle Management (IWCM)	Compliant. Adopted in 2006. This 6 year review.	

Other Potential Options – Level 2

Management Option 5c – Full compliance with best-practice guidelines

Ten year implementation cost: $20,000 ($10,000 p.a. in year 1 and 2)

While TSC currently substantially complies with the *Best-Practice Management Guidelines*, full compliance would be achieved with:

- Adoption of TSC's trade waste policy;
- Improvements in water supply customer metering (separate metering of multi-residential properties, refer Section 4.1.3). This would initially require an audit of multi-residential properties to provide confidence in the number of connections and provide input into the feasibility of separately metering all flats and units. Substantial costs would be incurred if Council separately metered all multi-residential properties;
- Development of a pricing policy for non-potable water supplies (recycled water). While application of a charge for recycled water supplies is not recommended at this time, development of a policy for future cost recovery should be undertaken as part of the identification of increased opportunities for recycling (refer Section 4.3.1). It is acknowledged that introduction of a charge for recycled water use is likely to decrease the attractiveness of recycled water schemes for the user; and
- Ongoing review and update (every 5-6 years) of the Development Servicing Plans (refer Section 4.3.1).

Management Option 5d – Review and Update Sewer Overflow Abatement Strategy

Ten year implementation cost: $50,000 (in year 1)

The *Sewer Overflow Abatement Strategy* (TSC, 2007a) was prepared in 2007 in response to reporting conditions of the sewerage system licences (PRP100). The report recommended a total of $3,375,000 expenditure to address specific needs over those met by ongoing operations budgets over the period 2007 – 2012. However, the actions have not all been implemented due to lack of funding and resources. There is a need to review the actions and update the *Sewer Overflow Abatement Strategy* considering realistic overflow containment targets, the required procedures for overflows to sensitive environments and identification of funding for implementation.

Management Option 5e – Review and update water supply and wastewater Business Continuity Plans

Ten year implementation cost: $150,000 ($30,000 every 5 years from year 2 and $10,000 p.a. in other years)

Business Continuity Plans (BCPs) were prepared in 2011 for:

- Management of Treated Water Supply in the Event of 'Contamination of a Raw Water Source';
- Management of Treated Water Supply in the Event of 'Contamination of a Supply Network';
- Management of Water Supply in the Event of 'Impending Water Source Failure and Inadequacy of Planned Emergency Supply Arrangements';
- Management of Water Supply and Wastewater Schemes in the Event of a 'Major Flood Event'; and
- Management of Water Supply and Wastewater Schemes in the Event of a 'Tsunami'.

The BCPs document arrangements and procedures that enable TSC to respond to an event that lasts for an unacceptable period of time and return to performing its critical functions after an interruption. The BCPs provide a list of prioritised actions and recommend a 'full' review on a four yearly cyclic basis (commencing 2014) and an annual 'minor' review. The BCPs should be updated as required when other related strategies such as the *Drought Management Strategy* and *Restrictions Policy* (refer Section 4.2.4), water supply augmentation strategy (Section 4.2.2) and climate change adaptation strategy (Section 4.1.6) are updated. The latest guidelines (including revised 2012 Water Directorate guidelines should also be considered).

Other Potential Options – Level 3

Management Option 5f – Management of natural assets

Ten year implementation cost: $100,000 ($50,000 in year 2 and 3)

As part of a total water cycle approach, natural assets (land, waterways and vegetation) are considered as part of the asset cycle. For example, in terms of drinking water asset management, the catchment assets form a key initial component of pollution control and raw water quality whilst the condition and extent of natural assets are a key determinant of waterway health. Similar to the approach adopted for the water supply, sewerage and drainage asset management plans, the Shire's natural resources would be considered in terms of levels of service, asset stock and condition, risk management, maintenance requirements, priorities and funding. These considerations would form key inputs into the development of sub-catchment management plans. This concept is partly addressed through estuary health and coastal zone management programs but would be extended to all sub-catchments through the total water cycle approach (refer Section 4.5.1). The building and management of social capital (for instance community capacity building in IWCM) might also form part of this approach.

4.1.6 Climate Change Adaptation

Issues to be addressed:

Issue 7: Climate change implications need to be integrated into planning for urban water services, catchment management and natural resource management - Future sea level rise and climate variations will affect water cycle management infrastructure and activities. This impact needs to be considered in future water supply and wastewater planning, demand management and risk management.

Issue 8: High energy consumption and greenhouse gas emissions – Council's water supply and wastewater infrastructure consumes high levels of energy, which is currently sourced from non-renewable sources. There are opportunities to reduce energy consumption and greenhouse gas emissions and develop energy and greenhouse gas emission targets.

Current Strategy – Level 1

Management Option 6a – Consideration of Sea Level Rise Impacts

In response to the risk of sea level rise, TSC is developing coastline management and floodplain management strategies as well as coastal zone management plans. Sea level rise impacts are considered with reference to assets and values of the local area and actions are recommended to plan for avoidance of future issues, to mitigate unavoidable impacts and where information gaps exist, further investigate the potential effects of sea level rise. Key strategies and plans are:

- *Tweed Valley Floodplain Risk Management Study and Plan* (BMT WBM, under development);
- *Tweed Valley Flood Study* (BMT WBM, 2005) and Climate Change update (BMT WBM, 2009);

- *Tweed Shire Coastline Hazard Definition Study* (WBM, 2007); *Tweed Shire Coastline Management Study* (Umwelt, 2005a) and Tweed Shire Coastline Management Plan (Umwelt, 2005b);
- *Coastal Zone Management Plan for Tweed Coast Estuaries* (Hydrosphere Consulting, 2013b);
- *Coastal Zone Management Plan for Cobaki Broadwater and Terranora Broadwater* (Australian Wetlands, 2010).

Management Option 6b – Energy Savings Action Plan

The NSW Government introduced legislation in May 2005 requiring high energy users and local councils in NSW to prepare Energy Savings Action Plans. Annual reports are required for three years post-approval. The plans are expected to be reviewed after four years.

Actions to reduce energy consumption and greenhouse gas emissions have been focused on the delivery of initiatives in TSC's Energy Savings Action Plan and identifying opportunities for renewable energy generation at water and sewer facilities. Planet Footprint has been engaged to assist TSC with identifying opportunities to reduce energy consumption and greenhouse gas emissions such as renewable energy sources. Examples of climate change action initiatives undertaken by TSC with relevance to water and wastewater service delivery include:

- Environmental Design Guidelines for new council facilities including requirements for energy and water efficiency, waste minimisation, the use of local native plants for landscaping and design that reduces reliance on the motor vehicle for facility access; and
- Actions to improve energy and water efficiency of infrastructure such as energy efficient pumps and motors, reducing peak load consumption by pumping in off-peak times and designing networks to maximise the use of gravity for water and wastewater transfer.

There is currently limited funding and staff resources to implement further actions of the Energy Savings Action Plan in the water and sewer business.

Other Potential Options – Level 2

Climate change is an important consideration for water cycle management, particularly in coastal areas where the combined effects of sea level rise and increased storminess are considered key threats. Adaptation to climate change impacts and improvement in public awareness is important for effective partnership. Adaptation strategies need to be developed covering increased flooding, tidal inundation, storminess and natural resource management in relation to urban water assets and operations, surface water availability and greenhouse gas emissions and these are discussed below. Council's coastal zone management planning process is already addressing the impact of climate change on natural assets such as dunes and riverbanks as well as community infrastructure. Integration of these parallel processes is addressed through the TWCM approach (Section 4.5.1).

Management Option 6c - Climate Change Adaptation - Flooding and Tidal Inundation

Ten year implementation cost: $150,000 ($50,000 every 4 years from year 2)

There is a risk that increased flooding and tidal inundation due to climate change will affect Council's ability to achieve its levels of service. BMT WBM (2009) modelled flooding extents in the Tweed Valley with climate change scenarios incorporating sea level rise projections and increases in rainfall intensity (refer Section 2.2.2). The flood extents show that large tracts of urban land in the Shire are at risk of flooding and this is likely to be exacerbated with sea level rise. Coastal erosion and recession is also expected to increase into the future with implications for coastal infrastructure and assets (WBM, 2007).

There are key implications for water cycle management in the Tweed Shire including:

- Inundation of low lying water, wastewater and stormwater assets causing asset failure and reduced access for maintenance during flooding events;
- Increased groundwater infiltration into water, wastewater and stormwater systems affecting system performance (e.g. overflows, increased salinity, etc.); and
- Coastal erosion impacting on coastal assets such as water and wastewater pipelines, outfalls and stormwater assets.

It is recommended that a risk assessment is undertaken to assess climate change impacts on water cycle management and particularly asset management in areas vulnerable to flooding, tidal inundation and coastal recession. The existing flood mapping and coastal hazard definition studies for the Tweed Shire (and their subsequent updates when available) provide a sound basis for the risk assessment. The priority areas are the highest density development and commercial areas where flooding, tidal inundation and/or coastal erosion are already an issue. As part of the risk assessment, there is an opportunity to identify potential risks relating to future land use planning.

Management Option 6d - Climate Change Adaptation - Surface Water Availability

Ten year implementation cost: $250,000 ($100,000 in year 1 and $50,000 every 4 years)

Key climate change considerations relating to surface water availability are:

- Changes in mean and peak stream and river flows due to increased evaporation and precipitation and changes in run-off resulting in reduced surface water availability and impacts on secure yield of water supplies. This is discussed further in Section 2.2.2;
- Greater competition for existing water sources;
- Changes in customer demand and usage patterns due to warmer temperatures; and
- Increased tidal inundation and salinity in waterways and implications for town water supplies, particularly Bray Park Weir. While not a current issue, the potential for saline intrusion is considered to increase with sea level rise.

The potential reduction in surface water availability and long-term suitability should be addressed as part of the consideration of water supply augmentation strategies (refer Section 4.2.2).

Management Option 6e – Reduction in energy consumption and greenhouse gas emissions

Costs are assumed to be covered by Council's broader sustainability initiatives

Increasing levels of service and more stringent licensing requirements such as improved water and wastewater treatment processes, has resulted in increased energy consumption. While operational modifications may have some impact on reducing energy consumption of individual assets, it is likely that the overall energy and consumption will not be significantly affected by these actions and may continue to increase (e.g. with the need for energy-intensive sludge treatment processes to increase beneficial reuse opportunities).

There is a need for corporate level policy and funding to continue implementation of energy saving actions identified by TSC. On-going review, evaluation and improvement of actions will be important to ensure TSC remains up to date with advances in technology and operational best-practice to reduce energy consumption. Approaches that may be relevant include:

- Greater focus on energy efficiency improvements;
- Purchase of renewable energy from energy providers as an alternative to traditional fossil fuel sources which will reduce the overall greenhouse gas emission footprint. Additional broader benefits include increasing the investment in the renewable energy sector in Australia; and
- Greater use of local renewable energy sources such as solar panels for Council assets.

Where reduction targets are appropriate, energy and greenhouse gas emission KPIs should be developed.

This action would be part of TSC's broader sustainability initiatives and is not considered to be unique to the water cycle management program.

Other Potential Options – Level 3

No additional options are identified as part of a TWCM approach.

4.2 Urban Town Water Supply

4.2.1 Water Supply Demand Management

Issues to be addressed:

Issue 10: Improved data collection and reporting procedures would facilitate adaptive forecasting of demand and assist with community education

Issue 11: There is currently no mechanism to promote retrofit of rain water tanks or installation of large rainwater tanks in new development - Council's policy for rainwater tanks in urban areas encourages the installation of rainwater tanks to provide non-potable water for outdoor uses, flushing toilets and washing machines. However there is no incentive to install tanks larger than required by BASIX or to retrofit existing properties. Continuing and expanding the existing rebate program and introduction of innovative education and incentive programs are well supported by the community but will require significant additional investment.

Issue 12: Council's 2013 target for non-revenue water was not achieved - Council's target of 10% non-revenue water (NRW) by 2013 was not achieved - the 5 year average is 13.7%. However it is expected that the implementation of projects to reduce leakage and unauthorised use of standpipes will reduce the level of NRW over time. These "real losses" represent a wasted resource, reduce the effective capacity of a water supply system and may result in unnecessary operating costs, and so a long-term water loss reduction program needs to be developed and included in Council budgets.

Issue 19: Council and the community have a desire for increased water recycling but there are significant barriers to implementation of recycled water schemes within the Tweed Shire - Council has a target for 15% of treated effluent to reused by 2013, however, this timeframe has not been met, with between 5% and 9% of wastewater currently being recycled. Increasing regulations, treatment requirements and cost associated with use of recycled water contribute to this issue. With the current Council direction and policy relating to recycled water use, the initiative to implement recycling is left to the developer which provides little incentive for recycling. Nonetheless, future planning and assessment of recycled water schemes must weigh up the high cost to the community.

Current Strategy – Level 1

Management Option 7a - Adopted Demand Management Strategy

The adopted demand management strategy (DMS) currently focuses on the following demand management programs:

- Ongoing communication and education;
- Residential consumption targets – currently 180 L/p/d;
- Assistance to top non-residential water users to reduce consumption;
- Reduction in water losses;
- Effluent reuse schemes (and recycled water target of 15% by 2013);
- Residential retrofits and rebates; and
- Rainwater tank policy.

Other state government initiatives such as BASIX and rebates also contribute to water savings in the Shire. All new residential development must comply with the State Government's Building Sustainability Index

(BASIX) which requires 40% reduction in potable water use per household through a combination of rainwater tanks, water efficient appliances, garden design or recycled water use.

Communication and Education

Community education tools include:

- The *Target 180* campaign;
- New water bills (commenced in June 2012) which aim to assist people to avoid wasting water and money, give householders and businesses an easier to understand picture of how much water they are using, what it is costing them and steps to avoid wasting water and money and provide clear information about water use and charges. The bill encourages householders and businesses to monitor their own water usage and have a better understanding of the costs involved;
- A *Meet Your Meter* campaign was launched in November 2012 to further support the residential water saving program; and
- Information provided on TSC's website including rebate information, water savings tips, instructions on how to read meters, a water calculator to compare water consumption to the target of 180 L/p/day and water efficiency information.

Residential Consumption

Figure 13 shows the KPIs and targets based on the current demand and population estimates. There is a clear downward trend in total demand and residential demand since the early 1990s for the Shire, despite significant population growth. Based on this information, the residential sector demand management activities appear to be successful and the targets appear to be achievable.

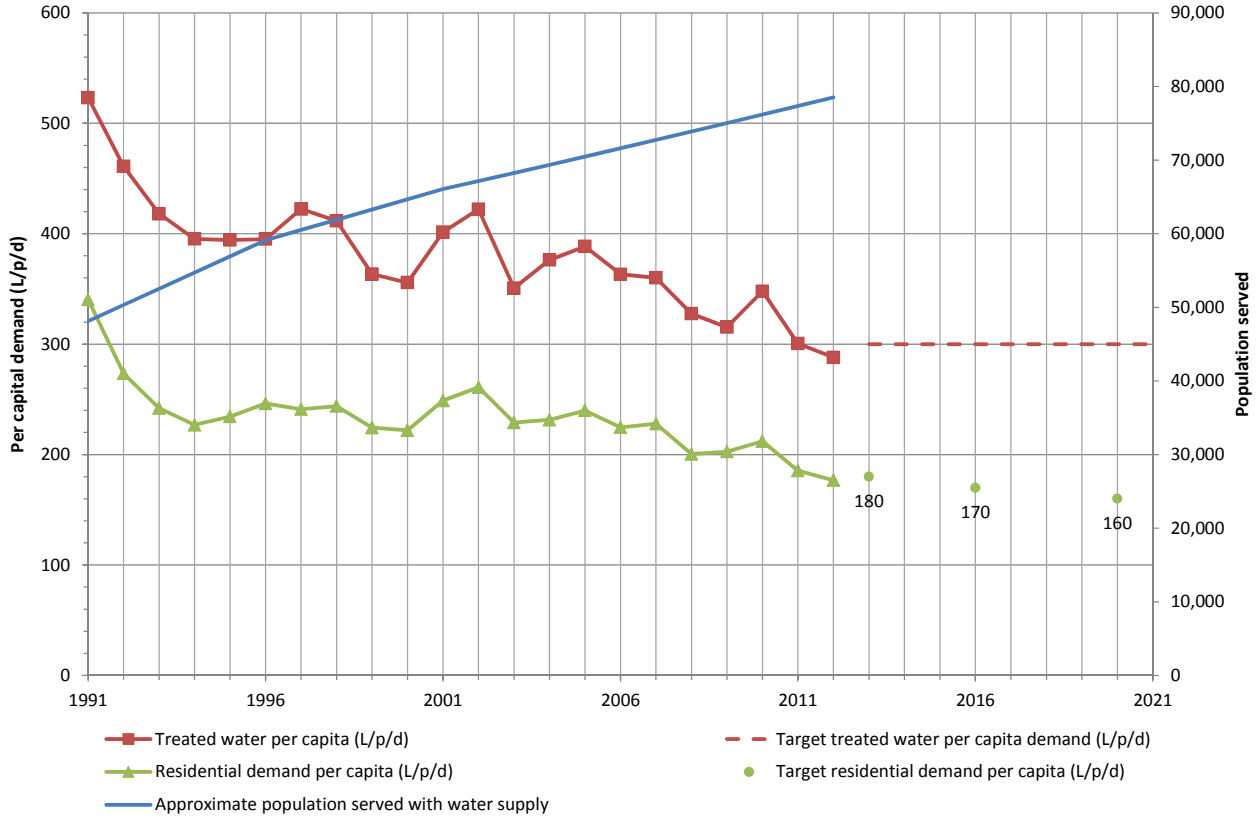

Figure 13: Water Supply Demand KPIs and Targets

Non-Residential Consumption

The parallel target of 300 L/p/d (treated water produced from the WTPs per person) included in the demand management strategy represents the consumption across all customer sectors. The Tweed's Top 20 water users program was completed in early 2013 with all participating businesses completing their water savings projects. The Shire's next top 80 non-residential water users were also invited to participate in the Tweed's Top 100 water saving program launched in July 2012.

The top 20 Council-owned properties using the most water have been identified and meetings have been held with the managers of these sites to progress water audits and ascertain any obvious water saving opportunities.

These programs are expected to result in further reductions in treated water per capita (the red line on Figure 13).

Water Losses

TSC participated in the Water Loss Management Program (WLMP) for Regional NSW Water Utilities between 2006 and 2011. Following the program, a bulk meter installation program has been implemented to enable monitoring of the water balance. A leakage control and pressure management program is currently being developed involving network testing, modelling and leakage investigation using specialised equipment.

The National Performance Reporting Framework classifies water losses in the distribution system as either apparent losses (unauthorised consumption, retail metering errors) or real losses (leakage and overflows from mains, service reservoirs and service connections prior to customer meters). Water losses are also experienced during the process of water treatment. The components of the water balance for the last 4 years (as reported to NSW Office of Water as part of annual performance reporting) are shown in Table 12 and Figure 14.

TSC has adopted a KPI of 10% for NRW (Figure 14) which includes the water lost through unknown leakage, meter inaccuracies, theft, water provided for fire-fighting, known and unavoidable leakage, use of unmetered standpipes plus water lost during emergency and planned maintenance of water mains. This is equivalent to the total treated water less the water sold to customers.

Table 12: Components of Water Supply

Component of Water Balance	2009	2010	2011	2012
Raw water extraction (1)	9,564	10,555	8,938	8,830
Treated water production (2)	8,639	9,674	8,487	8,275
Bulk supply and treatment losses (3) = (1) – (2)	925	881	451	555
% bulk supply and treatment losses = 100 x (3)/(1)	9.7%	8.3%	5.0%	6.3%
Metered consumption (4)	7,582	8,175	7,175	7,134
Distribution system losses (5) = (2) - (4)	1,057	1,499	1,312	1,140
Distribution losses as % of treated water = 100 x (5)/(2)	12.2%	15.5%	15.5%	13.8%
Real losses (leakage) [1] (6)	518	773	509	496
Meter inaccuracies [2] (7)	109	163	103	99
Unauthorised supply (8) = (2) - (4) – (10) – (7) – (6)	377	508	658	504
Apparent losses (unauthorised supply, meter errors) (9) = (7) + (8)	486	671	761	603
Unbilled consumption [3] (10)	53	55	42	41

Component of Water Balance	2009	2010	2011	2012
NRW (11) = (2) – (4)	1,057	1,499	1,312	1,140
NRW (as % of treated water) = 100 x (11)/(2)	12.2%	15.5%	15.5%	13.8%
Total losses (12) = (3) + (11)	1,982	2,380	1,763	1,696
Total losses as % of raw water extraction = 100 x (12)/(1)	20.7%	22.5%	19.7%	19.2%

Source: TSC data reported annually to NSW Office of Water.

1. Estimated as 6.0 % of treated water production (8.0% in 2010).
2. Estimated as 2.0% of residential consumption.
3. Estimated as 0.5% of treated water production.

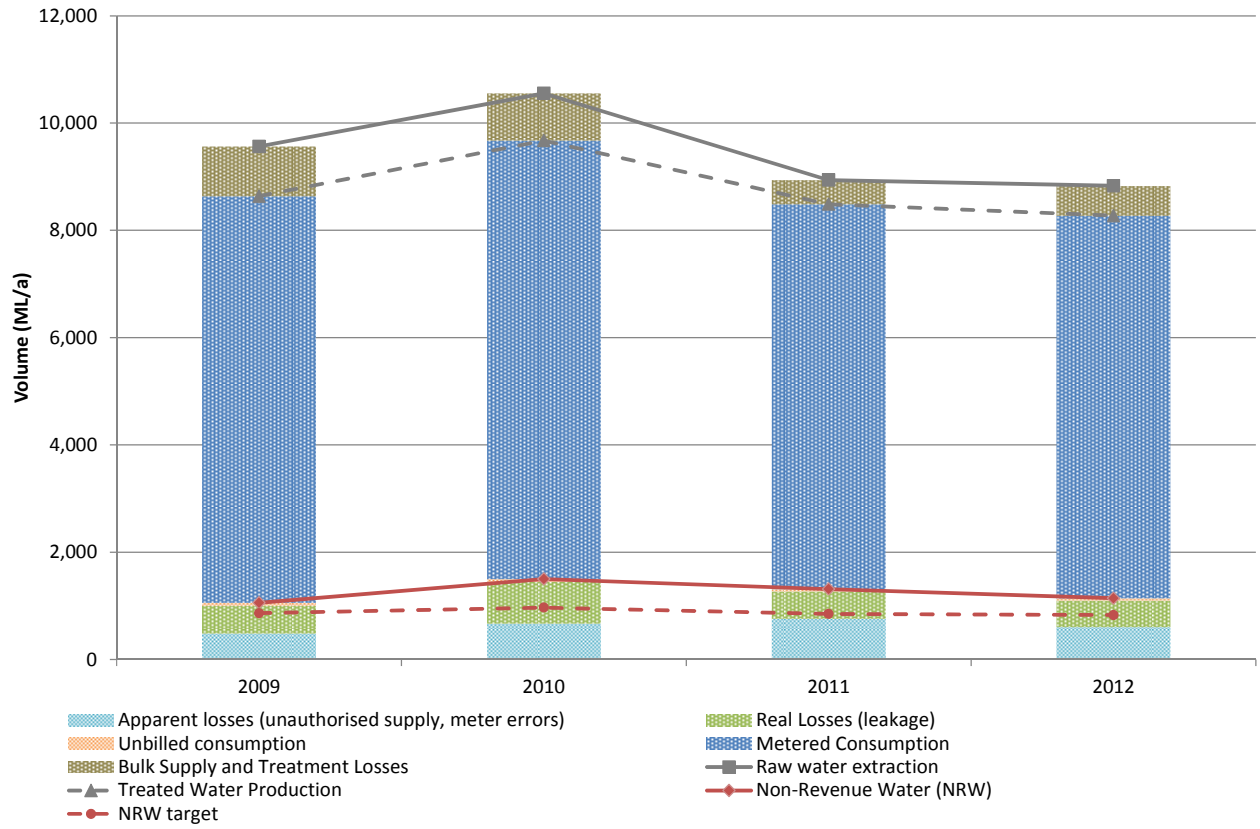

Figure 14: Components of Water Supply 2009 - 2012

The level of bulk supply/treatment losses appears to have decreased since the commissioning of the new Bray Park WTP in April 2010. The major component of treatment losses is assumed to be the wastewater from the sludge dewatering process which is discharged to the sewerage system and it is unlikely that this component of losses can be reduced further.

Real losses (leakage and overflows from mains, service reservoirs and service connections prior to customer meters) represent a wasted resource, reduce the effective capacity of a water supply system, and may result in unnecessary operating costs. Leakage is currently assumed to be 6% - 8% of treated water production in the Tweed Shire. Opportunities for more accurately identifying and reducing real losses are likely to be identified through the proposed leakage control and pressure management program.

Apparent losses (unauthorised consumption, retail metering errors) have historically ranged from 6.0 - 9.0 % of treated water production which is a significant component of the total distribution system losses (12 - 16 %

of treated water production). External bulk water sales are currently difficult to quantify as the data includes water stolen from standpipes, water used for major construction and carting to Tyalgum during droughts.

The target of 10% NRW by 2013 was adopted as part of the Demand Management Strategy. It is acknowledged that the deadline for this target has not been met, although current measures to reduce water losses will contribute to achievement of this KPI.

Effluent Reuse Schemes

TSC has implemented or is developing a number of recycled water schemes for agricultural uses, sugar mill cooling water and irrigation of playing fields and golf courses. Currently, between 5% and 9% of wastewater (400 – 800 ML/a) is recycled. TSC has a recycled water target of 15% of treated effluent reused by 2013. Other recycled water schemes are being progressively investigated and developed.

The DMS assessed options for water and wastewater services for new developments in the Tweed Shire including dual reticulation, direct potable reuse and rainwater tanks. The DMS concluded that the preferred scenarios of BASIX implementation and 5,000 L rainwater tanks would have broader community acceptance than scenarios including recycled water use, achieve the same reductions in water demand and were less expensive than other options considered. Based on the outcomes of the DMS, TSC has adopted the BASIX and rainwater tank option as its preferred policy for new developments.

The DMS also recommended that TSC continues to encourage effluent reuse schemes and other integrated water solutions that are sustainable in the long-term proposed by developers of greenfield sites. Where opportunities are identified by developers, TSC will assess the proposals put forward for reuse and recycling opportunities. A recent example is a proposed private utility scheme including dual reticulation at West Pottsville. The scheme will replace an estimated 53% of total water demand as well as providing recycled water for irrigation supply and fire-fighting. TSC is participating in the development of this strategy as part of the rezoning process.

The target of 15% recycled water by 2013 was adopted as part of the Demand Management Strategy. It is acknowledged that the deadline for this target has not been met. However, Council still intends to maximise recycling with consideration of any new opportunities as they arise. Although there are uncertainties with the timing of any future recycled water projects and it is difficult to adopt a timeframe that is meaningful and realistic, the target could be achieved through a combination of relatively small and viable projects that have been identified by Council (e.g. schemes at Les Burger fields and Murwillumbah Race Course). Council will continue to report the percentage of water that is recycled against the 15% target.

Residential retrofits and rebates

The Residential Water Saving Program is a key component of the DMS Implementation Plan. The program is being staged over a three-year period from 1 July 2011. Key components include a residential rebate for water saving shower heads, aerators and spouts/mixers and a residential rebate for dual flush toilets. The dual flush rebate program was fully taken up at the end of 2012 (6 months earlier than expected) and the showerhead rebate has been extended to June 2014. TSC also plans to conduct research into the feasibility of a retrofit service and a rebate for residential rainwater tanks in future years.

There are currently no State or Federal government rebates applicable to rainwater tanks in the Tweed Shire, however, rebates, guidelines and regulations are continually being reviewed.

Rainwater tank policy

TSC's policy for rainwater tanks in urban areas adopted in 2011 encourages the installation of rainwater tanks to provide non-potable water for outdoor uses, flushing toilets and washing machines. Customers are encouraged to install the largest tank they can. The policy encourages dual supply rainwater tanks in single residential premises to have a minimum storage capacity of 5.0 kL and a minimum roof area catchment of 160 m^2. For multi-residential dwellings, it is recommended that the rainwater tank volume is maximised with

80% to 90% of the roof area connected. In addition to reducing the consumption of treated potable water, the policy also recognises the benefits of a rainwater tank in reducing the amount, intensity and frequency of downstream stormwater runoff. To provide this benefit, the continuous tank draw down is to be maximised by connecting toilets, washing machines and external taps.

Rainwater tanks provide a potential alternative water source and can reduce the demand on the mains water supply. Community feedback obtained during the IWCM review strongly supports the use of household rainwater tanks as a water saving measure for external and internal use. There are a number of constraints which need to be considered, such as rainfall, roof catchment size, purpose of use and cost, to ensure that the most appropriate sized rainwater tank is installed. Although larger rainwater tanks provide a greater capacity for storage and reduce the demand on mains water, they are more expensive, are not refilled in dry times and may be restricted by planning controls and space.

The cost and responsibilities of having rainwater tanks is often not well understood by the community:

- The costs (capital, operating and maintenance costs) are borne by the property owner;
- Energy costs for pump operation are likely to increase as electricity prices increase in future (in fact Council is aware of some instances where pumps have been turned off due to high energy costs with the result being increased potable water use); and
- Adequate maintenance is necessary for water quality and quantity maximisation.

Some feedback from the community suggested that rainwater tanks could provide a large component of future water supply needs for the shire and that Council should be advocating the installation of larger tanks. Because of this feedback, the appropriateness of the current rainwater tank policy was re-assessed for a range of rainwater tank sizes for a number of different water uses in Murwillumbah (refer Appendix 3). The analysis showed that the optimum tank size is 5,000 L and tanks up to 10,000 L may also provide cost-effective water savings when also connected to internal plumbing (toilet flushing and washing machine use). As the appropriate tank size for each property is highly dependent on water uses, costs and local rainfall, the current policy (minimum 5,000 L tank) is still considered appropriate.

Other Potential Options – Level 2

Management Option 7b - Improved Community Understanding of Water Consumption Targets

Ten year implementation cost: $35,000 ($10,000 in year 1 and $5,000 p.a.)

The results of the community surveys suggest that the majority of people believe that their household uses less water than the average household in the Shire. In addition, only 25% of those surveyed could identify the current target for average daily water use by residents in the Tweed Shire (180 L/p/d). While the *Target 180* campaign and the new water bills are relatively new, this suggests that the message about residential consumption is not yet reaching the community. To continue to reinforce the water saving message and targets, it may be necessary to increase efforts in this regard including additional innovative ways to increase involvement and understanding within the community such as the *Meet Your Meter* campaign. Wider promotion of the program within Council would also assist in providing consistent messages during related community engagement programs.

Management Option 7c - Targets for non-residential consumption

Ten year implementation cost: minimal

The current target of 300 L/p/d (treated water produced from the WTPs per person) appears to be easily achievable. It would be appropriate to adopt lower targets for the future similar to the 180/170/160 residential

targets. These may be presented as targets for treated water produced from the WTPs per person or as a percentage reduction in the consumption of the top 100 water users relative to an average or baseline.

Management Option 7d - Water Loss Management Program

Ten year implementation cost: $150,000 ($50,000 in year 1 to 3)

As shown in Table 12, the water loss components are estimated using industry guidelines. The development and implementation of a Water Loss Management Program would include:

- Identification of areas of water loss although the planned bulk metering program;
- Improved data on customer consumption (Section 4.1.3);
- Selection and reporting of appropriate leakage and water loss indicators - the reporting of leakage and water losses as a percentage of water supplied identifies the significance of these parameters in relation to the total water supplied, however NSW Office of Water considers that it is not helpful in monitoring the effectiveness of a utility's performance in reducing losses and is affected by reductions in water consumption and water restrictions due to drought. In addition, these indicators do not measure the efficient management of leakage in a distribution system because they take no account of multiple properties, density of service connections, length of mains, customer meter location in relation to the property boundary or the operating pressure.

  Water loss in L/d per connection is recommended by the International Water Association (IWA) as the best traditional basic technical indicator for real losses, although it does not account for other factors such as length of main or operating pressure. In particular, reductions in operating pressure have been shown to greatly reduce system leakage. The Infrastructure Leakage Index (ILI) has been proposed as an indicator which measures how effectively real losses are being managed at current operating pressure while accounting for other influential factors such as length of mains, number of service connections and customer meter location. The ILI is recommended by the IWA for international comparisons of water utilities. The National Performance Framework has adopted ILI as a measure of leakage and the NSW Office of Water has reported the ILI for each LWU since 2005/06 although accurate data for TSC are not currently available.

  An enhanced water loss management program would include the adoption of appropriate, measureable and achievable targets for water losses;
- A review of policies and procedures on standpipe use and access to mains water by water carters, Council staff and private individuals to reduce theft, unmeasured usage and inaccuracies in metering; and
- Implementation of a customer meter replacement program to improve measurement of consumption.

Management Option 7e – Review of effectiveness of rainwater tanks

Ten year implementation cost: $35,000 ($20,000 in year 1 and $5,000 p.a. for year 2 to 4)

Prior to promoting any major expenditure on rainwater tanks (by either TSC or property owners), data on the actual water savings and rainwater tank costs are required to demonstrate value for money. Similar projects have been conducted by the Department of Planning and Rous Water as part of the review of the effectiveness of the BASIX rainwater tank program.

Generally, rainwater tanks under 10,000 L do not require Council approval so there are no records of these installations. There is currently has no way of compulsorily requiring households to provide information about the types, volumes and uses of tanks being installed on existing homes and businesses. A voluntary web-

based registration system is proposed to commence collection of some data. This should be extended (potentially through the use of a survey) to identify properties with and without rainwater tanks and compare their water consumption patterns. Data to be collected would include:

- Date of installation and size of rainwater tank;
- End-uses and any modifications with time;
- Consumption before and after the installation of the tank, monitored over at least a three-year period; and
- Household composition (dwelling type, occupancy etc.).

Review of these data would assist in verifying the performance of rainwater tanks in the Tweed, identifying any factors that improve performance and developing a rebate program (refer below) based on the findings.

Management Option 7f - Rainwater Tank Rebate

Ten year implementation cost: $700,000 ($140,000 p.a. in year 5 to 9)

Rebates encourage residential water consumers, particularly those in pre-BASIX non-efficient houses, to become water efficient houses. While BASIX mandates the inclusion of rainwater tanks in new developments and 5,000L tanks are encouraged as part of TSC's rainwater tank policy, there is no financial incentive for existing customers to install a rainwater tank or for new developments to install a larger tank.

A survey was conducted in May 2012 to provide input to the review of the Residential Water Saving Program including rebates. Results of the survey suggest that continuing and expanding the rebate program and introduction of innovative education and incentive programs are well supported by the community. Similar community feedback was received as part of the IWCM review community surveys.

A range of rainwater tank rebate programs are currently offered in other parts of Australia. The rebate programs are regularly reviewed and modified but some current programs are as follows:

- South Australia - up to $200 for a new stand-alone rainwater tank with a capacity of 1,000 litres or more which is not connected to household plumbing;
- Victoria - $850 (2,000L to 3,999L connected to toilet and/or laundry), $1,300 (4,000L or greater connected to toilet or laundry), $1500 (4,000L or greater and connected to toilet and laundry) and $500 for tank to toilet and/or laundry connections;
- Rous Water - Rous Water offers three levels of rebate, based in the first instance on the tank volume ($100 for 2,000 – 4,499 L, $400 for 4,500 – 8,999 L and $500 for 9,000 L or more). Additional rebates are available if rainwater from the tank is supplied for flushing toilets ($500) and/or to the washing machine ($500); and
- Queensland - $1,500 for rainwater tanks installed up to 3,000 L which are internally plumbed to either a toilet or toilets and a laundry cold water tap.

Rous Water estimates that the installation of tanks has reduced average household water use by 50 kL/connection per year (Rous Water, 2012). The cost to Rous Water is estimated at $9.41/kL saved per year. Similar water savings are predicted by the DWE Rainwater Tank Model (refer Appendix 3) for a 5,000L tank used for external use only with 100 kL/connection per year savings with external use and connection to toilets and washing machine (10,000 L tank).

The rebate structure offered by Rous Water could be appropriate given the target is pre-BASIX connections and additional incentive should be offered for connection to internal plumbing. This would also assist with consistency in demand management programs across the Northern Rivers region. A rebate of $400 per tank for 1,000 connections with 30% assumed to connect to toilets and washing machines would cost TSC

approximately $700,000 with expected water savings of approximately 65 ML/a ($10.80 per kL saved per year). As discussed above, a review of the effectiveness of rainwater tanks is recommended prior to any major expenditure.

All rebate programs should be reviewed on an ongoing basis to ensure rebates are effective in achieving water efficiency outcomes. Reviews should include assessment of each rebate program in relation to:

- Value for money in relation to water savings;
- Level of uptake within the community;
- Value in achieving water efficient behaviour change; and
- Appropriateness of technical advice offered in conjunction with rebates.

Management Option 7g - Permanent Water Conservation

Ten year implementation cost: $30,000 ($10,000 in year 2 and 3 and $5,000 every 3 years)

The Best-Practice Guidelines recommend that permanent water saving measures are examined as part of a demand management program to minimise wastage. However, the appropriateness of either voluntary or mandatory permanent water conservation measures has not yet been considered for the Tweed.

A community consultation process was conducted by Rous Water in 2008 to gauge attitudes towards 'Permanent Water Saving Measures'. The survey found "a strong commitment towards permanent and mandatory water conservation measures – regardless of dam levels". This was despite healthy rainfall in the Rous Water catchment area over much of the preceding seven months (Rous Water, 2012). Similar feedback was received from the Tweed community during the IWCM review.

Rous Water and its constituent Councils (Ballina, Byron, Lismore and Richmond Valley) have endorsed a list of permanent water saving measures which are currently voluntary. The NSW government is currently considering legislation that would permit Councils to enforce water saving measures. Mandatory irrigation days and times are a cost-effective demand management measure, however, voluntary measures require less expenditure on enforcement and advertising.

In recognition of the objective of regional approach to demand management (refer Section 2.7.4), permanent voluntary water conservation measures similar to those adopted by Rous Water and its constituent Councils could be appropriate (refer Table 13). Although the resulting water savings have not been determined, there are expected to be secondary effects such as increased water awareness and education, reduction in internal uses and demand hardening potentially impacting on opportunities for demand reductions when drought restrictions are imposed.

Other Potential Options – Level 3

No additional options are identified as part of a TWCM approach.

Table 13: Permanent Water Saving Measures for Rous Water supply area

OUTDOOR WATERING	
Applies to all homes, private and public gardens and sports grounds. Does not apply to commercial market gardens and nurseries.	WATERING TIMES AND DAYS
	This applies to the use of all types of sprinklers, watering systems, hand-held hoses, watering cans and buckets, topping up swimming pools and outdoor spas. Outdoor watering and water use is permitted between 6am and 10am and between 3pm and 10pm.
	NEW TURF WATERING
	Watering of new turf or the beginning of a new lawn is permitted every day for the first fourteen (14) days during the watering times above.
	HAND-HELD HOSES
	All hand-held hoses should be fitted with a trigger nozzle.
	USE LESS WATER
	When watering lawns or gardens, use the least amount of water necessary. Evidence of puddling or runoff is an indication that too much water has been used. All outdoor watering should be carried out in such a way that no hard surfaces are included in the watered area.
CLEANING VEHICLES & BOATS	
Applies to all private and commercial use.	Vehicles and boats may be washed on any day. Where possible, vehicles and boats should be washed on the lawn or where the water will run off onto the lawn or garden. Hoses should be fitted with a trigger nozzle.
DRIVEWAYS, PATHS & PAVED AREAS	
Applies to all private and commercial premises. Applies to all impervious surfaces such as driveways, paths and paved areas.	Water should not be used to clean driveways, paths, paved areas and other impervious surfaces unless it is necessary as a result of an accident, fire, hazard to health or the environment, or other emergency. High pressure water cleaners may be used.
CONSTRUCTION & GENERAL CLEANING	
Applies to all private and commercial building, renovation and construction activities, including roof and house cleaning. Applies to all private and commercial cleaning activities.	Cleaning may be carried out on any day. Hoses should be fitted with a trigger nozzle. High pressure water cleaners may be used.
	USE LESS WATER
	When using high pressure water cleaners, use the least amount of water necessary to do the job. Avoid puddling or runoff to hard surfaces such as driveways, paved areas and the street. Use only high pressure water cleaners that use no more than ten (10) litres of water per minute.

4.2.2 Water Supply Availability

Issues to be addressed:

Issue 2 There is a need for informed and transparent decision-making and better management of community expectations

Issue 13: Augmentation of the Tweed District Water Supply will be required in future due to population growth although the timing and additional supply required are unclear – Data on current population growth rates suggest that augmentation of the Tweed district water supply will not be required until approximately 2030 and possibly beyond that time frame. However there are uncertainties regarding future population and demand as well as climate change implications and secure yield, and it is important to continually review available data to optimise the timing of the significant investment that will be required.

Current Strategy – Level 1

Management Option 8a - Future Water Supply Augmentation

The current strategy recognises the need for a major augmentation of the Tweed District water supply in future. While a significant amount of work has been undertaken on the assessment of augmentation strategies for the Tweed water supply system, a preferred option has not been adopted. The current data suggest that:

- For the purpose of an interim secure yield estimate, 13,750ML/a is considered reasonable, although TSC acknowledges that the secure yield estimate needs to be refined to take into account more data on climate change impacts, future environmental flows and future demand. It should be noted that the current secure yield of the Tweed/Bray Park system is at least 13,750 ML/a, however climate change is expected to reduce the secure yield below that before 2060;
- Population growth has not occurred as fast as originally predicted. The Shire's long-term population forecasts are currently being updated by Forecast.ID but the current data indicate that the 2031 connected population will be between 100,000 and 120,000; and
- The trends in customer demand suggest TSC's demand management programs, combined with legislative requirements (BASIX) and rebates are having a positive influence on customer demand.

The future demand and supply forecast is based on the population projections presented in Section 2.3 and assuming the target demand of 300 L/p/d from the WTP will be achieved in the short-term and maintained over the long-term. The current secure yield and the forecast future demand for the Bray Park water supply are shown on Figure 15.

The forecasts predict that augmentation of the Bray Park water supply may be required from 2030. The potential supply deficit at 2060 is predicted to be approximately 6,180 ML/a. However, long-term water supply planning will need to consider a potentially larger supply deficit that may result from climate change impacts.

Given that a new water supply source is not expected to be required as soon as first thought, it is considered appropriate to confirm this through updating data on population growth, demand and system secure yield.

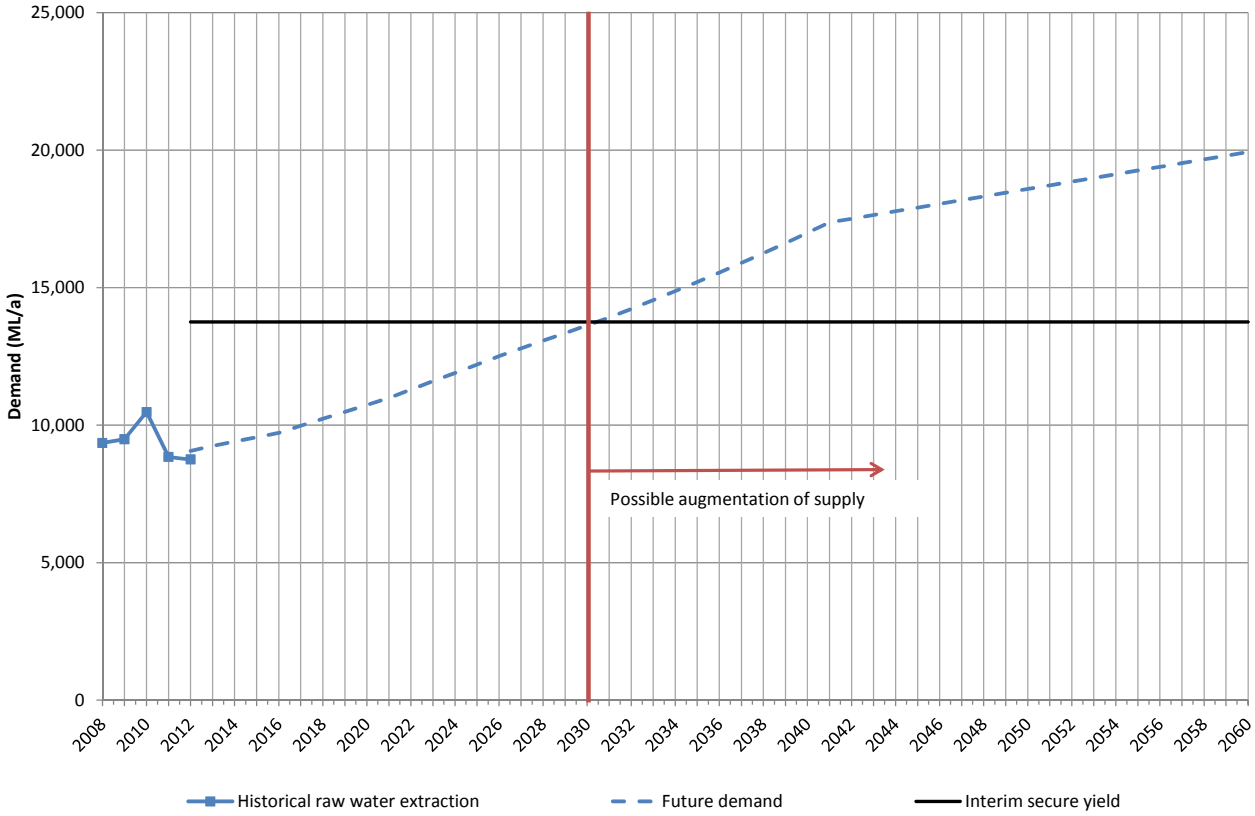

Figure 15: Bray Park System (Tweed District and Uki) Future Demand and Supply Forecasts

Information Gaps – Demand Side

As discussed in Section 4.1.3, improvements in data collection and review procedures would result in better understanding of current and future customer numbers and demand as well as facilitate more adaptive responses to new information. The key aim is to provide more confidence in the demand forecast (the dashed line on Figure 15).

Information Gaps – Supply Side

Given that climate and rainfall are highly variable from year to year, it is necessary to estimate the amount of water that can be reliably obtained from the water sources during any year, regardless of climatic conditions. For the past 25 years or so most urban water supply headworks in regional NSW have been sized on the basis of “Security of Supply”. This security of supply basis was developed to cost-effectively provide sufficient dam storage capacity to allow the water utility to effectively manage its water supply in future droughts of greater severity than experienced over the past 100 or more years. ‘Secure Yield’ is the theoretical water demand that can be expected to be supplied with only moderate restrictions during a significantly more severe drought than has been experienced since about 1895 (from when generally reliable rainfall records are available). The required water restrictions must not be too severe, not too frequent, nor of excessive duration (NSW Urban Water Services, 2013).

Secure yield is calculated using historic climate and stream flow data and a set of rules that describe water demand and the long-term effect of water restrictions.

Current Secure Yield

The secure yield of Tweed’s water supplies was determined using the NSW Security of Supply Methodology (the highest annual water demand that can be supplied from a water supply headworks system whilst

meeting the 5/10/20 rule - restrictions no more than 5% of the time with a frequency of no more than 1 in 10 years and on average a 20% reduction in consumption).

There has been a significant reduction in average water use per connection due to increased water awareness within the community and increased use of water efficient fixtures and appliances, as promoted through demand management programs and the BASIX efficient building requirements (refer Section 4.2.1). Increased water efficiency and demand management strategies have reduced or eliminated many of the non-essential uses of water from everyday life, meaning that it is now harder for water restrictions to achieve sustainable long-term reductions in demand (this is termed 'demand hardening'). Future water supply planning in NSW is now based on achieving a 10% reduction in consumption i.e. a "5/10/10 rule", which supersedes the previous "5/20/10 rule" and acknowledges the impact of demand hardening. This new rule dictates that a water supply should be designed to be able to supply a minimum of 90% (instead of 80%) of normal water demand during the worst drought.

Increased confidence is required in the current secure yield of the water supplies. TSC has not yet assessed the impact of demand hardening on its water supplies. The impact of demand hardening is predicted to be a reduction in the secure yield of Rous Water supplies of 800 ML/a or 5.8% (Hydrosphere Consulting, 2013a) and similar reductions may be experienced by TSC.

In addition, the current secure yield needs to be re-assessed considering the environmental flow criteria in the Water Sharing Plan, future demand predictions (normal and restricted demand) and the Drought Restrictions Policy.

Future Secure Yield

The secure yield of Tweed's existing water supplies is expected to be significantly impacted by climate change as discussed in Section 4.1.6. There are no data available on the likely impact of climate change on the secure yield of the Tweed water sources.

The draft NSW *Guidelines on Assuring Future Urban Water Security* (Office of Water, 2013b) has adopted the medium global warming emissions scenario A1B for water supply planning purposes for ~Year 2030 which projects an average global warming rise of 0.9ºC from 1990 to ~2030. The Intergovernmental Panel on Climate Change has developed 15 global climate models (GCMs) which provide daily rainfall and evapotranspiration data suitable for planning purposes. Studies have not yet reached a consensus on which GCMs are likely to provide reliable future climate projections so the guidelines recommend planning carried out using a wide range of archived GCM simulations (all the 15 models with daily data).

The Rous Water bulk supply system was one of the 11 non-metropolitan water supplies included in a pilot study currently undertaken by NSW Office of Water to provide insights on the impacts of climate changed hydrometeorological data on water security and to develop a suitable methodology and guidelines for application by other NSW water utilities. The pilot study involved hydrological and system modelling to determine the impact of climate change on secure yield. The pilot study incorporated the scientific logic of the CSIRO's Murray Darling Basin Sustainable Yields Project which used daily historical data from 1895 to 2006 and applied the relevant GCMs to provide projected (~2030) climate changed data for each GCM for this period.

The study forecasted the percentage change in year 2030 secure yield due to climate change for each of the 11 water supplies in the pilot study. The pilot study determined that the secure yield after climate change should be considered to be the lesser of:

- Secure yield for the median of the 15 GCMs on the basis of the 5/10/10 rule; and
- Secure yield for the GCM with the lowest secure yield on the basis of a 5/10/25 rule (the 25% severity of restrictions under this rule amounts to being able to 'survive' the least favourable GCM, albeit with relatively harsh water restrictions to cope with the reduced availability of water).

The pilot study found that secure yield at around the Year 2030 under the methodology proposed in these guidelines, is reduced by up to 9% for coastal utilities including Rous Water (Samra and Cloke, 2010).

Subsequent to the NSW Office of Water pilot study in 2010, Rous Water has undertaken further analysis of its system headworks model to determine secure yield currently and allowing for future climate change. The recent work has also provided estimates of future secure yield adjusted for climate change on the basis of warming of 1°C (predicted to occur by about 2032) and 2°C (predicted to occur by about 2060). The reduction in secure yield (17.5 %) for the 1°C warming and 33.7% reduction for 2°C warming is significantly greater than obtained from the Office of Water pilot study. This is apparently due to the different rainfall and runoff assumptions used to generate the input data.

While the Office of Water pilot study suggests that the impact of climate change is system dependent, the main impacts on year 2030 secure yield were found to be no greater than a reduction of 9% for the coastal utilities included in the pilot study and the impact of climate change on the other system located on the northern NSW coast included in the study (Coffs Harbour) is also predicted to be -9%. A study undertaken by Seqwater (QWC, 2010) has adopted a 10% reduction in surface water availability (by 2030) across South-East Queensland for long-term water supply planning. No other studies have predicted the impact of climate change for the longer term (2060).

The NSW Office of Water has suggested the methodology and results of the pilot study should be applied to other NSW LWUs. The NOROC study (Hydrosphere Consulting, 2013a) concluded that is appropriate to consider the impact of a 10% reduction in secure yield of surface water sources in the NOROC region due to climate change by 2030. Beyond 2030, it is considered that the loss in secure yield will be at least 20%. Water supply planning will need to consider the risk of future increased reductions in secure yield and the ability of any adopted options to be able to cater for greater climate change impacts should they occur.

Each NSW local water utility needs to assess the impact of global warming and climate variability on the secure yield of its water supply system in accordance with the Office of Water guidelines. Secure yield assessments form an integral part of the IWCM Strategy. For LWUs with a storage dam or shallow bores, analysis similar to that carried out in the pilot study is generally recommended. Where a utility has sufficient supply capacity to enable it to defer a major capital investment decision for additional surface water supplies for 5 or more years, the Office of Water suggests that improved data on future climate and stream flows should be collected to improve decision-making.

Augmentation Options

The Tweed District Water Supply Augmentation Options Study (MWH, 2009b; MWH, 2010) was undertaken to assist Tweed Shire Council in the determination of a preferred option for the augmentation of its water resources. Initially, a long list of options was developed (MWH, 2009b) with a high level assessment undertaken to enable each to be scored against Triple Bottom Line (environmental, social and economic) criteria to enable a short list to be developed for further, more detailed investigation (MWH, 2010). TSC has not adopted a preferred augmentation option.

TSC's current demand management initiatives have resulted in significant per capita demand reductions. Additional measures recommended in this IWCM Strategy would further assist with demand reduction. The extent that demand management can offset the need for any supply augmentation will depend on the long-term success of the demand measures as well as the future population growth and future secure yield of water supplies. However, demand management options (including potable water substitution such as rainwater tanks or recycled water) may not be sufficient to offset the need for a new supply source and there is a need to confirm the timing and quantity of any augmentation needs as well as any lead time and planning considerations.

The key knowledge gaps are the timing of the required supply augmentation and the quantity of additional water that will be needed. Accurate prediction of these depends on the demand projection (refer Section

4.2.1) and the secure yield explained above. Given that water augmentation is not envisaged as soon as first thought, there appears to be sufficient time to fill the identified data gaps and this should be TSC's short-term (1-3 year) focus. This time period will allow TSC to collect data, undertake the required modelling and provide increased confidence that decisions are based on the latest and most reliable information available.

The NOROC Regional Bulk Water Supply Strategy (Section 2.7.4) is currently investigating potential options for regional integration. The findings of this study will be directly relevant to the Tweed IWCM Strategy and should be used along with the results of the Fine Screen Options Study as key considerations in the selection of a preferred augmentation strategy for the Tweed.

As discussed above, the short-term focus should be the monitoring of population growth and review of demand projections as well as confirmation of current and future secure yield. Although there is no need to adopt a preferred augmentation option in the short-term, it is considered appropriate for TSC to continue to participate in regional water sharing initiatives.

Other Potential Options – Level 2

No additional options have been identified as part of an urban water cycle management approach as this is TSC's current focus. The current approach meets the current Office of Water guidelines for IWCM.

Other Potential Options – Level 3

No additional options are identified as part of a TWCM approach.

4.2.3 Drinking Water Quality

Issues to be addressed:

Issue 14: The drinking water catchments are impacted by current and historical land use and development - The catchments for Clarrie Hall Dam and Bray Park Weir are impacted by historical and current agricultural land management practices as well as the impacts of on-site sewerage management systems. While treatment facilities at Bray Park and Tyalgum have been upgraded to provide additional treatment reliability, there are opportunities for improved catchment management activities to control pollution at the source including agricultural land management, urban stormwater quality improvements, riparian management, point source pollution controls, education and catchment development controls.

Issue 15: As a precaution the Uki WTP is shut down during dirty water events - The need for consideration of the adequacy of treatment facilities at Uki was raised in the 2011 review of the IWCM Strategy. However, the appropriate management actions (e.g. operational controls, WTP modifications or upgrade) have not yet been determined.

Issue 24: There is a need for a holistic catchment management strategy for the Shire - There is currently no framework for coordinating catchment management activities across the Shire. Existing estuary management plans and coastal zone management plans for estuaries have been developed through the state government's planning process. While the more recently updated plans have acknowledged the upstream catchment areas as affecting the health of estuaries, the main focus is on the health of the estuarine reaches. If a total catchment approach to water cycle management is desired, there is a need to strengthen the linkages between existing catchment management, plans for estuary management, agricultural management and IWCM programs and activities.

Current Strategy – Level 1

Management Option 9a - Development of a Drinking Water Quality Management Plan

An assessment of TSC's compliance with the ADWG was undertaken in 2010 and strategies were developed to address the identified gaps (Water Futures and City Water Technology, 2010). TSC adopted the Drinking Water Quality Policy (Version 1.0) in December 2010. The policy formalises TSC's position and commitment to drinking water quality and its management, as recommended in the Australian Drinking Water Guidelines (ADWG). TSC's Drinking Water Quality Management Plan (DWQMP) is progressively being developed.

Overall, TSC operates largely in accordance with the intent of the ADWG framework and is generally either partially or wholly compliant with the framework. The main improvements recommended following the review are:

- To formalise and reference existing processes to demonstrate compliance to the Framework; and
- To fill gaps where current process are either not in place or not quite up to current good practice levels.

Specific recommendations have also been made regarding the ADWG Framework elements, components and actions that need to be completed relating to (Water Futures, 2011):

- Regulatory and formal requirements for water quality;
- Identification of stakeholders and engagement processes;
- Update of the water quality data, hazard and risk assessment for Tyalgum with completion of the new WTP;
- Development of the Corporate Knowledge Base

- Review and update maintenance management and asset management systems;
- Employee awareness and training;
- Associated documentation preparation and review;
- Long-term evaluation of data; and
- Development of an audit program.

Management Option 9b - Upgraded treatment facilities at Bray Park and Tyalgum

TSC has successfully focussed on the provision of safe drinking water through the upgrade of the Bray Park and Tyalgum WTPs as well as algal and cyanobacterial control through improved mixing and destratification of Clarrie Hall Dam.

Other Potential Options – Level 2

Management Option 9c – Business continuity planning for Uki water supply

Ten year implementation cost: Included in Option 5e

Consideration of the adequacy of treatment facilities at Uki was raised in the 2011 review of the IWCM Strategy. Currently, if raw water quality deteriorates, the Uki WTP is shut down and treated water is carted from the Bray Park system. While this continues to provide safe drinking water to Uki, documentation of the risks and appropriate management actions (operational controls, trigger points and carting procedures) is yet to be included in the business continuity plan. This should be undertaken as part of Option 5e - Review and update water supply and wastewater Business Continuity Plans (refer Section 4.1.5).

Management Option 9d – Drinking water catchment management planning

Ten year implementation cost: $100,000 ($50,000 in year 1 and 2)

The risk assessment process carried out for the drinking water quality management plan identified some of the hazards impacting on the drinking water catchments. A catchment management plan should be developed covering the full catchment of Bray Park weir including Clarrie Hall Dam and its catchment (Doon Doon Creek) and all tributaries of the Tweed River upstream of Bray Park weir. A risk-based approach to drinking water quality management would consider:

- Catchment characteristics, condition, land-use and activities;
- Buffer-zone characteristics and condition;
- Waterway characteristics and condition;
- Storage characteristics and operations;
- Weir characteristics and operations;
- Potential future impacts of climate change (sea level rise and increased storminess); and
- Existing catchment management activities.

Key risks include agricultural activities within the catchment, recreational activities within the catchment, waterways and dam, management of public areas, aquatic weeds, riparian vegetation condition, stream bank erosion, blue-green algae, tidal intrusion and thermal stratification. Potential augmentation of Clarrie Hall Dam and the required management measures should also be addressed in the plan. The catchment management plan would need to link to the overall DWQMP including objectives and targets, actions identified to address the risks and a clearly defined implementation strategy.

Other Potential Options – Level 3

As part of the TWCM approach, the drinking water catchment management plan could be undertaken as part of the model described in Section 4.5.1. This would still address the requirements of the ADWG but would also consider risks to waterway health as part of the holistic approach.

4.2.4 Drought and Emergency Management

Issues to be addressed:

Issue 16: Drought contingency and water supply emergency management measures need to be further developed - Given the predicted delay until augmentation of the Tweed District water source is required, it is considered appropriate to reassess the water supply failure scenarios including normal, restricted and emergency demand requirements. This assessment should consider the impacts of water sharing plan rules, potential fish passage requirements, proposed catchment management measures and effectiveness of the upgraded Bray Park WTP. Feasible contingency measures to cater for emergency scenarios (e.g. drought, infrastructure failure, raw water contamination) will also need to be developed.

Current Strategy – Level 1

Management Option 10a - Adopted Drought Management Strategy and Restrictions Policy

The *Tweed Shire Council Drought Management Strategy* (MWH, 2009) was prepared in 2009 and restriction levels and demand targets were subsequently adopted by TSC and reviewed in 2012.

The *Business Continuity Plan (BCP) for Water and Wastewater Services* (TSC, 2011c) addresses the scenario where the level of Clarrie Hall Dam drops to 25% and river flow has previously ceased and only about 6 months of restricted supply remains. This BCP has been compiled to enable a response to source failure due to prolonged drought, and where implementation of level 7 restrictions and planned emergency supply arrangements is inadequate.

Other Potential Options – Level 2

Management Option 10b – Review and Update Drought Management Strategy

Ten year implementation cost: $150,000 ($50,000 every 4 years)

The Drought Management Strategy should be updated with the findings of previously identified actions including:

- Current demand patterns (Section 4.2.1);
- Security of supply planning based on the 5/10/10 rule, Water Sharing Plan environmental flow and fish passage requirements (Section 4.2.2);
- Emergency supply requirements, scenarios and response feasibility;
- Normal, restricted and emergency demand requirements and the ability to achieve the target demand reductions;
- Blue-green algae management protocols; and
- Catchment planning actions (Section 4.2.3).

Feasible contingency measures to cater for emergency scenarios (such as prolonged drought, infrastructure failure and raw water contamination) will also need to be developed and documented in the BCP (refer Section 4.1.5).

As discussed in Section 2.7.4, the NOROC regional water supply strategy has identified potential regional and local solutions to improve water supply security in the Tweed. Potentially beneficial options include interconnection with the Rous Water supply combined with regional sharing of surface water supplies, a regional desalination facility and local groundwater supplies.

Other Potential Options – Level 3

No additional options are identified as part of a TWCM approach.

4.3 Urban Wastewater Management

4.3.1 Servicing New Developments

Issues to be addressed:

Issue 17: The opportunities for development (urban expansion) outside of the wastewater service areas is limited by the capacity of Council's infrastructure and the environment - Estuary management planning in the Tweed has identified issues relating to the impacts of wastewater discharges and urban runoff and the nutrient assimilation capacity of the waterways. The sustainable servicing of new development areas will require consideration of the sensitivity of the receiving waterways, increasing regulations, treatment requirements and costs as well as the development of policies to translate the IWCM objectives into development controls.

Issue 19: Council and the community have a desire for increased water recycling but there are significant barriers to implementation of recycled water schemes within the Tweed Shire

Current Strategy – Level 1

Management Option 11a – Ongoing water supply and wastewater servicing strategies

TSC's current IWCM strategy with regard to urban wastewater management consists of a number of actions. These are summarised below:

- Banora Point WWTP has being upgraded to increase its capacity from 50,000 EP to 75,000 EP to allow for future growth including improved effluent quality discharged to receiving waters;
- A new WWTP and associated reticulation system has been constructed to service the villages of Burringbar and Mooball;
- TSC has obtained approval to redevelop the decommissioned Tweed Heads WWTP to 10,000 EP with equivalent effluent quality to the upgraded Banora Point WWTP, if and when required;
- Development of infrastructure strategies to concept stage for future developments at Cobaki Lakes and The Rise at Bilambil Heights; and
- An infrastructure strategy to concept stage has also been developed for future development at Kings Forest; and
- Ongoing liaison with private water utilities developing servicing strategies.

Currently, there are urban development projects underway with Part 3A development approval from the Minister of Planning (e.g. Cobaki Lakes, west of Tweed Heads and Kings Forest, south west of Kingscliff). Both developments have adopted the preferred demand management scenario of BASIX implementation and 5,000 L rainwater tanks. The urban areas will be connected to TSC's centralised wastewater treatment systems. The recent upgrade to Banora Point WWTP provides capacity to service the Cobaki Lakes

development while Kingscliff WWTP will require further upgrade to cater for the fully developed Kings Forest site.

Other Potential Options – Level 2

No additional options have been identified as part of an urban water cycle management approach as this is TSC's current focus. The current approach meets the Office of Water guidelines for IWCM.

Other Potential Options – Level 3

Management Option 11b - Integrated Servicing Strategies

Ten year implementation cost: $160,000 ($20,000 from year 3)

Further detailed planning is required for service provision for new developments based on population forecasts, land use planning and land/waterway and infrastructure capacity. While major treatment plants are being upgraded to increase capacity and improve effluent quality, the impact of the ultimate pollutant loadings (as a result of servicing new developments) on the receiving environments still needs to be considered.

Recent community consultation has identified a growing level of community support for improved environmental outcomes for the Tweed Shire, particularly in association with the health of the Shire's waterways (refer Section 3.3.2). In responding to the community's desire for protection of waterways, a total water cycle approach would incorporate waterway health considerations as key inputs in the early stages of land use and development planning.

Such an approach aims to ensure decision makers understand the linkages between land use planning and the effect on the overall water cycle. In this case it will be important to identify key links between water supply, wastewater and stormwater servicing proposals and the measured health of the Shire's waterways. For example, if waterways are already showing signs of ecosystem stress, such as elevated nutrient concentrations or pathogen levels, adding further input of pollutants to the system, is likely to result in a greater level of risk to ecosystem values. The total water cycle management approach offers a framework for integrated planning across catchments and consideration of the urban water cycle in the context of waterway health which can be utilised most effectively in early land use planning stages. The proposed framework discussed in Section 4.5.1 (Management Option: 17g – Total water cycle management) uses sub-catchment management plans to identify land use planning constraints on a local scale.

Management Option 11c – Identify opportunities for increased water recycling

Ten year implementation cost: $250,000 (years 1 to 4)

TSC's current effluent reuse strategy is limited to on-site reuse at WWTPs, irrigation schemes and cooling water for Condong Sugar Mill. The Demand Management Strategy (MWH, 2009a) considered recycled water options for greenfield developments as well as open space irrigation. In addition to demand reduction, MWH noted that the progressive implementation of recycled water will have clear environmental benefits including reduction in nutrient loads and other pollutants currently discharged to the Tweed River but found that the cost of the greenfield development scenarios increased significantly with the inclusion of recycled water components.

Since that time, some large urban developments have been approved by the State Government under Part 3A without the requirement for dual reticulation. Construction of these developments has not yet commenced and sections of the community have raised concerns that dual reticulation should be a requirement. However, Council has no power to require developers to operate outside of the conditions of the Part 3A approval. What is possible is for Council to consider future policy development and opportunities

for increased water recycling as part of the development of the servicing strategies for other greenfield developments. This is a key component of the TWCM approach in this IWCM strategy.

The recent community consultation conducted as part of this IWCM review has indicated that there is continued support for the use of rainwater tanks and local stormwater harvesting options and also a growing community acceptance of recycled water initiatives. Of the people surveyed, 93 % supported using rainwater from residential tanks for toilet, laundry and outdoor taps, while 89 % agreed with the use of locally harvested stormwater, and 66 % were supportive of treated wastewater or sewage for these purposes (refer Appendix 2). The community survey also revealed a strong preference for funding to be allocated to protect natural waterway health, which was the second most preferred option after protection of water supply.

The Demand Management Strategy (MWH, 2009a) estimated that the recycled water options examined reduced effluent flows to the waterways by more than 10%. Community acceptance for recycled water solutions and support for funding of environmental initiatives could provide opportunities to strengthen policy around greater implementation of these initiatives into the future and may allow TSC and the community to justify the additional economic cost of these schemes. A TWCM approach (see Section 4.5.1) provides further support for schemes that provide the best overall outcomes for the community as well as waterway health.

A recent local example of such an approach is the current Urban Water Management Strategy adopted by Ballina Shire Council (BSC). BSC recognised that wastewater discharges were negatively impacting environmental values for the Richmond River, and there was a strong community desire to improve the health of the river. This desired environmental outcome became a primary driver for the decision to upgrade their wastewater treatment facilities to improve the quality of wastewater discharges and reduce the total discharge of wastewater to the environment through increased recycling initiatives (e.g. open space and agricultural irrigation and dual reticulation for new developments).

A TWCM approach should consider water recycling options as part of the integrated servicing strategies (Option 11b) in future development areas that are not yet approved where:

- Receiving environments are sensitive to increased loadings or are showing signs that they are already stressed;
- The development is located far from existing centralised systems and the cost of pumping and transport are high;
- Existing centralised systems are limited in their capacity for upgrades to increase capacity (e.g. Hastings Point WWTP);
- Where new WWTPs are required to service developments and local utility schemes or ‘package plants’ are recommended as part of land use planning; and
- Recycled water opportunities (apart from domestic use) are available e.g. agricultural irrigation/sports fields etc.

Table 14 and Figure 16 detail the future urban development areas that are either:

- Zoned for urban development, with approval for subdivision (including an approved wastewater service plan); or
- Zoned for urban development, without approval for subdivision; or
- Identified by the *Tweed Urban and Employment Land Release Strategy* (TUELRS, GHD, 2009), or the *Far North Coast Regional Strategy* (DoP, 2006) as potential future urban land, with no approval for subdivision.

The table presents the factors of each site described above and potential opportunities for water recycling initiatives as part of the servicing strategies.

As part of the total water cycle approach and the development of sub-catchment management plans (refer Section 4.5.1), the land-use and development constraints identified would assist in the development of integrated asset management and servicing strategies. This would need to be supported by Council policy and funding to ensure achievement of the required outcomes.

Table 14: Potential urban development sites in the Tweed Shire

Site Name	Land Zoning Status	Approx. max no. dwellings (TUELRS, 2009)	Approx. distance to nearest WWTP (km)	Wastewater service requirements	New WWTP or upgrade required?	Proposed wastewater servicing (by Council)	Approval Status	Opportunity for water recycling initiatives?
East Kielvale (Area 1)	Potential urban area (TUELRS, 2009)	1,500	7.5	Needs new WWTP to service it either package WWTP, or upgrade Murwillumbah WWTP	Yes	nothing proposed	None	Yes – large development > 7km from existing WWTP. New WWTP or upgrade of existing plant likely to require recycling.
West Murwillumbah (Area 2)	Potential urban area (TUELRS, 2009)	500	4	Augmentation of Murwillumbah WWTP required prior to connection	Yes	nothing proposed	None	Possibly – medium size site, approx. 4km from existing WWTP. Opportunity to upgrade existing WWTP to provide for reuse or package plant at site depending on timing of the development.
West Murwillumbah (Area 3)	Potential urban area (TUELRS, 2009)	100	4.5	Close to Murwillumbah WWTP, augmentation of plant required prior to connection	Yes	nothing proposed	None	Possibly – medium size site, approx. 4km from existing WWTP. Opportunity to upgrade existing WWTP to provide for reuse or package plant at site depending on timing of the development.
West Kings Forest (Area 4)	Potential urban area (TUELRS, 2009)	1,000	8	Needs new WWTP or upgrade of Kingscliff WWTP required	Yes	nothing proposed	None	Possibly - large development over 8km from existing WWTP. Opportunity to upgrade existing WWTP to provide for reuse, but distance from WWTP lends itself to possibility of package plant at site. Note the adjoining Kings Forest site is approved to connect to Kingscliff WWTP without recycling.
North Seabreeze estate (Area 5)	Potential urban area (TUELRS, 2009)	140	6	Needs new WWTP to service it - Hastings Point has limited capacity for upgrade	No	Treatment at Hastings Point WWTP	None	Unlikely - small size and immediately adjacent to existing infrastructure means likely to be treated at Hastings Point WWTP when capacity available after Tanglewood development becomes stand-alone.

Site Name	Land Zoning Status	Approx. max no. dwellings (TUELRS, 2009)	Approx. distance to nearest WWTP (km)	Wastewater service requirements	New WWTP or upgrade required?	Proposed wastewater servicing (by Council)	Approval Status	Opportunity for water recycling initiatives?
West Seabreeze estate (Area 6)	Potential urban area (TUELRS, 2009)	30	6.5	Needs new WWTP to service it - Hastings Point has limited capacity for upgrade	No	Treatment at Hastings Point WWTP	None	Unlikely - small size and immediately adjacent to existing infrastructure means likely to be treated at Hastings Point WWTP when capacity available after Tanglewood development becomes stand-alone.
Dunloe Park (Area 7)	Potential urban area (TUELRS, 2009)	1,000	10	Needs new WWTP to service it as Hastings Point WWTP has limited capacity for upgrade	Yes	Private utility scheme with package plant and dual reticulation	Council endorsed feasibility plan from private utility scheme	Yes – Appears feasible for private utility with dual reticulation and other reuse schemes.
Burringbar (Area 8)	Potential urban area (TUELRS, 2009)	50	4	Needs new WWTP to service it - Burringbar WWTP has limited capacity.	No	Treatment at Burringbar/ Mooball WWTP	None	Unlikely - small area likely to be treated at Burringbar facility when capacity available after Mooball Area 9 becomes stand alone.
Mooball (Area 9)	Potential urban area (TUELRS, 2009)	230	2	Needs new WWTP to service it - new Burringbar STP has limited capacity package STP required	Yes	nothing proposed	Council endorsed feasibility plan from private utility scheme	Yes - small –medium size area but new WWTP required as Burringbar facility cannot be upgraded to cater for it. Potential to free-up capacity for Burringbar Area 8 to connect to Burringbar/Mooball WWTP.
Cobaki Lakes	Zoned for residential development (LEP, 2000)	5,500	8.5	Banora Point WWTP has capacity to cater for site.	No – upgrade just completed	BASIX and rainwater tanks 5000L wastewater treatment at Banora Point WWTP.	Part 3A approval of concept plan	Unlikely given capacity available and distance to return recycled water.

Site Name	Land Zoning Status	Approx. max no. dwellings (TUELRS, 2009)	Approx. distance to nearest WWTP (km)	Wastewater service requirements	New WWTP or upgrade required?	Proposed wastewater servicing (by Council)	Approval Status	Opportunity for water recycling initiatives?
Kings Forest	Zoned for residential development (LEP, 2000)	4,500	5.5	Connection to Kingscliff WWTP planned 3 stages based on construction program. Kingscliff WWTP will require upgrade to cater for development.	Yes, upgrade of Kingscliff WWTP required	BASIX and rainwater tanks 5000L wastewater treatment at Kingscliff WWTP.	Part 3A approval of concept plan	Unlikely given capacity available and distance to return recycled water.
Bilambil Heights	Zoned for residential development (LEP, 2000)	2500	10	Large development can be connected to Banora Point WWTP	No	Banora Point WWTP recently upgraded to cater for increase in urban area.	state significant site approval of concept	Unlikely given capacity available and distance to return recycled water although Banora Point EIS identified this site as potential for dual reticulation. No approval to date for wastewater servicing
Terranora Area E	Zoned for residential development (LEP, 2000)	1600	3	Large development can be connected to Banora Point WWTP	No	Banora Point WWTP recently upgraded to cater for increase in urban area.	Application for first 300 lots awaiting Part 3A approval.	Unlikely given capacity available and distance to return recycled water although Banora Point EIS identified this site as potential for dual reticulation. No approval to date for wastewater servicing
West Kingscliff	Zoned for residential development (LEP, 2000)	1375	1.5	Large development can be connected to Kingscliff WWTP	Yes, upgrade of Kingscliff WWTP required	Connection to Kingscliff WWTP	No application to date, no approval for subdivision	Possibly – in close proximity to Kingscliff WWTP. DMS recommended recycled water be made available to future industrial land use areas where demand is identified
Tanglewood	Zoned for residential development (LEP, 2000)	650	2.5	Large development requiring new WWTP to service it - Hastings Point has limited capacity for upgrade(TUELRS, 2009)	Yes	None proposed	No application to date, no approval for subdivision	Yes – large development requiring new WWTP and could be suitable for a package plant with dual reticulation

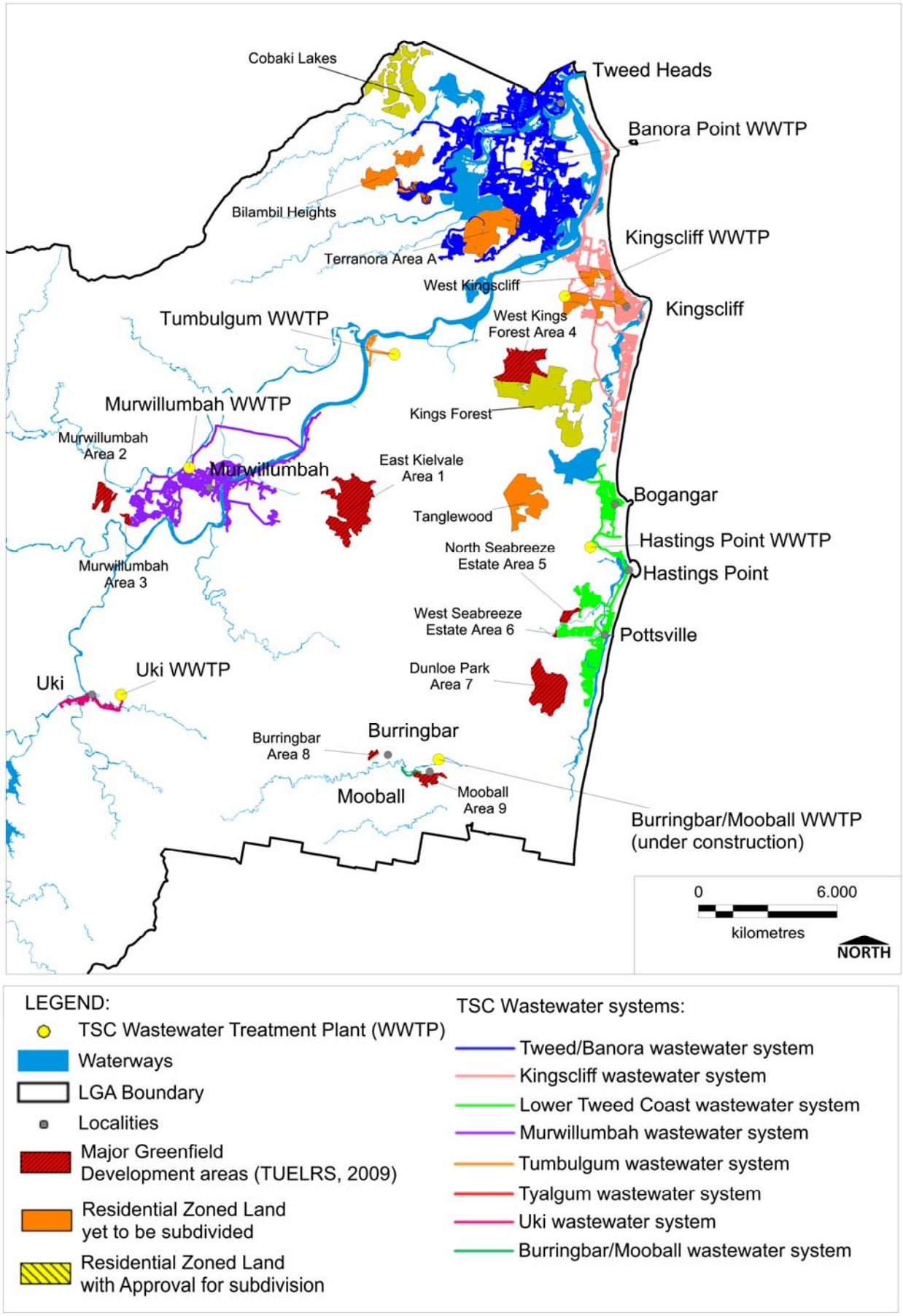

Figure 16: Tweed Shire existing wastewater systems and future development areas

4.3.2 Algal Blooms in Uki Effluent Storage Pond

Issues to be addressed:

Issue 18: Licence requirements for pH and suspended solids at Uki WWTP need to be reviewed - As all effluent is used for irrigation of a koala feed tree eucalyptus plantation, high levels of suspended solids and pH in the irrigation dam are not a concern from an environmental protection point of view. However the environment protection licence requirements are mandatory targets and liaison with the NSW EPA is required to establish more appropriate targets for this situation.

Current Strategy – Level 1

Management Option 12a – Uki WWTP Modifications

To control algal growth and the resulting increase in suspended solids and pH in the licensed effluent discharge from Uki WWTP, TSC has trialled surface aeration, biological additives and maintaining a low water level in the storage pond but these have not been effective in the control of algae. A suite of plant modifications has been designed to improve plant performance, particularly the removal of nutrients from the effluent discharge which would reduce the growth of algae in the pond. Additional modifications may include reducing the size of the effluent pond to enable increased turn-around.

While licence limits for pH and suspended solids are not always achieved due to the algal growth, all effluent is used for irrigation and the high levels of suspended solids and pH in the irrigation dam are not a concern from an environmental protection point of view. However, the success of these modifications will need to be reviewed in accordance with licence conditions. TSC may be able to renegotiate its licence conditions with the NSW EPA to establish more appropriate licence requirements for this situation.

Other Potential Options – Level 2

No additional options have been identified as part of an urban water cycle management approach as this is TSC's current focus. The current approach meets the Office of Water guidelines for IWCM.

Other Potential Options – Level 3

No additional options are identified as part of a TWCM approach.

4.3.3 Biosolids Management

Issues to be addressed:

Issue 20: There is a high cost of sustainable biosolids management - The challenges with biosolids management include the high cost and energy consumption of treatment options for beneficial reuse, odour impacts, potential changes to auditing and regulation requirements and land availability for storage and treatment. There are potential synergies between biosolids reuse and Council's Agriculture Strategy and increased integration between these strategic planning processes may provide additional benefits for farm management as well as wastewater management.

Current Strategy – Level 1

Management Option 13a - Farmland application of biosolids

TSC WWTPs produce approximately 1,500 dry tonnes of biosolids each year. Anaerobic lagoons are used to stabilise biosolids at all TSC's WWTPs except Banora Point WWTP (due to space limitations). Biosolids from Banora Point WWTP (approximately 75% of the total produced) are currently transported to farmland in the Darling Downs. The stabilised biosolids are transported to cane farms in the Tweed Valley.

Other Potential Options – Level 2

Management Option 13b – Biosolids Management Strategy

Ten year implementation cost: $150,000 ($50,000 every 4 years)

Council is planning to develop a management plan for future biosolids reuse and disposal. The strategy will depend on issues such as stabilising options for Banora Point WWTP, regulatory requirements, storage requirements, handling and management options. The strategy will identify biosolids quality and quantity, legislative requirements and flexible management options that can cater for future changes to biosolids loadings, reuse options and regulatory requirements. Beneficial use options include agricultural applications, compost/landscaping, capital and operating costs, transport, handling and space requirements as well as social and environmental impacts.

There are potential synergies between biosolids reuse and TSC's Agriculture Strategy (discussed in Section 4.5.1). Increased integration between these strategic planning processes may provide additional benefits for farm management as well as wastewater management. As an example, Tweed Shire Council is currently conducting a composting trial using WWTP biosolids with stabilised compost to be applied to 5 local cane farms. If successful, the production of compost from WWTP biosolids is predicted to result in economic benefits for the shire as well as increased nutrient availability, improved soil physical condition, reduced runoff and waterlogging, reduced fertilisation costs and increased productivity for farmland. Increased carbon sequestration in the compost enriched soils can also reduce net greenhouse gas production.

Biochar is an emerging solution to waste management that presents an opportunity for recycling of organic wastes including biosolids to create green energy, increase soil carbon sequestration and provide beneficial uses as a soil conditioner for agricultural application. The Biochar technology presents a possible alternative option for biosolids management as part of a broader integrated waste management strategy with renewable energy production, carbon sequestration and agricultural land improvement benefits. The disadvantage of this option is the high set up and running costs which has so far prevented its implementation, particularly in comparison to low tech options such as composting that are much more affordable.

Ballina Shire Council has recently received government funding to assist in developing a Biochar plant in Ballina which is expected to be operational by mid-2015. Preliminary indications are that the requirement for biosolids at the plant will be fully supplied by the Ballina wastewater treatment plant. Depending on the final scale of the Ballina plant, and potential expansions there may be future opportunities for use of Tweed Shire biosolids at the Ballina facility at much lower costs to Council than establishing its own plant. Further liaison with Ballina Council is recommended to explore this opportunity. Alternatively, TSC may investigate the suitability for similar integrated waste management solutions in the Tweed Shire.

Other Potential Options – Level 3

No additional options are identified as part of a TWCM approach. Increasing beneficial reuse of biosolids is also appropriate as a component of a total water cycle management approach.

4.4 Urban Stormwater Management

4.4.1 Water Sensitive Urban Design

Issues to be addressed:

Issue 21: Increased emphasis on water sensitive urban design will require more integrated Council responsibilities, increased community education and increased staff capabilities and funding - The draft Tweed Urban Stormwater Quality Management Plan (Australian Wetlands, 2011) has a strong emphasis on achieving water quality objectives for downstream waterways. The Plan refers to guidelines, resources and tools that should be used to implement best-practice stormwater management, many of which have been developed by the Water By Design program for the South East Queensland Health Waterways Partnership. Implementation of the WSUD framework will require significant strategic planning, community education and additional resources to be effective.

Issue 22: Existing Council development controls do not fully address the residual load of urban stormwater on downstream sensitive waterways - For some developments, existing Council development controls (e.g. D7) can be satisfied through design of stormwater pollutant reduction systems yet residual loads may be detrimental to downstream sensitive waterways. In these cases, compensatory activities to offset residual and cumulative impacts of stormwater discharge into waterways may be considered, however, guidelines and policy mechanisms are required to enforce offsets and address the residual impacts.

Current Strategy – Level 1

Management Option 14a – Preliminary development of WSUD Policies

The potable water demand management components of WSUD have been addressed in Sections 4.2 and 4.3.

The *Tweed Urban Stormwater Management Plan* was prepared in 2000 (TSC, 2000) and a 7 year infrastructure program was developed. This Plan has now been superseded by the draft *Tweed Urban Stormwater Quality Management Plan* (USQMP, Australian Wetlands, 2012) which has been prepared based on WSUD philosophies for stormwater management. The draft USQMP has not been adopted by Council to date and sections of the plan are currently under review. TSC's *Development Design Specification D7 – Stormwater* (also currently under review) will complement the draft USQMP by detailing stormwater objectives/standards and prescribed stormwater management measures that comply with the draft USQMP and contemporary best-practice. Issues such as how developments are planned, education of the community and strengthening planning requirements are being considered by Council and incorporated into the updated LEP and future revisions of subdivision and stormwater design specifications.

TSC Planning, Engineering, NRM and Water Unit staff continue to work collaboratively in assessing new developments with a view to promoting sustainable water cycle management options. Stage 1 of the Demand Management Strategy identified demand management actions which are undertaken as part of the implementation of WSUD and ESD principles. TSC staff aim to form a stormwater working group covering activities over the whole asset life cycle (planning, development controls, design, operation, maintenance and renewal) to develop systems and guidelines and ensure resources for each of these phases are adequate.

In relation to the design and management of Stormwater Quality Improvement Devices (SQIDs), the draft USQMP recommends the implementation of a SQID design and management process consistent with the Water by Design program of the South East Queensland Healthy Waterways Partnership. The USQMP refers to the suite of Water by Design documents to ensure stormwater design and maintenance is consistent with current best-practice.

Other Potential Options – Level 2

No additional options have been identified as part of an urban water cycle management approach as this is TSC's current focus.

Other Potential Options – Level 3

While TSC is working towards greater implementation of WSUD principles in all aspects of urban design, development, and operation a number of barriers have been identified to full implementation which are discussed below.

WSUD Asset Management and Maintenance

There is a need for greater integration of TSC stormwater management responsibilities and resourcing to cater for knowledge sharing and improved outcomes for on-ground works. It has been identified that, in general, TSC staff that maintain the stormwater systems have functional/engineering capability but limited knowledge of natural systems/vegetation. Conversely, TSC's Parks and Gardens staff who maintain the vegetated areas have limited stormwater engineering capability.

TSC's *Drainage Assets Management Plan* (TSC, 2010b) is focussed on traditional stormwater assets (e.g. pipes, channels, floodgates). The Plan sets out a framework for asset management in the Shire including levels of service, lifecycle management, asset register (database), financial strategy and a monitoring and improvement program. TSC currently utilises the 'myData' and 'Works & Assets' software systems for Asset Management purposes. The system stores inventory, attribute, condition, financial and historical data (TSC, 2010). However there is only limited consideration of SQIDs such as GPTs, wetlands and sedimentation ponds as well as the natural asset components of the stormwater system. This is discussed further in Section 4.1.5.

The draft USQMP reviewed TSC's current stormwater activities and assets and identified a large resource deficiency with regard to the management of existing stormwater treatment assets, limited maintenance and limited data on condition and performance (Australian Wetlands, 2012). The Plan recommended that existing stormwater quality treatment devices need to be audited and information provided to the asset management planning process to ensure adequate maintenance and rectification of issues. The draft USQMP recommends funding is increased to ensure asset maintenance is carried out at a level that ensures the continued treatment performance of stormwater assets.

Space limitations restricting WSUD

Design of Council roads and stormwater systems does not usually incorporate WSUD due to space restrictions. Swales are typically being replaced with kerb and gutter systems to reduce maintenance and end-of pipe solutions are included in their place. TSC's WSUD objectives are documented in the draft USQMP and incorporate general aspirational targets for waterway health and improved uses such as improved aquatic ecosystems, recreational and commercial values, WSUD retrofit targets for existing urban areas, receiving waterway water quality targets and construction phase objectives. To comply with these objectives, TSC will need to review the process for design of Council roads and stormwater systems to address the space limitations currently identified.

Limited powers to enforce WSUD principles in state significant developments

TSC has limited power to enforce WSUD and ESD principles in developments approved under Part 3A of the EP&A Act (now replaced by State Significant Assessment system). There are two large urban development sites in the Tweed Shire that have been declared State Significant Development (Cobaki and Kings Forest) and the NSW Minister for Planning is the current consent authority for the projects. While TSC is a major stakeholder and has been consulted throughout the process, final approval decisions rest with the Minister. To enable effective communication of Council requirements in these situations, it is important to establish clear and concise Council policy, guidelines and regulation with regard to WSUD as well as establishing water cycle links (particularly between catchment land use activities, stormwater quality and the health of

receiving waterways) will assist in achieving TSC's targets, even when TSC is not making the final decisions. The total water cycle management approach offers a framework for utilising locally derived catchment information collected in sub-catchment management plans to develop land use planning constraints on a local scale. This level of detail, supported by scientific evidence, aims to provide clear guidelines for TSC input into state approval processes and ultimately to achieve the best outcomes for local catchments and waterways. Refer to Section 4.5.1 (Management Option: 17g – Total water cycle management) for further discussion of the proposed framework.

Legacy of existing stormwater controls with little or no water detention or treatment

Many of the existing Tweed Shire urban areas contain traditional stormwater assets, which are designed to quickly convey stormwater from urban areas to receiving waterways, often with no treatment or detention capacity. TSC recognises that many waterways in the Tweed are currently under stress as a result of historical urban development without due consideration of stormwater impacts on receiving environments.

A number of stormwater improvement projects have been undertaken since 2000 as part of implementation of the *Tweed Urban Stormwater Management Plan* (TSC, 2000) however the full program has not been implemented to date due to lack of funding. External grant funding was provided in 2008 for the installation of SQIDs on stormwater outfalls discharging into the Tweed River and Cudgen Creek.

As part of the review of TSC's current stormwater activities and status of assets and, the draft USQMP identified a large resource deficiency with regard to the management of existing stormwater treatment assets, limited maintenance and limited data on condition and performance (Australian Wetlands, 2012). The report recommended that existing stormwater quality treatment devices need to be audited and information provided to the asset management planning process to ensure adequate maintenance and rectification.

Constraints to Urban Development

The *Urban and Employment Land Release Strategy* (TSC, 2009) guides future urban development within the Shire until at least 2031. The strategy identifies water supply and sewerage infrastructure constraints as well as environmental constraints and opportunities to determine land suitability. There are a number of unknowns including the capacity of local waterways to assimilate stormwater flow and changes in quality. The TWCM approach aims to identify the land-use and development constraints and guide future land use planning, growth management and integrated servicing strategies. Refer to Section 4.5.1 (Management Option: 17g – Total water cycle management) for further discussion of the framework.

Management Option 14b - Greater integration of WSUD across Council

Ten year implementation cost: $500,000 ($100,000 in year 2 and $50,000 p.a.)

Strategic planning, education and additional resources focussed on the implementation of the WSUD framework is required to achieve improved urban stormwater management. Improved integration of WSUD into TSC policies and procedures requires the following considerations:

- Review of TSC stormwater design guidelines and specifications (see section 4.4.2 below);
- Review of the *Drainage Assets Management Plan* (TSC, 2010b) to better incorporate WSUD and strengthen linkages between the draft USQMP. The existing framework provided by the *Drainage Assets Management Plan* provides tools to assist in management and on-going maintenance of WSUD assets. Integration with the existing asset management systems will prevent unnecessary duplication of processes within Council. This may require additional outputs from the existing asset database and link with site specific information such as operation and maintenance manuals provided by developers, and relevant monitoring and maintenance checklists. A feedback loop will be important for on-ground works, follow-up assessment and future works scheduling. Feedback from the asset condition and maintenance tracking into the planning and development stages of WSUD will also be important to identify any significant maintenance issues and allow for on-going improvements specific to the local area;

- The Water by Design suite of documents recommended by the draft USQMP provides a number of useful guidelines to assist in stormwater asset handover, maintenance and repairing WSUD assets (refer Figure 17);
- An audit of existing urban stormwater systems and SQIDs is required to identify priority maintenance and/or retrofit sites. Integrating this with a TWCM approach would assist in prioritisation and achieving the 'best bang for buck'. Such an approach would involve:
    - Mapping of stormwater sub-catchments incorporating urban stormwater assets and discharge points;
    - Risk assessment of sub catchments based on physical characteristics (size, slope, land use, age of infrastructure, complaints etc.) for prioritisation;
    - Site audits of stormwater systems noting age and condition, (vegetation/weeds, sedimentation, damage, water quality issues etc.);
    - Review results of previous ecosystem health or water quality studies (EMP/CZMPs etc.) as a preliminary action with targeted additional sampling if required;
    - Recommend priority actions to improve stormwater systems (e.g. maintenance work, re-design, retrofit etc.); and
    - Funding requirements.

  Many of the above tasks could be achieved as a subset of a broader TWCM framework (refer Section 4.5.1); and
- There is a need for greater integration of TSC stormwater management responsibilities and resourcing to cater for knowledge sharing and improved outcomes for on-ground works. Staff carrying out works need to be equipped with the tools and experience necessary to maintain WSUD assets or need to have access to staff with that knowledge.

A TWCM approach (refer Section 4.5.1) would assist in identifying and prioritising sites for improvement, identifying data gaps and building a greater knowledge base on which to make informed decisions. TSC has undertaken extensive planning for asset management but on-ground works are limited. A strategic/ TWCM approach with clear priorities would assist decision makers in allocating funding for on-ground works.

An overriding framework for WSUD implementation would assist in greater integration across Council. Figure 17 provides an example of a framework that reflects the documentation required to support the urban development process from planning through to asset maintenance (the full asset lifecycle). Much of the required documentation exists through TSC's current guidelines and can be supplemented by best-practice approaches provided by other government agencies such as Water by Design (South-East Queensland Healthy Waterways Partnership).

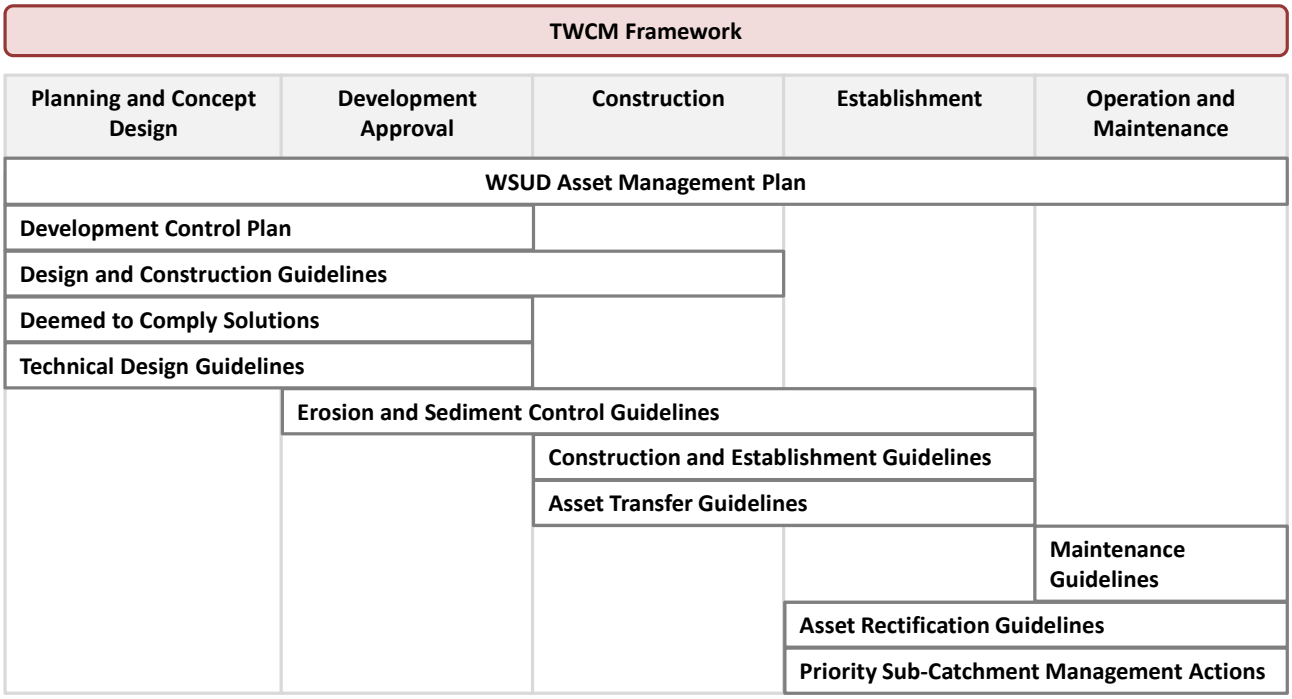

Figure 17: Example Water Sensitive Urban Design Implementation Framework

Adapted from Hydrosphere Consulting (2012b)

4.4.2 Development Controls

Issues to be addressed:

Issue 22: Existing Council development controls do not fully address the residual load of urban stormwater on downstream sensitive waterways

Issue 25: There is limited integration between urban and rural strategic land use planning - There is a need to protect the agricultural values and limit encroachment and cumulative impacts of urban development on farming land. Integration of rural strategic planning with the urban area planning is required to achieve the aims of the IWCM Strategy.

Current Strategy – Level 1

Management Option 15a – Review of Stormwater Development Controls

TSC's Planning and Infrastructure and Engineering Units are updating *Development Design Specification D7 – Stormwater Quality* (TSC, 2012). The stormwater objectives provided in Council's D7 specification apply to all new development in the Tweed region unless there is a catchment specific stormwater objective provided in the Tweed USQMP, a catchment management plan or a coastal zone management plan.

Developers can design stormwater pollutant reduction systems that meet existing DCPs (such as D7), but a residual load still occur and be detrimental to downstream sensitive waterways. For some developments, the desired level of protection may not be achievable, even when a range of appropriate measures have been incorporated. For some recent developments, compensatory activities have been proposed to offset residual and cumulative impacts of stormwater discharge into waterways. The draft USQMP includes this new approach of compensatory activities however, the approach has not yet been formalised into Council policy and can therefore not be enforced.

Other Potential Options – Level 2

No additional options have been identified as part of an urban water cycle management approach as this is TSC's current focus.

Other Potential Options – Level 3

Management Option 15b – Develop guidelines for compensatory measures

Ten year implementation cost: $60,000 ($30,000 in year 1 then $10,000 every 3 years)

In order to implement a system of development offsets, TSC need to develop guidelines and policy to formalise the process for addressing the residual impacts of urban developments. Clear rules and regulations are required to ensure the objectives of the policy are achieved.

Where it is determined that the residual discharge from a development will have a detrimental impact on stormwater objectives, Council may consider a Voluntary Planning Agreement (VPA) via which stormwater impacts on the waterway are offset by rehabilitation, retrofit or compensation measures at another location. The basis of this concept is that the overall ecological health and resilience of the waterway can be improved as a result of the development, despite the potential worsening of local conditions. A VPA can also be a mechanism via which resources are strategically redirected to contribute to catchment wide water quality initiatives, achieving ecological and economic benefits of scale, rather than smaller, localised stormwater devices.

Guidelines need to be developed specifying:

- The accepted application of compensatory measures. TSC needs to document the specific criteria where offsets can be considered and the relationship with the existing development controls to avoid any misinterpretation of requirements;
- The desired hierarchy of potential offset measures e.g. within the same catchment, within a similar habitat or addressing a similar issue in a different location;
- The nature of offsets including minimum criteria in terms of type of works. For example riparian restoration works factors such as buffer width, percentage cover, species composition, weed management and maintenance periods should be specified; and
- The mechanisms for provision of the measures e.g. VPAs.

It is also recommended that a register of potential compensatory activities or sites is developed based on prioritised catchment actions or projects (see Section 4.5.1). Such projects should have adequate scope of works, desired outcomes and defined targets and be ready for on-ground implementation. The priority projects will essentially form a list of preferred offsets for developments.

4.4.3 Erosion and Sediment Control

Issues to be addressed:

Issue 23: Existing subdivision erosion and stormwater controls and resources are not adequate for the rainfall and rate of development experienced in the Tweed - Resources for inspection and/or enforcement of Council's erosion and sediment control requirements for new developments are limited and Council relies on complaints or inspections to highlight inadequacies in control systems.

Current Strategy – Level 1

Management Option 16a – Existing Erosion and Sediment Controls

Construction phase stormwater quality is controlled through Councils *Development Design Specification D7*, Annexure A - "Code of Practice for Soil and Water Management on Construction Works". Works to capture sediment laden water are required to be designed to accommodate a design storm of the ARI 3 month storm (deemed to be 40% of the ARI one year event) and overflow/bypass arrangements are to be designed to accommodate an ARI 100 year storm without erosion, scouring or structural damage to erosion or sediment control devices or re-mobilisation of previously captured sediment. Council's development construction specification (C211) - Control of Erosion and Sedimentation covers the construction of structures and the implementation of measures to control erosion and sedimentation in accordance with the approved Erosion and Sediment Control Plan or Soil and Water Management Plan included in the design plans.

Other Potential Options – Level 2

No additional options have been identified as part of an urban water cycle management approach as this is TSC's current focus.

Other Potential Options – Level 3

Management Option 16b – Review and update erosion and sediment controls and provide increased resources

Ten year implementation cost: $1,520,000 ($120,000 in year 1 to 3 then $200,000 p.a.)

Resources for enforcement of the requirements of D7 and C211 are limited and TSC relies on complaints and follow-up inspections to highlight inadequacies in control systems. A review of the erosion and sediment control regulation process would allow for the identified issues to be addressed. Better coordination of education, inspections and enforcement is needed to resolve some of the issues. Education of developers, contractors and on-ground workers should be the focus of work to improve understanding of the issues and to make the expectations clear. Improvements in the regulation and enforcement of conditions are also required. Both self-regulation (by contractors) and Council regulation should be considered including mandatory inspections of construction sites, especially following rainfall events. A clear system of expected level of performance, education and accountability is required supported by a structured site inspection regime.

An alternative or complimentary option would include an incentive program for sites achieving the requirements. Contractors could receive a rating for their environmental performance based on site management, staff education, self-regulation and Council inspections.

Increased TSC resources would be required to adequately undertake the above actions.

4.5 Catchment Management

4.5.1 Catchment Management Planning

Issues to be addressed:

Issue 4: Uncertainty regarding the preferred Tweed district water supply augmentation option creates confusion regarding land use planning

Issue 14: The drinking water catchments are impacted by current and historical land use and development

Issue 24: There is a need for a holistic catchment management strategy for the Shire

Issue 25: There is limited integration between urban and rural strategic land use planning

Current Strategy – Level 1

Management Option 17a – Management of separate areas of catchments as part of existing local and regional programs undertaken by various stakeholders

Historically, separate elements of the Tweed Shire catchments have been managed by different parts of Council or State Government authorities (e.g. Office of Environment and Heritage and Office of Water) and the responsibilities are continually changing through state government restructure. A range of other stakeholders are also involved in different areas of catchment management and on-ground works. The Tweed River Committee provides direction on initiatives for items such as stream bank protection, planning controls, education and revegetation. Community groups such as Landcare initiatives undertake catchment revegetation and bush regeneration works at various sites in the Shire. Individual landholders in cooperation with Council and with funding from the Water and Sewer Dividend Payment undertake catchment and water quality improvement initiatives within the drinking water supply catchment which includes the upper Tweed River to Bray Park Weir at Murwillumbah (refer below). Catchment rehabilitation works, including riparian restoration and rural and urban stormwater improvement have also been carried out in the Terranora and Cobaki Broadwaters as part of a suite of offsets for the Banora Point WWTP upgrade.

TSC has a number of management plans for different areas of the Tweed catchment. Figure 18 shows the areas of the Tweed Shire covered by existing plans of management and policies related to catchment management and waterway health. There are a range of policies and management plans related to catchment management, agricultural and vegetation strategies, urban stormwater management and estuary health. Some plans and policies have limited areas of application and others have Shire-wide application. Each of the separate planning documents and frameworks has their own defined purpose, objectives and area of application. Details of the various strategies and plans in operation are discussed in the Background Paper (Appendix 1).

The 2006 IWCM strategy provided a framework for the integration of aspects of the water cycle, however this was focussed on the urban water cycle (particularly water and wastewater services) without detailed consideration of whole of Shire water cycle issues and links to the non-urban areas.

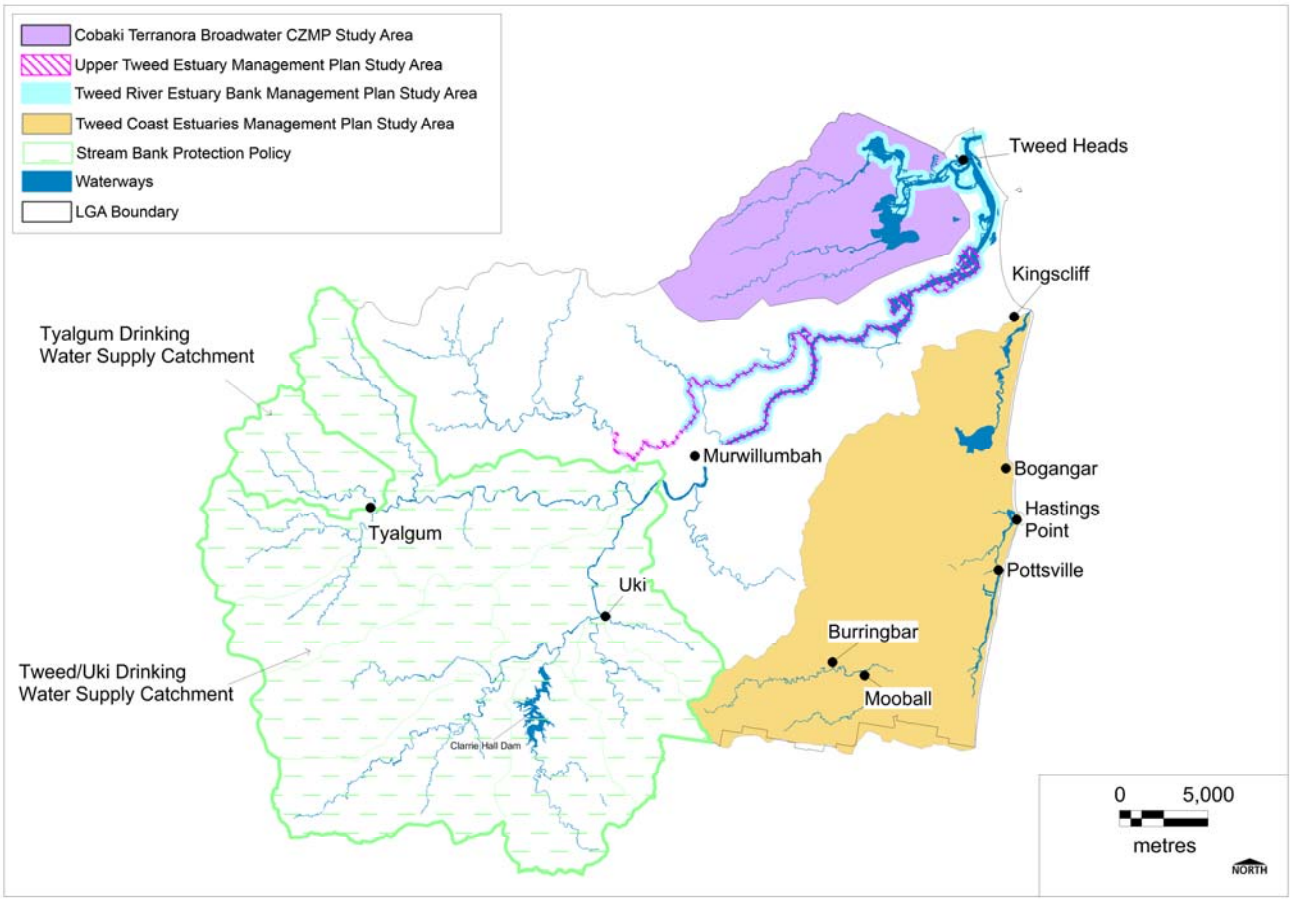

Figure 18: Areas covered by existing management plans or policies related to catchment management in the Tweed Shire

Management Option 17b – Preliminary development of Sustainable Agriculture Strategy

The Tweed Shire Sustainable Agriculture Program aims to foster a viable farming community and improve the environmental capacity of Tweed farmland by working with local landholders with support from the Tweed River Committee, Tweed Coastal Committee and state agencies. Projects undertaken as part of the Sustainable Agriculture Program include:

- Floodgate management - improve tidal flow and fish passage through floodgate modification in drains and creeks on the floodplain (refer below);
- Greenbanks - planting out cane drains with native ground cover and small trees to stabilise the banks, discourage weeds and prevent topsoil runoff;
- Drain modifications - levelling and drain in-filling program to reduce acid sulfate soil runoff to local waterways;
- Compost trials - on-farm trials to compare the benefits of organic compost and manures with conventional fertilisers;
- Soil conservation and erosion control; and
- Research projects.

TSC is preparing a Sustainable Agriculture Strategy to address key challenges in the Tweed area. Progress in developing the strategy is hindered by limited staff resources.

Management Option 17c – Floodplain Management Planning

A review of future development and planning considerations was undertaken as part of the Floodplain Risk Management Study (WBM, BMT, under development) which covered the Tweed Valley floodplain

downstream of Byangum (the extent of 'flood prone land'). Substantial parts of future urban areas in the Tweed Shire are low lying and will require filling to a minimum 100 year ARI flood level (including an allowance for climate change). This fill has the potential to impact on flood storage and flood conveyance. The cumulative effects of this fill have been assessed as part of this study to determine the hydraulic constraints to future development and inform appropriate planning recommendations. While the Floodplain Risk Management Study was still under development at the time of writing this document, it is anticipated that once finalised, outcomes of the study will be incorporated into Council Policy.

Management Option 17d – Water Supply Catchment Stream Bank Protection Policy

TSC adopted a *Stream Bank Protection Policy* in 2007 (TSC, 2007b) to support rural land owners in the drinking water supply catchment to manage their stream banks in a manner which protects and enhances the integrity of the raw water supply. Through adoption of the policy, TSC has implemented a River Health Grants program to improve and protect water quality. The Scheme aims to improve water quality with the focus on rehabilitating riparian zones and providing off-stream drinking water for stock. The River Health Grants Program is funded by the TSC Water Unit through the Catchment Water Quality Budget (water and sewer fund tax equivalent dividend payments).

Under the policy, proposals are selected based on merit and TSC staff streamline the application process by visiting landholders to determine requirements directly with them. Successful landholders are required to sign an agreement with TSC confirming their intention to complete and maintain the works, in a certain time frame, for a nominated sum. Funding is generally supplied for purchase of materials, equipment, and design of access and erosion works, weed control and maintenance of sites up to three years after initial works. Labour costs are generally expected to be contributed by landholders. Landholders are expected to maintain their projects in the long-term.

To date, approximately 40 km of stream bank, representing 100 agreements has been treated (with weed management, fencing or revegetation). Combined with work under the Sustainable Agriculture Program approximately 100 km of riparian land has been treated along streams and canals.

Management Option 17e – Environmental monitoring programs

TSC implements a range of environmental monitoring programs across a number of departments and locations which are often driven by specific projects or service requirements with limited integration. The type of monitoring undertaken includes:

- Licence compliance monitoring for wastewater systems required by the POEO Act 1997 Licences;
- Raw water quality at water supply sources including Clarrie Hall Dam, Bray Park Weir, Tyalgum weir, Uki off take on the Tweed River,
- Treated water quality at WTPs, along distribution systems and at customer taps required by the ADWG;
- Waterway health monitoring undertaken at key locations in the Shire to assess on-going trends over time and identify sources of impact. This program includes parameters for the assessment of recreational water quality in estuaries; and
- Project specific environmental monitoring including flora and fauna surveys, ecological health assessments and water quality monitoring.

Other Potential Options – Level 2

No additional options have been identified as part of an urban water cycle management approach as this is TSC's current focus.

Other Potential Options – Level 3

Management Option 17f – Review of Stream Bank Protection Policy and River Health Grants Program

Ten year implementation cost: $20,000 (year 1)

The Stream Bank Protection Policy and grant program is considered to be a beneficial way to direct funds generated by the water business into improving aspects of the water cycle with flow on effects into other parts of the water cycle. The primary mechanism is in improving water quality through stock fencing and riparian management which will lead to improved outcomes for potable water supply through reduced water treatment requirements and reduced risk of poor water quality events. This is consistent with the aims of the IWCM Strategy and should be encouraged. However, the implementation of this program is limited by the voluntary co-investment by land owners and the available TSC staff resources. The ongoing requirements for maintenance may also be a deterrent for some landholders. The current program is not operating to its full potential and there is a need for review of the program to improve uptake and on-ground implementation.

In early 2013, TSC extended the program to areas outside the water supply catchment to improve uptake of the initiative and provide for social equity in the distribution of funding for natural resource management.

A review of the policy should consider the following as a minimum:

- Ongoing work on public land such as Crown Reserves, community land and TSC land;
- Increased focus on education and provision of extension officers to overcome barriers to take-up and provide assistance in funding applications;
- Taking a strategic approach to identify priority sites for works that will help to focus efforts and target areas likely to achieve the best ‘bang for buck’. This would consider site factors such as ecosystem health status, location in the catchment, proximity to existing vegetated areas, habitat corridors and land use;
- Creation of demonstration sites, ideally on public land to allow the community to experience the improvements that can be achieved through the works, not only for improvements in water quality, but in habitat creation and enhancements in biodiversity as well as improved amenity and scenic value;
- Involvement of local community groups such as LandCare in the implementation and maintenance of works;
- Increased promotion and marketing of the scheme via TSC’s website, TweedLink and local media;
- Approaches to promoting the program that balance program take-up through improved landholder support (e.g. demonstration or priority projects) with the need for co-investment from the landholder to ensure appropriate long-term commitment and capacity; and
- Possible options for regulation of polluting agricultural activities where landholders refuse or are unable to adopt incentives that result in implementation of best-practice management.

Management Option 17g – Total water cycle management

Ten year implementation cost: $450,000 ($350,000 in year 3 to 5 then $20,000 p.a.)

The National Water Initiative aims to increase the productivity and efficiency of Australia’s water use, the need to service rural and urban communities, and to ensure the health of river and groundwater systems by establishing clear pathways to return all systems to environmentally sustainable levels (National Water Commission, 2013). The National Urban Water Planning Principles list a key principle to achieve urban water planning as: *Principle 4: Manage water in the urban context on a whole-of-water-cycle basis*.

TWCM recognises that all elements of the water cycle are interdependent and a decision made in one part of the water cycle impacts other parts of the cycle. All elements of the water cycle should therefore be considered, both separately and in combination. TWCM requires that decision makers understand the linkages between issues and how decisions affect the overall system.

There are existing TWCM programs in place in other parts of Australia. The TWCM planning approach is now mandatory in South-East Queensland (SEQ). Local governments in SEQ are required to develop a TWCM Plan with a 20-year planning horizon to account for long-term patterns and changes. The TWCM Plan Guidelines (Water by Design, 2010) describes the TWCM Plan as a framework which will:

- Be a key strategic document within the local government corporate and operational framework;
- Influence decisions and actions across the organisation, as well as influencing decisions and actions by other stakeholders such as water service providers (where this is separate to local government);
- Provide a central point of reference to investigate existing information about water management and planned activities; and
- Be an endorsed, transparent, accountable, and publicly accessible basis for decisions by local governments and water service providers about all aspects of water management.

The Plans consist of a TWCM Strategy, an Implementation Plan and may include detailed planning reports where necessary.

The recently released Draft *Northern Rivers Catchment Action Plan* (CAP2, NRCMA, 2012) is consistent with an integrated system approach to catchment management. The CAP2 acknowledges a fundamental shift in the approach to natural resource management away from looking at specific issues in isolation to an understanding of whole systems. There are a number of strategic directions (SD) and priority actions proposed by the CAP relevant to water cycle management including:

- SD 2.1 - Integrating natural resource management at all spatial scales to protect, conserve and enhance landscape function;
- SD 2.2 - Identify and address existing and emerging threats to the Region's soil, biodiversity, river, wetland, estuarine, coastal and marine systems;
- SD 3.2 - Addressing existing and emerging threats that influence natural resource productivity and resilience, including land-use/sea-use change, climatic variation and extreme climatic events; and
- SD 5.1 - Developing an integrated framework for adaptive governance and management.

Consistency with the Northern Rivers CAP2 reinforces the argument for a total catchment approach to water cycle management in the Tweed Shire and may present opportunities for TSC to leverage funding for implementation of actions which assist in achieving CAP2 goals.

Developing a total water cycle management framework for the Tweed Shire

A key premise which was confirmed during this IWCM review was a strong desire from both the community and TSC to implement a TWCM approach that integrates all aspects of the water cycle, including urban and non-urban elements. Community feedback received during the course of the strategy development added further support for this approach. For this to be achieved there is a need to strengthen the linkages between the urban water cycle elements, the non-urban water cycle and planning decisions. It will be important for decision makers to understand how issues and decisions fit into the overall, inter-linked system. Integration of infrastructure planning with land use planning and the related water supply and wastewater services, planning, urban development and broader catchment management, stormwater management and agricultural land use and land management practices is required.

Greater integration of all aspects of the water cycle across the Shire will require a shift away from TSC's current urban-centric approach to water cycle management. To achieve Shire-wide catchment management, an effective overriding framework would need to be established. The key aim will be to illustrate the linkages

between natural systems and land use practices and to better manage and influence key water cycle services for the communities and the environment. A TWCM framework would address the identified administrative, planning and asset management issues with key objectives of:

- Improved Council administration and management;
- Increased funding to implement management initiatives;
- Improved direction and guidance for TSC staff and developers regarding water cycle management considerations for:
    - land use planning;
    - development services;
    - asset management;
    - climate change adaptation; and
    - protection of ecosystem health.
- Addressing current information gaps relevant to total water cycle management (e.g. environmental water requirements and impacts on environment and the water cycle due to climate change); and
- Increased community education and understanding.

An example of the type of implementation framework that could guide the total catchment approach is provided in Figure 19. This framework divides the Tweed Shire into sub-catchments for management at local scales. A risk-based approach is recommended where sub-catchments are assessed on their local values and uses and water cycle issues.

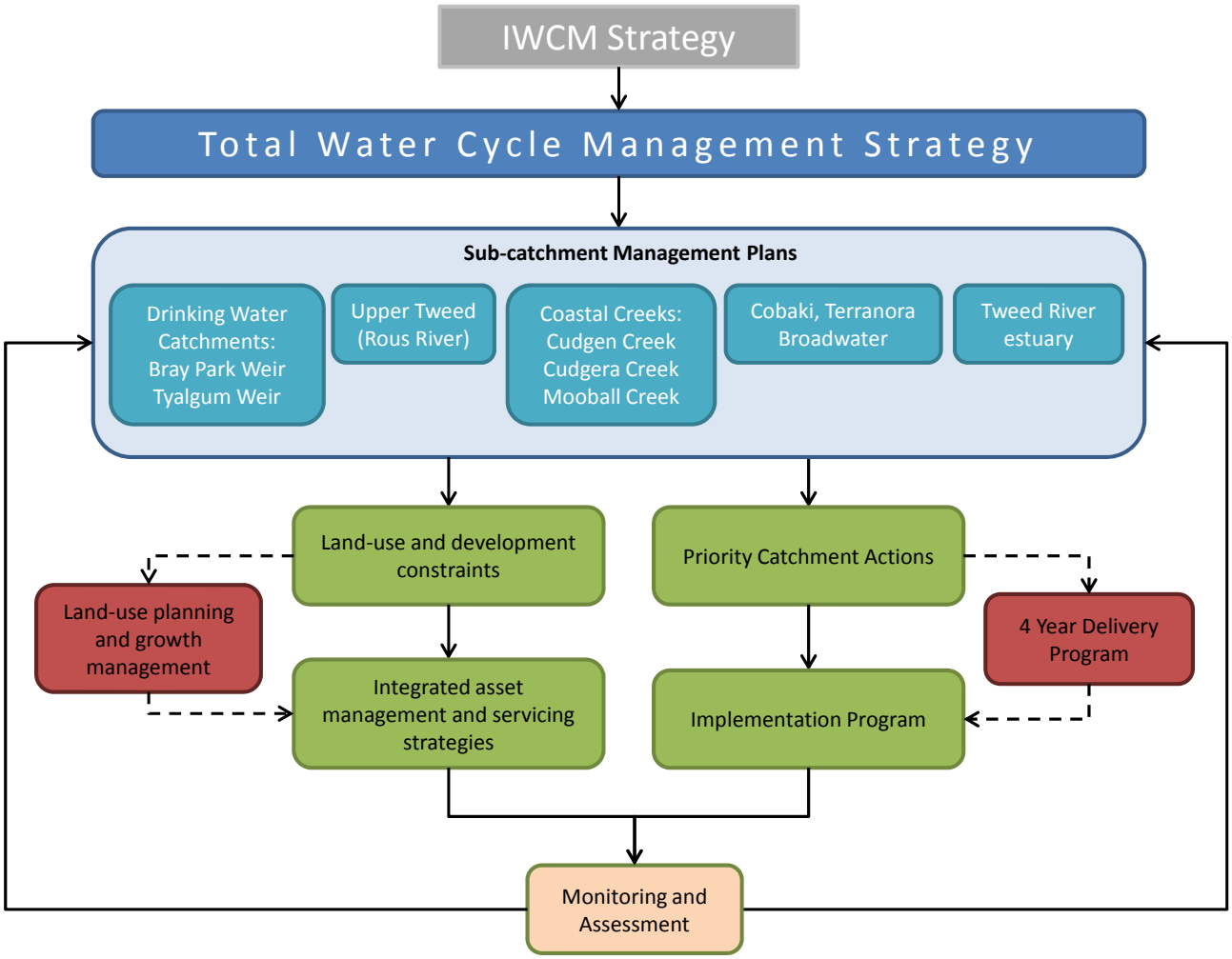

Figure 19: Potential framework for Tweed Shire total water cycle management

Sub-catchment management considerations include:

- Land use planning and growth management (as part of Council's broader responsibilities);
- Development controls (refer Section 4.4.2);
- Climate change impacts (refer Section 4.1.6);
- Floodplain management (refer Section 4.5.1);
- Agriculture and rural land uses (refer Section 4.5.1);
- Drinking water demand, supply and quality (refer Section 4.2);
- Wastewater servicing strategies (refer Section 4.3);
- Urban stormwater (refer Section 4.4);
- On-site sewage management (refer Section 4.5.2);
- Community values (refer Section 3.3.1);
- Broader catchment objectives (e.g. CMA planning);
- Coastal zone/estuary management planning; and
- Regulatory considerations such as Water Sharing Plans.

Other catchment specific considerations may include threatened species habitat and impacts of river flows and dam releases on aquatic habitats, species and groundwater dependent ecosystems.

The framework would need to document where each of the existing plans and policies fit and their purpose and role in TWCM. Documenting how existing plans currently deal with the identified issues and the adequacy of these actions would also be important in identification of gaps in existing policy and information and recommending management actions.

From the sub catchment management plans, a list of priority catchment actions would be produced that provide detailed tasks, targets and an estimate of costs of proposed actions to address the priority issues. This framework proposes that the actions then feed into the TSC Integrated Planning and Reporting System to ensure funding is allocated. The framework will also identify overlaps in water cycle sectors and opportunities for cooperation and shared funding opportunities (e.g. the extension of TSC's Water Supply Catchment Stream Bank Protection Policy discussed above).

Land-use and development constraints would also be identified at the sub-catchment management level, providing key inputs to land-use planning and growth management as well as requirements for integrated asset management and servicing strategies (refer Sections 4.1.5 and 4.3.1).

In addition, the TWCM framework would consolidate the Level 3 options discussed in Section 4 of this document:

- 1b – Integrated Council-Wide IWCM Delivery;
- 2c – Community engagement covering the full water cycle;
- 3c – Increased understanding of total water cycle;
- 4b - Strengthened IWCM Policies (under Water Industry Competition Act);
- 5f – Management of natural assets;
- 11b - Integrated Servicing Strategies;
- 14b - Greater integration of WSUD across Council;
- 15b – Develop guidelines for compensatory measures;
- 16b – Review and update erosion and sediment controls and provide increased resources;
- 17f – Review of Stream Bank Protection Policy and River Health Grants Program; and
- 18c - Integration of OSSM with catchment management.

On-going monitoring will allow feedback about the success of initiatives and follow up risk assessments for sub-catchments. This is discussed further below.

Management Option 17h – Upper catchment floodplain planning

Ten year implementation cost: $400,000 ($80,000 p.a. year 3 to 7)

Flood studies and risk management plans need to be developed for the upper areas of the Tweed, Rous and Oxley River valleys. These projects would be undertaken in accordance with technical guidelines provided by the NSW Office of Environment and Heritage. Reliable flooding data can then be applied to dam and water supply management strategies under the IWCM Strategy.

Management Option 17i – Monitoring, evaluation and reporting program

Ten year implementation cost: $400,000 ($50,000 p.a. from year 3)

Obtaining feedback on the success of management initiatives is a critical aspect of effective management. Monitoring of the on-going implementation of actions and improvements in environmental variables such as water quality, as well as community opinions should be undertaken to provide a solid information base for future decision making.

All monitoring should seek to capitalise as much as possible on existing information to provide a baseline from which the success of management actions can be measured and effort can be targeted to appropriate actions. Monitoring should be prioritised to address high risk/high priority outcomes and provide robust scientific data while considering the limited human and financial resources available. Success of catchment management actions could be indicated by:

- Stakeholder acceptance or increased support;
- Securing sufficient funds to implement these actions;
- Implementation of actions in an efficient and timely manner;
- Uptake of actions by stakeholders and others;
- Positive stakeholder feedback on improvements; and
- Measured improvements in catchment health such as improved water quality and value of riparian areas.

Key Performance Indicators (KPIs) could be developed to provide a target for achievement of the management actions. Major steps in each action should be identified where appropriate for each management action and suitable indicators selected to measure success.

4.5.2 Onsite Sewerage Management

Issues to be addressed:

Issue 14: The drinking water catchments are impacted by current and historical land use and development

Issue 25: There is limited integration between urban and rural strategic land use planning

Issue 26: The effective management of onsite sewerage systems within the Shire is limited by the available resources - Although there are some on-site sewerage (OSS) systems that are failing there is limited opportunity to cost-effectively connect to Council reticulated wastewater systems due to transfer costs and capacity limitations. Additional financial and human resources would be required to adequately regulate, inspect OSS and educate residents.

Current Strategy – Level 1

Management Option 18a – Review of OSSM Strategy

The On-site Sewage Management (OSSM) Strategy details TSC's approach to the supervision of sewage management systems in the Tweed Shire. There are currently approximately 6,000 on-site systems within the Shire with two full-time TSC staff for approvals, inspections, education, regulation and response to complaints. TSC's OSSM Strategy is being reviewed in 2012/13 with further development of policy, procedures and protocols.

The 2006 IWCM identified the unsewered localities of Mooball and Burringbar as critical areas requiring reticulated sewerage. The Mooball and Burringbar sewerage scheme has recently been constructed to connect more than 180 properties to TSC's reticulation network.

Other Potential Options – Level 2

Management Option 18b – Increased Resources for OSSM Regulation

Ten year implementation cost: $1,400,000 ($200,000 p.a. from year 4)

It is not practical or cost effective to connect all households to TSC reticulated sewer systems. It will therefore be necessary to improve the performance of on-site sewerage systems to reduce the risk of

contamination from these sources. TSC has a target of 100 inspections per quarter with zero systems failing. While TSC staff are achieving the target number of inspections, the number of failing systems (26%) far exceeds the target. It is therefore apparent that in order to achieve this target, additional financial and human resources are required to adequately regulate, inspect OSSM systems and particularly to educate residents. Given the number of failing systems, further resources should be directed to the upgrading and compliance program aspects detailed in the OSSM Strategy.

Other Potential Options – Level 3

Management Option 18c - Integration of OSSM with catchment management

Ten year implementation cost: Included in Option 17g

As part of the review of the OSSM Strategy, there is an opportunity for increased integration with catchment management planning and IWCM and improved long-term direction for OSS systems within the Shire. The TWCM approach and identification of priority catchment areas and risks will assist with allocation of resources and potential increase in resources if required. This could include prioritisation of systems for improvement based on location and identification of potential funding sources from different areas of TSC to assist in system improvements.

5. IWCM SCENARIOS

5.1 Development of IWCM Scenarios

The process used to develop the IWCM scenarios is as follows:

- Consideration of IWCM drivers, community objectives and stakeholder values to develop IWCM management objectives (Section 3.3);
- Review of IWCM targets and management objectives and identification of IWCM issues (Section 3.5);
- Development of a broad range of options to address the issues (Section 4). The options are based on the nature of the problem, its location and extent and consideration of the work that has already been undertaken to address the relevant IWCM issue; and
- The options resolve different issues and are not mutually exclusive. Therefore comparison of the individual options does not provide a meaningful outcome or recommended approach. Instead the options have been bundled together into IWCM scenarios in this section.

This process is illustrated in Figure 20.

A key challenge is to assign priorities to the various scenarios, given internal and external stakeholders have different perspectives and perceptions of the issues and competing demands for funds in an environment where costs need to be fully justified to a broad spectrum of interest groups. The scenarios therefore represent three implementation levels to assist Council in determining the resourcing and funding requirements to achieve IWCM goals and objectives, and in particular to enable the community to understand the limitations and priorities impacting on their successful implementation. These levels are:

- Level 1: Fully funded actions already underway or planned through the existing 2006 IWCM Strategy;
- Level 2: Additional (unfunded) actions that are the minimum required to meet the NSW Office of Water guidelines. These actions are in addition to those identified in the 2006 strategy and are required to address new issues that have arisen since 2006 (e.g. due to changing circumstances, changes in regulation) or are subsequent phases to Level 1 actions; and
- Level 3: Additional (unfunded) actions designed to address wider catchment management objectives and align with Council's broader IWCM responsibilities across the entire Tweed catchment. These actions are outside the traditional Office of Water urban water management guidelines.

Table 15 presents the IWCM Scenarios (bundles of options) and the 26 IWCM issues that they address.

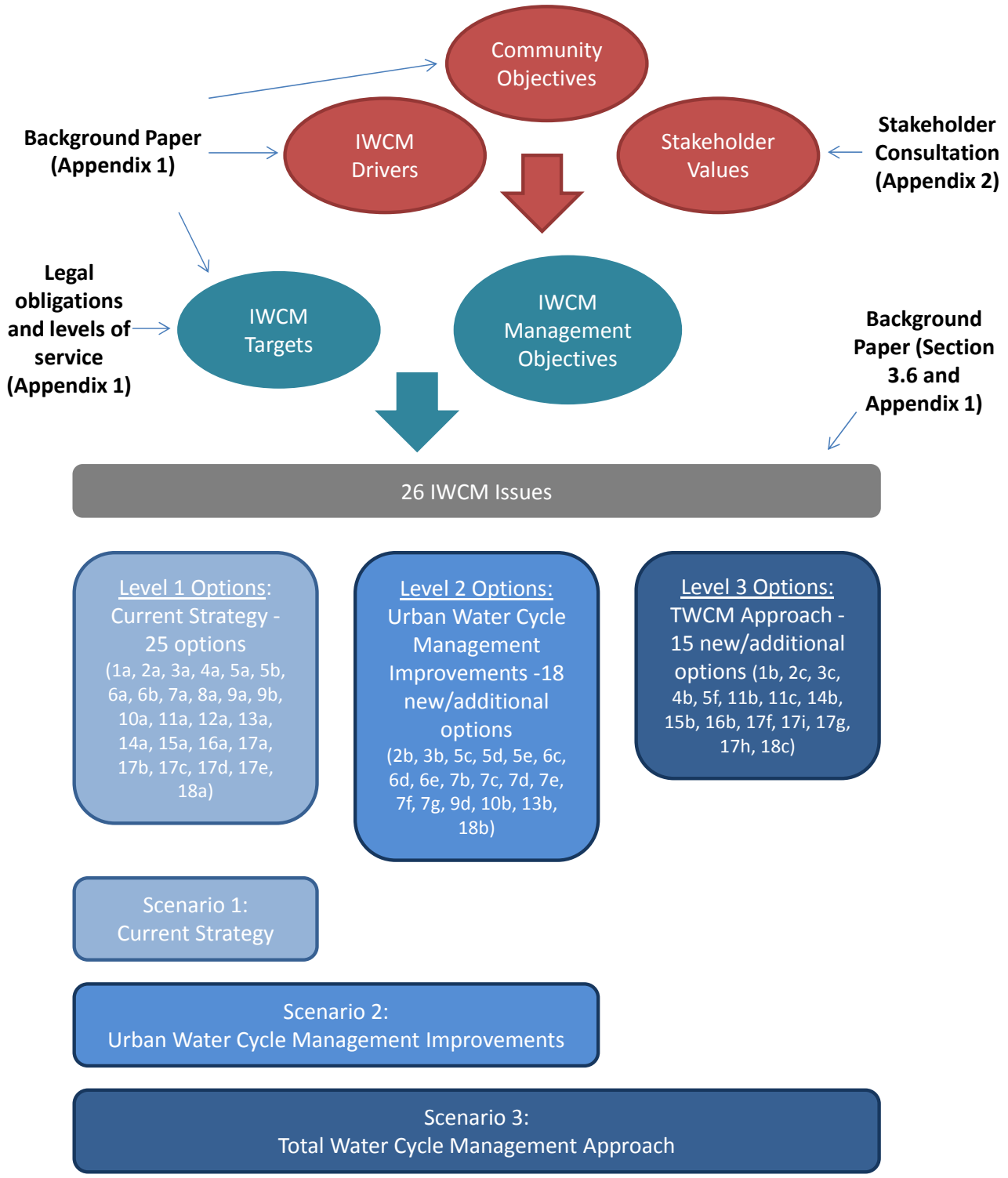

Figure 20: Development of IWCM Scenarios

Table 15: IWCM Options and Scenarios and the 26 IWCM issues that they address

Issue		Current Strategy – Level 1	Level 2 - Urban water cycle management improvements to comply with Office of Water guidelines (additional to the current strategy)	Level 3 - Total water cycle management to fully integrate urban and catchment management (Additional to the current strategy and Level 2)
Scenario Outcome		*Continue with current strategy – ongoing strategic planning with progressive implementation of high priority actions*	*Increased urban water cycle integration to resolve current issues and address urban water related objectives*	*Total water cycle management and full achievement of all identified objectives over the long-term*
Administration and Governance				
1	IWCM principles, responsibilities and priorities are not fully implemented across all Council units	1a – Urban Water Focus: IWCM activities are implemented through the TSC Water Unit with input from other functional areas as required	No additional options identified as part of an urban water cycle management approach as this is TSC's current focus.	1b – Integrated Council-Wide IWCM Delivery: Structural integration to improve the coordination and delivery of water cycle management services and the success of water cycle management initiatives
2	There is a need for informed and transparent decision-making and better management of community expectations	2a – Community engagement in IWCM decision-making: Community engagement as part of the development and ongoing implementation of IWCM Strategy components	2b – Strengthened community engagement process: Future engagement activities are focussed, transparent and appropriately considered. Community expectations are managed, particularly regarding Council funding and resources.	2c – Community engagement covering the full water cycle: 2b is also a key component of this level but would encompass a greater range of topics and issues.
3	There is a need for defendable and robust population forecasts	3a – Ongoing data collection and review: Review of population forecasts	3b – Improved data management: Improved understanding of customer numbers and types, demand, annual review of growth projections, longer-term demand forecasts	3c – Increased understanding of total water cycle: 3b also applies to this level but would consider a broader range of data
4	Uncertainty regarding the preferred Tweed district water supply augmentation option creates confusion regarding land use planning	2a – Community engagement in IWCM decision-making	2b – Strengthened community engagement process	2c – Community engagement covering the full water cycle: 2b is also a key component of this level but would encompass a greater range of topics and issues.

Issue		Current Strategy – Level 1	Level 2 - Urban water cycle management improvements to comply with Office of Water guidelines (additional to the current strategy)	Level 3 - Total water cycle management to fully integrate urban and catchment management (Additional to the current strategy and Level 2)
5	The implications of private industry involvement in town water supply and wastewater management are unclear, particularly with regard to regulation and Council responsibilities	4a - Participate in WIC Act Licensing for Private water utility schemes: Participate in the development of private utility schemes and resolution of the last resort arrangements	No additional options identified as part of an urban water cycle management approach as this is TSC's current focus.	4b - Strengthened IWCM Policies: Application of IWCM objectives for private water utility schemes as part of the total water cycle planning approach
6	Asset management planning	5a - Asset Management planning as part of Integrated Planning and Reporting Framework: Ongoing development and review of asset management plans	5d – Review and Update Sewer Overflow Abatement Strategy: review the actions and update the strategy considering overflow containment targets and procedures for overflows to sensitive environments 5e – Review and update water supply and wastewater Business Continuity Plans: Annual and 4-yearly reviews with consideration of other related strategies	5f – Management of natural assets: Natural assets (land, waterways and vegetation) are considered as part of the asset cycle
7	Climate change implications need to be integrated into urban water services planning	6a – Consideration of sea level rise Impacts: Coastline management and floodplain management strategies	6c - Climate change adaptation – flooding and tidal inundation: Develop adaptation strategies for increased risk of flooding and tidal inundation 6d - Climate change adaptation – surface water availability: Increase knowledge and develop adaptation strategies for reduced surface water availability	No additional options identified as part of a total water cycle management approach
8	High energy consumption and greenhouse gas emissions	6b – Energy Savings Action Plan: existing implementation with limited funding	6e – Reduction in energy consumption and greenhouse gas emissions: Through TSC's broader sustainability initiatives	No additional options identified as part of a total water cycle management approach.

Issue		Current Strategy – Level 1	Level 2 - Urban water cycle management improvements to comply with Office of Water guidelines (additional to the current strategy)	Level 3 - Total water cycle management to fully integrate urban and catchment management (Additional to the current strategy and Level 2)
9	Best-Practice Compliance	5b – Substantial compliance with best-practice guidelines	5c – Full compliance with best-practice guidelines: Address requirements for trade waste, strategic business planning, water supply customer metering, non-potable water pricing and development servicing plans	No additional options identified as part of a total water cycle management approach
Urban Town Water Supply				
10	Improved data collection and reporting procedures would facilitate adaptive forecasting of demand and assist with community education	3a – Ongoing data collection and review 7a - Adopted Demand Management Strategy: Ongoing communication and education and *Target 180* campaign	3b – Improved data management 7b – Improved Community Understanding of Water Consumption Targets: Develop innovative ways to reinforce water saving message and targets 7c - Targets for non-residential consumption: Develop medium-term targets for non-residential sector	The range of demand management measures in Level 2 is also appropriate as a component of a total water cycle management approach
11	There is currently no mechanism to promote retrofit of rain water tanks or installation of large rainwater tanks in new development	7a - Adopted Demand Management Strategy: No rebate for rainwater tanks	7e – Review of effectiveness of rainwater tanks: Prior to promoting any major expenditure on rainwater tanks, data on the actual water savings and rainwater tank costs is required to demonstrate value for money 7f - Rainwater Tank Rebate: Review feasibility of a residential rebate program	Options 7e and 7f are also appropriate as a component of a total water cycle management approach
12	Council's 2013 target for non-revenue water was not achieved	7a - Adopted Demand Management Strategy (bulk meter program)	7d - Water Loss Management Program (including adoption of appropriate target)	A water loss management program is also appropriate as a component of a total water cycle management approach

Issue		Current Strategy – Level 1	Level 2 - Urban water cycle management improvements to comply with Office of Water guidelines (additional to the current strategy)	Level 3 - Total water cycle management to fully integrate urban and catchment management (Additional to the current strategy and Level 2)
13	Augmentation of the Tweed District Water Supply will be required in future due to population growth although the timing and additional supply required are unclear	3a – Ongoing data collection and review 7a - Adopted Demand Management Strategy 8a - Future Water Supply Augmentation: need for future augmentation is recognised and assessment of options has been undertaken	3b – Improved data management 6d - Climate change adaptation – surface water availability 7b – Improved community understanding of water consumption targets 7c - Targets for non-residential consumption 7d - Water Loss Management Program 7e - Rainwater tank rebate 7g - Permanent water conservation measures: Implement permanent water conservation measures	11c – Identify opportunities for increased water recycling: Implement recycling in future developments supported by servicing strategies and development controls Climate change adaptation programs and demand management measures in Level 2 are also appropriate as a component of a total water cycle management approach
14	The drinking water catchments are impacted by current and historical land use and development	9a - Development of a Drinking Water Quality Management Plan: Continue to develop the plan in accordance with ADWG 9b - Upgraded treatment facilities at Bray Park and Tyalgum: high quality drinking water supply through treatment upgrades	9d - Drinking water catchment planning: Develop a drinking water catchment management plan	17g – Total water cycle management framework and sub-catchment plans: Develop a total water cycle management framework for the Tweed Shire Specific drinking water quality measures would be required to comply with the ADWG
15	As a precaution the Uki WTP is shut down during dirty water events	9a - Development of a Drinking Water Quality Management Plan	9c – Business continuity planning for Uki water supply (as part of Option 5e)	17g – Total water cycle management approach
16	Drought contingency and water supply emergency management measures need to be further developed	10a - Adopted Drought Management Strategy and Restrictions Policy: Strategy developed in 2009 and Restrictions Policy reviewed in 2012	10b – Review and update Drought Management Strategy: Review and update drought management strategy with consideration of increased knowledge and related strategies	No additional options identified as part of a total water cycle management approach

Issue		Current Strategy – Level 1	Level 2 - Urban water cycle management improvements to comply with Office of Water guidelines (additional to the current strategy)	Level 3 - Total water cycle management to fully integrate urban and catchment management (Additional to the current strategy and Level 2)
Urban Wastewater Management				
17	The opportunities for development (urban expansion) outside of the wastewater service areas is limited by the capacity of Council's infrastructure and the environment	11a – Ongoing water supply and wastewater servicing: Develop servicing strategies and upgrade infrastructure as required	No additional options identified as part of an urban water cycle management approach as this is TSC's current focus	11b - Integrated Servicing Strategies: Waterway health considerations in land use planning and servicing strategies 11c – Identify opportunities for increased water recycling
18	Licence requirements for pH and suspended solids at Uki WWTP need to be reviewed	12a – Uki WWTP modifications: improve plant performance	No additional options identified as part of an urban water cycle management approach as this is TSC's current focus	No additional options identified as part of a total water cycle management approach
19	Council and the community have a desire for increased water recycling but there are significant barriers to implementation of recycled water schemes within the Tweed Shire	7a - Adopted Demand Management Strategy: Recycled water target of 15% to be maintained	No additional options identified as part of an urban water cycle management approach as this is TSC's current focus	11c – Identify opportunities for increased water recycling
20	There is a high cost of sustainable biosolids management	13a - Farmland application of biosolids: Reuse on farms in Tweed Valley cane farms and Darling Downs	13b – Biosolids Management Strategy: Develop biosolids management strategy to improve water cycle outcomes and reduce costs (if possible)	Increasing beneficial reuse of biosolids is also appropriate as a component of a total water cycle management approach
Urban Stormwater Management				
21	Increased emphasis on water sensitive urban design will require more integrated Council responsibilities, increased community education and increased staff capabilities and funding	14a – Preliminary development of WSUD Policies: Draft Urban Stormwater Quality Management Plan	No additional options identified as part of an urban water cycle management approach as this is TSC's current focus	14b - Greater integration of WSUD across Council: Develop whole-of Council framework for WSUD covering full asset lifecycle 17g – Total water cycle management

Issue		Current Strategy – Level 1	Level 2 - Urban water cycle management improvements to comply with Office of Water guidelines (additional to the current strategy)	Level 3 - Total water cycle management to fully integrate urban and catchment management (Additional to the current strategy and Level 2)
22	Existing Council development controls do not fully address the residual load of urban stormwater on downstream sensitive waterways	14a - Preliminary development of WSUD Policies 15a - Review of Stormwater Development Controls: Review and update of D7	No additional options identified as part of an urban water cycle management approach as this is TSC's current focus	14b - Greater integration of WSUD across Council 15b - Develop guidelines for compensatory measures – formalise policy for addressing impacts of urban development 17g – Total water cycle management
23	Existing subdivision erosion and stormwater controls and resources are not adequate for the rainfall and rate of development experienced in the Tweed	16a – Existing Erosion and Sediment Controls: D7 and C211	No additional options identified as part of an urban water cycle management approach as this is TSC's current focus	16b – Review and update erosion and sediment controls and provide increased resources: Improved coordination, education and enforcement and increased resources 17g – Total water cycle management
Catchment Management				
24	There is a need for a holistic catchment management strategy for the Shire	17a – Management of separate areas of catchments as part of existing local and regional programs undertaken by various stakeholders 17c – Floodplain Management Planning: Flood studies and floodplain management plans are being prepared 17d – Water Supply Catchment Stream Bank Protection Policy: River health grants scheme 17e – Environmental monitoring programs: various	No additional options identified as part of an urban water cycle management approach	17f – Review of Stream Bank Protection Policy and River Health Grants Program: Improve delivery mechanism 17g – Total water cycle management 17i – Monitoring Evaluation and Reporting program: to support TWCM framework

Issue		Current Strategy – Level 1	Level 2 - Urban water cycle management improvements to comply with Office of Water guidelines (additional to the current strategy)	Level 3 - Total water cycle management to fully integrate urban and catchment management (Additional to the current strategy and Level 2)
25	There is limited integration between urban and rural strategic land use planning	17b – Preliminary development of Sustainable Agriculture Strategy: Development of a strategy to improve the viability and environmental capacity of the Tweed's farmland 17c – Floodplain Management Planning: Flood studies and floodplain management plans are being prepared	No additional options identified as part of an urban water cycle management approach	17g – Total water cycle management 17h – Upper catchment floodplain planning Sustainable agriculture strategies are also required as part of a total water cycle management approach
26	The effective management of onsite sewerage systems within the Shire is limited by the available resources	18a - Review of OSSM Strategy: Insufficient resources to implement OSSM Strategy	18b – Provide increased resources for OSSM regulation: Identify resource requirements and funding	17g – Total water cycle management 18c - Integration of OSSM with water cycle management: Risk-based approach considering catchment values and issues

5.2 Comparison of Scenarios

The IWCM scenarios (bundles of options) were compared and prioritised by considering a number of factors including:

- Cost of implementation;
- Effectiveness of each scenario in addressing the management objectives;
- Expected level of community support and acceptance of the action; and
- Benefits to the water cycle arising from the scenario.

5.2.1 Implementation Costs

Preliminary cost estimates have been developed as incremental increases for each level (i.e. Level 2 costs are additional to the current strategy and Level 3 costs are additional to both Level 1 and Level 2). The options involve expenditure to undertake investigations, develop strategies or provide additional human resources. Major capital works expenditure has not been identified for the next 10 years, however, the strategies developed as part of Level 2 and Level 3 may recommend capital expenditure as part of the implementation components. For example, an option to investigate additional recycled water opportunities has been included in the TWCM scenario but cost estimates relate to conceptual development only. As more information is required before recycled water options can be assessed, capital cost estimates have not been provided.

Expenditure for Council's asset renewal program and provision of infrastructure to service new growth areas is additional to the IWCM implementation program and will be directed by many of the outcomes of the IWCM actions, particularly climate change adaptation, sewer overflow abatement strategy, biosolids management strategy, integrated servicing strategies and recycled water opportunities.

5.2.2 Achievement of Management Objectives

The IWCM objectives (Section 3.3) focus on implementation of a total water cycle management approach and identification and incorporation of community priorities. The options to address each issue provide different outcomes and varying levels of achievement of the objectives with varying costs (i.e. with each scenario level, there is a corresponding increase in achievement of the objectives with an associated increase in cost).

5.2.3 Expected Level of Community Support

Based on the feedback obtained from the community though this IWCM review and previous community engagement programs, the level of community support for each scenario is expected to increase with implementation of Level 1 and Level 2 options.

5.2.4 Expected Environmental Benefits

Based on the aims of the options in each scenario, the water cycle benefits are predicted to increase with implementation of Level 1 and Level 2 options.

5.2.5 Preferred IWCM Scenario

The greatest water cycle benefit and community support are expected to be achieved with Level 3 (the TWCM Scenario). The IWCM guidelines and Office of Water expectations are fully achieved and the scope of an IWCM Strategy is exceeded with Level 3 through inclusion of catchment management initiatives. This

scenario would also enable TSC's IWCM objectives (discussed in Section 3.3) to be achieved. For these reasons, Level 3 is the recommended strategy.

However, the TWCM scenario requires significant additional investment (refer Appendix 4). The increased benefits with the Level 3 approach come at significantly increased cost compared to Level 2. Overall attractiveness of the TWCM scenario is reduced due to this incremental cost particularly in the short-term. For this reason, immediate implementation of all Level 3 options is not supported at this time.

Given the limited funding available to Council and the competing priorities for those funds, it is recommended instead that a TWCM approach is adopted but with progressive implementation of Level 2 and Level 3 actions over time. Implementation of the Level 2 actions will achieve full compliance with Office of Water IWCM guidelines and provides a strong basis for further broadening the scope of Council's decision making to encompass the full water cycle. The aspirational target would be to achieve the TWCM approach over time. However this will not be achieved until funding sources are identified. Implementation requirements including funding requirements are discussed in Section 6.

6. STRATEGY IMPLEMENTATION

6.1 Administrative Requirements

Success of the IWCM Strategy relies on the improved administration and coordination of water cycle related activities. The preferred IWCM scenario integration suggests this could be achieved through the introduction of a new IWCM Program Leader role that will facilitate TWCM across TSC (as part of the Level 3 approach). Until this new position is filled, the IWCM Stakeholder Group should continue to coordinate the implementation of the adopted IWCM Strategy. The priority tasks for this position (or group) are the implementation of this IWCM Strategy and integration with TSC's other strategic priorities.

This role/group would have responsibility for:

- Development and ongoing review of a funding strategy (refer below);
- Consultation with TSC staff, developers, the community and consultants;
- Coordination of training to TSC staff, developers and consultants;
- Implementation of priority actions;
- Ongoing coordination of IWCM considerations with other TSC functions; and
- Periodic review of this IWCM Strategy.

6.2 Funding

The major funding and resourcing requirements are:

- Creation of the new permanent position of IWCM Program Leader;
- Other internal staff positions identified;
- On-ground works; and
- External consultancies (as required) to assist with implementation of the IWCM Strategy.

6.2.1 Funding Constraints

The timing for implementation of the proposed IWCM actions is dependent on the availability of financial and human resources. This Strategy assigns priorities with consideration of the limited internal resources available and is designed to remain flexible to access potential sources of external funding which may become available in future.

Potential funding sources are discussed in the following sections.

6.2.2 Existing and Potential Funding Sources

In accordance with the *Local Government Act, 1993*, Councils can obtain income from rates, charges, fees, grants, borrowings and investments.

Council General Fund

General income comes from ordinary rates, special rates and annual charges. The rate at which TSC's general income can be increased each year is set by IPART (currently 3% p.a.). However it is acknowledged there is a finite level of funding and competing demands for Council services. Given current budgetary pressures, it is unlikely that the General Fund will be able to provide significant additional funding for Level 2

or 3 activities. For this to change, innovative integrated solutions that are desired by the community need to be seen as a priority in the provision of services funded through general income.

External Grants

Identification of grants and successful application is an important component of this IWCM Strategy. Council has historically had some success pursuing grant funding in an *ad hoc* manner, however a more strategic and better resourced approach may provide further success, in particular increased TSC staff availability to prepare applications and a more focussed approach to the limited number of relevant funding programs available. The IWCM Program Leader would provide an additional resource to support other TSC business unit in applying for funding.

While lobbying State and Federal governments to increase funding and providing sufficient human resources to access the available grants is essential for successful implementation of the IWCM, this source of funding should only be considered as a supplement to internal Council funding sources. Grants are usually provided on the basis of funding matched by Council.

Urban Stormwater Management Service Charge

In accordance with the State Government guidelines (DLG, 2006), urban residential properties can be levied $25 p.a. and urban business land can be charged up to $25 per $350 m^2 of land area or part thereof for stormwater management services, based on the expected cost of provision of these services. This is expected to yield approximately $1 million in revenue each year. The intention to levy a stormwater charge is advertised through the Integrated Planning and Reporting process and income and expenditure are reported through Council's annual report.

A council may only levy the stormwater management service charge after discontinuing any stormwater special rates or charges that are raised either within its general income limit or via a special variation to its general income level. This is to prevent the perception of 'double-charging'. TSC does not currently have in place any special rate variations approved primarily for stormwater management activities.

Application of the funds from the stormwater management service charge should be determined on a priority basis utilising the asset management practices discussed in Section 4.1.5. The income from the charge can be spent on both capital and recurrent expenditure relating to new/additional stormwater management services such as (DLG, 2006):

- Planning, construction and maintenance of drainage systems, including pipes, channels, retarding basins and waterways receiving urban stormwater;
- Planning, construction and maintenance of stormwater treatment measures, including gross pollutant traps and constructed wetlands;
- Planning, construction and maintenance of stormwater harvesting and reuse projects;
- Planning and undertaking of community and industry stormwater pollution education campaigns;
- Inspection of commercial and industrial premises for stormwater pollution prevention;
- Cleaning up of stormwater pollution incidents (charge can fund a proportion);
- Water quality and aquatic ecosystem health monitoring of waterways, to assess the effectiveness of stormwater pollution controls (charge can fund a proportion);
- Monitoring of flows in drains and creeks, to assess the effectiveness for flow management (flooding) controls (charge can fund a proportion); and
- Staff specifically appointed to provide the stormwater management service associated with the charge (e.g. temporary project staff).

Works on Private Land

TSC should also continue to charge the appropriate fee for service for works on private land. Additional mechanisms to enable or enhance landholder responsibilities for asset management and maintenance may also be required to reduce the burden on TSC funds and resources. Other financial instruments such as bonds, contributions and Voluntary Planning Agreements (VPAs) may be appropriate in the case of offsets and maintenance agreements to ensure ongoing liabilities are fully funded.

Section 94 Contributions

Development contributions are payments made by developers to enable Council to provide public amenities and services required for new residents and businesses. TSC currently has 23 active contribution plans, approximately half of these apply to the whole Shire and the rest are area-specific plans. The majority of plans levy contributions on residential and tourist development, while others, like the Road Contribution Plan and Council Admin Facilities Plan also levy contributions for commercial development.

The introduction of Section 94 contributions for stormwater works would ensure the full cost of developments is recovered at the development approval stage. The application of Section 94 contributions would need to be assessed to determine which components are applicable to future development.

In 2010, the NSW Government introduced reforms to increase housing development including a limit on the amount of development contributions ($20,000 per residential lot for established areas and $30,000 per lot for greenfield areas) unless exemptions are approved. TSC's current developer contributions average around $17,000 per dwelling (current dollars). TSC should consider including stormwater works in any future review of the contributions plan or if the cap is raised. There is also the potential to raise higher contributions for greenfield developments.

Section 64 Developer Charges

Developer charges are up-front charges that a LWU can levy under section 64 of the *Local Government Act 1993* to recover part of the infrastructure costs incurred in servicing new development or additions and changes to existing development. Developer charges provide a source of funding for infrastructure and provide signals to the community regarding the cost of urban development. The NSW Office of Water has issued Developer Charges Guidelines for Water Supply, Sewerage and Stormwater, December 2002 pursuant to section 306 (3)(C) of the *Water Management Act 2000*. NSW local water utilities are required to prepare a Development Servicing Plan (DSP) and to levy developer charges in accordance with these guidelines. A DSP documents all the relevant information used to calculate the developer charges per lot.

TSC has adopted DSPs for water supply and sewerage services. The preparation of a DSP for stormwater services would also facilitate recovery of costs associated with stormwater management for new developments. This would replace the need for section 94 stormwater contributions and may provide more flexibility in collection and application of funds.

Dividends from TSC Water and Sewer Funds

Under the best-practice guidelines, a local government LWU is permitted to pay an annual dividend from its water supply or sewerage businesses. The dividend is a ‘return on investment’ paid to the ‘shareholder’ which in this case is the local government council responsible for managing and investing in the LWU’s water supply and sewerage functions. Council may apply the dividend for any purpose under the *Local Government Act* or any other Act (DWE, 2007).

The dividend is in two parts - a dividend calculated for tax-equivalents and a dividend calculated from the surplus. All LWUs must pay the dividend for tax-equivalents up to a maximum of $3 per assessment. The dividend from the surplus may only be paid by LWUs which achieve full compliance with best-practice management criteria.

As discussed in Section 4.5.1, the River Health Grants Program is funded through the Catchment Water Quality Budget (water and sewer fund tax equivalent dividend payments). This program provides approximately $190,000 p.a. (the maximum of $3 per water supply and sewer assessment) for stream bank protection works on private land. It is recommended that this program is continued and potentially extended or modified to increase its effectiveness following a review of the program.

Once TSC has achieved full compliance with the best-practice guidelines and can generate a surplus from the water supply and sewer dividends, the potential for payment of a dividend from the surplus should be considered. There must be a surplus and the dividend must not exceed 50% of the surplus or $30 per assessment. If applied, this dividend would require an increase in water supply and sewerage charges in each year of the dividend.

Environmental Levy

Where the community has a capacity and willingness to pay, an environment levy is one way for councils to fund environmental projects. Ratepayers contribute to the levy yearly via their rates. Byron Shire Council introduced an environmental levy in 2008 with funds allocated to a five year works program and budget. Coffs Harbour, Bellingen and Kempsey Councils also have an environmental levy in place with ratepayers contributing an average of $30 - $40 per year to the fund through their annual rates. Typical projects funded by the levy include:

- Extension Officers (intermediary between Council and landholders);
- Biodiversity and Sustainability programs;
- Coastal and Estuary programs;
- Bush regeneration projects;
- Weed removal;
- Community and business sustainability workshops; and
- Sustainable schools programs.

Councils wishing to introduce an Environmental Levy as an additional charge over the rate peg must apply to IPART for a Special Rates Variation (SRV). An SRV allows councils to increase general income above the rate peg, under the provisions of the *Local Government Act 1993*. Local councils that are seeking special variations to general income are required to submit applications to IPART for review and assessment. IPART will assess each application based on its merits against the assessment criteria. In doing so, IPART will consider:

- Size of the council;
- Resources of a council;
- Size (both actual $ and %) of increase requested;
- Current rate levels and previous rate rises;
- Purpose of the special variation; and
- Any other matter considered relevant in the assessment of a special variation application.

The assessment criteria set out in the guidelines are as follows:

- The need for and purpose of a different revenue path (as requested through the special variation) is clearly articulated and identified through the council's Integrated Planning and Reporting (IP&R) documents, including its Delivery Program and Long-term Financial Plan (TSC, 2012). Evidence for this criterion could include evidence of community need/desire for service levels/project and limited

council resourcing alternatives and the Council's financial sustainability conducted by the NSW Treasury Corporation.

- Evidence that the community is aware of the need for and extent of a rate rise. This should be clearly spelt out in IP&R documentation and the council must demonstrate an appropriate variety of engagement methods to ensure opportunity for community awareness/input. The IP&R documentation should canvas alternatives to a rate rise, the impact of any rises upon the community and the council's consideration of the community's capacity and willingness to pay rates.
- The impact on affected ratepayers must be reasonable, having regard to both the current rate levels, existing ratepayer base and the proposed purpose of the variation. TSC's IP&R process should also establish that the proposed rate increases are affordable having regard to the local community's capacity to pay.
- The proposed Delivery Program and Long-term Financial Plan must show evidence of realistic assumptions.
- An explanation of the productivity improvements and cost containment strategies the council has realised in past years, and plans to realise over the proposed special variation period.

The community feedback received through this IWCM Strategy review suggests that the Tweed community supports the priorities identified in this IWCM Strategy and cost-sharing arrangements to implement the priorities. Additional consultation would be required to confirm this as part of the application for the SRV. The competing priorities across Council's areas of responsibility throughout the Shire would also need to be aligned – for example through the process of developing TSC's Environmental Sustainability Strategy (as discussed below).

6.3 Proposed Implementation Program

The management options have been compiled into a proposed ten year implementation program, including cost estimates, timing, TSC responsibilities and potential funding sources (Table 16).

The implementation program identifies existing and new actions that are recommended to achieve the desired IWCM outcomes. Level 1 actions are already funded and being implemented by TSC and these are considered to remain an integral component of the future strategy. The Level 1 strategic planning initiatives that should be continued are:

- 2a – Community engagement;
- 5a - Asset management planning (as part of Integrated Planning and Reporting Framework);
- 5b - Best-practice management (compliance with the NSW Office of Water best-practice guidelines);
- 6a - Coastline management (climate change adaptation);
- 7a - Implementation of the Demand Management Strategy;
- 9a – Drinking water quality management;
- 14a – Development of WSUD Policies)including urban stormwater quality management planning and review of development controls);
- 17c – Floodplain management planning;
- 17d - Water Supply Catchment Stream Bank Protection Policy (River health grants scheme);
- 17b – Development of Sustainable Agriculture Strategy; and
- 18a - Review of On-site Sewerage Management Strategy.

The Level 2 and 3 actions complement the existing actions but broaden the focus to include the TWCM approach.

In this program, it has been assumed that the position of IWCM Program Leader will be filled by 2016/17 (year 3 of the program) and the IWCM Stakeholder Group (or similar) will be responsible for coordination and implementation of the IWCM Strategy prior to then. In this way, the first 2 years of the program would follow the Level 2 approach (urban water cycle management improvements) with transition to Level 3 (TWCM approach) commencing from year 3.

In reality, Level 1 and Level 2 actions that Council is able to fund will form the basis of IWCM actions in the short to medium term. To achieve full IWCM implementation, the remaining unfunded Level 2 and Level 3 actions would be the focus of a medium to longer term program. These actions will also be considered in the development of Council's Environmental Sustainability Strategy (ESS) and the overall resourcing, funding and priorities set by this program. The ESS is in the early stages of development and an initial framework is expected to be completed in 2014. It is envisaged this would allow priorities to be set in 2015, which in turn would provide direction on the feasibility of currently unfunded IWCM Level 2 and Level 3 actions.

To enable ongoing discussion and to ensure identified issues are not lost, this strategy has outlined an implementation program based on prioritised management actions as follows:

- Community engagement and data collection actions are considered to be fundamental to the IWCM program and the enhanced approaches recommended in this Strategy should commence as soon as possible;
- Best-practice compliance actions should also be completed as soon as possible as compliance is a key aim of the Strategy. The required action is an audit of multi-residential water supply connections to increase understanding of water supply demand which would also assist in the data collection actions;
- The preparation of the TWCM framework and sub-catchment management plans and IWCM policies would be more effectively undertaken by the IWCM Program Leader and are therefore logically completed once this position is filled;
- The additional resources for OSSM regulation are a significant cost component and would be more easily justified following the preparation of the sub-catchment priority actions and drinking water quality management plan;
- Similarly, allocation and prioritisation of additional resources for environmental monitoring, evaluation and reporting would logically follow the preparation of the sub-catchment management plans;
- Climate change adaptation actions are considered to be a priority to inform future decision-making. Due to the potential for reduced water supply availability as a result of demand hardening and climate change, there is a need to undertake the security of supply planning actions in the short-term. Similarly, the risks of flooding and tidal inundation on water supply, wastewater and stormwater assets are a key knowledge gap. Business continuity planning and drought management are actions that rely on the findings of the climate change adaptation information;
- The preparation of a drinking water catchment management plan is a key component of the drinking water quality management plan currently being prepared. This would be better informed if the natural assets within the catchment were better understood and hence the action to determine natural asset stock and condition within the drinking water catchments is a priority;
- The Streambank Protection Policy is an important funding source and has the potential to provide significant benefits if used to the maximum potential. The review of the policy and grants program is therefore a priority;
- The implementation of a WSUD framework is considered to be a long-term process that should commence as soon as possible with the development of guidelines and an implementation plan;

- Permanent water conservation measures are considered to be a low-cost and effective demand management measure that is likely to be well supported by the community. The introduction of voluntary measures in the Tweed would also improve consistency across the Northern Rivers region. The action requires initial planning and community engagement as a priority;
- Continued implementation and extension of the water loss management program is also considered to be a priority in reducing water wastage;
- The review of the effectiveness of rainwater tanks is a prerequisite to the introduction of a feasible rainwater tank rebate and is likely to require collection of data over a few years. This should commence as soon as the existing demand management priorities permit;
- The overflow abatement strategy previously recommended priority actions which have not yet been funded. A review of the strategy is therefore required to identify current priorities;
- A review of the biosolids management strategy is also required to identify potential cost savings and increased beneficial applications of biosolids; and
- To achieve TSC's target for recycled water use, additional recycling opportunities need to be identified. This would commence with an assessment of benefits to be gained from urban and recreational reuse in future greenfield areas and the subsequent development of integrated servicing strategies.

The proposed ten year implementation program has a total budget cost of $9.07 million (current dollars) with approximately $1.97 million required in the first three years.

Table 16: IWCM Strategy Implementation Program

	Options	Action (Levels 1, 2, and 3)	Responsibility	Potential Funding	10 year total ($'000) Note 1	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Administration and Governance	1b	Integrated Council-Wide IWCM Delivery	IWCM Program Leader + other units as required (interim IWCM Stakeholder Group)	C&NR, Env levy	**1,200**	Committee		150	150	150	150	150	150	150	150
	2a, 2b, 2c, 7b	Community engagement	IWCM Program Leader + other units as required	C&NR	**265**	40	25	25	25	25	25	25	25	25	25
	3a, 3b, 3c	Data collection	IWCM Program Leader + other units as required	C&NR	**360**	60	60	30	30	30	30	30	30	30	30
	4a, 4b	Strengthened IWCM policies (under Water Industry Competition Act)	Water	Water	**50**			50							
	5b, 5c, 12a	Best-practice compliance	Water	Water	**20**	10	10								
	9c, 5e	Business Continuity Planning	Water	Water	**150**		30	10	10	10	30	10	10	10	30
	6b, 6e	Reduction in energy consumption and greenhouse gas emissions	Sustainability Coordinator	-	**-**	Included in Council's broader sustainability initiatives									
Urban Town Water Supply	6d, 8a	Climate change adaptation – surface water availability	IWCM Program Leader + Water, P&I	Water	**250**	100	50				50				50
	7a, 7c	Targets for non-residential consumption	Water	Water	**-**	Minimal									
	7g	Permanent water conservation measures	Water	Water	**30**		10	10			5			5	
	7a, 7d	Water Loss Management Program	Water	Water	**150**	50	50	50							
	7e, 7f	Rainwater tank rebate	Water	Water	**735**	20	5	5	5	140	140	140	140	140	
	9a, 9b, 9d	Drinking water catchment planning	Water	Water	**100**		50	50							
	10a, 10b	Review and update Drought Management Strategy	Water	Water	**150**		50				50				50
Urban Wastewater Management	5d	Review and Update Sewer Overflow Abatement Strategy	Water	Water	**50**	50									
	13a, 13b	Biosolids Management Strategy	Water	Water	**150**		50				50				50
	7a, 11a, 11b, 11c	Integrated servicing strategies and recycled water opportunities	IWCM Program Leader + other units as required	C&NR, Env levy, s94, s64	**410**		50	70	120	70	20	20	20	20	20
Urban Stormwater Management	14a, 14b, 15a, 15b, 16a, 16b	Implement water sensitive urban design framework	IWCM Program Leader + other units as required	C&NR, P&R, E&O, grants, SMSC, s94, s64	**2,080**	50	150	100	260	250	250	260	250	250	260

Fundamental actions	Priority Actions	Actions relying on prerequisite (priority) actions	Level 3 (TWCM) components

C&NR – Community and Natural Resources Directorate, P&R – TSC Planning and Regulation Directorate, E&O – TSC Engineering and Operations Directorate, B&EH – TSC Building and Environmental Health Unit, P&I – TSC Planning and Infrastructure Unit, NRM – TSC Natural Resources Management Unit, Water – TSC Water Unit, Env levy – proposed environmental levy, SMSC – proposed stormwater management service charge, s94 – proposed additional developer contributions.
Years correspond to end of financial year i.e. 2015 is year 1 (start 1st July 2014, end 30th June 2015), etc.
Note 1: Level 1 actions are already funded and being implemented by TSC and these are considered to remain an integral component of the future strategy. The actions in the Implementation Program are additional to the Level 1 actions and are new strategic planning actions that are recommended to achieve the desired IWCM outcomes. None of the IWCM issues identified directly require investment in capital works within the next ten years. However, the outcomes of these actions may result in the identification of additional expenditure requirements for the future that have not been documented in this Strategy. Expenditure for Council's asset renewal program and provision of infrastructure to service new growth areas is additional to the IWCM implementation program and will be directed by many of the outcomes of the IWCM actions, particularly climate change adaptation, sewer overflow abatement strategy, biosolids management strategy, integrated servicing strategies and recycled water opportunities.

	Options	Action (Levels 1, 2, and 3)	Responsibility	Potential Funding	10 year total ($'000) Note 1	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Catchment Management	5a, 5f	Natural asset management	NRM, Water	Water, Env levy	**100**		50	50							
	6a, 6c, 17c	Climate change adaptation – flooding and tidal inundation	IWCM Program Leader + Water, P&I	Water, P&I, grants	**150**		50				50				50
	17g, 18c, 4b, 5f, 9d, 11b, 11c, 14b	Total water cycle management framework and sub-catchment plans	IWCM Program Leader + other units as required	C&NR, Env levy	**450**			150	100	100	20	20	20	20	20
	17d, 17f	Review of Streambank Protection Policy	NRM, Water	NRM	**20**	20									
	17e, 17i	Monitoring, evaluation and reporting	IWCM Program Leader + other units as required	C&NR, Env levy	**400**			50	50	50	50	50	50	50	50
	17b, 17h	Upper catchment floodplain planning	P&I	P&I, grants	**400**			80	80	80	80	80			
	18a, 18b, 18c	On-site sewage management (additional resources)	B&EH	B&EH	**1,400**				200	200	200	200	200	200	200
Total 10 year IWCM Strategy					**9,070**	**400**	**690**	**880**	**1,030**	**1,105**	**1,200**	**985**	**895**	**900**	**985**

Fundamental actions	Priority Actions	Actions relying on prerequisite (priority) actions	Level 3 (TWCM) components

C&NR – Community and Natural Resources Directorate, P&R – TSC Planning and Regulation Directorate, E&O – TSC Engineering and Operations Directorate, B&EH – TSC Building and Environmental Health Unit, P&I – TSC Planning and Infrastructure Unit, NRM – TSC Natural Resources Management Unit, Water – TSC Water Unit, Env levy – proposed environmental levy, SMSC – proposed stormwater management service charge, s94 – proposed additional developer contributions.
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ABBREVIATIONS

ADWG	Australian Drinking Water Guidelines
ASS	Acid Sulfate Soil
BASIX	Building Sustainability Index
BCP	Business Continuity Plan
BSC	Ballina Shire Council
CAP	Catchment Action Plan
CMA	Catchment Management Authority
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSP	Community Strategic Plan
CWG	Community Working Group
CZMP	Coastal Zone Management Plan
DCP	Development Control Plan
DECC	(former) NSW Department of Environment and Climate Change
DECCW	(former) NSW Department of Environment, Climate Change and Water
DNR	(former) NSW Department of Natural Resources
DWQMP	Drinking Water Quality Management Plan
EMP	Environmental Management Plan
EP	Equivalent Persons
EP&A	Environmental Planning and Assessment (Act)
EPA	Environment Protection Authority
ESD	Ecologically Sustainable Development
ESS	Environmental Sustainability Strategy
FSL	Full supply level
GPT	Gross Pollution Trap
GCM	Global Climate Model
HNFY	Historic No Failure Yield
HWA	Hunter Water Australia
IPART	Independent Pricing and Regulation Tribunal
IQQM	Integrated Quantity Quality Model
IWCM	Integrated Water Cycle Management
kL	Kilolitre
KPI	Key Performance Indicator
L	Litre

L/p/d	Litres per person per day
LEP	Local Environmental Plan
LWU	Local water utility
ML	Megalitre
NOROC	Northern Rivers Organisation of Councils
NRCMA	Northern Rivers Catchment Management Authority
NRM	Natural Resource Management
NRW	Non-Revenue Water
NWI	National Water Initiative
OEH	Office of Environment and Heritage
OSS	On-Site Sewerage
OSSM	On-Site Sewerage Management
PAC	Powdered Activated Carbon
POEO	Protection of the Environment Operations (Act)
QWC	Queensland Water Commission
REP	Regional Environmental Plan (now deemed SEPP)
RSE	Random Sampling Error
SEPP	State Environmental Planning Policy
SLR	Sea level rise
SOAS	Sewer Overflow Abatement Strategy
SQID	Stormwater Quality Improvement Device
SRV	Special Rates Variation
SSD	State Significant Development
SSI	State Significant Infrastructure
TSC	Tweed Shire Council
TUELRS	Tweed Urban and Employment Land Release Strategy
TWCM	Total Water Cycle Management
VPA	Voluntary Planning Agreement
WIC	Water Industry Competition (Act)
WSP	Water Sharing Plan
WSUD	Water Sensitive Urban Design
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

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APPENDIX 1: IWCM REVIEW BACKGROUND PAPER

Six Year Integrated Water Cycle Management Strategy Review

Background Paper

November 2012

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PROJECT 12-020– TSC SIX YEAR IWCM REVIEW

REV	DESCRIPTION	AUTHOR	REVIEW	APPROVAL	DATE
0	Draft issued for TSC review	R Campbell, K. Pratt	M Howland	M Howland	4/10/10
1	Updated with TSC comments	R Campbell	M Howland	M Howland	6/11/12
2	Final	R Campbell	M Howland	M Howland	8/11/12

EXECUTIVE SUMMARY

Since 2006, Tweed Shire Council's (TSC) Integrated Water Cycle Management (IWCM) Strategy has provided strategic guidance for the management of the Shire's urban water, sewerage and stormwater systems. As part of TSC's commitment to continuous improvement, minor updates to the Strategy were adopted in 2009 and 2011. In line with best management practice, TSC has elected to undertake an independent six-year review of its IWCM Strategy to capture new information, emerging issues and community preferences.

IWCM Review Scope

This background paper is part of TSC's six year IWCM Strategy review process. It aims to document the current status of the IWCM Strategy (and its evolution), the actions already undertaken and the degree of success (where known) as well as new or emerging issues. Whereas the State Government IWCM approach is focussed on the management of urban water services, Council has indicated a desire to broaden the traditional IWCM scope to a whole-of-Council and total catchment approach to water cycle management. This IWCM Review will seek to enhance the natural linkages between Council's water and wastewater businesses as well the natural resource and land management responsibilities of Council. It is intended that the outcomes from this process are highly specific to priority issues, local constraints and stakeholder expectations.

IWCM Strategy Implementation Progress

The current IWCM Strategy guides the development of strategic plans and provides long-term direction for urban water services. The current actions are focussed on the urban water cycle (particularly water and wastewater services) and are largely being implemented by staff within Council's Water Unit. Implementation progress is summarised below:

- Urban Water Supply: significant progress in demand management, water supply investigations and upgrade of water treatment facilities for Tyalgum;
- Urban Wastewater Management: ongoing sewerage system optimisation and development of infrastructure strategies and opportunities for water recycling;
- Urban Stormwater: management plan and development specifications are being updated with current best-practice;
- Catchment Management: River Health Grants program for drinking water catchment management activities, estuary/coastal zone management planning, on-site sewerage management regulation; and
- Overarching Strategies and Plans: ongoing detailed water and wastewater asset management planning and strategic business planning.

IWCM Issues and Challenges

For the purposes of this IWCM Strategy review, a new list of issues was generated from:

- The status of the current IWCM Strategy actions;
- Relevant specialist studies;
- Existing community feedback received by Council; and
- TSC staff input.

A number of the issues are related to Council's desire to pursue greater integration of water cycle management responsibilities and cross-divisional cooperation. These issues would not have been identified in a traditional (urban water) IWCM approach but are underlying factors that logically influence Council's approach to water management. A number of the issues also relate to future or emerging issues such as climate change and increasing regulation where more information has become available since previous IWCM reviews were undertaken.

The key challenges that Council faces are:

- Identifying the issues that have the greatest impact on Council and the community;
- Finding cost effective ways to deal with the issues;
- Assigning priorities given different perspectives and perceptions of the issues and competing demands for funds in an environment where costs need to be fully justified to a broad spectrum of interest groups;
- Ensuring continuity of business through changing circumstances such as climate change; and
- Meeting increasing regulatory requirements.

The new issues identified as part of this review are presented in the broad categories of:

- Administration and Governance;
- Urban Town Water Supply;
- Urban Wastewater Management;
- Urban Stormwater Management; and
- Catchment Management.

Administration and Governance

Issue 1: IWCM principles, responsibilities and priorities are not fully implemented across all Council units – The current IWCM Strategy largely follows the traditional IWCM approach which is based on delivery of integrated urban water services by a local water utility. While Council has already implemented some improvements in integration and cross-divisional cooperation, increased integration may lead to increased opportunities for gains in efficiency and/or better IWCM outcomes.

Issue 2: There is a need for informed and transparent decision-making and better management of community expectations - Council does not have unlimited resources to meet the demand for infrastructure and services as well as address all community desires for prosperity and environment protection. This highlights the need for informed and transparent decision-making as well as effective communication with the community in order for rate payers to have faith in the decision-making process. Given the finite level of Council resources and the capital-intensive nature of urban water services, Council needs to provide leadership and justification for its decisions based on the best available information;

Issue 3: There is a need for defendable and robust population forecasts - Population forecasts are inherently difficult as they rely on assumptions regarding demand for land sales, the capacity of urban release areas, community preferences for settlement, the future types of housing and the planning approvals process. The 2011 census data indicates that there is a lower rate of population growth than was assumed in the current IWCM Strategy. This has implications for the selection and timing of water and wastewater infrastructure;

Issue 4: Uncertainty regarding the preferred Tweed district water supply augmentation option creates confusion regarding land use planning – Council has been progressively purchasing land to cater for the inundation areas (and buffer zones) of the proposed Byrrill Creek Dam and potential raising of Clarrie Hall

Dam. The absence of a firm direction regarding the future water supply is likely to cause anxiety amongst affected land holders as well as difficulties implementing land use planning and development controls;

Issue 5: The implications of private industry involvement in town water supply and wastewater management are unclear, particularly with regard to regulation and Council responsibilities - The *Water Industry Competition (WIC) Act, 2006* allows private utility operators to develop and operate water and wastewater schemes under licence from the Independent Pricing and Regulatory Tribunal (IPART). Council's role and responsibilities regarding private schemes are unclear. In addition, there is a need to ensure the private schemes implement Council's IWCM objectives.

Issue 6: Asset management planning - The current IWCM Strategy includes an action to implement the water supply and sewerage asset management plans. Whilst these plans were prepared in 2010, implementation is an ongoing process and there is a need to continuously improve asset management planning. While IWCM principles will continue to assist in prioritising infrastructure actions, asset management planning will be undertaken as part of the State Government water utility best-practice requirements as well as the Integrated Planning and Reporting Framework;

Issue 7: Climate change implications need to be integrated into urban water services planning – Future sea level rise and climate variations will affect water cycle management infrastructure and activities. This impact needs to be considered in future water supply and wastewater planning, demand management and risk management;

Issue 8: High energy consumption and greenhouse gas emissions – Council's water supply and wastewater infrastructure consume high levels of energy, which is currently sourced from non-renewable sources. There are opportunities to reduce energy consumption and greenhouse gas emissions and develop energy and greenhouse gas emission targets;

Issue 9: Best-Practice Compliance - While Council currently substantially complies with the NSW government best-practice requirements, the Strategic Business Plans and Development Servicing Plans require regular review to remain compliant. In addition, water usage patterns for existing multi-residential properties needs to be better understood.

Urban Town Water Supply

Issue 10: Improved data collection and reporting procedures would facilitate adaptive forecasting of demand and assist with community education - The demand management implementation plan is focussed around a campaign of target residential demand per person. However, reporting of performance against demand KPIs creates confusion and inconsistencies. In addition, Council has implemented a new customer management system with revised data and reporting requirements and retrieval of accurate data relating to customer types and water demand is therefore problematic. Despite this, the current targets for residential demand are considered to be achievable;

Issue 11: There is currently no mechanism to promote retrofit of rain water tanks or installation of large rainwater tanks in new development - Council's policy for rainwater tanks in urban areas encourages the installation of rainwater tanks to provide non-potable water for outdoor uses, flushing toilets and washing machines. However there is no incentive to install tanks larger than required by BASIX or to retrofit existing properties. Continuing and expanding the existing rebate program and introduction of innovative education and incentive programs are well supported by the community but will require significant additional investment;

Issue 12: Council's 2013 target for non-revenue water is not likely to be achieved - Council's target of 10% non-revenue water (NRW) by 2013 is not likely to be achieved as the 5 year average is 13.7%. However it is expected that the implementation of projects to reduce leakage and unauthorised use of standpipes will reduce the level of NRW over time. As the "real losses" represent a wasted resource, reduce

the effective capacity of a water supply system and may result in unnecessary operating costs, a long term water loss reduction program needs to be developed and included in Council budgets;

Issue 13: Augmentation of the Tweed District Water Supply will be required in future due to population growth although the timing and additional supply required are unclear – Data on current population growth rates suggest that augmentation of the Tweed district water supply will not be required until at least 2030 and more likely beyond that time frame. However there are uncertainties regarding future population and demand as well as climate change implications and secure yield, and it is important to continually review available data to optimise the timing of the significant investment that will be required.

Issue 14: The drinking water catchments are impacted by current and historical land use and development - The catchments for Clarrie Hall Dam and Bray Park Weir are impacted by historical and current agricultural land management practices as well as the impacts of on-site sewerage management systems. While treatment facilities at Bray Park and Tyalgum have been upgraded to provide additional treatment reliability, there are opportunities for improved catchment management activities to control pollution at the source including agricultural land management, urban stormwater quality improvements, riparian management, point source pollution controls, education and catchment development controls;

Issue 15: As a precaution the Uki WTP is shut down during dirty water events - The need for consideration of the adequacy of treatment facilities at Uki was raised in the 2011 review of the IWCM Strategy. However, the appropriate management actions (e.g. operational controls, WTP modifications or upgrade) have not yet been determined;

Issue 16: Drought contingency and water supply emergency management measures need to be further developed - Given the predicted delay until augmentation of the Tweed District water source is required, it is considered appropriate to reassess the water supply failure scenarios including normal, restricted and emergency demand requirements. This assessment should consider the impacts of water sharing plan rules, potential fish passage requirements, proposed catchment management measures and effectiveness of the upgraded Bray Park WTP. Feasible contingency measures to cater for emergency scenarios (e.g. drought, infrastructure failure, raw water contamination) will also need to be developed.

Urban Wastewater Management

Issue 17: The opportunities for development (urban expansion) outside of the wastewater service areas is limited by the capacity of Council's infrastructure and the environment - Estuary management planning in the Tweed has identified issues relating to the impacts of wastewater discharges and urban runoff and the nutrient assimilation capacity of the waterways. The sustainable servicing of new development areas will require consideration of the sensitivity of the receiving waterways, increasing regulations, treatment requirements and costs as well as the development of policies to translate the IWCM objectives into development controls;

Issue 18: Licence requirements for pH and suspended solids at Uki WWTP need to be reviewed - As all effluent is used for irrigation of a koala feed tree eucalyptus plantation, high levels of suspended solids and pH in the irrigation dam are not a concern from an environmental protection point of view. However the environment protection licence requirements are mandatory targets and liaison with the NSW EPA is required to establish more appropriate targets for this situation;

Issue 19: Council and the community have a desire for increased water recycling but there are significant barriers to implementation of recycled water schemes within the Tweed Shire - Council has a target for 15% of treated effluent to reused by 2013, however, this target is not likely to be met, with between 5% and 9% of wastewater currently being recycled. Increasing regulations, treatment requirements and cost associated with use of recycled water contribute to this issue. With the current Council direction and policy relating to recycled water use, the initiative to implement recycling is left to the developer which provides little incentive for recycling. Nonetheless, future planning and assessment of recycled water schemes must weigh up the high cost to the community;

Issue 20: There is a high cost of sustainable biosolids management - The challenges with biosolids management include the high cost and energy consumption of treatment options for beneficial reuse, odour impacts, potential changes to auditing and regulation requirements and land availability for storage and treatment. There are potential synergies between biosolids reuse and Council's Agriculture Strategy and increased integration between these strategic planning processes may provide additional benefits for farm management as well as wastewater management.

Urban Stormwater Management

Issue 21: Increased emphasis on water sensitive urban design will require more integrated Council responsibilities, increased community education and increased staff capabilities and funding - The Draft Urban Stormwater Quality Management Plan (Australian Wetlands, 2011) has a strong emphasis on achieving water quality objectives for downstream waterways. The Plan refers to guidelines, resources and tools that should be used to implement best practice stormwater management, many of which have been developed by the Water By Design program for the South East Queensland Health Waterways Partnership. Implementation of the WSUD framework will require significant strategic planning, community education and additional resources to be effective;

Issue 22: Existing Council development controls do not fully address the residual load of urban stormwater on downstream sensitive waterways - For some developments, existing Council development controls (e.g. D7) can be satisfied through design of stormwater pollutant reduction systems yet residual loads may be detrimental to downstream sensitive waterways. In these cases, compensatory activities to offset residual and cumulative impacts of stormwater discharge into waterways may be considered, however, guidelines and policy mechanisms are required to enforce offsets and address the residual impacts;

Issue 23: Existing subdivision erosion and stormwater controls and resources are not adequate for the rainfall and rate of development experienced in the Tweed - Resources for inspection and/or enforcement of Council's erosion and sediment control requirements for new developments are limited and Council relies on complaints or inspections to highlight inadequacies in control systems.

Catchment Management

Issue 24: There is a need for a holistic catchment management strategy for the Shire - There is currently no framework for coordinating catchment management activities across the Shire. Existing estuary management plans and coastal zone management plans for estuaries have been developed through the state government's planning process. While the more recently updated plans have acknowledged the upstream catchment areas as affecting the health of estuaries, the main focus is on the health of the estuarine reaches. If a total catchment approach to water cycle management is desired, there is a need to strengthen the linkages between existing catchment management, plans for estuary management, agricultural management and IWCM programs and activities;

Issue 25: There is limited integration between urban and rural strategic land use planning - There is a need to protect the agricultural values and limit encroachment and cumulative impacts of urban development on farming land. Integration of rural strategic planning with the urban area planning is required to achieve the aims of the IWCM Strategy;

Issue 26: The effective management of onsite sewerage systems within the Shire is limited by the available resources - Although there are some on-site sewerage (OSS) systems that are failing there is limited opportunity to cost-effectively connect to Council reticulated wastewater systems due to transfer costs and capacity limitations as discussed in Issue 17. Additional financial and human resources would be required to adequately regulate, inspect OSS and educate residents.

Next Steps in the IWCM Review

Consultation activities to be undertaken as part of this IWCM Review aim to build on the activities already undertaken by Council through implementation of the current IWCM Strategy. The objectives of the next consultation phase are to engage the wider community in the IWCM Review and establish the community priorities for water cycle management. The community will also be invited to provide comment on the IWCM Strategy during public exhibition of the draft IWCM Strategy.

Water cycle management objectives will be developed utilising information provided in this Background Paper and feedback from the community and other stakeholders. A series of options will be developed to address the issues and assessed according to the water cycle management objectives, the benefits and the costs. For the preferred IWCM scenario, the required actions, indicative timeframes, likely costs, risks and opportunities will be identified.

CONTENTS

ISSUES

FIGURES

TABLES

1. INTRODUCTION

1.1 Need for Tweed Shire Council's IWCM Strategy Review

The NSW Government introduced the Integrated Water Cycle Management (IWCM) process in 2004 to assist local water utilities to sustainably manage their water systems, maximise benefits to the community and environment and achieve improved communication between local water utilities, water users and water managers. IWCM is a key component of the NSW Office of Water's NSW Best-Practice Management of Water Supply and Sewerage Framework. Within this framework, IWCM is the process of balancing water needs with the sustainable use of available water resources. In an urban context, IWCM identifies appropriate water cycle management options to efficiently provide water supply, sewerage and stormwater services, while sustainably managing the available water resources.

The IWCM Strategy adopted by Tweed Shire Council (TSC) in 2006 and reviewed in 2009 and 2011 is the strategic plan which has guided and prioritised actions regarding Council's management of the urban water supply, sewerage and stormwater systems for the last 6 years. TSC has committed significant time and effort in the regular reviews and updates of its IWCM strategy including detailed specialist studies and ongoing consultation activities.

The purpose of this review is to ensure the long-term future direction is appropriate, with due consideration of the current or emerging challenges facing Council and the community desires for future water cycle management. The review is consistent with the best-practice management framework which requires a major review every 6-8 years. While this independent review is partly driven by current state government guidelines, a desire to enhance IWCM implementation across Council has prompted this major review. Council aims to maximise the benefit of the IWCM process by ensuring the strategy is appropriate and cost-effective, the community are fully engaged and that all aspects of the Shire's water resources are considered. The aim of the review is to ensure that Council policy keeps pace with changing circumstances and new information through a process of continual improvement.

1.2 Scope of the Review

The review involves revisiting and updating the original assumptions used to develop the current IWCM Strategy such as population growth, water demand, community preferences and waterway health, confirming if the planning targets are being met and data gaps from the original study are being addressed. Some of these steps have already been undertaken by TSC in its bi-annual IWCM reviews. This current review will evaluate implementation progress, consider and where necessary, modify overall objectives and determine the scope of new actions that should be considered.

Whereas the State Government IWCM approach is focussed on the management of urban water services, Council has indicated a desire to broaden the traditional IWCM scope to a whole-of-Council and total catchment approach to water cycle management. This review is therefore able to provide a revised strategy that covers the broader responsibilities of Council and provide efficiencies and improved outcomes. It is intended that the outcomes from this process are highly specific to priority issues, local constraints and stakeholder expectations.

The review process including stakeholder engagement activities is illustrated in Figure 1.

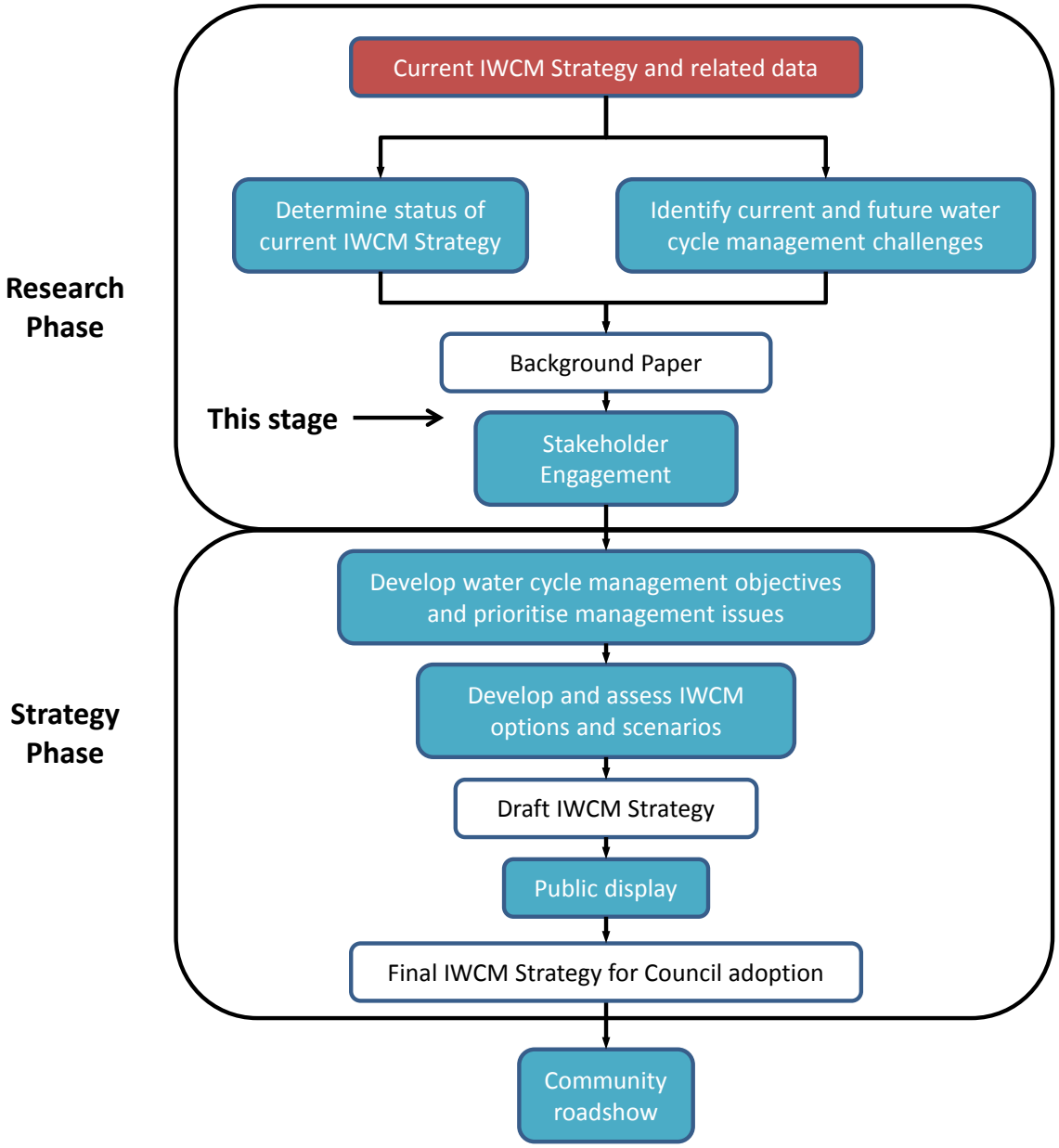

Figure 1: Six Year IWCM Review Process

1.3 Aims of the Background Paper

This Background Paper is a key step in documenting the current status and issues relating to TSC's water management. It focuses on describing the current IWCM Strategy (and its evolution), the actions already undertaken and the degree of success (where known). The Background Paper aims to:

- Discuss the evolution of the current IWCM Strategy;
- Provide an assessment of the current IWCM Strategy;
- Identify IWCM obligations/targets;
- Identify all current and future IWCM issues;
- Discuss the existing options and alternatives; and
- Identify the range of considerations for the IWCM Review (i.e. scope of this review).

2. THE CURRENT IWCM STRATEGY

2.1 Original 2006 IWCM Strategy

TSC commenced the IWCM process in 2004. The critical drivers at that time were:

- The ability of existing surface water sources to adequately service future populations - driven by a number of factors including predicted ongoing high population growth rates, a reduction in the estimate of safe yield of its water supply sources and the possibility of a reduced entitlement to water in the future (as a result of the proposed water sharing plan process);
- The impacts of urban stormwater on the Lower Tweed Estuary - driven by high population growth, high urban runoff rates and the minimal use of stormwater quality improvement devices;
- The impacts of effluent on the Lower Tweed Estuary - driven by high population growth, low effluent reuse and effluent from the four major wastewater treatment plants (WWTPs) discharging directly into the Lower Tweed Estuary; and
- The impacts of agricultural runoff on the Upper Tweed River and Bray Park Weir - driven by the high proportion of agricultural land in the catchment, past land management practices that led to loss of vegetation (including riparian) and past and existing agricultural practices.

To manage the above issues, Council committed to an IWCM process involving the integrated management of the water supply, sewerage and stormwater services within a whole of catchment strategic framework. The objectives of the IWCM Context Study and Strategy (HWA, 2006) were to:

- Develop guiding principles and objectives for urban water services that are consistent with the broader catchment and triple bottom line requirement;
- Evaluate and short-list IWCM options for water service delivery that address these objectives and requirements;
- Provide a forum for community and other stakeholder involvement in the ongoing development of an IWCM strategy for urban water services;
- Provide the strategic framework for the future development of the urban water services; and
- Deliver sustainable urban water services within a sound business planning context.

Additional information on the 2006 IWCM Strategy is provided in Appendix A, Section A1.

2.2 Interim IWCM Strategy Reviews in 2009 and 2011

Following adoption of the IWCM Strategy in 2006, progress was monitored and strategy actions were revised to enable ongoing implementation. The progress of the IWCM Strategy was reported to Council in 2009 and 2011 and the strategy actions were revised at each stage with the current set of 18 actions adopted by Council in February 2011. Further information on each initiative is included in Appendix A.

The current IWCM Strategy consists of a series of actions as follows:

- Overarching Strategies and Plans:
  - Develop Quality Management Plan;
  - Develop Environmental Management Plan;
  - Implement Asset Management Plans;
  - Implement WSUD and ESD Principles
  - Liaise with proponents of developments to promote WSUD and ESD; and

  - Implement Water Education and Training.
- Urban Water:
  - Adopt Demand Management Implementation Plan;
  - Adopt Drought Management Implementation Plan;
  - Develop Risk Based Water Quality Management Plan;
  - Develop and Implement Leakage Reduction Program;
  - Determine Preferred Option for the Augmentation of the Water Supply;
  - Procure upgraded WTP at Tyalgum; and
  - Investigate and determine requirement for upgrading the WTP at Uki.
- Urban Wastewater:
  - Optimise Existing Sewerage Infrastructure;
  - Determine Options for Augmentation of the Sewerage Infrastructure; and
  - Maximise Water Recycling (Effluent Reuse) Opportunities.
- Urban Stormwater:
  - Review Urban Stormwater Quality Management Plan;
  - Update Development Design Specification D7 – Stormwater Quality; and
  - Identify Targeted Retrofit Program for Retention/Treatment Hotspots.
- Catchment Management:
  - Review On-site Sewage Management Strategy; and
  - Develop Drinking Water Catchment Management Plan.

2.3 IWCM Strategy Implementation Progress

A summary of the progress of the IWCM Strategy Actions since 2006 is given in Table 1. The numbering in Table 1 shows actions from the 2006 and 2011 IWCM action lists.

Many of the actions have been substantially completed or progressed. The table also identifies the key aspects of each action and its associated assumptions which are recommended for review. This is discussed further in Section 4.

Table 1: Summary of IWCM Strategy Implementation Progress since 2006

No. (2011)	No. (2006)	Action	Summary of Implementation Progress	Status	Key Aspects for IWCM Review
1	1	Demand Management Strategy	Council has implemented a number of programs aimed at educating and assisting residents and businesses to reduce their water use. Between November 2005 and December 2008 Tweed Shire Council hosted a number of product giveaways and installations that resulted in nearly 50% of the Shire's homes being fitted with energy and water saving devices resulting in 827 million litres of water savings to the town water supply annually. Council has invested in the "waterwise" education of school children. Education facilities have been built at the Environment Centre at Kingscliff WWTP and at the new Bray Park WTP. Water supply demand forecasts and demand management scenarios have been developed for residential and non-residential customer demand (refer Appendix A, Section A7.2). As noted in the 2006 IWCM Strategy, residents are aware of the importance of reducing water consumption are continuing to reduce potable water use (refer Section 4.2). Stage 1 of the Demand Management Strategy which addresses demand management in both greenfield (new) and brownfield (existing) residential areas was adopted by Council on 17 February 2009. Stage 2 of the Demand Management Strategy which addresses demand management in commercial and industrial areas and a summary report of both stages were adopted by Council on 19 October 2010. In December 2010 TSC employed a Demand Management Program Leader whose main responsibility is to implement the recommendations of the overall Demand Management Strategy. An implementation plan for the Demand Management Strategy was developed and adopted by Council in March 2011 (refer Appendix A, Section A7.2.6). Council's Demand Management Strategy highlights a range of initiatives and programs to manage demand for the Tweed's water supply. Overarching all of the programs and activities is a campaign approach to encourage residents and households to be water wise and aim to achieve a certain target per capita consumption per day.	Complete	• Demand forecasts; • Suitability of KPIs and reporting methodology; and • Expected success of demand management initiatives.

No. (2011)	No. (2006)	Action	Summary of Implementation Progress	Status	Key Aspects for IWCM Review
	3	Explore Demand Substitution Options	Options were considered as part of the Demand Management Strategy development: • 5,000 L rainwater tanks for external uses, toilets and washing machines; • Recycled wastewater for external uses and toilet flushing; • Indirect potable reuse; and • Four pipe system (blackwater and greywater recycling). Stormwater harvesting for reuse has also been investigated.	Complete	• Implementation of TSC rainwater tank policy; • Implications of private water utility schemes; and • Recycled water use and potential expansion.
	7	Undertake Long Term Demand Forecasts	Long term demand forecasts were completed for the Demand Management Strategy.	Complete	Demand forecasts and comparison with secure yield predictions.
2	-	Drought Management Strategy	The Drought Management Strategy was adopted by Council in November 2009. The 'Drought' Business Continuity Plan prepared in December 2010 documents emergency response actions. A water quality study of Clarrie Hall Dam was commenced in late 2010 to investigate the nature and occurrence of stratification in the dam and potential management measures. Additional destratification capacity will provide more capability in managing the existing water supply system generally and particularly during drought conditions. Alternative drought emergency water supply is being considered as part of the water supply augmentation project (Action 7) as it progresses.	Complete	• Drought management policy; • Water restriction triggers and targeted savings; and • Emergency actions.
3	8	Develop Risk Based Water Quality Management Plan	An assessment of Council's compliance with the ADWG, including a gap analysis Council was undertaken in 2010 and strategies were developed to address the identified gaps. Council adopted the Drinking Water Quality Policy (Version 1.0) in December 2010. The policy formalises Council's position on and commitment to drinking water quality and its management, as recommended in the ADWG. A workshop was held in 2009 to assess the drinking water supply system (Element 2), identify risks and develop preventative measures for the three water supplies (Element 3). The Drinking Water Quality Management Plan is progressively being developed.	In progress	Development and implementation of the Drinking Water Quality Management Plan.

No. (2011)	No. (2006)	Action	Summary of Implementation Progress	Status	Key Aspects for IWCM Review
4	2	Develop and Implement Leakage Reduction Plan	Council received funding from the NSW Water Directorate to undertake leak detection studies and install flow meters. Actions to date have included reservoir drop tests, other leak detection and repairs and installation of flow metering. The KPI for non-revenue water (water that is produced but does not end up raising revenue because it is lost from the system before it makes it to the customer meters, including water lost through leakage, meter inaccuracies, maintenance activities such as flushing of mains, main breaks and theft) is 10% by 2013. The 2010/11 performance was 15.7% with a 5 year average of 13.7%. TSC plans to develop a detailed leakage reduction plan as part of the Demand Management Strategy implementation.	In progress	Development and implementation of the Leakage Reduction Plan.
5	-	Quality Management Plan	TSC has prepared and implemented plans and strategies that address many of the elements that would be included in the QMP including: • Council's Community Strategic Plan; • Water Supply and Wastewater Activity Management Plans; • Business Continuity Plan and risk management; • Asset Management Plan; • Maintenance management system; • Operating manuals; • Renewals planning; • Level of service reviews; • Corporate knowledge base; • Policy development; and • Corporate, NWI and State government performance reporting. The DWE Best-Practice of Water Supply and Sewerage Guidelines (Aug 2007) encourage but do not require local water utilities to prepare and implement a Quality Management Plan aimed at improving performance in terms of customer and stakeholder satisfaction through documentation of procedures and processes (refer Appendix A, Section A4.3).	Incomplete	Existing plans and strategies and opportunities for improved documentation and implementation.

No. (2011)	No. (2006)	Action	Summary of Implementation Progress	Status	Key Aspects for IWCM Review
6	-	Environmental Management Plan	Council has many management plans and strategies relating to environmental management of the catchments, including estuary management plans, a vegetation management strategy, a local action plan for greenhouse gas reduction, State of the Environment reporting and Standard Operating Procedures for works carried out by Council field staff. Any significant works will have Project Management Plans and large projects also have specific Environmental Management Plans (EMP). The DWE Best-Practice of Water Supply and Sewerage Guidelines (2007) encourage but do not require local water utilities to prepare and implement an EMP. An overarching Environmental Management Plan may be developed in future, pending resource allocation, to establish the overall context of these other plans and strategies	Incomplete	Existing plans and strategies and opportunities for improved documentation and implementation.
7	-	Determine Preferred Option for the Augmentation of the Water Supply	A Water Supply Augmentation Options study has been undertaken to determine the best way to augment the water supply to meet the Shire's needs until 2036 (refer Appendix A, Section A7.3). This included a coarse screen assessment, a fine screen assessment of short-listed options and community consultation. Raising Clarrie Hall Dam was found to be the preferred option. In 2010, two augmentation options have been either recommended by Council officers or identified by Council. Both are water storages, namely: • Increasing the capacity of the existing Clarrie Hall Dam at Doon Doon Creek; or • Building a new water storage on Byrrill Creek. While significant investigations have been undertaken, a preferred option has not yet been adopted by Council.	In progress	• Demand forecasts; • Relevance of study outcomes; and • New or emerging issues.

No. (2011)	No. (2006)	Action	Summary of Implementation Progress	Status	Key Aspects for IWCM Review
	4	Review of Secure Yields	Yield studies have determined the historic no failure yield (HNFY) as a measure of system yield. HNFY is the annual volume of water that could have been extracted from a water supply system operating over the historic period of record, without storages falling below minimum operating levels. HNFY estimates for the Tweed River System have been reduced with successive studies as more data and improved methods were used. The estimates in the 1980, 2002 and 2006 studies were 27,500, 18,000 and 16,200 ML/a respectively. In 1980, a monthly water balance method was used, while in 2002 and 2006, daily simulation models were used. Furthermore, in 2006, the 2002 model was recalibrated and the drought of 2002/03 was considered. Environmental flow provisions were not considered in the modelling undertaken in 1980 and 2002. The system yield of the Clarrie Hall Dam/Bray Park Weir system with an assumed environmental flow requirement (prior to adoption of the Water Sharing Plans) was assessed in 2006 as approximately 13,750 ML/annum. A study was undertaken in 2010 to assess the impact of the proposed water sharing plan environmental flow provisions on the secure yield and this found that the WSP was not as constraining as the provisions assumed previously. The safe yield of Tyalgum water supply was assessed as 120 ML/a in 2003.	Complete	• Use of 13,750ML/a as an interim secure yield; • Inclusion of climate change considerations; • Impact of WSP environmental flows (current and future); and • Impact of demand hardening on secure yield.
	5	Determine Impacts of Water Sharing Plans on Water Supplies	Ongoing discussions were held with the Department of Water and Energy (now Office of Water) during development of the Water Sharing Plan to seek advice on the requirements for environmental flows that may impact on the secure yield of Clarrie Hall Dam. An assessment of the environmental flow requirements in the draft WSP was undertaken in 2010. This study indicated that the current WSP provisions will not reduce the current secure yield of the Tweed/Uki water supply. However, the State government can review the WSP provisions every ten years or if Council applies for an augmentation of the water source.	Complete	The impact of revised environmental flow provisions which may be required as part of the water supply augmentation still needs to be considered.

No. (2011)	No. (2006)	Action	Summary of Implementation Progress	Status	Key Aspects for IWCM Review
	26	Ground Water Study	A study to determine the extent of groundwater and its suitability for urban supply were undertaken as part of the Water Supply Augmentation Options study. EHA (2008) found that the following groundwater sources should be considered (refer Section A7.3): • Alluvial aquifers associated with middle arm of the Tweed River system upstream of Bray Park. A likely short-term yield in the order of 50 L/s (4.32 ML/d) could potentially be exploited to improve the raw water feed quality to the Bray Park WTP from up to 7 bores constructed to 20 m deep; and • Small-scale coastal dune sand supplies that occur on the coast.	Complete	The Office of Water is currently preparing a water sharing plan for the north coast coastal sands. Any new data on groundwater resources should be considered as part of augmentation options.
8	6	Procure Upgraded WTP at Tyalgum	Council resolved to construct a membrane filtration plant at Tyalgum. The WTP is expected to be commissioned in November 2012.	Complete	-
9	-	Investigate and determine requirement for upgrading the WTP at Uki	The drinking water quality risks associated with Uki WTP were assessed as part of the development of the Drinking Water Quality Management Plan (DWQMP, Water Futures, 2010). Water Futures (2010) recommended that the filtration plant performance is validated prior to the risks being re-assessed. TSC will develop an operations manual for the Uki WTP defining critical control points and operational controls.	In progress. Awaiting completion of DWQMP	Outcomes of DWQMP.
10	-	Asset Management Plan – Water Supply	An Asset Engineer and Asset Officer were appointed in 2010 to progress asset management planning and improvements. The Assetic program is being implemented across Council for valuation and financial asset management and Water Unit assets are in the process of being added to the Assetic program. The pipeline renewal program has been updated using the AssetPlan decision support system with data currently being converted for use in Assetic for renewal modelling. Maintenance management, customer request, GIS, telemetry and SCADA, water quality and other data systems are being progressively developed to provide the matrix of inputs for asset management requirements. A risk-based maintenance strategy, risk-based pipeline renewal manual and an asset management manual have been developed for the Water Unit. The Water Supply Asset Management Plan was prepared in 2011.	Ongoing	Limited review in IWCM Strategy required. Will be reviewed as part of the Integrated Planning and Reporting Framework.

No. (2011)	No. (2006)	Action	Summary of Implementation Progress	Status	Key Aspects for IWCM Review
11	10	Optimise the Present Sewerage Infrastructure	Council prepared a Sewer Overflow Abatement Strategy (SOAS) in 2007. Implementation of the SOAS is ongoing and while it has not been fully implemented due to resourcing and funding limitations, all major actions are programmed to be completed by 2016.	In progress	Review SOAS implementation status.
	9	Undertake Sewerage System Gauging and Monitoring	Council undertook flow gauging and monitoring in some catchments of Banora Point, Tweed Heads, Bilambil Heights and Murwillumbah. The data are being analysed and modelled to determine the program of works required to abate overflows and optimise these catchments.	In progress	Review implementation status.
12	15	Determine Options for the Augmentation of the Sewerage Infrastructure	Banora Point WWTP is being upgraded to increase its capacity from 50,000 EP to 75,000 EP with improved effluent quality. A new WWTP and associated reticulation system are being constructed to service the villages of Burringbar and Mooball. Council has obtained approval to redevelop the decommissioned Tweed Heads WTTP to 10,000 EP with equivalent effluent quality to the upgraded Banora Point WWTP, if and when required. Planning for new development areas has included: • Liaison with private water utilities developing servicing strategies; • Development of infrastructure strategies to concept stage for future developments at Cobaki Lakes and The Rise at Bilambil Heights. To cater for these new developments, further augmentation of the Banora Point WWTP may be required ; and • An infrastructure strategy to concept stage has also been developed for future development at Kings Forest.	In progress	• Implications of private utility involvement in water supply and wastewater services; and • Implementation status.
13	11	Effluent Reuse Opportunities	Council has been recycling small quantities of treated wastewater since the 1980s and over the last decade has increased the amount of water recycled throughout the Shire. Several reuse projects were identified and planning to realise these opportunities was undertaken (refer Appendix A, Section A7.2.5). Options for effluent reuse were also considered in the Demand Management Strategy. The DMS recommends that for West Kingscliff, recycled water be made available to future industrial land use areas where demand is identified. The DMS also recommends that Council continues to encourage effluent reuse schemes and other integrated water solutions that are sustainable in the long term proposed by developers of greenfield sites.	Ongoing	• Implementation progress and additional opportunities for recycled water use.
	13	Assess Short-Term Options for Increasing Effluent Quality and Reuse			

No. (2011)	No. (2006)	Action	Summary of Implementation Progress	Status	Key Aspects for IWCM Review
	14	Dual Reticulation and Decentralised Sewerage for New Development Areas	As part of the Stage 1 Demand Management Strategy options for dual reticulation and decentralised sewerage were assessed. It was found that in general dual reticulation and decentralised sewerage provided no advantage or additional advantage over the proposed implementation of BASIX with 5,000 L water tanks and reduced infiltration gravity sewers. Where opportunities are identified by developers, Council will assess the proposals put forward.	Ongoing	• Implications of private utility involvement in water supply and wastewater services.
14	-	Asset Management Plan – Wastewater	The Wastewater Asset Management Plan was prepared in 2011. Refer Action 10.	Ongoing	Will be reviewed as part of the Integrated Planning and Reporting Framework.
15	16	Implement Targeted Retrofit Program for Stormwater Retention/ Treatment Hotspots	A Stormwater Management Plan was prepared in 2000 and a 7 year infrastructure program was developed. Funding has not been allocated to implement the full program. Grant funding was provided in 2008 for the installation of SQIDs on stormwater outfalls discharging into the Tweed River and Cudgen Creek. A gross pollutant trap was also installed during the redevelopment of Jack Evans Boat Harbour. Council prepared a draft Urban Stormwater Quality Management Plan in 2011 to reflect the philosophies of Water Sensitive Urban Design (refer Appendix A, Section A7.9) which provides objectives for stormwater management in existing urban areas. Council's Planning and Infrastructure Unit is updating D7, the development design specification for new development relating to stormwater quality. For this review, WSUD practices from south-east Queensland have been adopted where applicable.	In progress	• Status of Urban Stormwater Quality Management Plan; • Success of stormwater quality initiatives; • Success of stormwater discharge and source controls; and • Council's human resources and funding commitments for implementation of the Plan.
	17	Ongoing Review of Stormwater Management Plan			

No. (2011)	No. (2006)	Action	Summary of Implementation Progress	Status	Key Aspects for IWCM Review
16	18	Ongoing Implementation of WSUD and ESD Principles	The draft Urban Stormwater Quality Management Plan has been prepared based on WSUD philosophies for stormwater management (refer above). Stage 1 of the Demand Management Strategy identified demand management actions which are undertaken as part of the implementation of WSUD and ESD principles. Issues such as how developments are planned, education of the community and strengthening planning requirements are being considered by Council and incorporated into the updated LEP and future revisions of subdivision and stormwater design specifications.	Ongoing	• Application of WSUD principles; • Adequacy of policies that promote WSUD; and • Council's human resources and funding commitments for implementation of WSUD principles.
17	19	Continue Liaison with Proponents of Developments to Promote WSUD and ESD	Council Planning, Engineering and Water Unit staff continue to work collaboratively in assessing new developments with a view to promoting sustainable water cycle management options. However, Council has limited power to enforce WSUD and ESD principles in developments approved under Part 3A of the *EP&A Act* (now replaced by State significant assessment system).		
17	20	Preliminary Planning and discussions with Developers for Alternatives to Rainwater Tanks	Stage 1 of the Demand Management Strategy made recommendations on the provision of water and sewerage services to the new greenfield developments. Council included these in its submissions in response the public exhibition of these developments under the previous Part 3A of the *EP&A Act*.		

No. (2011)	No. (2006)	Action	Summary of Implementation Progress	Status	Key Aspects for IWCM Review
18	-	Complete a Drinking Water Catchment Management Plan	The risk assessment process carried out for the drinking water quality management plan (Action 3) identifies some of the hazards impacting on the drinking water catchment. A more detailed catchment management plan will be commenced, pending adequate resources, once Action 3 has been completed.	Not yet commenced	• Adequacy of catchment management planning. • Actions to integrate the On-Site Sewage Management Strategy into a Catchment Management Strategy. • Resourcing and funding arrangements for implementation of catchment management activities. • Catchment management initiatives.
	23	On-Site Sewage Treatment and Disposal	Council's On-Site Sewage Management Strategy is being implemented and will be reviewed within the next 12 months. On-site systems have been identified as a risk to drinking water quality (Water Futures, 2010) and 26% of the systems inspected by Council were found to be failing or needing repairs (refer Appendix A, Section A7.12). Council has insufficient resources to regulate the operation of existing on-site systems.	Ongoing	
	24	Identify Hot Spots that adversely Impact on Water Quality	A data base of hot spots has been prepared but as yet no Strategy to address the hot spots has been developed.	Incomplete	
	25	Ongoing Support to Catchment Management Initiatives	The Tweed River Committee provides direction on initiatives for items such as stream bank protection, planning controls, education and revegetation. The Water and Sewer Dividend Payment funds catchment and water quality improvement initiatives which provides an important source of funding for this program.	Ongoing	

3. IWCM TARGETS AND OBJECTIVES

The IWCM process is about addressing water cycle management problems. The issues are defined by non-compliance with urban water service targets, both legal obligations and agreed levels of service or non-achievement of water cycle management objectives.

All councils have targets which relate to legislation, contracts, standards and agreed levels of service. Some targets relate to regulatory requirements (for example water extraction, water processing, water discharge and waste disposal) and cannot be varied. These targets are mandatory and non-compliances are therefore described as IWCM issues. For the purposes of this IWCM review, targets also include formal guidelines and objectives which Council intends to meet.

The targets and objectives that are relevant to this IWCM Review are listed in the following table. These are discussed further in Appendix A.

Table 2: IWCM Targets

Source	Target	Summary of Objectives Related to IWCM (reference section in Appendix A)
Integrated Planning and Reporting Framework	Community Strategic Plan (CSP)	Identifies the long term aspirations of the community, key directions, outcomes and key result areas (Section A2.2).
	Delivery Program	Interprets the long term strategic plan into 4 year strategic actions (Section A2.3).
	Operational Plan	Annual Operational Plan for the budget year (Section A2.4).
	Resourcing Strategy	Includes the Financial Plan, Workforce Management Plan and Asset Management Strategy (Section A2.5).
	State of the Environment Report	Identifies pressures, responses and priorities (Section A2.6).
Legislation	Local Government Act, 1993, and Local Government (General) Regulation 2005	Best-practice management (Section A4.3), on-site sewage management (Section A7.12), regulation of private sewer systems, pricing.
	Local Government (Water Services) Regulation,1999	Water restrictions, trade waste
	Public Health Act, 2010	Framework for Management of Drinking Water Quality (Australian Drinking Water Guidelines, Section A3.4)
	Protection of the Environment Operations (POEO) Act, 1997	Environmental Protection Licences (refer below).
	Water Management Act, 2000	Water Sharing Plans and Water Access Licences (Section A3.3) and Developer Charges.
	Catchment Management Authorities Act, 2003	Catchment Action Plan (Section A6.1).
	Environmental Planning and Assessment (EP&A) Act, 1979	Environmental impact assessment and planning and relevant planning instruments (refer below).
	Occupational Health and Safety Act 2000 and Rehabilitation Act 1987	Provision of safe working environment.
	Independent Pricing and Regulatory Tribunal (IPART) Act, 1992	Determination and advice on prices and pricing policy for government monopoly services.
	Competition Policy including Competition Policy Reform Act, 1995	Prohibition on anti-competitive behaviour.

Source	Target	Summary of Objectives Related to IWCM (reference section in Appendix A)
	Water Industry Competition Act, 2006	Encourage competition in the water industry and to foster innovative recycling projects and dynamic efficiency in the provision of water and wastewater services.
Environmental Planning Instruments	SEPP Building Sustainability Index (BASIX), 2004	BASIX was mandatory for regional NSW from 2005/06.
	State and Regional Development SEPP, 2011	The system establishes two separate assessment frameworks for State significant development (SSD) and State significant infrastructure (SSI). Projects that fall within these categories will be assessed by the Department of Planning and Infrastructure and determined by the Minister, the Planning Assessment Commission or senior departmental staff. The SSD assessment system has been established to guide planning decisions on: • Large-scale industrial, resource and other proposals in 24 different development classes; or • Development in precincts identified as important for the State by the NSW Government. The SSI assessment system has been established to allow planning decisions on major infrastructure proposals, in particular linear infrastructure (such as roads, railway lines or pipes which often cross a number of council boundaries) or development which doesn't require consent but which could have a significant environmental impact (such as a port facility).
	SEPP Infrastructure, 2007	Provides a consistent planning regime for infrastructure and the provision of services across NSW, along with providing for consultation with relevant public authorities during the assessment process.
	SEPP Coastal Protection	Development in the NSW coastal zone is appropriate and suitably located.
	North Coast REP, deemed SEPP (1988)	This plan covers all of the North Coast LGAs. It identifies environmental features that are important to the region and provides a basis for new urban and rural development.
	Tweed LEP	Tweed LEP 2000 currently zones a range of areas for various urban land uses. It provides the main statutory basis for future development and is the statutory instrument that has been used to implement the existing Residential Development Strategy, 1992 (through the rezoning process). It sets the basis for the existing stock of zoned and developed or undeveloped land that needs to be considered in assessing the long term requirements for urban land in Tweed Shire.
	Tweed DCP	DCPs indicate to developers what level of detail is required with certain types of applications and what standards are sought with the design of certain developments.
Water Sharing Plans and Licences	Water Sharing Plan Tweed River Area Unregulated and Alluvial Water Sources	Rules for sharing water (Section A3.3).
Environment Protection	Banora Point WWTP	TSC is required to comply with load limits and concentration and volume limits are specified for the effluent quality
	Hastings Point WWTP	

Source	Target	Summary of Objectives Related to IWCM (reference section in Appendix A)
Licences (under POEO Act)	Kingscliff WWTP	monitoring point. The STP licences also require TSC to monitor and record pollution complaints, STP bypasses, biosolids and sewer overflows to the environment.
	Murwillumbah WWTP	
	Tumbulgum WWTP	
	Tweed Heads WWTP	
	Tyalgum WWTP	
	Uki WWTP	
Water Supply and Wastewater Activity Management Plans	Demonstrates the link between the community's needs, the agreed levels of service and management of the services.	
Water and Sewerage Levels of Service	Define the standards required from the water and wastewater systems.	
National Water Initiative and Best-Practice Management	The NWI provides objectives, outcomes and agreed actions to be undertaken by state and local governments across all aspects of water management. BVSC is required to demonstrate compliance with the NWI by encouraging best-practice through effective, efficient and sustainable water supply and wastewater businesses. Substantial compliance with the Best-Practice Guidelines is also a pre-requisite for State Government financial assistance towards the capital cost of backlog water supply and wastewater infrastructure and for payment of a dividend from the surplus of the water supply or wastewater business to the council's general revenue. Compliance with the Best-Practice Management Guidelines is also a requirement of the Division of Local Government's Planning and Reporting Manual (Section A4.3).	
Northern Rivers Catchment Action Plan	The CAP outlines targets that are aimed at improving and protecting natural assets, such as water, soil, native vegetation, cultural heritage, biodiversity, and the adjoining assets in the coastal and marine environment. The CAP also has a variety of targets relating to water management, some of which include water supply and waste water management, water conservation management, water quality management and water sharing. The CAP also promotes the value of people and communities in the catchment (Section A6.1).	
Recycled Water Agreements	Council has agreements with Currumbin Wildlife Sanctuary, Tweed Golf Course and Chinderah Golf Course for supply of recycled water.	
Guidelines, Standards and Codes	Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (2006)	Adopt a risk management approach to managing risks to human health and the environment from recycling of water from greywater and treated sewage.
	National Water Quality Management Strategy - Guidelines for Sewerage Systems - Use of Reclaimed Water (2000)	Provide advice on reclaimed water quality, level of treatment, safeguards and controls and monitoring.
	NSW Interim Guidelines for Management of Private Recycle Schemes (2008)	Provides advice, for obtaining approval to install and operate a private recycled water scheme
	NSW Guidelines for Greywater Reuse in Sewered, Single Household Residential Premises (2008)	Guidelines for approval of greywater treatment systems in accordance with Item C6, Section 68, *Local Government Act, 1993*
	Environmental Guidelines: Use of Effluent by Irrigation (DECC, 2004)	Guidelines for use of treated effluent in landscape watering, irrigation of pasture, crops, orchards, vineyards, plantation forests or rehabilitated sites and irrigation of golf courses, racecourses and other recreation grounds

Source	Target	Summary of Objectives Related to IWCM (reference section in Appendix A)
	Environmental Guidelines: Use and Disposal of Biosolids Products (EPA, 2000)	Guidelines related to the beneficial use and disposal of biosolids
	Environment and Health Protection Guidelines: Onsite Sewage Management for Single Households (known as the 'Silver Book'), 1998	Guidelines to assist with the assessment, regulation and management of single household on-site sewage management systems
On-site Sewage Management (OSSM) Policy	Promotes sustainable on-site sewage management and to guide landholders or developers towards best practice (Section A7.12).	

4. IWCM ISSUES AND CHALLENGES

The adopted IWCM Strategy provides for the development of strategic plans and providing long-term direction for urban water services. The IWCM actions are focussed on the urban water cycle (particularly water and wastewater services) and are largely being implemented by staff within Council's Water Unit. As discussed in Section 2.3, the IWCM actions have been substantially implemented. This IWCM review considers the strategic focus of the IWCM Strategy in accordance with Council's aim to provide a broader whole-of-catchment management approach.

This review of the adopted IWCM Strategy is required to identify current and emerging issues and determine if the existing direction is adequate to address these issues. Based on the review of the current IWCM strategy, the progress of the actions and data collected as part of this IWCM review, a current set of IWCM issues has been developed. These are discussed in the following sections.

The current issues identified as part of this review are presented in the broad categories of:

- Administration and Governance;
- Urban Town Water Supply;
- Urban Wastewater Management;
- Urban Stormwater Management; and
- Catchment Management.

A number of the issues are related to Council's desire to pursue greater integration of water cycle management responsibilities and cross-divisional cooperation. These issues would not have been identified in a traditional (urban water) IWCM approach but are underlying factors that logically influence Council's approach to water management. A number of the issues also relate to future or emerging issues such as climate change and increasing regulation where information has become more available since previous IWCM reviews were undertaken.

The key challenges that Council faces are:

- Identifying the issues that have the greatest impact on Council and the community;
- Finding cost effective ways to deal with the issues;
- Assigning priorities, given the different perspectives and perceptions of the issues and competing demands for funds in an environment where costs need to be fully justified to a broad spectrum of interest groups;
- Ensuring continuity of business through changing circumstances such as climate change; and
- Increasing regulatory requirements.

4.1 Administration and Governance

4.1.1 Integration of Council Water Cycle Management Activities

Issue 1: IWCM principles, responsibilities and priorities are not fully implemented across all Council units

The drinking water supply and wastewater management services have a strong influence on the health of the waterways (through infrastructure, water extraction and wastewater discharges). Similarly, urban development and agricultural activities are a significant influence on the health of waterways. Historically, water supply, wastewater, urban stormwater and natural resources have been managed by different parts of

Council and State Government regulators (e.g. Office of Environment and Heritage and Office of Water). This has created a departmentalised focus across government on the discrete parts of the water cycle.

The traditional focus of an IWCM Strategy is an integrated approach to delivery of urban water services by a local water utility (i.e. Tweed Shire Council's Water Unit). TSC's 2006 IWCM Strategy and much of the recent strategy implementation effort have focussed on the urban town water and wastewater services (refer Section 2). Catchment management activities have been undertaken on the periphery of the IWCM Strategy with relatively minor funding compared to the core functions of the Water Unit. While this approach is consistent with the IWCM strategy development and implementation of other NSW councils and the IWCM process administered and regulated by the NSW Office of Water, Council staff involved in this IWCM review have expressed a desire to consider the wider catchment context and seek greater integration between the activities of the Council units that have a role in water cycle management. This aim is supported by community feedback.

In order to achieve these objectives, future planning needs to present a holistic approach to water cycle management including:

- Water supply;
- Wastewater;
- Urban stormwater;
- Catchment management; and
- Floodplain management.

In all the above aspects of the water cycle, planning for population growth and climate change are key considerations.

The current structure and functions of Council, with the Community and Natural Resources directorate including the Water Unit and the natural resource management unit allow direct co-ordination between some of these functional areas and activities. This in turn facilitates coordinated development of priorities for funding (for example, the dividends from the water supply and wastewater businesses are used to fund stream bank protection works). The water cycle management activities of the Planning and Regulation and Engineering and Operations directorates are less integrated (refer Figure 2). A successful IWCM strategy requires a coordinated approach across Council with long-term support and clear responsibilities for implementation.

Providing a more holistic catchment management approach and a shared vision for the Shire would require enhanced integration of the related council functions including:

- The Waterways Program (estuary and river health);
- Drinking water supply;
- Wastewater management;
- Stormwater management;
- Land use planning;
- Urban development;
- Agricultural services; and
- Recreation Services.

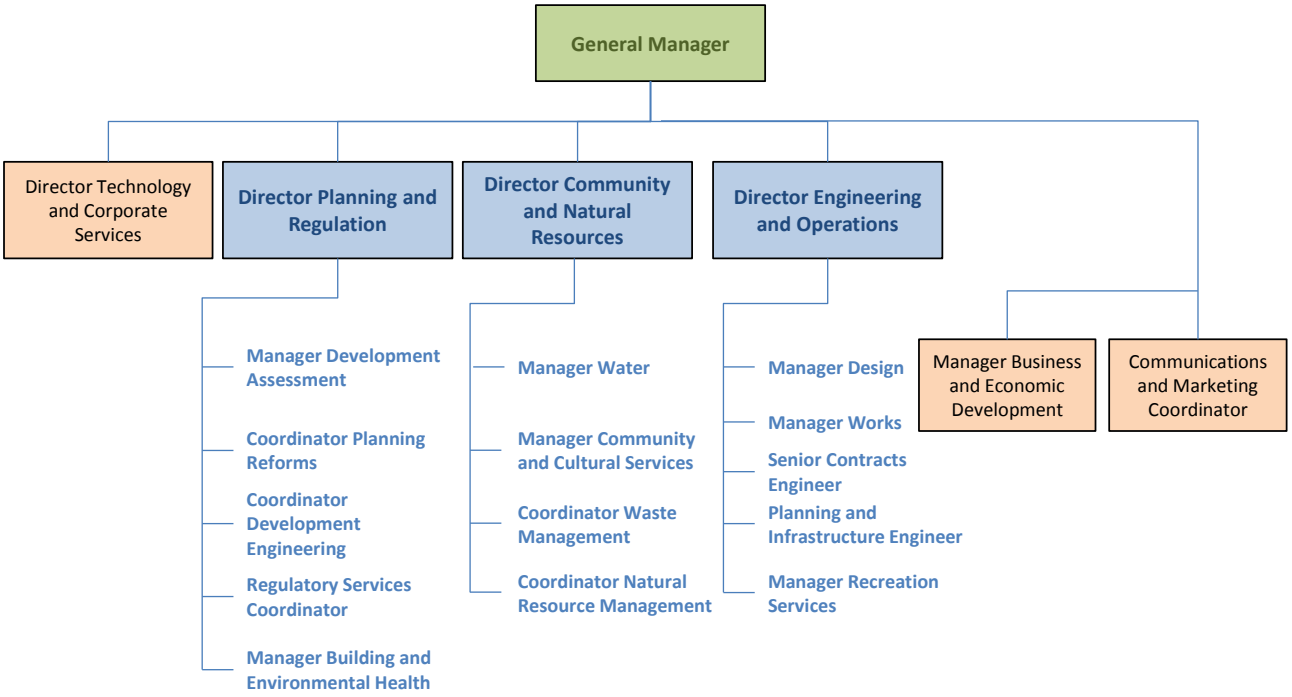

Figure 2: Council organisation structure and functions related to water cycle management

Council's Sustainability Gap Analysis (Fitzroy & Associates, 2010) identified that the new cross-department (lateral) roles of Demand Management Program Leader and Sustainability Program Leader will provide opportunities for integrating issues and policies with a wider range of community needs. However, there was also found to be a need for internal referral/communication processes to be established/embellished to deliver better sustainability outcomes for Council's infrastructure and service delivery. The cross-Council steering committee set up to facilitate the review of the IWCM Strategy aims to bridge the gaps between activities of the related directorates, however, this approach needs to be supported by appropriate knowledge, recognition and continued support from Council and senior management. There is also a need to ensure that IWCM strategies consider the implications for all Council activities (e.g. public health risks and regulatory requirements) as part of strategy development and ongoing review. Other potential areas for increased Council services integration are discussed in relation to other issues in the following sections.

During the research phase for this review, it was found that some Council staff were not fully aware of the actions in the IWCM Strategy or how their activities contribute to IWCM. While the IWCM Strategy is being used by management staff to set priorities and staff are following these IWCM initiatives, the desire for a whole-of-Council IWCM focus is not yet being achieved. For example, Water Unit operations staff who are responsible for the management and operation of the water supply and wastewater assets need to be involved in the development of the IWCM Strategy insofar as it affects their roles. Similarly, the Recreation Services department is progressively implementing actions that are relevant to IWCM such as irrigation management systems to rationalise water use but these activities have been undertaken outside the IWCM strategy with limited funding or support from the Water Unit. The demand management strategy for Council water users will address this particular issue through assistance with coordination and priorities for water conservation at Council sites such as parks and gardens, nurseries, public toilets and public pools as well as education of Council staff.

This IWCM review provides opportunities for consideration of improved governance models for IWCM as well as determination of future priorities for the IWCM Strategy that will enhance IWCM outcomes and identify cost efficiencies.

4.1.2 Leadership and Decision-Making

Issue 2: There is a need for informed and transparent decision-making and better management of community expectations

Council has undertaken extensive community engagement as part of the development and ongoing implementation of IWCM Strategy components (refer Appendix B). The community feedback received by Council in relation to IWCM activities indicates that the respondents have strong preferences for key outcomes such as the adoption of a preferred option for water supply augmentation, the use of alternative water supplies and stronger Council initiatives in relation to water cycle management for greenfield developments. The Sustainability Gap Analysis (Fitzroy & Associates, 2010) found that Council does not have the resources to meet the demand for infrastructure and services as well as address all community desires for prosperity and environment protection. This highlights the need for informed and transparent decision-making as well as effective communication with the community in order for rate payers to have faith in the decision-making process. Given the finite level of Council resources and the capital-intensive nature of urban water services, Council needs to provide leadership and justification for its decisions based on the best available information.

Council needs to balance the provision of value-for money services with innovative integrated solutions that are desired by the community. As an example, implementing Council's IWCM objectives and managing community expectations regarding IWCM initiatives such as recycling can be a challenge for Council staff. Regulations are becoming more stringent and the need for robust planning and management controls requires increased funding and resources to address risks. While the community and Council have a desire for increased wastewater recycling, the increasing regulatory requirements of providing non-potable standard effluent for reuse as well as the cost of facilities and operational controls can make these options unattractive. Wastewater recycling is discussed further in Issue 19.

Feedback from the community on a range of issues also indicates that there are strong and often competing community desires for particular approaches. The challenge for Council will be to manage this wide range of community priorities and gain community acceptance of the final adopted outcomes.

Issue 3: There is a need for defendable and robust population forecasts

Population forecasts are inherently difficult as they rely on assumptions regarding demand for land sales, the capacity of urban release areas, community preferences for settlement, the future types of housing and the planning approvals process (including land rezoning, structure planning and development approvals). The population forecasts used in the 2006 IWCM Strategy (refer Appendix A, Section A1.1.1) were based on the high growth rates experienced between 1996 and 2001 which were expected to continue due to the large amount of undeveloped urban land available. The 2006 and 2011 census data indicates that this high rate of population growth has not been realised. While there is still a large amount of undeveloped land within the Tweed Shire, environmental and economic constraints may potentially reduce the development capacity of this land. However, growth drivers such as migration from other parts of NSW and also Queensland (tree changers and sea changers) are expected to continue and while the rate of growth may have slowed, the ultimate population may be similar to that predicted in previous forecasts.

Council's population and demographic data and forecasts are developed by Forecast.ID, based on census data and expected trends in fertility and migration. Council has published information on its website relating to methodologies, current data and projections and the variation in the forecasts available from the State government and Council. While it is acknowledged that population forecasting is not an exact science and will vary with time, it is important to consider the potential future variations as part of any decision-making. Population forecasts (together with secure yield estimates available at the time) were used in the 2006 IWCM Strategy and more recently as part of the demand management study and Tweed water supply augmentation options assessment (refer Appendix A, Sections A7.2 and A7.3 respectively) to highlight the timing and capacity of the required water supply augmentation. Based on the latest 2011 census data, these

forecasts appear to over-estimate the rate of population growth and the hence the required timing of major water supply infrastructure development.

There can be other implications of developments not proceeding as fast as projected. If future infrastructure planning is based on over-estimated population growth rates, infrastructure for growth may be provided early but costs would not be recovered through developer charges due to slower actual growth (development servicing plans are due to be reviewed in 2012). This type of situation would have implications for Council's financial management and debt servicing.

Population forecasts are also important for urban water services planning on a local scale, particularly with sizing of infrastructure and the capacity of the environment to cater for growth. Water extraction for town water supply is constrained by the yield of the water source which is determined by climatic and catchment characteristics as well as regulatory considerations. Similarly, the capacity of the waterways to accept wastewater and stormwater discharges is dependent on the climatic and catchment characteristics, waterway health and regulatory requirements (refer Issue 17).

There has been inconsistent application of development forecasts across Council's departments. For example, some future urban release areas are not adequately served by existing water and wastewater systems or considered in planning for system upgrades (e.g. restrictions on the Burringbar/Mooball wastewater system). Conversely, land release strategies do not adequately consider the capability or capacity of existing water and sewer infrastructure or the capacity of the environment to receive increased WWTP discharges or loads. As a result, developers are turning to private water utilities for services which creates other implications for Council as discussed in Issue 5.

While it is appropriate to be conservative with regard to infrastructure planning, there is a need to balance the scale of infrastructure provision to ensure decision-making can adapt to updated information as it is available and optimise the timing and investment in major infrastructure. The challenge for Council is to implement an IWCM Strategy that can be adapted to key drivers of change such as population growth whilst balancing competing factors of sustainability, financial control and community expectations.

Forecast.ID is currently updating the long-term population forecasts for the Tweed although these will not be available for this IWCM review. A range of potential forecasts of population served with water supply is provided in Figure 3. This figure shows:

- The historical population served with water supply (the blue line). These connected water supply population data will be updated by Forecast.ID during 2013;
- A 30 year forecast based on the actual rate of growth (1.3% p.a.) experienced between 2006 and 2011 (the red line);
- An increased growth rate (average 2.2% p.a. of 30 years) which assumes the 2031 population currently predicted by Forecast.ID will still be realised (the green line); and
- The population forecasts assumed in the Demand Management Strategy (the purple line).

These population forecasts will be reviewed and updated during 2013.

Given the long-term nature of urban water services planning and long asset life, there is also a need to consider the longer-term (say 40-50 years) population growth, taking into account the remaining capacity for urban land releases and potential future housing characteristics. This would facilitate longer-term planning, and assist with more integrated Council planning, development policies and infrastructure service provision.

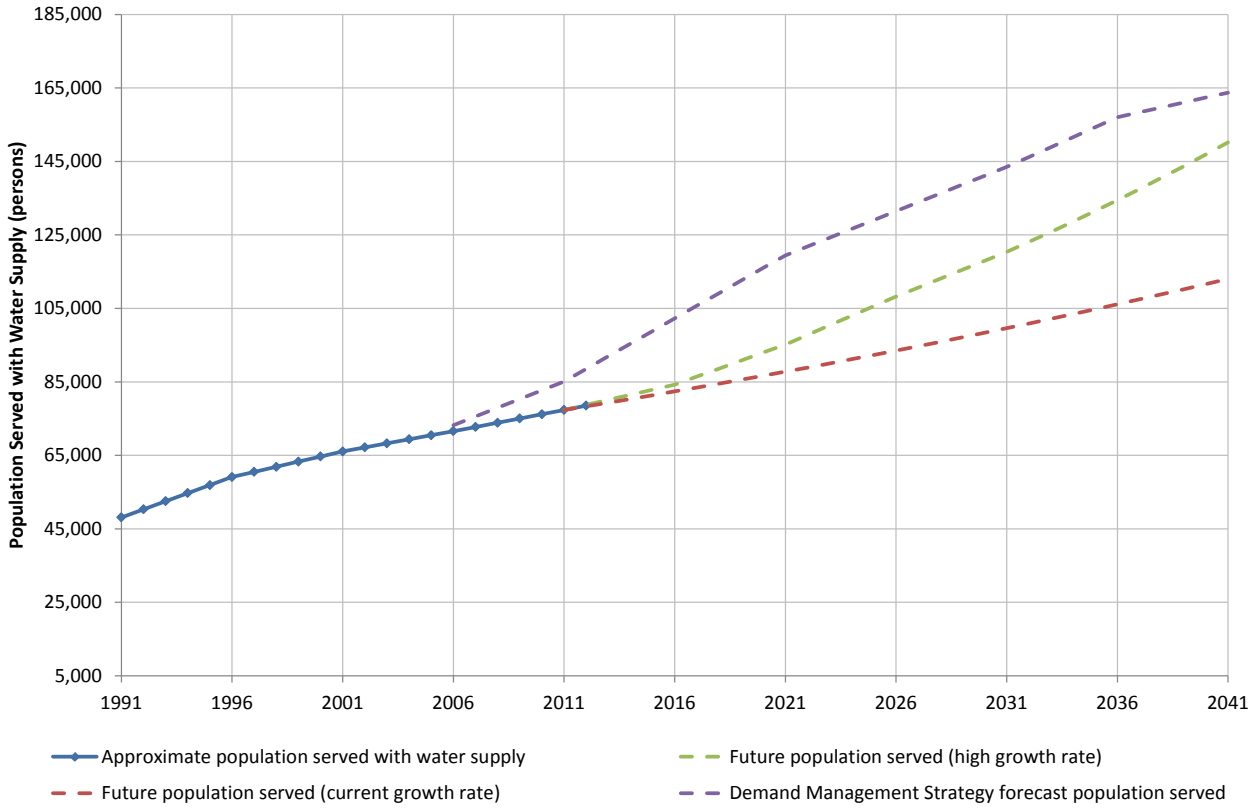

Figure 3: Comparison of population forecasts

Issue 4: Uncertainty regarding the preferred Tweed district water supply augmentation option creates confusion regarding land use planning

Council has been progressively purchasing land within the inundation areas (and buffer zones) of the proposed Byrrill Creek Dam as well as the raised Clarrie Hall Dam. Approximately 14 properties within the BCD inundation area and 20 properties within the inundation area for the raised Clarrie Hall Dam remain in private ownership. The uncertainty regarding Council's future direction is likely to cause anxiety amongst these land holders.

Council is currently preparing a revised LEP. Land use planning is required to consider the controls required to be imposed to protect land values and purposes. Particular controls are required to be included in the LEP for drinking water catchments. The lack of clear direction regarding the water supply augmentation creates uncertainty for land use planning and controls as well as for the properties affected.

4.1.3 Regulation

Issue 5: The implications of private industry involvement in town water supply and wastewater management are unclear, particularly with regard to regulation and Council responsibilities

The objectives of the *Water Industry Competition (WIC) Act, 2006* and supporting Regulations are to encourage competition in the water industry and to foster innovative recycling projects and dynamic efficiency in the provision of water and wastewater services. The core reforms introduced by the Act are the establishment of a new licensing regime for private sector providers of reticulated drinking water, recycled water and wastewater services, provisions to authorise IPART to arbitrate certain sewer mining disputes and the establishment of a third-party access regime for water and wastewater infrastructure. Prior to the introduction of the *WIC Act* (refer Appendix A, Section A3.1) approval for private water and wastewater infrastructure was granted by councils under the *Local Government Act, 1993*. Private individuals or companies wishing to produce and use recycled water in schemes larger than a single dwelling are still

required to apply to their local council under section 68 of the *Local Government Act* for approval for the installation and operation of the treatment system except where an environment protection licence under the *Protection of the Environment Operations Act 1997* (POEO Act) is in force for the scheme or if a licence under the *WIC Act* has been issued (clause 48 of the *Local Government (General) Regulation*). This has created confusion within some parts of the community and for Council regulators.

A water supply and wastewater strategy is required to be prepared and endorsed by the private land owners and Council stakeholders prior to applying for IPART approval under the *WIC Act* and rezoning or release of land for development. While Council's IWCM Strategy can provide objectives for water cycle management across the shire, it is not directly applicable to private utility schemes. However, strengthened policies such as the IWCM Strategy will assist in application of these objectives across the shire.

Council would normally develop wastewater strategies for land identified for rezoning. However Council's resources are allocated to the development of land already rezoned and there are insufficient financial resources available to develop infrastructure strategies for future rezoning. Private water utility schemes may create opportunities for servicing areas not currently or not able to be supplied by Council. They may also allow redirection of existing served areas to increase capacity in existing infrastructure and improve operation. For example, a private scheme proposed for the Tanglewood development, if successful, would enable distribution of recycled water within the development and allow Council to service other areas within the Hastings Point WWTP catchment.

Adoption of the service delivery model using a private water utility would relieve Council of the responsibilities associated with development of water supply and wastewater infrastructure in anticipation of development. The licensed network operator would be responsible for compliance with environmental regulations and other considerations and the licensed retailer would be responsible for collection of charges and paying the network operator for its facilities. However, there is concern among NSW water utilities regarding the consequences of failure of a private utility system ("last resort arrangements") and Council's role in this regard. The NSW Office of Water is currently reviewing the last resort arrangements under the *WIC Act* and TSC has provided input to this review. Improved understanding of Council's role and responsibilities for these schemes is required.

4.1.4 Asset Management

Issue 6: Asset management planning

The provision of infrastructure is one of the most important roles of a council as it strives to provide safe and functional services. Ensuring that this important infrastructure is managed in the most effective and efficient manner and continues to meet the needs of the customers, in both the short and long term, is a key issue.

Asset management is a continuous process, covering the full life cycle of the asset. It requires a practical and financially responsible means of managing assets through the creation, acquisition, maintenance, operation, rehabilitation and disposal of assets to provide for present and future needs. A formal approach to the management of infrastructure assets is essential in order to provide services in the most cost-effective manner, and to demonstrate this to customers and other stakeholders. TSC's Asset Management Strategy identifies strategies to address these issues and enable Council to produce advanced Asset Management Plans that will guide the long-term financial planning for its assets.

The current IWCM Strategy includes an action to implement the water supply and sewerage asset management plans. Whilst these plans were prepared in 2010, implementation is an ongoing process and there is a need to continuously improve asset management planning processes, particularly condition assessments, life-cycle analysis and renewal planning to enable appropriate allocation of resources and achieve the adopted levels of service.

Related asset management strategies and plans include:

- The Resourcing Strategy details Council's capacity to manage assets (Asset Management Plans), the workforce (Workforce Management Plan) and long-term funding (Long Term Financial Plan) needed to implement the Community Strategic Plan's 10-year objectives (refer Appendix A, Section A2.4);
- Sewer Overflow Abatement Strategy (refer Appendix A, Section A7.6.2): The actions in the SOAS have not all been implemented. There is a need to review the actions and update the SOAS. Council is developing overflow containment targets and preparing models of the current sewer systems. Environmental procedures for overflows to sensitive environments also need to be improved;
- Demand Management Strategy – the implementation of significant demand reduction measures for residential and non-residential customers will influence the planning for future water supply infrastructure;
- Business Continuity Plans (refer Appendix A, Section A7.6.4): The emergency response actions proposed in the BCPs for water supply and wastewater services need to be further developed to ensure they are viable. In particular, viable options for an emergency water supply and contingency plans should be developed (refer Issue 16);
- Activity Management (Strategic Business) Plans (refer Appendix A, Section A7.6): Council is currently updating the Activity Management Plans for water supply and wastewater in accordance with the latest guidelines from Office of Water which require a total asset management approach; and
- Acid sulfate soil (ASS) management: Council has prepared a generic management plan to guide development and infrastructure works in ASS areas. While this may be applied to Council infrastructure developments, improved ASS management planning including treatment of ASS backfill and condition assessment of underground assets in ASS areas is required.

While IWCM principles will continue to assist in prioritising infrastructure actions, asset management planning will be undertaken as part of the State Government water utility best-practice requirements as well as the Integrated Planning and Reporting Framework.

Issue 7: Climate change implications need to be integrated into urban water services planning

Natural variations in temperature and rainfall in NSW are influenced by the naturally variable climate systems. Although there is natural variability in the climate, there is consensus among climate scientists that the rate and magnitude of climate change is outside the expected range of this natural variability. Climate change is an important consideration for strategic planning, particularly in coastal areas where the combined effects of sea level rise and increased storminess are considered key threats.

Sea level rise is anticipated to result in water cycle management issues including increased inundation of low lying lands, infrastructure and development, increased salinity in waterways and implications for drainage and flooding in urban areas. The potential issue of increased storminess is less well understood. It is generally anticipated that rainfall events will become more intense, even if average rainfall reduces, in response to climate change. This may result in effects such as more floods as well as greater erosion of unconsolidated sediments within the catchment.

The NSW Government commissioned the CSIRO to prepare climate change reports for regional NSW, including one for the North Coast Region. A reduction in winter rainfall and a decrease in soil moisture in winter and spring are projected for the region. Sea levels will rise, changing flood patterns and affecting the coast. Minimum temperatures across all seasons are projected to be warmer, with winter maximum temperatures rising more than summer maximum temperatures (DECC, 2008). The report found that overall, there will more likely than not be a slight increase in average annual runoff and stream flow. Runoff is likely

to increase in summer and autumn and decrease in winter and spring. The consequences of the changed catchment runoff for streamflow and consumptive water users will depend on the rate of change as well as the influence of water infrastructure. If the drier end of the range were realised, there is a risk of inflow reductions of 10 to 20% during drier periods.

A study undertaken by Seqwater reported significant impacts from slight changes in rainfall on catchment wetting and drying and the effect of patterns of rainfall within a year, particularly the intensity of rainfall leading to run-off (QWC, 2010). As a conservative estimate, a 10% reduction in surface water availability is likely to occur by 2030 across south-east Queensland and this scenario was adopted for long-term water supply planning.

A study by the CSIRO (2006) for Rous Water suggests that climate change is likely to result in decreases in the security of the Rous Water bulk supply and increasing need for a new water source. This study concluded that:

- There is more than 99% probability that evaporation rates within the area will increase over the next 25 years (between 10% and 26% increase in evaporation by 2030);
- Rainfall is more likely to decrease than increase in the region (between 21% decrease and 17% increase in rainfall by 2030); and
- There is more than 50% probability that the secure yield of Rous Water's water supplies will decrease (7.4% reduction in secure yield by 2030).

More recent work by the Office of Water and Rous Water suggests that climate change will reduce the secure yield of Rous Water's water sources by 9% by 2030 and 20% by 2060.

In the absence of local data for the Tweed, it is considered appropriate that any review of secure yield as part of IWCM planning considers the impact of a 10% reduction in secure yield of surface storages due to climate change by 2030 and a 20% reduction by 2060. However, this impact is likely to occur over the long term and the true impacts of climate change cannot be fully quantified.

There will be impacts from climate change that are unavoidable such as sea level rise and changes to rainfall patterns and therefore long-term management planning needs to consider the likely changes and the factors constraining adaptation to such change. Council needs to ensure that water cycle management planning accounts for climate change adaptation requirements to ensure appropriate function of the water supply, wastewater and stormwater systems under climate change conditions.

Changes in customer demand and usage patterns should also be considered in future water service planning. Adaptation to climate change impacts and improvement in public awareness is important for effective partnership. Water security planning needs to accommodate drought impacts and maintain sufficient flexibility to adapt as climate change science improves.

Issue 8: High energy consumption and greenhouse gas emissions

Council's water supply and wastewater operations produced 429 tonnes CO_2 equivalents per 1,000 properties compared to the state-wide median of 360 tonnes CO_2 equivalents per 1,000 properties reported in the 2010/11 performance report prepared by the Office of Water.

Total energy consumption and greenhouse gas emissions are reported by Planet Footprint for Council's infrastructure and properties. Planet Footprint reports that Council's water and wastewater infrastructure consumed 12,349 MWh of energy and 13,200 tonnes CO_2 equivalents in 2011/12. All energy was supplied from non-renewable sources.

Energy consumption is mainly a consequence of geography, dispersion of areas served, location of water sources and WWTPs and the resulting pumping requirements as well as the treatment processes employed. Planet Footprint will assist Council with opportunities to reduce energy consumption and greenhouse gas

emissions such as renewable energy sources. Where reduction targets are appropriate, energy and greenhouse gas emission KPIs should also be developed.

Issue 9: Best-Practice Compliance

The *Best Practice Management of Water Supply and Sewerage Guidelines* (DWE, 2007) were prepared to encourage continuing improvement in performance and identify criteria for best practice management of water supply and wastewater. The outcome of a local water utility (LWU) complying with the *Best-Practice Management Guidelines* is appropriate, affordable and cost-effective services to meet community needs while protecting public health and the environment and making best use of regional resources. TSC aims to maintain full compliance with the *Best-Practice Management Guidelines.*

While Council currently substantially complies with the best-practice requirements (refer Appendix A, Section A4.3), the following items require attention:

- Council's trade waste policy has been developed and will be adopted following public exhibition;
- The Strategic Business Plans (2006 Activity Management Plans) are currently being updated in accordance with the 2011 Strategic Business Planning guidelines. These will need to be reviewed every 3 years;
- Water supply billing – Quarterly billing will be introduced in 2013;
- Water supply customer metering – Existing multi-residential properties are not separately metered (refer Issue 10);
- Pricing for non-potable water supplies (recycled water) is to be based on full cost recovery. Council does not currently charge for recycled water supplies. Considerations include the provision of incentives for use of recycled water, supply and water quality guarantees; and
- Development Servicing Plans – The DSPs for water supply and wastewater will be updated in 2014. A key consideration will be the growth projections and associated infrastructure requirements (refer Issue 3).

4.2 Urban Town Water Supply

Issue 10: Improved data collection and reporting procedures would facilitate adaptive forecasting of demand and assist with community education

The demand management implementation plan is focussed around a campaign of target residential per person demand as follows:

- Target 180 L/person/day by 2013 – this is based on metered residential consumption and the estimated population served with water supply. A parallel target of 300 L/p/d (treated water produced from the WTPs per person) is also included in the demand management strategy;
- Target 170 L/person/day by 2016; and
- Target 160 L/person/day by 2020.

The demand management KPIs are based on these targets. The progress of achieving these targets is reported to Council annually. Residents are also encouraged to determine if they are meeting the target using data from their water bills. The success of the residential demand program will depend on the provision of clear information on these targets as well as the performance of individual households and Council as a whole.

Council's customer data management systems are based on billing requirements and are not specifically designed for reporting of customer connections or demand. While new duplexes and triplexes are provided with separate meters, there is no policy for separate metering of existing multi-residential properties which

makes collection of data on connections and demand and application of water saving initiatives less accurate. While separate metering may not be practical, a better understanding of multi-residential connections is required to properly understand usage patterns.

In addition, Council has implemented a new customer management system with revised data and reporting requirements. Retrieval of accurate data relating to customer types and water demand has therefore been problematic. However, Water Unit personnel are currently developing improved data retrieval processes which may overcome current issues.

As discussed in Appendix A, Section A7.2.6, the historical per capita consumption has been reported to Council on the basis of observed as well as “climate corrected” consumption. The aim of climate correction is to adjust or normalise the observed consumption on the basis of the climate factors experienced in that period. Variations in climate are often suspected as being a major driver for demand variability as there are intuitive linkages between household water use and the weather. A climate correction model (refer Appendix A, Section A7.2.1) has been utilised to determine the climate corrected historical demand but it is unclear whether the climate variables modelled are a dominant influence on demand or whether other factors such as tourism, consumption behaviour, land development or water losses drive this variability. However, there are anomalies with this approach as is evident in the results for 2010 and 2011 in which the climate corrected demand in 2011, a wet year (213 L/p/d) was significantly higher than the climate corrected demand in 2010, a dry year (166 L/p/d). The corresponding observed demand was 173 L/p/d in 2011 and 183 L/p/d in 2010. In these years it appears that non-climatic factors are also influencing the demand.

SunWater (2006) aimed to estimate the climatic demand or the relationship between usage data and rainfall, evaporation and temperature using various methods but a reasonable correlation was not found. On the basis of the lack of quantifiable climatic relationships, it is considered that the climate correction methodology is not appropriate unless a clear link between climate variables and demand can be established for the recent historical demand in the Shire. It is likely that this would require analysis of demand and climate variation across the Shire, as well as other demand drivers for the different customer types. It is noted that the climate corrected approach is not applied to education campaigns which encourage residents to determine their own performance against Target 180. This approach is considered appropriate as it provides a straight forward measure without the complexity and potential errors associated with climate correction.

Another aspect with the demand KPIs is the need for accurate data on population served. As discussed for Issue 3, the estimation of population served with water supply is problematic. Clearly the setting and reporting against per capita benchmarks is dependent on accurate demand and population data.

Figure 4 shows the KPIs and targets based on the current demand and population estimates. There is clear downward trend in total demand and residential demand since the early 1990s for the whole Shire. Based on this information, the targets appear to be achievable.

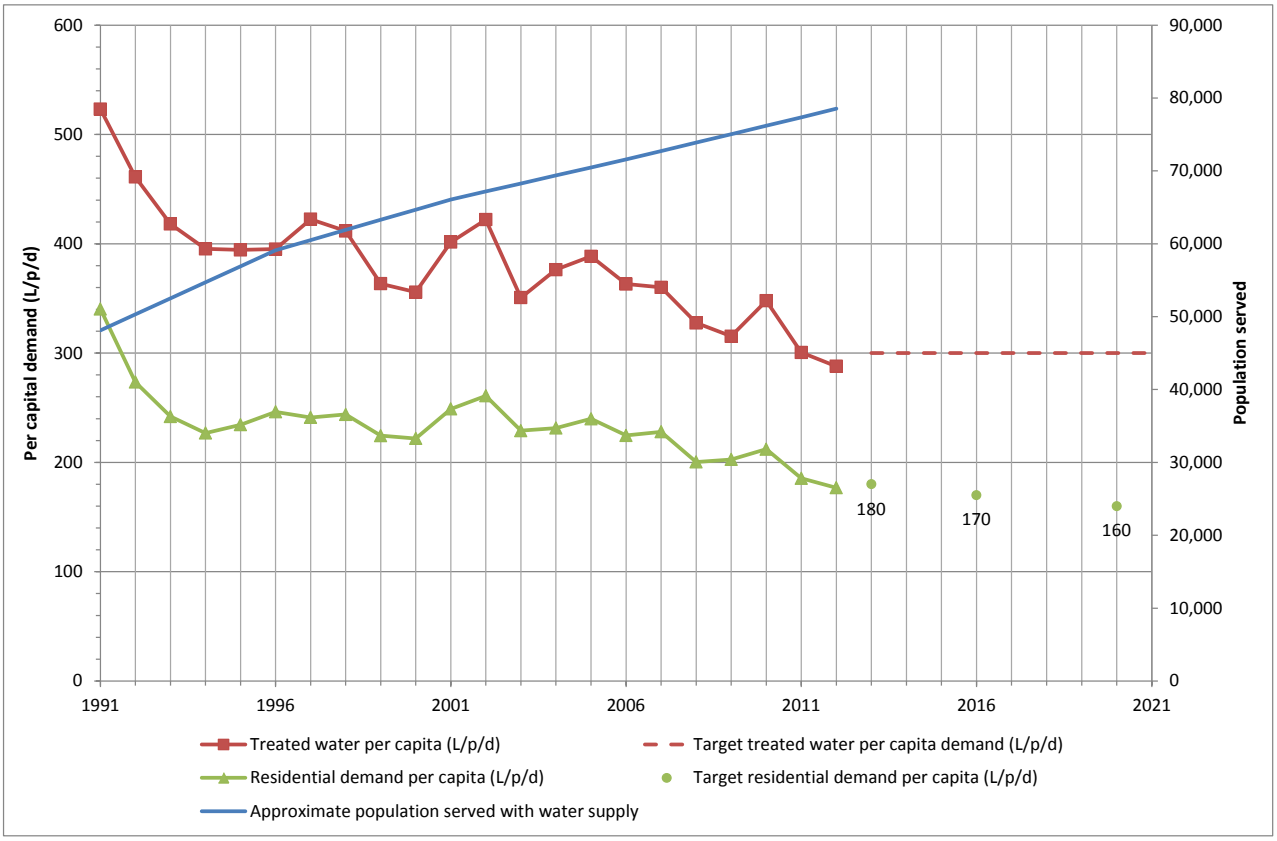

Figure 4: Water Supply Demand KPIs and Targets

Issue 11: There is currently no mechanism to promote retrofit of rain water tanks or installation of large rainwater tanks in new development

All new residential development must comply with the State Government's Building Sustainability Index (BASIX) which requires 40% reduction in potable water use per household through a combination of rainwater tanks, water efficient appliances, garden design or recycled water reuse. The Demand Management Strategy - Stage 1, recommended Council adopt requirements in excess of BASIX. While Council cannot override the BASIX requirements, Council's policy for rainwater tanks in urban areas adopted in 2011 encourages the installation of rainwater tanks to provide non-potable water for outdoor uses, flushing toilets and washing machines. Customers are encouraged to install the largest tank they can. The policy requires dual supply rainwater tanks in single residential premises to have a minimum storage capacity of 5.0 kL and a minimum roof area catchment of 160 m^2. For multi-residential dwellings, it is recommended that the rainwater tank volume is maximised with 80% to 90% of the roof area connected.

In addition to reducing the consumption of treated potable water, the policy also recognises the benefits of a rainwater tank in reducing the amount, intensity and frequency of downstream stormwater runoff. To provide this benefit, the continuous tank draw down is to be maximised by connecting toilets, washing machines and external taps. All new subdivisions are required to retain and reuse stormwater so that stormwater flows mimic pre-development flows.

The State government offered household rebates under the NSW Home Saver Scheme until 30 June 2011. Under that scheme, rebates were provided for 931 rainwater tanks, 1,065 washing machines and 309 dual flush toilets (OEH, 2012). There are currently no State or Federal government rebates applicable to rainwater tanks in the Tweed Shire.

The adopted demand management strategy for brownfield areas included Council rebates for water efficient showerheads. Rebates for rainwater tanks and washing machines were not considered to be cost-effective (refer Appendix A, Section A7.2). TSC has implemented residential home retrofit and rebate scheme for water efficient showerheads, aerators and spouts/mixers since 1 July 2011. Council's target for number of

participants in the residential rebate program is 2,400 participants (10% of all residential connections) by 2013 with a cumulative water saving of 36 ML/a. As discussed in Appendix A, Section A7.2.6, current performance falls short of this target. Council has recently introduced a rebate on new dual flush toilets to households connected to the town water supply (up to $200 rebate from 1 July 2012 to 30 June 2013).

While BASIX mandates the inclusion of rainwater tanks in new developments, there is no incentive for existing customers to install a rainwater tank or for new developments to install a larger tank. Notwithstanding, the average tank volume (for properties inspected by Council for BASIX compliance) since 2005 is 6,500 L which suggests that new developments are complying with the rainwater tank policy. Furthermore, in developing the rainwater tank policy, Council has acknowledged that the take-up of rainwater tanks in response to the Rainwater Tank Policy will need to be monitored with a view to offering a rebate if it is warranted.

A survey was conducted in May 2012 to provide input to the review of the Residential Water Saving Program including rebates. Results of the survey suggest that continuing and expanding the rebate program and introduction of innovative education and incentive programs are well supported by the community. Council plans to investigate the feasibility, cost and governance implications of a rainwater tank rebate in year three of the Residential Water Saving Program (2013/14).

Issue 12: Council's 2013 target for non-revenue water is not likely to be achieved

The National Performance Reporting Framework classifies water losses in the distribution system as either apparent losses (unauthorised consumption, retail metering errors) or real losses (leakage and overflows from mains, service reservoirs and service connections prior to customer meters).

The relevant Council KPI is the level of non-revenue water (NRW) which includes the water lost through unknown leakage, meter inaccuracies, theft, water provided for fire-fighting, known and unavoidable leakage, use of unmetered standpipes plus water lost during emergency and planned maintenance of water mains. This is equivalent to the total sourced potable water less the water sold to customers. The historical percentage of NRW is shown in Figure 5.

It appears that Council's target of 10% NRW by 2013 will not be achieved as the 5 year average is 13.7%. However it is expected that the implementation of current projects to reduce leakage (leak detection, metering and network modelling) and targeting unauthorised use of standpipes will reduce the level of NRW over time. As the "real losses" represent a wasted resource, reduce the effective capacity of a water supply system and may result in unnecessary operating costs, a long term leakage reduction program needs to be developed and included in Council budgets.

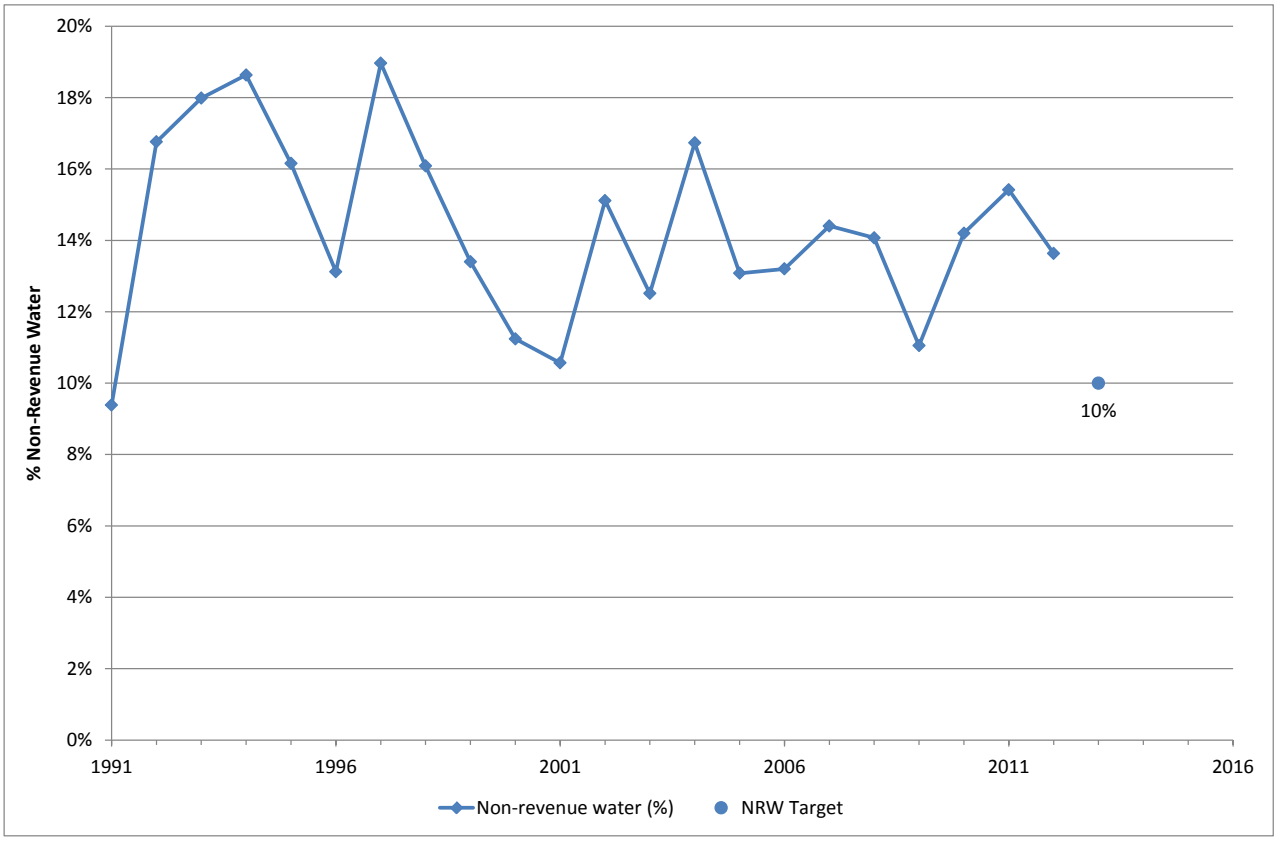

Figure 5: Historic level of Non-Revenue Water

Issue 13: Augmentation of the Tweed District Water Supply will be required in future due to population growth although the timing and additional supply required are unclear

Current Secure Yield

A key factor in the planning for future water supplies is the secure yield of the water supply sources. Current planning for the water supply augmentation is based on various specialist studies, however, the impact of future demand, environmental flows and climate change on the secure yield of the water sources needs to be re-assessed regularly based on available knowledge and data. Each assessment of secure yield will be limited by the information available at the time.

In 1980, Department of Public Works, NSW (1980) carried out the yield and flood hydrology investigations in connection with the design of Clarrie Hall Dam as part of the previous augmentation to the Tweed District Water Supply Scheme. In this analysis, a monthly water balance method was used and historical no failure yield (HNFY) was estimated as 27,500 ML/a for a storage similar to the current storage of Clarrie Hall Dam.

In 2002, SunWater (2002) carried out the preliminary system yield study for Tweed Shire Council on the Tweed District Water Supply Management Works. This was based on analysis of long-term daily flows into Clarrie Hall Dam and Bray Park Weir, together with extractions for town water supply and irrigation. Assumed environmental flow requirements were taken into account (prior to the adoption of the Water Sharing Plan). The system performance was re-assessed by SunWater (2006) for various scenarios, restriction regimes, environmental flow requirements and contingency storage. The system yield of 13,750 ML/a has been adopted by Council in the consideration of options for water supply augmentation (refer Appendix A, Section A7.3).

While various future scenarios were considered by SunWater (2006), these do not represent the requirements of the WSP, Council's current Water Access Licence, Council's draft Drought Water Restrictions or the latest demand projections as follows:

- Environmental flow releases assumed by SunWater (2006) were based on requirements at the time (based on inflows to Clarrie Hall Dam and volumes in weir storage) whereas the environmental flow criteria for the Tweed River System have been modified since this study was undertaken and are now related to flows in the Tweed River (under the Water Sharing Plan and Council's Water Access Licence, refer Appendix A, Section A3.3.1). Environmental flow releases through the fish ladder at Bray Park weir are now related to the capacity of Clarrie Hall Dam and the imposition of town water restrictions;
- Future demand (long term, >30 years) for the Bray Park system was assumed to be 24,500 ML/a (175,000 population). More recent estimates suggest this population growth and demand is over-estimated (refer discussion for Issue 3 and Issue 10);
- The 5/10/20 rule (restrictions no more than 5% of the time with a frequency of no more than 1 in 10 years and on average a 20% reduction in consumption is assumed) was assumed by SunWater (2006). Demand hardening, where restrictions have lessening effect as water use per person is reduced due to the conservation education of consumers, may affect water use behaviour during drought restrictions. More recent work by the Office of Water has found that a 5/10/10 rule may be more appropriate, where only a 10% reduction in consumption can be assumed due to the success of demand management measures and reductions already achieved; and
- Five levels of water restrictions based on the storage level in Clarrie Hall Dam were assumed and these restrictions do not match the current draft Drought Restrictions Policy.

These assumptions may impact on the secure yield.

The effect of the environmental flow requirements in the draft water sharing plan were assessed by NSW Public Works in 2010 using its in-house system behaviour yield model. This study found that the WSP environmental flow requirements are not as constraining as the conditions modelled by SunWater in 2006. However, there were limitations with the model and Council's approach has been to continue to adopt the secure yield of 13,750 ML/a for planning purposes as it allows for some buffer to account for modelling assumptions and future climate change and demand hardening.

Future Secure Yield

Climate change in the Tweed region is expected to impact rainfall, temperature, evaporation and stream flows. The potential impacts of climate change on the secure yield of the water supplies should be considered as part of any water supply planning (refer Issue 7).

Water supply augmentation may trigger a review of the town water access licence, environmental flow provisions and fish passage requirements. The Office of Water has advised that town water supplies are not subject to access rules (cease to pump) under the Water Sharing Plan unless an augmentation occurs. Alterations to infrastructure that involve acquiring additional entitlement could require a new works approval and/or access licence which would be subject to environmental assessment and a review of the environmental water conditions. Statutory approval for any raising of Clarrie Hall Dam or construction of a new dam on Byrill Creek is also likely to be conditional on the provision of contemporary and effective fish passage facilities (at Bray Park weir or Byrill Creek Dam respectively). Consultation with DPI-Fisheries is required to obtain further advice in this regard. Council's water access licence for Clarrie Hall Dam and Bray Park weir (refer Appendix A, Section A3.3.1) includes a requirement to "undertake a fishway assessment study to enable the adoption and implementation of a fishway management plan to the satisfaction of the department of Industry and Investment Fisheries Management Division and the Office of Water" by July 2011. While DPI-Fisheries and the Office of Water have not yet enforced this requirement, it is considered that the future requirements for fish passage at Bray Park weir may impact on the flow releases from the weir and hence the secure yield of the system (refer also Issue 7).

Demand Forecast and Yield Deficit

Previous demand management and water supply augmentation studies undertaken on behalf of Council have suggested that the secure yield of the Tweed District water supply (currently assumed to be 13,750 ML/a) will be reached between 2023 and 2031 depending on the success of the adopted demand management program. Since those studies were undertaken, updated data on population growth, secure yield and customer demand are available which suggest that the existing source will be sufficient for a longer time period. The current data sets suggest:

- The current secure yield of the Tweed/Bray Park system is at least 13,750 ML/a. Although climate change is expected to reduce the secure yield as discussed in Issue 7, this interim secure yield is considered to allow some buffer for future considerations. It is acknowledged that the secure yield estimates need to be refined once more data are available on climate change impacts, future environmental flows and future demand;
- Population growth has not occurred as fast as originally predicted (refer Issue 3). The Shire long-term population forecasts are currently being updated by Forecast.ID but the current data indicate that the 2031 connected population will be between 100,000 and 120,000; and
- The trends in customer demand suggest Council's demand management programs, combined with legislative requirements (BASIX) and rebates are having a positive influence on customer demand (refer Issue 10).

Based on the above assumptions, a range of demand forecasts compared to the secure yield of Council's supplies is shown on Figure 6. In terms of long-term future demand, the biggest uncertainty is expected to be the rate of population growth. The forecasts on Figure 6 use the same assumptions as the population growth discussion in Issue 3, namely:

- A 30 year forecast based on the rate of growth experienced between 2006 and 2011 (1.3% p.a.); and
- An increased growth rate (average 2.2% p.a. of 30 years) assuming the 2031 population predicted by Forecast.ID will still be realised.

The demand forecasts on Figure 6 represent:

- The current growth rate with the target per capital demand of 300 L/p/d (the red line);
- The higher growth rate with the target per capital demand of 300 L/p/d (the green line); and
- The current growth rate with the average per capita demand over the last 5 years of 316 L/p/d (the blue line).

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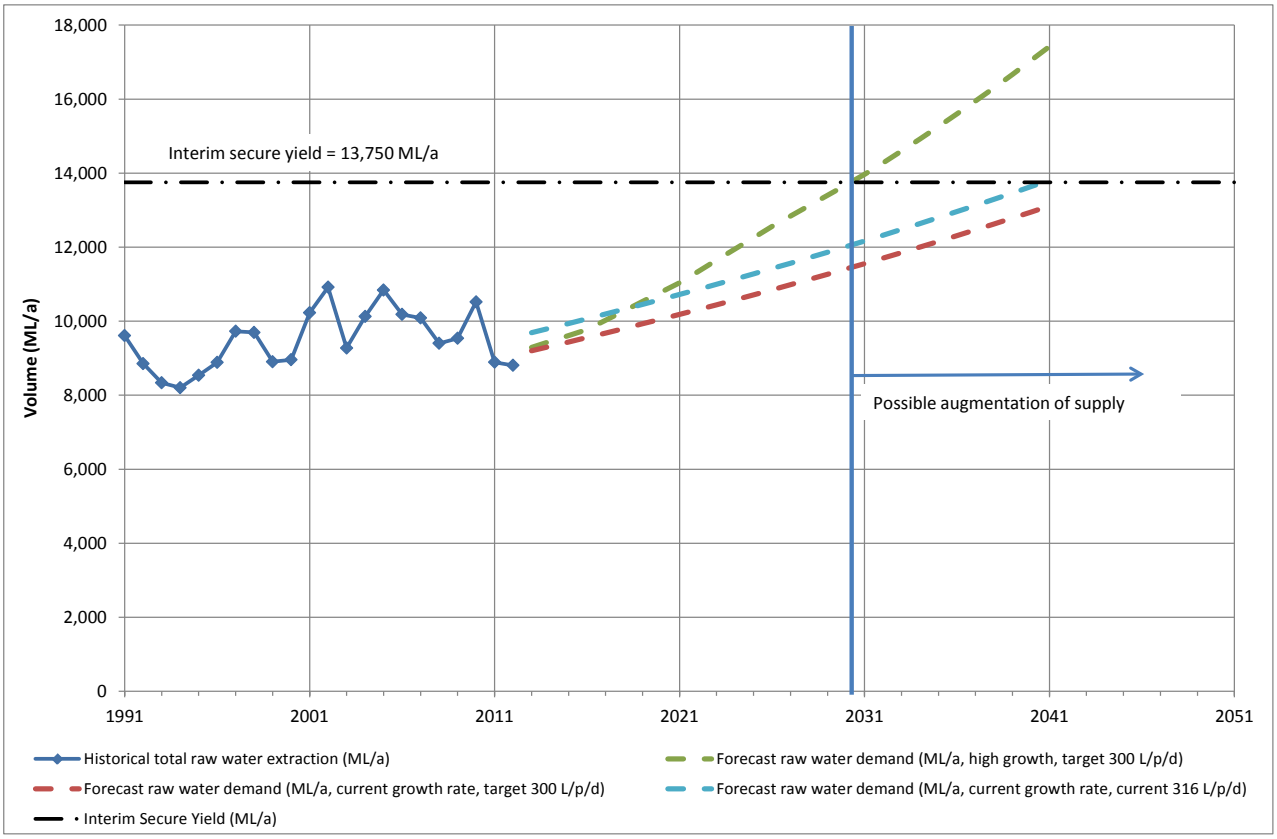

Figure 6: Demand Forecasts

Figure 6 suggests that augmentation of the water supply will not be required until at least 2030 and more likely beyond that time frame based on current growth trends. While there are uncertainties in all of the above assumptions, it is important to continually review the available data to optimise the timing and scale of the significant investment that will be required. Any augmentation, particularly a new dam, is likely to have a long lead time and this will need to be considered as part of the decision-making process.

Issue 14: The drinking water catchments are impacted by current and historical land use and development

As part of the Australian Drinking Water Guidelines (ADWG) Framework for Management of Drinking Water Quality all aspects of water supply need to be managed, which include the drinking water source catchments, To date, health requirements have meant that Council has successfully focussed on the provision of safe drinking water through the upgrade of the WTPs, algal and cyanobacterial control through improved mixing and destratification of Clarrie Hall Dam and increased water quality monitoring. Notwithstanding the provision of safe drinking water, the catchments for Clarrie Hall Dam, Bray Park Weir and Tyalgum Weir are impacted by historical and current land use practices and there are opportunities for improved catchment management activities to control pollution within the catchment.

Of overall importance from a water quality perspective are the high average runoff rates from the Tweed catchment. These rates are due to steep ranges in the upper catchment and short stream lengths in the lower catchment (HWA, 2006). In combination, the topographical features of the catchment can give rise to peak flows which can carry high levels of runoff contaminants such as pathogens and particles quickly into waterways. The Bray Park WTP was upgraded in 2010 to increase plant capacity and to improve the existing water treatment process to provide an increase in treatment barrier reliability in times of raw water quality challenges.

Water extracted from Tyalgum Creek (Oxley River) services the township of Tyalgum. While water abstracted from the weir pool is generally of good quality, during storm events, deteriorating water quality results in high turbidity levels. The weir pool can experience growth of cyanobacteria during dry winter/spring

periods. Cyanobacterial blooms can restrict pumping for up to 3 weeks depending on rainfall. Other potential water quality risks with this water source include protozoa and bacteria generated by cattle grazing adjacent to the waterway and potential human pathogens from any failing and hydraulically connected onsite sewage management systems. The new membrane filtration plant at Tyalgum will provide additional treatment reliability.

A drinking water quality risk assessment undertaken in 2010 (Appendix A, Section A7.5.1) identified risks to drinking water quality and recommended various catchment management actions. A review of raw water quality data collected between 1997 and 2011 (HWA, 2011) was undertaken to examine raw water within the Clarrie Hall Dam/Bray Park system. Three significant water quality issues are encountered in the Tweed catchment area. These typically occur in the still or slow flowing parts of Clarrie Hall Dam and river systems (HWA, 2011):

- Occasional cyanobacteria (blue-green algae) blooms, which can discolour water, form surface scums, produce unpleasant tastes and odours, and create problems for aquatic life. Cyanobacteria are a primary health concern in dams and waterways as they have the potential to produce toxins. Cyanobacteria typically occur in stratified water bodies as they are able to take advantage of the changed buoyancy conditions;
- *Salvinia (Salvinia molesta*), a noxious aquatic weed that disrupts aquatic ecosystems and decreases water quality by causing odours, accumulation of organic matter and stagnation of streams. This weed can occur in the still or slow flowing parts of Clarrie Hall Dam and river systems; and
- High manganese levels, which if unsuccessfully removed in the drinking water treatment process, will result in undesirable taste and stains to plumbing fixtures and laundry. At low concentrations manganese can also form coatings on water pipes that may later slough off as a black precipitate.

Although there have been algal events in the weirs and in Clarrie Hall Dam there has not been a toxic event. During the summer of 2001/02, algal blooms of the genus *Anabaena* occurred in the Tweed River resulting in the cyanobacterial metabolite, geosmin, being released into the river water. The existence of geosmin in the raw water may result in taste and odour issues in the treated water supply. This event coincided with a period of high demand resulting in the use of the existing Powdered Activated Carbon (PAC) dosing facility at the Bray Park WTP for a period of approximately 3 weeks during November 2001 and for another 8 weeks during December-January 2001/02. As part of the drought response additional releases were also made from the Clarrie Hall Dam to flush algae from the Tweed River and Bray Park Weir.

Council's River Health Grants scheme provides for improved riparian vegetation management and erosion control and Council's OSSM Program aims to reduce risks from on-site sewage management systems (refer Issue 26). However, there are opportunities for improved catchment management activities to control pollution at the source including integration of the Agriculture Strategy, urban stormwater quality improvements, on-site sewage management, riparian management, point source pollution controls, education and catchment development controls. This is discussed further in Issue 24.

Issue 15: As a precaution the Uki WTP is shut down during dirty water events

Water for Uki is abstracted directly from the Tweed river downstream of Clarrie Hall dam. Uki WTP includes conventional treatment of coagulation with aluminium sulphate, clarification, Dynasand filtration and disinfection (sodium hypochlorite). A Risk Workshop (Water Futures, 2010) identified some issues of concern for the Uki water supply such as high levels of manganese and iron, dirty water and taste and odour complaints. On occasions toxic cyanobacteria are detected above trigger values, and to avoid health risks the plant is shut down and treated water is carted from the Bray Park system.

To avoid this situation, consideration of the adequacy of treatment facilities at Uki was raised in the 2011 review of the IWCM Strategy. However, the appropriate management actions (operational controls, WTP modifications or upgrade) have not yet been determined.

Issue 16: Drought contingency and water supply emergency management measures need to be further developed

TSC's Drought Management Strategy was prepared in 2009 and restriction levels and demand targets were subsequently adopted by Council and reviewed in 2012. The current restriction policy is based on demand forecasts from the demand management strategy and the 5/10/20 rule where on average, restrictions are implemented no more than 5% of the time, restrictions are imposed no more than once every 10 years and a 20% demand reduction is achieved during drought restrictions. As discussed in Issue 7 and Issue 13, the applicability of these assumptions needs to be reviewed.

Contingency planning for the Bray Park system is based on supplying an emergency demand of 120 L/p/day for the residential sector and 75% of normal non-residential demand, or a total of 18 ML/d, based on the previously predicted 2018 population. Contingency options were investigated in the Drought Management Strategy to identify practical alternatives to the existing water supply as follows:

- Water carting;
- Pipeline link to Rous Water supply;
- Pipeline link to the South East Queensland Water Grid;
- Groundwater; and
- Desalination of seawater.

Water cartage was proposed as a contingency supply for the village of Uki but not considered feasible for the Tweed system. The options of pipeline links to Rous Water and SEQ water grid and groundwater supplies were discussed in the Drought Management Strategy and more recently considered as part of the water supply augmentation study (refer Appendix A, Section A7.3). The preferred contingency option for Tyalgum system was water carting, although the Strategy noted that the cost of carting had increased significantly.

Algal events are more likely under drought conditions and can reduce the availability of suitable quality raw water. Potential contingency measures discussed in the Drought Management Strategy for algae events include flushing from Bray Park weir and PAC treatment at Bray Park WTP, water carting to Tyalgum from the Tweed system, catchment management activities to improve raw water quality, additional mixing in Clarrie Hall Dam to reduce algal growth and development of a Blue Green Algae Response Plan. Drinking water catchment management is discussed further in Issue 14.

The Drought Management Strategy recommended:

- Update of the drought restriction policy in accordance with the proposed restriction levels – these were adopted in November 2009 and have been reviewed in 2012;
- Setting the cessation level for flow bypass requirements at Bray Park Weir at a level of 50% of the capacity of the Clarrie Hall Dam. However since the strategy was adopted, the water sharing plan requires environmental flows of 3ML/d when the volume of water in Clarrie Hall Dam water storage is at or less than 50% of full capacity;
- Continue to pursue a pipeline link to the SEQ Water Grid with a capacity of up to 20 ML/day as the preferred contingency plan for the Bray Park water supply system with further investigation as part of the Water Supply Augmentation Study. This study (MWH, 2009b; 2009c) concluded that an emergency supply will only be required in the event that the preferred option for augmentation of supply is not completed in the medium-term and may be provided through either the pipeline to Rous Water or the groundwater supply. A pipeline to the SEQ Water Grid was found to have high risks associated with cross-border issues, the high bulk purchase price of water and the lack of assurance as to whether supply from the SEQ Water Grid would be maintained;
- Develop a Blue Green Algae Management Plan;

- Develop a catchment management plan and land management guidelines for the Upper Tweed catchment (upstream of Bray Park Weir) – refer Issue 14 and Issue 24;
- Install an additional mixer in the Clarrie Hall Dam to enhance the capacity, flexibility of the existing system and to provide system redundancy – Council is currently reviewing the performance of the destratification system;
- Develop a register of critical customers for use in the drought communications plan – not yet developed; and
- Upgrade monitoring capability for the Tweed River and Doon Doon Creek in preparation for the water sharing plan – monitoring data is being reviewed by NSW Office of Water.

The Business Continuity Plan (BCP) for Management of Water Supply in the Event of 'Impending Water Source Failure and Inadequacy of Planned Emergency Supply Arrangements' (refer Appendix A, Section A7.6.4) addresses the scenario where the level of Clarrie Hall Dam drops to 25% and river flow has previously ceased and only about 6 months of restricted supply remains. This BCP has been compiled to enable a response to source failure due to prolonged drought, and where implementation of level 7 restrictions and planned emergency supply arrangements is inadequate.

The BCPs require that the Operations Engineer - Water, identifies and arranges for appropriate / alternate water supply option(s) if required including:

- Portable and easily mobilised package water treatment plant (e.g. to treat brackish water);
- Tankers to transport from alternate treated supply;
- Treated supply from Queensland system;
- Customer rainwater tanks and boil water for potable use;
- Bottled water; and
- Non-potable supply from existing treatment plant.

The drought BCP also includes options of a pipeline from dam to the treatment plant to avoid river transmission losses and covers or spray emulsions on the surface of the dam to reduce evaporation.

There are no documented procedures to enable implementation of any of these options. The Drought Management Strategy also discussed the long lead times required to implement some contingency options. Given the large population in the Tweed system, immediate supply of bottled water and water cartage for extended periods are not considered to be viable options. The health implications of non-potable supply to customers are potentially significant.

Given the predicted increased time until augmentation of the Tweed District water source is required (refer Issue 13) it is considered appropriate to reassess the water supply failure scenarios including:

- Normal, restricted and emergency demand requirements;
- The impacts of water sharing plan rules and potential fish passage requirements (refer Issue 13); and
- Proposed catchment management measures (Issue 14) and effectiveness of the upgraded Bray Park WTP.

Feasible contingency measures to cater for emergency scenarios (such as prolonged drought, infrastructure failure and raw water contamination) will also need to be developed.

4.3 Urban Wastewater Management

Issue 17: The opportunities for development (urban expansion) outside of the wastewater service areas is limited by the capacity of Council's infrastructure and the environment

Estuary management planning in the Tweed has identified issues relating to the impacts of wastewater discharges and nutrient on the waterways. While major treatment plants are being upgraded to increase capacity and improve effluent quality, the impact of the ultimate pollutant loadings (as a result of servicing new developments) on the receiving environments still needs to be considered.

Options for effluent disposal are likely to come under increased scrutiny, to consider options to relocate the effluent outfalls and/or provide a higher level of treatment, to part of or all dry weather flows and to maximise recycled water (effluent reuse) opportunities from the augmented plants (refer also Issue 19). The sustainable servicing of new development areas will require consideration of the sensitivity of the receiving waterways, the increasing regulations, treatment requirements and costs as well as the development of policies to translate the IWCM objectives into development controls.

Issue 18: Licence requirements for pH and suspended solids at Uki WWTP need to be reviewed

The Uki WWTP consists of a continuous activated sludge process. One hundred percent of the effluent is treated and stored in an irrigation dam prior to chlorination and beneficial reuse for irrigation of koala feed trees. Effluent quality is measured between the effluent storage pond and effluent reuse area in accordance with the environment protection licence. High pH levels occur as a result of algal growth in the dam which causes high suspended solids. An aerator in the dam was installed to control algal growth but is not fully effective. Council has also trialled surface aeration and biological additives to control algal blooms as well as operation of the effluent lagoon at very low levels to increase turnover rates but these have not been effective in the control of algae.

While licence limits for pH and suspended solids are not always achieved, all effluent is used for irrigation and the high levels of suspended solids and pH in the irrigation dam are not a concern from an environmental protection point of view. However the environment protection licence requirements are mandatory targets and liaison with the NSW EPA is required to establish more appropriate licence requirements for this situation.

Issue 19: Council and the community have a desire for increased water recycling but there are significant barriers to implementation of recycled water schemes within the Tweed Shire

The drivers for increased water recycling are:

- Potable demand reduction;
- Reduction in discharges to sensitive receiving environments. Reuse schemes will become more attractive where discharges to receiving waterways are a concern; and
- Community desires balanced with acceptance and willingness to pay.

Council has implemented or is developing a number of recycled water schemes for agricultural uses, sugar mill cooling water and irrigation of playing fields and golf courses. Currently, between 5% and 9% of wastewater (400 – 800 ML/a) is recycled (refer Appendix A, Section A7.2.5). Council has a recycled water target of 15% of treated effluent reused by 2013 which is not likely to be achieved with the current progress of the planning for recycled water schemes. The development of the schemes has been hampered by the increasing regulations, treatment requirements and costs and community perceptions of the use of recycled water.

Some members of the community consider that the decision not to adopt dual reticulation as an alternative source is a missed opportunity given the large areas of future greenfield development. The decision not to

pursue dual reticulation was based on the high capital and operation costs of a recycled water scheme which were considered to outweigh the advantages of reduced potable water consumption and discharge of nutrients to waterways. For example, MWH (2009a) found that a decentralised sewage treatment scheme for Cobaki Lakes would result in lower capital and operating costs than treatment at Banora Point WWTP, but the overall cost of recycled water (to Council and the community) was found to be higher than provision of potable water. MWH (2009a) considered that the preferred scenarios of BASIX implementation and 5,000 L rainwater tanks would have broader community acceptance than scenarios including recycled water use and noted that local and regional water management drivers for implementation of recycled water use were not as apparent in the Tweed Shire as in south-east Queensland. Based on the experience of other local councils in the region, it is considered that these conclusions are still valid.

As with stormwater reuse (and rainwater tanks), recycled water schemes must be adequately regulated to ensure protection of public and environmental health. This includes the planning and design of reuse schemes, provision of appropriate treatment facilities, ongoing monitoring and reporting on performance. The increasing regulation has the effect of reduced risks to the public and the environment but at high cost to Council and the consumer, which is often prohibitive and affects the viability of the scheme. Despite the high costs of these schemes, the advantages include reduced discharge of pollutants to waterways and reduced potable water demand.

As part of the demand management strategy, Council aims to consider proposals by developers to utilise recycled water in Greenfield developments. For those developments that are proceeding without the requirement for dual reticulation, there is limited opportunity for Council to review its previous decision regarding dual reticulation. Greenfield sites earmarked for urban land release in the medium to longer term (based on development assumptions provided by Forecast ID for land identified as suitable for urban land release as part of the Tweed Shire Urban Land Release Strategy (GHD, 2009)) include:

- East Kielvale (Area 1) – 1,500 dwellings with 440 dwellings allocated between 2024 and 2031;
- West Murwillumbah (Area 2) - 500 dwellings with 455 dwellings allocated between 2018 and 2031;
- West Murwillumbah (Area 3) - 100 dwellings allocated between 2019 and 2025;
- West Kings Forest (Area 4) – 1,000 dwellings with 160 dwellings allocated between 2027 and 2031;
- North Sea Breeze (Area 5) – 140 dwellings allocated between 2021 and 2028;
- West Sea Breeze (Area 6) – 30 dwellings allocated between 2027 and 2031;
- Dunloe Park (Area 7) – 1,000 dwellings allocated between 2018 and 2031;
- Burringbar (Area 8) – 50 dwellings allocated between 2026 and 2031 and Mooball (Area 9) – 230 dwellings with 190 dwellings allocated between 2019 and 2031 which are part of a proposed private water utility scheme.

A private water utility scheme currently being proposed for future urban development in West Pottsville includes dual reticulation (for toilet flushing, clothes washing and outdoor uses) replacing an estimated 53% of total water demand as well as recycled water for irrigation supply and fire-fighting. Council is participating in the development of this strategy (refer Issue 5) as part of the rezoning process.

Despite the concerns with the viability of recycled water schemes, it is considered appropriate that water recycling options are considered as part of the future developments on a case-by-case basis. While there are opportunities for Council to encourage water recycling initiatives for the future developments through stronger policy initiatives and IWCM objectives, the decision to adopt wastewater recycling as a demand management or source augmentation option needs to be made with a clear understanding of the costs and benefits compared to other options.

Greywater reuse is becoming more common but requires the householder to comply with stringent guidelines and the potential health, odour and runoff impacts. Improved upfront management involving community education and Council support is required for this to be successful.

With the current Council direction and policy relating to recycled water use, the initiative to implement recycling is left to the developer which provides little incentive for recycling. Approved designs are based on traditional engineering solutions rather than integrated concepts and opportunities for wastewater recycling and demand management are not being realised. Nonetheless, future planning and assessment of recycled water schemes must weigh up the high cost to the community.

Issue 20: There is a high cost of sustainable biosolids management

The majority of WWTP biosolids are currently reused on farmland in the Darling Downs with the remainder transported to cane farms in the Tweed Valley. This results in high cartage costs. Council is developing a biosolids management plan which may revise this strategy but there will be challenges in finding sustainable low cost and low energy approaches to reuse. Additional considerations include odour impacts, potential changes to auditing and regulation requirements and land availability for storage and treatment.

There are potential synergies between biosolids reuse and Council's Agriculture Strategy. Increased integration between these strategic planning processes may provide additional benefits for farm management as well as wastewater management (refer also Issue 25).

4.4 Urban Stormwater Management

Issue 21: Increased emphasis on water sensitive urban design will require more integrated Council responsibilities, increased community education and increased staff capabilities and funding

The Draft Urban Stormwater Quality Management Plan (Australian Wetlands, 2011) has a strong emphasis on achieving water quality objectives for downstream waterways. The Plan refers to guidelines, resources and tools that should be used to implement best practice stormwater management, many of which have been developed by the Water By Design program for the South East Queensland Healthy Waterways Partnership. The Plan emphasises the development of Stormwater Quality Improvement Devices (SQIDs) from design and approval to construction and maintenance stages. It also includes a new approach of compensatory activities to offset residual and cumulative impacts of stormwater discharge into waterways.

The aim of the revised USQMP was to provide a streamlined and focused plan based on Council's objectives for waterway health but not complicated by prescriptions that risk becoming out-dated as the practice of stormwater management evolves. In order to keep Council's stormwater management current, Tweed Shire Council's Development Design Specification D7 – Stormwater Quality, as the relevant policy document, needs to refer to the latest versions of current best practice WSUD guidelines and to the Tweed USQMP for catchment-specific (local) objectives. The stormwater objectives provided in Tweed Shire Council's Development Design Specification D7 – Stormwater Quality apply to all new development in the Tweed region unless there is a catchment specific stormwater objective provided in the Tweed USQMP, a catchment management plan or a Coastal Zone Management Plan (CZMP, refer Appendix A, Section A7.8.3). Council is currently reviewing and updating D7.

The review of the Urban Stormwater Quality Management Plan in 2011 identified a large resource deficiency with regard to the management of existing stormwater treatment assets, limited maintenance and limited data on condition and performance. Existing stormwater quality treatment devices need to be audited and information provided to the asset management planning process to ensure adequate maintenance and rectification.

Design of Council roads and stormwater systems does not usually incorporate WSUD due to space restrictions. Swales are being replaced with kerb and gutter systems to reduce maintenance and end-of pipe

solutions are included. To comply with Council's WSUD objectives, improved guidelines on WSUD are required to address maintenance, access and space limitations.

Community education and capacity building is essential to the success of the WSUD framework. This applies to:

- Residents and businesses with regard to stormwater function and pollution control;
- Council staff in relation to the introduction of new procedures for land use planning, development controls and asset maintenance; and
- Developers and builders regarding the new development requirements and erosion and sedimentation controls.

Responsibilities for maintenance of vegetated stormwater systems/natural drainage channels are unclear and technical capability for ongoing operation and maintenance of WSUD systems may be insufficient. Council staff that maintain the stormwater systems have functional/engineering capability but limited knowledge of natural systems/vegetation. Conversely, Council's Parks and Gardens staff who maintain the vegetated areas have limited stormwater engineering capability. Council staff are proposing to form a working group covering activities over the whole asset life cycle (planning, development controls, design, operation, maintenance and renewal) to develop systems and guidelines and ensure resources are adequate.

Issue 22: Existing Council development controls do not fully address the residual load of urban stormwater on downstream sensitive waterways

Council's estuary management planning has identified high levels of nutrients in the Shire's waterways and the occurrence of algal blooms (refer Appendix A, Section A7.8.3). Additional nutrient loads will exacerbate this situation. Existing Council development controls (e.g. D7) can be satisfied through design of stormwater pollutant reduction systems yet residual load may be detrimental to downstream sensitive waterways. For some developments, the desired level of protection may not be achievable, even when a range of appropriate measures have been incorporated.

In these cases, compensatory activities may be considered to offset residual and cumulative impacts of stormwater discharge into waterways. Where it is determined that the residual discharge from a development will have a detrimental impact on stormwater objectives, Council may consider a voluntary planning agreement (VPA) via which stormwater impacts on the waterway are offset by rehabilitation, retrofit or compensation measures at another location. The basis of this concept is that the overall ecological health and resilience of the waterway can be improved as a result of the development, despite the potential worsening of local conditions. A VPA can also be a mechanism via which resources are strategically redirected to contribute to catchment wide water quality initiatives, achieving ecological and economic benefits of scale, rather than smaller, localised stormwater devices.

D7 does not currently allow for consideration of sensitive receiving environments. There is a need for regular and accurate identification and mapping of these sensitive areas as well as development of guidelines for their protection. Development controls should be developed with consideration of the appropriate controls for these receiving environments. Asset management planning and particularly maintenance activities also need to be cognisant of the impact of the activities in these areas as well as the need for protection.

Council is negotiating with developers to include offsets to improve outcomes within the Shire's waterways. While offsets have been flagged in the USWMP (to be adopted) there are no guidelines or policy mechanisms in place to enforce offsets or address the residual impacts.

Issue 23: Existing subdivision erosion and stormwater controls and resources are not adequate for the rainfall and rate of development experienced in the Tweed

Planning for soil and water management on construction works is controlled through D7, Annexure A. Works to capture sediment laden water are required to be designed to accommodate a design storm of the ARI 3 month storm (deemed to be 40% of the ARI one year event) and overflow/bypass arrangements are to be designed to accommodate an ARI 100 year storm without erosion, scouring or structural damage to erosion or sediment control devices or re-mobilisation of previously captured sediment. Council's development construction specification (C211) - Control of Erosion and Sedimentation covers the construction of structures and the implementation of measures to control erosion and sedimentation in accordance with the approved Erosion and Sediment Control Plan or Soil and Water Management Plan included in the design plans.

Resources for enforcement of these requirements are limited and Council relies on complaints or inspections to highlight inadequacies in control systems. Council staff have found that existing penalties do not always deter inappropriate development practices. Council is aiming to limit exposed areas through consent conditions. Similarly, for house developments, education is limited and there are not enough building inspectors to enforce requirements.

4.5 Catchment Management

Issue 24: There is a need for a holistic catchment management strategy for the Shire

The community feedback received by Council in relation to IWCM activities (refer Section B1) indicates that the respondents have a strong preference for whole-of-catchment considerations such as water quality and environmental flow issues in the Tweed River. As discussed in Section 1.2, Council has also indicated a desire to broaden the traditional IWCM scope to a whole-of-Council and total catchment approach to water cycle management.

There are a number of management plans and policies dealing with various aspects of the water cycle and catchment management in the Tweed Shire. Some plans and policies have limited areas of application and others have Shire-wide application. Relevant plans and policies include (refer Figure 7 and Appendix A1, Section A7.8):

- Estuary Management Plans:
    - Coastal Zone Management Plan for Cobaki Broadwater and Terranora Broadwater (Australian Wetlands, 2010);
    - Upper Tweed Estuary Management Plan (TSC, 1996);
    - Tweed Coast Estuaries Management Plan 2004-2008 (Australian Wetlands, 2004), currently being updated.
- Water Supply Catchment Stream Bank Protection Policy (TSC, 2007);
- Tweed River Estuary Bank Management Plan (PBP, 1998).
- Draft Urban Stormwater Quality Management Plan (Australian Wetlands, 2012);
- On-site Sewage Management Strategy (TSC, 2002);
- Tweed Sustainable Agriculture Strategy (in development); and
- Tweed Vegetation Management Strategy (Ecograph, 2004).

These Council management plans have identified issues relating to water cycle management such as (refer Appendix A1, Section A7.8):

- Urban stormwater pollution and the potential for algal blooms;

- On-site sewerage system management;
- Livestock access to waterways causing bank erosion and water quality reduction;
- Construction phase erosion and sedimentation; and
- Lack of native riparian vegetation.

Other agency plans include:

- Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources (NSW Office of Water, 2010); and
- Northern Rivers Catchment Action Plan (NRCMA, 2005), currently being reviewed;

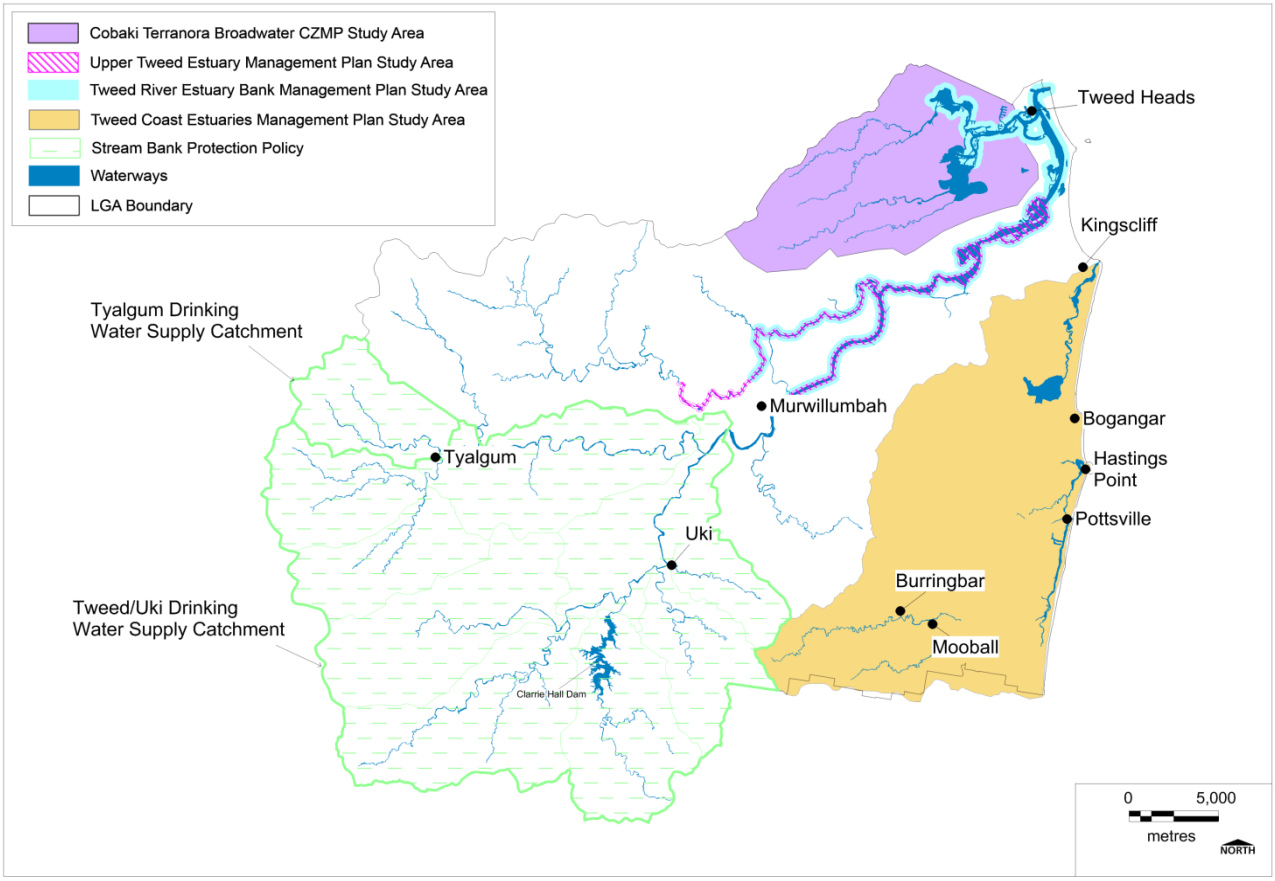

Figure 7: Areas covered by existing management plans or policies related to catchment management

A major focus of the TSC Waterways Program and catchment management activities is the implementation of the River Health grants scheme, administered through the Water Supply Catchment Stream Bank Protection Policy (TSC, 2007). The Scheme aims to improve water quality with the focus on rehabilitating riparian zones and providing off-stream drinking water for stock. The effectiveness of this program is limited by the voluntary co-investment by land owners. To date, approximately 25 km of stream bank has been treated (with either weed management, fencing or revegetation) but the overall condition of the stream banks or the total rehabilitation requirements are not known.

There is a need to coordinate the management response to the issues identified in Council's waterway management planning with the urban water responsibilities of Council. However, there is currently no framework for coordinating catchment management activities across the Shire. Existing estuary management plans and coastal zone management plans for estuaries have been developed through the state government's estuary management planning process. While the more recently updated plans have acknowledged the upstream catchment areas as affecting the health of estuaries, the main focus is on the health of the estuarine reaches. If a total catchment approach to water cycle management is desired, there is

a need to strengthen the linkages between existing catchment management, estuary management, coastal zone management, agricultural management and IWCM programs and activities.

Catchment management planning would provide a valuable reference for Council's land use planning and development approvals, particularly for protection of drinking water (refer Issue 14), waterway health, contaminated land management, education programs and stormwater controls (Issue 22). This would also provide a valuable link between water quality, river flows, ecosystem health objectives and community engagement processes as well as sustainable agriculture practices and urban development.

Issue 25: There is limited integration between urban and rural strategic land use planning

Agriculture is one of the main land uses in the Tweed Shire occupying over 65% of the Shire (TSC, 2011). However, in some areas, particularly along the coastal zone, there is increasing demand for urban housing in existing rural areas. Farmers on the floodplain are concerned about the impact of urban encroachment on farmland. Key concerns include:

- Impacts on floodplain hydrology associated with infilling the floodplain. The concern is that infilling results in more frequent and or longer duration flooding of surrounding areas, and the impacts of cumulative infilling on floodplain farmland are not considered as part of Council's land use planning or development assessment process. Council is currently preparing coastal and floodplain risk management studies to address these concerns; and
- Prime agricultural land may be lost if urban development proceeds in some areas. Once urban housing estates are built, the land is effectively "locked up" and unable to be used for agriculture. There are examples of prime agricultural land in the Tweed Shire that have attributes making it highly desirable for urban development (i.e. close to the coast and townships, scenic views, rural lifestyle etc.). As urban land is significantly more valuable than farmland, there is pressure for development in some areas.

There is a need to protect the agricultural values and limit encroachment and cumulative impacts of urban development of farming land. Council's Sustainable Agricultural Strategy (currently under development) aims to improve the viability and environmental capacity of farmland in the Tweed. Integration of rural strategic planning with the urban area planning is required to achieve the aims of the IWCM Strategy (refer also Issue 24).

Issue 26: The effective management of onsite sewerage systems within the Shire is limited by the available resources

Council has a target of 100 inspections per quarter with zero systems failing. Currently, 26% of systems inspected failed or needed repair work and of these, 14% were rated high risk (refer Appendix A, Section A7.13). There are currently approximately 6,000 on-site systems within the Shire with 2 full-time Council staff for approvals, inspections, education, regulation and response to complaints.

Although there are some on-site systems that are failing there is limited opportunity to cost-effectively connect to Council reticulated sewer systems due to transfer costs and capacity limitations (e.g. Tanglewood, Killvale, some areas of Mooball, Nunderry and Bilambil). Additional financial and human resources would be required to adequately regulate, inspect OSS and educate residents.

Council's OSSM Strategy will be reviewed in 2012/13 with further development of policy, procedures and protocols. As part of this review, there is an opportunity for increased integration with catchment management planning and IWCM and improved long-term direction for OSS systems within the Shire as discussed in Issue 24.

5. NEXT STEPS IN THE IWCM REVIEW

5.1 Community Engagement

Consultation activities to be undertaken as part of this IWCM Review aim to build on the activities already undertaken by Council as part of the IWCM implementation actions (refer Appendix 3).

The objectives of the next consultation phase are to engage the wider community in the IWCM review and establish the community priorities for water cycle management. The community engagement activities will focus on:

- Provision of information on the current status of the IWCM Strategy and the issues to be addressed in the IWCM review (this Background Paper);
- Identification of community priorities through community surveys; and
- Promotion of the project and engagement activities to the wider community as well as youth groups, seniors, interest groups and community groups.

The feedback from the community and other stakeholders will be incorporated into the development of the future IWCM Strategy.

The community will also be invited to provide feedback on the IWCM Strategy during public exhibition of the draft IWCM Strategy.

5.2 Development of the IWCM Strategy

Water cycle management objectives will be developed utilising information provided in this Background Paper and feedback from the community and other stakeholders. A series of options will be developed to address the issues and assessed according to the water cycle management objectives, the benefits and the costs. For the preferred IWCM scenario, the required actions, indicative timeframes, likely costs, risks and opportunities will be identified.

Potential IWCM actions are likely to include:

- Progression of the current IWCM actions;
- Development of strategic plans to enable implementation of the IWCM objectives;
- Collection and monitoring of data to enable adaptive management;
- Ongoing stakeholder liaison;
- Additional studies to determine the preferred longer term solutions;
- Development of concepts and designs (where a clear solution is found);
- Review of administrative arrangements to enable implementation of the IWCM objectives;
- Identification of funding sources; and
- Ongoing monitoring and reporting against targets.

ABBREVIATIONS

ADWG	Australian Drinking Water Guidelines
ASS	Acid Sulfate Soil
BASIX	Building Sustainability Index
BCP	Business Continuity Plan
CMA	Catchment Management Authority
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSP	Community Strategic Plan
CZMP	Coastal Zone Management Plan
DECC	(former) NSW Department of Environment and Climate Change
DECCW	(former) NSW Department of Environment, Climate Change and Water
DCP	Development Control Plan
DNR	(former) NSW Department of Natural Resources
DWQMP	Drinking Water Quality Management Plan
EMP	Environmental Management Plan
EP&A	Environmental Planning and Assessment (Act)
EPA	Environment Protection Authority
ESD	Ecologically Sustainable Development
FSL	Full supply level
HNFY	Historic No Failure Yield
HWA	Hunter Water Australia
IPART	Independent Pricing and Regulation Tribunal
IQQM	Integrated Quantity Quality Model
IWCM	Integrated Water Cycle Management
kL	Kilolitre
L	Litre
LEP	Local Environmental Plan
L/p/d	Litres per person per day
LWU	Local water utility
ML	Megalitre
NRCMA	Northern Rivers Catchment Management Authority
NRW	Non-Revenue Water
OEH	Office of Environment and Heritage
OSS	On-Site Sewerage

OSSM	On-Site Sewerage Management
PAC	Powdered Activated Carbon
POEO	Protection of the Environment Operations (Act)
QWC	Queensland Water Commission
REP	Regional Environmental Plan (now deemed SEPP)
SEPP	State Environmental Planning Policy
SOAS	Sewer Overflow Abatement Strategy
SQID	Stormwater Quality Improvement Device
SSD	State Significant Development
SSI	State Significant Infrastructure
TSC	Tweed Shire Council
VPA	Voluntary Planning Agreement
WIC	Water Industry Competition (Act)
WSP	Water Sharing Plan
WSUD	Water Sensitive Urban Design
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

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MWH (2006b) *Tweed Shire Council Wastewater Activity Management Plan*

MWH (2006c) *Tweed Shire Council Recycled Water Opportunities Concept Designs*

MWH (2006d) *Biosiolids Management Strategy*

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APPENDIX A: INFORMATION REVIEW

A1. THE 2006 IWCM STRATEGY

A1.1 Key Data used in the 2006 IWCM Strategy

The development of the 2006 IWCM Strategy was based on the data available at the time on the condition of the water supply, wastewater systems, stormwater systems, catchments and waterways. These data, which form the pretext of the 2006 Strategy, are discussed in the following sections.

A1.1.1 Population Growth

The high growth rates experienced between 1996 and 2001 were expected to continue due to the large amount of undeveloped urban land. The population was projected to double in the 30 to 40 years (to 2035-2045), largely as a result of retirees relocating to the area. Anticipated annual growth rates over the 30 years were expected to remain at around 2% p.a. or around 2,000 people per annum. The key population data used in the 2006 Strategy are shown in Table A 1. The predicted potential population of residential release areas is shown in Table A 2.

Table A 1: Population Predictions (2006 IWCM Strategy)

Locality	2001 Census Population	2005 Estimated Population	Projected Medium Term Population (+10 to 15 years)	Projected Long Term Population (>30 years)
Tweed Heads	38,600	-	60,000	72,000 to 93,000
Kingscliff	9,150	-	10,400 to 20,000	34,000 to 40,000
Coastal Villages	8,000	-	13,300	23,400
Murwillumbah	9,360	-	9,900	12,000 to 16,000
Rural	9,270	-	13,500	15,500
TOTAL STUDY AREA	74,380	80,000	107,100 to 116,700	156,900 to 186,900

Source: HWA, 2006

Table A 2: Predictions Potential Population of Residential Release Areas (2006 IWCM Strategy)

Urban Release Areas	Remaining Potential Population	Current Status
Casuarina	2,500	Under construction
Kings Forest	10,000	Zoning being reviewed
Salt (lot 490 & seaside city)	2,500	Under construction
Cobaki Lakes	14,000	Development approval granted
Banora Point / Sth Tweed	6,150	Nearing completion
West Kingscliff	4,500	Under construction
Bilambil Heights	8,000	Starting construction
West Murwillumbah	2,330	Under construction
Koala Beach, Pottsville	2,750	Under construction
Seabreeze, Pottsville	2,000	Under construction
Black Rocks, Pottsville	750	Under construction
Area E, Terranora	2,000	Zoning being reviewed
TOTAL STUDY AREA	57,480	

Source: HWA, 2006

A1.1.2 Surface Water Quantity

The estimated secure yield for Bray Park Weir and Clarrie Hall Dam (which impacts the Tweed and Uki water supply systems) was reported as 18,500 ML/a, based on a safe yield survey undertaken by SunWater in 2002. The IWCM Context Study included a preliminary review of the secure yield which concluded that there were several components of the previous modelling that needed refining, with the likely outcome of the rework being a reduction in the previously stated secure yields.

At the time of preparation of the 2006 IWCM Strategy, the Upper Tweed catchment was identified as a high priority for preparation of a Water Sharing Plan due to the combined environmental (medium) and hydrological (high) stress ratings. Prior to the Water Sharing Plan, there were no environmental flow objectives for the Tweed River catchment.

The secure yield of the Tyalgum town water supply (weir pool on Oxley River) was reported as 37 ML/a based on a 99.9% security (based on a 2003 yield study for Tyalgum weir by SunWater). However, the 2006 IWCM Strategy Plan notes that severe water restrictions had to be enforced, including a total ban on outdoor water use for 23 weeks during the 2002/03 drought and water carting from Murwillumbah was required for 3 months in late 2002 due to a combination of very low river flows and poor raw water quality in the weir.

A1.1.3 Surface Water Quality

The key conclusions of the surface water quality assessment undertaken for the 2006 IWCM Context Study were (HWA, 2006):

- Upper Tweed catchment:
  - The upper Tweed catchment was significantly impacted by agricultural runoff, including soil erosion, and modified rural runoff containing fertilisers and animal waste,

- The greatest increases in nutrient and faecal coliform concentrations occurred at monitoring sites located downstream from high density animal husbandry. Increased nutrient and faecal coliform concentrations also occurred downstream of townships and in areas where stock have ready access to waterways, and
- Suspended solids generally increased with rainfall, with soil erosion considered the primary source.

- Tweed estuary:
  - The Tweed Estuary generally had poor water quality, including high levels of nutrients, suspended sediments and faecal coliforms,
  - Water quality at the mouth of the Tweed estuary was good as it is relatively well flushed with oceanic water,
  - Terranora Inlet is well flushed by tidal movement but was subject to a high level of pollutant inputs from the adjacent heavily urbanised area including several canal estates,
  - Terranora and Cobaki Broadwaters are both shallow water bodies with reasonable water quality but were subject to nutrient and sediment accumulation from the catchment,
  - The Rous River was identified as a major hotspot, as it experienced eutrophication and was a likely source of pollution to the mid estuary,
  - There was a strong seasonal variations in water quality, with higher turbidity and nutrients and lower pH during wet seasons,
  - In flood events the lower estuary experienced high levels of nutrients (transported from upstream),
  - Water quality processes were dominated by point source loadings during dry months, while diffuse loads from the whole catchment dominated during wet periods,
  - The upper estuary was impacted by nutrients derived from agricultural fertilisers,
  - The mid to upper estuary and Rous River were impacted by wastewater discharges and agricultural fertiliser runoff,
  - The mid estuary was impacted by wastewater discharges, and
  - The lower to mid estuary was heavily impacted by urban runoff processes.
- Coastal estuaries:
  - Estuaries at Bogangar, Hastings Point and Pottsville were affected by urban development, and
  - Poor agricultural and urban development practices increased pollution runoff, siltation and exposure of acid sulphate soils.

A1.1.4 Town Water Consumption

The average annual residential consumption for 2002/03 was reported as 203 kL/a/dwelling, however during this period outdoor water use was banned for 22 weeks. The average annual residential consumption for Tweed was 243kL per dwelling in 2001/02. A typical breakdown of town water consumption at that time is shown in Figure A 1.

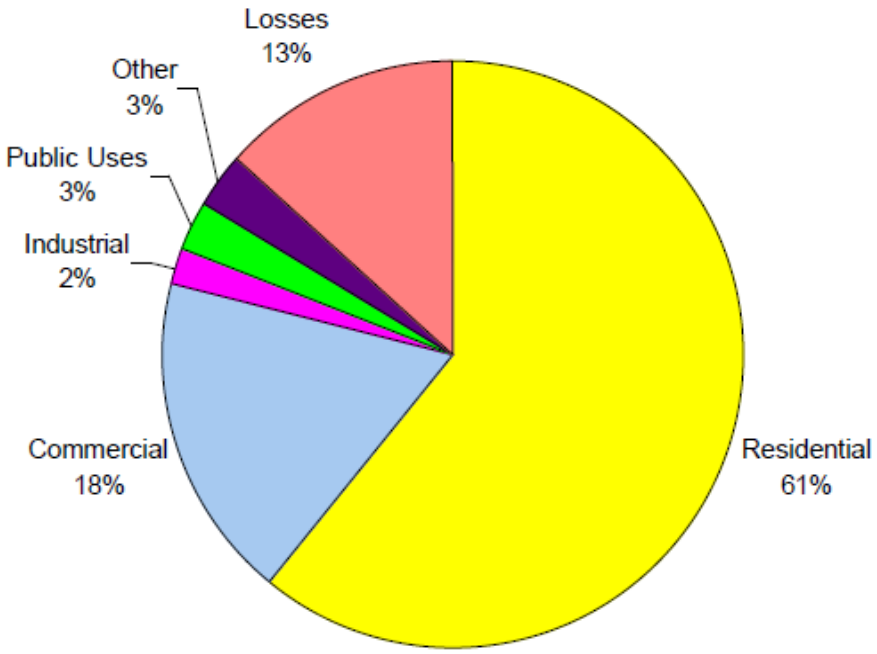

Figure A 1: Typical Breakdown of Town Water Consumption – 2002/03

Source: HWA, 2006

A1.1.5 Town Water Supply Pricing

A two-part tariff charging system was implemented in 2002/03, with a fixed service charge and a volumetric charge. The volumetric charge was 62 c/kL and the average residential bill in 2003/04 was $239 per property. The previous pricing structure had a higher fixed charge and a free water allowance of 250kL/a.

A1.1.6 Town Water Supply Quality

The 2006 IWCM Strategy Plan reported that water supplied from the Bray Park and Uki WTPs complied with the requirements of the Australian Drinking Water Guidelines (ADWG). Low levels of manganese (below ADWG guideline levels) in the water supplied from Uki WTP had resulted in taste and odour and dirty water complaints.

Water quality in the Tyalgum Weir pool during low flow events was a concern and water restrictions were introduced as a result of poor raw water quality in the weir pool and reduced raw water availability during the drought of 2002/03.

A1.1.7 Wastewater Systems

The status of the eight STPs at the time of the 2006 IWCM Strategy can be summarised as follows:

- Banora Point STP and Tweed Heads STP would require future augmentation in order to cater for predicted population increases. Council had adopted an effluent disposal strategy for the WWTPs, which will involve enhanced effluent treatment via improved nutrient removal and disinfection processes in order to reduce bacterial and nutrient levels in effluent discharged to the Terranora Inlet;
- 5% of average daily flows from Banora Point STP were used for irrigation of Tweed Head/ Coolangatta Golf Course;
- Kingscliff STP was to be replaced in the near future in order to cater for predicted population increases in the catchment and improve effluent quality;

- Hastings Point STP was being augmented, with improved quality effluent discharged into the coastal dune system. Opportunities for providing effluent to a nearby turf farm and/or for irrigation of local sporting fields were also being investigated;
- Murwillumbah STP was upgraded in 2001, with improved quality effluent being discharged into Rous River, however, nutrient accumulation was still occurring downstream of the STP during dry periods due to poor flushing of the river. Reuse opportunities were being investigated in order to reduce nutrient loadings on the Rous River including a cogeneration project at a nearby sugar mill, golf course and race course irrigation and irrigation of open spaces in new development areas;
- Tumbulgum STP generally had a reliable effluent quality and some effluent was used to irrigate taro crops on an adjacent farm;
- Tyalgum STP performance was at times unreliable. Potential expansion of the effluent irrigation areas with woodlots was identified as a possible solution; and
- Effluent from Uki STP was used to irrigate nearby koala feed trees and overflows from the irrigation discharged into Smiths Creek and eventually the Upper Tweed River.

The total volume of treated effluent was 7,810 ML/a (21 ML/d) with 235 ML/a (approximately 4%) recycled for irrigation purposes.

There were approximately 4,000 onsite wastewater systems throughout the Shire, located in the unserviced villages and rural areas. The provision of reticulated wastewater services to Burringbar and/or Mooball was being investigated.

A1.1.8 Stormwater Systems

Stormwater monitoring undertaken in high priority drains since January 1997 had indicated very high levels of pollutants within the drains with a significant impact on receiving waters.

A1.1.9 Data Gaps

The available data was generally considered adequate for development of the 2006 IWCM Strategy. However collation of data was found to be difficult due to the lack of a centralised data storage system and associated referencing system as well as wide distribution of reports and responsibilities throughout Council. Data gaps were found to be:

- Distribution and condition mapping of riparian vegetation – Tweed Landcare has since prepared a report on restoration prioritisation of high conservation value riparian lands (upper and Mid Tweed River);
- Stream gauge data for Oxley River, Tyalgum and Byrrill Creek – this is coordinated by the Office of Water as part of the water sharing plan;
- Flow gauge data upstream and downstream of Clarrie Hall Dam and Bray Park Weir – recorded as part of the water sharing plan requirements;
- System yield (refinement of modelling) for Clarrie Hall Dam/Bray Park Weir and Tyalgum Weir – undertaken in 2006 and 2010;
- Detailed assessment of groundwater quantity and quality – undertaken for the water supply augmentation study;
- Pump Station telemetry data and development of calibrated inflow and infiltration models – being developed;
- Water quality downstream of stormwater quality improvement devices – not yet implemented;

A1.2 Total Catchment Water Cycle Issues

For the 2006 IWCM Strategy, a range of water cycle issues / problems were identified from the background information for the catchment water cycle. These included some issues that were outside of Council's control in terms of the cause of the issues and the associated impacts. These issues were categorised as 'external issues' [ext] and were considered to be outside of the scope of the IWCM process, which focused on the urban water cycle. The total catchment water cycle issues identified in the 2006 IWCM Strategy Plan are summarised in Table A 3 and Table A 4 and discussed below.

A1.2.1 Urban Town Water Issues

High Extractions for Town Water / Town Water Security

The high extraction rates were considered to be contributing to environmental stress of the Upper Tweed River. The town water demand was expected to exceed the current secure yield estimate from the existing system within the next 30 years, as a result of the high population growth occurring in the area. The extent and timing of this exceedance was not known, as environmental flow requirements for the Tweed River and the risk level for town water supply security had not been defined by the water sharing plan process. The secure yield was expected to be overestimated as the impact of future environmental flow requirements on the secure yield of the storages was considered to be significant. Regardless of future environmental flow objectives, if consumption levels continued, town water demand in the study area was predicted to exceed the secure yield from the existing system as early as 2012. A buffer storage was recommended to allow time for the provision of an emergency supply, likely to be a small desalination facility (HWA, 2006).

Poor Raw Water Quality

Poor water quality in Bray Park Weir was found to be caused by a combination of poor land use practices in rural areas, wastewater from intensive agriculture and urban runoff from villages such as Uki and Tyalgum. Poor water quality during low flow periods and only partial treatment of raw water for Tyalgum had resulted in prolonged periods of water carting in association with severe restrictions. The 2006 IWCM Strategy Plan noted Council's future plans to upgrade Bray Park WTP and provide full treatment for Tyalgum to address these issues.

A1.2.2 Urban Wastewater Issues

Sewerage System Discharges

The 2006 IWCM Strategy Plan noted that Council had identified some areas that were under capacity during wet weather events, however, the extent and frequency of overflows from the sewerage systems during storm events was largely unknown. Flow gauging of the systems and subsequent calibration of a dynamic hydrological / hydraulic model was recommended to assess the existing extent and potential future extent of sewerage system overflows (HWA, 2006).

Effluent Discharges

The proposed upgrades of the major STPs (Hastings Point, Banora Point, Tweed Heads and Kingscliff) were predicted to be successful in achieving significant improvements in effluent quality and reducing the loadings of pathogens and nutrients on the Tweed Estuary and coastal aquifers.

A1.2.3 Urban Stormwater Issues

A desktop environmental assessment was undertaken to determine the impact of urban areas on the water resource. The focus was on determining the relative inputs of nutrients due to stormwater runoff from various land uses (urban, agriculture and undisturbed) and the nutrient inputs from point sources such as STPs. The

major source of pollutants was found to be rural runoff with STPs contributing approximately 21% of total phosphorous and 7% of total nitrogen loads the study area waterways (primarily the Tweed Estuary. Loading rates from 'undeveloped' and 'rural' were considered unlikely to increase significantly in the future, while loading rates from 'urban' and 'STP' were predicted to potentially double in the next 30 to 40 years (HWA, 2006).

A1.2.4 General Urban Issues

Residential Development

Potential impacts of residential development on the urban water cycle included vegetation clearing, modified/ contaminated stormwater runoff and increased pressure on the water supply system and sewerage systems (ultimately resulting in increased extractions for town water and increased effluent discharges). As the urban water cycle system was considered to be already under significant pressure, the IWCM Strategy Plan recognised the need for residential development to occur in a sustainable manner. It was recommended that monitoring of urban water cycle impacts associated with new development areas and review of the existing planning controls both at a State level (BASIX) and at a Council level (the inclusion of ESD and WSUD requirements in existing DCPs) were undertaken to ensure that they achieved the desired objective of sustainable development.

Renewals / Augmentations of Assets

The lack of formal asset management plans was considered to result in a reduction in the levels of service provided to customers due to unplanned disruptions in water, wastewater and stormwater services, the shifting of the cost burden of augmentations and renewals onto future generations and the social and environmental impacts associated with systems failures (e.g. sewage pump station overflows and localised flooding).

A1.2.5 Rural / Catchment Issues

Rural Residential Development

The impacts associated with rural residential development were considered to be similar to the impacts from urban residential developments, with the potential for slightly higher stormwater runoff rates and higher town water usage.

Surface Water Diversions for Irrigation / Groundwater Extractions

The existing impacts associated with surface water diversions and groundwater extractions were considered to be primarily external to the urban water cycle and were not considered in detail in the 2006 IWCM Strategy Plan. A water sharing plan was considered to be the appropriate mechanism to ensure that potential future impacts associated with irrigation usage of surface water and groundwater were minimised.

On-site Sewage Treatment System Failures

The impact of on-site system failures was not quantified in the 2006 IWCM Strategy Plan although the potential for system failures / overflows to impact on raw water quality in the Upper Tweed catchment was noted. Some areas identified as critical through Council's licensing and inspection program such as Mooball and Burringbar were not yet provided with reticulated sewerage systems.

Contaminated Rural Stormwater Runoff / Riparian Vegetation Clearing

Contaminated rural stormwater runoff resulting from agricultural and earthwork practices in the past was found to be the key pollution source (point and diffuse) for the upper Tweed River. The 2006 IWCM Strategy Plan found that:

- More than half of the vegetation cover in the study area had been cleared for agricultural and urban purposes, resulting in increased and modified stormwater runoff;
- A large proportion of riparian vegetation along the upper (freshwater) and lower (estuary) Tweed River had been cleared for agriculture and damaged by stock;
- Less than 60% of the stream and estuary length were vegetated;
- Modified runoff due to soil erosion was causing turbidity, nutrient export and sedimentation; and
- Due to a lack of riparian vegetation the runoff in the cleared areas was unfiltered before it entered the river and stock could also gain direct access to the river;
- Vegetation clearing and agriculture was causing excess amounts of nutrients to be discharged to the waterways resulting in algal blooms in Bray Park Weir, Clarrie Hall Dam, Tyalgum Weir and reaches of the Oxley and Rous Rivers; and
- Aquatic weed (such as *Salvinia molesta*) outbreaks had also occurred, on the still and slow flowing dam, river systems and drainage schemes in the Tweed.

Wastewater from Intensive Agriculture

The other key pollutant source in the Upper Tweed catchment was identified as wastewater from intensive agricultural enterprises such as dairies and piggeries. Farms that did not have appropriate pre-treatment of wastewater prior to discharging to local waterways contributed concentrated point loadings of nutrients and pathogens. Wastewater from intensive agriculture contributed to the water quality problems in Tyalgum Weir and Bray Park Weir, particularly during dry periods.

Uncontrolled Earthworks Disturbing ASS

The impacts of ASS were found to be reduced water quality and health of local waterways and estuaries in the lower catchments as well as increased construction costs for assets due to ASS management and increased asset replacement costs due to corrosion.

Table A 3: Existing and Potential/Future Issues – Upper Tweed Catchment (2006 IWCM Strategy)

ISSUE	CURRENT CONTROL MEASURES	IMPACTS [$C, $S, S, E]		DESIGN / MANAGEMENT GAPS
		EXISTING (ACTUAL)	POTENTIAL / FUTURE	
High Extractions for Town Water	• Fish ladder flows are maintained at Bray Park Weir, except during low flow periods • Some environmental flows are released from Clarrie Hall Dam • Informal demand management program • BASIX	• Reduced / altered downstream river flows reduce river health and have undefined estuary health impacts due to reduced fresh water inflows [E] • Reduced social amenity of downstream watercourses [S]	• Increased extractions from Bray Park Weir in the future will further increase hydrological stress on river and potentially reduce estuary health [E] • Further reductions in social amenity and potential impacts on tourism based activities [S]	• Extractions from weirs are not subject to environmental flow rules (no water sharing plan) • A comprehensive demand management program has not been adopted • Other water sources (eg recycled water) are not presently utilised • Pumping from Bray Park Weir for irrigation is not properly managed by DNR
Poor Raw Water Quality (for Town Water)	• Full treatment provided at Bray Park & Uki WTP's • Coarse screening & chlorination only provided at Tyalgum WTP • Releases are made from Clarrie Hall Dam to flush Bray Park Weir during poor water quality / algal bloom events	• Reduced treated water quality [S] and/or increased treatment costs [$C] during poor water quality events (algal blooms / post storm runoff / low flows) • Water carting to Tyalgum during drought [$C] in association with severe restrictions [$S/S] • Generally poor to average water quality to consumers from Tyalgum WTP [S]	• Increased extractions in the future will increase the need to extract water from Bray Park Weir during poor water quality events [$C/S]	• Insufficient capacity and treatment standard (for varying raw water qualities) at Bray Park WTP for future growth • Inadequate level of treatment at Tyalgum WTP • No water supply catchment management plan for Bray Park Weir
Sewerage System Discharges	• Tyalgum & Uki systems, treated effluent only discharges to adjacent water ways after prolong periods of wet weather • STP's have limited stormwater overflow storage	• Minimal impacts noted to date from overflows from Tyalgum and Uki sewerage systems	• Potential for dry & wet weather overflows to discharge into downstream waterways, adversely impacting on river health [E] and raw water quality [$C, S]	• Risk assessment required to determine dry & wet weather overflow storage requirements • Monitoring of inflow/infiltration rates is needed at Tyalgum
Effluent Discharges	• Nominally 100% dry weather reuse of effluent at Tyalgum and Uki STP's • Uki system is new and is below design load • Limited wet weather storage of excess effluent	• Minimal impacts noted to date from overflows from Tyalgum and Uki effluent reuse systems	• Potential for effluent from Uki and Tyalgum reuse schemes to discharge into downstream waterways, with likely minor impacts on river health [E] and raw water quality [$C, S]	• Effluent management plans have not been prepared • Risk assessment is required to determine wet weather overflow storage requirements
Urban Stormwater Runoff Flows & Quality	• Post 2000 development is subject to WSUD requirements • Current stormwater management plan • DCP's covering stormwater & WSUD • Limited use of stormwater treatment and/or detention systems in pre 2000 development areas	• Runoff from pre 2000 development increases sediment and nutrient loads on Tweed River [E], impacts on raw water quality (including contributing to algal blooms) in Bray Park Weir [$C, S] and increases erosion of local watercourses [E]	• Future impacts are likely to be similar to existing impacts due to limited growth & more stringent DCP's	• Developments prior to 2000 discharge stormwater without treatment or detention

ISSUE	CURRENT CONTROL MEASURES	IMPACTS [$C, $S, S, E]		DESIGN / MANAGEMENT GAPS
		EXISTING (ACTUAL)	POTENTIAL / FUTURE	
Rural Residential Development	• Existing DCP's • BASIX • Extent of recent development	• Servicing with water and/or sewer is more expensive than standard residential [$C] • Clearing of vegetation for development [E]	• Demand for rural residential land may require extension of existing water and wastewater systems to more remote areas [$C/E] • Runoff from rural residential land may impact on raw water supply quality & river health [$C/E]	• DCP's for rural residential lots need to include WSUD components including rainwater tanks & stormwater detention / treatment
On-site Sewage Treatment System Failures	• Septic systems constructed post 2002 are licensed & subject to annual inspections • Ongoing program of inspections & upgrades to systems built prior to 2002 • Township of Uki sewered in 2004	• Overflows from poorly performing or failed septic systems impact on health of downstream surface waters and groundwater [E]	• Potential for septic system overflows / failures to impact on raw water quality in Bray Park Weir and Tyalgum Weir [$C, S]	• Backlog of pre 2002 septic systems still requiring upgrades • Not all lots in the township of Uki have connected to new sewerage system
Contaminated Rural Stormwater Runoff	• Draft Vegetation Management Strategy • CMA initiatives and programs, including catchment management plan • Interim Water Quality Management Plan	• Increased runoff rates due to vegetation clearing and earthworks increases nutrient & sediment loads on Tweed River [E], adversely impacts on raw water quality (including contributing to algal blooms in Bray Park Weir) [$C, S] and increases erosion of local waterways [E]	• Further clearing of vegetation & earthworks would increase impacts & potentially increase frequency of algal blooms	• Little Monitoring of 'hot spots • An overall coordinated Government approach not yet in place
Riparian Vegetation Clearing	• See above • Limited targeted riparian remediation by Council	• Lose of riparian vegetation reduces filtering of rural runoff with impacts similar to above	• Further lose of riparian vegetation would increase impacts & potentially increase frequency of algal blooms	• Further targeted riparian remediation is required
Wastewater from Intensive Agriculture	• EPA licensing	• Wastewater from intensive agriculture increases nutrient & pathogen loadings on Tweed River [E], adversely impacting on raw water quality (including contributing to algal blooms in Bray Park Weir) [$C, S]	• Further establishment of intensive agricultural farms would increase impacts & potentially increase frequency of algal blooms	• Little Monitoring of 'hot spots • An overall coordinated Government approach not yet in place
Surface Water Diversions for Irrigation [ext]	• DNR licensing of irrigators	• Increases hydrological stress on river, adversely impacting on river health [E] • Reduced raw water availability for town water during low flow periods [S]	• Any increase in surface water diversions would further increase hydrological stress [E] & reduce raw water availability [S]	• A water sharing plan has not been prepared for the Upper Tweed River (DNR)
Groundwater Extractions [ext]	• DNR licensing of bores	• Unknown	• Extraction of groundwater above sustainable yields will deplete resource availability in future years, adversely impacts groundwater dependent ecosystems & may impact on river flows [E]	• A water sharing plan has not been prepared for the Upper Tweed River (DNR) • Sustainable yield of groundwater sources is not known (DNR)

Note: Impact codes: Council cost [$C], social cost [$S], general social impact [S], environmental impact [E]

Source: HWA, 2006

Table A 4: Existing and Potential/Future Issues – Lower Tweed Catchment (2006 IWCM Strategy)

ISSUES	CURRENT CONTROL MEASURES	IMPACTS [$C, $S, S, E]		DESIGN / MANAGEMENT GAPS
		EXISTING (ACTUAL)	POTENTIAL / FUTURE	
Town Water Security (Supply from Upper Catchment	• Informal demand management program • Drought contingency measures / restrictions	• There have been extended periods of restrictions during drought periods [$C/$S/S]	• Increased frequency & duration of restrictions due to system yield being exceeded [$C/$S/S] • Potential for severe restrictions & high cost drought contingencies measures being required if system yield is exceeded [$C/$S/S]	• Town water demands are likely to exceed system yield in the medium term (10 to 15 years) • Comprehensive demand management program has not been adopted • Other water sources (eg recycled water) are not presently utilised • HNFY Methodology for Town Water Supply Security is now considered low
Sewerage System Discharges	• Capital works program for future augmentations • Investigation & modelling (Static theoretical models) studies to assess existing system overflows • Dry weather detentions times at pumping stations • Constructed overflow locations	• Dry & wet weather overflows increase nutrient and pathogen loads on local waterways and downstream estuaries [E/S]	• Increasing loadings & aging infrastructure may lead to more dry & wet weather overflows [E/S]	• No formal inflow / Infiltration reduction program • EPA licensing of system overflows will be required in the future • No time series / calibrated modelling studies to assess existing system overflows
Effluent Discharged to Estuaries & Sand Dunes	• Interim Water Quality Management Plan • Monitoring & reporting on estuarine water & groundwater quality • Nominal effluent reuse at Tumbulgum STP • Currently upgrading Hastings Point STP	• Pathogen & nutrient loads impact health of estuaries & groundwater [E] and reduce social amenity of estuaries [S]	• Reductions in estuary health may potentially impact on water quality at downstream beaches [E] and reduce social amenity [S] • Reduction in GW quality may impact on its suitability as a source water [$C] • Increased loadings may lead to further reductions in estuary / g'water health [E/S]	• Full tertiary treatment is not currently available at all STP's • Effluent discharged to estuary is not available / utilised for reuse • Banora Point, Tweed Heads & Kingscliff STP's all require augmentation to cater for future growth
Urban Stormwater Runoff Flows & Quality	• Post 2000 development is subject to WSUD requirements • Current stormwater management plan • DCP's covering stormwater & WSUD • Limited use of stormwater treatment and/or detention systems in pre 2000 development areas	• Runoff from pre 2000 development increases nutrients, sediments, oxygen demanding substances, heavy metals, oils and grease loads on local waterways, estuaries and groundwater, reducing health [E/S] • Runoff volumes and velocities increase erosion of local waterways [E]	• Reductions in estuary health may potentially impact on water quality at downstream beaches [E] and reduce social amenity [S] • Reduction in GW quality may impact on its suitability as a source water [$C] • Increased stormwater discharges may lead to further reductions in estuary and groundwater health [E/S]	• Developments prior to 2000 discharge stormwater without treatment or detention • Ongoing development of Stormwater Management Plan is required

ISSUES	CURRENT CONTROL MEASURES	IMPACTS [$C, $S, S, E]		DESIGN / MANAGEMENT GAPS
		EXISTING (ACTUAL)	POTENTIAL / FUTURE	
Urban Residential Development / Growth	• Existing DCP's (including WSUD requirements) • BASIX • Partial compliance with DEUS Best Practice Guidelines for Water and Sewer • Council's Tweed Futures Draft Strategic Plan	• Growth in recent years has placed increasing pressure on urban water cycle components, resulting in the need for significant augmentations of assets [$C, E] and increasing extractions, effluent discharges & stormwater runoff (see below) • Clearing of vegetation for new urban development areas [E] • Ever increasing burden of management / operation of expanding systems [$C]	• There will be an increasing need to provide services to areas that are remote from existing infrastructure [$C] • Further increases in extractions, effluent discharges & stormwater runoff (see below)	• Ongoing updating of DCP's • Requirements that development master plans consider urban water cycle impacts & WSUD / ESD principles • Full compliance with DEUS Best Practice Guidelines for Water and Sewer • Developer / community eduction & training in WSUD / ESD principles
Renewals & Augmentations of Assets	• Assets are generally replaced when ongoing repair / maintenance costs become excessive	• Failure of assets reduces levels of service [S], impacts on the environmental [E] & generally requires urgent & costly replacement [$C]	• Inadequate replacement program now may lead to more frequent failures of assets [S/E] and an excessive cost burden [$C] in the future	• No formal Asset Management Plan is in place
On-site Sewage Treatment System Failures	• Septic systems constructed post 2002 are licensed & subject to annual inspections • Ongoing program of inspections & upgrades to systems built prior to 2002	• Overflows from poorly performing or failed septic systems impact on health of downstream waterways, including local creeks, estuaries and groundwater [E]	• Future impacts are likely to be similar to existing impacts due to limited potential for new on-site systems	• Backlog of pre 2002 septic systems still requiring upgrades • Townships of Mooball & Burringbar are not sewered
Contaminated Rural Stormwater Runoff [ext]	• Draft Vegetation Management Strategy • CMA Initiatives and programs, including catchment management plan • Interim Water Quality Management Plan • Floodgate policy	• Increased runoff rates due to vegetation clearing (including riparian) and earthworks increases nutrients and sediment loads on local waterways and downstream estuaries [E/S] and increases erosion of local waterways [E]	• Further clearing of vegetation and earthworks would increase impacts	• Little Monitoring of 'hot spots'
Uncontrolled Earthworks Disturbing Acid Sulphate Soils [ext]	• DCP's requiring ASS management plans • ASS Management Advisory Committee guidelines • ASS risk maps	• Increased construction costs due to ASS management [$C/$S] • Increased asset replacement costs [$C] • Uncontrolled disturbance of ASS has an adverse impact on estuary health [E] • Concentrated acidic flushes during storm events adversely impacts on estuary health [E]	• The impacts associated with ASS may increase in the future with increasing pressure to develop in areas affected by ASS	• An overall coordinated Government approach not yet in place
Groundwater Extractions [ext]	• DNR licensing of bores	• Unknown	• Extraction of groundwater above sustainable yields will deplete resource availability for future years [E]	• A water sharing plan has not been prepared (DNR) • Sustainable yield of coastal aquifers is not known (DNR)

Note: Impact codes: Council cost [$C], social cost [$S], general social impact [S], environmental impact [E]

Source: HWA, 2006

A1.3 IWCM Strategy Development

For each of the urban water cycle issues identified in the 2006 IWCM Strategy Plan, broad improvement objectives were nominated, along with potential solutions with emphasis on sustainable (economical, environmental and social) and integrated solutions. A preliminary strategy was proposed to encourage solutions to be implemented in the short term, while the ongoing IWCM process continued through the detailed strategy development and implementation phases. The recommended short term actions were:

Urban Town Water Actions:

1. Formalise a Demand Management Program and explore further demand management options – including targeted non-residential audit and education (e.g. motels, caravan parks, clubs, etc.);
2. Target 12% unaccounted for water by 2010;
3. Explore demand substitution options such as effluent and stormwater reuse;
4. Review and refine current estimates of system yields and supply security including assessing the potential impacts of environmental flow rules being applied at Bray Park Weir and determining increased yields from supply enhancement options such as raising Clarrie Hall Dam and constructing Byrrill Creek Dam;
5. Determine the impacts on town water supplies of the proposed water sharing plan for the Tweed River, in association with DNR (now Office of Water) and the CMA, which will define environmental flow requirements for the Tweed River (including defining fish ladder and estuary fresh water requirements);
6. Investigate and implement improved treatment process at Tyalgum WTP and assess impact of water sharing plan on town water supply security;
7. Undertake detailed, long term town water demand forecasts; and
8. Determine impact of new Australian Drinking Water Guidelines (ADWG) on Town Water Supplies and operations.

Urban Wastewater Actions:

9. Undertake sewerage system flow gauging and build a calibrated sewerage system model in association with monitoring of inflow / infiltration rates and sewerage system overflow locations;
10. Ongoing implementation of sewerage system optimisation (in association with a calibrated sewerage system model), including targeted inflow / infiltration works;
11. Prepare Effluent Reuse Opportunities Report;
12. Monitor wet weather performance of Upper Tweed treatment plants;
13. Assess short term options for increasing effluent quality and reuse;
14. Implement investigation and planning for dual reticulation and/or decentralised sewerage systems for future development areas, such as Cobaki and Kings Forest; and
15. Undertake detailed, long term sewage loading forecasts.

Urban Stormwater Actions:

16. Prepare a targeted retrofit program of stormwater detention and/or treatment devices for ‘hot spot’ pre 2000 development areas; and
17. Ongoing review and development of Stormwater Management Plans.

General Urban Actions

18. Ongoing implementation of WSUD and ESD principles for new developments, including education of developers and the community and ongoing strengthening of local planning requirements;
19. Update existing local planning instruments to be in line with and to complement BASIX;
20. Undertake preliminary planning for alternatives to rainwater tanks for new development areas (e.g. grey water reuse, dual reticulation of treated effluent, stormwater reuse). Hold forums with local developers and the community to discuss the advantages and disadvantages of various options;
21. Prepare and implement Asset Management Plans; and
22. Continued implementation of DEUS Best Practice Guidelines with a focus on IWCM outcomes.

Rural / Catchment Actions (in association with DNR, CMA & local land care groups)

23. Continue to identify and assess critical areas where on-site sewage disposal is ineffective and implement appropriate solutions;
24. Identify and monitor catchment 'hot spots' areas that adversely impact on water quality in the Upper Tweed River;
25. Support ongoing catchment management initiatives, including planning controls, education, vegetation restoration (by assisting land care groups and individual landholders) and engage with the CMA; and
26. A detailed groundwater study needs to be undertaken in order to assess current quality issues and the potential for aquifer storage and recovery (may be undertaken by or in association with DNR).

The 2006 IWCM Context Study and Strategy Plan (HWA, 2006) study was placed on public exhibition and subsequent to that public exhibition Council resolved to adopt the IWCM Strategy incorporating the above 26 actions.

The following broad steps were suggested for ongoing strategy development and associated implementation of IWCM:

1. Assemble and setup a steering committee with representation from key stakeholders;
2. Initiate an ongoing community consultation process;
3. Prioritise issues and set firm objectives and incorporate into Council's Management Plan and all relevant subsidiary plans;
4. Undertake detailed studies of solutions and impacts, including: effluent / stormwater reuse options, supply enhancement options, water quality improvement options;
5. Detailed options formulation and assessment, including TBL assessment;
6. Preparation and adoption of preferred options;
7. Implementation of the preferred options; and
8. Annual review of priorities and updates and major five yearly reviews of the IWCM Strategy.

A2. INTEGRATED PLANNING AND REPORTING

The NSW Government has established Integrated Planning and Reporting legislation, requiring all councils to establish a long term strategic, infrastructure and financial framework. Figure A 2 shows how "objectives" identified in the Community Strategic Plan translate into "strategies" which feed into the Delivery Program. Actions are identified, funded and delivered through the annual Operational Plan. The documents are discussed in the following sections.

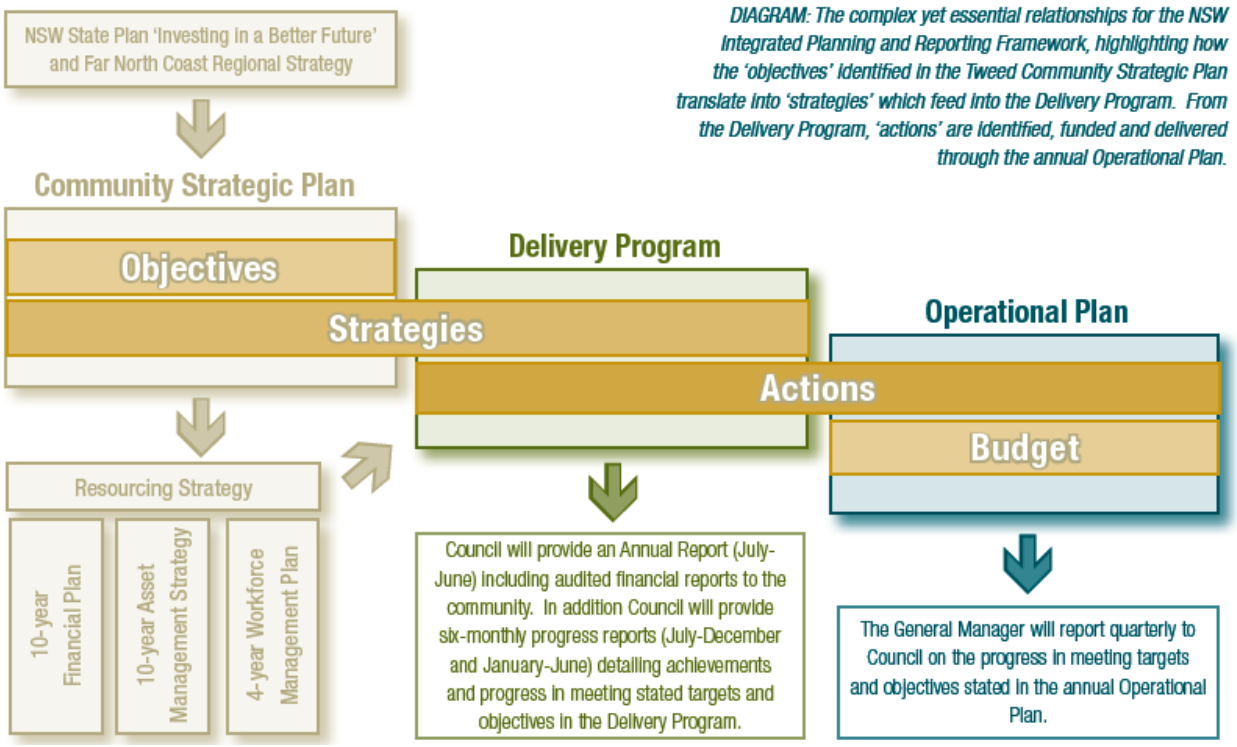

Figure A 2: Integrated Planning and Reporting Framework

A2.1 Community Engagement Strategy

The Community Engagement Strategy outlines the process for involving the Tweed community in Council's strategic planning and decision-making processes. Ranging from the development of Council's 10-year Community Strategic Plan to day-to-day activities, Council supports the right of citizens to participate in decision making that affects their future. The objectives of the Community Engagement Strategy are:

1. Involve the Tweed community in the development, implementation and review of Council's strategic planning and decision-making processes, within its legislative abilities.
2. Ensure Council and Councillors receive quality information representative of the views of the Tweed community sourced from a range of methods to assist in effective decision making.
3. Coordinate and centralise the engagement/participation process for Council to avoid duplication and loss of valuable information. This will help build an ongoing understanding and rapport between the community and Council.
4. Build a positive reputation for Tweed Shire Council by demonstrating that Council is listening, informing and being informed by the broad Tweed community.
5. Establish a uniform approach and minimum standards to the way Council, and consultants engaged by Council, engages the community on a range of issues.

A2.2 Community Strategic Plan

The Tweed Community Strategic Plan 2011/2021 is the community's 10-year vision for the Tweed, to protect the qualities that make the Tweed a great place to live and to create communities which are strong and well connected. The plan creates a framework to implement Council's four-year Delivery Program and annual Operational Plan, which will align the community's aspirations with the necessary strategy development, planning and resourcing required to achieve the long-term vision and deliver the outcomes.

The 2011/2021 Tweed Community Strategic Plan is built around four themes:

1. Civic Leadership: To set the overall direction and long-term goals for the Tweed in accordance with community aspirations.
2. Supporting Community Life: To create a place where people are healthy, safe, connected and in harmony with the natural environment to retain and improve the quality of community life.
3. Strengthening the Economy: To strengthen and diversify the region's economic base in a way that complements the environmental and social values of the Tweed.
4. Caring for the Environment: For Council and the community to value, respect and actively participate in the care and management of our natural environment for current and future generations.

The 2011/2021 Tweed Community Strategic Plan acknowledges that the management, protection, conservation and restoration of the Shire's environmental assets are vitally important, because it is environment that ultimately supports society and the economy. Improving water quality and river flows has been identified as a priority to safeguard aquaculture, fishing and lifestyle amenities. Urban expansion and agricultural activities were cited as potential causes of further deterioration in water quality and amenity because of siltation, pollution and algal blooms. Pressure on the coastal environment is likely to continue, given planned expansion of urban areas along the coastal zone. A long-term environmental management framework has been developed to protect the qualities of beaches, dune systems, wetlands, wildlife habitats and the management of extensive environmental protection areas. The establishment of wildlife corridors was necessary to protect flora and fauna species from extinction. Quality urban design is recognised as essential to retain the distinctive character of towns and villages in the Shire.

The objectives and strategies relevant to water cycle management are given in Table A 5.

A2.3 Delivery Program

The Community Strategic Plan is supported by the four-year Delivery Program, which outlines how the Strategic Plan's long-term objectives will be delivered over the period from 2011 to 2015. The Delivery Program provides a focus for Council. All its activities, plans, projects and funding allocations will be directly linked to this document, which incorporates the final year of the Seven Year Infrastructure and Services Program.

Council will maintain a 10-Year Capital Works Program, supported by its new asset management plans, to prioritise the allocation of scarce funds to capital projects and refurbishment programs identified in the Delivery Program.

Table A 5: Community Strategic Plan Objectives and Strategies relevant to IWCM

Objectives Relevant to IWCM		Relevant Strategies
Civic Leadership		
1.1 Ensure actions taken and decisions reached are based on the principles of sustainability	1.1.1 Establish sustainability as a basis of Shire planning and Council's own business operations.	• Asset Management Plans • Community Engagement Strategy • Developer Contribution Plans (Section 94 and Section 64) • Far North Coast Regional Strategy (NSW Planning) • Five Year Works Programs • Integrated Water Cycle Management Strategy • Floodplain Risk Management Plans • NSW State Plan (NSW Government) • Seven Year Infrastructure and Services Plan • State of the Environment Report • Tweed Development Control Plan 2008 • Tweed Development Program • Tweed Futures 2004-2024 • Tweed Local Environmental Plan • Water Supply Demand Management Strategy
	1.1.2 Create a sustainable, socially and environmentally aware community through education	
	1.1.3 Prepare for climate change through adaptation and mitigation strategies	
1.2 Improve decision making by engaging stakeholders and taking into account community input	1.2.2 Decisions made relating to the allocation of priorities will be in the long-term interests of the community	
	1.2.3 Financial requirements and the community's capacity to pay will be taken into account when meeting the community's desired levels of service	
	1.2.4 Involve communities including youth, elderly and aboriginal groups in decision making that affects their area and the wider Tweed community	
	1.2.5 Effective communication between Council and Community groups	
1.5 Manage and plan for a balance between population growth, urban development and environmental protection and the retention of economically viable agricultural land	1.5.1 Sustainable management of the population in accordance with strategic decisions of previous councils, the NSW and Commonwealth Governments and the Far North Coast Regional Strategy, including provision of amenities, infrastructure and services	
	1.5.2 Land use plans and development controls will be applied and regulated rigorously and consistently and consider the requirements of development proponents, the natural environment and those in the community affected by the proposed development	
	1.5.3 The Tweed Local Environmental Plan will be reviewed and updated as required to ensure it provides an effective statutory framework to meet the needs of the Tweed community	

Objectives Relevant to IWCM		Relevant Strategies
Supporting Community Life		
2.3 Provide well serviced neighbourhoods	2.3.2 Provision of a secure, high quality and reliable drinking water supply service which meets health and environmental requirements and projected demand. 2.3.3 Provision of high quality and reliable wastewater service which meets health and environmental requirements and projected demand 2.3.5 Ensure adequate stormwater drainage, flood management and evacuation systems are in place to protect people and property from flooding.	• Integrated Water Cycle Management Strategy • Interim Water Quality Management Plan • Five Year Works Programs • Floodplain Risk Management Plans • Tweed Futures 2004-2024 • Tweed Urban Stormwater Quality Management Plan • Wastewater Activity Management Plan • Water Activity Management Plan • Water Supply Demand Management Strategy • Water Supply Drought Management Strategy
Strengthening the Economy		
3.2 Retain prime agricultural land, farm viability, manage rural subdivision and associated landscape impacts	3.2.1 Foster a viable farming community	• Developer Contribution Plans (Section 94 and Section 64) • Far North Coast Regional Strategy • Five year Works Programs • Seven Year Infrastructure and Services Plan • Tweed Development Control Plan 2008 • Tweed Futures 2004-2024 • Tweed Local Environmental Plan
3.3 Maintain and enhance the Tweed lifestyle and environmental qualities as an attraction to business and tourism	3.3.1 Establish planning controls that balance the need for urban growth against the protection of agriculture, village character and the environment. 3.3.2 Facilitate government-funded infrastructure	
3.4 Provide land and infrastructure to underpin economic development and employment.	3.4.2 Ensure sustainable provision of infrastructure (utilities, services and transport) is available to support economic development	
Caring for the Environment		
4.1 Protect the environment and natural beauty of the Tweed	4.1.1 Retain open space and greenbelts for conservation and for all people to enjoy. 4.1.2 Protect, regulate and maintain natural assets (the coastline, coastal and inland waterways, biodiversity, bushland and scenic landscapes) for current and future generations. 4.1.3 Manage and regulate the natural and built environments.	• Coastal Estuaries Management Plan • Coastal Zone Management Plans • Coastline Management Plan • Integrated Water Cycle Management Strategy • Interim Water Quality Management Plan • Far North Coast Regional Strategy • Floodplain Risk Management Plans • Seven Year Infrastructure and Services Plan • State of the Environment Report
4.2 Conserve native flora and fauna and their habitats	4.2.1 Promote the protection of native vegetation and wildlife habitat of high conservation value, social or cultural significance in Tweed Shire 4.2.2 Encourage and promote rehabilitation and management of native vegetation and wildlife habitat in Tweed Shire.	

Objectives Relevant to IWCM		Relevant Strategies
	4.2.3 Recognise the social and economic impacts of managing vegetation.	• Tweed Futures 2004-2024 • Tweed Local Environmental Plan • Tweed Urban Stormwater Quality Management Plan • Vegetation Management Strategy • Water Activity Management Plan • Water Supply Demand Management Strategy • Water Supply Drought Management Strategy
	4.2.4 Promote and encourage partnerships between the community and governments through consultation and participation	
	4.2.5 Establish and promote a framework for the implementation, continued development and monitoring of vegetation management and planning measures	
4.3 Maintain and enhance Tweed's waterways and its catchments	4.3.1 Manage water resources sustainably and minimise impact on the environment by achieving more integration of water supply, wastewater and stormwater services	
	4.3.2 Improve urban stormwater discharge through water sensitive urban design	
	4.3.3 Improve rural stormwater discharge quality and ecosystem health through best practice land management.	
4.4 Manage the Tweed coastline to ensure a balance between utilisation and conservation	4.4.1 Recognise and accommodate natural processes and climate change	
	4.4.2 Protect and enhance the aesthetic qualities of the coastal zone	
4.5 Improve the environmental capacity of Tweed agricultural lands.	4.5.1 Promote and encourage sustainable and innovative agricultural practices	
	4.5.2 Promote and encourage partnerships between farming communities, governments and research institutions through consultation and participation	
	4.5.3 Provide information and support on sustainable land use practices to the agricultural community	

A2.4 Operational Plan

The Community Strategic Plan and Delivery Program are underpinned by the 2012/2013 Operational Plan to identify the actions, services and projects that will be undertaken, within Council's financial and resourcing capacity, to achieve its objectives and strategies. The Operational Plan contains an annual budget and revenue statement including proposed rates, fees and charges.

The Resourcing Strategy details Council's capacity to manage assets (Asset Management Plans), the workforce (Workforce Management Plan) and long-term funding (Long Term Financial Plan) needed to implement the Community Strategic Plan's 10-year objectives.

A2.5 Asset Management Strategy

Council adopted the Asset Management Strategy (AMS) in 2011. The objective of the AMS is to develop a structured set of Strategic Actions aimed at enabling Council to improve its asset management practices to support Council's Asset Management Policy and service delivery needs.

Council has identified a need to develop long-term financial management plans for its asset provision as part of a process to adopt continuous improvement programs.

The AMS and the Asset Management Plan for each asset class, developed as a result of the Strategy will provide Council with detailed comprehensive information and knowledge to assist it with its short and long term service delivery planning.

Asset management issues and needs have been identified as follows:

- Adopting good-practice asset management strategies to ensure the intergenerational sustainability of community assets;
- Ensuring that the required funding is available to upgrade the existing assets of the Council to meet changing expectations of the community;
- Moving towards consumption-based funding analysis and optimised budgeting methods;
- Being able to reliably predict the condition of assets after 10 years at the current rate of expenditure;
- Ensuring sound risk management and mitigation associated with Council's assets;
- Community Education/involvement and understanding of levels of service and the relationship between funding and service delivery;
- Life cycle costing to justify new assets; and
- Future maintenance needs for new infrastructure and managing sustainability.

The AMS identifies strategies to address these issues and enable Council to produce advanced Asset Management Plans that will guide the long-term financial planning for its assets. The Asset Management Plans for the water cycle assets are discussed in Section A7.6.3.

A2.6 State of the Environment Report

The State of the Environment (SoE) Report is a statutory reporting requirement of the Local Government Act, 1993. Its purpose is to:

- Identify specific pressures being placed upon the ecological sustainability of the Shire;
- Report on responses being undertaken to help address these pressures;
- Monitor and evaluate the effectiveness of these responses; and
- Identify additional environmental management priorities.

The identified pressures relating to management of the water cycle are listed in Table A 6. These pressures are likely to increase in proportion to population.

Table A 6: Water Cycle Environmental Pressures identified in State of the Environment Report 2010/11

Environmental Pressure	Council Response
Built Environment (greenfields and brownfields development)	
• Increase in the Shire's urban footprint and an associated reduction in the size, function and connectivity of natural ecosystems • Demands on the water supply catchment • Diffuse source waterways pollution (e.g. stormwater) • Point source waterways pollution (e.g. waste water)	• LEP • DCP • Tweed Urban and Employment Land Strategy 2009 • Specific controls including Height Limits, locality based development codes and constructed wetlands • Environmental Enforcement Levy • Ecologist appointed to Development assessment unit • Planning Reforms • Building Reforms • Vegetation Management Strategy • Urban Stormwater Quality Management Plan • Development contributions
Water Supply	
• Water extraction rates and the associated impacts on environmental flows. • Altered flow patterns of natural watercourses • Energy use and greenhouse gas emissions associated with treatment and supply of water.	• Water Supply Augmentation • Clarrie Hall Dam Spillway Upgrade • Drought Management Strategy • Water Loss Management • Rainwater Tank Policy • Community Education / Support • Water saving rebates and retrofit program • Excess Water Charge for High Consumers • Demand Management Strategy • Integrated Water Cycle Management Strategy • Environmental flow provisions • Development servicing plans • Water Restrictions Policy • Secure Yield Projections • Leak Detection Program • Recycled Water Projects • Waterway health program

Environmental Pressure	Council Response
Wastewater Management	
• Discharge of treated waste water to local waterways • The strength and volume of liquid trade waste • High failure rates of on-site sewage management systems and the associated impacts on adjacent waterways • Greenhouse gas emissions associated with energy input for the treatment and disposal of waste water and methane generation from the treatment process.	• Village sewage treatment schemes (Burringbar/Mooball, Uki, Tumbulgum, Tyalgum) • Tweed Heads WWTP Upgrade • Banora Point WWTP Upgrade • Kingscliff WWTP Upgrade • Murwillumbah WWTP Upgrade • Hastings Point WWTP Upgrade • Recycled Water Projects • Demand Management Strategy • Trade Waste Policy • Sewer Overflow Monitoring • Community Education / Support • Integrated Water Cycle Management Strategy • Pump Station Telemetry Upgrade • Sewage Overflow Abatement Strategy • Development servicing plans • Emergency response procedures • On-Site Sewage Management
Transport Infrastructure	
• Stormwater pollution - Impervious surfaces associated with transport infrastructure create stormwater discharges and associated pollution of local waterways	• Urban road stormwater upgrades
Environmental Education and Capacity Building	
• Barriers to volunteer participation • Lack of community awareness and engagement about local environmental issues • Lack of institutional awareness and capacity to proactively respond to local and global environmental issues	• Environmental Volunteers Manual • Water Education Facility • Sustainable Streets • rate incentive • Waste-Wise Schools • water saving fact sheets • On-line Water Consumption Calculator • NRM Community Support Officer • Environmental guides • Educational DVD • Council-Supported Environmental • Committees • Environmental Education Officer • Sustainable Living Centre • Residential Rebate Program • Catchment Activity Model • Stormwater education program and fact sheets

Environmental Pressure	Council Response
Catchment Management	
• Barriers to fish passage (weirs, road crossings and floodgates) • Acid sulfate soil run-off (low pH and metals discharging to waterways) • Invasive environmental weeds in riparian vegetation • Loss of riparian vegetation and catchment clearing • Point-source pollution (waste water treatment plant discharges) • Diffuse-source pollution (stormwater, agricultural run-off, failing on-site sewage management systems, erosion of topsoil) • Stock access to waterways leading to erosion and fouling of water • River water extraction and alteration of natural-flow regimes • Stream bank erosion from high-flow events and boat wake	• Education and Capacity Building • Tweed Coastal Creeks and • Catchment Management Plan • Urban Stormwater Quality Management Plan – Review • Fish Friendly Farms • Estuary Ecosystem Health Report Card • Bilambil Creek and Charles Bay • Reserve Riparian Corridor • Project • Cudgera Creek Baseline Ecological Assessment • Byrrill Creek Riparian Rehabilitation Project • Tweed River Riparian Restoration - Uki • Water Quality Monitoring / Data Assessment Program • Fish Passage Barrier Removal • River Health Grants Scheme • Riverbank Policy • Bray Park Weir Pool Riparian Management • Oxley Cove Peninsular Vegetation Rehabilitation Works • Knox Park Constructed Wetland • Lower Estuary River Bank • Stabilisation • Tyalgum Weir Pool Revegetation • Floodgate Modifications • Estuarine Vegetation Monitoring Program • Lavender Creek Riparian Vegetation Project • Riparian Rehabilitation Project – Tyalgum • Waste-water Treatment Plant • Stormwater Treatment Devices • Estuary Management Plans
Bushland and Biodiversity	
• Draining of swamps and wetlands • Degradation of riparian habitats by camphor laurel, privet and numerous exotic vines • Grazing and disturbance by cattle in riparian and wetland areas	• Biodiversity Grants • Tweed Byron Bush Futures • Recovery of Threatened Species in Priority Implementation Areas • Aerial Survey for Vine Weed Mapping • Biodiversity DCP • Habitat Management Plan Policy • Biodiversity Program • Planning Reforms and the Local • Environment Plan • Vegetation Management Strategy

Environmental Pressure	Council Response
Soils and Sustainable Agriculture	
• Acid sulfate soils, which lead to land degradation and reduced productivity in agricultural areas and water quality degradation and the associated impacts on aquatic and marine ecosystems • Erosion and sedimentation associated with agricultural and construction activities • Changing land-use patterns	• Acid Sulfate Soil Research Projects • Sustainable Agriculture Strategy • Sustainable Agriculture Program • Bray Park Wetland Rehabilitation • Floodgate Modifications • Vegetative Filter Strips • Cane Farming Best Practice Guidelines
Atmosphere	
• Identifying, responding and adapting to climate change risks	• Climate change mitigation – council operations and community • Emissions reduction targets • Cities for Climate Protection (CCP) Program • Coastline management • Floodplain management
Council Operations	
• None identified	• Environmental Management System • Sustainability Gap Analysis • Workplace Environmental Safety Protocol • Environmental Design Guidelines for New Council Facilities • Energy and Water Monitoring • Staff Training and Inductions • Rainwater tanks on public facilities • Waterless Urinals • Recycled Water • Water Efficient Beach Showers • Irrigation Practices

A3. LEGISLATIVE REQUIREMENTS

A3.1 Relevant Legislation

The key legislation which drives many of the IWCM targets is discussed in Table A 7.

Table A 7: Key Legislation driving IWCM Targets

Legislation	Summary of Requirements
Local Government Act, 1993, and Local Government (General) Regulation 2005	This Act provides the legal framework for the system of local government in NSW. The Act addresses: • Requirement to comply with DWE best-practice management criteria before making a payment of a dividend from the surplus of Council's water supply or sewerage businesses; • General pricing and headwork charges as well as developer charges for water supply and sewerage services and stormwater contributions; • Approval for private greywater and sewage treatment systems; • Inspection, assessment and licensing of on-site sewage systems; • Approval from the Minister of Land and Water Conservation (i.e. Office of Water) to undertake water supply or sewerage works (Section 60); • Accountable, effective end economical management; • Self-funding of water utility operations, and no cross subsidy with other Council activities; • Stormwater management service charge up to $25 per household; • Ministerial approval for undertaking water supply and sewerage new works and augmentation; and • Agenda 21 and ecological sustainability.
Local Government (Water Services) Regulation,1999	The Regulation supplements the provisions of the Local Government Act 1993 relating to the carrying out of water supply, sewerage and stormwater drainages works by councils and regulates the use of such works including: • the imposing of water restrictions, • the discharge of prohibited matter into sewers and drains, • the functions of councils in relation to water supply, sewerage and stormwater drainage (includes provisions for joint council works, installation of fire hydrants, inspection of pipes and drains, cutting off of water supply and connections to sewerage systems), • general requirements for the carrying out of water supply, sewerage and stormwater drainage work, • the installation, use and testing of water meters, • the use and misuse of water, and • the prohibition of joint sewerage services. The Regulation refers to the Plumbing and Drainage Code of Practice in relation to the laying of house service pipes.

Legislation	Summary of Requirements
Public Health Act, 2010	The Act requires drinking water suppliers to establish and adhere to a quality assurance program that addresses the Framework for Management of Drinking Water Quality (Australian Drinking Water Guidelines) by 1 September 2014. The Act gives NSW Health powers with respect to the provision of safe drinking water. These include powers to: • Require the issuing of advice to the public on the safety of a drinking water supply; • Require the correction of any misleading information issued to the public; • Enter and inspect premises of a supplier of drinking water; • Require testing of drinking water; • Require production of information including the results of testing; and • Order the rectification or closure of a water supply. The Act mandates compliance with the "health critical" elements of the Australian Drinking Water Guidelines in regional NSW. Division 1 of the Act deals with safety measures for drinking water and requires that: • Drinking water must be fit for human consumption; and • A supplier of drinking water must establish, and adhere to, a quality assurance program that complies with the requirements prescribed by the regulations. The regulations may make provision for water testing, maintenance of records.
Protection of the Environment Operations (POEO) Act, 1997	TSC and private businesses are required to exercise due diligence to avoid environmental impact. The Act addresses: • Penalties to individuals and corporations who cause pollution; • Council needs to develop operations emergency plans and due diligence plans to ensure that procedures are in place to prevent / minimise pollution; • A system is required to monitor operations, improve controls and reduce risks; • Council's officers, as well as the Council, may be liable for breaches of requirements; • Council has a duty to notify Office of Environment and Heritage of pollution incidents; • System licensing for sewerage systems (Scheduled Activity) including Pollution Reduction Program (PRP) requirements; and • Pollution from private systems - Local councils are the regulatory authorities for non-scheduled activities, except activities undertaken by a public authority which the EPA will regulate.
Water Management Act, 2000	This Act provides for the sustainable and integrated management of the water sources of NSW. The Act provides a framework for water sharing plans and environmental flows, sets out bulk water supply regimes, defines local water utility access licences and requires TSC to levy developer charges.
Catchment Management Authorities Act, 2003	The Northern Rivers Catchment Management Authority is the statutory body created in this Act relevant to TSC. CMA activities assist Council to protect water sources and reduce discharges from urban areas to the catchment. The Act gives the basis for the preparation of a CAP which sets the direction over a10 year timeframe for investment in natural resource management in the catchments.

Legislation	Summary of Requirements
Water Industry Competition Act 2006	The Act and regulations supporting its implementation (the Water Industry Competition (General) Regulation 2008 and the Water Industry Competition (Access to Infrastructure Services) Regulation 2007) commenced on 8 August 2008. The Act and regulations have been developed to encourage competition in the water industry and foster innovative recycling projects and dynamic efficiency in the provision of water and wastewater services. The provisions under the WIC Act include: • a new licensing regime for private sector providers of reticulated drinking water, recycled water and sewerage services • a third-party access regime for water and sewerage infrastructure • authorisation of the Independent Pricing and Regulatory Tribunal (IPART) to arbitrate certain sewer mining disputes. The WIC Act encourages competition and investment by: • promoting new water recycling businesses • establishing a comprehensive access regime to help new suppliers negotiate arrangements for the transportation and storage of water and sewerage using existing water networks • ensuring private schemes and the public water utilities face similar obligations, where like services are provided • providing equality between private and public water utilities for activities such as laying pipes in public roads and reading meters. In addition, the regulations set out strict licensing rules to ensure that drinking water meets Australian standards, that recycled water is 'fit for purpose', and that all services are delivered in a safe, reliable manner with minimal environmental impacts. It also includes provisions for customer protection and the implementation of NSW Government social policies, such as pensioner rebates. IPART administers the licensing regime and its functions include considering licence applications, recommending the terms or conditions of a licence to the Minister for Water, auditing and enforcing licences and arbitrating third-party access agreements.

Other relevant legislation includes:

- *Environmental Planning and Assessment (EP&A) Act, 1979* - The Act requires that all proposals, activities and functions which are investigated, designed, planned, constructed and operated by TSC should be studied during all stages of their environmental impact on the basis of scale, location and performance. Environmental impact assessments may also be required to satisfy Commonwealth legislation processes. The Act provides the basis for the preparation of environmental planning instruments (refer below);
- *Occupational Health and Safety Act, 2000* - The Acts places emphasis on risk management and consultation with staff to minimise work related accidents and health impacts. Council needs to train staff in safety issues and provide a safe working environment and supply equipment to ensure safety. Council and Council's officers may be liable for breaches of these requirements.
- *Independent Pricing and Regulatory Tribunal (IPART) Act, 1992* - Determination and advice on prices and pricing policy for government monopoly services.
- *Competition Policy including Competition Policy Reform Act, 1995* - Council is subject to prohibition on anti-competitive behaviour, according to the Trade Practices Act. The provision of services by a monopoly is subject to compliance with the National Water Commission (previously the National Competition Council).

A3.2 Environmental Planning Instruments

The *EP&A Act, 1979* provides a framework for the preparation of environmental planning instruments that may directly or indirectly impose requirements and obligations on TSC (Table A 8).

Table A 8: Environmental Planning Instruments

State Environmental Planning Policies (SEPPs)	
North Coast REP, deemed SEPP (1988)	This plan covers all of the North Coast LGAs. It identifies environmental features that are important to the region and provides a basis for new urban and rural development. The plan sets requirements for, and guides, the preparation and processing of local environmental plans and some forms of development.
State and Regional Development SEPP 2011	The State significant assessment system establishes two separate assessment pathways known as State significant development (SSD) and State significant infrastructure (SSI). Projects that fall into these categories are assessed by the Department of Planning and Infrastructure. The SEPP defines which projects come into the system. The SSD assessment system has been established to guide planning decisions on large-scale industrial, resource and other proposals and development in precincts identified as important for the State by the NSW Government.
SEPP 1 (Development Standards)	The aim of SEPP 1 is to provide councils with the flexibility to vary development standards contained within gazetted environmental planning instruments where it can be demonstrated that compliance with the development standard, in the particular circumstances of an individual development application, is unreasonable or unnecessary.
SEPP Infrastructure, 2007	Provides a consistent planning regime for infrastructure and the provision of services across NSW, along with providing for consultation with relevant public authorities during the assessment process. The SEPP supports greater flexibility in the location of infrastructure and service facilities along with improved regulatory certainty and efficiency The policy consolidates and updates 20 previous State planning instruments which included infrastructure provisions. It also includes specific planning provisions and development controls for 25 types of infrastructure works or facilities. The SEPP provides that STPs, sewage reticulation systems and water recycling facilities (including irrigation schemes) within prescribed zones do not require development consent, and thus require environmental assessment and approval under Part 5 of the EP&A, 1979.
SEPP 71 Coastal Protection	The policy has been made under the *Environmental Planning and Assessment Act 1979* to ensure that development in the NSW coastal zone is appropriate and suitably located, to ensure that there is a consistent and strategic approach to coastal planning and management and to ensure there is a clear development assessment framework for the coastal zone
SEPP 62 Sustainable Aquaculture	Encourages the sustainable expansion of the industry in NSW. The policy implements the regional strategies already developed by creating a simple approach to identity and categorise aquaculture development on the basis of its potential environmental impact. The SEPP also identifies aquaculture development as a designated development only where there are potential environmental risks.
SEPP 26 Littoral Rainforests	Protects littoral rainforests, a distinct type of rainforest well suited to harsh salt-laden and drying coastal winds. The policy requires that the likely effects of proposed development be thoroughly considered in an environmental impact statement. The policy applies to 'core' areas of littoral rainforest as well as a 100 metre wide 'buffer' area surrounding these core areas, except for residential land and areas to which SEPP No. 14 - Coastal Wetlands applies.

State Environmental Planning Policies (SEPPs)	
SEPP 19 Bushland in Urban Areas	Protects and preserves bushland within certain urban areas, as part of the natural heritage or for recreational, educational and scientific purposes. The policy is designed to protect bushland in public open space zones and reservations, and to ensure that bush preservation is given a high priority when local environmental plans for urban development are prepared.
SEPP 14 Coastal Wetlands	Ensures coastal wetlands are preserved and protected for environmental and economic reasons. The policy applies to local government areas outside the Sydney metropolitan area that front the Pacific Ocean. Land clearing, levee construction, drainage work or filling may only be carried out within these wetlands with the consent of the local council and the agreement of the Director General of the Department and Planning. Such development also requires an environmental impact statement to be lodged with a development application.
Remediation of Land, 1998	TSC must ensure contaminated land undergoes remediation before it is developed through the application of land remediation guidelines. The appropriate management and remediation of contaminated sites will minimise the risk of contamination of waterways.
Housing for Seniors or People with a Disability, 2004	The implementation of this SEPP may potentially increase the system demand in existing water and sewerage service areas as a result of higher density development.
Coastal Protection	The policy aims to ensure that development in the NSW coastal zone is appropriate and suitably located, to ensure that there is a consistent and strategic approach to coastal planning and management and to ensure there is a clear development assessment framework for the coastal zone.
SEPP No. 65 - Design Quality of Residential Flat Development	The policy raises the design quality of residential flat development across the state through the application of a series of design principles.

Local Environmental Plans (LEPs)	
Tweed LEP	The Tweed Shire Council's major local planning instrument is Tweed Local Environmental Plan 2000, which is a Shire wide LEP. Tweed LEP 2000 currently zones a range of areas for various urban land uses. It provides the main statutory basis for future development and is the statutory instrument that has been used to implement the existing Residential Development Strategy, 1992 (through the rezoning process). It sets the basis for the existing stock of zoned and developed or undeveloped land that needs to be considered in assessing the long term requirements for urban land in Tweed Shire. Tweed Shire Council is currently reviewing Tweed LEP 2000 to create an LEP that is consistent with the Standard LEP issued by the State Government in March 2006.

Development Control Plans (DCPs)	
Tweed DCP	Development Control Plans (DCPs) are created by Council under the provisions of the EP&A Act. They deal in more detail with selected areas of the Shire or with selected issues that apply across all of the Shire. In 2007 Council consolidated all of its DCP's into a single document consistent with the approach recommended by the State government. It is likely that Council will review the content of its DCP's over the next few years as it updates its planning instruments.

A3.3 Water Sharing Plans and Licences

The Water Management Act, 2000 requires the implementation of ten-year plans defining water sharing arrangements between the environment and water users. Water Sharing Plans (WSPs) are progressively being developed for rivers and groundwater systems in NSW following the introduction of the Act. WSPs set rules for sharing water between the water users and environmental needs of the river or aquifer, and also between the different types of water use such as town water supply, stock watering, rural domestic supply, irrigation and industry. The aim of the water sharing plans is:

- To protect the fundamental environmental health of the water source;
- To ensure that the water source is sustainable in the long-term; and
- To provide water users with a clear picture of when and how water will be available for extraction.

Under the *Water Management Act 2000*, all existing *Water Act 1912* licences are converted to Water Access Licences (WAL) following the commencement of a WSP. Specific purpose category WALs (such as local water utility, domestic and stock and Aboriginal cultural) provide higher priority access to water than licences for general security.

WALs have a share component and an extraction component. Licence holders must comply with both the share and extraction components.

Total daily extraction limits (TDELs) may be specified in the WSP. The TDEL establishes the maximum daily volume of water that can be taken from a water source (or catchment zone) for each flow class. TDELs establish a consumptive pool share of the available water and allow groups of licence holders to work together under a TDEL applying to that group, so that individuals can extract daily volumes they require, as long as the group does not exceed the cumulative TDEL. This allows extractions to be managed across a range of stream flow and allows groups of licence holders to work together under a TDEL applying to that group, so that some individuals can extract daily volumes in excess of what would otherwise be their individual IDEL, as long as the group does not exceed their cumulative TDEL (NSW Office of Water, 2011e). The overall aim is to reduce the total volume of water extracted during low flows and enable more extraction from higher, less environmentally sensitive stream flows, utilising off-stream storages.

Individual daily extraction limits (IDEL) may also be specified in a WAL. An IDEL is the maximum daily volume of water that an individual WAL holder can extract from a water source for each flow class.

A3.3.1 Water Sharing Plan Tweed River Area Unregulated and Alluvial Water Sources

The *Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2010* covers 31 water sources that are grouped into three extraction management units (EMU). The key focus of the water sharing plan is the:

- Environmental water rules – the share of the water reserved for the environment;
- Access rules – which determine when extraction is allowed (for example above a set river flow rate); and
- Dealing rules – which control the trade of water, both the transfer of share components of an access licence and assignment of water allocation between access licences, as well as changing the location for water extraction.

The water sharing plan recognises the economic benefits to the region that are generated by commercial users such as irrigators and industry. It sets rules so that commercial users can continue to operate productively. Thirteen of the water sources covered by the plan were classified as being of high economic significance to local communities due to their dependence on commercial extraction (Office of Water,

2010a). The Byrill Creek and Mid Tweed River were also assessed as having high instream value, based on the presence of threatened species, current condition, diversity and surrounding land uses.

The water sharing plan provides for the sharing of water between the environment, town water supplies, basic landholder rights and commercial uses of water. The volume of water available to meet all competing environmental and extractive needs varies on a yearly and daily basis, depending on the weather and river flows (Office of Water, 2010b). To manage water on a day to day basis the plan defines daily access rules that govern when licence holders are permitted to extract water. As a minimum, licence holders cannot pump when there is no visible flow at their pump site. Depending on the assessments of instream value and hydrologic stress, some of the water sources are also divided into one or more flow classes.

Each year, available water determinations (AWD) will be made defining how much of the share component will be available under each category of licence. Under the water sharing plan, specific purpose access licences, such as domestic and stock or local water utility access licences, will generally receive 100 per cent of their share component, although in years of exceptional drought the daily access rules may limit extraction to the extent that annual entitlement cannot be fully realised.

Council holds WALs for Bray Park, Uki and Tyalgum water sources. The share components of TSC local water utility access licences authorised to take water from these water sources are 27,567 ML/year in the Mid Tweed River Water Source (Tweed – 27,500 ML/a, Uki – 67 ML/a) and 46 ML/a in the Upper Oxley River Water Source (Tyalgum system).

Clause 29 of the WSP specifies operational rules for local water utility storages:

- A daily release of water shall be made from Clarrie Hall Dam in the Doon Doon Creek Water Source (inclusive of any release for local water utility purposes) into Doon Doon Creek which is equal to or greater than:

  (a) 1 ML/day when flow at the flow reference point is at or less than 3 ML/day (95th percentile flow);

  (b) 2 ML/day when flow at the flow reference point is greater than 3 ML/day and less than 13 ML/day (80th percentile flow), and

  (c) 4 ML/day when flow at the flow reference point is at or greater than 13 ML/day.

  The flow reference point is the flow of water measured at the Eungella gauge until sufficient stream flow data is available to calibrate the new Tweed River Palmers Road gauge.

- A daily release of water shall be made from Bray Park Weir in the Mid Tweed River Water Source through the fish ladder(s) on Bray Park Weir which is equal to or greater than:

  (a) 8 ML/day when the volume of water in Clarrie Hall Dam water storage is at or greater than 75% of full capacity,

  (b) 5 ML/day when the volume of water in Clarrie Hall Dam water storage is less than 75% and greater than 50% of full capacity, and

  (c) 3 ML/day when the volume of water in Clarrie Hall Dam water storage is at or less than 50% of full capacity.

  Note. Clarrie Hall Dam is at full capacity when the water level in that dam is at 61.5 metres AHD.

- These do not apply where the Minister is satisfied that the releases cannot be made due to:

  (a) an emergency situation, or

  (b) a maintenance activity that has the potential to temporarily affect the flow rate or behaviour of water for a period of more than 24 hours.

The WALs also specify the monitoring and reporting requirements and specific requirements for control of noxious aquatic weeds and a fishway management plan for the Bray Park system.

A3.4 Australian Drinking Water Guidelines

The Australian Drinking Water Guidelines (ADWG) were developed by the National Health and Medical Research Council (NHMRC) and the Natural Resource Management Ministerial Council (NRMMC). The ADWG is designed to provide an authoritative reference on what defines safe, good quality water and how it can be achieved and assured. The ADWG provides a framework for good management of drinking water supplies, which will assure safety at point of use when correctly implemented.

The ADWG provide a basis for determining the quality of water to be supplied to consumers in all parts of Australia. These determinations need to consider the diverse array of regional or local factors, and take into account economic, political and cultural issues, including customer expectations and willingness and ability to pay. The *Public Health Act, 2010* and *Regulation 2012* require water utilities to prepare and implement a risk-based drinking water quality management plan in accordance with the ADWG. The ADWG was updated in 2011.

The Framework for Management of Drinking Water Quality is a preventive management approach that encompasses all steps in water production from catchment to consumer. The Framework incorporates a preventive risk management approach including elements of the Hazard Analysis and Critical Control Point (HACCP) system, Australian and International Standards (ISO 9001 and AS/NZS 4360), but applies them in a drinking water supply context to support consistent and comprehensive implementation by suppliers.

The coverage of the framework includes all aspects of supply from catchment to consumer and all water products, systems and organisational responsibilities.

A3.5 Environment Protection Licences

Sewage systems with capacity greater than 2,500 persons or 750 kL/d are scheduled activities which are required to be licensed under the POEO Act. Council holds Environment Protection Licences for all WWTPs.

TSC is required to comply with load limits and concentration and volume limits are specified for the effluent quality monitoring points. Concentrations of pollutants are also monitored at the ambient water monitoring sites. The WWTP licences also require TSC to monitor and record:

- Pollution complaints;
- STP bypasses;
- Biosolids; and
- Sewer overflows to the environment.

Under the licences, TSC is required to produce annual return documents, notify of any harm to the environment as a result of the sewerage system operation, provide written reports as requested by the authority, notify of bypass or overflow incidents and supply annual performance reports. The licences include pollution reduction programs (PRPs) and Special Conditions if required improvements to operation of the sewerage systems have been identified.

A4. STATE GOVERNMENT POLICY

A4.1 NSW Government Sea Level Rise Policy Statement, 2009

To support sea level rise adaptation, the NSW Government has prepared a Sea Level Rise Policy Statement. This sets out the Government's approach to sea level rise, the risks to property owners from coastal processes and assistance that Government provides to councils to reduce the risks of coastal hazards.

The Policy Statement includes sea level planning benchmarks which have been developed to support consistent consideration of sea level rise in land-use planning and coastal investment decision-making. The adopted benchmarks are for a rise relative to 1990 mean sea levels of 40 cm by 2050 and 90 cm by 2100. These benchmarks represent the Government's guidance on sea level rise projections for use in decision-making.

A4.2 Water Quality and River Flow Objectives

The ANZECC Guidelines for Fresh and Marine Water Quality (2000) provide a framework for conserving ambient water quality in rivers, lakes, estuaries and marine waters. This framework is used to develop water quality and river flow objectives.

The EPA has developed water quality and river flow objectives for the Tweed River Catchment. Each objective aims to improve river health by recognising the importance of natural river flow patterns. Councils are required to consider these environmental values and long-term goals when assessing and managing the likely impact of its activities on waterways.

The objectives were developed in a whole of government process lead by DECCW. Objectives were developed through extensive community consultation and are intended to assist resource managers in assessing and setting targets for environmental values with associated water quality indicators defined by ANZECC.

There are eleven water quality objectives that provide reference levels to guide water quality planning and management. The objectives consist of three parts, environmental values, their indicators, and their numerical criteria. Environmental values outline values and beneficial uses of the environment that are important to a community. The primary contact recreation environmental value for example, includes swimming or any activity with a likelihood of water being swallowed. The indicators provide a measurement of specific environmental trends while the criteria provide the framework for measuring how close current water quality is to meeting the desired levels.

A4.3 National Water Initiative and Best-Practice Management

The National Water Initiative (NWI) agreement is Australia’s blueprint for national water reform. The agreement has been signed by all State governments. It provides objectives, outcomes and agreed actions to be undertaken by state and local governments across all aspects of water management.

TSC is required to demonstrate compliance with the NWI by encouraging best-practice through effective, efficient and sustainable water supply and sewerage businesses. The *Best Practice Management of Water Supply and Sewerage Guidelines* (DWE, 2007) were prepared to encourage continuing improvement in performance and identify criteria for best practice management of water supply and sewerage. Substantial compliance with the Best-Practice Guidelines is a pre-requisite for State Government financial assistance towards the capital cost of backlog water supply and sewerage infrastructure and for payment of a dividend from the surplus of the water supply or sewerage business to the council’s general revenue. Compliance with the Best-Practice Management Guidelines is also a requirement of the Division of Local Government’s

Planning and Reporting Manual. To facilitate council reporting under the NSW Local Government Integrated Planning and Reporting Framework, the strategic business plan are now required to provide input to the 10-year Community Strategic Plan, the 4-year Delivery Program and the Annual Operational Plan.

There are six criteria TSC needs to complete to demonstrate best-practice management of water and sewerage businesses (Table A 9). In 2010/11, Council complied with 100% of the best practice requirements for water supply and 100% for sewerage (NSW Office of Water, 2012).

Table A 9: Compliance with Best-Practice Management Requirements

Criteria	Summary of Requirements	Current Status – Water Supply	Current Status – Sewerage
Strategic Business Planning	A current, sound Strategic Business Plan (SBP). A robust 20-year financial plan which includes a capital works plan and identifies the lowest possible typical residential bill (TRB).	The 2006 Activity Management Plan is currently being updated	The 2006 Activity Management Plan is currently being updated
Pricing (including Developer Charges, Liquid Trade Waste Policy and Approvals)	Full cost recovery for water supply and sewerage businesses. Appropriate tariffs without significant cross-subsidies. Total annual income and projected TRB should be consistent with the financial plan, generally resulting in a positive economic real rate of return (ERRR). Water supply tariff with appropriate water usage charge/kL based on long-run marginal cost, access charge relative to a customer's capacity requirements, step price increase for high water consuming residential customers. At least 75% of residential revenue generated through usage charges by June 2008 and at least 60% by June 2007. Appropriate sewerage tariff with uniform residential bill and a two-part tariff to non-residential customers. Complying liquid trade waste fees and charges for all liquid trade waste dischargers. Liquid trade waste approval issued to each trade waste discharger. Development Servicing Plan with commercial developer charges. For dual supply systems with non-potable component, LWUs are encouraged to install water meters and apply an appropriate non-potable water usage charge per kL based on long run marginal cost and access charge relative to customer's capacity requirements.	Substantially compliant (refer Section A7.2.6). The DSP was adopted in 2007 and will be updated in 2013. Non-compliant. Each unit in a multi-residential property is required to have a 20mm service connection. For non-potable component the usage charge is to be based on long-run marginal cost and access charge to be relative to a customer's capacity requirements with at least 50% of residential revenue generated through usage charges.	Council will adopt a Trade Waste Policy with sewage discharge allowance phased-out over 3 years. The DSP was adopted in 2007 and will be updated in 2013

Criteria	Summary of Requirements	Current Status – Water Supply	Current Status – Sewerage
Water Conservation	Sound water conservation and demand management in place, involving appropriate demand forecasting, monitoring and management and subsidy of at least 2 of the identified demand management initiatives.	Compliant. Refer Demand Management Strategy (Section A7.2)	-
Drought Management	Sound drought management implemented in accordance with the adopted schedule of trigger points for implementation of water restrictions.	Compliant. Refer Drought Management Strategy (Section A7.4)	-
Performance Monitoring	Completed performance reporting forms to DWE by 15 September each year. Performance reported data audited in an independent, rigorous and comparable manner. Review 2-page LWU Performance Report and prepare Action Plan.	Undertaken annually	
Integrated Water Cycle Management (IWCM)	Completion of IWCM Evaluation by June 2007. Completion of IWCM Strategy by June 2008. Implementation of IWCM in accordance with the Strategy by June 2008.	Compliant. Adopted in 2006. This 6 year review.	

A5. URBAN WATER REFORM

Urban water reform is being investigated by State and Federal Governments. The outcomes of the inquiries are likely to affect the delivery of water and wastewater services in Tweed Shire.

A5.1 NOROC Regional Bulk Water Supply Strategy

The Northern Rivers Regional Organisation of Councils (NOROC) has identified the need for a cooperative approach and innovative resource sharing initiatives to ensuring long-term future water demands within the Northern Rivers region will be met. The NOROC Water Managers Group has developed a Memorandum of Understanding (MOU) to provide a foundation for developing a voluntary, co-operative partnership between the member Councils to deliver best practice water supply and sewerage services to the Northern Rivers region of New South Wales and to optimise shared resources (staff, equipment, materials, specialist knowledge and capabilities). A targeted short-term objective under this MOU is the development of a regional water supply strategy incorporating integrated water cycle management criteria, based on a 50-year planning horizon.

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

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

Each local water utility (LWU) is continually reviewing and implementing its strategic planning initiatives to ensure continuing water supply security within its own local government area. Through consideration of water supply from a regional perspective, potential cost and supply efficiencies may be obtained.

The complementary regional approach to water supply delivery will be developed with the following broad objectives:

- To implement sustainable integrated water cycle management principles across the region;
- To provide for long-term drought security across the region;
- To provide a cohesive and consistent approach to water supply planning within the region;
- To provide long-term regional efficiencies in service delivery;
- To investigate the legitimacy of the local approaches and to explore any advantages or disadvantages that may result from integration and regionalisation of the individual LWU approaches to bulk water supply; and
- To further develop the partnership between the local Councils and the State Government in relation to regional water supply.

Specific aims of the strategy are:

- To determine the region’s water supply capacity in relation to long-term water demand;

- To explore cost-effective opportunities for system integration to provide long-term water supply security; and
- To recommend an integrated regional approach to the provision of bulk water supply for the long term.

The outcomes of the NOROC BWSS will provide input into TSC's IWCM Strategy and vice versa.

A5.2 Inquiry into the adequacy of water storages in NSW

The Standing Committee on State Development has commenced an inquiry into the adequacy of water storages in NSW, and in particular:

- The capacity of existing water storages to meet agricultural, urban, industrial and environmental needs;
- Models for determining water requirements for the agricultural, urban, industrial and environmental sectors;
- Storage management practices to optimise water supply to the agricultural, urban, industrial and environmental sectors;
- Proposals for the construction and/or augmentation of water storages in NSW with regard to storage efficiency, engineering feasibility, safety, community support and cost benefit;
- Water storages and management practices in other Australian and international jurisdictions; and
- Any other matter relating to the adequacy of water storages in NSW.

A5.3 Review of Water Supply and Sewerage Services in Regional NSW

In October 2007, the NSW Minister for Water Utilities announced a review to identify the most appropriate structural and regulatory arrangements for the provision of water supply and sewerage services in regional NSW. The Inquiry Panel received written submissions and conducted public hearings.

The Inquiry Panel provided a Report to the Minister in December 2008. Key recommendations of the report are:

- Improve Regulation - The regulation of local water utilities be strengthened to require utilities to implement all relevant plans, guidelines and standards. This must be complemented by an adequate reporting and monitoring framework and the designation of a regulator with adequate enforcement powers;
- Improve Pricing - The regulation of local water utilities' pricing be strengthened to require utilities to establish prices in accordance with approved business plans and financial plans. Local water utility prices must be approved by an independent body. This body could be a government agency such as the Department of Water and Energy;
- Cut Red Tape - The reporting and regulatory roles undertaken by State Government agencies be reviewed with a view to streamlining these requirements and to ensure a consistent approach across these agencies;
- Consumer Protection - The Energy and Water Ombudsman NSW scheme be adopted by local water utilities as a mandatory requirement, provided it can be demonstrated that there are net benefits in doing so; and
- Skills Shortages - Several options could be implemented simultaneously to manage and mitigate future skills shortages.

The NSW Government is yet to respond to the Independent Inquiry Report although the timeframe is not known.

A5.4 Regional Towns Water Quality and Security Review

Infrastructure Australia commissioned a report (Aecom, 2011a) to help identify opportunities to improve Australia's regional towns' water quality and security and to form practical recommendations for change at the federal, state and local government levels. Infrastructure Australia's initial infrastructure audit identified concerns that in many regional towns, water quality does not always meet health standards and that planning for security is often inadequate. The review looked at a sample of towns across Australia with populations between 2,000 and 15,000 and with a reticulated water supply.

The report outlines the problems, analyses their causes, explores options and recommends a range of solutions. The key recommendations are to:

- Mandate compliance with Australian Drinking Water Guidelines through legislation or regulation;
- Implement a nationally consistent Best Practice Management Framework for all regional water utilities;
- Move toward more cost reflective pricing water pricing;
- Develop a more highly skilled workforce to operate and maintain water systems in regional water utilities by developing a nationally consistent trade qualification; and
- Reform the governance structure of regional water utilities in NSW and Queensland.

Infrastructure Australia is now developing a plan of action to respond to the findings and recommendations in the report.

A5.5 Productivity Commission Inquiry into examining the case for microeconomic reform in Australia's urban water sector

The Australian Government has asked the Productivity Commission to examine the case for microeconomic reform in the urban water sector and to identify pathways to achieving improved resource allocation and efficiency. The terms of reference are:

- Identify opportunities for efficiency gains through changes to structural, institutional, regulatory, and other arrangements in the Australian urban water and wastewater sector;
- Provide options to achieve the identified efficiency gains, and quantitatively assess these options; and
- Propose a work program, including priority areas and implementation plans.

The Inquiry considers:

- The role of governments in water services;
- Regulation of the urban water sector;
- Water, wastewater and stormwater services;
- Pricing;
- Non-price demand management;
- Affordability and consumer protection; and
- Options for reform.

A6. REGIONAL MANAGEMENT PLANS

A6.1 NRCMA Catchment Action Plan

The 2006 Northern Rivers Catchment Action Plan (CAP) has been developed by the Northern Rivers Catchment Management Authority (NRCMA) under the *Catchment Management Authorities Act, 2003* (NRCMA, 2007). The Plan sets a 10-year investment strategy for targeted investment for the region which extends over most of the NSW North Coast, from the Camden Haven River in the south to the Queensland border in the north and extending west to the Northern Tablelands. The CAP is the central mechanism to prioritise and deliver natural resource management investment and outcomes to the community of the Northern Rivers region.

The CAP draws together targets outlined in three previous Catchment Blueprints that have been reviewed and evaluated through a facilitated process of stakeholder engagement. Targets aim to improve the natural assets such as water, coastal landscapes and estuaries, the marine environment, soil, cultural heritage and biodiversity. The CAP also promotes the value of communities in the catchment, and aims to capture the communities' priorities and aspirations for the protection and enhancement of natural resources in the region.

The CAP outlines many varied approaches to achieve targets, the majority of which rely on voluntary input from landholders and other stakeholders. The CAP also provides priorities to guide a range of other processes including local government and NSW Government regulatory processes.

The CAP is being reviewed during 2012/13 as directed by the NSW Natural Resources Commission.

A6.2 Far North Coast Regional Strategy

The Far North Coast Regional Strategy was prepared by the Department of Planning in 2006. It is intended to guide local planning in the six local government areas of Ballina, Byron, Kyogle, Lismore, Richmond Valley and Tweed, and inform decisions on service and infrastructure delivery. It will be reviewed every five years.

The purpose of the Regional Strategy is to manage the Region's expected high growth rate in a sustainable manner (DoP, 2006). The Strategy recognises the potential impacts on the Region from the rapid growth of South East Queensland. It sets out a regional hierarchy of centres and specifically identifies Tweed Heads as a major regional centre. The revitalisation of Tweed Heads Town Centre (CBD) will become the focus for the Tweed urban area enabling it to provide a high level of services, employment and housing to complement those provided in the adjoining South East Queensland Region. Tweed Heads will also continue to develop as a major regional centre for tourism and the provision of retail services and community facilities. Additionally, the strategy identifies that the Tweed LGA currently has 34,650 existing dwellings and by the year 2031 Council should be planning to provide an additional 19,100 dwellings in the Tweed LGA (DoP, 2006). Assuming an average occupancy rate of 2.4 persons per dwelling this is an average growth rate of approximately 1,800 persons per year over the next 25 years. It suggests that 60 % of this additional growth should take place in coastal locations (generally east of the Pacific Highway) and 40% in non-coastal areas, however this is taken across the whole region, not just Tweed Shire.

A7. COUNCIL MANAGEMENT PLANS, STRATEGIES AND POLICIES

A7.1 Urban and Employment Land Release Strategy

The 2009 Urban and Employment Land Release Strategy was prepared as Council's Local Growth Management Strategy in response to the 2006 Far North Coast Regional Strategy (NSW Department of Planning). The Strategy guides and manages future urban development within the Shire until at least 2031.

The Strategy predicts the Shire population will increase from 83,023 in 2006 to 118,754 persons in 2031 (1.4% p.a. growth between 2006 and 2031). The supply of land and housing to meet future demand will come from a combination of sources:

- Vacant lots within existing zoned residential subdivisions;
- Residential zoned land that is yet to be subdivided;
- Redevelopment of existing residential or other properties; and
- Rezoning of new land for residential purposes ("Greenfield sites").

The land supply statistics suggest the dwelling yield from existing residential zoned land is 20,210 dwellings accommodating 46,247 persons. Further residential land is available from Greenfield sites.

The strategy identifies water supply and sewerage infrastructure constraints as well as environmental constraints and opportunities to determine land suitability.

A7.2 Demand Management Strategy

The Demand Management Strategy (DMS, MWH, 2009a) was developed in two stages. Stage 1 (Interim Strategy) was adopted by Council on 27 January 2009 and focussed predominantly on the residential sector. Stage 2 focussed on the evaluation of water demand management measures for the non-residential sector. A summary of the DMS is given below.

A7.2.1 Baseline Demand Forecast

The population forecast used in the DMS is given in Table A 10. Population was estimated to more than double in the next 30 years and of this growth 66,000 would be housed in Greenfield areas, providing a significant opportunity for the implementation of measures such as rainwater tanks and efficient fixtures and fittings.

Table A 10: Serviced (Water) Residential Population Projection

ESTIMATED POPULATION	2006	2011	2021	2031	2036	2041
Existing Serviced Population	73,185	71,966	69,018	66,044	64,854	64,854
Projected Infill Population	0	6,951	16,402	22,435	25,896	28,461
Major Development Areas						
Bilambil Heights	*0*	*0*	*2,934*	*5,609*	*6,881*	*6,881*
Cobaki Lakes	*0*	*0*	*4,454*	*8,525*	*10,464*	*10,464*
Kings Forest	*0*	*0*	*4,640*	*8,880*	*10,900*	*10,900*
Terranora Area A	*0*	*0*	*1,300*	*2,498*	*3,071*	*3,071*
West Kingscliff	*0*	*0*	*1,158*	*2,197*	*2,687*	*2,687*
Total of Major Development Areas	0	0	14,486	27,709	34,003	34,003
Greenfield outside Major Areas	0	6,182	19,540	27,301	32,295	36,395
Tweed Shire Total	**73,185**	**85,099**	**119,446**	**143,488**	**157,048**	**163,714**

Source: MWH (2009a)

Non-residential account projections are summarised in Table A 11.

Table A 11: Serviced (Water) Non-Residential Account Projection

	NUMBER OF ACCOUNTS							ADOPTED GROWTH RATE
SECTOR	2008	2013	2018	2023	2028	2033	2038	
Bulk Sales	103	121	143	165	177	193	207	As per population growth
Commercial	830	975	1,151	1,330	1,429	1,558	1,672	
Industrial	152	160	168	178	185	195	205	1% per annum
Public Uses	422	496	585	676	727	792	850	As per population growth
Rural	13	13	13	13	13	13	13	0%
Sewer	162	190	225	260	279	304	326	As per population growth
TOTAL	**1,682**	**1,955**	**2,284**	**2,623**	**2,811**	**3,055**	**3,273**	

Source: MWH (2009a)

The volume of Non-Revenue Water (NRW) was determined as the difference between total water production (treated water from the Bray Park Water Treatment Plant) and total water consumption (as measured at customer meters). For the purposes of the DMS a baseline NRW level of 13% of the total production was adopted for future demand modelling and assessment.

The MWH “Decision Support System” (DSS) was used to develop a detailed demand forecast. The DSS is an end use model, designed for assessing baseline water demand forecasts as well as for evaluating various demand management, water use efficiency or source substitution (e.g. rainwater tanks or recycled water) measures. The Baseline Forecast (Figure A 3) is based on current and future predicted market share of fixtures without the impact of WELS or BASIX. The total annual demand predicted in 2036 for the baseline

scenario is 19,804 ML/a. Since the original forecast was determined in 2006, the overall demand has continued to decrease despite continued population growth and the removal of climate influences (MWH, 2009a).

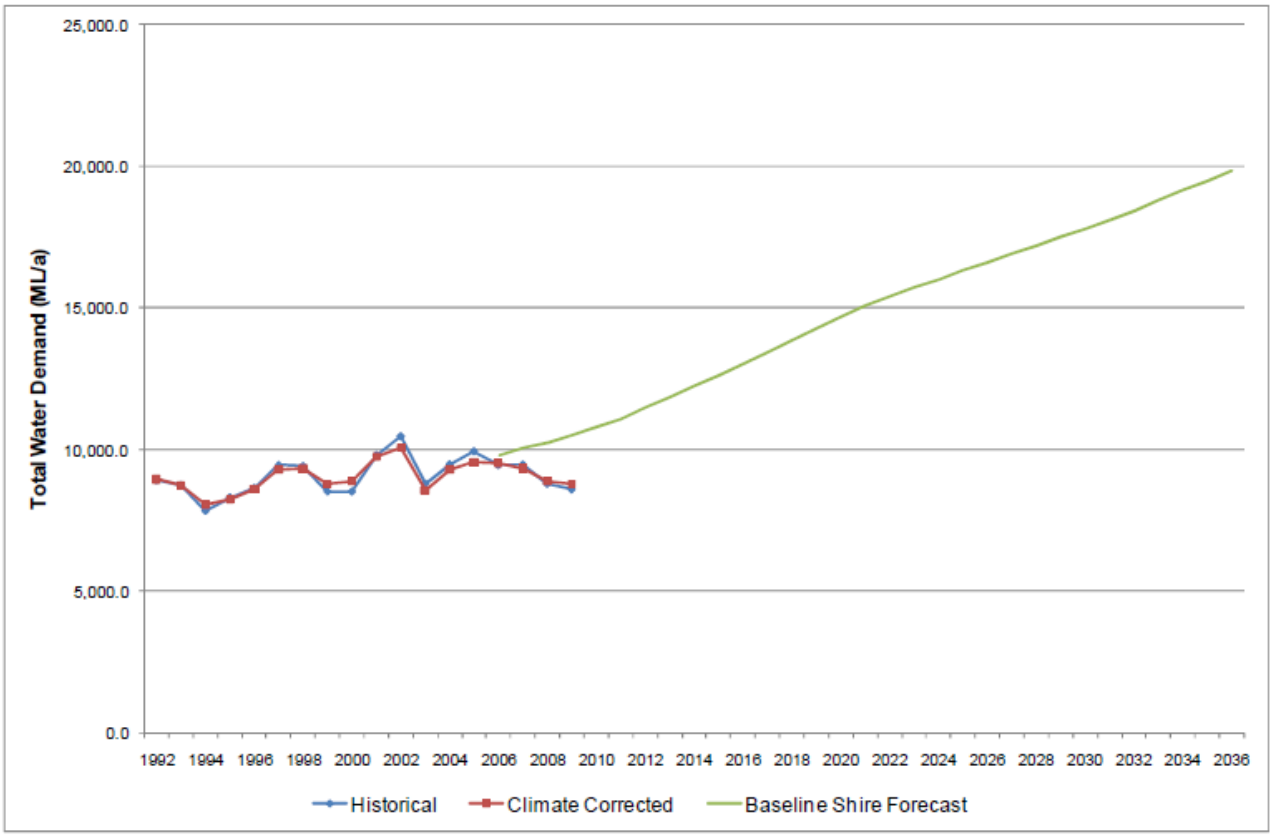

Figure A 3: Total Annual Demand – Baseline Forecast

Source: MWH (2009a)

The baseline demand per capita based on total production is shown in Table A 12 and Figure A 4. This includes historical (observed) demand and climate corrected demand although no data on the influence of the climate variables is provided in MWH (2009a).

Table A 12: Total per capita Baseline Demand Forecast

	PER PERSON WATER DEMAND (L/PERSON/DAY)						
	2006	2011	2016	2021	2026	2031	2036
Total Demand per Capita (includes NRW)	367	310	288	276	269	264	259

Source: MWH (2009a)

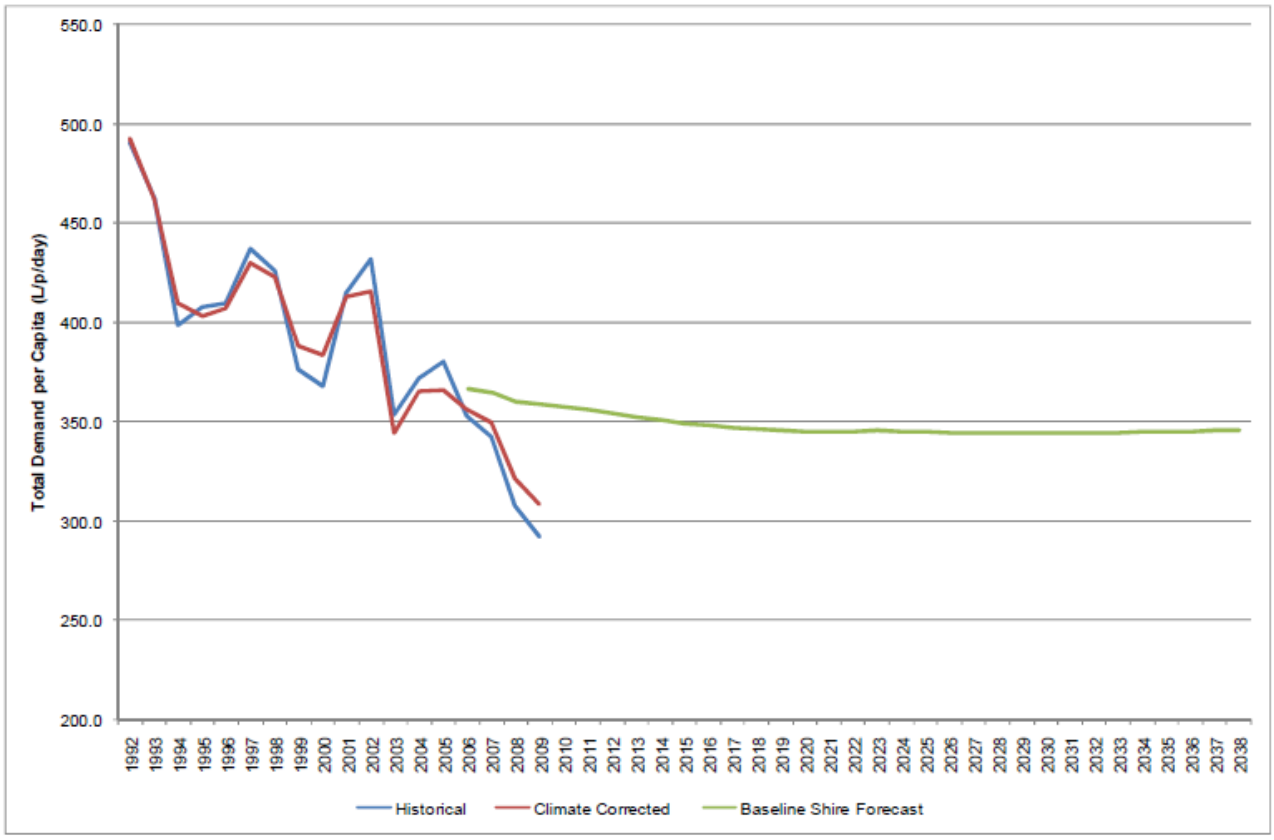

Figure A 4: Total per Capita Demand – Baseline Forecast

Source: MWH (2009a)

A7.2.2 Managed Demand Scenarios - Greenfield Areas

Five demand scenarios were considered for the major greenfield development areas of Cobaki Lakes, Bilambil Heights, Terranora Area A, West Kingscliff and Kings Forest. The scenarios reviewed were (MWH, 2009a):

- Greenfield Development Scenario 1 – Implementation of BASIX including a 5,000 L rainwater tank connected to external uses, toilet flushing and cold water to the washing machine;
- Greenfield Development Scenario 2 – BASIX (without rainwater tanks) together with recycled water for external use and toilet flushing;
- Greenfield Development Scenario 3 – BASIX with a 5,000 L rainwater tank for internal uses and recycled water for external uses;
- Greenfield Development Scenario 4 – Indirect Potable Reuse combined with rainwater tanks to further lower the reliance on dam sources; and
- Greenfield Development Scenario 5 – A fourth pipe system that would collect and treat greywater and blackwater separately for recycling of greywater to households and blackwater to open space.

A detailed assessment of the infrastructure and demand impacts was undertaken for Scenarios 1 to 4. Scenario 5 was not considered in detail due to the number of operational issues and higher capital and on-going costs associated with such a system. The assessment was used to perform a triple bottom line assessment to guide the recommendation of a preferred option for Greenfield development area demand management. Greenfield Development Scenario 1 (implementation of BASIX including a 5,000 L rainwater tank connected to external uses, toilet flushing and cold water to the washing machine) was recommended for the Cobaki Lakes, Bilambil Heights, Terranora and Kings Forest developments. This scenario was selected as it demonstrated the lowest costs to community, best return on investment, modest environmental

impacts and expected broad community acceptance in comparison to Scenarios 2 and 3. For West Kingscliff (Greenfield), MWH (2009a) recommended that recycled water be made available if there is a sufficient level of end use in the industrial land uses (due to its proximity to the WWTP).

A7.2.3 Managed Demand Scenarios – Whole of Council

Demand scenarios comprising a range of water efficiency measures, source substitution and water loss management were developed and assessed in the DMS for the remainder of the Shire. A summary of demand management measures included in each scenario is given in Table A 13.

Table A 13: Demand Management Measures Included in each Scenario

	SCENARIO			
SECTOR	1	2	3	4
Residential				
BASIX Fixtures and WELS	✓	✓	✓	✓
BASIX - Internal/External Rainwater Tank (5kL)	✓	✓	✓	✓
Inclining Block Tariff			✓	✓
Residential Education Program			✓	✓
Landscape Use Efficiency Awards			✓	✓
Residential Rebate Program - Showerheads			✓	✓
Residential Retrofit			✓	✓
NRW				
Pressure and Leakage Management Program		✓	✓	✓
Non-residential				
Major Users Audit				✓
Commercial Business Water Audit Program				✓
Aged Care Audit				✓
TSC Open Space Irrigation Audit				✓
Waterwise Non-residential Education				✓
Training Landscape Managers				✓
Non-res Efficient Fittings Regulation and Management				✓

Source: MWH (2009a)

The managed total demand forecast for each scenario is given in Table A 14 and Figure A 5. The managed per capita demand forecast for each scenario is given in Figure A 6.

Table A 14: Total Annual Demand Forecasts

	2006	2011	2016	2021	2026	2031	2036
Baseline Forecast	9,804	11,084	13,036	15,055	16,581	18,077	19,804
Scenario 1 – BASIX / WELS	9,804	10,471	11,987	13,395	14,457	15,479	16,653
Scenario 2 - BASIX /WELS and Loss Management Program	9,804	10,028	11,449	12,767	13,765	14,725	15,827
Scenario 3 – Scenario 2 plus Active Demand Management Options	9,804	9,845	11,182	12,508	13,511	14,474	15,577
Scenario 4 – Scenario 3 plus Non Residential Demand Management	9,804	9,649	10,788	15,055	12,950	13,839	14,859

Source: MWH (2009a)

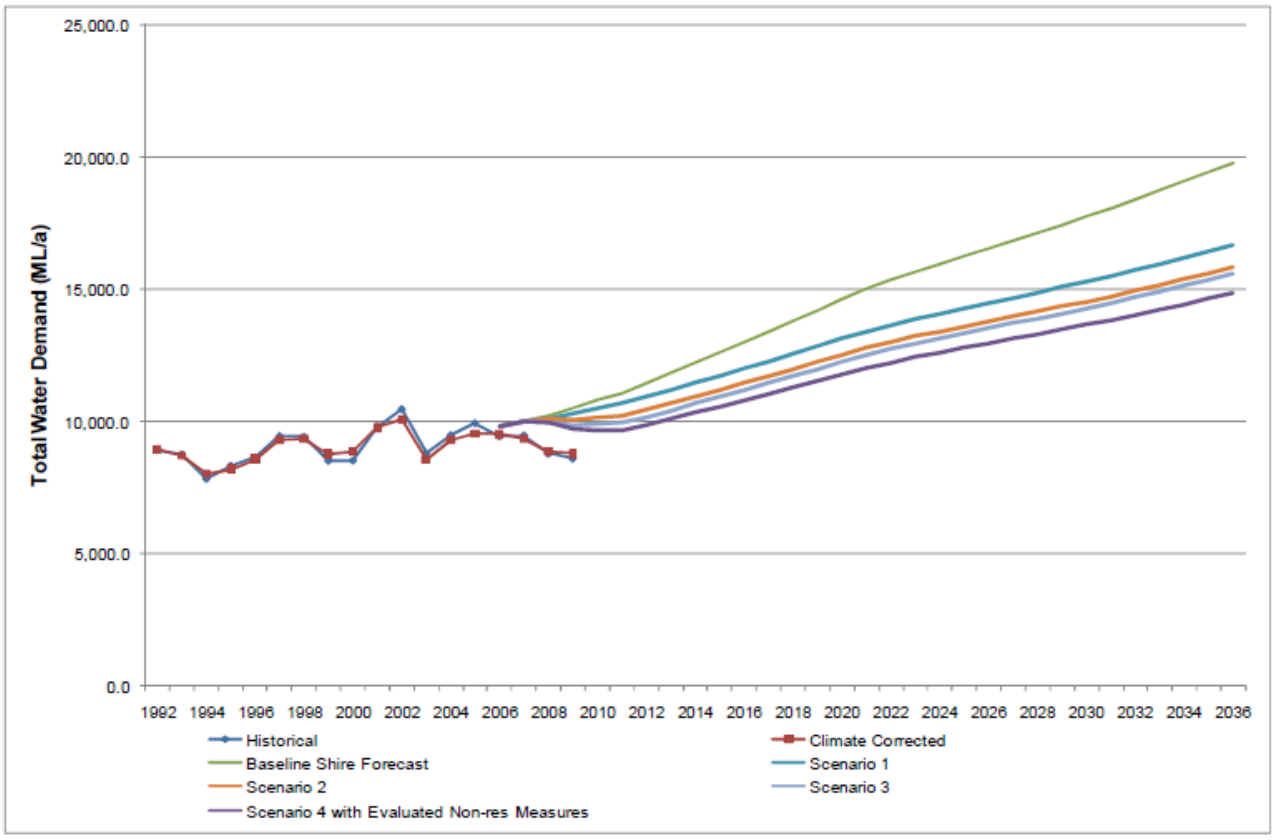

Figure A 5: Total Annual Demand – Managed Forecast

Source: MWH (2009a)

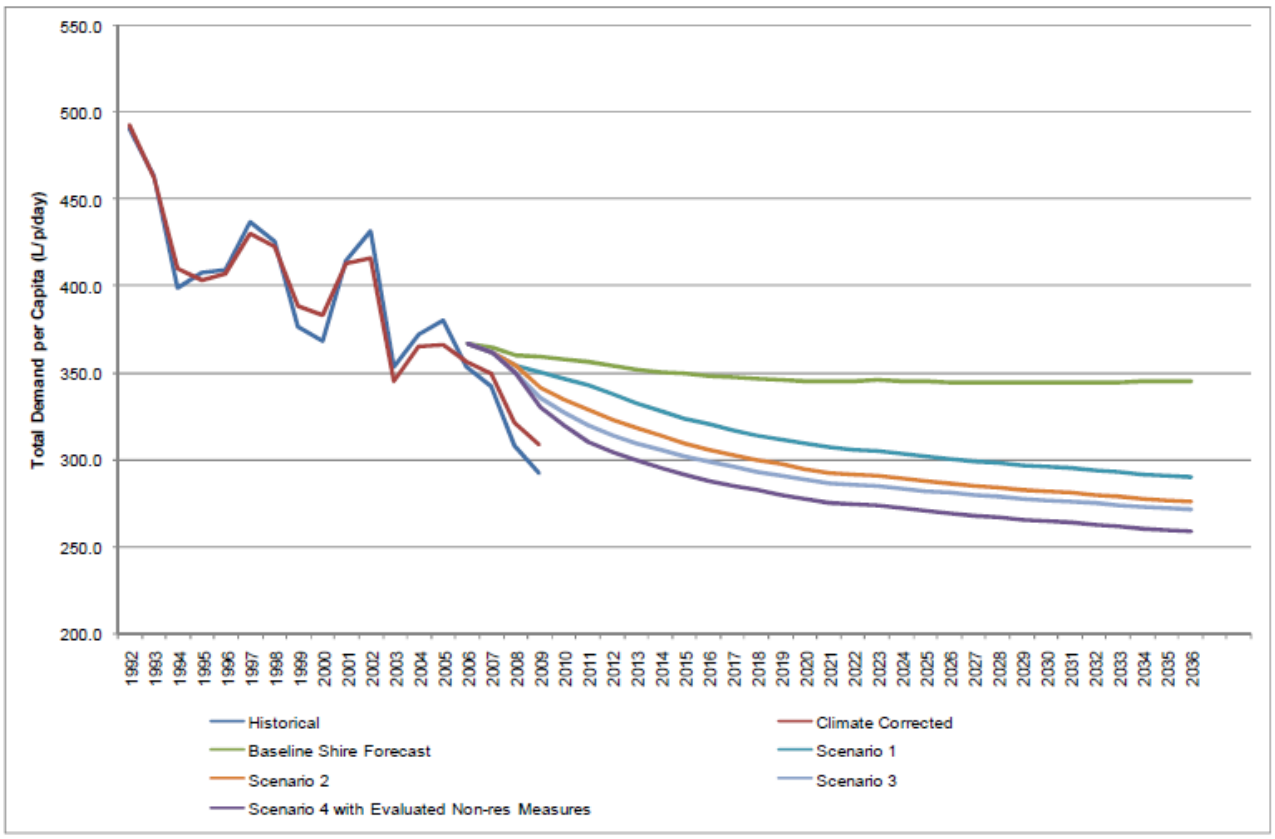

Figure A 6: Total per Capita Demand – Managed Forecast

Source: MWH (2009a)

A cost assessment was undertaken for each of the scenarios considering Council capital costs, customer capital costs, Council operational costs and customer operational costs. The DMS (MWH, 2009a) provided the following observations:

- The majority of savings is due to the installation of rainwater tanks in new residential developments. The savings are due to the expected high growth in the Shire and the yield of the rainwater tanks based on modelling undertaken by MWH;
- The requirement for water efficient fixtures in new developments under BASIX and the influence of WELS also result in major potable water savings in the Shire. These measures are already regulated and have no direct cost implications for TSC;
- The pressure and leakage management program results in major savings for the Shire and has an annualised cost of just under $1 per kL. The majority of this cost is required upfront in the implementation of District Metering Areas (DMAs) and Pressure Management Areas (PMAs); and
- For the non-residential sector, the most significant savings come from the major user and commercial auditing programs, the requirement for water efficient fittings in all new developments and the requirement for a water management plan for all new high users.

Based on the evaluation of scenarios the DMS recommended Scenario 4 for the whole Shire, comprising the implementation of BASIX with 5,000 L rainwater tanks, a pressure and leakage management program and demand management measures for both the residential and non-residential sectors. Greenfield residential development scenarios comprising BASIX with rainwater tanks was recommended for residential developments. The DMS recommended that recycled water be made available to future industrial land use areas in West Kingscliff where demand is identified.

The DMS also documented an implementation plan, staffing requirements, performance tracking and reporting requirements, educational and promotional measures and funding opportunities.

A7.2.4 Adopted Demand Management Strategy

At the Council Meeting on 17 February 2009, Council adopted Scenario 4 for existing and infill development areas, with a key focus on developing an extensive active leakage control and pressure management program. For greenfield areas, namely Cobaki Lakes, Bilambil Heights, Terranora and Kings Forest developments, Council adopted Scenario 1. For West Kingscliff, recycled water is to be made available to future industrial land use areas where demand is identified. Council also resolved that:

- Council officers develop a Rain Water Tank education program, focused on the correct use and maintenance including a regular program of inspections;
- Council officers develop an on-going communication and education program as part of the preferred program to ensure that savings are maintained in future;
- The inclining block water tariff structure be maintained and enhanced to provide a price signal for high users;
- Council considers options for a non-residential demand management program;
- A review is undertaken of the potable water design standards based on the demand assessment undertaken in this report. A regular assessment should then be undertaken to review the adopted design standards; and
- Council continues to encourage effluent reuse schemes and other integrated water solutions that are sustainable in the long term proposed by developers of greenfield sites.

At the Council Meeting on 19 October 2010, Council adopted the recommended non-residential Water Demand Management program and also resolved to:

- Conduct a Workshop with a view to forming a proposal to lobby the State Government to review the BASIX and WELS programs to enhance the water conservation outcomes; and
- Develop a water friendly garden Policy.

A7.2.5 Recycled Water Use

The Coolangatta-Tweed Heads Golf Club has been using treated effluent from Banora Point WWTP for irrigation since 1987. Council also operates a koala feed tree eucalyptus plantation at Uki (since 2004) and recycled water is used for irrigation of pasture at Tyalgum (since 1987) and cooling at Condong Sugar Mill (recycling from Murwillumbah WWTP since 2007).

In response to a NSW EPA recommendation that beneficial recycled water reuse from STPs be maximised to reduce disposal of nutrients into the waterways and TSC's commitment to extending its drinking water supplies by substituting potable water where it is used for irrigation purposes, a report on the options and costs for recycled water supply was prepared by MWH in 2006. The report considered the following recycled water irrigation sites:

- Banora Point STP – Arkinstall Park Municipal Oval (TSC), Tweed Heads Memorial Gardens (TSC);
- Hastings Point STP – Barry Sheppard Oval and Pony Club (TSC), Rugby League Club (TSC), Turf Farm (privately owned);
- Kingscliff STP – Chinderah Golf Course (private ownership), Chinderah Ti Tree Plantation (private ownership);
- Uki STP – Nursery (TSC); and
- Tyalgum STP – Currumbin Wildlife Sanctuary Eucalyptus Tree Plantation.

The report found that the above options are technically feasible.

TSC has entered into an agreement with Chinderah Golf Course to supply between 105 ML/a and 160 ML/a from Kingscliff WWTP. Council is also progressing the following initiatives:

- Provision of recycled water to irrigate the Les Burger Field (Bogangar Rugby League grounds), recycling up to 55 kL/d from Hastings Point WWTP. Council has applied for Section 60 approval for the scheme;
- A concept design has been completed for Arkinstall Park and Memorial Gardens, Tweed Heads – recycling up to 230 ML/a from Banora Point WWTP; and
- Irrigation of a turf farm at Round Mountain Road.

Recycled Water Management Plans (RWMPs) have been prepared for Les Burger Field, Arkinstall Park and the Tweed Heads Crematorium and Memorial Gardens. The RWMPs provide the framework upon which recycled water is supplied and managed at the sites taking into consideration all issues and constraints and providing methods to manage environmental and public health risks.

Council is currently preparing an irrigation designs and environmental management plans for recycled water use at Arkinstall Park and Tweed Heads Memorial Gardens

Recycled effluent volumes during 2010 and 2011 are given in Table A 15.

Table A 15: Recycled Water Volumes in 2010 and 2011

WWTP	Recycled Water Uses	Volume Recycled (ML/a) (% of total effluent)	
		2010	2011
Banora Point	Irrigation of Coolangatta-Tweed Heads Golf Club	258 (5.0%)	67 (1.3%)
Kingscliff	Irrigation of Chinderah Golf Course	44 (4.3%)	22 (2.1%)
Hastings Point	WWTP wash water	2.1 (0.2%)	2.0 (0.2%)
Murwillumbah	Cooling water for Condong Sugar Mill	436 (33.3%)	299 (18.2%)
Tumbulgum	WWTP wash water	0.1 (0.3%)	0.1 (0.3%)
Tyalgum	Pasture irrigation	19.5 (100%)	27.7 (100%)
Uki	Irrigation of koala feed tree eucalyptus plantation	14.9 (100%)	19.7 (100%)
All		775 (9.1%)	438 (4.8%)

A7.2.6 Water Supply Pricing

Council adopted the user pays water pricing policy in July 2002. To encourage water conservation, high residential consumers are subject to a 50% step price increase for consumption in excess of 300 kL/a. From 1 July 2012, residential water use is subject to a charge of $2.05 per kL for usage up to and including 300 kL/a and $3.10 per kL for usage in excess of 300 kL/a. From 1 July 2012, water use by non-residential consumers is subject to a charge of $2.05 per kL. The step price increase does not apply to business and other non-residential water consumption.

A comparison of water charges for a residential (20mm water service) property in the area is given below.

Table A 16: Residential Water Supply Pricing in the Region (2012/13)

Council	Access Charge ($/a)	Step 1 Usage Charge ($/kL)	Step 1 (kL/a)	Step 2Usage Charge ($/kL)	Typical Residential Bill ($/a, 200kL/a)
Tweed	128.00	2.05	300	3.10	538
Byron	145.00	2.10	450	3.15	565

Council	Access Charge ($/a)	Step 1 Usage Charge ($/kL)	Step 1 (kL/a)	Step 2Usage Charge ($/kL)	Typical Residential Bill ($/a, 200kL/a)
Richmond Valley	114.00	1.76	200	2.64	466
Ballina	165.00	1.77	350	2.66	519
SEQ Water	201.50	3.2692	all	-	855
Average					589

The best-practice guidelines require the water usage charge/kL to be based on the long-run marginal cost of water supply. Residential water usage charges must be set to recover at least 75% of residential revenue. LWUs must bill at least three times each year (and preferably every quarter) to improve the effectiveness of pricing signals. Pricing is to be determined using a strategic business plan with a 30-year financial plan.

The revenue from residential usage charges was 73% of the total residential revenue in 2011. Council will be moving from twice-yearly water billing to quarterly billing from 1 July 2013.

A7.2.7 Demand Management Implementation Plan

A three year (2011/12 – 2013/14) demand management strategy implementation plan was developed and adopted by Council on 15 March 2011 comprising the actions and current status given in Table A 17. Key performance indicators were adopted on 19 April 2011. The budget for the implementation plan is $2.45m over the three year period.

Table A 17: Demand Management Strategy Implementation Actions and Status

Action		Current (2011) Status
DMS Program Planning	Review of the DMS findings and recommendations	Undertaken in 2011 and for the six-year IWCM review
Performance Tracking Framework	For average residential water use, a target of 180L/capita/day by 2013 has been adopted.	The observed demand was 173 L/p/d and climate corrected demand was 213 L/p/d based on population estimated to be connected to water supply = 81,303 in 2010/11. Climate correction of demand was used by TSC as the rainfall was higher than average in 2010/11. As a comparison, the climate corrected result for 2009/2010, which was a drier than average year, was 166 L/person/day. Further consideration of the suitability of climate correction is recommended.
	For average total water demand, a target of 300L/capita/day by 2013 has been adopted.	The observed demand was 286 L/p/d and climate corrected demand was 301 L/p/d based on population estimated to be connected to water supply = 81,303 in 2010/11.
	A non-revenue water target of 10% of water produced by 2013 has been adopted.	15.7%
	A recycled water target of 15% of treated effluent reused by 2013 has been adopted.	4.8% (refer Section A7.2.5). The figure was lower than 2010 reuse due to reduction in use of treated effluent at Condong Sugar Mill.
	Performance will be reported to Council annually. Reporting on the various demand management projects will also be incorporated in Council's quarterly reporting.	On target

Action		Current (2011) Status
	Ongoing communication and education programs	An information session was held in March 2012.Council staff also took advantage of several promotional opportunities during the year. Displays featured information about Council's water saving rebate, rainwater tanks, water efficient products, general water management and a water quiz.
Water Billing Process	To be reviewed.	A new water bill format was introduced with more information to customers to increase customers' awareness of their water use and encourage them to take water saving actions.
	The inclining block tariff structure will be maintained and enhanced to provide a price signal for high residential water users. It is proposed to continue to reduce the consumption limit which triggers the second step (+50%) residential volumetric charge (300kL/property/a in 2011/12)	On target

Action		Current (2011) Status
Residential Retrofits and Rebates	A new residential home retrofit and rebate scheme for water efficient showerheads will be developed and implemented. Rebates for other water saving products will also be assessed.	The first stage of the residential rebate program, providing a rebate for water efficient showerheads, aerators and spouts/mixers has been running since 1 July 2011. The program has been well received but is tracking well short of the targets. A random selection of 25 participating households (7.5% of total participants at the time) was audited in April and May 2012. Your Green Planet is also carrying out retrofits of showerheads in the Tweed Shire under the NSW Energy Saving Scheme which is a NSW Government initiative to promote energy efficiency. To date, 718 showerheads have been installed in 463 homes by Your Green Planet, resulting in estimated water savings of 6.945 ML/a. A survey seeking input from members of the community and other stakeholders was run during May 2012 to provide input to the review of the Residential Water Saving Program, including rebates. The program adopted for 2012/13 consists of: • Continuation of the existing residential rebate with some tightening of conditions to ensure that the products being installed deliver the expected water savings. • Introduction of a new residential rebate for dual flush toilets. • Introduction of a 'Water Jackpot' for residential water users, to encourage householders to monitor their water use and make water savings. • Introduction of a web-based register for residential rainwater tanks. • Clear links with Council's 'Target 180' campaign • New water consumption bill format, quarterly billing and pro-rata charging for residential water consumption. • Increased promotion and access to information using simple messages and untapped opportunities such as media, Council's website and involving other stakeholder groups. • Investigation of alternative rebate payment options and assistance for cash-poor and disadvantaged customers • Partnerships and other options to deliver a cost-effective water use assessment and installation service to residential homes • Investigation of the feasibility of a rebate for residential rainwater tanks in year three of the Residential Water Saving Program • Continue to build community awareness and research additional ways to reward and promote positive behaviour change • Monitor and evaluate the impact and effectiveness of all rebates and supporting activities to assist with the design of the Residential Water Saving Program in year three.

Action		Current (2011) Status
	A target of 2,400 residential rebate participants by 2013 has been adopted	199
	A cumulative water saving target of 36 ML/a for residential rebates by 2013 has been adopted	1.8 ML/a
Rainwater Tank Program	Council's existing Rainwater Tank Policy will be reviewed and amended as necessary to match the requirements of the DMS.	The Rainwater Tank Policy introduces recommendations that exceed the requirements of the NSW Government Building and Sustainability Index (BASIX). Council cannot impose mandatory requirements in excess of BASIX and therefore the recommendations relating to development requirements can only be entered into on a voluntary basis between Council and each individual developer. Methods to encourage the installation of rainwater tanks, possibly with the introduction of a rebate, will be considered. A target of 100% of single family residences (new dwellings) with tank volume ≥ 5,000 L has been set. The average tank volume (for properties inspected by Council for BASIX compliance) since 2005 is 6,500 L.
	Promotion	The revised policy has been widely promoted in the Tweed Link and through regular media releases. Plumbers and builders located in the Shire were notified about the updated policy via a mail out during the public exhibition period. Information about the policy and new resources dealing with the selection, installation and maintenance of rainwater tanks has been posted on Council's website to assist the public.
	Liaison with the Department of Planning to resolve any differences between TSC's rainwater tank policy and the State Government's BASIX requirements for Development.	Not yet commenced.
	The take-up of rainwater tanks in response to Council's Policy will be monitored with a view to offering a rebate if it is warranted.	The Federal rebate for tanks ended in May 2011 and the NSW rebate ended on 30 June 2011.
Top 20 Water Users – Non-Residential Program	The top 20 non-residential water users will be audited to determine where their water use can be reduced.	A target of 20 completed audits by 2013 has been adopted. 6 have been audited so far. It appears that audits will not be required for all of the Top 20 because in a number of cases, the highest priority works possible within the $5,000 budget available, were made clear from the initial meeting. Two of the Top 20 businesses will be unable to participate because they are caravan parks/villages, which are essentially residential, without any public amenities. Businesses ranked 21 (chicken processor) and 22 (aged care home) have now been included in the Top 20 list. Individual water savings targets will be developed on a case by case basis.

Action		Current (2011) Status
TSC Audits	Key TSC properties will be identified and audited.	Recommendations from these water audits will be summarised in an action plan for implementation as resources become available. Training will be provided for office and field based staff to reduce Council's water use.
Open Space Irrigation Guidelines – Water Efficient Garden Policy	TSC will develop Open Space Irrigation Guidelines and a Water Efficient (Friendly) Garden Policy.	The guidelines and policy will be widely promoted in the community and made available to gardening professionals. Training will be provided for Council's Recreation Services staff and external groups.
Other Major Water Users – Top 100	The balance of the top 100 water users will be identified and audited.	The top 100 program was launched on 18 July 2012. As with the top 20 water users, TSC will aim to develop water efficiency plans with individual performance targets for participants in this group.
	TSC will liaise with key state government agencies regarding the implementation of water efficiency programs for state government buildings, such as hospitals and schools.	Not yet commenced.
	TSC will also liaise with industry and commercial representatives/groups to form relationships and disseminate information regarding demand management programs to target sectors.	Not yet commenced.
	TSC will consider the introduction of regulations to control non-residential internal fittings and fixtures, including taps, showers, toilets and urinals, as well as opportunities for grey water reuse and rainwater tanks.	Not yet commenced.
	A non-residential education program will be developed and delivered to participating businesses.	Not yet commenced.
Permanent Water Restrictions	Permanent restrictions in place elsewhere in NSW will be reviewed and a list of measures, suitable for the Tweed district will be prepared.	If adopted, the permanent restrictions would be promoted widely in the community and supporting educational materials would be developed. Information sessions would be held for interested members of the public.
Recycled Water Projects	TSC will continue to pursue opportunities for water recycling as they arise. Specific projects that have been identified will be investigated in more detail.	Refer Section A7.2.5.
Unaccounted for Water	TSC will continue to implement leakage reduction works.	A leakage control and pressure management program is being developed. Network testing, modelling and leakage investigation using specialised equipment.

Action		Current (2011) Status
	TSC's policy on standpipe use will be reviewed and alternative metering/access options will be investigated. TSC will consult widely with water carters and other stakeholders during this review process.	Not yet commenced.
Water Sensitive Urban Design/ESD	Further opportunities for implementing WSUD/ESD principles in new development, specifically for reducing potable water usage, will be pursued. A review of the potable water design standards will be undertaken.	The DMS recommends that, on a voluntary basis, dual flush toilets, three star WELS rated showerheads and tapware should be encouraged in new dwellings. The BASIX requirements for new development are most likely to achieve this. Where possible, TSC will encourage developers to exceed BASIX requirements by installing larger rainwater tank sizes and more efficient water using fixtures and fittings.
	A review of Reduced Infiltration Gravity Sewers (RIGS) will be undertaken and the best components will be specified for new developments.	Not yet commenced.
	Opportunities for sewer mining, recycling of water and other integrated water solutions for greenfield areas will be assessed on a case by case basis.	Assessed on a case by case basis.

A7.3 Tweed District Water Supply Augmentation Options Study

The Tweed District Water Supply Augmentation Options Study (MWH, 2009b; 2009c) was undertaken to assist Tweed Shire Council in the determination of a preferred option for the augmentation of its water resources. Initially, a long list of options was developed (MWH, 2009b) with a high level assessment undertaken to enable each to be scored against Triple Bottom Line (environmental, social and economic) criteria to enable a short list to be developed for further, more detailed investigation (MWH, 2009c).

A7.3.1 Coarse Screening

The coarse screening options assessment adopted a target average annual water demand of 19,000 ML/a by 2036, which was stated as representing the demand achieved by the implementation of statutory elements of the DMS only, i.e. BASIX, as well as the natural progression of water efficient fittings and fixtures such as dual flush toilets and water efficient showerheads and washing machines (representing a population of 157,000).

In the coarse screening report (MWH, 2009b), the system demand of 19,000 ML/a was predicted to exceed the secure yield (13,750 ML/a) by 2016 under the baseline projection, or by 2019 under the adopted demand forecast (Scenario 4). If demand reductions of the preferred scenario are fully achieved, this date would be extended to around 2022. The options for water resource augmentation were therefore assessed on their ability to provide the additional 5,250 ML/annum of secure yield.

These demand projections are higher than those reported in the DMS (MWH, 2009a), which stated that the 2036 predicted demand for the BASIX/WELS scenario was 16,653 ML/a and the adopted demand forecast (scenario 4) was 14,859 ML/a (refer Section A7.2).

Nine options were identified in the Stage 1 long-list process as worthy for consideration as part of the options review. The nine options were broadly grouped as follows:

Options involving Dams:

1. Raising the existing Clarrie Hall Dam to RL 70m AHD to increase the storage capacity to 42,300 ML with an overall secure yield of 22,000 ML/annum;

2. New dam on Byrill Creek with a full supply level (FSL) of 115.5 m AHD and storage capacity of 16,300 ML with a secure yield of 9,000 ML/annum;

3. New dam on Oxley River, near Tyalgum (Rocky Cutting site) with a full supply level (FSL) of 56 m AHD and storage capacity of 35,000 ML with a secure yield of 20,000 ML/annum.

Options involving Pipelines to the Assets of other Water Utilities:

4. Pipeline link to Rous Water, at Ocean Shores comprising a pumping station and an 18.3 km, 300 mm diameter pipeline with a capacity of 5 ML/day, linking to the Tweed system at Pottsville;

5. Pipeline link to the South East Queensland Water Grid at the Tugun desalination facility comprising a pumping station and 6 km of 500 mm diameter pipeline with a capacity of 20 ML/day to Kennedy Drive, Tweed Heads.

Other Options:

6. Desalination: a. Thermal desalination plant at Condong (20 ML/day multiple distillation process) with raw water sourced from the Tweed River with delivery into the adjacent distribution system to Terranora and to Duranbah. Brine would be discharged through an 18 km pipeline along Clothiers Creek Road to Norries Head; b. Membrane desalination plant at Kingscliff (2-stage @ 10 ML/day each reverse osmosis process) with raw water sourced from the mouth of Cudgen Creek, with delivery to the Kingscliff and Bogangar service reservoirs. Brine would be discharged to the sea at the northern end of Bogangar Beach; c. Membrane desalination plant at Cudgen (2-stage @ 10 ML/day each reverse osmosis process) with raw water sourced from brackish groundwater of the Tweed floodplain, with delivery to the Kingscliff and Bogangar service reservoirs. Brine would be discharged to the sea at the northern end of Bogangar Beach;

7. Groundwater supply – either two sites located upstream of Bray Park in the Tweed valley alluvial aquifers, with a borefield comprising up to 7 bores, each 20 m deep may yield around 4.3 ML/day. These sites are in proximity to the Bray Park Water Treatment Plant and reservoirs or dune sand deposits along the coast, between Chinderah and Bogangar;

8. Indirect potable reuse - advanced MF/RO treatment and advanced oxidation of 75% of the available effluent from the Banora Point WWTP and Kingscliff WWTP and pumping of the water through a 50 km pipeline to Clarrie Hall Dam (producing 28 ML/day);

9. Direct potable reuse - advanced MF/RO processes as well as advanced oxidation. A plant with a capacity of approximately 19.5 ML/day would be constructed at the Banora Point WWTP with a pumped connection to the distribution network at Tweed Heads. Another plant with a capacity of approximately 8.3 ML/day would be constructed at the new Kingscliff WWTP with a pumped connection to the distribution network at Chinderah.

The options were compared on the basis of the following assessment criteria:

- Secure Yield;
- Planning Obligations;
- Established Technologies & Feasibility;
- Environmental Constraints;
- Social Acceptability;
- Legislative Acceptability;

- Cultural Heritage Impacts;
- Lead Time and Potential for Escalation;
- NPV and Costs per kL; and
- Greenhouse Gas & Energy Consumption.

The score for each option was derived from the product of the rating (based on a qualitative assessment of the risk and impact) and the weighting factor of the relative level of significance for each of the criteria. The resultant scores were then ranked from one to nine to identify the top preferences for further assessment (fine screening). The initial ranking of options is given in Table A 18.

Table A 18: Initial Ranking of Options

Rank	Option	NPV ($m)	Annualised Cost	Assessed Score
1	Option 1 - Raising Clarrie Hall Dam	$42 million	$569/ML	151
2	Option 2 - Byrrill Creek Dam Construction	$51 million	$653/ML	117
3	Option 5 - Pipeline to the SEQ Water Grid	$116 million	$1,655/ML	111
4	Option 4 - Pipeline to Rous Water	$51 million	$2,444/ML	109
5	Option 3 - Oxley River Dam Construction	$64 million	$696/ML	102
6	Option 7 - Groundwater Supply	$44 million	$2,535/ML	93
7	Option 6 - Desalination	$194 million	$2,782/ML	81
8	Option 8 - Indirect Potable Reuse	$331 million	$3,579/ML	72
9	Option 9 - Direct Potable Reuse	$307 million	$3,318/ML	65

Source: MWH, 2009b

Option 4: Pipeline to Rous Water and Option 7: Groundwater Supply did not meet the mandatory criteria of 5,250 ML/annum (15 ML/d) of secure yield. The report noted that this option could still be considered as a short-term emergency source in the event that the capacity of the Tweed network cannot supply the demands of growth at the southern extremities of the system or as part of a combined scheme involving small supply options.

Option 9 – Direct Potable Reuse was rejected on the basis that it does not use accepted technical practices involving established standards and workable outcomes which are beyond question.

Based on the initial assessment of the options, Option 1 involving the raising of the existing Clarrie Hall Dam ranked the highest by a significant margin, however MWH noted that the investigation and approvals process associated with the raising of Clarrie Hall Dam, coupled with the relatively long phase of project implementation, may put at risk the completion of the project by the year 2016, when the existing secure yield of 13,750 ML/annum could be reached. A contingency plan was recommended to deliver an emergency supply in the event that augmentation of supply is not completed by the year 2016. Possible contingency options were identified as Option 5 - Pipeline to the SEQ Water Grid, Option 4 - Pipeline to Rous Water and Option 7 - Groundwater Supply.

A7.3.2 Fine Screening

This stage of the options assessment focused on the merits of the shortlisted options to analyse in more detail capital and operating costs, timing and constraints.

The fine screen report adopted the long-term demand forecasts given in Table A 19 which are similar to those given in the DMS (A7.2).

Table A 19: Demand Forecasts used in Fine Screen Report

Forecast Scenario	Year that Secure Yield (13,750 ML/annum) is Reached	Demand at 2036 (ML/annum)
Baseline Demand	2018	19,750
BASIX/WELS Demand	2023	16,750
Recommended Strategy	2031	14,850

The BASIX/WELS demand forecast was considered to be a more conservative target and more readily achievable than the recommended strategies and is supported by an existing legislative framework in NSW. The 2036 demand of 16,750 ML/a was used as the basis for assessing the water supply augmentation options. The options for water resource augmentation were assessed on their capacity to provide an additional 3,000 ML/a of secure yield (MWH, 2009c).

The combined emergency supply (pipe to Rous Water, pipeline to SEQ water and groundwater supply) has a shorter time for implementation and was assessed on its capacity to meet the short term forecast demand in 2023 (being the year that the existing secure yield is reached under the BASIX/WELS demand forecast), which was stated as 2,000 ML/a (5.5 ML/day) or the difference in 2023 between the BASIX/WELS and the baseline demand forecasts.

The fine screening assessment of the shortlisted options utilised the additional reports, stakeholder meetings and community consultation activities that took place after completion of the coarse screening stage. As part of the Fine Screen process the assessment criteria were grouped to achieve a more focussed sustainability based analysis. The groups were developed in terms of a Quadruple Bottom Line for sustainable development with the following four objectives:

- Governance (of Natural Resources);
- Maintenance of Stable Economic Growth;
- Effective Protection of Social Values; and
- Effective Protection of the Environment.

The ten assessment criteria, which were analysed in the coarse screen report modified for use as fine screen assessment criteria as follows:

Governance (of Natural Resources):

- Secure Yield - Whether the augmentation option has sufficient capacity and certainty of provision to meet the 2036 forecast demand of 16,750 ML/annum for 157,000 population, and to what extent it has excess capacity to meet the uncertainty of the predicted demand and meet future demand beyond that date;
- Planning Obligations - The number of stakeholders involved in the regulatory framework to meet the statutory compliance requirements and the associated timeframe and risks for completion by 2023, when augmentation is required;
- Legislative Acceptability - The extent to which required legislation is influenced by discretionary powers, which impact upon the augmentation option to increase its uncertainty of delivery.

Maintenance of Stable Economic Growth:

- Established Technologies and Feasibility - Whether existing technologies and accepted practice are involved, or whether there are risks associated with water quality, innovation and emerging technologies;
- Lead Time for Construction & Potential for Escalation of Costs - Where the uncertainties associated with the preliminary phases of project delivery increase the risks of blow-out of time and of the end costs of the completed project;
- Net Present Value based on Capital and Operating Costs and Levelised Cost ($ per ML) - evaluation of estimated Net Present Value, taking account of the capital and operations costs over 80 or 30 years discounted to present day dollars at 7%. This is also expressed as levelised cost per unit of production ($ per ML);

Effective Protection of Social Values

- Social Impacts - Impact on established developed areas (urban, rural, agricultural, commercial, industrial, etc.) and their associated political interactions;
- Cultural Heritage Impacts - Impacts upon areas of historical importance and sites of cultural significance;

Effective Protection of the Environment

- Environmental Constraints - Extent and severity of environmental impacts that are likely to be encountered including aquatic, terrestrial and areas of conservation significance; and
- Greenhouse Gas Emissions and Energy Consumption - An assessment of the greenhouse gas emissions due to embodied energy, construction activities and ongoing operational activities

MWH (2009c) assigned a rating based on a qualitative impact on the assessment criteria and a weighting factor was applied to the assessment criteria relative to the level of significance of the criteria. The MCA process was applied to three sets of weighting factors in order to demonstrate the sensitivity of applying different weighting factors (which are subjective) and to vary the levels of significance of the assessment criteria:

- The first scenario applies the ratio of weighting factors, which were based on those used previously in the Coarse Screen report but revised based on the additional information made available during this Fine Screen stage;
- The second scenario applies evenly weighted factors over the 4 sets of assessment criteria. This scenario is presented to express an even balance of the quadruple bottom line between the governance, economic, social and environmental issues; and
- The third scenario applies the ratio of weighting factors to reflect the greater significance of the social and environmental criteria. This scenario is presented to reflect concerns expressed by members of the Community Working Group.

A score was derived based on the product of the rating and the weighting factor to provide a comparison of the shortlisted options. The ratings for the Combined Emergency Supply were averaged, then multiplied by the rating factors to derive the score. The resultant scores were then ranked from one to four to identify the preferred option.

The MCA analyses undertaken by MWH showed that the highest ranked option is Option 1 - Raising of Clarrie Hall Dam. This option remained the first ranked option against each of the three MCA weighting approaches used. The second ranked option, Option 5 – Pipeline to SEQ Water Grid, appeared to have inherently high risks associated with:

- The expected protracted negotiations over the dealings with a number of political and procedural issues between the States, which have not previously been confronted;

- The uncertainties over the high bulk purchase price of water from the SEQ Water Grid Manager; and
- The lack of certainty regarding these issues which may prove insurmountable within the timeframe available for augmentation of the Tweed system.

The third ranked option, Option 2 – Construction of a New Dam on Byrrill Creek, did not rate higher than the raising of Clarrie Hall Dam for any of the assessment criteria, except possibly for the Social Acceptability criterion, where it was found to be marginally favourable.

The Fine Screen Report (MWH, 2009c) recommended Option 1 - Raising of Clarrie Hall Dam as the most secure way forward for augmenting the Tweed district water supply.

A7.4 Drought Management Strategy

The Drought Management Strategy (MWH, 2009d) was prepared to outline the actions to be taken when water supply to customers in the Tweed Shire is required to be restricted for any reason. The objective was to develop a strategy to be implemented during periods of water shortages and to provide for the responsible use of the region's water resources. As part of the report, details of water restrictions to be implemented during droughts or other emergencies were provided.

A7.4.1 Historical Water Supply Performance

The drought of 2002/03 was the worst on record (>100 years of record). During this drought the water storage reduced to 35% and had the drought continued, failure could have occurred within 6 months. The Drought Management Strategy notes that the restrictions policy in place at the time allowed the level in Clarrie Hall Dam to fall to 50% prior to the introduction of Level 1 restrictions. The drought broke shortly after Level 3 restrictions (introduced at 35% full) were imposed.

Demand reductions achieved during Level 2 Restrictions (45% full) were assessed at approximately 24% of the average demand. Although this was slightly higher than the target of 20%, the reduction was achieved almost entirely from the ban on external use, and occurred at the peak of summer.

The Drought Management Strategy reported that it was unlikely that the Tyalgum water supply system would fail due to quantity constraints, however quality issues had occurred in the past. During the 2002/03 drought, water was carted to Tyalgum from Murwillumbah due to poor raw water quality, and the inability of the water treatment plant to meet water quality guidelines.

A7.4.2 Demand Forecasts

The Drought Management Strategy adopted a 2036 demand forecast of 23,796 ML/a for the baseline and 17,926 ML/a for the preferred management demand forecast for the Tweed/Uki system. These forecasts were subsequently revised downwards in the DMS (refer Section A7.2) by approximately 3,000 – 4,000 ML/a.

A7.4.3 Restriction Levels

Drought restriction levels proposed in the Drought Management Strategy were based on the 5/10/20 rule where on average, restrictions are implemented no more than 5% of the time, restrictions are imposed no more than once every 10 years and a 20% demand reduction is achieved during drought restrictions. The revised restrictions policy adopted increased trigger levels which would provide more time to manage both demand and supply.

Seven levels of restrictions were developed ranging from 90% to 40% of capacity of Clarrie Hall Dam. Due to the time taken to administer and implement drought restrictions (more than 4 weeks), the revised restriction

levels adopted by Council in 2007 (Table A 20) allowed for only Levels 2, 4, 6 and 7 to be used. A basic end use model was used to gauge the level of demand reduction that could be achieved for each level.

Table A 20: Restriction Levels and Demand Targets – Bray Park system

Restriction Trigger Levels	Target Demand Reduction	Restriction Level Imposed @ (% of Clarrie Hall Dam Full Capacity)
External Sales banned and Pre Activation Activities	0%	90%
Level 2 Restrictions	15%	75%
Level 4 Restrictions	20%	60%
Level 6 Restrictions	25%	50%
Level 7 Restrictions	30%	40%

Restriction triggers in relation to historic levels of the Clarrie Hall Dam are shown in Figure A 7. The carting ban would occur regularly (approximately once every two years). Water restrictions however could occur only once every 20 years. MWH (2009d) concluded that the level of service will meet the 5/10/20 rule for the foreseeable future. To account for the impact on levels of service resulting from demand growth, the strategy recommended that the trigger levels be reviewed at 2012 or when any new permanent or emergency water source is implemented.

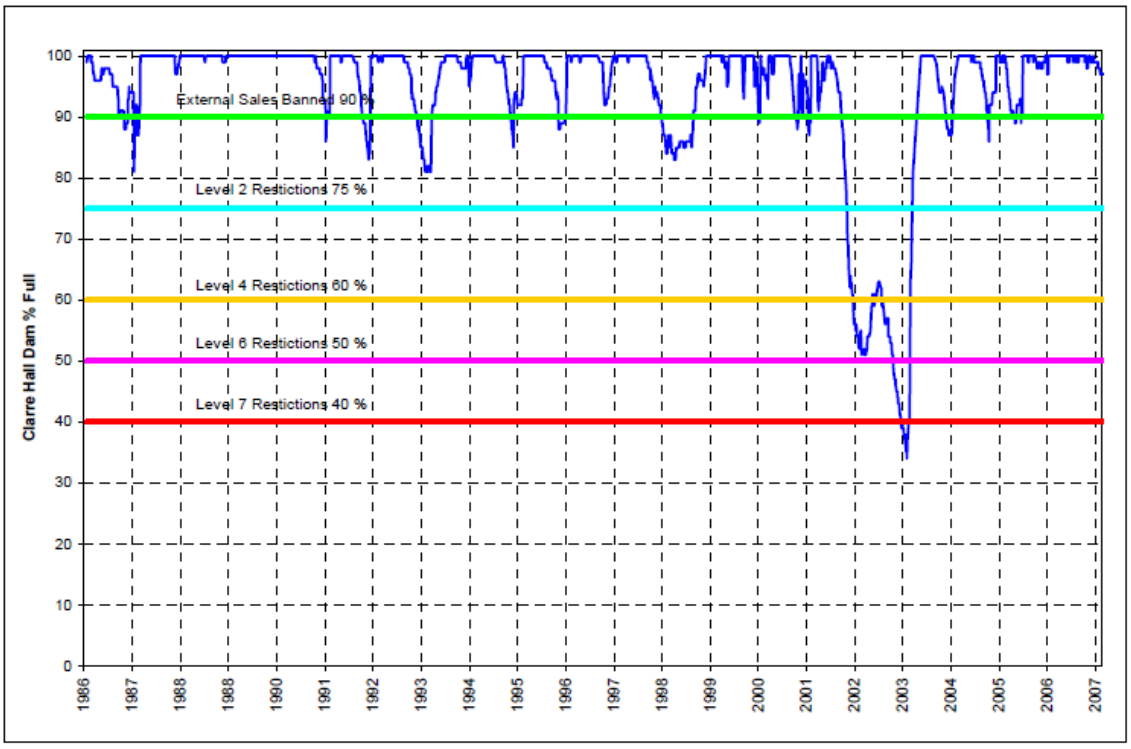

Figure A 7: Restriction Levels and Historic Storage Levels in Clarrie Hall Dam

Source: MWH (2009d)

Restriction levels for Tyalgum system were proposed as follows:

- Level 2 Restrictions when water flow over the weir ceases, i.e. no visible flow (20% demand reduction); and
- Level 4 Restrictions when water carting commences, due to poor water quality in the weir or reaching dead water level in the weir, as indicated by poor product water quality from the WTP (30% demand reduction).

The Drought Management Strategy adopted by Council in November 2009 recommended a review of the drought water restrictions, restriction triggers and targeted savings. The review was carried out in late 2011 and significant modifications to the drought water restrictions were proposed, while recommending no changes to the restriction triggers or targeted savings. The revised restrictions had been expanded to include more activities and were described in greater detail to provide more information to the public, should drought water restrictions be implemented. The proposed restriction policy was placed on public exhibition in December 2011/January 2012. All of the issues raised in submissions are either being addressed or will be addressed by current and future IWCM and demand management programs.

A7.5 Drinking Water Quality Policy

Council adopted the Drinking Water Quality Policy in December 2010. Council will implement a Drinking Water Quality Management System that is based on the following principles:

- Managing water quality at all points along the delivery chain from source water to consumer;
- Using a risk-based approach in which potential threats to water quality are identified and managed;
- Integrating the requirements of our consumers, stakeholders, regulators and employees into our planning;
- Establishing regular monitoring of the quality of drinking water and effective reporting mechanisms to provide relevant and timely information, to promote confidence in the water supply and its management;
- Developing appropriate contingency planning and incident response capability;
- Continually improving our practices by assessing performance against corporate commitments and stakeholder expectations; and
- Implementing and regularly reviewing maintenance and asset management programs.

A7.5.1 Implementation of a Drinking Water Quality Management System

TSC has commenced the implementation of the Framework for Management of Drinking Water Quality in accordance with the *Public Health Act, 2012* and the ADWG (refer Appendix A, Section A3.4). A workshop was held with the Drinking Water Management Team in June 2009 to prepare the following elements of the framework (Water Futures, 2010):

- Element 2: Water supply system analysis, assessment of water quality data, hazard identification and risk assessment; and
- Element 3: Preventive measures and multiple barriers, critical control points.

Water quality issues were identified for the Bray Park, Uki and Tyalgum systems and hazards and risks to the end users of the water and the critical control points were determined. A total of 67 risk events were identified. Critical Control Points (CCPs) and Quality Control Points (QCPs) were used to facilitate a Framework for upgrade of the Bray Park system as well as help to build compliance for the rest of Tweed's water supply systems. Actions were captured to form a Drinking Water Quality Management Improvement Plan and Bray Park WTP Upgrade checklist.

Issues of concern identified in the risk assessment include:

- Bray Park (potentially addressed through upgrade of Bray Park WTP):
    - Storm events in the catchment are known to challenge the water treatment process.
    - Cyanobacterial blooms occur in the weir.
    - Upstream rocky cuttings cause flashy runoff from the catchment.

- Uki:
  - High levels of manganese and iron.
  - Dirty water and taste and odour complaints.
- Tyalgum (potentially addressed through upgrade of Tyalgum WTP):
  - Historical losses of disinfection control (>4 mg/L dosed but still loss of residual).
  - Poor water quality in the weir pool under low flow conditions (high algae, faecal coliforms, colour and turbidity).

TSC has since been developing a gap analysis for full development of the drinking water quality management system.

A7.6 Water Supply and Sewerage Asset Management

A7.6.1 Activity Management Plans

TSC adopted its water supply and sewerage strategic business plans ("Activity Management Plans") in 2006.

The best-practice management guidelines consider that a Strategic Business Plan (SBP) is current if it has been updated in the last 3 years.

The 2006 Activity Management Plans document:

- Council's vision, mission and objective for water supply and wastewater activities;
- Levels of service and performance measures;
- Industry benchmarking indicators (2005 data);
- Maintenance and operating issues and projected costs;
- Future demand and demand management;
- Service areas;
- Projected capital expenditure and funding; and
- Review and update of the Plans.

The major assumptions and uncertainties documented in the plans include the condition of underground assets and the rate of development and the impact on income.

A7.6.2 Sewerage Overflow Abatement Strategy

The Sewer Overflow Investigations Report was prepared in 2007 in response to reporting conditions of the sewerage system licences (PRP100). PRP100 required the production of a report identifying overflow points within the sewage reticulation and conveyance system, assessment of the likelihood of overflows, the significance of impacts on the environment and public health, evaluation of the risk to the environment and public health and identification of management priorities and actions to reduce harm to the environment and public health. The report found that:

- Reported problems in the sewerage system appeared to be widespread in all but new subdivision areas. There was a significant incidence of Customer Work Requests (CWRs) for pipes older than 15-20 years. uPVC sewers seemed to perform better than AC, RCP or VC although these older type of pipes also showed the effect of age. Rehabilitation programs were targeted towards these older types of pipes;

- Tree root intrusion appeared to be the single greatest problem in gravity sewers and warranted a policy initiative to control tree types near sewers;
- A significant proportion of complaints arose from house connections and therefore recommended rehabilitation works included junctions, side lines and boundary inspection shafts;
- The number of overflows recorded was low compared with the number of chokes and breaks recorded, and was possibly understated;
- There was a need for more attention to detail in recording CWR's so that the information gathered will be more meaningful;
- Problems with Sewer Rising Mains seemed to be limited to breaks either by works in the vicinity or due to corrosion and aging of unlined cast iron and asbestos cement mains which are no longer used in new works;
- Existing emergency relief structures in the sewerage system have been documented and found to fall short of the current WSA02 Sewerage Code of Australia standard by varying degrees;
- Sewerage Pump Stations failures were one of the most probable causes of overflows due to insufficient storage, lack of alarm systems or back-up power supplies;
- Improved Supervisory Control and Data Acquisition System (SCADA) was required;
- 15% of the sewerage catchments were rated high or significant risk of overflows;
- There is a need to undertake sewer flow gauging and dynamic modelling to be able to understand the relationship between wet weather events and flows in Council's sewers; and
- Improved CWR reporting and analysis is required.

The report recommended a total of $3,375,000 expenditure to address specific needs over those met by ongoing operations budgets over the period 2007 – 2012.

A7.6.3 Asset Management Plans

Asset Management Plans (AMP) were prepared to improve Council's long-term strategic management of its infrastructure assets in order to cater for the community's desired levels of service in the future, in accordance with Council's key strategic documents as well as demonstrate reasonable management in the context of Council's available financial and human resources. The AMPs achieve this by setting standards, service levels and programmes which Council will develop and deliver. The standards and service levels have been set in accordance with user needs, regulations, industry practice and legislative codes of practice. AMPs have been prepared for Council's water cycle assets, namely drainage, water supply and wastewater.

The Drainage AMP (TSC, 2010c) provides an improvement program to address the identified issues:

- Lack of drainage in some areas;
- The drainage network in older areas will not provide the same level of service as would be found in more recently constructed suburbs. A significant amount of the drainage network has been retro-fitted as development has increased, to cater for increased flows as the need has arisen. As a result, a well-planned drainage network that caters for changing community needs and increasing development has not always resulted;
- The drainage standards and design criteria may vary throughout the municipality due to the age of much of the drainage network and the time period over which it was constructed;
- Some areas do not have an effective drainage system. This is particularly the case in the older parts of the Shire where allotments are small and the road reserves are narrow;

- Urban development increases peak flow rates, runoff volumes and the level of pollutants entering waterways;
- There is a lack of capacity in some parts of the underground drainage system; and
- A lack of community awareness results in issues such as construction across an easement, replacing vegetated areas with impervious surfaces and litter and other pollutants entering the underground stormwater pipes.

The Water Supply and Wastewater AMPs (TSC, 2011d and 2011e) document service levels based on:

- Environment sustainability and efficiency of service delivery;
- Protection of public health;
- Quality of water supplied;
- Reliability, availability and adequacy of the wastewater and water supply systems including ability of reticulation to provide water for fire fighting purposes;
- System capacity to accommodate growth;
- Affordability to customers;
- Responsive, effective and equitable service to customers; and
- Meeting legislative requirements.

The priority asset related improvement actions over the next 4 years have been included in Council's Delivery Program.

A7.6.4 Business Continuity Plans

Business Continuity Plans (BCPs) have been prepared for:

- Management of Treated Water Supply in the Event of 'Contamination of a Raw Water Source';
- Management of Treated Water Supply in the Event of 'Contamination of a Supply Network';
- Management of Water Supply in the Event of 'Impending Water Source Failure and Inadequacy of Planned Emergency Supply Arrangements';
- Management of Water Supply and Wastewater Schemes in the Event of a 'Major Flood Event'; and
- Management of Water Supply and Wastewater Schemes in the Event of a 'Tsunami'.

The BCPs document arrangements and procedures that enable TSC to respond to an event that lasts for an unacceptable period of time and return to performing its critical functions after an interruption. The BCP details business contingency measures to be undertaken in the event of a threat being realised.

A7.6.5 Irrigations Assets Specification

TSC has prepared a specification for irrigation standards for development of public open space projects to be managed and maintained by Council covering the design, supply, installation, commissioning, upgrade &/or maintenance of irrigation works. The specification applies to any irrigation asset or works that is or shall be managed by TSC, including:

- All public sports turf surfaces;
- Public parks, recreation facilities, council building surrounds and memorial facilities;
- Road reserves and streetscapes particularly feature gardens and high traffic turf areas; and
- Renovations and upgrades.

The specifications allows for alternative water sources such as recycled water, stormwater harvesting, bore or river providing the water is of sufficient capacity, suitable quality and appropriate permits or licences are met.

Irrigation values are listed as:

- Protect community investment by maintaining Tweed Shire Council parks, recreational grounds and gardens in good condition;
- Utilise irrigation assets and parks resources to have a positive environmental impact;
- Demonstrate water conservation by excellence in irrigation design and operational practices;
- Enhance public open spaces for the benefit of residents and community;
- Provide quality safe sports turf surfaces for the sporting community;
- Encourage recreation activities by providing functional open spaces;
- Support regional tourism efforts by providing attractive parks and facilities; and
- Facilitate education of Shire staff and progress communication with community facility users in the responsible use of water for irrigation purposes.

A7.7 Biosolids Management

Biosolids are solid waste by-products from water and wastewater treatment processes. TSC's biosolids management strategy (MWH, 2006d) recommended:

- Transport of biosolids to a regional thermal hydrolysis facility on the Gold Coast - this option has not been realised as the thermal hydrolysis plant at Oxley has been difficult to operate and maintain;
- Removal of large biosolids stockpiles at Murwillumbah, Hastings Point, Kingscliff and Banora Point WWTPs - this has been completed and smaller stockpiles are progressively transported to disposal sites; and
- Construction of stabilisation lagoons at all plants - anaerobic lagoons providing stabilisation to Grade B biosolids have been constructed at all plants except Banora Point WWTP which requires a lime stabilisation plant due to insufficient space for lagoons. Biosolids from these plants have been spread on local cane farms without odour issues. Spreading of biosolids from Banora Point WWTP has been trialled on local cane farms but has created objectionable odours and numerous complaints.

Biosolids quantities in 2011 are given in Table 3.

Table 3: WWTP Biosolids Production and Characteristics 2011

WWTP	Biosolids Production (dry Tonnes/year)	Contamination Grade	Stabilisation Grade [1]	Classification Level [1]	Disposal
Banora Point	1,100	C	B	Restricted Use 2	Farmland, Darling Downs
Kingscliff	301	C	B	Restricted Use 2	Farmland, Darling Downs Cane farms, Tweed Valley
Hastings Point	73	C	B	Restricted Use 2	Cane farms, Tweed Valley

WWTP	Biosolids Production (dry Tonnes/year)	Contamination Grade	Stabilisation Grade [1]	Classification Level [1]	Disposal
Tyalgum	3	C	B	Restricted Use 2	Cane farms, Tweed Valley
Uki	0.6	C	B	Restricted Use 2	Cane farms, Tweed Valley
Murwillumbah	80	C	B	Restricted Use 2	Cane farms, Tweed Valley
Tumbulgum	5	C	B	Restricted Use 2	Cane farms, Tweed Valley
Total (approx.)	1,460				

1. Based on stability and contaminant gradings in accordance with the DECC guideline Use and Disposal of Biosolids Products.

The approximate cost of transport and disposal of the WWTP biosolids is approximately $570,000 p.a.

Approximately 2-3 wet tonnes of alum sludge is also produced at the Bray Park WTP each week.

TSC aims to update its current Biosolids Management Strategy and consider biosolids management options, opportunities and latest technologies. Key considerations include:

- Stabilising options for Banora Point WWTP if reuse on cane farms is the preferred option. Banora is by far the largest cost to Council and there are significant savings to be made by being able to use biosolids locally;
- Likely management changes, for example, to auditing and regulation requirements resulting from the Office of Water's review of biosolids management in NSW;
- Providing storage for biosolids if spreading on local cane farms is the preferred option. Typically cane farms in the Tweed Valley can be accessed for only 3 - 8 months of the year meaning large storage areas are required to store 4 - 9 month of production;
- Biosolids handling and management options so that Council can increase local transport contractor options. Local transport companies may be able to provide cost effective biosolids transport and spreading if Council could manage the stockpiling and monitoring. For example local contractors currently spread filter press from the Sugar Mill to Cane Farms;
- Introduction of the Carbon Tax and probable changes to costs associated with various options;
- Consideration of strategies of nearby Councils, particularly the Biochar and waste to energy project of Ballina Shire Council;
- Latest technologies considered including, drying, stabilisation and energy capture technologies;
- Alternative options for disposal of WTP alum sludge including possibility of blending with wastewater treatment plant biosolids; and
- Possible collaboration with Waste Unit to manage Greenwaste along with biosolids.

A7.8 Natural Resource Management Strategies

A7.8.1 Water Supply Catchment Stream Bank Protection Policy

Council adopted a policy in 2007 to support rural land owners in the drinking water supply catchment to manage their stream banks in a manner which protects and enhances the integrity of Tweed Shires raw water supply. Through adoption of the policy, Council has implemented a River Health Grants program to improve and protect water quality. The scheme supplies funding to rural land holders to target the typical problems found on river banks including erosion and weed infestation. To improve the hygiene of water supplies, a priority activity is to supply off-stream stock watering points throughout the catchment. The River Health Grants Program is funded through the Catchment Water Quality Budget.

A7.8.2 Tweed Vegetation Management Strategy

This Strategy was prepared in 2004 in close consultation with the community-based Tweed Vegetation Management Plan Steering Committee to provide a coordinated approach to the management of ecological processes in the Tweed. The strategy conducted a number of investigations including:

- Ecological Assessment;
- Assessment of Soil and Water Resources
- Socio-economic evaluation;
- Overview of Aboriginal values; and
- Planning Assessment.

The Soil and Water Resources Assessment has relevance to this IWCM. The assessment comprised a review of major issues affecting land degradation and water quality in Tweed Shire. Information was collated from existing sources in order to determine what the major characteristics and issues for soil and water resources are, and how vegetation management may influence the quality of these resources. It was found that the management of native vegetation though clearing controls and rehabilitation has an important role in protecting and enhancing soil and water resources. In particular vegetation on steep and unstable lands, riparian zones, coastal dunes and acid sulphate soils were recommended as priority areas for management.

A7.8.3 Estuary/Coastal Zone Management Plans

Upper Tweed Estuary Management Plan

The study area of the Upper Tweed Estuary Management Plan (TSC, 1996) stretches from Barneys Point to Murwillumbah including Bray Park Weir. While the focus of the Plan is on estuary health and recreational enjoyment of the upper estuary, there are some key areas and issues raised with relevance to IWCM including:

- Effluent discharges from sewage treatment plants affected water quality in the estuary;
- Stormwater runoff increased rates of sediment and pollution delivered to the estuary;
- Increased population and urbanisation was predicted to increase pollutant loads to the estuary;
- Diffuse pollutant loads from the catchment were identified as one of the root causes of poor water quality in the estuary. The Plan recommended a strategic approach on a holistic catchment basis to provide integrated management of productive land, cleaner water and a diversity of vegetation and wildlife; and
- Actions related to Bray Park Weir upgrade of recreational facilities and riparian planting.

The Plan is now over 16 years old and requires review.

Tweed Coastal Creeks Estuary Management Plan

The Tweed Coast Estuaries Management Plan 2004-2008 (Australian Wetlands, 2004), provides a management framework for Cudgen, Cudgera and Mooball Creek estuaries. The Plan embraces the long-term vision of healthy, productive and attractive estuaries that can be resilient to all types of responsible land uses and possess healthy ecological and recreational values. The objective of the Plan is to provide well-founded, cooperative and integrated management to achieve this vision.

General strategies are proposed for the protection, maintenance, rehabilitation, and enhancement of environmental values including water quality, entrance management, recreational aspects, and catchment management. The focus of the plan is on the protection of downstream estuarine environments, but a total catchment management plan approach is promoted to best manage sources of pollution impacting estuaries. Of particular relevance to IWCM are the following issues and management recommendations raised by the EMP:

- Urban stormwater was identified as a potential source of pollutants to the estuary. Community concern was documented about increases in population and the flow on effects of increased urbanisation, stormwater impacts and declines in waterway health. Water Sensitive Urban Design was put forward as a general conceptual framework on which to base management;
- Overflows from the Hastings Point WWTP plant during extreme flood events were identified as affecting the health of Christies Creek and Cudgera Creek; and
- On-site sewage systems were identified as a risk to water quality, and the Plan supported the planned Mooball WWTP and ongoing implementation of Council's On-site Sewage Management Strategy.

Coastal Zone Management Plan for Cobaki Broadwater and Terranora Broadwater

The Coastal Zone Management Plan for Cobaki Broadwater and Terranora Broadwater (Australian Wetlands, 2010) provides a scheduled sequence of recommended activities that need to be undertaken to achieve the estuary management objectives. The objectives relate to improving the water quality and ecosystem health of the estuaries through revegetation of riparian zones, improving the quality of rural and urban discharge, protecting and enhancing habitat values, increasing public access, supporting viable commercial fishery industries, stabilising creek bed and banks, and increasing community awareness of areas important to Aboriginal cultural heritage. The Plan sets long-term management targets for riparian cover, ecosystem health and water quality. Of particular relevance to IWCM are the following issues and management recommendations raised by the CZMP:

- A key management issue is the potential for algal blooms in the broadwaters due to nutrient inputs from the catchment stormwater following large rain events;
- There is a significant source of nitrogen likely from on-site wastewater treatment systems and/or manure from livestock within the catchments;
- TSC's Banora WWTP was identified as a threat to ecosystem health and this was attributed to pump station overflows and recycling of nutrients from sediments and nutrients from WWTP effluent moving upstream with the tides to the broadwaters; and
- Many existing stormwater assets are identified as having negative impacts on ecosystem health and require retrofitting with suitable SQIDs in addition to education. The Western Drainage Scheme discharging to the Terranora Broadwater was identified as a key problem area due to aquatic weed outbreaks, sediment accumulation, algal blooms and poor water quality.

- Sedimentation of the broadwaters is considered a priority issue. Sediment from the construction phase of development, agricultural activities and stormwater drains contribute to sedimentation issues.
- Lack of native riparian vegetation was the most visible process influencing condition of the waterways.

Cudgera Creek and Kerosene Inlet

A baseline ecological health assessment was conducted for the Cudgera Creek estuary at Hastings Point and Kerosene Inlet on Letitia Spit Fingal Head, NSW (Australian Wetlands, 2010). The report concluded that Cudgera Estuary is under some pressure in relation to nitrogen and phosphorous. While various potential sources of pollution were identified by the report including urban development, agriculture and STP overflows, the study did not confirm any causative factors of water quality decline observed in the waterways.

A7.9 Urban Stormwater Management

The Tweed Urban Stormwater Quality Management Plan (USQMP, TSC, 2000) was prepared in 2000 in response to the Notice issued to all NSW Councils by the Environment Protection Authority under Section 12 of the *Protection of the Environment Administration Act, 1991*. The purpose of the Plan was to ensure Urban Stormwater management is addressed by Council and that issues are incorporated into the planning, budgetary and ongoing works activities of Tweed Shire Council. The USQMP (2000) provided specific stormwater management actions to be implemented throughout existing urban areas of the Tweed.

During the update of the USQMP during 2011/12, an audit was undertaken on the implementation status of the existing stormwater management actions. While many of the actions have been completed, recommendations have been provided to improve Council's compliance, regulation and operations procedures.

With assistance from the NSW Government's Stormwater Trust, Council installed stormwater quality improvement devices (SQIDs) on two major stormwater outfalls into the Ukerebagh Passage on the Tweed River in 2008. Council also received financial assistance from Environment Australia to install SQIDs on stormwater outfalls discharging into Cudgen Creek at Kingscliff.

Long and short-term stormwater objectives from the draft USQMP for existing urban areas are listed in Table A 21. The objective of retrofitting 75% of the existing untreated urban catchment with best-practice WSUD is not likely to be achieved with current funding arrangements.

Table A 21: Stormwater Management Objectives for Existing Urban Areas (Australian Wetlands, 2012)

Value	Long Term Objectives	Short-term Objectives
Aquatic ecosystems (AQ)	o 75% of existing untreated urban catchment is retrofitted with best practice WSUD o Water quality in all waterways meets catchment-specific WQOs (once developed) o Aquatic habitat flourishing, particularly seagrass in the lower Tweed River estuary and Coastal Creeks. o Retention, maintenance and enhancement of mangrove, saltmarsh and freshwater ecosystems.	1. 25% of existing untreated urban catchment is retrofitted with best practice WSUD 2. Physico-chemical water quality of estuaries to meet TSC WQOs 3. Physico-chemical pollutant loading from sub-catchments to be reduced. 4. A measurable reduction in anthropogenic pollutants from commercial and industrial areas. 5. Physico-chemical pollutant loading from developing sub-catchments not to exceed pre-development levels. 6. Nitrogen and phosphorus concentrations reduced in all waterways impacted by urban land use. 7. Suspended solids load in all waterways is to meet TSC WQOs.
Commercial shellfish production (CS)	o Retention of a viable commercial oyster industry maintained in the Tweed River estuary.	8. Water quality to meet guidelines stated within the Tweed River Shellfish Quality Assurance Program. 9. Reduce incidence of sewer pump station overflows. 10. Minimise runoff to stormwater systems from on-site sewage disposal
Primary contact recreation (PC)	o Water quality in the Tweed River and Coastal Creeks to meet ANZECC guidelines for primary contact recreation.	o No's 4, 9 and 10 above 11. Physico-chemical water quality of estuaries to meet ANZECC criteria for primary contact recreation.
Secondary contact recreation (SC)	o Water quality in the Tweed River and Coastal Creeks to meet ANZECC guidelines for primary contact recreation.	o Covered by objective 11

Regional stormwater objectives for new urban development requiring consent in the Tweed are outlined in Tweed Shire Council's Development Design Specification D7 – Stormwater Quality. This specification details the information relating to stormwater quality required to accompany development applications and construction certificate applications. This specification complements the Tweed USQMP by detailing stormwater objectives/standards and prescribed stormwater management measures that comply with the Tweed USQMP and contemporary best practice. The stormwater objectives provided in this specification apply to new development in the Tweed Region unless there is a catchment specific stormwater objective provided in the Tweed USQMP.

In relation to the design and management of Stormwater Quality Improvement Devices (SQIDs), the updated Tweed USQMP aims to ensure the following (Australian Wetlands, 2011):

- Stormwater design and maintenance is always consistent with current best practices; and
- All stages of SQID implementation, including the planning, design, construction, performance monitoring and asset handover phases, are conducted with consultation between the applicant and Council.

The USQMP recommends the implementation of a SQID design and management process consistent with the Water by Design program of the South East Queensland Healthy Waterways Partnership (Figure A 8).

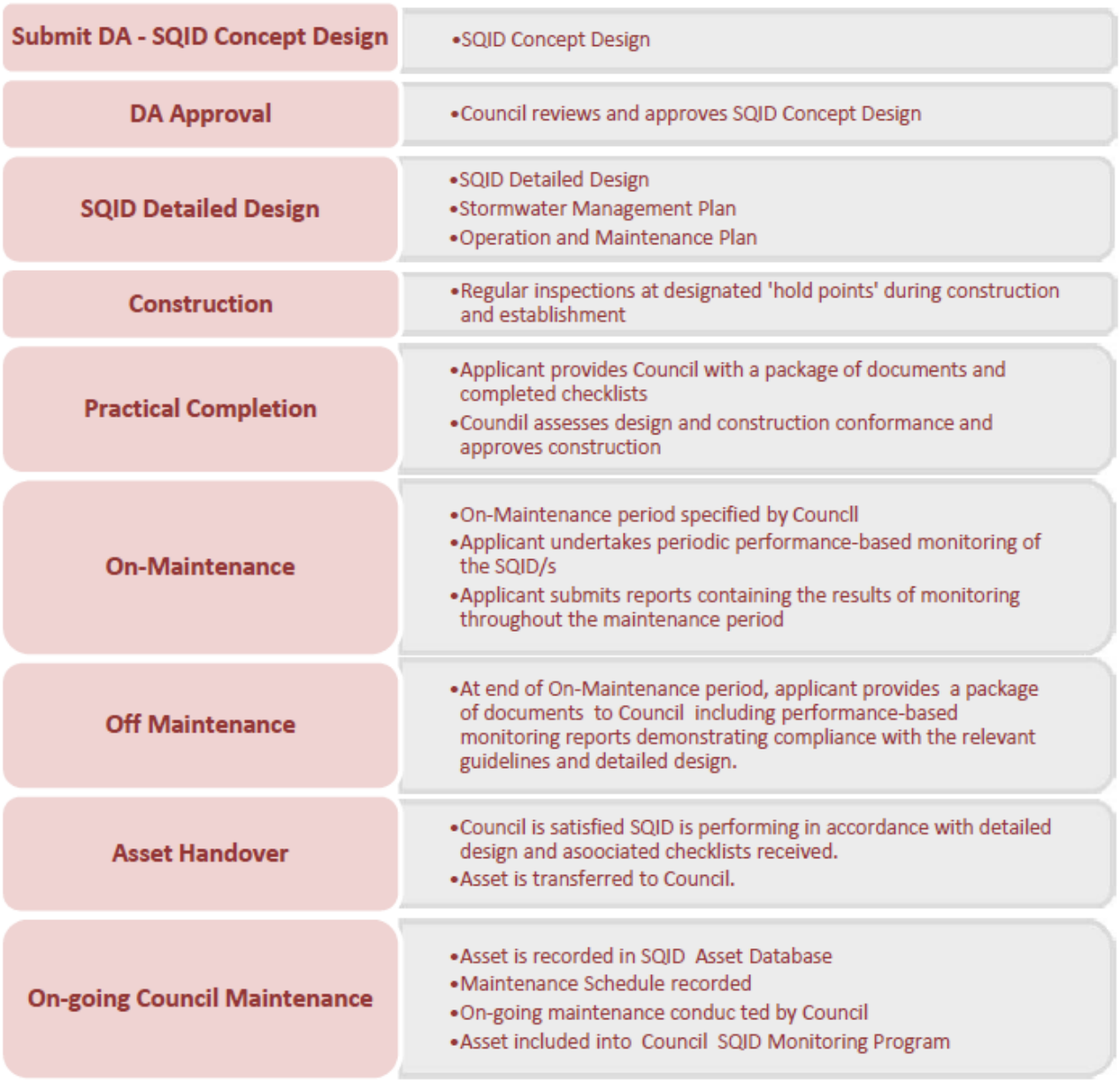

Figure A 8: Summary of SQID Design and Management Process

Source: Australian Wetlands (2011)

Council will update the DCP (D7 Stormwater Quality) once the USWQMP is adopted.

A7.10 Sustainability Gap Analysis

TSC commissioned a gap analysis of its operational framework to identify opportunities to improve environmental management and sustainability outcomes across the organisation (Tim Fitzroy & Associates, 2010). A summary of the gap analysis findings is given below.

Table A 22: Sustainability Gap Analysis – Actions, Gaps, Opportunities and Recommendations Relevant to IWCM

Strategic Theme	Current Actions	Gaps or Opportunities	Recommendations
Civic Leadership/ Governance	• Community engagement process • Internal engagement process	• Resourcing shortfall between community expectations and what Council can deliver. • Internal communication of roles and responsibilities between Divisions/ Units/ Positions to draw upon specific expertise for better social/ environmental/ economic outcomes	• Community engagement • Utilise internal communication processes to raise awareness about the lateral roles within Council. Provide the necessary support and resourcing to allow effective utilisation of these roles. • Cross-Council teams, organisation structure that breaks down 'silos'
Civic Leadership/ Sustainability and Climate Change	• Carbon accounting • Fuel and energy management • Community education • Coastal and floodplain development control • Broad level risk assessment • Cities for Climate Protection Program (Mitigation plan)	• Reduction targets and action plan are no longer current • Tweed/Byron Adaptation Plan has not been incorporated into management framework • KPI and associated targets for fuel and energy consumption	• Incorporate mitigation and adaptation planning into a Climate Action Plan that is used to inform Council resourcing • Establish new targets for greenhouse gas reduction
Supporting Community Life/ Water Supply	• IWCM Strategy • DMS • Catchment management resourcing • Urban Stormwater Management Plan • Community education	• Stormwater harvesting and WSUD opportunities in new development • Ongoing rebate/retrofit program for residential sector • Large scale recycled water opportunities • Internal referrals/communication • Overflow abatement strategy not integrated with other policies • Knowledge of IWCM process across Council is limited	• Review best-practice and innovative techniques for WSUD • Review, update and implement WSUD including requirement for bioretention in DCP • Consider introduction of ongoing rebate schemes along with retrofit programs
Supporting Community Life/ Built Environment	• Development assessment	• In-house referrals process to enable best-practice environmental design	• Investigate options for improving in-house referrals/ communication

Strategic Theme	Current Actions	Gaps or Opportunities	Recommendations
Caring for the Environment/ Natural Resource Management	• Assistance program for landholders in water supply catchment/ bushland areas/ farmland • Riparian/coastline restoration projects • Water quality monitoring • Policy, planning and project advice to Council Divisions • Community education and support	• Management plans for upper catchment • Statutory backing for riparian management control • Sustainable Agriculture Program activities not available in website • Lack of documented management framework for Sustainable Agriculture Program	• Develop management plans for waterways in the upper catchment (e.g. Rous River) • Develop Sustainable Agriculture Policy/ Management Plan in consultation with relevant stakeholders

Source: Tim Fitzroy & Associates (2010)

A7.11 Environmental Design Guidelines for Council Facilities

TSC has prepared guidelines to ensure that Council buildings are designed to minimise operating costs, promote the sustainable use of resources and reduce waste.

The goal for Water is: 'To ensure that the development maximises water conservation'. The guidelines specify the use of rainwater tanks for re-use and water efficient appliances and require the consideration of reuse of sewage or grey water in accordance with New South Wales guidelines.

The goal for Landscaping is: 'Landscaping should enhance the operation and use of the building, while promoting biodiversity and providing habitat for native plant and animal species'. The guidelines specify the requirements for plant species and climate tolerance.

Council's Procurement Standards specify the minimum requirements for water and energy efficiency ratings.

A7.12 Sustainable Agriculture Program

The Tweed Shire Community Strategic Plan 2011- 2021 identifies the need to foster a viable farming community and improve the environmental capacity of Tweed farmland. The Sustainable Agriculture Program is a response to these community objectives. By working with local landholders and with support from the Tweed River Committee, Tweed Coastal Committee and state agencies, Tweed Shire Council is seeking to improve the viability and environmental capacity of the Tweed's farmland.

Agriculture is one of the main land uses in the Tweed Shire. However, a range of social, economic and environmental pressures - including an ageing farming population, changing land uses and increasing variability of environmental factors - are all impacting on the viability of agriculture in the Tweed. Council is preparing a Sustainable Agriculture Strategy to address these challenges.

Other projects include:

- Floodgate management - improve tidal flow and fish passage through floodgate modification in drains and creeks on the floodplain;
- Greenbanks - planting out cane drains with native ground cover and small trees to stabilise the banks, discourage weeds and prevent topsoil runoff;
- Drain modifications - levelling and drain in-filling program to reduce acid sulfate soil runoff to local waterways;
- Compost trials - on-farm trials to compare the benefits of organic compost and manures with conventional fertilisers;

- Soil conservation; and
- Research projects.

A7.13 On-Site Sewage Management Strategy

The On-site Sewage Management (OSSM) Strategy details Council's approach to the supervision of sewage management systems in the Tweed Shire. The *Local Government Act* requires landowners to obtain Council approval to operate their on-site sewage management systems and to maintain and operate their systems to standards protecting public health, the environment and community living. The Act gives Councils the responsibility to issue approvals to operate and to monitor all systems to ensure they meet the standards.

The objectives of Council's On-Site Sewage Management Strategy are:

- Prevention of public health risk;
- Protection of environmental health;
- Conservation and reuse of resources; and
- Protection of community amenity.

The OSSM Strategy describes the risk assessment and inspection program and performance standards for on-site systems. Inspections are undertaken for the purposes of Section 68 approvals to operate, install or upgrade, pre-purchase inspections and follow-up repairs/complaints/investigations. The frequency of inspections depends on the risk category:

- Low Risk - Inspection every 6 years;
- Medium Risk - Inspection every 4 years; and
- High Risk - Inspection every 2 years.

The risk assessment is based on flood potential, exposure/aspect, slope, distance to waterways, property area, soil type, type of effluent disposal and health, environmental and community amenity hazards (determined from a desktop audit and site audit).

Quarterly reports are provided to Council summarising the inspections undertaken and the number of failing systems (Table A 23).

Table A 23: Quarterly Inspections of OSSM Systems

Quarter	Number of inspections	% of OSSM systems inspected in quarter which failed or need repair work	Number of failed systems rated high risk
Jun 2012	148	36%	9
Mar 2012	167	53%	12
Dec 2011	135	45%	30
Sep 2011	121	39%	23
Jun 2011	75	33%	10
Mar 2011	155	14%	22
Dec 2010	174	12%	20
Sep 2010	209	11%	22
Jun 2010	197	23%	45
Mar 2010	182	15%	28
Total (10 quarters)	**1,563**	**26%**	**221 (14%)**

APPENDIX B: STAKEHOLDER ENGAGEMENT

B1. IWCM CONSULTATION ACTIVITIES

As part of the IWCM Strategy development and implementation, Council has undertaken a range of consultation activities. These are summarised in the following sections.

B1.1 Water Supply Augmentation Project Community Working Group

The Tweed Shire Water Supply Augmentation Community Working Group (CWG) consisted of members of the Tweed Shire community and aimed to be a representative cross-section of the Tweed Shire community. CWG Members were selected from a large number of nominations received from residents of Tweed Shire. The members representing residents, environmental, business and catchment user groups were selected by an impartial selection panel from Southern Cross University (SCU) according to predetermined selection criteria. The remaining representatives were nominated directly by their stakeholder group.

The CWG's aim was to assist Council to select a preferred option from four shortlisted water supply augmentation options. The role of the group was to investigate the options in some detail, collect and disseminate information with stakeholders and the wider community, and to work with Council to identify the key environmental and social issues associated with each option. . The CWG met to discuss and deliberate these issues during five meetings held between 1 December 2009 and 1 March 2010.

Council invited the community and the Community Working Group to comment on the options short-listed for the water supply augmentation project, the proposed multi- criteria analysis process, any deficiencies or consultation gaps, and help to identify the environmental, social and cultural impacts of each of the options and how each might be managed. The CWG provided a report to Council on the group's recommendations together with the views, interests and issues of individual CWG members. The report provides the CWG's assessment of the environmental and social impact of the three short-listed options, and recommendations for review of the process and further assessment required including the need to:

- Review population projections and water demand projections;
- Review the demand management approach, benchmarking, and use of alternative water supplies;
- Better market the IWCM strategy;
- Consider climate change scenarios, adaptation and mitigation;
- Consider other options;
- Consider environmental costs/values;
- Improve the consultation process, increase input from broader community and consideration of feedback by the CWG;
- Address water quality and environmental flow issues in the Tweed River;
- Increase action in relation to water cycle issues for new greenfield developments;
- Review Councils population growth policy; and
- Consider separate charges for water supply in greenfield developments

The wider community was informed about the augmentation project and their feedback was sought through the media as well as a Community Working Group, community information sessions, meetings with the Aboriginal Advisory Committee and various community groups (TSC, 2010b). A total of 159 submissions were received containing over 1,000 individual matters or issues. Major issues raised by these respondents included concerns about:

- Population growth, population projections and the carrying capacity of the Tweed;
- New developments should be required to be more sustainable;

- More focus on demand before supply: water substitution and alternative water sources should be pursued, and Council to support rebates and retrofits;
- Better education, higher water pricing, and communication of water use required;
- Meter individual dwellings in Retirement Villages and Multi-Unit Complexes;
- An independent review of Council's approach to water required;
- The adequacy of the CWG and community consultation. The need for a mechanism to better engage the broader community;
- The appropriateness of the starting point for the consultation process; and
- Understanding that there is a need for augmentation. Each of the four options has benefits and disadvantages.

B1.2 Demand Management Strategy

The first stage of the DMS, focussing on residential water use was placed on public exhibition for a period of eight weeks during 2008. The Stage 2 report, updated Stage 1 report and a combined summary report were placed on public exhibition for a period of 12 weeks during 2010. Consultation activities included:

- Media advertising, Tweed Link articles and media releases;
- Community information sessions;
- Free call 1800 telephone line to ask questions and make a verbal submission;
- Designated email address;
- An Interested Parties Register to keep people and organisations informed of developments either by email or regular post; and
- Multiple factsheets and reports available online and at Council offices and libraries

The initial public exhibition of the first stage of the DMS in August 2008 resulted in only one late submission received. There was more public interest and feedback during the second phase of community consultation and public exhibition, although compared to the overall population the response is low (83 submissions received and 40 members of the community attended public information sessions).

The Community Working Group also provided recommendations for Council's demand management approach, and in particular suggested improvements in the way the community is informed about demand management.

More recently, Council has conducted community surveys as part of the ongoing review of the demand management program:

- A survey seeking input from members of the community and other stakeholders was run during May 2012 to provide input to the review of the Residential Water Saving Program, including rebates; and
- A survey on the content of the water bills is being undertaken during October and November 2012.

B1.3 Six Year IWCM Review Brief

During development of the consultancy brief for the six year IWCM review in early 2012, Council requested community input on issues that should be included in the brief. The submissions requested a review of:

- Population projections;
- Demand forecast;

- Water management practices aimed at improving river and estuary health;
- Catchment management practices and impact on raw water quality;
- The success of existing Council programs;
- Alternative water sources;
- Water cycle management in greenfield developments;
- Water sensitive urban design;
- Unaccounted for water; and
- Opportunities for entire community to present views.

Community members were also invited to sign-up to the Interested Parties Register.

Many of the submissions referred to a technical review of Council's DMS and Water Supply Augmentation Options Study which was undertaken by engineers from GeoLINK, an environmental management and design consultancy. GeoLINK undertook the review at its own initiative and did not receive any payment for the work. Some respondents requested that this document be considered as part of the IWCM review. Findings of the review can be summarised as:

- The demand management and water supply options should be considered together (demand side and supply side management);
- BASIX and WELS should be included in any baseline forecasts of future water demand ;
- The demand forecasts appear to be overestimated;
- The yield targets appeared to be overestimated; and
- Larger rainwater tanks should be considered, potentially also combined with recycled water use and decentralised sewer mining schemes.

B1.4 Internal Council Stakeholders

B1.1.1 Input into Six Year IWCM Review brief

Council established a steering committee for the 6 year IWCM review and requested feedback from Council staff on the scope of the IWCM Review.

B1.1.2 Interviews with Council Staff

Interviews with Council staff were held on 23 and 24 August 2012 to determine:

- Staff understanding and perceptions of IWCM;
- Current and planned IWCM activities;
- Key issues to be addressed in the review;
- Constraints to successful implementation of IWCM initiatives; and
- Other considerations for the IWCM review.

Staff from the following departments were interviewed:

- Planning and Infrastructure;
- Water Unit;
- Design Unit;
- Recreation Services;

- Natural Resource Management Unit;
- Building and Health Department; and
- Planning Reforms Unit.

Urban Stormwater

- Responsibilities for maintenance of vegetated stormwater systems/natural drainage channels are unclear and technical capability for ongoing operation and maintenance of WSUD systems may be insufficient. Council staff that maintain the stormwater systems have functional/engineering capability but limited knowledge of natural systems/vegetation. Parks and Gardens staff who maintain the vegetated areas have limited stormwater engineering capability. Increased emphasis on WSUD and natural systems will require integrated responsibilities/capabilities. In addition, existing procedures for handover of stormwater systems for ongoing Council operation and maintenance are considered to be inadequate. Staff are proposing to form a working group covering activities over the whole asset life cycle (planning, development controls, design, operation, maintenance and renewal) to develop systems and guidelines and ensure resources are adequate.
- Existing Council development controls (e.g. D7) can be satisfied through design of stormwater pollutant reduction systems yet residual load may be detrimental to downstream sensitive waterways e.g. Kings Forest development is predicted to discharge residual load into Cudgen Creek system which would be detrimental to ecosystem health. D7 does not currently allow for consideration of sensitive receiving environments. Council is negotiating with the developer to include offsets to improve outcomes within the Cudgen creek system. While offsets have been flagged in the USWMP (to be adopted) there are no guidelines or policy mechanisms in place to enforce offsets or address the residual impacts.
- Existing subdivision erosion and stormwater controls (C211) are not adequate for the range of storms experienced in the Tweed. Resources for enforcement are limited and Council relies on complaints or inspections to highlight inadequacies in control systems. Existing penalties are not considered sufficient to improve practices. Council is aiming to limit exposed areas to <5 ha at a time through consent conditions however there are no area limits specified in the Code of practice for soil and water management on construction works (D7 Annexure).
- Similarly, the controls for house developments are hard to enforce, education is limited and there are not enough building inspectors to enforce requirements.
- Stormwater recycling at the community level is not considered beneficial due to the large amount of rainfall, large land area required for storage and infrastructure costs. RWTs at the house level are considered to be most appropriate.
- The OSD policy/guidelines need to be updated.
- Design of Council roads and stormwater systems does not usually incorporate WSUD due to space restrictions. Swales are being replaced with kerb and gutter systems to reduce maintenance and end-of pipe solutions are included. More guidelines on WSUD and less emphasis on traditional end-of-pipe solutions are required.

Urban Water Demand

- Data collection and retrieval is problematic. Data on number of connections and water demand is not readily available due to categorisation of connections (e.g. multi-residential properties are not separately metered) and changeover to new data management system.

- While new duplexes and triplexes are provided with separate meters, there is no policy for separate metering of existing multi-residential properties which makes demand data collection and application of water saving initiatives difficult.
- Meters are read twice a year on a rolling program and bills are sent out following the read. From 1 July 2013, quarterly reads and bills will be pro-rata on financial year basis. New bills (introduced July 2012) are considered to be a deterrent to over-use.
- The effectiveness of water efficient appliances is reduced with residents altering the devices e.g. removing flow restrictors out of showerheads. Rising electricity costs have meant some residents are disconnecting rainwater tanks from pumps.
- There is currently no mechanism to promote retrofit of RWTs. While Council has a policy of encouraging RWTs >5kL, this is not supported by BASIX or incentive programs.
- A long term leakage reduction program needs to be developed and costed and included in Council budgets.
- Council's Recreation Services department is progressively implementing irrigation management systems to rationalise water use but implementation is limited by funding.
- Some Council staff need education on water use and efficiency.
- Council pools are a large user of water but health regulations limit potential for recycling backwash water.
- The Council nursery is a large user of water due to old irrigation systems/overhead sprinklers.
- There are opportunities for RWT in public spaces for irrigation and cleaning toilets.

Governance

- Some operational staff were not aware of the actions in the IWCM Strategy or how their activities contributed to IWCM. While IWCM initiatives are being implemented, the IWCM Strategy is not driving the mindset or activities on a day to day basis.
- The implications of potential Council amalgamations are unclear.
- The implications of private industry involvement in town water supply and wastewater management are unclear, particularly with regard to regulation and Council responsibilities.
- There is inconsistent application of development forecasts within Council planning department and Water Unit. Future urban release areas are not adequately served by existing water and wastewater systems or considered in system upgrades (e.g. design of Burringbar/Mooball sewerage system). Conversely, land release strategies do not adequately consider the capability or capacity of existing water and sewer infrastructure and developers are turning to private water utilities for services.
- There is a need for defendable and robust population forecasts.
- There is a need for informed decision-making. Political views (greens vs pro-development) are dominating decision-making.
- Developments have not proceeded as fast as projected. Infrastructure for growth has been provided but is not recovered through developer charges. Future infrastructure planning has been based on over-estimated population growth rates (due to high historical growth rates not continuing). Development servicing plans are due to be reviewed in 2012.
- IWCM is not adequately enforced through development consents. Approved designs are based on traditional engineering solutions rather than integrated concepts. Opportunities for wastewater recycling and demand management are not realised.

- Managing community expectations regarding IWCM initiatives such as recycling is a challenge. Council needs to balance the provision of value-for money services with innovative integrated solutions that are desired by the community. Council aims to promote recycling but this is not necessarily the best bang for buck.
- The increasing liability of providing non-potable standard effluent for reuse is a concern.
- The regulatory requirements of the WICA Act and Council responsibilities for Section 68 (private water and sewer systems) approvals are unclear. Similarly the risks to Council of private utility developments are not known.
- There is a need to ensure that IWCM strategies consider the implications for all Council activities e.g. public health risks, regulatory requirements etc. as part of strategy development and ongoing review.
- Greywater reuse is becoming more common but is not encouraged by Council due to the need to comply with stringent guidelines, potential health, odour and runoff impacts. Improved upfront management involving community education and Council support is required for this to be successful.
- The proposed restructure of Council could be informed by the IWCM Strategy.

Asset Management

- Climate change implications have not been considered in urban water services planning e.g. flood levels, sea level rise and implications for assets, reduction in secure yield.
- Asset management planning needs to be improved, particularly condition assessments, life-cycle analysis and renewal planning.
- ASS affect condition of underground assets. Council has found that previous backfilling operations that did not adequately treated ASS have resulted in corrosion of pipes. Current operations follow new management plans which will avoid this problem in the future.

Drinking Water Quality

- Drinking water catchment management actions are limited and there is no formal management plan in place.
- The temporary treatment system for manganese removal at Bray Park WTP requires upgrading.
- Dirty water events at Uki still require carting from Tweed system.
- Algae in Clarrie Hall Dam

Water Extraction

- Extraction licence for Clarrie Hall Dam requires environmental releases which are considered to be too high.
- Operational management of extraction monitoring and environmental releases is difficult and resource intensive due to daily readings in remote areas, complicated determination of required environmental releases and use of river gauges to check spillway flows.

Urban Wastewater Systems

- Licence requirements for pH and suspended solids are not always achieved at Uki WWTP due to algae growth in the tertiary pond.
- Previous issues with overflow of dune exfiltration system at Hastings Point WWTP have been resolved through ongoing maintenance and increased capacity of dune discharge system.

However, the community has misunderstanding of cause of water quality issues in wet weather – due to catchment ASS discharges, not treated effluent.

- The actions in the SOAS are not all implemented. There is a need to review the actions and update the SOAS. Council is developing overflow containment targets and preparing models of the current sewer systems. Environmental procedures for overflows to sensitive environments need to be improved.
- Irrigation of recycled water is constrained by increasing regulations and lack of regulator expertise to review and approve. The cost of irrigation reuse is increasing.
- Council has not prepared recycled water management plans for all reuse applications but is aiming to develop guidelines and monitoring procedures for all sites.
- Increasing regulatory requirements for phosphorous removal do not consider the holistic cost of chemicals and energy etc, just driven by EPA licence requirements.
- All WWTP biosolids are reused on farmland in rural areas. This results in high cartage costs. Council is developing a biosolids management plan which may revise strategy but there will be challenges in finding acceptable low cost and low energy approaches.
- Councils' trade waste policy has not been adopted as NOW has not accepted Council's proposed approach of allowing businesses to discharge the residential wastewater discharge allowance at no charge. Council is currently proposing to phase-in the removal of this allowance over 3 years.
- The Bray Park WTP discharge of trade waste to sewer needs improved management to reduce the suspended solids load.
- The upgrade of Banora Point WWTP (double capacity) will result in increased nutrient loads even though disinfection is included. Reuse schemes will become more attractive where discharges to receiving waterways are a concern.
- There are some on-site systems that are failing but there is limited opportunity to cost-effectively connect to Council reticulated sewer systems (e.g. Tanglewood, Killvale, some areas of Mooball, Nunderry, Bilambil).
- Additional financial and human resources are required to adequately regulate, inspect OSS and educate residents.
- The new Burringbar/Mooball WWTP is constructed on flood prone land with limited potential for expansion. This has implications for growth in areas surrounding Buringbar/Mooball.

Water Supply

- The basis for assessment of water supply augmentation options should be reviewed with current information on community expectations, regulatory requirements, demand forecasts, costs etc. There is a need to find the appropriate balance between demand and supply.
- The raising of Clarrie Hall Dam may trigger a review of environmental flow provisions and other requirements such as fish passage.
- The existing LEP is the only protection of drinking water catchments, no DCP.

Rural/Catchment Management

- Council's Agriculture Strategy is focussed on raising the environmental capacity of farms (agronomics) but has not been integrated with urban area planning.
- Farmers on the floodplain are concerned about urban development and the impact of filling on the floodplain e.g. cane fields are more frequently flooded. The impacts of cumulative infilling as an urban development approach on farmlands are not considered.

- There is a need to protect the agriculture values and limit encroachment of urban development of farming land. Protection of prime agricultural land is required.
- Council staff wish to extend the River Health Grants scheme to include the whole Shire to increase uptake of grants and the success of the scheme and provide for whole-of-catchment social equity.
- There is no catchment management plan for the Upper Tweed. Catchment management activities are limited to diffuse source pollution control undertaken as part of the River Health Grants Scheme and OSSM.
- There is a need to strengthen the linkages between existing catchment management, estuary management, coastal zone management, agriculture and IWCM programs and activities.
- The coastal zone/estuary management planning process will identify the assimilative capacity of waterways and this needs to inform policy on land use planning and urban development.

APPENDIX 2: STAKEHOLDER CONSULTATION ACTIVITIES AND RESULTS

TWEED IWCM STRATEGY - STAKEHOLDER ENGAGEMENT ACTIVITIES

Objectives

The objectives of the stakeholder engagement program for the six year IWCM strategy review are:

- Involve the Tweed community in the six year IWCM strategy review;
- Engage with relevant Council units to ensure input into the review and ownership of the adopted strategy;
- Ensure Council staff and Councillors receive quality information representative of the views of the Tweed community using a range of methods, to assist in effective decision making;
- Build a positive reputation for TSC by demonstrating that Council is listening, informing and being informed by the broad Tweed community;
- Incorporate numerous engagement methods to involve people who otherwise would not be able to participate in the review;
- Facilitate involvement in water cycle management decisions.
- Enhance the relationship between Council and the community; and
- Increase community ownership of the adopted strategy.

Key Messages

To Council Units:

- IWCM can provide synergies/efficiencies if a Council-wide approach is taken;
- By being involved from the beginning, you will have maximum influence on the outcomes; and
- The quality of data supplied and accuracy of feedback will determine the quality of the final strategy;

To stakeholders and the community:

- By being involved from the beginning, you will have maximum influence on the outcomes; and
- The IWCM review will confirm if the existing direction is appropriate and identify alternative direction if required.

Key Stakeholders

The key stakeholders for the IWCM review are:

- Tweed Shire residents and ratepayers;
- Businesses – represented by Chambers of Commerce;
- Community/interest groups – civic groups, sporting groups, environmental groups, Landcare groups;
- Aboriginal groups – Native Title claimants, Land Councils, Elders;
- Councillors;
- Council staff; and
- Government agencies and statutory authorities – NSW Office of Water, DPI-Fisheries, CMA.

Community Consultation Tools

- The project webpage on Council's website - (http://www.tweed.nsw.gov.au/Water/IWCMstrategyReview2012.aspx) provided information and links to the survey and document downloads.
- Fact sheet (refer attached).
- Promotional material was distributed at the Murwillumbah Pool and shire libraries, Civic offices, the Coolamon Centre, Banora Point Community Centre and Pottsville Beach Neighbourhood Centre.
- Media Releases (attached) and Tweed Link articles (4/12/12 Issue 789, 27/11/12 Issue 788, Issue 785, 6/11/12) were used to promote the project and community involvement.

- Telephone Survey – refer Jetty Research report - *A random telephone survey of Tweed Shire residents regarding the 2013 integrated water cycle management (IWCM) strategy* (Jetty Research, 2013a).
- Online/Hard Copy Survey – refer separate Jetty Research report - *An online and paper survey of Tweed Shire residents regarding the 2013 integrated water cycle management (IWCM) strategy* (Jetty Research, 2013b).
- Youth groups:
    - a covering letter, paper surveys, business posters and business cards were sent to identified contacts at ten Tweed Shire high schools, plus TAFE (Kingscliff and Murwillumbah campuses), Southern Cross University, and Tweed Heads PCYC. This included follow-up phone calls and emails.
    - Distribution (via TSC's youth development officer) of a promotional email and web survey link to approx. 70 local youth groups and service providers;
- Distribution of business card promoters and paper surveys at the Tweed River Festival (November 17 and 18th, 2012).
- Seniors – information and hard copy surveys were made available to seniors through Council staff working at Banora Point Community Centre.
- Aboriginal Groups – presentation to Aboriginal Advisory Committee Meeting 7 December 2012 (attended by representatives from Canowindra, Tweed Wollumbin Aboriginal Education Consultative Group, Tweed Byron Local Aboriginal Land Council, Tweed Aboriginal Corporation for Sport and Tweed Aboriginal Co-Op Society Ltd).
- Targeted correspondence - emails (12/11/12 and 7/12/12) were sent to state government agencies, community groups and members of the Interested Parties Register requesting input into the review.

Table 17: Targeted Correspondence

Stakeholder	Contact	Status/Feedback
Government Agencies and Statutory Authorities		
Office of Water	Chris Hennessy chris.hennessy@water.nsw.gov.au Patrick Pahlow patrick.pahlow@water.nsw.gov.au	Feedback on Background Paper received 7/12/12
DPI-Fisheries	Pat Dwyer patrick.dwyer@industry.nsw.gov.au	No response
Northern Rivers CMA	Peter Boyd Peter.boyd@cma.nsw.gov.au	No response
Community Groups		
Tweed Landcare	chrisrob127@gmail.com; franohara590@gmail.com	No response
Chambers of Commerce – Tweed and Kingscliff	info@kingscliffchamber.com.au; info@tweedchamber.com.au	No response
Tweed Canegrowers Association	Rgquirk@bigpond.com	No response
Tweed River Committee	Tom Alletson talletson@tweed.nsw.gov.au	No response
Tweed Heads Environment Group	rwmy125@tpg.com.au	Submission received 3/12/12 (1)

Stakeholder	Contact	Status/Feedback
Northern Rivers Guardians	info@norallygroup.org	Submission received 12/12/12 (2)
Save Byrrill Creek	savebyrrillcreek@bigpond.com	No response
Caldera Environment Centre	caldera@calderaenvironmentcentre.org	Submission received 12/12/12 (3) [1]
Community Members		
Interested Parties Register	Confidential – online registration, email notifications 12/11/12 and 4/12/12	All responses included below
Other		Submissions Received: Ari Ehrlich, 13/12/12 (4) [1] Joanna Gardner, Byrrill Creek Landcare, 13/12/12 (5) Menkit Prince, 12/12/12 (6) Kirsten Ealand, 12/12/12 (7) [1] Eddie Roberts, 12/12/12 (8) [1] Carolyn Rifello, 12/12/12 (9) [1] Pam O'Connor, 12/12/12 (10) [1] Ian Walker, 12/12/12 (11) Peter Conde, 12/12/12 (12) [1] Malcolm Bailey, 12/12/12 (13) [1] Suzanne Gray, 12/12/12 (14) [1] Stephanie Barlow, 12/12/12 (15) [1] Ray Thorpe, 12/12/12 (16) [1] Bill Walton, 12/12/12 (17) [1] Marie Jack, 12/12/12 (18) [1] Rhonda James, 12/12/12 (19) [1] Johanna Garnett, 12/12/12 (20) [1] Anne Whittingham, 12/12/12 (21) [1] Heather Barnard, 12/12/12 (22) [1] Paul Taylor, 12/12/12 (23) [1] Charles Smith, 11/12/12 (24) [1] Peter Symons, 11/12/12 (25) [1] Kathleen Green, 11/12/12 (26) [1] Clover Hart, 11/12/12 (27) [1] Alexandra Manzi Fe, 11/12/12 (28) [1]

1. Many of the respondents have repeated the submission (either in full or in part) from the Caldera Environment Centre (submission no. 3).

Summary of feedback from Community Groups and Community Members:

Feedback Provided	Submissions	Response/Recommendation for IWCM Review
General		
Request for an independent review of the option selection process, water demand management projections, projected population growth and the impacts of climate change.	1, 2, 3, 5, 6	These considerations will be included in the IWCM Review and further investigation will be recommended if required.
Not enough background information has been provided to the Tweed community to enable them to make an informed response to some on-line survey questions.	1, 6	The survey was designed to capture community opinions. The IWCM Background Paper provided additional information on the survey topics.
Need for updated population forecasts and water consumption rates	1, 3, 4, 5, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28	Population and consumption data are reported in the IWCM Review Background Paper. Forecast.ID is currently updating the long-term population forecasts for the Tweed.
The current IWCM Strategy follows a traditional IWCM approach and Council will struggle to identify, assess and implement integrated water management solutions if the various departments keep working in isolation	4, 5, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28	Some examples of inter-departmental cooperation are provided in the IWCM Review Background Paper. The IWCM review will determine the extent to which additional integration is required and recommend strategies to implement this.
There is a need for Integrated Water Solutions to Tweed's Water Management	2, 3, 4, 5, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28	The IWCM Review will develop future strategies for integrated water management.
Energy consumption and greenhouse gas emissions should be considered in selection of options.	1, 5	These considerations will be included in the IWCM Review.
Concern about the effects of climate change	1	Climate change implications will be considered in the IWCM Review.
Potable Water Supply		
The IWCM information provided by the Tweed Shire Council makes little mention of the extensive community consultation of the Tweed District Water Supply Augmentation Project, completed in March 2010.	1	Appendix B of the IWCM Review Background Paper provides a summary of consultation undertaken to date including Community Working Group process and feedback.
Tweed Shire Council vehicles have been observed drawing Tweed drinking water supplies to provide dust reduction on new earthworks. This might be a source of unaccounted water lost.	1	As part of the demand management program, Council plans to review standpipe use and target unauthorised use.

Feedback Provided	Submissions	Response/Recommendation for IWCM Review
Opposed to building of a new dam	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28	The extent to which demand management and source substitution options can meet the predicted supply deficit will be a key consideration in the IWCM Review. Source augmentation and new sources of water will also be considered.
Concerned about sale of water to bottled water companies.	11	Access to water supplies is subject to the Water Sharing Plan and apart from town water supplies is beyond Council's control.
Dirty water events should be defined in relation to Uki WTP	1	This issue is discussed in the IWCM Review Background Paper (Issue 15: manganese, iron, blue-green algae). Drinking water catchment management will be considered in the IWCM Review.
Accuracy of demand management strategy is questionable and independent review needed.	3, 4, 5, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28	The IWCM Review Background Paper has provided information on current demand and management measures as well as updated forecasts of future water supply demand (Issue 13) Forecast.ID is currently updating the long-term population forecasts for the Tweed and these will be used in future demand forecasts. The IWCM Review will consider whether other demand management or source substitution measures are appropriate.
Coastal sands groundwater supplies occur on Tweed coast	1	Groundwater supplies will be considered in the IWCM Review.
Waterway/Catchment Management		
Concern about nutrient loads to Terranora and Cobaki Broadwaters.	1, 5, 6	This is being addressed through the coastal zone management planning process. The IWCM review will ensure appropriate synergies between relevant Council programs.
Concern that 2012 Tweed River Health Report has been carried out, but has been not been made available for public scrutiny	1	The report in question is not being prepared by TSC.
Concern about use of pesticides and herbicides near waterways.	3, 6	Catchment management will be considered in the IWCM Review.
Support for LEP controls for drinking water catchments	1, 3, 5	Drinking water catchment management will be considered in the IWCM Review.
Concern about cattle access to waterways within the drinking water catchment	1, 3, 5, 6, 11	Drinking water catchment management will be considered in the IWCM Review.
Concern about camphor laurel trees	11	Catchment management will be considered in the IWCM Review.

Feedback Provided	Submissions	Response/Recommendation for IWCM Review
Concern about protection of fish populations	11	Catchment management will be considered in the IWCM Review.
Need for river bank stabilisation works	11	Catchment management will be considered in the IWCM Review.
Concern about uncontrolled drainage from public roads and private access roads within the drinking water catchment	1	Drinking water catchment management will be considered in the IWCM Review.
High tides overtop the Bray Park weir	1	Saltwater intrusion into Bray Park weir pool is not currently an issue. However, sea level rise implications will be considered in the IWCM Review.
The focus of IWCM programs and activities should continue to be on those areas providing Tweed's drinking water catchment supply to Bray Park Weir and the Tyalgum Water Treatment Plant catchment.	1	Drinking water catchment management will be considered in the IWCM Review.
Support for total catchment approach	5	Catchment management will be considered in the IWCM Review.
Biosolids Management		
More information on costs and biosolids management should be provided to the community.	1	Biosolids management will be considered in the IWCM Review.
New developments		
Support for recycled water in new developments.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28	The feasibility of dual reticulation and future requirements will be considered in the IWCM Review.
A new attitude and emphasis on WSUD and ESD for new developments is a priority by both Planning & Water Department Staff	1, 2, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28	WSUD and ESD will be key considerations in the IWCM Review.
An independent new cost analysis of recycled water for new urban developments should be commissioned	2, 4, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28	The IWCM review will include information on recycled water schemes from other areas and their costs and recommend additional investigation if required.
There is a need for Council to adopt a new approach in urban design and this could be integrated with storm water capture ponds for reuse, providing recreational garden/lake space, rather than run off into our rivers.	1, 2, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28	Stormwater management will be a key consideration in the IWCM Review.
5,000L tanks should be mandated in DA approvals. Larger tanks of 10,000L are preferable to 5,000L. Rebates should be considered.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28	Rainwater tanks will be a key consideration in the IWCM Review.

Feedback Provided	Submissions	Response/Recommendation for IWCM Review
With integrated solutions of recycling water and stormwater capture, and tanks this would solve the problem of water supply and contribute to a healthy river ecosystem.	1, 2, 3, 4, 5, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28	The extent to which demand management and source substitution options can meet the predicted supply deficit will be a key consideration in the IWCM Review. Source augmentation and new sources of water will also be considered.

Tweed Integrated Water Cycle Management Review – Fact Sheet

Six Yearly Review of Tweed's Integrated Water Cycle Management Strategy

Council has engaged local consultants Hydrosphere Consulting to undertake a review of the Integrated Water Cycle Management (IWCM) Strategy to determine its long-term future direction. Due consideration will be given to the current or emerging challenges facing Council, as well as the community desires for future water cycle management.

The IWCM Strategy adopted by Council in 2006 - and reviewed in 2009 and 2011 - is the strategic plan which has guided and prioritised actions regarding Council's management of the urban water supply, sewerage and stormwater systems for the last six years.

While this independent review is partly driven by current state government guidelines, future challenges and Council's desire to maximise an integrated approach necessitate this major review. Council aims to maximise the benefit of the IWCM process by ensuring the strategy is appropriate and cost-effective, the community is fully engaged and that all aspects of the Shire's water resources are considered. The aim of the review is to ensure that Council policy keeps pace with changing circumstances and new information through a process of continual review.

Current Progress

Hydrosphere Consulting has produced an IWCM Review Background Paper which provides information on the current IWCM Strategy (and its evolution), along with the actions already undertaken and their success. The background paper also discusses current issues and potential future direction for the IWCM Strategy for consideration by the community and other stakeholders.

Copies of the background paper and fact sheets can be viewed at Council Contact Centres or downloaded from Council's website www.tweed.nsw.gov.au (go to "Our Services", then "Water and Wastewater" and then "Integrated Water Cycle Management").

TWEED
SHIRE COUNCIL

Integrated Water Cycle Management Review - Fact Sheet

Next Steps

Consultation activities to be undertaken as part of this IWCM Review aim to build on the activities already undertaken by Council as part of the IWCM implementation actions. The objectives of the next consultation phase are to engage the wider community in the IWCM review and establish the community priorities for water cycle management. The community engagement activities will focus on:

- Provision of information on the current status of the IWCM Strategy and the issues to be addressed in the IWCM review (the Background Paper);
- Identification of community priorities through a community survey; and
- Promotion of the project and engagement activities to the wider community and interest groups.

The background paper and feedback from the community and other stakeholders will be used to develop water cycle management objectives. These will be used in the IWCM Strategy to prioritise the water cycle management issues and develop strategies to address them. A series of options will be developed to address the issues and then bundled into scenarios that can be compared to the water cycle management objectives and assessed according to their benefits and costs.

Have Your Say

Members of the community are encouraged to get involved in the process, to help guide the creation of the future IWCM Strategy. To provide your views on the IWCM priorities for the Tweed, complete the quick on-line survey (accessed from Council's website). Hard copies of the survey can also be obtained from Council offices and posted to:

Tweed IWCM Strategy Review
Jetty Research
Reply Paid 1555
Coffs Harbour NSW 2450

The survey period closes 12 December 2012.

All survey respondents will go in the draw to win one of two iPADs (valued at approx. $500 each) or their equivalent value in shopping vouchers.

(NSW Lottery Permit Number LTPM/12/00219)

The community will also be invited to provide feedback on the IWCM Strategy during future stages of the project when the IWCM Strategy goes on public exhibition next year.

In parallel to the surveys, Jetty Research is conducting a telephone survey on behalf of Council, and residents may also be contacted and asked to contribute through this process.

Current Timeframe

November/December 2012: Engagement period for community input into development of the Strategy.
January – March 2013: Strategy development by Hydrosphere Consulting.
April – May 2013: Public exhibition of draft IWCM Strategy.
June – July 2013: Finalisation of IWCM Strategy.
August 2013: Council considers IWCM Strategy for adoption and implementation.
August – October 2013: Community roadshows to explain and promote IWCM Strategy outcomes.

Stay informed

If you would like to be kept informed of water updates and progress you may wish to sign up to our Interested Parties Register by emailing a request to waterTSC@tweed.nsw.gov.au.

TWEED SHIRE COUNCIL

Media Release

Monday 12 November 2012

Have your say on Tweed's future water management strategy

Complete the online survey for your chance to win one of two iPads

Tweed Shire Council is inviting residents, businesses and other interested parties to contribute their views to the region's future water strategy – and offering them the chance to win one of two iPads (or $500 shopping vouchers).

Online, paper and telephone surveys are currently being utilised to explore the community's views in regards to establishing future priorities for the Tweed's long-term water cycle management. The online version of the survey is available now on Council's website.

Council is seeking the feedback as it embarks on a major review of its Integrated Water Cycle Management (IWCM) Strategy.

The community has previously provided valuable input into key water issues for the Tweed. Council's Director Community and Natural Resources, David Oxenham, said that this major review will consider the current or emerging challenges facing Council as well as the community priorities for future water cycle management.

"The future IWCM Strategy will seek to enhance the natural linkages between the water and wastewater businesses and the natural resource and land management responsibilities of Council," Mr Oxenham said.

"This will ensure that the outcomes from this project are highly specific to the local issues, processes and community expectations."

The Integrated Water Cycle Management (IWCM) Strategy adopted by Council in 2006 - and reviewed in 2009 and 2011 - is the strategic plan which has guided and prioritised actions regarding Council's management of the urban water supply, sewerage and stormwater systems for the past six years.

"Council aims to maximise the benefit of the IWCM process by ensuring the strategy is appropriate and cost-effective, the community is engaged, and that all aspects of the Tweed's water resources are considered," Mr Oxenham said.

Hydrosphere Consulting has produced an IWCM Review Background Paper which provides information on the current IWCM Strategy (and its evolution), along with the actions already undertaken and their success. The Background Paper also discusses current issues and potential future direction for the IWCM Strategy for consideration by the community and other stakeholders.

Members of the community are encouraged to get involved in the process to help guide the creation of the future IWCM Strategy by completing a survey to help Council identify community priorities for future water cycle management. A link to the survey is available on the home page of Council's website www.tweed.nsw.gov.au. All survey respondents will go in the draw to win one of two iPADs (valued at approx. $500 each) or their equivalent value in shopping vouchers.

The survey period closes 12 December 2012.

Further information on the IWCM Review can be viewed at Council's Customer Contact Centres and Council's website www.tweed.nsw.gov.au. Click on 'Our Services', then 'Water and Wastewater' and the 'Integrated Water Cycle Management'.

- ends -

Contact: Fran Silk (02) 6670 2575 or 0409 781 208

Media Release

Thursday 6 December 2012

Win an iPad or $500 in shopping vouchers in time for Christmas

Survey poses the big questions about the Tweed' s future water management

Want to win an iPAD or $500 in shopping vouchers for Christmas? Then make sure you fill out the Integrated Water Cycle Management (IWCM) survey, which closes at midnight on Wednesday, 12 December 2012.

Council has two iPads to give away, or their equivalent in $500 shopping vouchers.

"Council is surveying Tweed residents and businesses about the Tweed Shire's future water cycle management priorities and is hoping for input from as many residents as possible," Mayor of Tweed, Councillor Barry Longland said.

"Here's an opportunity to win an iPad or shopping vouchers in time for Christmas and have your say on the future of water management in the Tweed at the same time.

"The survey poses some big questions about water in the Tweed, querying respondents about their thoughts on water restrictions, water quality, water pricing and the use of recycled water,"

"One very topical question posed in the survey is whether it is more important to reduce water usage or increase water availability.

"Water management is a complex topic, however this survey manages to break it down to simple questions we can all answer by choosing a response from one of the options provided."

Council is seeking the feedback as it embarks on a major review of its IWCM Strategy. This major review will consider the current or emerging challenges facing Council, as well as the community priorities for future water cycle management.

The Integrated Water Cycle Management (IWCM) Strategy adopted by Council in 2006 - and reviewed in 2009 and 2011 - is the strategic plan which has guided and prioritised actions regarding Council's management of the urban water supply, sewerage and stormwater systems for the past six years.

Council aims to maximise the benefit of the IWCM process by ensuring the strategy is appropriate and cost-effective, the community is engaged, and that all aspects of the Tweed's water resources are considered.

The survey and more information about IWCM is available from the link on the home page of Council's website www.tweed.nsw.gov.au and hard copies are available from Council offices at Murwillumbah and Tweed Heads.

The survey is being conducted by Council's consultants Hydrosphere and Jetty Consulting, who will receive all completed surveys and conduct the iPad draw. An independent phone survey of Tweed residents has already been completed.

- ends -

Contact: Fran Silk (02) 6670 2575 or 0409 781 208

A random telephone survey of Tweed Shire residents regarding the 2013 integrated water cycle management (IWCM) strategy

A representative fixed line telephone survey of 616 Tweed Shire adult residents conducted by Jetty Research for Hydrosphere Consulting, on behalf of Tweed Shire Council

FINAL REPORT dated February 5th 2013

p: 02 6650 9175 f: 02 6650 9275 e: info@jettyresearch.com.au w: www.jettyresearch.com.au
a: Level 1, 30 Industrial Drive Coffs Harbour NSW m: PO Box 1555 Coffs Harbour NSW 2450
Jetty Research Pty Ltd ACN 121 037 429

Table of Contents

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Executive summary

A random fixed line telephone survey of Tweed Shire residents was commissioned in late 2012 by Tweed Shire Council (TSC), as part of a broader deliberation process surrounding the shire's integrated water cycle management (IWCM) six-year plan. More specifically, survey questions were designed to seek representative community feedback on issues raised in the "Six Year Integrated Water Cycle Management Strategy review" background paper, prepared by Hydrosphere Consulting and dated October 2012. See Appendix 1 for copy of final questionnaire.

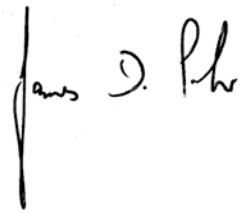
The survey, of 616 adult residents, was conducted in November 2012 by Jetty Research using a team of 12 researchers. The survey was entirely random, other than seeking regional quotas to ensure adequate representation from across the shire. See "Methodology" (pages 7-8) for further details.

Random sampling error for a survey of 616 adult residents was +/- 3.9 per cent at the 95 per cent confidence level: this means in effect that were the same random survey to be conducted 20 times, result should be representative of all Tweed Shire adult residents to within +/- 3.9 per cent in 19 of those 20 surveys. (See sampling error, pages 8-9, for further details.)

Among the survey's major conclusions:

1. 30 per cent of respondents were concerned "a lot" about the Tweed Shire's ability to meet its water needs in the medium- to long-term, while a further 31 per cent were concerned "a little". However 59 per cent of respondents agreed that the Tweed community as a whole had made serious efforts over the past three years to reduce daily water use.
2. Some 66 per cent of respondents believed they used less water than the average Tweed Valley household, while just 9 per cent felt they used more. (The balance believed they were about on average.) Only 11 per cent of those surveyed were able to name (unprompted) the 180 litre per person per day target for average daily water use.
3. On the question of whether Council should focus its activities more on reducing water usage or increasing availability, the majority of residents favoured a balanced approach. However the mean score of 4.66 (on a 0-10 scale, with midpoint of 5) suggested a very slight bias towards reducing usage.
4. When asked to nominate which of six water supply factors were most important to them personally, respondents focused firstly on ensuring a continuous supply of drinking water. This was followed by maximizing stormwater and wastewater re-use, then maintaining the natural environment in river and catchment areas, and encouraging households to reduce their water consumption. Encouraging commercial properties and industries to reduce consumption, and protecting waterways for recreational use were deemed of (relatively) less importance.
5. Residents were unequivocal in their belief that even if it could treated to drinking quality prior to reaching their taps, source water needed to be clean and of high quality. Some 81 per cent felt this was "very important", with a further 16 per cent deeming it "quite important".
6. In terms of how important it was to conserve water when dams were full, respondents came down heavily in support of saving water even in times of plenty. The mean score of 7.53 (again on a 0-10 scale, with zero signifying "use as much water as we like when dams are full" and ten being "save as much water as possible at all times") indicates a strong water conservation ethos.

7. 69 per cent of residents agreed that it was appropriate to introduce water restrictions when dam levels fell to 75 per cent, while 26 per cent believed they should be introduced sooner.
8. Among five possible funding initiatives for Council, protecting the water supply was the most popular choice (nominated by 41 per cent of respondents), followed by protecting natural habitat and water quality (31 per cent) and improving the quality of treated water water/urban stormwater runoff (19 per cent). Conversely, only 4 per cent classed protecting water quality for swimming, boating and fishing as their major funding priority for council.
9. As to which of four prompted water-saving initiatives respondents would prefer to see Council allocate resources towards, opinion was almost evenly divided among: more household rebates for water saving devices; construction of another drinking water supply; greater use of recycled water; and behavioural change/further education.
10. There was widespread support for three prompted alternative water sources. Some 93 per cent supported using rainwater from residential tanks for toilet, laundry and outdoor taps, while 89 per cent agreed with the use of locally harvested stormwater, and 66 per cent were supportive of treated wastewater or sewage for these purposes.
11. Asked whether recycled water supplied to their house should cost more or less than, or the same as the current supply price of $2.05 per kilolitre, 50 per cent believed it should cost less. A further 37 per cent felt it should cost the same, while only 7 per cent believed it should cost more.
12. 73 per cent of those surveyed believed that farmers and council should share the burden of maintaining the health of rivers and other waterways within rural/agricultural areas of the Tweed shire, while only 25 per cent felt Council (i.e. ratepayers) should pay solely for this.
13. Likewise, 63 per cent agreed that property owners and council should jointly pay for maintaining the health of rivers and other waterways within urban areas, with 32 per cent believing Council/ratepayers should shoulder this burden on their own.
14. 76 per cent of respondents agreed that the current two-tiered system of residential water pricing is fair, while just 22 per cent believed all households should pay the same rate per kilolitre regardless of usage.



James Parker, **B. Ec, Grad Cert Applied Science (Statistics), AMSRS**
Managing Director
February 5th 2013

Introduction

Background

The 2012 Tweed Shire Council Integrated Water Cycle Management (IWCM) telephone survey, commissioned by managing consultants Hydrosphere Consulting, was a random fixed line telephone poll of 616 Tweed Shire residents aged 18 and above. It was designed to provide representative community input into a review of the shire's IWCM six-year plan.

Council's IWCM strategy (originally adopted in 2006, and then updated in 2009 and 2011) has guided its management of the urban water supply, sewerage and stormwater systems for the past six years. Council is now conducting a major six-year review of the IWCM to ensure its long-term direction remains appropriate. This telephone survey was designed to provide one form of input to that process, by seeking a statistically valid expression of resident views and knowledge relating to different aspects of water cycle management.

Methodology

Survey content was based largely around the "Six Year Integrated Water Cycle Management Strategy Review" background paper, written by Hydrosphere Consulting in collaboration with Tweed Shire Council (TSC) and dated October 2012. The intent of the telephone survey was to seek representative community feedback to key issues raised in that background paper, in a format accessible to the general public. See Appendix 1 for actual survey questions.

Sampling frame for the survey was 4,375 valid and randomly generated residential telephone numbers, sourced from all Tweed Shire postcodes. The list was uploaded from Sampleworx, which supplies postcode-specific lists of randomised valid telephone numbers to many market and social research suppliers.

The survey was piloted for length, clarity etc. on the evening of Thursday November 8th 2012, using a team of five researchers.

Following a successful pilot, polling commenced on Monday November 12th. A team of 12 researchers called Tweed Shire residents from 3.30-7.30 pm each afternoon/evening (Monday to Thursday). Surveying was completed on Tuesday, November 20th 2012.

Those completing a survey were eligible to win one of two iPads, or the equivalent value ($500) in shopping gift cards.

Potential respondents too busy to complete a survey when first contacted were offered specified callback times in order to maximise their willingness and ability to participate. Likewise, numbers that were engaged, not answered or diverted to answering machines were called up to five times at different phases of the afternoon and evening.

The survey sample was entirely random other than ensuring an adequate representation across each of three geographic areas within the Tweed Shire – defined as "Tweed Coast (north of Tweed River)", Tweed Coast (south of Tweed River)" and "Hinterland".

Potential respondents were screened to ensure they were aged 18-plus, and lived within the Tweed Shire. In all 616 interviews were conducted. Interview time ranged from 8 to 29 minutes, with an average of 13.3 minutes.

Of eligible households successfully reached, 41 per cent agreed to complete a survey.

Due to the nature of the survey, not all respondents answered all questions. The number answering each question is marked as "n = XXX" in the graph accompanying the relevant data. Care needs to be taken in extrapolating results from smaller sample sizes due to high levels of random sampling error.

Where differences in this report (e.g. by demographic grouping) are classed as significant, this implies they are statistically significant based on independent sample t-scores or other analysis of variation (or ANOVA) calculations. In statistical terms, significant differences are unlikely to have been caused by chance alone. In tables, statistically significant differences are typically shaded blue (above mean) and pink (below mean).

Where a graph title denotes "prompted", this means that the respondent was offered a series of prompted options.

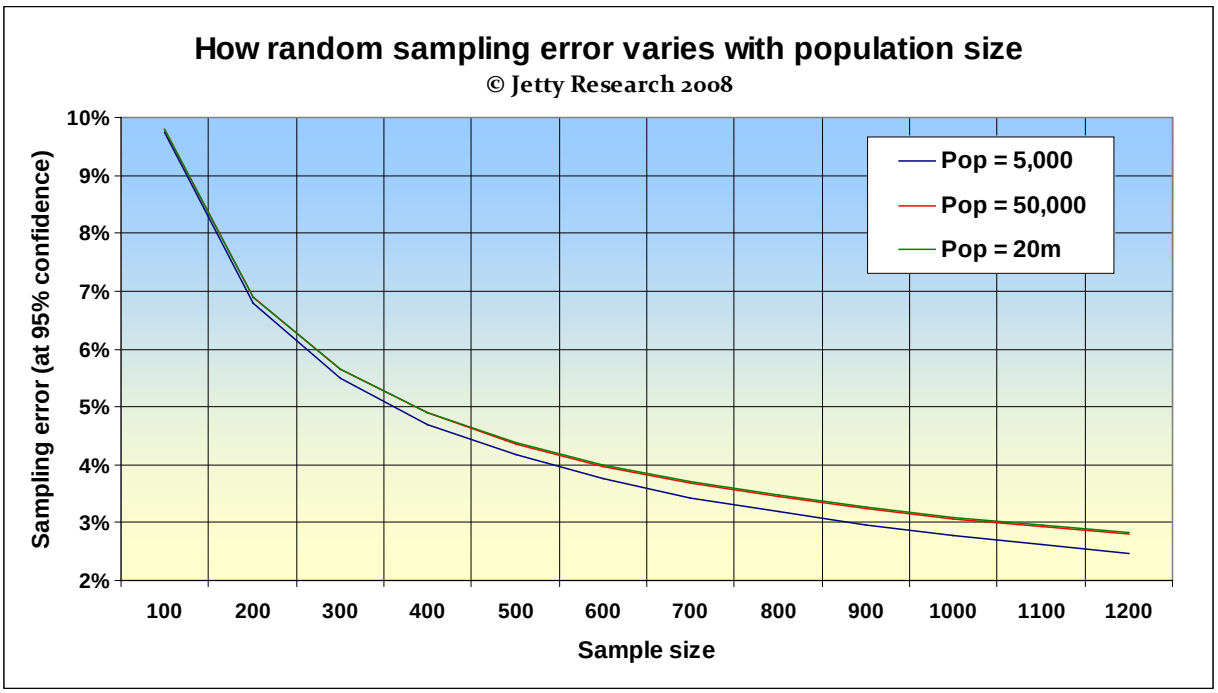
Results have been post-weighted to reflect the demographic breakdown of the Tweed Shire adult population by age and gender (based on ABS 2011 Census data, Usual Resident profile).

Sampling error

There were 33,657 households in the Tweed Shire as at the 2011 ABS Census (Usual Resident Profile). Random sampling error (RSE) for a survey of 616 households is +/- 3.9 per cent at the 95 per cent confidence level. (Effectively this means that were the same random survey to be conducted 20 times, results should be representative of the overall adult Tweed Shire population to within +/- 3.9 per cent in 19 of those 20 surveys.)

Note that sampling error rises as sample sizes fall: see Table i, below. For example, within each of the regional sub-samples (where n = approx. 200), RSE will be +/- 6.9 per cent, again at the 95 per cent confidence level. Care hence needs to be taken in interpreting smaller sample sizes (e.g. those contained within cross-sectional analysis) due to the larger RSE that will apply.

Table i: How sampling error varies with sample and population size



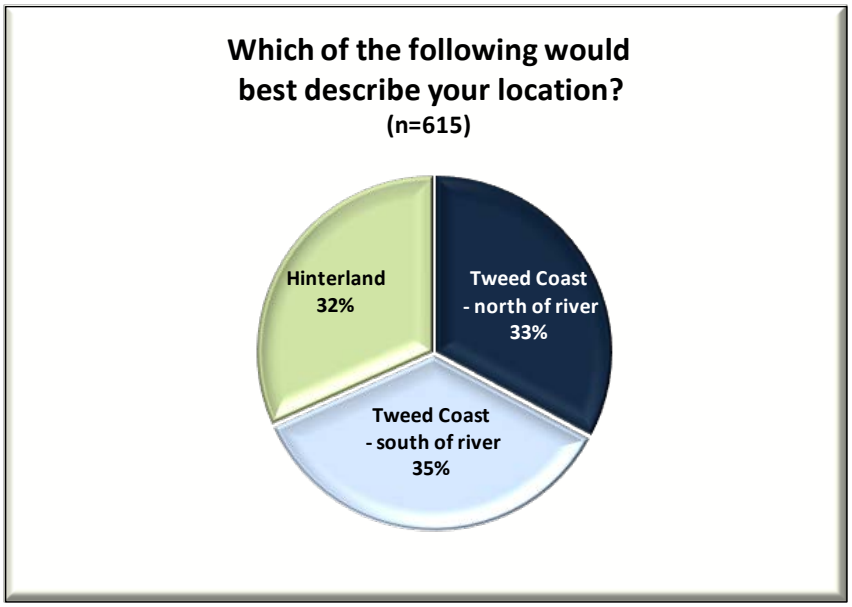
In addition to the random sampling error, above, there may also be some forms of non-random sampling error which may have affected results. These include respondents without fixed line phones, the proportion of non-respondents (refusals, no answers etc.) and/or imperfections in the survey database.

However there is no evidence (at least in terms of significant variances between demographic groups within the survey sample) to suggest that such non-random error has affected the integrity of the following data.

Part 1: Demographics

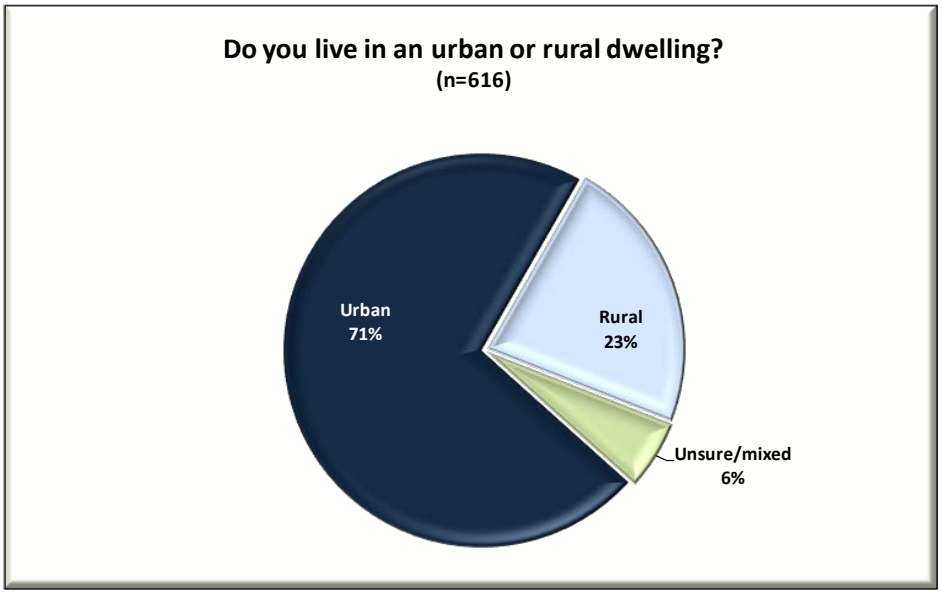
(Note that demographic data is shown in unweighted – i.e. "raw" form – to indicate actual respondent profiles. Data in remaining parts has been weighted by age and gender profiles from the 2011 ABS Census, to reflect the actual population split for Tweed shire residents aged 18 and above. See Appendix 2 for details of weighting process.)

Graph 1.1: Which of the following would best describe your location within the Tweed Shire? (Prompted)



As noted in the introduction, quotas were established during the survey process to ensure an approximately equal representation of respondents from each of three prompted sub-regions.

Graph 1.2: Do you live in an urban or rural environment?



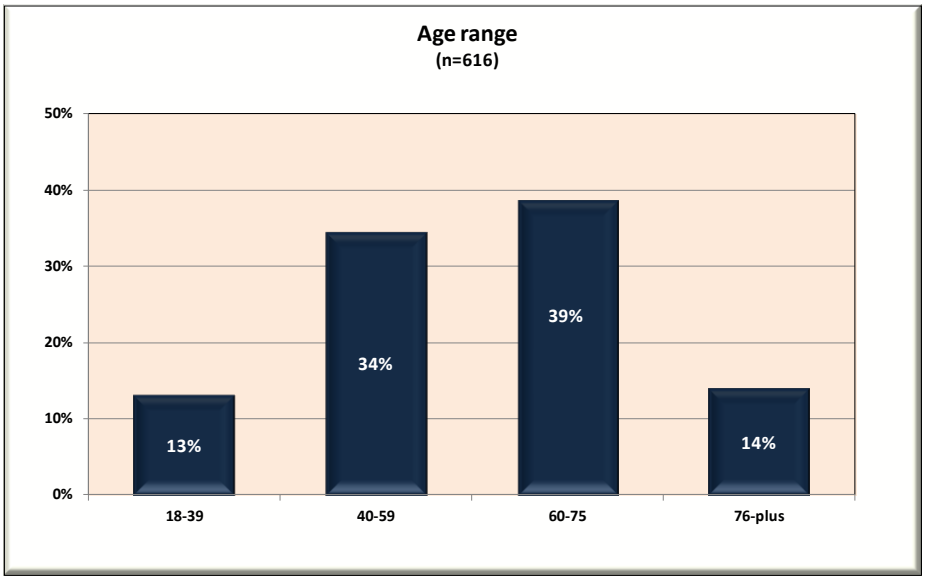
As shown in Graph 1.2, around seven in ten respondents claimed to live in an urban setting. A further 23 per cent resided rurally, with the balance (6 per cent) unsure or in a mixed setting. Breaking this down by location (i.e. sub-region):

Table 1.1: Urban/rural, by location

		Which of the following would best describe your location?			Total
		Tweed Coast - north of river	Tweed Coast - south of river	Hinterland	
Urban/rural setting	Urban	177	170	93	440
		87.6%	78.0%	47.7%	71.5%
	Rural	14	34	92	140
		6.9%	15.6%	47.2%	22.8%
	Unsure/mixed	11	14	10	35
		5.4%	6.4%	5.1%	5.7%
Total		202	218	195	615
		100.0%	100.0%	100.0%	100.0%

Half of all respondents classing themselves as "hinterland" lived in a rural setting. This compares with just 7 per cent of those on the Tweed Coast north of the river, and 16 per cent of Tweed Coast/south of river residents.

Graph 1.3: Age range



The survey sample was skewed slightly to older residents, as is common in all random fixed line telephone surveys[1]. This bias has been addressed through the post-weighting of data by age and gender to meet the shire's actual population profile.

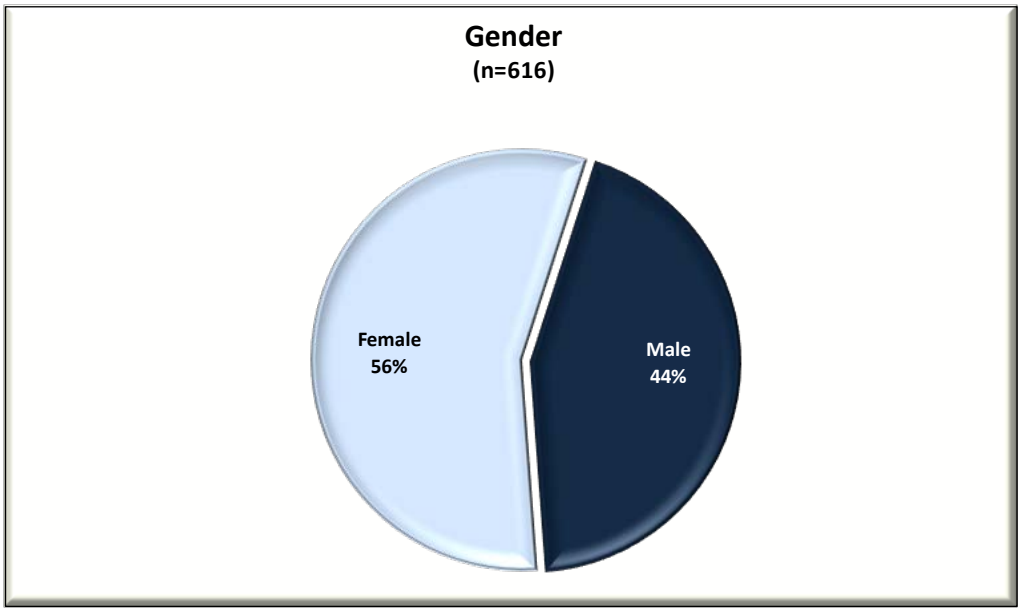
[1] This is due largely to older respondents having (a) a higher incidence of fixed line residential telephones; combined with (b) a greater willingness (in general terms) to undertake community-based surveys.

Table 1.2: Location by age

		Age				Total
		18-39	40-59	60-75	76-plus	
Which of the following would best describe your location?	Tweed Coast - north of river	20	56	91	35	202
		25.0%	26.4%	38.4%	41.2%	32.9%
	Tweed Coast - south of river	28	74	80	35	217
		35.0%	34.9%	33.8%	41.2%	35.3%
	Hinterland	32	82	66	15	195
		40.0%	38.7%	27.8%	17.6%	31.8%
Total		80	212	237	85	614
		100.0%	100.0%	100.0%	100.0%	100.0%

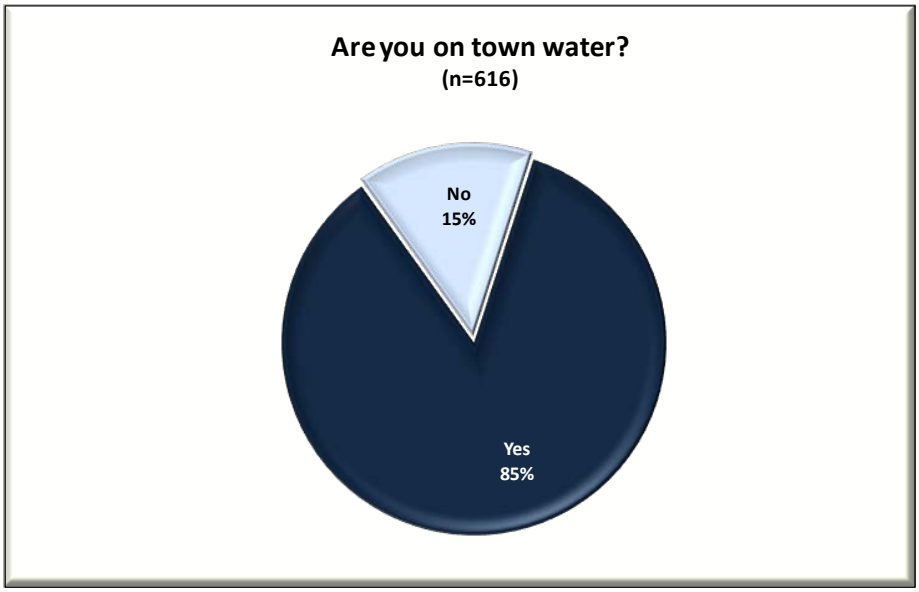
Table 1.2 suggests that older residents were (proportionately) more likely to live on the Tweed Coast, while younger residents (i.e. those aged less than 60) were more likely to be found in the Tweed hinterland.

Graph 1.4: Gender

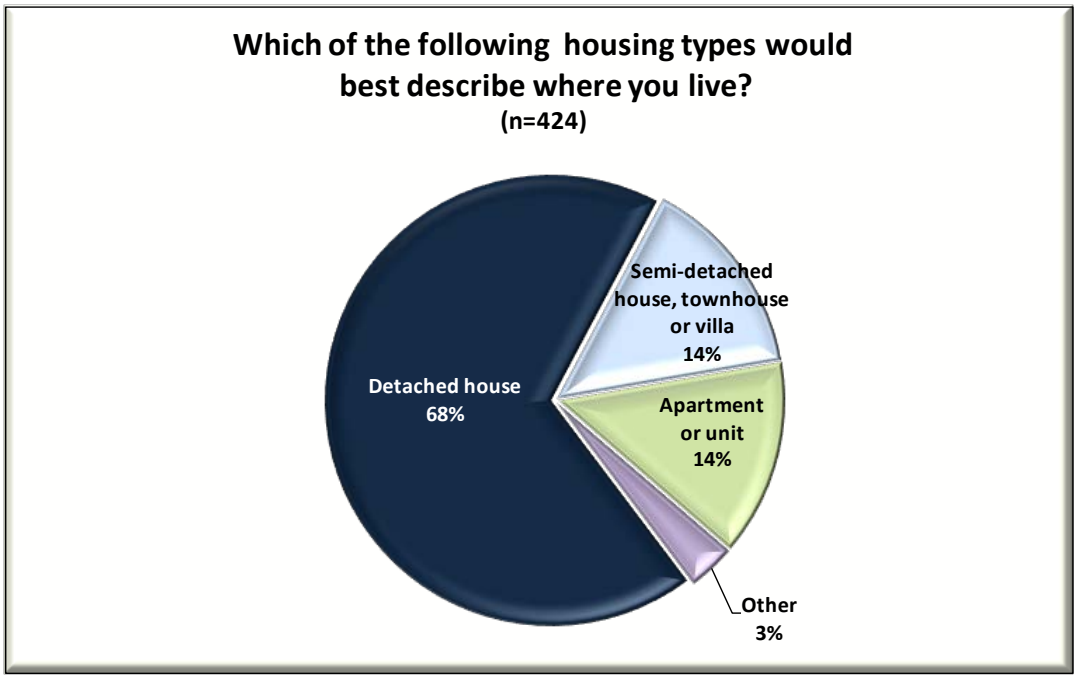


There was a relatively even gender split among respondents, with females making up 56 per cent of the sample.

Graph 1.5: Are you on town water?



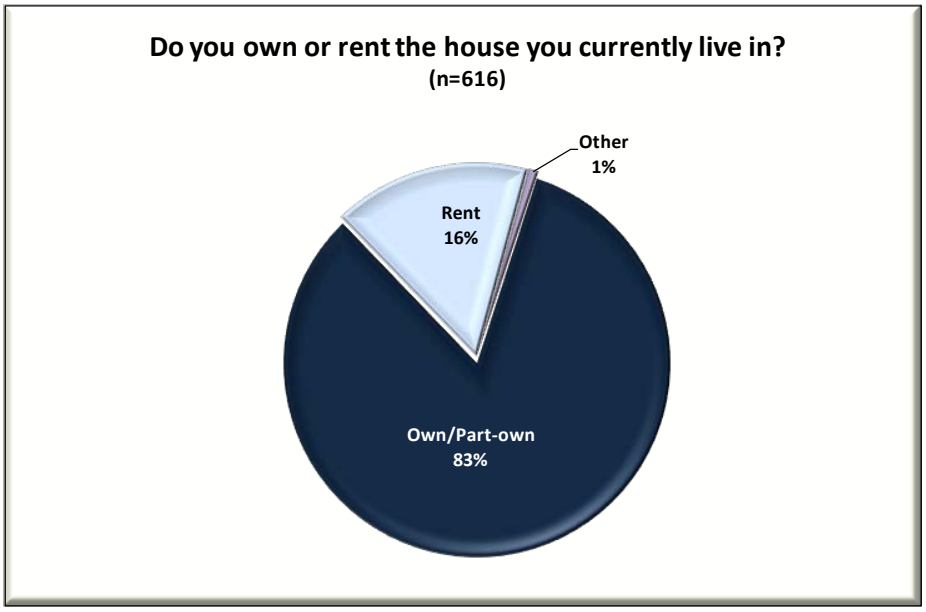
Graph 1.6: Which of the following housing types best describe where you live?



Some 85 per cent of respondents were on town water, which is consistent with the largely urban profile shown in Graph 1.2. Also unsurprisingly, 68 per cent of respondents lived in detached houses (Graph 1.6) with a further 14 per cent each in semi-detached housing or apartments.[2]

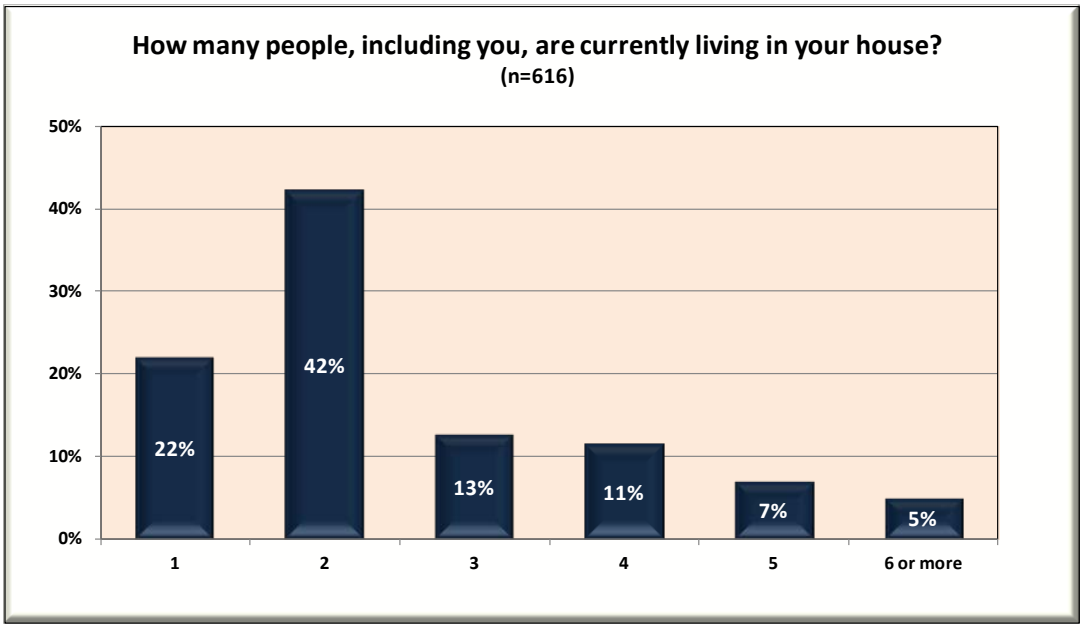
[2] This compares with 65 per cent of Tweed Shire dwellings being detached housing according to 2011 ABS Census data

Graph 1.7: Do you own or rent the house you live in?



Five in six respondents (83 per cent) owned or part-owned their house, with the balance renting.[3]

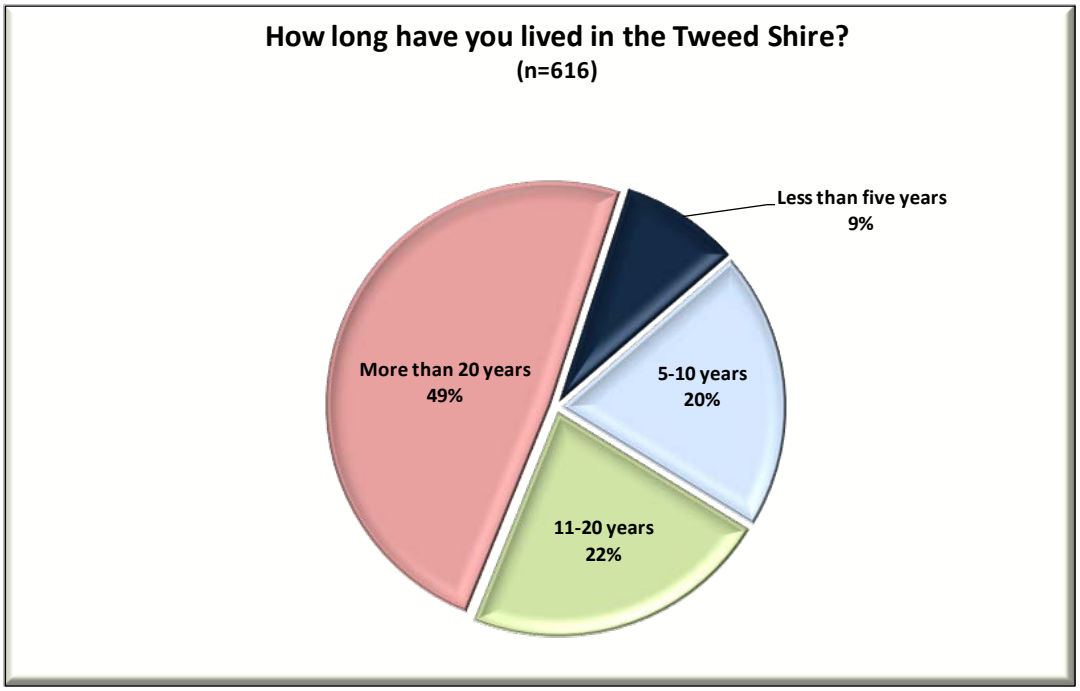
Graph 1.8: How many people, including yourself, live in your house?



The average number of respondents per household was 2.83, with a median and mode of two residents. Meanwhile 36 per cent of respondent households had three or more residents.[4]

[3] This compares with 2011 Census data suggesting that 70 per cent of Tweed shire households are owner-occupied
[4] Against 33 per cent of Tweed Shire households in 2011 Census data

Graph 1.9: How long have you lived in the Tweed shire?

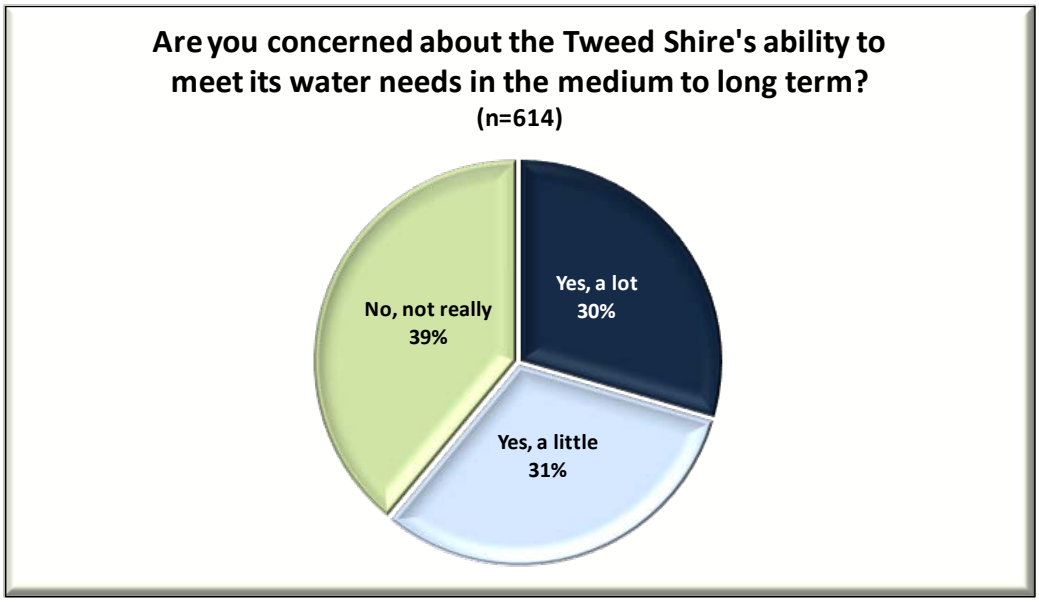


Almost half the sample had lived in the Tweed shire for 20 years or more. While this is not necessarily representative of the overall Tweed shire adult population, it may suggest that many respondents have a longstanding knowledge of - and opinions regarding - past water cycle practices.

Part 2: Introductory attitudes and knowledge

The survey commenced with a series of introductory questions designed to gain a better understanding of respondents' knowledge of, and attitudes regarding a number of water cycle issues:

Graph 2.1: Are you concerned about the Tweed Shire's ability to meet its water needs in the medium to long term? (Prompted)



Three in ten respondents claimed to be very concerned about the Tweed shire's ability to meet its water needs, with a further three in ten slightly concerned.

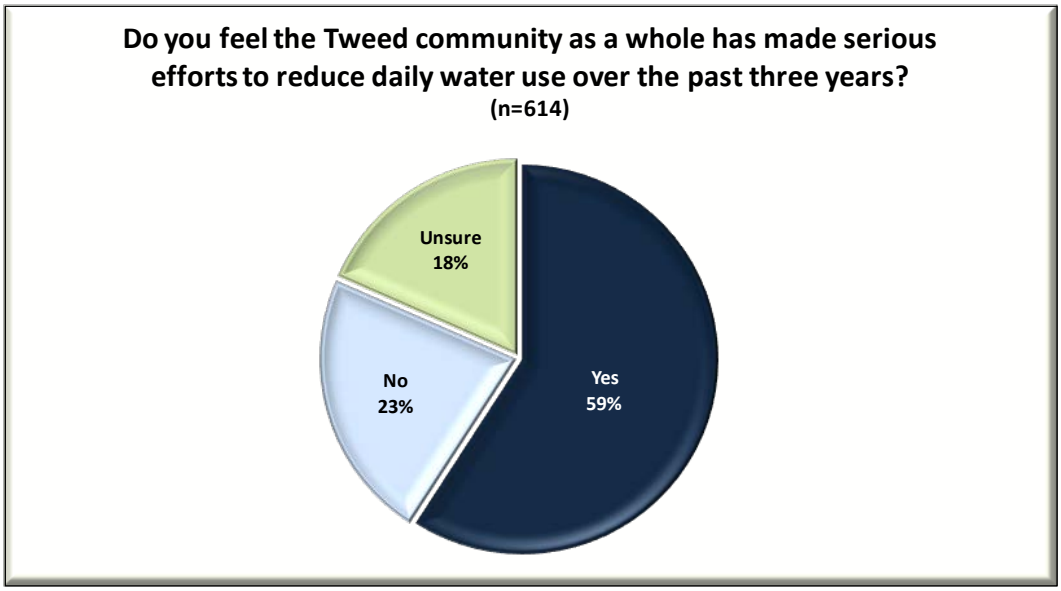
Table 2.1:Concern by age

		Age				Total
		18-39	40-59	60-75	76-plus	
How concerned are you with the shire's ability to meet water needs?	Yes, a lot	31	75	54	20	180
		18.8%	34.7%	36.2%	23.8%	29.3%
	Yes, a little	50	65	51	28	194
		30.3%	30.1%	34.2%	33.3%	31.6%
	No, not really	84	76	44	36	240
		50.9%	35.2%	29.5%	42.9%	39.1%
Total		165	216	149	84	614
		100.0%	100.0%	100.0%	100.0%	100.0%

As shown in Table 2.1, concern was highest among those aged 60-75, and lowest among respondents aged 18-39. This may suggest that older residents have longer memories of water supply shortages.

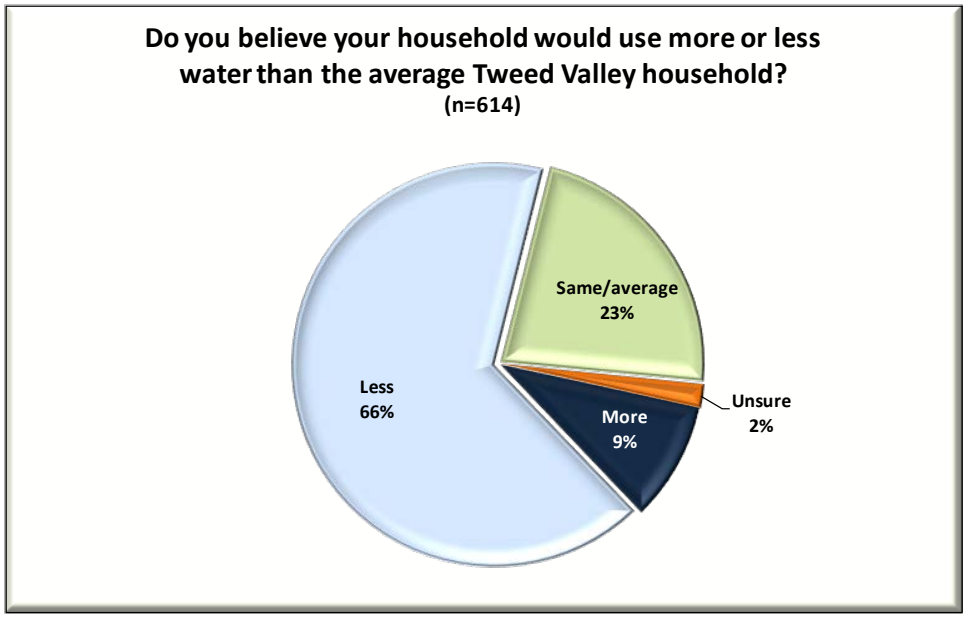
There were no significant differences by gender, location or whether the respondent lived in an urban or rural setting.

Graph 2.2: Do you feel the Tweed community as a whole has made serious efforts to reduce daily water use over the past three years?



The majority of respondents (59 per cent) agreed that the Tweed community had attempted to curtail water usage in recent years. Just 23 per cent felt it had not, with the balance unsure. This result was consistent by most demographic groupings: the exception being that residents living in the shire for 20 or more years were more positive than other respondents about the community's water-saving efforts.

Graph 2.3: Do you believe your household would use more or less water than the average Tweed Valley household? (Prompted)



Interestingly, two-thirds of respondents believed they used less than the average Tweed shire household, while 23 per cent thought they used about the same. *Only 9 per cent felt they used more average*.

Though this may partially reflect some form of social desirability bias[5], it also suggests that many households are under-estimating their water consumption – in relative terms at least.

Table 2.3.1: Average household water use by age

		Age				Total
		18-39	40-59	60-75	76-plus	
Do you believe your household uses more or less water than average?	More	25	22	10	2	59
		15.2%	10.2%	6.7%	2.3%	9.6%
	Less	94	135	102	74	405
		57.0%	62.8%	68.5%	86.0%	65.9%
	Same/average	43	54	33	9	139
		26.1%	25.1%	22.1%	10.5%	22.6%
	Unsure	3	4	4	1	12
		1.8%	1.9%	2.7%	1.2%	2.0%
Total		165	215	149	86	615
		100.0%	100.0%	100.0%	100.0%	100.0%

Table 2.3.1 suggest that younger respondents were most likely to acknowledge that their household used more water than average (albeit at a still modest 15 per cent).

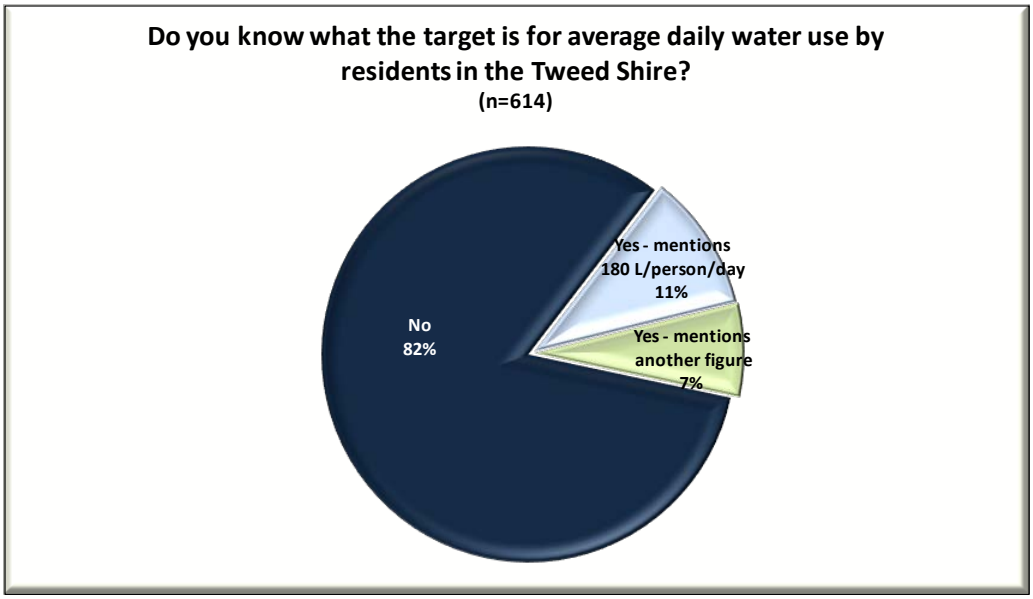
Table 2.3.2: Average household water use by household volume

		Number of residents		Total
		Less than 3 people living in the house	3 or more people living in the house	
Do you believe your household uses more or less water than average?	More	15	43	58
		4.5%	15.2%	9.4%
	Less	255	151	406
		77.0%	53.4%	66.1%
	Same/ average	57	82	139
		17.2%	29.0%	22.6%
	Unsure	4	7	11
		1.2%	2.5%	1.8%
Total		331	283	614
		100.0%	100.0%	100.0%

Intriguingly, over half of respondents living in households with three or more residents still think they use less water than the average household. Only 15 per cent believe they use more.

[5] By which respondents attempt to impress the interviewer with their answers, and/or portray themselves in the most favourable light.

Graph 2.4: Do you know what the target is for average daily water use by residents in the Tweed Shire? (unprompted)



As suggested in Graph 2.4, there is very little awareness among the community of the 180 litres per person per day target. Over 80 per cent of respondents said they didn't know the target, and just 11 per cent correctly nominated the 180 litre target.

There were no significant differences in knowledge by age, gender or location.

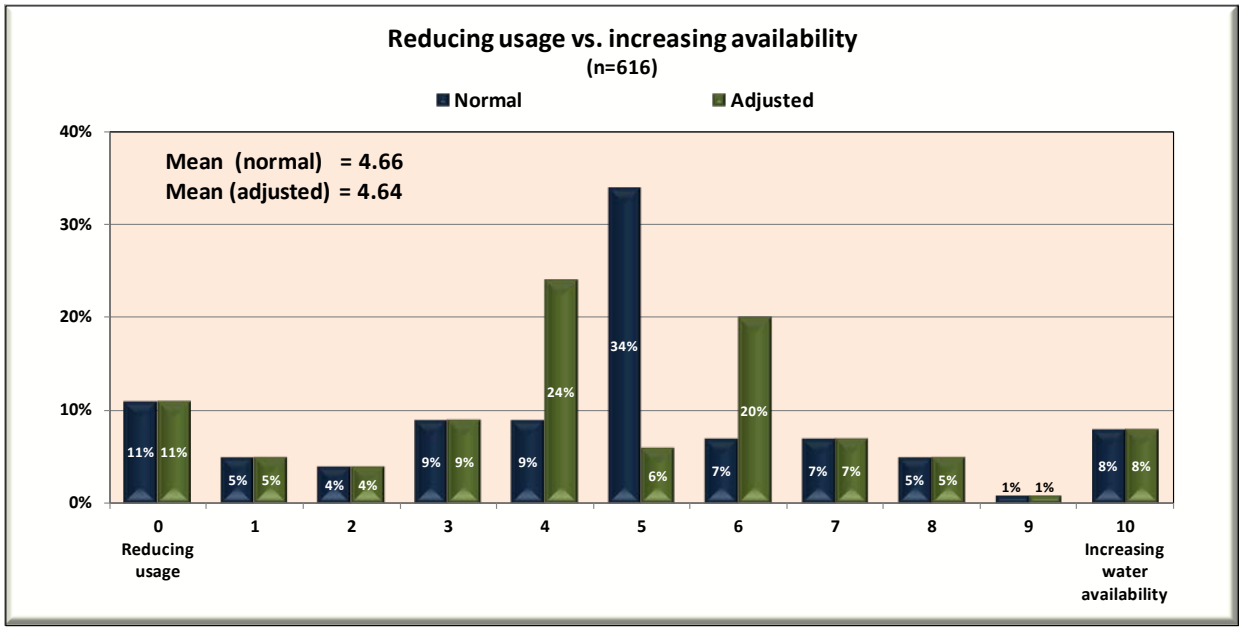
Part 3: Beliefs surrounding water usage and availability issues

The survey included a number of questions designed to test community beliefs surrounding water usage and availability. The first of these asked "Some people believe that ensuring a long-term water supply is mainly about reducing people's water usage, while others think it's more about increasing water availability. Where would you sit on a sliding scale of 0-10, where 0 means it should all be about reducing usage, and 10 means it should all be about increasing water availability?"

Those respondents providing a mid-point response (i.e. 5 on the 0-10 scale) were then asked "If you had to come down on one side of the fence or the other, would it be towards reducing usage or increasing water availability?"

The frequency responses are shown in Graph 2.5, below. The "normal" column shows respondents' initial responses, while the "adjusted" column indicates responses once the mid-point responses were distributed.[6]

Graph 3.1: Where would you sit on a sliding scale of 0-10, where 0 means (focus) should be all about reducing water usage, and 10 means it should be all about increasing water availability?



The findings suggest a wide diversity of views, with the largest proportion of respondents seeking an even balance between supply and demand. Even when asked to fall "one side of the fence or the other", roughly equal proportions (15 against 13 per cent) fell either side.

Likewise the mean (i.e. average) responses - 4.66 and 4.64 for the normal and adjusted findings respectively – indicate a balanced community view skewed (very) slightly towards reducing usage.

Meanwhile 11 per cent felt the focus should be entirely on reducing consumption, while 8 per cent believed it should be entirely based on increasing supply.

[6] Note that 6 per cent of respondents providing a mid-point response declined to answer the follow-up question, presumably being unable to decide one way or the other

Table 3.1.1: Reducing usage v increasing availability (mean) by age

Age	Mean	N	Std. Deviation
18-39	4.16	166	2.447
40-59	4.75	216	2.539
60-75	4.93	148	2.980
76-plus	4.90	85	2.890
Total	4.66	615	2.689

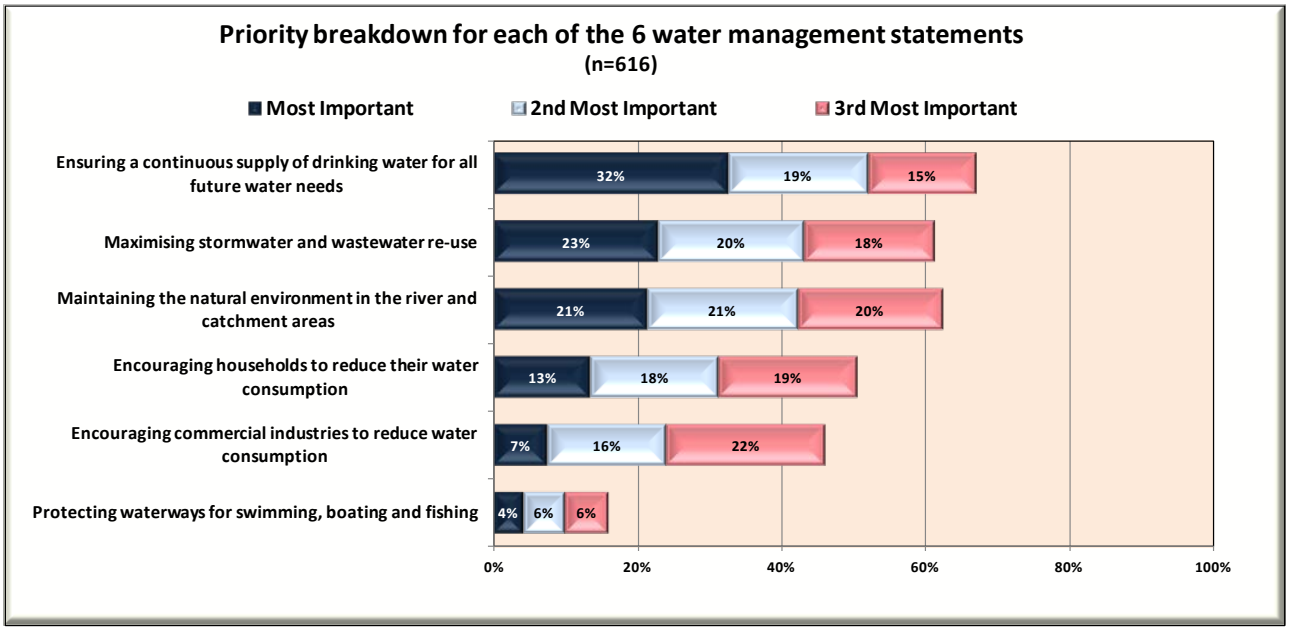
Table 3.1.2: Reducing usage v increasing availability (mean) by location

Location	Mean	N	Std. Deviation
Tweed Coast - north of river	5.14	192	2.827
Tweed Coast - south of river	4.87	217	2.417
Hinterland	4.02	206	2.689
Total	4.66	614	2.679

As shown in Tables 3.1.1 and 3.2.2, there were a number of statistically significant differences in mean score among different demographic groups. In particular, older respondents and those living on the Tweed Coast (north of Tweed River) were most likely to favour increasing availability, while younger residents and those living in the hinterland were more focussed on reducing usage.

In a three-part question, respondents were then read a list of six factors involved in securing a long-term water supply, and asked to progressively nominate which of these were the most, second most and third most important to them personally. The results are shown in Graph 3.2, below:

Graph 3.2: Priority breakdown for each of the six water management factors



Ensuring a continuous supply of drinking water for all future water needs was deemed the most important factor, in both "most important" and overall terms. While maximising stormwater and wastewater re-use ranked second among "most important" factors, maintaining the natural environment in the river and catchment areas was second overall (i.e. in terms of total mentions). Encouraging households to use less water was fourth most popular option, both in terms of first choices and overall nominations.

Table 3.2.1: Priorities by age

	Age				Total
	18-39	40-59	60-75	76-plus	
Ensuring a continuous supply of drinking water for all future water needs	109	134	112	59	414
	66.2%	62.4%	75.5%	69.4%	
Maintaining the natural environment in the river and catchment areas	105	142	83	51	381
	63.7%	65.9%	56.0%	59.6%	
Maximising stormwater and wastewater re-use	98	126	95	52	371
	59.5%	58.6%	63.8%	61.7%	
Protecting waterways for swimming, boating and fishing	31	40	21	12	104
	19.1%	18.4%	14.2%	13.8%	
Encouraging households to reduce their water consumption	75	108	75	51	308
	45.9%	49.9%	50.3%	59.8%	
Encouraging commercial properties/industries reduce water consumption	82	100	63	35	279
	49.9%	46.2%	42.2%	41.4%	
Total	164	216	148	85	613

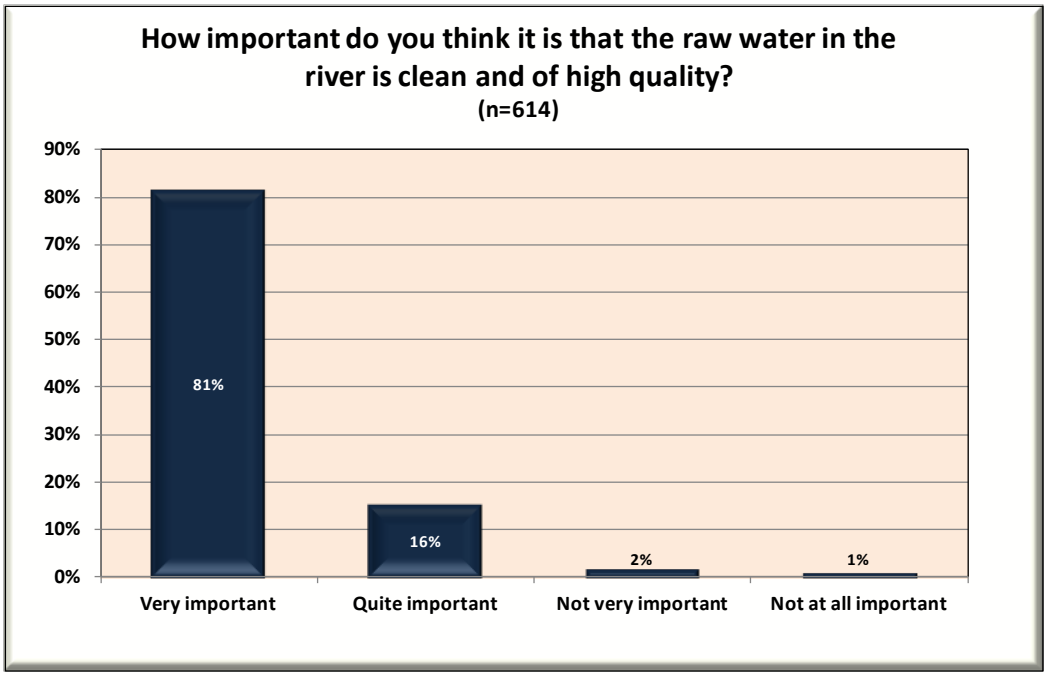
Table 3.2.2: Priorities by rural/urban

	Urban/rural setting			Total
	Urban	Rural	Unsure/ mixed	
Ensuring a continuous supply of drinking water for all future water needs	297	92	26	415
	70.3%	60.7%	64.6%	
Maintaining the natural environment in the river and catchment areas	255	100	26	381
	60.3%	65.7%	65.3%	
Maximising stormwater and wastewater re-use	238	101	32	371
	56.4%	66.3%	80.2%	
Protecting waterways for swimming, boating and fishing	82	15	7	104
	19.4%	9.8%	18.1%	
Encouraging households to reduce their water consumption	212	82	16	309
	50.1%	54.0%	39.4%	
Encouraging commercial properties/industries reduce water consumption	197	70	13	280
	46.7%	46.2%	32.5%	
Total	422	152	40	614

As shown in Table 3.2.1, residents aged 76-plus were more likely to prioritise encouraging households to reduce water consumption than younger age groups. And urban residents were more concerned than their rural counterparts about ensuring a continuous supply of drinking water (Table 3.2.2). Apart from these differences, however, results were remarkably consistent between different groups.

At this point respondents were told that "Water from the Tweed River can be treated to acceptable drinking standard before it reaches your tap", and asked "However how important do you think it is that the raw water in the river is clean and of high quality?"

Graph 3.3: How important do you think it is that the raw water in the river is clean and of high quality? (prompted)

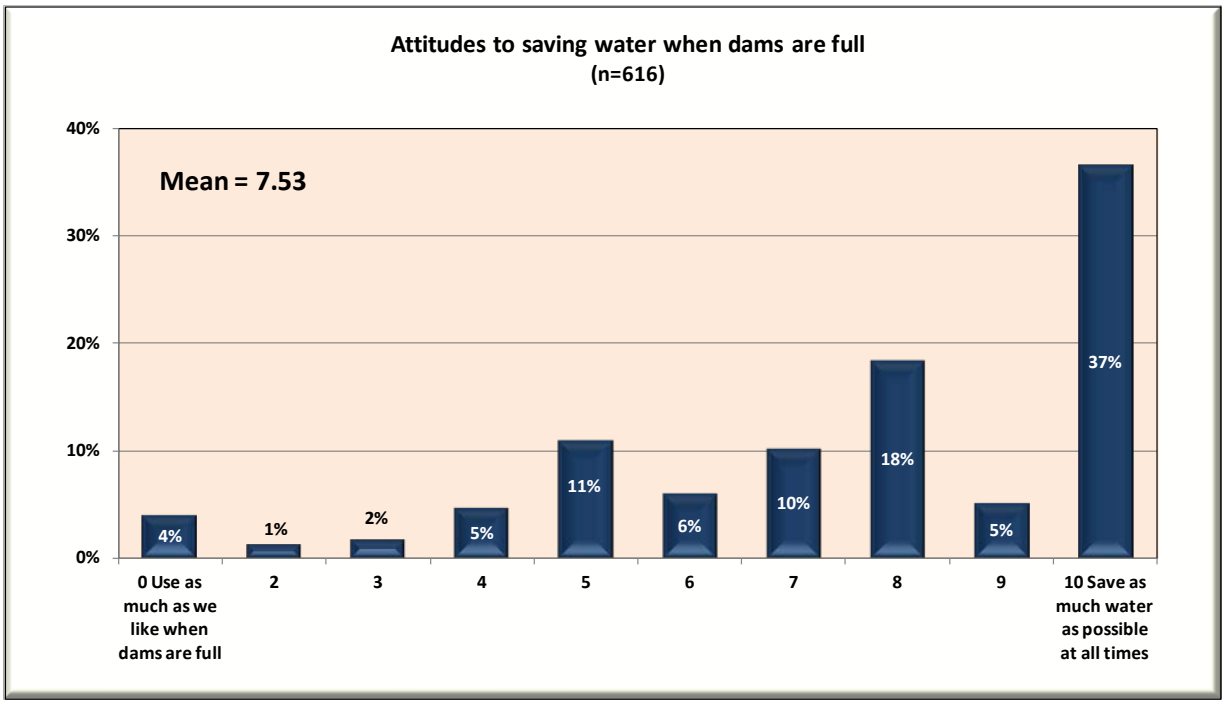


While the question was designed to test the cost-benefit of maintaining a high quality of untreated water, respondents apparently saw only the need to keep river water pure. Over 80 per cent felt it was "very important" that raw water be clean and of high quality, with a further 16 per cent saying it was "quite important". This left just 3 per cent questioning the value or cost of keeping source water clean.

In a further "forced choice" comparison (i.e. similar to Graph 3,1), respondents were then told that "Some people believe that when dam levels are full we should be able to use as much water as we like, while others believe the community should save as much water as possible at all times. Where would you sit on a sliding scale of 0-10, where 0 means we should be able to use as much water as we like when dams are full, and 10 means we should save as much water as possible at all times?"

The results are shown in Graph 3.4, next page:

Graph 3.4: Where would you sit on a scale of 0-10, where 0 means we should be able to use as much water as we like when dams are full, and 10 means we should save as much water as possible at all times?



The results to this question are unequivocal, with a strong preference to saving water even in times of plenty. Some 37 per cent of respondents scored this as 10/10, while just 12 per cent answered on the "Use as much as we like when dams are full" side of the midpoint. The mean score of 7.53 (out of a possible 10) further highlights a strong water conservation ethos.

Looking at mean ratings by age, gender and location:

Table 3.4.1: Unlimited use vs. saving at all times (when dams are full) by age

Age	Mean	N	Std. Deviation
18-39	6.98	166	2.740
40-59	7.59	216	2.611
60-75	7.66	148	2.599
76-plus	8.18	85	2.499
Total	7.53	615	2.650

Table 3.4.2: Unlimited use vs. saving at all times (when dams are full) by gender

Gender	Mean	N	Std. Deviation
Male	7.15	293	2.876
Female	7.87	323	2.379
Total	7.53	616	2.649

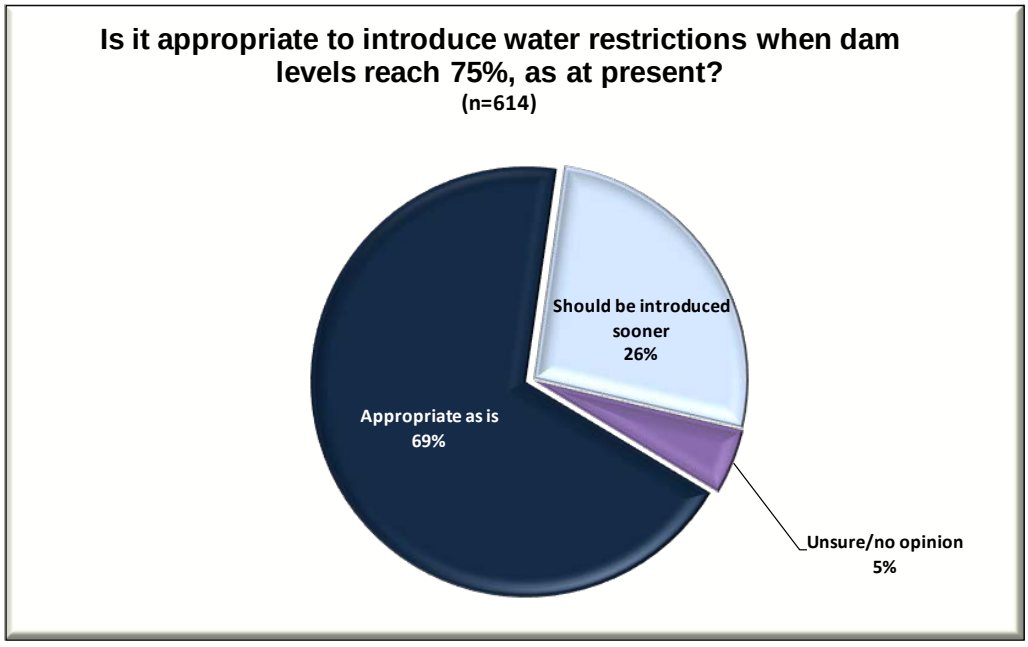
Table 3.4.3: Unlimited use vs. saving at all times (when dams are full) by location

Location	Mean	N	Std. Deviation
Tweed Coast - north of river	7.14	192	2.842
Tweed Coast - south of river	7.75	217	2.545
Hinterland	7.73	206	2.453
Total	7.53	614	2.623

This indicates that older residents, women and those living south of the Tweed River and in the Tweed hinterland were most keen to save water at all times. (However mean scores were well above the midpoint of 5 for all demographic groupings.)

At this stage, respondents were told that "Compulsory water restrictions for the Tweed shire currently come into effect when the dam level is 75 per cent, which last occurred in 2003". They were then asked if they felt this was appropriate, or whether they believed restrictions should be introduced sooner. The results are shown in Graph 3.5, below:

Graph 3.5: Is it appropriate to introduce water restrictions when dam levels reach 75%, as at present? (prompted)

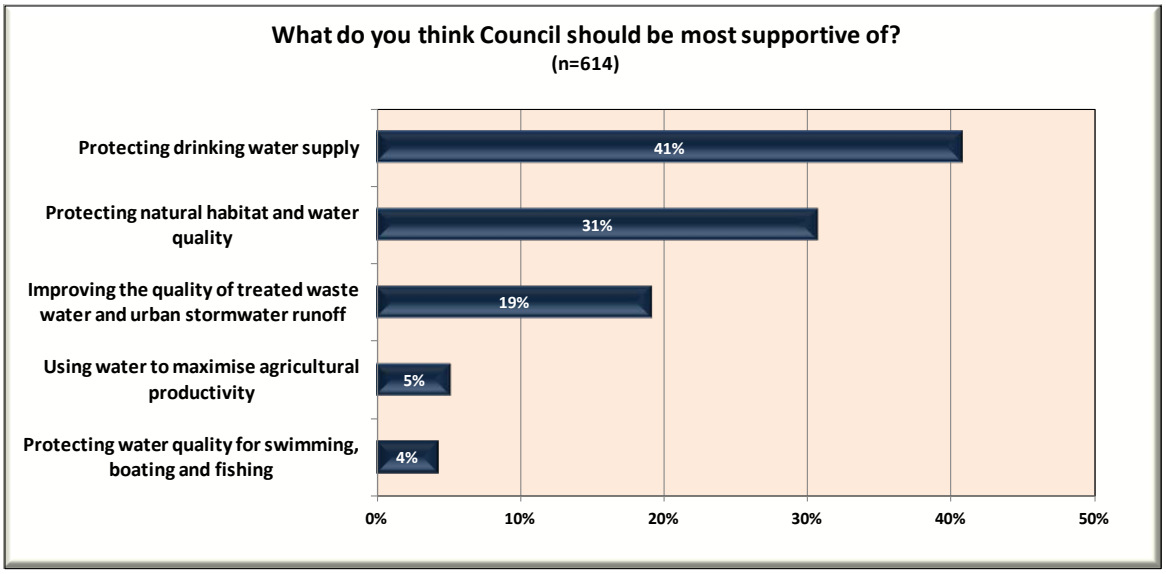


Around seven in ten respondents agreed that 75 per cent capacity was an appropriate time to introduce water restrictions, with just 26 per cent believing they should be introduced sooner. There were no significant differences in this result by age, gender or location.

Part 4: Additional water sources

At this point respondents were asked a series of demand and pricing questions about additional water supply sources. This began by asking which of five potential water uses Council should be *most* supportive of:

Graph 4.1: From the following, what do you think Council should be most supportive of? (prompted)



Protecting the water supply was the most popular choice (nominated by 41 per cent of respondents), followed by protecting natural habitat and water quality (31 per cent) and improving the quality of treated water water/urban stormwater runoff (19 per cent). Conversely, only 4 per cent classed protecting water quality for swimming, boating and fishing as their major funding priority for council.

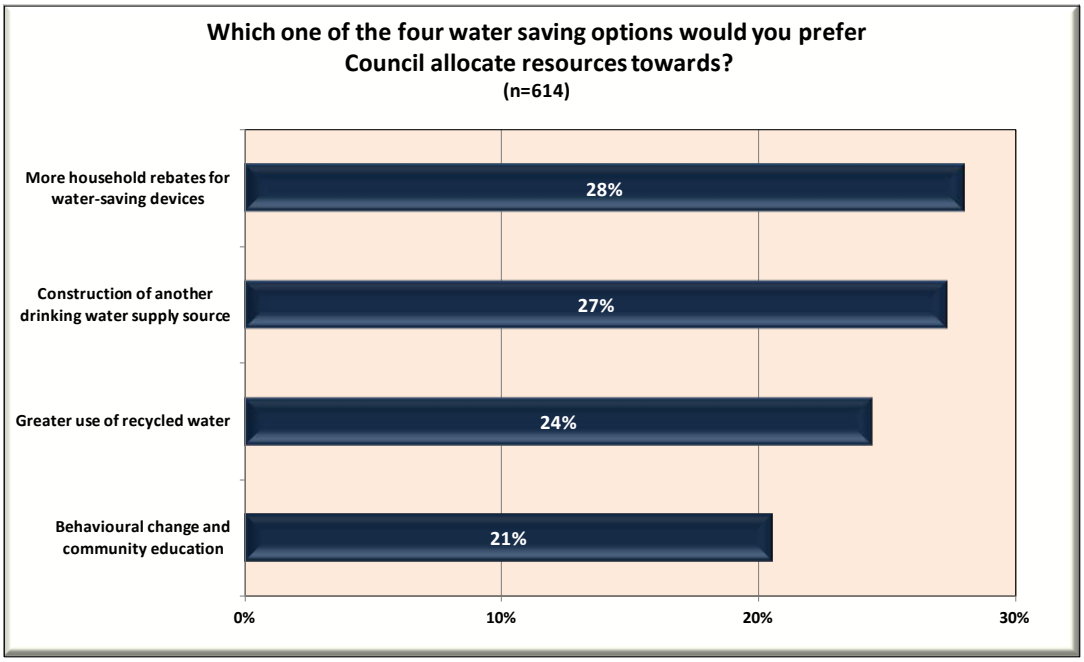
Table 4.1: Potential water priorities, by urban vs. rural

	Urban/rural setting			
	Urban	Rural	Unsure/ mixed	Total
Using water to maximise agricultural productiviy	17	11	4	32
	4.0%	7.2%	9.8%	5.2%
Improving the quality of treated waste water	82	30	5	117
	19.4%	19.7%	12.2%	19.0%
Protecting water quality for recreation	12	10	5	27
	2.8%	6.6%	12.2%	4.4%
Protecting natural habitat and water quality	118	60	12	190
	27.9%	39.5%	29.3%	30.8%
Protecting drinking water supply	194	41	15	250
	45.9%	27.0%	36.6%	40.6%
Total	423	152	41	616
	100.0%	100.0%	100.0%	100.0%

This indicates that rural residents were significantly more likely than their urban counterparts to prioritise protecting natural habitat and water quality over protecting the drinking water supply.

Respondents were then asked to decide which of four potential water-saving options was the most important for Council to be devoting resources towards. Their responses are shown in Graph 4.2, below

Graph 4.2: Which water saving option would you prefer to see Council allocate resources towards? (prompted)



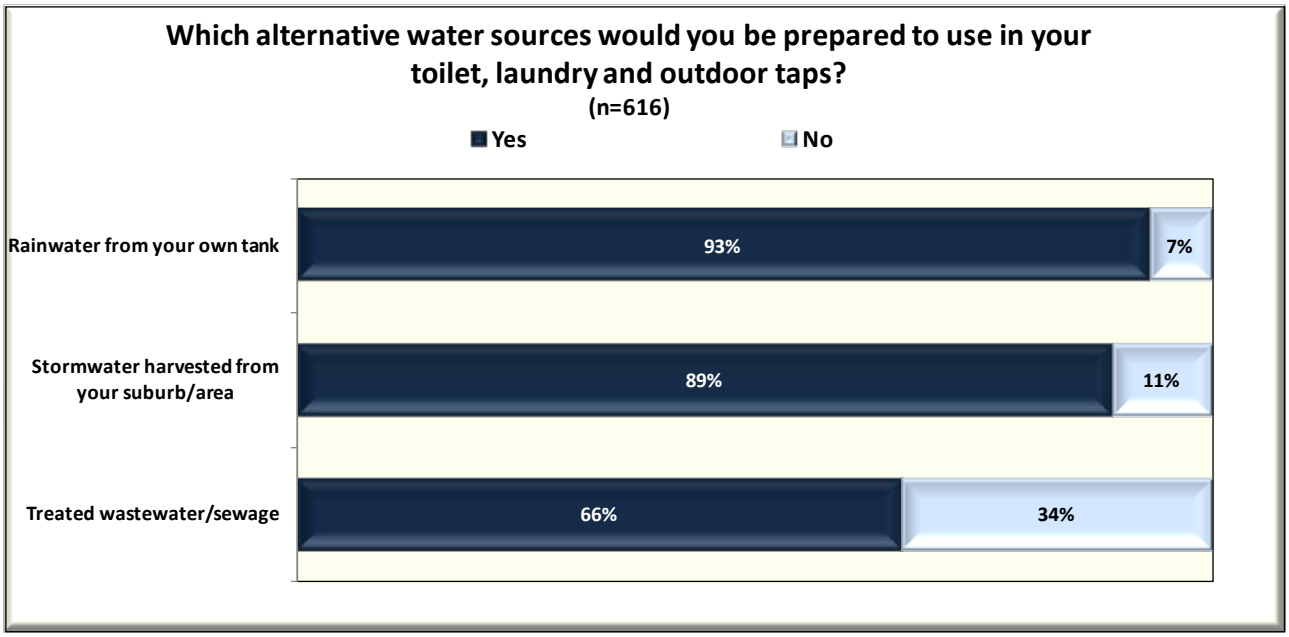
Opinion was evenly divided between the four options offered.

Table 4.2: Priorities for water saving options, by age

	Age				Total
	18-39	40-59	60-75	76-plus	
Greater use of recycled water	46	50	39	15	150
	27.7%	23.3%	26.4%	17.6%	24.4%
More household rebates for water-saving devices	64	57	25	23	169
	38.6%	26.5%	16.9%	27.1%	27.5%
Construction of another drinking water source	24	62	56	25	167
	14.5%	28.8%	37.8%	29.4%	27.2%
Behavioural change and community education	32	46	27	21	126
	19.3%	21.4%	18.2%	24.7%	20.5%
Unsure/don't care	0	0	1	1	2
	.0%	.0%	.7%	1.2%	.3%
Total	166	215	148	85	614
	100.0%	100.0%	100.0%	100.0%	100.0%

It appears that younger respondents (i.e. those aged 18-29) were keenest on Council devoting resources to household rebates for water-saving devices, while older residents were more likely to nominate construction of an additional water source.

Graph 4.3: Which of the following alternative water sources would you be prepared to use in your toilet, laundry and outdoor taps?



Meanwhile there was strong support for rainwater tanks and harvested stormwater (with 93 and 89 per cent respectively saying they would be prepared to use these for non-drinking purposes. And two-thirds of respondents also gave the thumbs-up to treated wastewater and/or sewage.

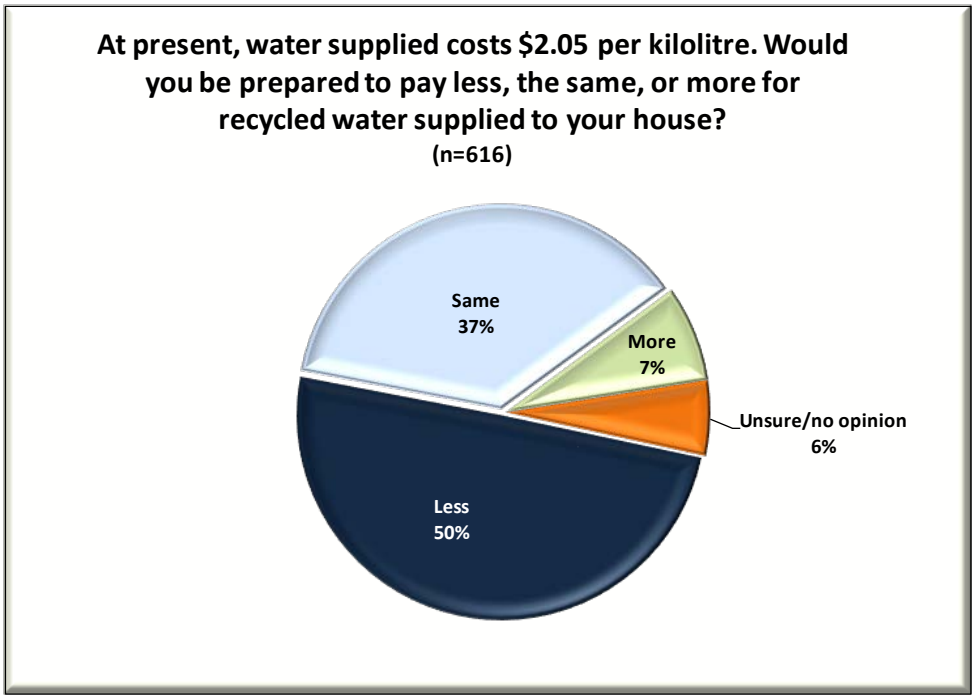
Table 4.3: Alternative water sources (treated wastewater) by age and gender

	Age				Gender		Total
	18-39	40-59	60-75	76-plus	Male	Female	
Yes	124	145	92	42	206	199	403
	74.7%	67.4%	62.2%	49.4%	70.3%	61.6%	65.6%
No	42	70	56	43	87	124	211
	25.3%	32.6%	37.8%	50.6%	29.7%	38.4%	34.4%
Total	166	215	148	85	293	323	614
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

As shown in Table 4.3, acceptance of treated wastewater and sewage was highest among younger respondents and males.

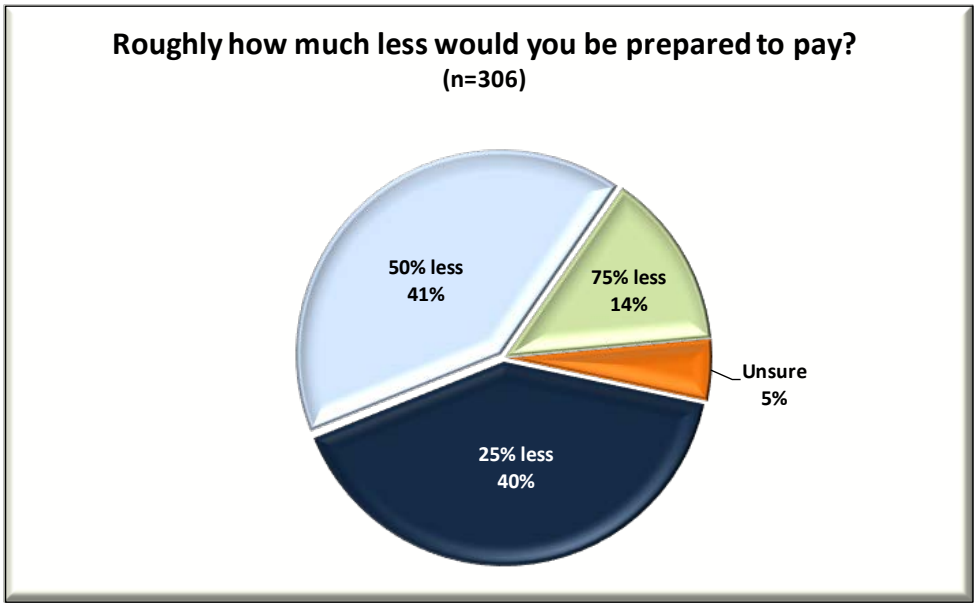
Moving next onto preferred water pricing for recycled water options:

Graph 4.4: At present, water supplied costs $2.05 per kilolitre. Would you be prepared to pay less, the same, or more for recycled water supplied to your house?

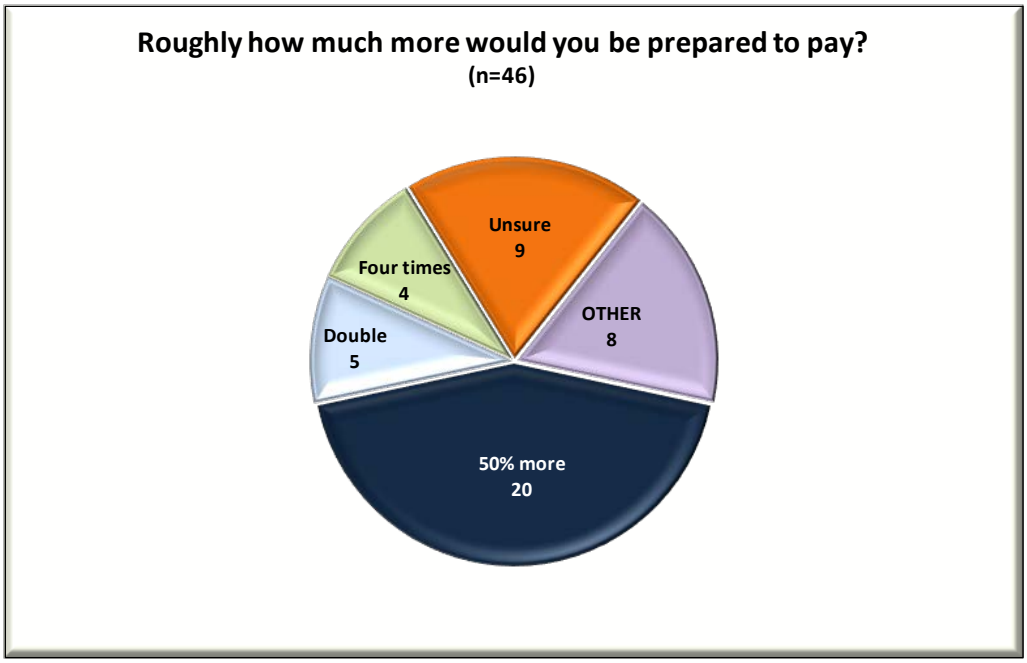


Half the sample felt that recycled water should be less expensive than existing supply. A further 37 per cent believed it should the same, while just 7 per cent said they would be prepared to pay more.

Graph 4.5a: (For those proposing less) Roughly how much less would you be prepared to pay? (prompted)



Graph 4.5b: (For those proposing more) Roughly how much more would you be prepared to pay? (prompted)



(N.B. Results shown as in numeric rather than percentage format due to small sample size)

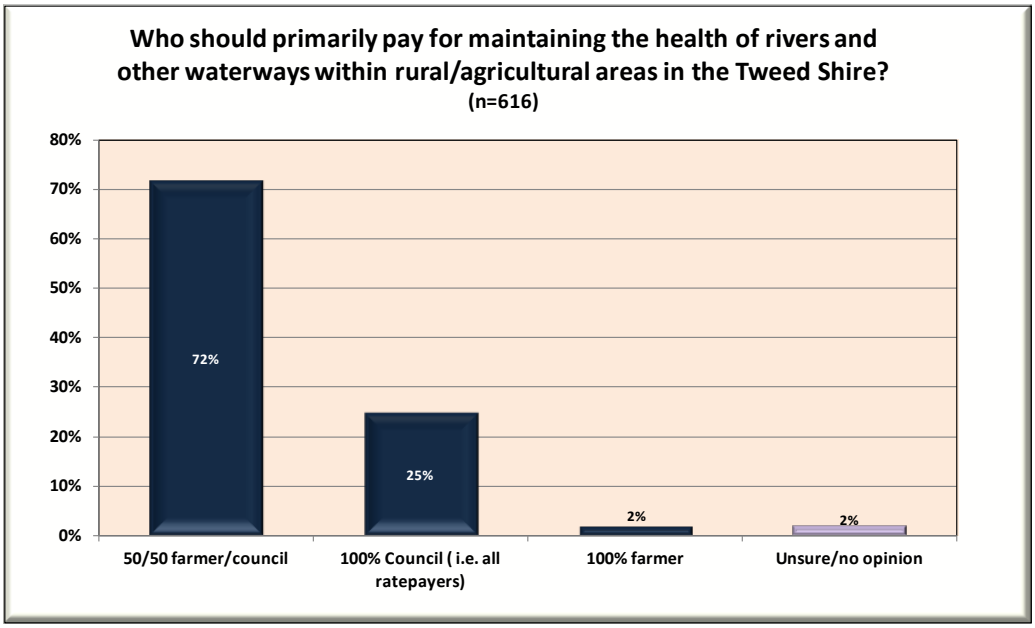
Graphs 4.5a and 4.5b quantify how much less or more residents would be prepared to pay. Of those (306 respondents) proposing less, 41 per cent believed it should cost half as much, while a further 40 per cent felt it should be 25 per cent cheaper. Of the 46 people prepared to pay more, just under half felt 50 per cent more was fair.

However at this stage of community awareness, it seems clear that the majority of residents expect future recycled water to be cheaper than – or at worst priced the same as – existing supply.

Part 5: Sharing the burden

The survey concluded with three questions designed to understand attitudes towards who should pay for maintaining river health in rural and urban areas: adjoining landowners, the community as a whole (i.e. via Council), or a combination of both. Looking first at rural/agricultural areas:

Graph 5.1: Who should primarily pay for maintaining the health of rivers and other waterways within rural/agricultural areas in the Tweed Shire? (prompted)



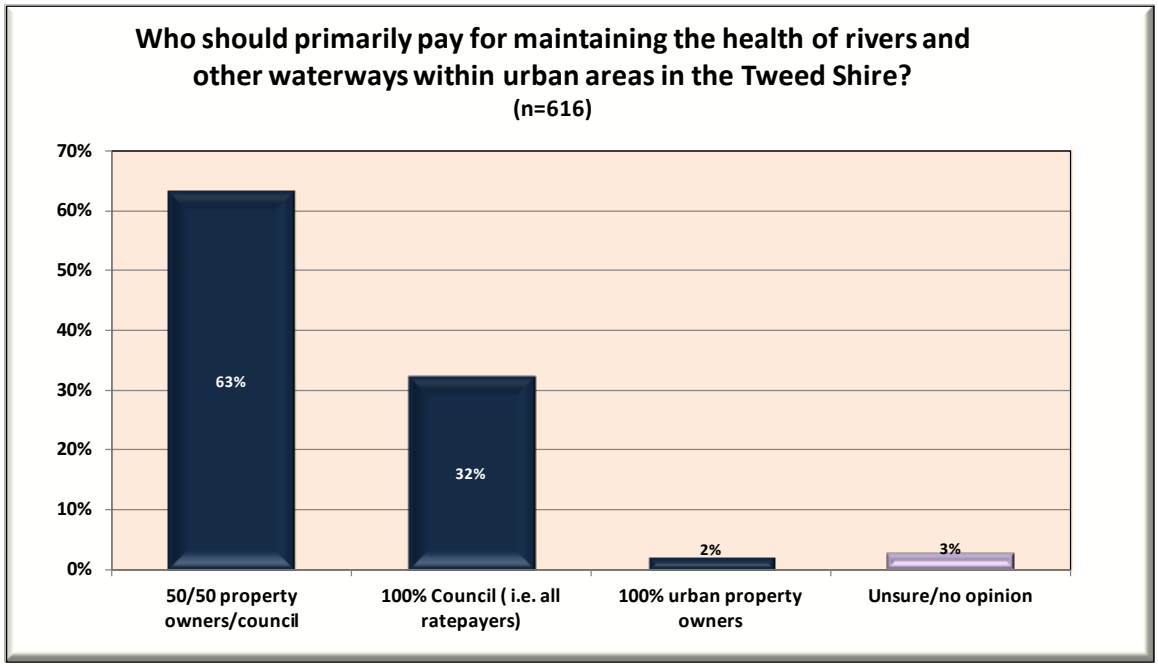
Just under three-quarters of all respondents felt that farmers should bear some of the burden of maintaining river health, while 25 per cent believed it should be solely up to Council.

Table 5.1: Prime payer (within rural areas) by urban/rural.

	Urban/rural setting			
	Urban	Rural	Unsure/ mixed	Total
100% farmer	9	0	0	9
	2.1%	.0%	.0%	1.5%
100% Council (i.e. all ratepayers)	91	47	15	153
	21.5%	30.9%	37.5%	24.8%
50/50 farmer/council	316	101	24	441
	74.5%	66.4%	60.0%	71.6%
Unsure/no opinion	8	4	1	13
	1.9%	2.6%	2.5%	2.1%
Total	424	152	40	616
	100.0%	100.0%	100.0%	100.0%

As one would expect, rural respondents were more likely than those in urban regions to feel Council should bear the burden of cost for river health. However it is interesting to note that a majority of both groups felt the 50/50 solution to have merit.

Graph 5.2: Who should primarily pay for maintaining the health of rivers and other waterways within urban areas in the Tweed Shire? (prompted)

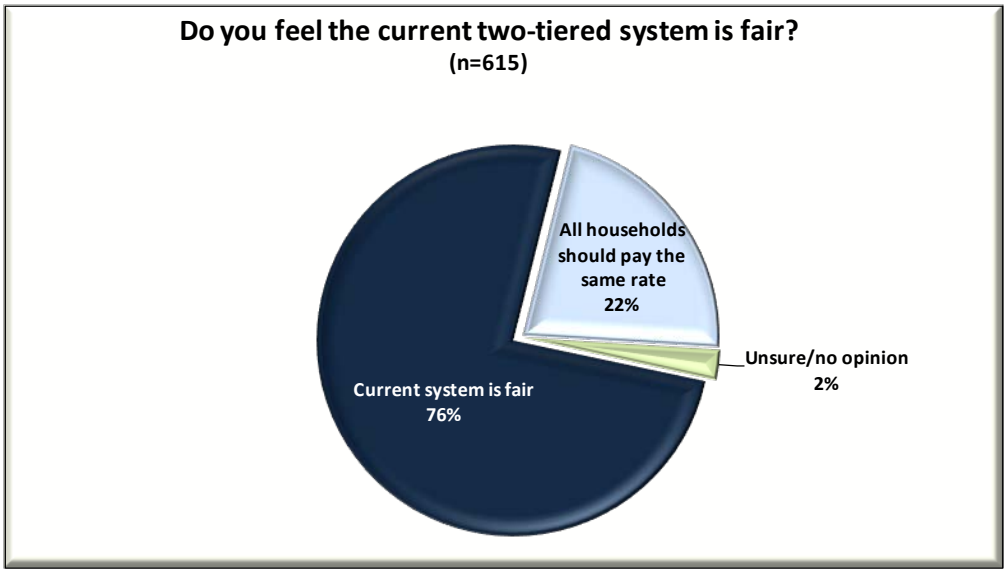


Results were similar in terms of urban areas, suggesting a consistency of "shared burden" belief throughout the Tweed shire. In this instance results were consistent across both urban and rural respondents.

Finally in this section, respondents were asked whether they believed the current two-tier tariff – in which households using a lot of water pay a higher rate per kilolitre for some of their water – was fair, or whether all households should pay the same price per kilolitre regardless of usage:

(Continued next page)

Graph 5.3: Do you feel the current two-tiered system is fair? (prompted)



More than three –quarters of respondents felt that the current system is fair – i.e. that heavy water users should pay a higher rate per kilolitre for their "excess" water use.

Table 5.3: Fairness of current two-tier system, by perception of current consumption

	Believe your household uses more or less water than average?				
	More	Less	Same/ average	Unsure	Total
Current system is fair	37	320	99	8	464
	63.8%	78.6%	71.2%	66.7%	75.3%
All households should pay the same rate	20	79	34	3	136
	34.5%	19.4%	24.5%	25.0%	22.1%
Unsure/no opinion	1	8	6	1	16
	1.7%	2.0%	4.3%	8.3%	2.6%
Total	58	407	139	12	616
	100.0%	100.0%	100.0%	100.0%	100.0%

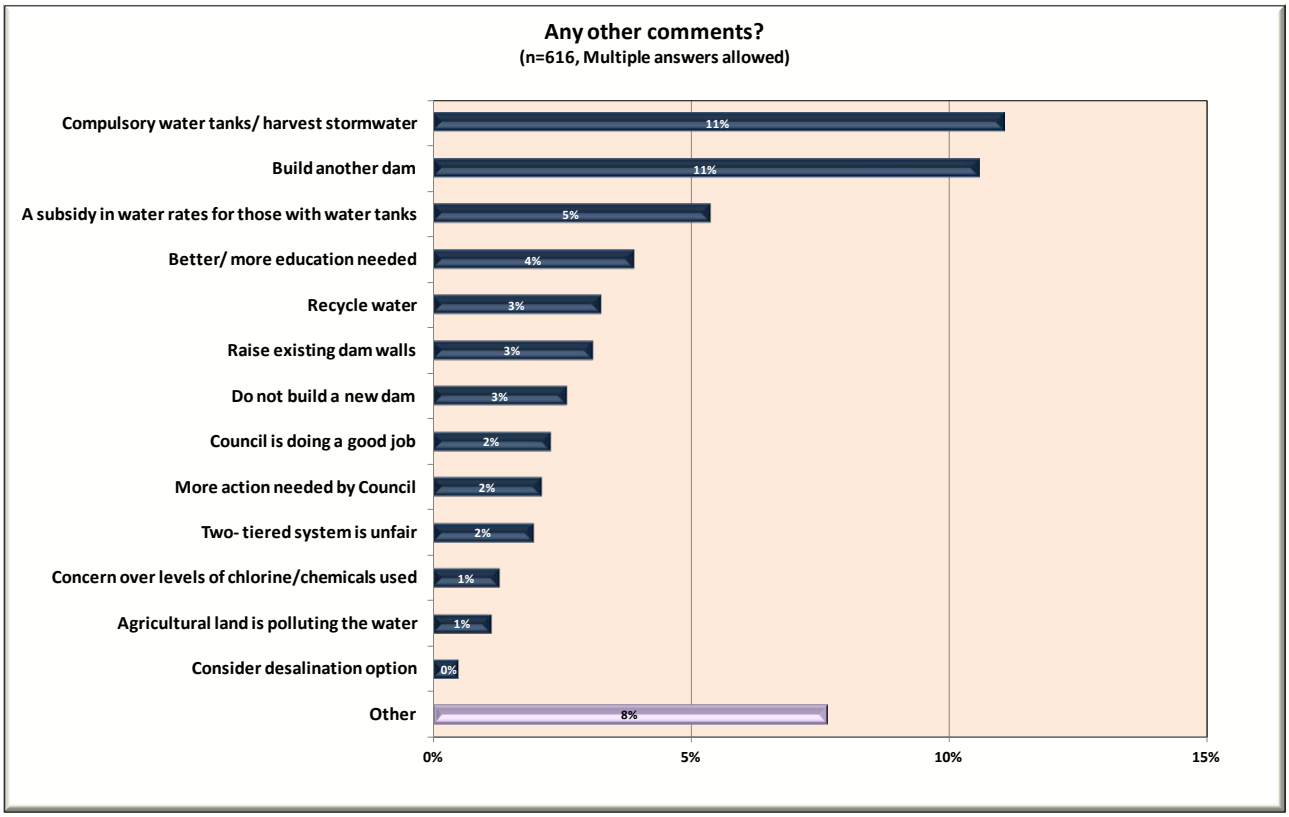
Those who believed their household used less water than average (see Graph 2.3) were significantly more likely to believe the existing system is fair than those claiming to use more than average (at 79 and 64 per cent respectively). However in both instances, a clear majority agreed with the current two-tier pricing model.

Part 6: Other comments

The telephone survey concluded with residents being asked, in an open-ended question, if they had any other thoughts on any aspects of the Tweed's future water cycle management priorities that they would like to share with council. Some 303 of the 616 respondents chose to provide additional comment.

These comments have been coded (i.e. themed), and the results are shown below. Note that percentages are as a proportion of *all* respondents, not just the 301 who answered this question.

Graph 6.1: Other comments and suggestions



Though there was an expectedly wide diversity in comment, prominent themes included a desired need for improved harvesting of stormwater and/or compulsory water tanks (raised by 11 per cent of respondents), the perceived need for an additional dam (also 11 per cent), the possibility of subsidies for those with water tanks (5 per cent), and the need for more education on water saving techniques (4 per cent).

In light of the "build another dam" result, it's important to note that 3 per cent of residents specifically noted that they did not want an additional dam built.

A list of all comments is included as Appendix 3 to this report.

Appendix 1: Survey questionnaire

Q1. Good afternoon/evening, my name is (name), and I'm calling from Jetty Research on behalf of Tweed Shire Council. Council is conducting a short resident survey regarding the shire's future water cycle management priorities. It will take less than 15 minutes, any answers you provide are confidential and we are not trying to sell anything. Plus you would go into the draw to win one of two iPad or $500 shopping vouchers. Would you be able to assist Council by completing a short survey this afternoon/evening?

Offer a CALL BACK if inconvenient time

Yes	1		
No	2		Q1

Answer If Attribute "No" from Q1 is SELECTED

Q2. Thank you for your time.

End

Q3. Before we start I just have two quick qualifying questions. Firstly can I confirm you are aged 18 or over?

Yes	1		
No	2	End	Q3

Q4. And do you live in the Tweed Shire?

Yes	1		
No	2		Q4

Answer If Attribute "No" from Q4 is SELECTED

Q5. I'm sorry but you must live in the Tweed Shire to qualify for this survey. Thank you for your time.

End

Q6. Thanks so much. Could I have your first name for the survey?

Type NA if not willing to give name

Q6

Q7. Thanks so much [Q6]. Just to let you know that this survey is being conducted according to guidelines established by the Australian Market and Social Research Association, and that all data you supply will be treated confidentially. Firstly, are you concerned about the Tweed Shire's ability to meet its water needs in the medium to long term?

PROMPTED

Yes, a lot	1	
Yes, a little	2	Q7
No, not really	3	

Q8. And do you feel the Tweed community as a whole has made serious efforts to reduce daily water consumption over, say, the past three years?

UNPROMPTED

Yes	1	
No	2	Q8
Unsure	666	

Q9. Do you believe your household would use more or less water than the average Tweed Valley household?

PROMPTED- Don't offer UNSURE

More	1	
Less	2	
Same/average	3	Q9
Unsure	666	

Q10. And do you know what the target is for average daily water use by residents in the Tweed Shire?

UNPROMPTED

No	1	
Yes - mentions 180 L/person/day	2	Q10
Yes - mentions another figure	3	

Q11. Now [Q6], some people believe that ensuring a reliable long-term water supply for the Tweed Shire is mainly about reducing people's water usage, while others think its more about increasing the water availability. Where would you sit on a sliding scale of 0-10, where 0 means it should be all about reducing usage, and 10 means it should all be about increasing water availability?

Confirm rating in correct

0 Reducing usage	0	
1	1	
2	2	
3	3	
4	4	
5	5	Q11
6	6	
7	7	
8	8	
9	9	
10 Increasing water availability	10	

*Q12. If you had to come down on one side of the fence or the other, would it be towards reducing usage or increasing water availability?

Answer If Attribute "5" from Q11 is SELECTED

If person can't decide either way skip to next question

Reducing demand	1	
Increasing supply	2	Q12

Q13. **Ensuring a secure long-term supply of water involves a trade-off between lots of different factors. I'm going to read out six of these factors, and ask you to rank which of these is the MOST important to you personally?**

PROMPTED

	Most important	No	
Ensuring a continuous supply of drinking water for all future water needs	1	2	Q13_1
Maintaining the natural environment in waterways and catchment areas	1	2	Q13_2
Maximising stormwater and wastewater re-use	1	2	Q13_3
Protection of waterways for swimming, boating and fishing	1	2	Q13_4
Encouraging households to reduce their water consumption	1	2	Q13_5
Encouraging commercial properties and industry to reduce water consumption	1	2	Q13_6

Q14. **And which of the following would be the second most important?**

PROMPTED

	2nd most important	No	
Answer If Attribute "Ensuring a continuous supply of drinking water for all future water needs" from Q13 is Maintaining the natural environment in waterways and catchment areas			
Ensuring a continuous supply of drinking water for all future water needs	1	2	Q14_1
Answer If Attribute "Maintaining the natural environment in waterways and catchment areas" from Q13 is Maintaining the natural environment in waterways and catchment areas			
Maintaining the natural environment in waterways and catchment areas	1	2	Q14_2
Answer If Attribute "Maximising stormwater and wastewater re-use" from Q13 is Maintaining the natural environment in waterways and catchment areas			
Maximising stormwater and wastewater re-use	1	2	Q14_3
Answer If Attribute "Protection of waterways for swimming, boating and fishing" from Q13 is Maintaining the natural environment in waterways and catchment areas			
Protection of waterways for swimming, boating and fishing	1	2	Q14_4
Answer If Attribute "Encouraging households to reduce their water consumption" from Q13 is Maintaining the natural environment in waterways and catchment areas			
Encouraging households to reduce their water consumption	1	2	Q14_5
Answer If Attribute "Encouraging commercial properties and industry to reduce water consumption" from Q13 is Maintaining the natural environment in waterways and catchment areas			
Encouraging commercial properties and industry to reduce water consumption	1	2	Q14_6

Q15. And which would be the third most important?

READ OUT again if necessary

	Third most important	No	
Answer If Attribute "Ensuring a continuous supply of drinking water for all future water needs" from Q14 is No			
Ensuring a continuous supply of drinking water for all future water needs	1	2	Q15_1
Answer If Attribute "Maintaining the natural environment in waterways and catchment areas" from Q14 is No			
Maintaining the natural environment in waterways and catchment areas	1	2	Q15_2
Answer If Attribute "Maximising stormwater and wastewater re-use" from Q14 is No			
Maximising stormwater and wastewater re-use	1	2	Q15_3
Answer If Attribute "Protection of waterways for swimming, boating and fishing" from Q14 is No			
Protection of waterways for swimming, boating and fishing	1	2	Q15_4
Answer If Attribute "Encouraging households to reduce their water consumption" from Q14 is No			
Encouraging households to reduce their water consumption	1	2	Q15_5
Answer If Attribute "Encouraging commercial properties and industry to reduce water consumption" from Q14 is No			
Encouraging commercial properties and industry to reduce water consumption	1	2	Q15_6

Q16. Water from the Tweed River can be treated to acceptable drinking standard before it reaches your tap. However how important do you think it is that the raw water in the river is clean and of high quality?

PROMPTED - Don't read out last option (don't know/care)

Very important	1	
Quite important	2	
Not very important	3	Q16
Not at all important	4	
Don't know/care	5	

Q17. [Q6], some people believe that when dam levels are full we should be able to use as much water as we like, while others believe the community should save as much water as possible at all times. Where would you sit on a sliding scale of 0-10, where 0 means we should be able to use as much water as we like when dams are full, and 10 means we should save as much water as possible at all times?

Confirm correct scale

0 Use as much as we like when dams are full	0	
1	1	
2	2	
3	3	
4	4	
5	5	Q17
6	6	
7	7	
8	8	
9	9	
10 Save as much water as possible at all times	10	

***Q18. If you had to come down on one side of the fence or the other, would it be using as much water as we like when dams are full, or saving as much water as possible at all times?**

Answer If Attribute "5" from Q17 is SELECTED

If unable to answer either way, skip to next question

As much water as we like	1	
Saving at all times	2	Q18

Q19. Compulsory residential water restrictions for the Tweed District currently come into effect when the dam level is 75 per cent, which last occurred in 2003. Do you think this is appropriate, or should they be introduced sooner?

PROMPTED - don't offer UNSURE

Appropriate as is	1	
Should be introduced sooner	2	Q19
Unsure/no opinion	3	

Q20. In terms of the Shire's waterways, what do you think Council should be most concerned about?

PROMPTED. Read list twice if necessary.

Maximising agricultural productivity	1	
Improving the quality of treated wastewater and urban stormwater runoff	2	
Protecting water quality for swimming, boating and fishing	3	Q20
Protecting natural habitat and water quality	4	
Protecting drinking water supply	5	

Q21. Now [Q6], providing an additional water supply source is costly. If they could only do one, which of the following three water-saving options would you prefer to see Council allocate resources towards?

PROMPTED - don't offer unsure

Greater use of recycled water	1	
More household rebates for water-saving devices	2	
Construction of another drinking water supply source	3	Q21
Unsure/don't care	4	

Q22. Assuming it was readily available, which alternative water sources would you be prepared to use in your toilet, laundry taps and (if applicable) outdoor taps? Please answer yes or no:

PROMPTED

	Yes	No	
Rainwater from your own tank	1	555	Q22_1
Stormwater harvested from your suburb or area	1	555	Q22_2
Treated wastewater/sewage	1	555	Q22_3

Q23. Treated and drinkable water supplied to households currently costs $2.05 per kilolitre. Would you be prepared to pay less, the same or more than this amount for recycled water supplied to your house for outdoor use, toilet flushing or clothes washing?

PROMPTED

Less	1	
Same	2	
More	3	Q23
Unsure/no opinion	4	

Q24. Roughly how much less would you be prepared to pay for this recycled water?

Answer If Attribute "Less" from Q23 is SELECTED

PROMPTED

25% less	1	
50% less	2	
75% less	3	Q24
Unsure	666	

Go to Q26

Q25. Roughly how much more would you be prepared to pay for this recycled water?

Answer If Attribute "More" from Q23 is SELECTED

PROMPTED

50% more	1	
Double	2	
Four times	3	Q25
Unsure	666	

Q26. [Q6], who should primarily pay for maintaining the health of rivers and other waterways within rural/agricultural areas in the Tweed Shire?

PROMPTED - don't read unsure option

All ratepayers	1	
Farmers bordering those waterways	2	
Both equally	3	Q26
Unsure/no opinion	4	

Q27. And who should be primarily responsible for paying to reduce household stormwater pollution in waterways within urban areas of the shire?

PROMPTED - except unsure

All ratepayers	1	
Individual property owners in houses bordering those waterways	2	
Both equally	3	Q27
Unsure/no opinion	4	

Q28. At the moment there is a two-tier water tariff, which means that households which use a lot of water pay a higher rate than others for some of their water. Do you think this system is fair, or should all households pay the same rate per kilolitre regardless of how much they use?

PROMPTED except unsure

Current system is fair	1	
All households should pay the same rate regardless of use	2	Q28
Unsure/no opinion	3	

Q29. And did you have any other thoughts on any aspect of the Tweed's future water cycle management priorities that you would like to share with Council?

PROBE for a response

Q29

_____

_____

Q30. Finally [Q6], we just have a few demographic questions to ensure we have a broad range of community views. Firstly, could you tell me into which of the following age ranges you would fall?

PROMPTED

18-39	1	
40-59	2	
60-75	3	Q30
76-plus	4	

Q31. Gender?

Don't ask

Male	1	
Female	2	Q31

Q32. Do you live in an urban or rural setting?

Urban-in town. Rural-on a property

Urban	1	
Rural	2	Q32
Unsure/mixed	3	

Q33. Are you on town water?

Do not answer If Attribute "Urban" from Q32 is SELECTED

Connected to mains water

Yes	1	
No	2	Q33

Q34. And which of the following housing types would best describe where you live?

PROMPTED

Detached house	1	
Semi-detached house, townhouse or villa	2	Q34
Apartment or unit	3	

Q35. And which of the following would best describe your location within the Tweed Shire?

PROMPTED

Tweed Coast - north of river	1	
Tweed Coast - south of river	2	Q35
Hinterland	3	

Q36. Do you own or rent the house in which you are presently living?

UNPROMPTED

Own/Part-own	1	
Rent	2	Q36
		Q36

Q37. How many people, including yourself, are currently living permanently or part-time in your home?

UNPROMPTED		
1	1	
2	2	
3	3	
4	4	Q37
5	5	
6	6	
More than 6	7	

Q38. And finally, how long have you lived in the Tweed Shire?

UNPROMPTED		
Less than five years	1	
5-10 years	2	
11-20 years	3	Q38
More than 20 years	4	

Q39. Thanks so much (name), that concludes the survey. Tweed Shire Council greatly appreciates your feedback this afternoon/evening. A summary of results from this will be available on Council's website early in 2013, and may also be reported in local media. As I mentioned at the start of the survey, you will now go into the draw to win one of two iPads, or the equivalent value in shopping vouchers. This competition will be drawn on Tuesday the 8th of January and winners will be notified by phone. The terms and conditions can be found on the Jetty Research website. Did you have any questions about the survey? Thank you again for your time, and have a good afternoon/evening.

Appendix 2: Weighting calculation

It is common in random surveys such as this to weight results by age and gender. This avoids the need to sample by quota (which is far more expensive than purely random sampling), and ensures the data from under- and over-represented groups is adjusted to meet the demographic profile of the survey population.

Population weighting can only occur where the true survey population is known. In this case the population, defined as "adult residents living in the Tweed Shire", can be accurately measured through the 2011 ABS Census[7]. We can hence weight the survey data by the known population.

To do this we divide the survey sample by gender (male/female) and across four age groups. This divides respondents into one of eight age and gender categories, as shown below:

Survey sample by age and gender		Gender		
		Male	Female	Total
Age	18-39	5.2%	8.0%	13.2%
	40-59	14.1%	20.3%	34.5%
	60-75	17.2%	21.3%	38.5%
	76-plus	7.2%	6.7%	13.8%
Total		43.7%	56.3%	100.0%

Meanwhile ABS data for the adult (18+) population of the Tweed Shire (as per 2011 ABS Census, Usual Resident profile), is shown in the following table:

ABS Census data (2011)			
Age	Gender		Total
	Male	Female	
18-39	13.2%	13.8%	27.0%
40-59	16.6%	18.4%	35.1%
60-75	11.7%	12.4%	24.1%
76+	6.0%	7.8%	13.8%
Total	47.5%	52.5%	100.0%

Dividing the "true" population by the sample population for each age and gender category provides the following weighting factors:

Weighting factor		
Age	Gender	
	Male	Female
18-39	2.529	1.738
40-59	1.176	0.906
60-75	0.678	0.584
76+	0.837	1.176

These weightings are then assigned to each data record based on each respondent's age/gender profile, and the raw data for each question is adjusted accordingly.

[7] ABS Census for Tweed Shire, 2011, Usual Resident profile.

Appendix 3: Other comments

ID	Comments
1	I'm rather astounded another dam source hasn't been investigated yet.
6	People who use the waterways should pay more.
7	I think that the storm water should be harvested.
9	Currently I pay the same rates as others but I'm not connected to the town water supply, and the only service I receive for this privilege is a waste collection. I also live on a dirt road with no kerb and channelling or street lights.
10	Think they should look at raising the wall on the Clarrie Hall dam.
12	I think there is a terrible waste of water of showers on the beaches as they wash their boards and shower, and the tap stays on even when they have finished.
13	I think they should put another dam in like they have been planning for a long time.
16	Get some women into Council who know about water, we need more women making decisions.
19	I support a new dam to future proof water supplies for the region.
23	We're pretty luck in the Tweed Shire that we have a good plentiful water supply. We don't seem to have problems although we haven't had rain for a while.
24	Tweed area is built out and over developed.
25	The council seems to waste money left right and centre when they could be allowing people to put tanks in there properties and the council should be paying 50 percent, this would give people greater incentive and show council support. Get the ball rolling and it will help in the long term. Rainwater tanks in a sensible fashion is a good way to go.
27	My only thought is they should maximise storage by building as many dams as possible.
29	A few years ago we had a lot of rain and we were put on restrictions down to only being allowed to use the water 2 hours in the afternoon and if we used it out of these hours we were fined, I just think we could have been able to have maybe 2 hours in the morning also.
31	I'm quite happy with what's happening now.
32	Tweed Shire do an excellent job.
34	It is slightly more unfair with the two tier tariff system for large families that can't help it if they need more water. I would like to see the council help people through encouragement and rebates to have a rain water tank for miscellaneous use around the house - gardens etc. Saves drinking water which is the most important life source.
37	I think that a subsidy for insulation for water or reduction per unit of usage for those who have and use water tanks.
39	It seems a shame not to make more use of water tanks, bio cycle tanks, which means water is recycled through your own systems. Having water tanks makes us more aware and conscious about our water and is much better tasting. I think there should be some sort of rebate on this also just like with the solar panels.
44	The biggest concern is the pumping of water from agricultural land that contain phosphates and affects the growth of weeds in the river and the wild life.
48	I think we need more water storage, either expanding on current storage or creating new storage.

49	I definitely think that the runoff from fertiliser is a pollutant in the river and effects our drinking water. The council needs to do something with the rural landholders to encourage them to plant trees and a legislation be passed that certain areas past their land has to be left clear to protect the waterways. Also planting additional trees on border of properties would prevent fertiliser run off from going into water.
50	Pressure water in the mains.
52	I think council are doing a pretty good job, public awareness.
53	To ensure that the water is the best quality that the Council could provide. I think that the Council does a very good job of looking after our waterways.
54	We should be looking for further inlets for a dam.
55	We do as much as we can to save water and believe that education is important.
59	I haven't really thought about it apart the need for another dam/catchment.
61	I think that they should not listen to the greenies and build another dam as they will have lots of problems when the population increases.
63	I would like to see every new dwelling have a rain water tank and greater rebates for existing homes to get tanks.
64	Area growing so fast it needs people in management who really know what they are doing.
65	If large developments (large subdivision) are going to be approved I would like to see the developers make a substantial contribution towards the ongoing cost of maintaining water infrastructure including future sourcing costs
67	I can't understand why we don't have an efficient river transport system like Brisbane rivercats.
68	With the rates, it depends how many people are living in the house. We cant help it if we have a large family.
69	I'd like to know what Council's going to do about the dam. I think they should extend the dam walls.
70	I don't think there's sufficient money put into stormwater and run off water.
74	Recycled grey water could be used a lot better e.g. water off roofs.
76	I think that a second dam needs to be built at Byrrill Creek. The land was purchased over 25 years ago and has been planted over with trees to be harvested. The harvested trees can partially fund the cost of the dam. There is blue green algae in the catchment area, this is a potential health concern for humans and animals, having a second dam would give an alternative water source while the other is treated. This solution also gives an alternative catchment area. Tweed shire Council should hold a referendum at the next state or federal election as the silent majority wants to see the start of the construction of the second dam straight away.
78	I think there is more talk in Council and not a lot of action about strategies to reduce water usage. I think people should be given incentives to put water saving measures in place. People should be encouraged to put in water tanks and not to unnecessarily use and waste water. People should also be made more aware of the different water saving measures.
81	If we could some how set up a system on how to reuse our household wastes and look at water tanks for all houses.
91	I think that the Council is trying their best.
97	I am in a complex of 8 units and two of us have gardens and the others do not. The complaint is that if we get a water bill overdue we all have to pay which is unfair.

98	If the population increases then something needs to be done.
101	There's an abundance of water in the hills and we should be selling it to the Gold Coast.
103	I would like to see where the many creeks in the Tweed should have a 'police system' on the waterways for people who use water from them without licences or proper approval.
104	More education on how to save water especially for the younger generation.
105	I think that it will be difficult for Council to keep up with water demand as the population in the area keeps increasing.
106	I'm not happy with cost of water rates and having to pay for a plumber to investigate my water usage as a single person in a house.
108	A good job done, water is clean.
109	Don't want any fluoride in the water. It reacts to my body I am allergic.
111	I think that there should be rebates for water tanks and all homes should have one.
115	Circumstances change so it all balances out in the end.
118	Nice if they paid for us to use rainwater out of our rainwater tank, not plumbed in at the moment.
119	Very happy with our council.
121	The drainage in my area is substandard, when it rains it always floods. This is a waste of water that we could use.
126	I think most houses should have a rainwater tank.
129	I think they should give us rebates for putting tanks in and more incentives for other water saving devices.
130	For people in areas such as Flamtree Park, is there anything that can be done to prevent flooding in this area such as water management.
132	There has been a lot of discussion but no action on the dam especially raising the dam wall as a possible cost effective solution to future water supply.
133	Improve water capacity by building more dams.
134	Primarily the goal should be sustainability.
135	I would not like to see the same thing happen here like they did in Toowoomba in regards to sewage water usage.
136	There is talk of putting a dam in to Byrrill Creek. I strongly object to this as an option because of the impact on the environment, fauna and flora. I would prefer increasing the capacity of the current dam.
137	How about Council rebates for water tanks in all houses.
140	I would like them to make up their mind about what they are going to do with the dam. I would rather them raise the wall of the existing dam.
141	I believe that our rivers and waterways should be kept as pristine as possible, this is so IMPORTANT!
144	I would not use recycled water at all.
147	The pricing of the multi tiering should be a "use as you pay " system.
151	Council should stop wasting water.
153	We need another water supply as Clarrie Hall Dam is not sufficient. Raising the wall is a good option. A dam at Byrrill Creek is not an option.
156	Against the new damn increase. Current capacity with the present damn is fine.
158	I hope that council keeps on doing the best to conserve water.

161	Council are being very responsible about our water's future.
162	The dam that's been talked about should go ahead.
172	Need to consider population growth in the region and the future water needs.
177	I live in a Community apartment housing unit and the inside residence metres are never read, but instead they read the one out on the road which is not a fair reading on residence water use. Because of this wrong metre reading process the residence are paying high rates for low water use. Alison actually went away for a month but still got charged the same rate even though she used no water during that time. Nobody is doing anything about the residents high cost situation and or the wrong meter practise. She has more than tried to be heard on many occasions and insists this important problem/complaint be passed on to a water managing council member to call her and explain why this unfair unrelated meter reading is currently over charging the residents.
178	I think the Council can learn or monitor what other Councils do to get better insights regarding water use and conservation.
179	Construct another dam so we have a reasonable amount of water.
184	I live on a river and river health should be a priority when considering future development.
185	People should be encouraged to use more rain water via tanks. More individual responsibility.
186	Education is the most important focus.
187	Council should build another dam at Byrrill Creek.
194	I would like to see NSW Waterways contribute to the health and maintenance of the waterways - the money collected from boaties could go towards this upkeep. Every household should be given the option and incentive to have a rainwater tank at their residence.
195	I think it's all pretty good at present.
197	I think if a dam is needed the Clarrie Hall dam should be extended.
198	Means testing for low income earners for water rates.
199	Building another dam is not a good idea. More about incentive to teach people how to use water properly.
202	More incentives for the water saving cost shower heads and should encourage water tanks in every yard with big incentives as well. Put Tweed Council Shire Water Management details on "face book" too encourage the younger age group to get on board with saving water, and reach a wider demographic of people and get them listening!
203	I've been a resident of the area for 12 years and Council should look at clearing gutters of green debris to prevent flooding.
205	I think we should have another dam.
206	Hurry up with Byrrill Creek before we get into the situation like the Gold Coast where we run out of water.
209	What about de-salination for an added water source?
210	I think the run-off water should be stored and used for gardens etc.
212	I think people should be more educated about water saving.
213	I Strongly oppose treated/sewage water for drinking, I am not opposed for it to be used outside. There would have to be a separate tank so we know what water we use for outside and inside areas. If this falls on to home owners this means our rates will be higher and personally ours are too high at the moment.
214	What about Council giving rebates to all homes so that all houses have rain water tanks.

215	Educate people about the importance of saving water and also give them knowledge on how stormwater is recycled as I have no idea about the quality of it, but would like to know.
217	I would like to see rebates for grey water systems used on properties. I would like to see urban water run off treated and used more appropriately to protect the regions future. environment and surroundings
219	I have no complaints with the water system here. Water pressure is very good and we have never ran out. Council have been very good.
220	Maybe when you build new estates it should be compulsory for them to have a rainwater tank and developers could contribute to this cost.
221	We should all be careful of our water usage. Be more aware.
224	It's hard to answer that question as we have a new Council but I have been satisfied up until now.
227	In favour of building the Byrrill Creek Dam.
230	I'd like the Council to consider rebates for rain water tanks, and utilise the rain more.
232	As a house owner I'm quite happy with the way it goes.
233	I live in on the river and I find that the commercial fisherman are fishing out the river and making it hard for anyone else fishing here. I think this needs to be looked at and stricter regulations put in place. Also I live along a canal/estuary and there are a lot of boats, water skis etc that do not adhere to the 5Km speed limit. I report this on a regular basis but nothing is ever done. We need to introduce a "No Wave" policy.
234	I think they should build the dam higher and not be supplying water to Queensland.
236	Effective education is the key to informing residents about possible alternative water sources.
238	Farmers should be paying a reduced water rate as they are supplying food for all of us.
240	This survey is a good start and more information from the Council to the residence.
241	I don't know what the cause is but when I fill up a water bottle it has a muddy smell when I first drink it. I would like to see some of the rivers dredged so that there is a better flow in and out of water and that the creeks are kept clearer. I also can see there is a lot of build of silt in the river and they need to be cleaned out.
244	I think Council should concentrate on keeping the waterways healthy. They need to focus on the amount of chemicals and waste that is allowed to run back into the waterways, farming in particularly.
246	We should all have water tanks for old and new houses. How about council rebates.
249	Drains are very overgrown and should be maintained to a better standard.
252	I think the waterways could be a bit cleaner than they are.
253	We should use rainwater more. Rainwater tanks should be subsidised.
254	I would like to see common sense used to solve future water cycle management.
255	Stop the people from building high rise buildings, if we didn't have so much high risers we wouldn't be so congested and there would be a lot more people like me happier.
256	More education about ways to reduce water usage and information about what Council is doing towards this goal.
261	I would like to see the Byrrill Creek dam built.
263	I feel sorry for people who live in units where there is one person who is using the water and they all pay for it which is unfair. The council should make it compulsory for new units to have individual water metres. There is also a person who lives behind me who uses grey water which smells pretty bad which is unbearable to be around.

265	There has been a long term plan and understanding that the land purchased and set aside for future construction of a dam if needed. I support the construction of the dam at Byrrill Creek as planned.
266	Need to do something about the catchment of water because of the increasing populated areas.
267	Anyone can put in rain water tanks especially suburban ones. I was in the UK recently and they had a great usage of tanks. I think we could be 50-80 percent self sufficient enough to have water tanks in all houses. Construction of new properties could have a compulsory rain water catchment tank under the drive ways.
270	I would put in a rainwater tank today if the Council had a rebate for it.
271	They should be looking at enlarging the dam or having a back up dam. In saying this, I think the Tweed Shire is better off water wise than most.
272	I really think the second dam should be built at Byrrill Creek as they have already acquired the land but nothing has been done.
273	I think the water rates are far too high, we aren't in a drought stricken area.
275	I'm in support of the Byrrill Creek Dam.
278	Recycling sewage and waste water is the way to go. A de-salination plant is a waste of money.
280	New developed housing areas should have some form of recycling as compulsory . No too the Byrrill Creek Damn.
281	I am concerned about the amount of chlorine that is being used in the water supply which is too often and due to this we have had to pay a lot of money to get filtration systems because of skin allergies.
287	I think that in all new homes it should be mandatory to have a tank put in and more public awareness of saving water. I also think people should be more educated about how important it is to save water.
288	The idea of a desalination plant is not very good and definitely would not consider this option. I think that all steps to saving water are being taken and should be introduced gradually so we can get use to the steps. I think we should have options as to having our own water tanks and I would like the Council take action on Coal Seam Gas or to seriously consider the effects of the water table and water quality this would have.
289	I don't think is really doing anything about water supplies or conservation just hitting us up for levies, rates and so on and not doing anything .
290	The waterways are not just a local system they are part of the national and global system and as such a larger body needs to oversee the health and vitality of river systems. Fence the rivers from cattle and livestock and regenerate riverbanks to allow the natural ecosystem to regenerate. Needs to be some fairness with water tariffs especially for young families who could be penalised for the need to wash nappies etc.
291	I would like to see every dwelling having its own water meter. Duplexes have only one metre shared between both residences.
294	The environment has intrinsic value which therefore translates into economic value. Once the environment is damaged then the cost of recovery would be greater than any benefit arising from the initial such activity. I strongly believe that we should not do any coal seam gas exploration or development within the shire as we do not know the long term consequences. Coal seam gas exploration can cause irreparable damage to the water table and can directly impact on waterways and water quality.

296	Council should be able to remove shopping trolleys and other rubbish from waterways - even every couple of months to maintain a clean environment.
297	They put too much chlorine in the water when I flush the toilet.
298	I could be self sufficient water wise here with water tanks if only the Council would let me connect the water to all parts of the house not just the toilet, laundry and outdoors. If people were encouraged to have rainwater tanks, there would be less or no need to worry about building up existing dam walls or building another dam. Surely this is a more logical answer and would cost less money in the long run.
300	My daughter has caught sigertory from eating fish from the river. The water quality in the Tweed river needs attention urgently.
302	People should be encouraged to catch their own rain water. Council should patrol for leaking taps and toilets that use too much water.
304	When it comes to the household putting in rainwater tanks and recycling grey water we have a lot of elderly pensioners that could do with assistance in implementing these systems. Smaller community areas could share rain and grey water harvesting and benefit people living in estates as a start.
306	I think a free supply of stormwater tanks to residents would be a good idea.
307	They should dredge the Broadwaters and the rivers to stop them from silting up.
308	I've got more to learn - I'm new to the area.
310	I don't believe that having a second dam in the Tweed Shire is the answer. I think Council should allow residents to install rainwater tanks on their properties.
314	The Tugun de-salination plant? What's happening with that? Will we use that water.
316	I think the council should be looking more carefully at what goes into stormwater drains.
317	I'd really like them to reharvest the water more. We lose a lot of stormwater also the irrigation of parks needs to be reduced.
318	I would like to see another dam built as the population is growing and rainfall seems less now than in years previous
319	I'm not to keen on the dam at Byrril Creek. Our current dam should have it's storage capacity extended.
321	Every new house that's built it should be mandatory to have a rainwater tank. Plus I believe there should be a bigger rebate for installing rainwater tanks.
322	I rang up the other day and I am a pensioner but do not qualify for a rebate as I am not a homeowner. I am paying nearly 10 times more for my water than I was paying in Melbourne. Can you tell me why is this so.
323	I think it 'd be a great idea to plan, and subsidise a rainwater tank for every home.
327	I believe that the current dam walls should be raised rather than construct another water storage.
328	Basically the production of water is 9000 litres per year and were throwing away 8500 litres, they could be using this towards roads and agriculture. If the water is not treated to a high standard there is still a nutrient load accumulating in the water. At the moment I am using drinking water on my garden when I should be using grey water but this has not been an option with council. The storm water harvesting idea is good and could be stored locally somewhere.

329	It's not fair for people who live in units to pay a minimum base rate for water and consequently the council is receiving a lot more income from the residents of the units. I have heard that the Tweed Community are in favour of a new dam but the state government seems to be interfering. The head labour leaders are ignoring local labour politicians and community wishes, perhaps there is state and federal interference on this issue. The regulations for farmers to protect the waterways need to be enforced as well as industry and factories.
331	I think there is no point raising the dam wall if there is not enough water in the catchment so the only option is a second dam. All new housing should have a minimum of 20,000 litre rain water tank for use on toilets, gardens and washing.
332	Recreational river use and subsequent bank erosion substantially reduces the quality of the water in Tweed river particularly upstream from Condong. A river usage levy could be introduced for speed boat users to mange the environmental damage.
335	I would like to see a move for water tanks to be encouraged which would give people a better understanding of water usage.
336	I think that they should be considering constructing the dam at Byrril Creek.
338	I'd like to see a second dam built as soon as possible
339	There needs to be some balance in the argument you cant lean towards total conservation and cut down our living standards.
340	I think people need more help in putting in water tanks. I also feel that farmers need more support particularly where dams are concerned on their property.
342	I have concerns about blue-green algae on the water. I hope this is being attended to before it becomes a problem.
343	Raise the Clarrie Hall Dam wall and widen the spillway. Any new developments need to be sustainable with their own water supply. This should include recycling grey water, harvesting rainwater and runoff and processing their own sewage and runoff.
347	My only concern is that a week ago the water tasted very bad and perhaps water testing may need to happen more often.
350	We're rural dwellers and are conscious about what any body puts in our water ways and are strongly opposed of any chemicals being used around rivers or any other waterways. The access of jet skis and speed boats between Condong and Murwillumbah should be limited or banned.
351	Increase the capacity of the Clarrie Hall dam.
353	No dam at Byrill Creek. Raise walls of current dam. Greater use of run off water and stormwater. More education for the public about conserving water.Compost toilets and grey water systems. The worst possible decision would be to allow CSG activities in the region.
354	I am not keen to use recycled water but happy to use a rainwater tank.
355	Under no circumstances is a dam to be built Byrril Creek. Raise level of existing dam and every new house have a rainwater tank.
356	I think people could be encouraged to have drinking water tanks on their properties. We should all be encouraged to use recycled water in our toilets. And not to destroy our precious habitats.
357	I think we all should have rainwater tanks - we are self sufficient with our water and are not connected to the town supply. A lot more education about water conservation and the cost of water supply.
359	I think the Tugun project should be reactivated to provide water for the Tweed Shire.

360	I think they should put another dam in so that they always have a backup in case something goes wrong with the other one.
362	It's something that they have spent to much time talking about water. I have lived on tank water and it did not satisfy my water needs. We should be making sure there is adequate water as we have more of a population. If we can double the capacity of the existing dam that would be sensible. We should not be continually allowing development to be taking place until they have water saving options and put in place during the construction of the development.
364	I think the council should consider the water desalination plant to be put to use in times of water shortage.
367	I think all new houses should have compulsory rain water tanks (plumbed into the toilet system). The rebates for water saving devices didn't work very well.
368	I can't drink any water out of the tap without it being filtered, it's over chlorinated.
370	I think we have to look after the local areas first and supply them with water.
372	My concern really is the too many people are opposing another dam, and it's got to happen regardless.
373	I think that the land has been purchased for the dam so therefore the Council should go ahead and build the dam. There are so many more housing developments going ahead at the moment thus the Council needs to plan for future water demand. Further to this the land developers should also fund future water development needs.
379	I think council needs to support self sufficiency in the provision of water tanks and grey water recycling so we don't impact on the environment any more than what we need to. More restoration of riverbanks and try and get it back to it's natural state, wider riparian zones needed.
380	The pollution from animals such as cattle running in rivers and water ways, this can be easily fixed by fencing off the streams and allocating water troths. Look at the average rainfall for this area, we have massive rainfall as we are in a very tropical area, this means we have a massive rain fall catchment. If Council subsidised water tanks for all homes we do not have to build another dam we can sustain our own water use by catching the water run off from our roofs into our water tanks.
383	I think more households should have tanks put in to save water.
384	I don't agree with a second dam at this point.
385	Households on rural properties should be allowed to put spears in.
386	I think there's too much waste water going into the river, it should be collected for re-use.
387	With the Tweed being in a high rain fall area and if would could capture this then we could keep it to a reasonable standard for all users maybe not drinking water. A council rebate with water tanks would be good which be less of a burden on the town water supply.
389	Concern they increase population and not the water resources, like building more dams.
391	I have some concerns about chemical spraying that we can smell near Condong and Scotts Island when we pass by. Is Council aware of or monitoring the chemicals being sprayed in this area?
392	People need to be educated how to be water wise.
393	I think that council should extend the walls of the existing dam.
394	Build another dam.
395	I think the council should think carefully about the extent of large new developments, they impact negatively on both water supply and the environment generally.

397	I think re-use and water storage and harvesting is the way to go. It is cost effective, and I think there is a lot of community support for it.
401	If they don't do something soon we'll be in real trouble. All this arguing over new dams we need action now.
403	I think the council should let residents use rainwater where possible - people in the country are already using rainwater where no town supply is available. Collecting rainwater would reduce run-off and waste and would be some assistance to the health of the river by reducing runoff. Everyone would naturally learn about water use and conserving supplies.
404	We need to do more about saving water, use less water and use recycled water rather than build another dam. How about rebates on rainwater tanks for all homes?
405	We have tanks and every year we pay Council a fee to send us a letter so we can get our plumbing checked. I realised this is important but because we put our own tanks in, I feel it is unfair that we should pay this fee. This I believe is discouraging people from putting tanks in and I think Council could do a lot more to encourage people to have tanks put in. Not only do we pay the fee, but we also then pay to have the plumber come out to check the plumbing, so it is annually quite an expense. It did discourage our neighbour from putting the tanks in, as she did a cost analysis and figured out it would be more costly to have them put in place than what she would save.
406	I think the Council do a fairly good job with the resources available to them.
407	I agree that the Byrill Creek Dam should go ahead.
408	Council should be focussing more on how to utilise wastewater better. Should be looking at Kings Forrest development. Where is the water coming from?
410	Rainwater tanks and grey water recycling could go a long way to self sufficiency.
412	The community needs to be confident the we have a secure long term supply of water. I support more storage capacity in the form of an extra dam or increasing the current storage.
413	If the Council could rebate everyone on water tanks that would save a lot of water.
415	I say that everyone around here has short memories as around 8-10 years ago we nearly ran out of water. All efforts must be made to ensure a sufficient water supply for the long term future e.g. another reservoir.
416	I think that it is a shame that the water has to be so heavily treated and that it should be looked after better.
417	Like Council to have a system that encourages people to supply their own water e.g. tanks or runoff catchments
419	I am concerned about the water quality, the water has a strong chlorine odour and smells like a pool.
422	I strongly support the theory that there should be a close relationship between population and the availability of water on occasions of maximum probable drought.
423	Would like to see another dam built.
424	Ultimately I think we do need another source of water but should consider the options for minimising usage and maximising storage.
427	I think that everyone should have rain water tanks.
430	Build a dam on the land bought years ago at Byrill Creek. Planted trees on the land for harvest.
431	Stop procrastinating and build another dam.
433	I think the State Government, local Councils and users need to come into the equation in the planning, maintenance and production of clean water.

434	I think there should be a proper pipeline from the dam to the current water supply, which would be a cleaner supply and less costly as the water supply from the dam as cleaner than from the river.
436	The river is silting up, and I would like to see it dredged to let the fish and wildlife come back into it. Once the silt is dredged, it could then could be sold as fill etc. Obviously this couldn't all take part at once, due to fish breeding etc, but I feel as a whole it would be greatly beneficial to the river and ecosystems within it. Also selling the silt that is dredged would help to offset the expense of the dredging process.
438	I think everybody should have tanks!
439	I think that the Council should make sure that we have adequate clean water supply at a reasonable cost.
440	Could do more to recycle but it is expensive.
443	I think Council should be taking sewerage water and treating it, once it is treated it is perfectly fine to drink.
444	Getting everyone involved and educated at a young age about the importance of water will be good.
445	I think the quality of our water at present is very good.
446	Town water there is a residue of white powder in glass bowl that is eroding away the glass bowl. Chemicals in drinking water is a concern with our health depression.
447	Subsidising water tanks for urban and rural people.
448	If Council didn't pay the General Manager so much for doing very little there would be more money to use for our resources. Why can't I have a water tank in my backyard and drink from it? Yet on rural properties the tank water is used for all purposes including drinking? What is wrong with this system? Why aren't there incentives for grey water systems to reduce water waste even further?
450	I think that if something was brought in such as recycled water I would happy to use it as long as it was 100 percent safe.
453	Living on the Tweed River and around us are some property owners that restrict animals access to the river and we see a much healthier riverbank. Perhaps council could encourage or offer incentives for riverbanks to be fenced to reduce erosion by farm animals.
455	The land for another dam has been purchased for over 25 years - it's there waiting so why doesn't Council build another dam as per original plans. We must do this given growth of population etc.
456	We must have this other dam. Our area is getting bigger and bigger.
457	Proposal for new dams is really bad. More effort put into recycled water. Be sincere with the community.
458	I think an additional dam would be okay as long as water can be released in flood conditions without creating floods.
459	Needs to be more education regarding the Byrill Creek dam to keep people informed.
462	I think we use a lot of water in toilet flushing. I think we need to explore other options further i.e. other countries use composting toilets and the like. I think we just have to research further how to use our water more wisely and educate people about it. We need to studies, do surveys find out more accurate information!
463	See more tanks on houses, more people to take responsibility which is less rates for everyone.

464	I'd like to see a little more care with the boating on rivers washing away banks. I don't think skiing should be allowed in some places. I'd like to see more education and policing of the waterways and illegal rubbish disposal.
465	Too much development makes too much demand on our water, and the developers walk away. The development at Kings Forest near Kings Cliff is to big and next to the last ban of koalas and dogs kill moving objects/koalas, Council have done their best to curb this development but I think the koalas will loose out.
466	The water always tastes beautiful.
467	I would like to see the streets cleaner from debris from over hanging trees in flood prone areas to prevent flooding.
469	I would like to see a ban on water skiing activities on the river because the cost of rehabilitating the river bank is very high. It would be better to preserve and look after the natural environment of the river and waterways.
471	With the area growing so quickly we have a very small catchment area and we need a decent permanent water supply source. We need another dam at Byrril Creek or stop the influx of new people into the region.
473	Not wasting and store as much water as possible and more rebates. Continuing rebates.
474	It would be good if they dredged the river so it could flow. Also the swamp in "Knox Park" as it is just a breeding ground for mozzies and cane toads. This flows into the river and I believe it must be contributing to the pollution of our waterways.
475	Council should encourage more people put in water tanks.
477	Natural habitats are a great amenity but people need to drink. Occasionally reality has to intrude.
478	Another dam is essential given the growth of the population in the region.
479	It worries me as water is becoming more and more scarce. We really have to be careful with our water and plan wisely for the future.
480	Raise the dam levels at Tweed dams.
481	should build another dam or raise the height of the Clarrie Hall Dam. There should be an agreement between Tweed and Qld in terms of sharing water.
482	I would like to see council make a decision about future water source before the Shire is in dire situation with water availability.
484	Erosion at Kirra Beach.
485	I think the council needs to take more care with controlling pollution that enters the Tweed river, primarily from recreational users.
486	I think that we will need to create more water storage for our region somewhere in the future, therefore Council should give serious consideration to construction of another source of water holding.
487	There should be rain water tanks in every home. How about rebates for that?
491	I do not agree with the need of another dam.
492	I think they should provide assistance for people with new houses to put water tanks and for other people in the area who also do not have one.
494	I think treated or recycled water should be less than the cost of drinking water.
495	More use of recycled water.
496	I believe we should re-use water as much as possible as there are and more water tanks.

499	I think if they don't do something they will eventually run out of water such as building a dam. They need to provide more rebates for people to put in water tanks. I think that residents in older style duplexes should have separate water metres read and built by the council as it is unfair that they pay half for water regardless of how much they use.
502	Tweed Shire Council does not need to build a dam. Council needs to look at curtailing over development of the region so as to maintain a safe future water supply.
504	Build that dam where they brought all the land. It doesn't matter how much water we're saving. We are populating more and building more developments which means more water usage.
505	I think there is enough science there to show that our water is dependent on the current weather patterns.
506	People to be encouraged to put water tanks in.
507	I believe that we should have more water tanks, every house should have one.
508	Should build another dam because of population growth.
511	I would like to see the river water quality improved, especially up river. I would also like to see a better system to ensure farming chemicals do not enter the waterways.
512	I wish council would come and clean our gutters out.
513	All new houses should have the ability to recycle and have tanks and there should be some sort of option for older housing.
517	Council should be doing something now about securing more water storage.
518	I think we waste too much water. I don't believe that another dam is the solution. I think that education of water use is important. Having said that, big housing developments mean that the current water supply would be insufficient, therefore securing water is an important issue. I would like to see Council concentrate on improvements and better use of the current water storage systems.
519	I think they should build another dam.
521	I believe a new dam needs to be built.
522	I live out of town and I think we need a new dam.
525	I witnessed stormwater overflowing after a storm. Should be someway to catch it. New houses and buildings should have water tanks.
527	Why have we got enormous water price/rate increases over the past 10 years? The increase doesn't fit the CPI so Council please answer?
528	They need to keep their infrastructure in planning for more population, and for new DA's there should be a compulsory water tanks or water recycling.
529	More developments means you need to build another dam.
531	If everyone had a rainwater tank, there'd be less drain on dam water reserves.
533	There is not a standard application for everyone. I feel some developers are getting special treatment.
536	Not so many personal boats on the river.
537	I think that responsibility for the care of rivers should be State Government's. Bores should have been included in this survey.
540	I think the Federal Government should pay for the care of rivers in urban areas.
545	I don't feel it's practical for everyone to have 10,000 Litre tanks. Go ahead with dam.
546	Stop taking commands from Qld (07) telephone areas? Residents over run by Council that is being pressure by Qld and Gold Coast region. Salt development is a disgrace.

547	A third tier in the water use should be introduced as a higher rate and ther lower tier rate should be cheaper to encourage good behaviour. The Clarrie Hall dam is not a particularly good idea, we need other alternatives and it shouldn't be raised at this stage.
548	The reuse of water is a good idea for outdoor use it should be mandatory for all new homes built.
550	I would like to see them put in a bigger dam so we have more water.
552	I feel because of the housing developments and increased population growth the Tweed region has an increased demand for water. The current water storage is inadequate to sustain future projected populations for our region. Therefore building another dam would ensure that the region has safe water stored in the future.
553	They should raise the Clarrie Hall dam wall.
555	Council needs to ensure that infrastructure is in place for future expansion of the area rather than use a bandaid solution to deal with increased population needs.
556	I would like to see Council offer better incentives or rebates to harvest their own stormwater.
564	Self composting toilets, looking at tanks. The householder should take some responsibility to save water and not rely on the Council all the time.
567	Unsure why Federal or State Government should pay contribution for maintaining rivers and catchment areas.
570	Raise the height of the dam wall. Should be able to drink the water from the tap which I can't do that at the moment.
571	We do need another dam to make sure we have got enough water.
573	I think they should encourage more people to put water tanks in by giving Council rebates.
574	Agree to build another dam because of increased population.
575	Because of the rapid growth of the Tweed shire, we support a new dam at Byrill Creek. Also other shires do use treated water for outdoor use quite successfully so I feel that it is appropriate that we do too.
576	More rainwater tanks.
577	All new development like Kings Forrest or any other development should have to have water harvesting in place and reticulation.
579	It's important to maintain irreplaceable top tourists sites in the future and should think about the environment and tourists attractions.
580	I am against building the Byrill Creek dam and in favour of raising the wall on the Clarrie Hall dam.
583	When we have heavy rain, the over flow from this should go into reserve tanks to be treated and re-used.
587	Building another dam is not a good idea as the land is too precious to be dammed up. Future problems with increased population so future developments should have water saving devices.
589	The dam at Byrill Creek should go ahead.
590	I think they should put a dam in then all the water problems will be solved.
591	Availability of use of water tanks in rural and urban areas.
592	I would like waste water and recycled water to be up and running and another dam built.
593	I think that if more people had water tanks there'd be less drain on the dam. How about subsidies for water tanks.

594	I would like to see Council provide a water recycling faculty for every household.
596	I would like to see the dam at Byrill Creek built for future water use.
599	We do get a lot of rain here in this area for as long as I have been here there has never been an issue with water. In my opinion I don't feel there has been any shortage, we always have plenty of water.
600	Are Council looking into extending Clarrie Hall dam?
601	To take shower water and reuse it for toilet flushing and garden use should be seriously considered or implemented. A considerable amount of water would be saved verses rain water which is still precious.
603	My fear is of coal seam gas will leak into produced water and it will come onto our valley.
606	Another dam would be good as we need.
607	I can't see why retreated water and more run-off water can't be used rather than the outright waste we now have.
609	Everyone should have tanks.
613	I'd like to see all houses with water tanks.

An online and paper survey of Tweed Shire residents regarding the 2013 integrated water cycle management (IWCM) strategy

An online and paper survey of 441 Tweed Shire adult residents conducted by Jetty Research for Hydrosphere Consulting, on behalf of Tweed Shire Council

FINAL REPORT dated February 5th 2013

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Table of Contents

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Executive summary

A paper and online survey of Tweed Shire residents was commissioned in late 2012 by Tweed Shire Council (TSC), as part of a broader deliberation process surrounding the shire's integrated water cycle management (IWCM) six-year plan.

The online and paper surveys were run in parallel with a random telephone survey of 616 Tweed Shire adult residents (see separate report). Both surveys were designed to seek community feedback on issues raised in the "Six Year Integrated Water Cycle Management Strategy review" background paper, prepared by Hydrosphere Consulting and dated November 2012. (See Appendix 1 for copy of final paper/online questionnaire.)

The paper and online surveys were available for completion between November 12th and December 12th 2012. Over that time, 441 valid surveys were received (335 online and 106 paper).

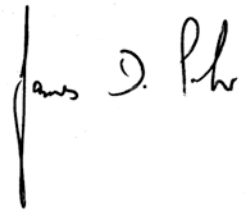
Note that due to the self-selecting nature of the online and paper sample, the results of this survey cannot necessarily be used to make reliable inferences about the overall population of the Tweed shire. The results, while a useful snapshot of community opinion, can (strictly speaking) only be used to reflect the views of those who chose to participate in the survey.

Among the online and paper survey's major conclusions:

1. 32 per cent of respondents were concerned "a lot" about the Tweed Shire's ability to meet its water needs in the medium- to long-term, while a further 48 per cent were concerned "a little". Less than half of online/paper respondents (i.e. 43 per cent) agreed that the Tweed community as a whole had made serious efforts over the past three years to reduce daily water use.
2. Half the respondents believed they used less water than the average Tweed Valley household, while just 9 per cent felt they used more. (The balance believed they were about on average.) One in four were able to correctly nominate the 180 litre per person per day target for average daily water use.
3. On the question of whether Council should focus its activities more on reducing water usage or increasing availability, there was a definite bias towards reducing usage with a mean score of 4.09 (on a 0-10 scale, with midpoint of 5).
4. When asked to nominate which of six water supply factors were most important to them personally, respondents focused firstly on ensuring a continuous supply of drinking water. This was followed by maintaining the natural environment in the river and catchment areas, and maximizing stormwater and wastewater re-use. Encouraging commercial properties and industries to reduce consumption, and protecting waterways for recreational use were deemed of (relatively) less importance.
5. Residents were strongly of the view that river water needed to be clean and of high quality, even if it could be treated prior to reaching their taps. Some 73 per cent felt this was "very important", with a further 23 per cent deeming it "quite important".
6. Regarding the importance or otherwise of conserving water when dams were full, respondents came down in support of saving water even in times of plenty. The mean score of 6.83 (again on a 0-10 scale, with zero signifying "use as much water as we like when dams are full" and ten being "save as much water as possible at all times") was well on the conservation side of the midpoint (i.e. 5).

7. Two-thirds of respondents agreed that it was appropriate to introduce water restrictions when dam levels fell to 75 per cent, with 23 per cent believing they should be introduced sooner.
8. Among five possible Council priorities for funding, protecting the natural habitat and water quality was the most popular choice (nominated by 46 per cent of respondents), followed by protecting the drinking water supply (33 per cent) and improving the quality of treated water/urban stormwater runoff (17 per cent). Conversely, only 3 per cent classed protecting water quality for swimming, boating and fishing as their major funding priority for council.
9. Regarding which of four prompted water-saving initiatives respondents would prefer to see Council allocate resources towards, the most popular option (selected by 45 per cent of those surveyed) was greater use of recycled water.
10. There was widespread support for three prompted alternative water sources. Eighty nine per cent each supported using (a) rainwater from residential tanks and (b) harvested stormwater for toilet, laundry and outdoor taps. Sixty one per cent agreed with using treated wastewater or sewage for these purposes.
11. Asked whether recycled water supplied to their house should cost more or less than, or the same as the current supply price of $2.05 per kilolitre, 44 per cent believed it should cost less. A further 37 per cent felt it should cost the same, while only 7 per cent believed it should cost more.
12. Half of those surveyed believed that farmers and council should share the burden of maintaining the health of rivers and other waterways within rural/agricultural areas of the Tweed shire, while a further 37 per cent felt Council (i.e. ratepayers) should pay solely for this.
13. Conversely, only 41 per cent agreed that property owners and council should jointly pay for maintaining the health of rivers and other waterways within urban areas, while 46 per cent felt Council/ratepayers should be responsible for this.
14. Just over three-quarters of respondents (i.e. 77 per cent) agreed that the current two-tiered system of residential water pricing is fair, while just 16 per cent believed all households should pay the same rate per kilolitre regardless of usage.

While the above summarises the results of the online and paper survey, it's important to note that this report also compares findings against the parallel random telephone survey of 616 Tweed shire residents aged 18-plus conducted in November 2012.



James Parker, **B. Ec, Grad Cert Applied Science (Statistics), AMSRS**
Managing Director
February 5th 2013

Introduction

Background

The 2012 Tweed Shire Council Integrated Water Cycle Management (IWCM) mixed-method online and paper survey, commissioned by managing consultants Hydrosphere Consulting, was designed to provide community input into a review of the shire's IWCM six-year plan.

Council's IWCM strategy (originally adopted in 2006, and then updated in 2009 and 2011) has guided its management of the urban water supply, sewerage and stormwater systems for the past six years. Council is now conducting a major six-year review of the IWCM to ensure its long-term direction remains appropriate. This online and paper survey, run in parallel with a representative telephone poll (see separate report), was designed to allow all those wishing to have a say on water cycle management the opportunity to do so.

Methodology

Survey content was based largely around the "Six Year Integrated Water Cycle Management Strategy Review" background paper, written by Hydrosphere Consulting in collaboration with Tweed Shire Council (TSC) and dated November 2012. Survey content was constructed by Jetty Research and Hydrosphere Consulting, and followed closely that of the parallel telephone survey (with only minor differences designed to accommodate the different survey methodologies). See Appendix 1 for the paper version of this survey.[1]

Two thousand copies of the (A4, double-sided) paper questionnaire were printed. The paper survey incorporated a reply paid envelope and two-sided adhesive tape for easy return. The online survey was loaded into the QuestionPro survey format.

The survey went "live" on Monday, November 12th 2012. Those completing a survey were eligible to win one of two iPads, or the equivalent value ($500) in shopping gift cards. Fifty A3 posters promoting the survey were produced by Jetty Research, along with 2000 double-sided business card-sized promoters. (See Appendix 2for examples of both).

The survey was publicised via the following means:

- Survey web link to the online version of the survey on the http://www.tweed.nsw.gov.au/Water and http://www.tweed.nsw.gov.au/Water/IWCM.aspx web pages
- Information packages – including covering letter, paper surveys, business posters and business cards – sent to identified contacts at ten Tweed Shire high schools, plus TAFE (Kingscliff and Murwillumbah campuses), Southern Cross University, and Tweed Heads PCYC. This included follow-up phone calls and emails.
- Distribution (via TSC's youth development officer Sylvia Roylance) of a promotional email and web survey link to approx. 70 local youth groups and service providers;
- Distribution of business card promoters and paper surveys at the Tweed River Festival (November 17 and 18th, 2012).

[1] Online questions were, for all intention purposes, identical

Tweed Shire Council and Hydrosphere Consulting also publicized the survey through other means as part of the broader IWCM review project.

The survey was open for one calendar month. As at the completion deadline of Wednesday December 12th 2012, 441 unique and valid surveys had been received (broken down as 335 online and 106 paper).

Breakdown of the survey sample by age, location and gender was as follows[2]:

Table i: Online/paper sample, by age, location and gender

Age * Region * Gender Crosstabulation

Count

Gender			Region				Total
			Tweed Coast north of river	Tweed Coast south of river	Hinterland	Other	
Male	Age	Under 18	22	29	4	6	61
		18-39	9	13	7	5	34
		40-59	10	16	13	3	42
		60-plus	19	19	15	0	53
	Total		60	77	39	14	190
Female	Age	Under 18	21	25	2	6	54
		18-39	16	19	8	2	45
		40-59	27	36	32	1	96
		60-plus	21	18	12	1	52
	Total		85	98	54	10	247

(See "Demographics" section of report for further analysis of survey sample.)

Throughout this report, results of the online and paper surveys have been compared against the telephone survey wherever appropriate. However the online/paper and telephone samples have not been merged, as the telephone survey was random while the paper and online surveys were not. (See "sampling error", below, for further details.)

Due to the nature of the survey, not all respondents answered all questions. The number answering each question is marked as "n = XXX" in the graph accompanying the relevant data. Care needs to be taken in extrapolating results from smaller sample sizes.

Where differences between telephone and paper/online results, or among different groupings of online/paper respondents (e.g. by age or gender) in this report are classed as "significant", this implies they are statistically significant based on independent sample t-scores or other analysis of variation (or ANOVA) calculations. In statistical terms, significant differences are unlikely to have been caused by chance alone. In tables, statistically significant differences are typically shaded blue (significantly above mean) and pink (significantly below mean).

Given the self-selecting nature of the online/paper sample (see "Sampling Error", below), results have not been post-weighted to reflect the demographic breakdown of the Tweed Shire adult population by age and gender.

[2] Note that four respondents chose not to supply one or more of these demographic characteristics, hence the total in Table i does not align exactly with the total sample size of 441

Sampling error

Were random sampling error to be applied to a sample of 441 residents (out of an estimated survey population of approximately 33,657 households in the Tweed Shire)[3] the random sampling error would be +/- 4.6 per cent at the 95 per cent confidence level. (This effectively means that if the survey was repeated 20 times, results should be representative of the overall survey population to within +/-4.6 per cent in 19 of those 20 surveys.)

However the online and paper methodology used for this survey, being self-selecting (i.e. "opt-in") in nature[4], is not strictly considered random. In a self-selecting sample it is difficult to assess the presence of bias i.e. whether the opinions or characteristics of the participants deviate from those of the target population. Participants may differ from the rest of the target population: for example, those who take part may have a strong opinion about the subject matter.

Hence the results of this survey cannot necessarily be used to make reliable inferences about the overall population of the Tweed shire. The results, while a useful snapshot of community opinion, can (strictly speaking) only be used to reflect the views of those who chose to participate in the survey.

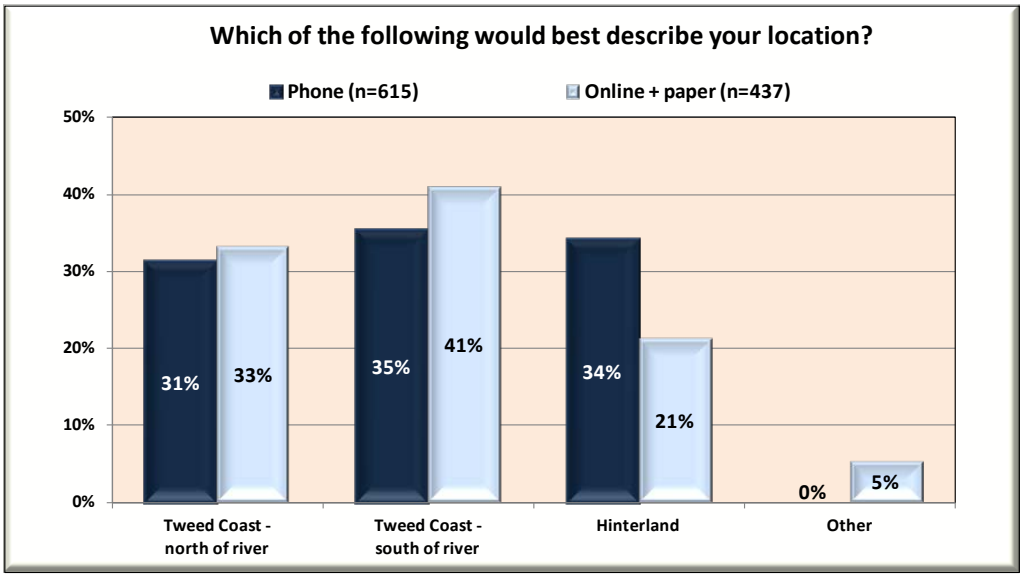
In most instances, results have been compared against the parallel random telephone survey. (Random sampling error for that survey was approx. +/- 3.9 per cent, again at the 95 per cent confidence level.)

[3] Based on ABS Census data, 2011

[4] While all residents aware of the survey had the opportunity to complete it, results are reliant on those who chose to do so rather than those who had been randomly selected to participate. Those who chose to take part may or may not be representative of the Tweed Shire community as a whole.

Part 1: Demographics

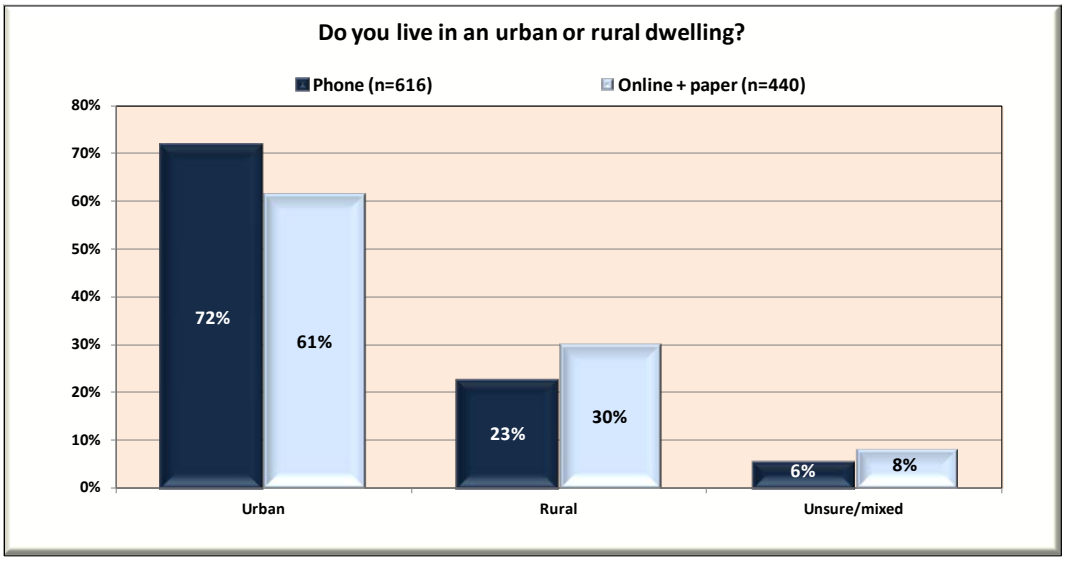
Graph 1.1: Which of the following would best describe your location within the Tweed Shire? (Prompted)



While the telephone survey aimed for a roughly equal split between residents living on the Tweed Coast north and south of the river, and in the Tweed Valley hinterland, the online/paper sample was skewed towards Tweed Coast/south of river (41 per cent) and away from hinterland residents (21 per cent). That said, there is still a broad spread across the three regions.

Five per cent of online/paper respondents lived outside the Tweed shire. However their views have been included given an assumed involvement in the shire as employers/employees, landholders, volunteers etc.

Graph 1.2: Do you live in an urban or rural environment?



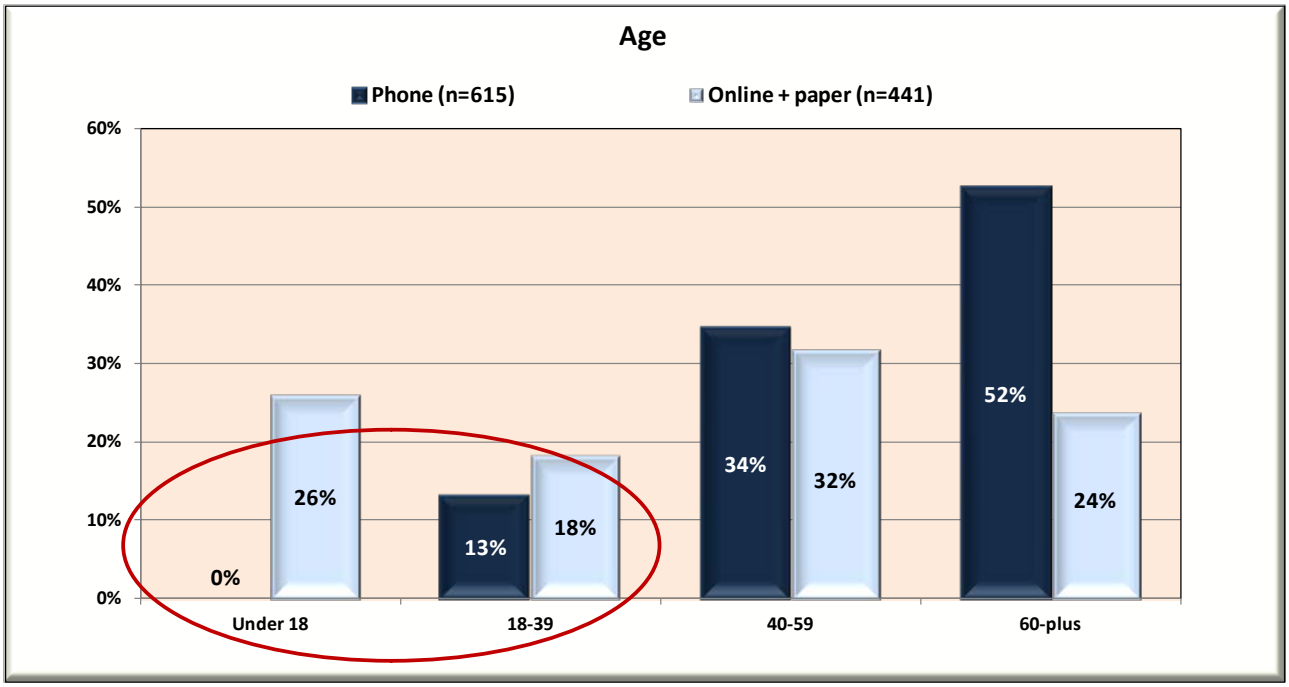
As shown in Graph 1.2, the online/paper survey enjoyed a good spread between urban (61 per cent) and rural (30 per cent) residents.

Table 1.2.1: Setting by location (Online/paper only)

		Which of the following would best describe your location?				
		Tweed Coast - north of river	Tweed Coast - south of river	Hinterland	Other	Total
Urban/rural setting	Urban	109	116	30	13	268
		75.2%	66.3%	32.3%	54.2%	61.3%
	Rural	22	45	57	8	132
		15.2%	25.7%	61.3%	33.3%	30.2%
	Unsure/mixed	14	14	6	3	37
		9.7%	8.0%	6.5%	12.5%	8.5%
Total		145	175	93	24	437
		100.0%	100.0%	100.0%	100.0%	100.0%

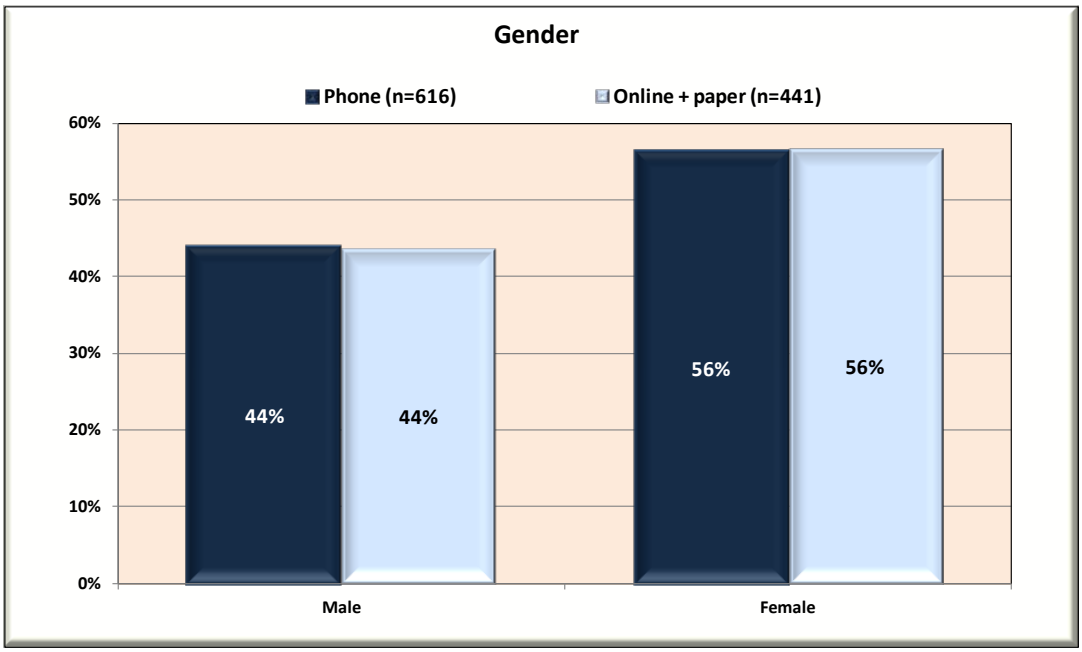
As one would expect, residents in the Tweed hinterland were proportionately more likely to live rurally than those living on the Tweed Coast.

Graph 1.3: Age



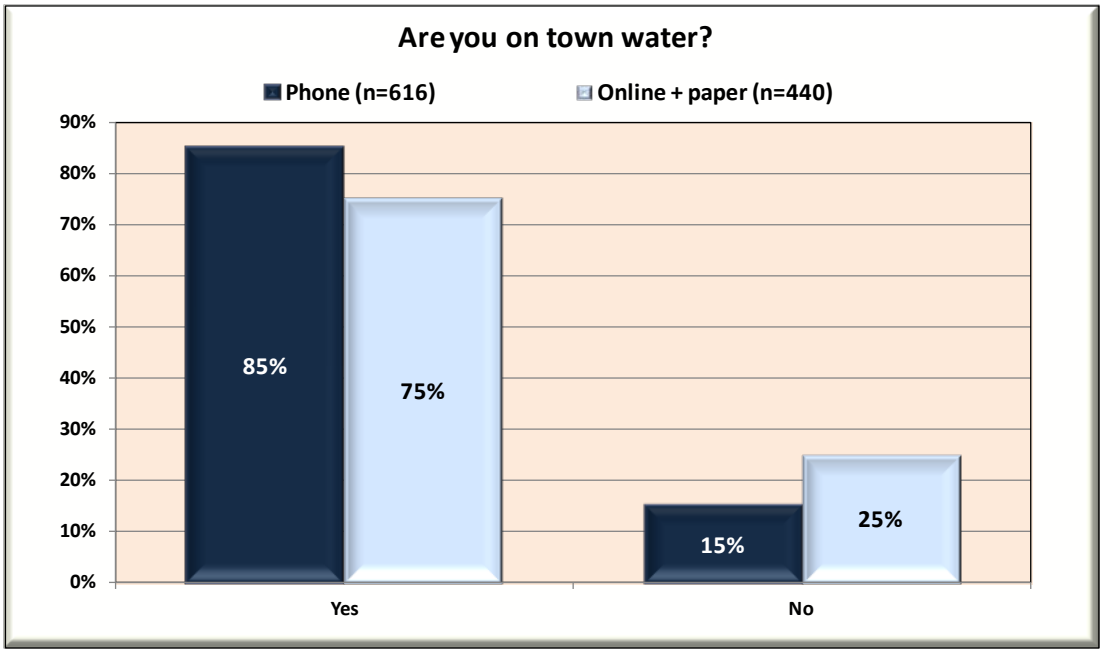
While the phone survey excluded residents aged less than 18 and was hence skewed towards older residents, the online survey provided a relatively even spread of ages. In particular, a promotional push through Tweed Valley high schools (see Introduction) pleasingly resulted in 115 completed surveys from the under-18's.

Graph 1.4: Gender



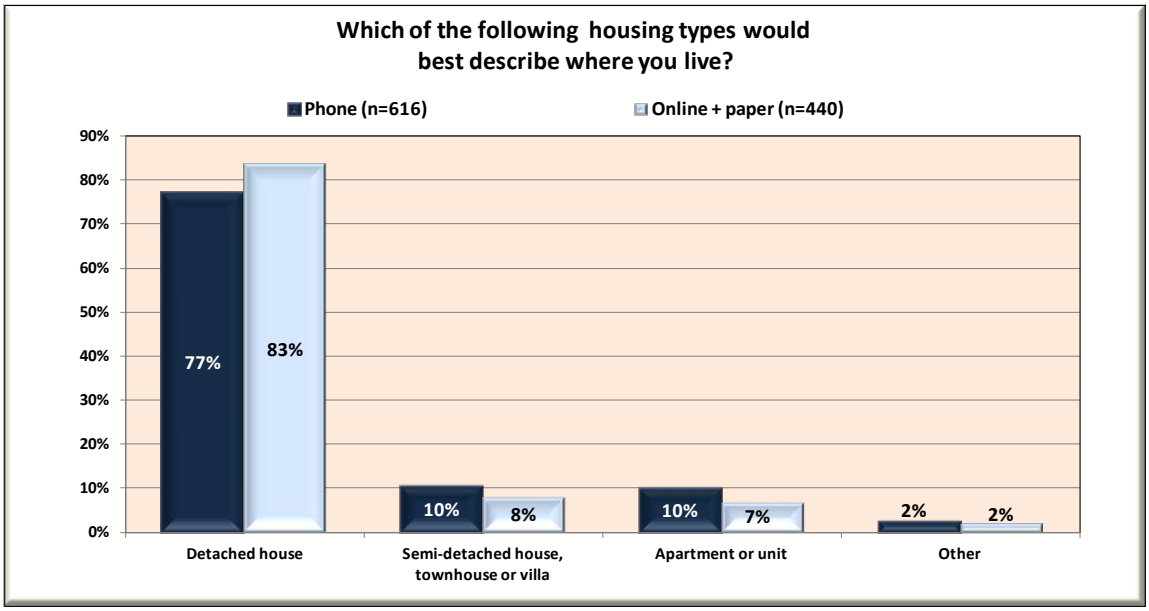
Gender split was almost identical between telephone and paper/online surveys.

Graph 1.5: Are you on town water?



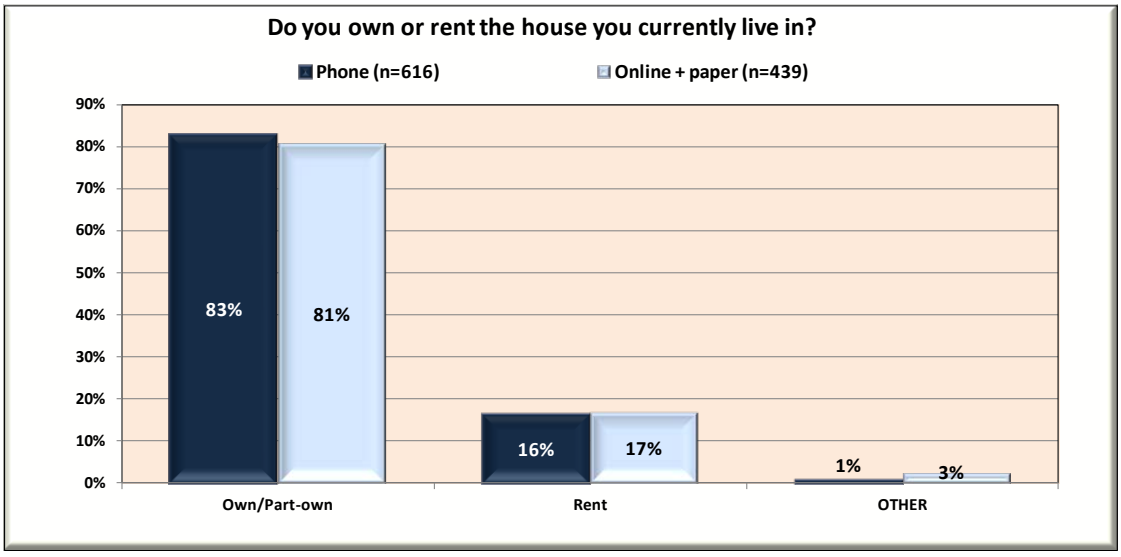
Online respondents were less likely to be on town water than those surveyed by phone, again suggesting a higher proportion of rural residents in this instance.

Graph 1.6: Which of the following housing types best describe where you live?



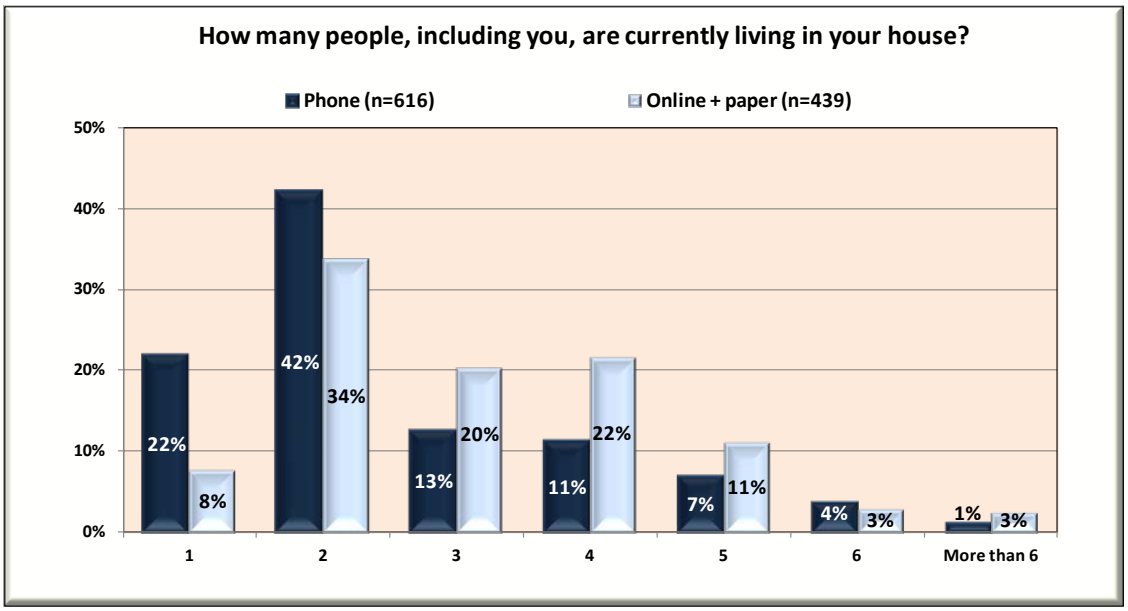
Housing type was relatively consistent between the two surveys. Among online/paper respondents, rural respondents were more likely than their urban counterparts to live in a detached house (at 90 and 80 per cent respectively).

Graph 1.7: Do you own or rent the house you live in?



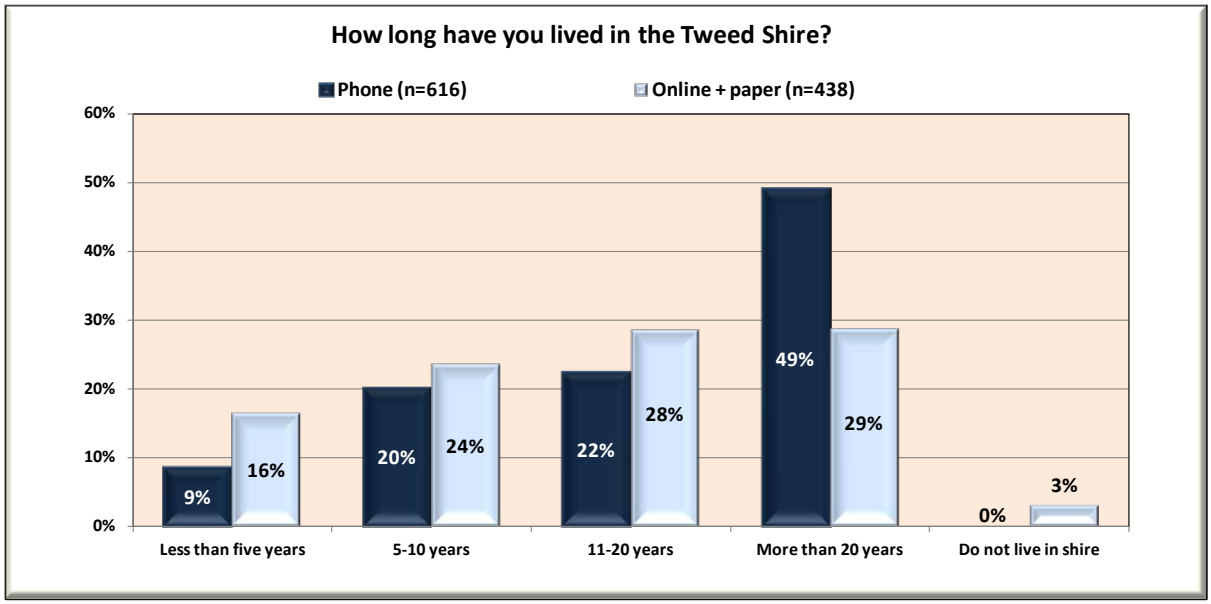
There were no significant differences in home ownership between the telephone and online/paper surveys.

Graph 1.8: How many people, including yourself, live in your house?



Online respondents were more likely than those surveyed by phone to live in households with three or more people. This is consistent with the younger age profile for online/paper survey participants.

Graph 1.9: How long have you lived in the Tweed shire?

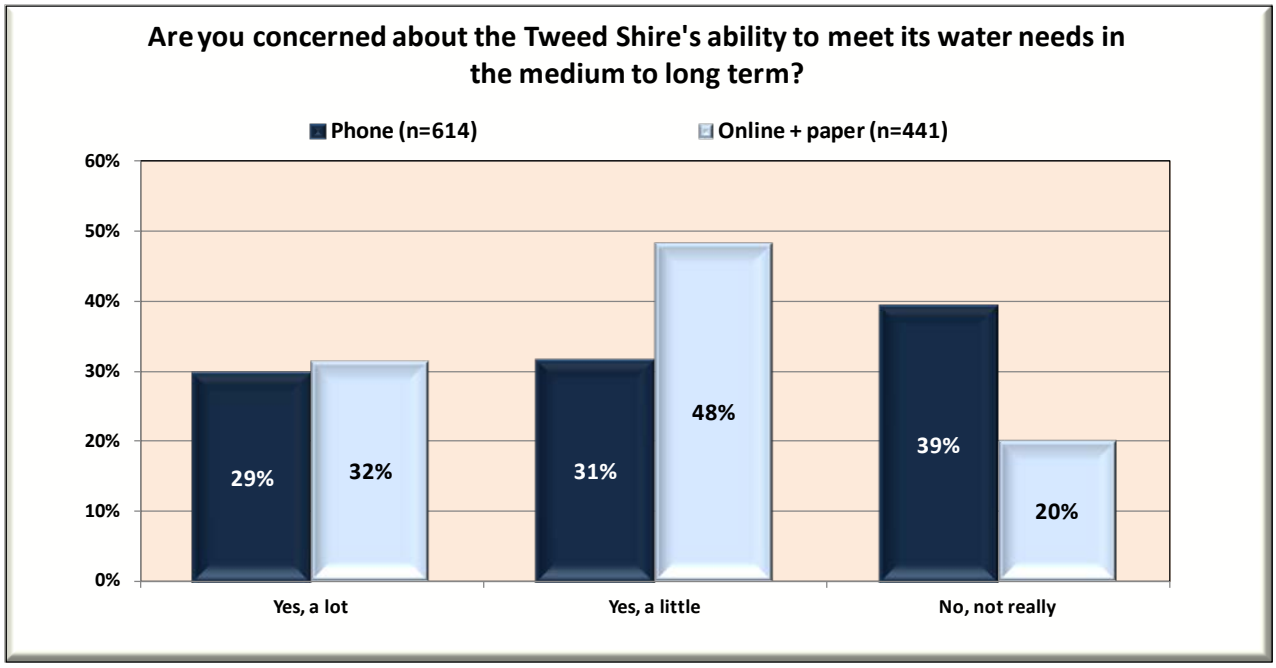


Likewise, the shorter length of residence among online/paper respondents reflects the younger age profile of this sample.

Part 2: Introductory attitudes and knowledge

The survey commenced with a series of introductory questions designed to gain a better understanding of respondents' knowledge of, and attitudes regarding a number of water cycle issues:

Graph 2.1: Are you concerned about the Tweed Shire's ability to meet its water needs in the medium to long term? (Prompted)



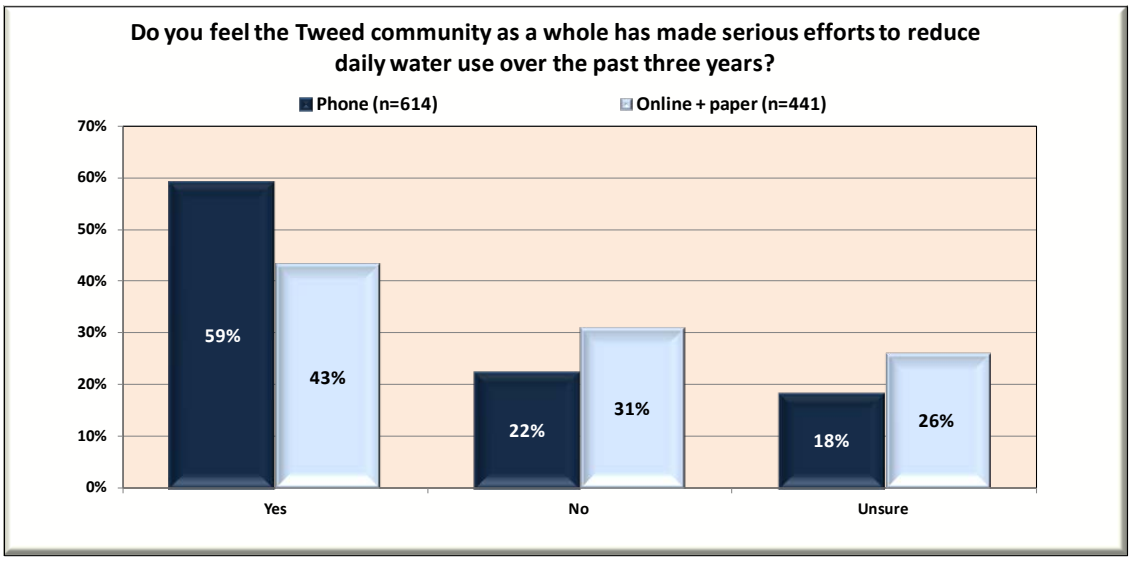
While the number of respondents concerned "a lot" was largely unchanged between telephone and online/paper surveys, the proportion of those concerned "a little" was significantly higher in the latter poll.

Table 2.1.1: Concern by age (Online/paper only)

		Age				Total
		Under 18	18-39	40-59	60+	
How concerned are you with the shire's ability to meet water needs?	Yes, a lot	24	15	51	49	139
		20.9%	18.5%	36.4%	46.7%	31.5%
	Yes, a little	68	41	65	39	213
		59.1%	50.6%	46.4%	37.1%	48.3%
	No, not really	23	25	24	17	89
		20.0%	30.9%	17.1%	16.2%	20.2%
Total		115	81	140	105	441
		100.0%	100.0%	100.0%	100.0%	100.0%

As shown in Table 2.1.1, among online and paper respondents concern the proportion of those concerned "a lot" rose significantly with age.

Graph 2.2: Do you feel the Tweed community as a whole has made serious efforts to reduce daily water use over the past three years?



As shown in Graph 2.2, online/paper respondents were less convinced than their telephone-polled counterparts that Tweed Valley residents had made serious efforts to reduce water consumption over the past three years.

Table 2.2.1 Effort by age (Online/paper only)

		Age				Total
		Under 18	18-39	40-59	60-75	
Feel Tweed community made serious efforts to reduce water use over past 3 years?	Yes	28	43	67	52	190
		24.3%	53.1%	47.9%	49.5%	43.1%
	No	37	22	44	33	136
		32.2%	27.2%	31.4%	31.4%	30.8%
	Unsure	50	16	29	20	115
		43.5%	19.8%	20.7%	19.0%	26.1%
Total		115	81	140	105	441
		100.0%	100.0%	100.0%	100.0%	100.0%

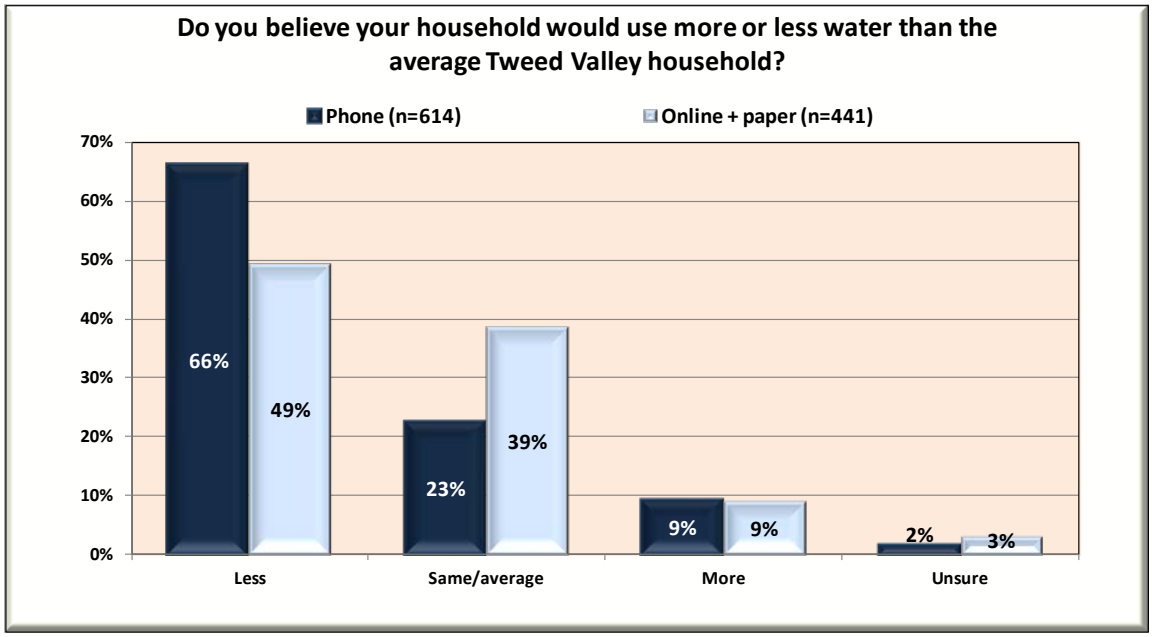
Interestingly, those aged under 18 were significantly less likely than all other age groups to agree that residents had made serious efforts to reduce water use.

Table 2.2.2: Effort by setting (Online/paper only)

		Urban/rural setting			Total
		Urban	Rural	Unsure/ mixed	
Feel Tweed community made serious efforts to reduce water use over past 3 years?	Yes	132	46	12	190
		48.9%	34.6%	32.4%	43.2%
	No	70	53	12	135
		25.9%	39.8%	32.4%	30.7%
	Unsure	68	34	13	115
		25.2%	25.6%	35.1%	26.1%
Total		270	133	37	440
		100.0%	100.0%	100.0%	100.0%

Likewise, as shown in Table 2.2.2, urban residents were more confident in the shire's water-saving efforts than those living in rural areas.

Graph 2.3: Do you believe your household would use more or less water than the average Tweed Valley household? (Prompted)



Online/paper respondents were perhaps more "realistic" in their interpretation of how much water they used, with only 49 per cent claiming they used less than the average Tweed Valley household (against 66 per cent of those surveyed by phone). However the proportion believing they used more than average was the same in both polls, at just 9 per cent.

Table 2.3.1: Perceived usage by location (Online/paper only)

		Which of the following would best describe your location?				Total
		Tweed Coast - north of river	Tweed Coast - south of river	Hinterland	Other	
Believe your household uses more or less water than average?	More	17	17	4	2	40
		11.7%	9.7%	4.3%	8.3%	9.2%
	Less	63	80	69	3	215
		43.4%	45.7%	74.2%	12.5%	49.2%
	Same/average	63	73	18	14	168
		43.4%	41.7%	19.4%	58.3%	38.4%
	Unsure	2	5	2	5	14
		1.4%	2.9%	2.2%	20.8%	3.2%
Total		145	175	93	24	437
		100.0%	100.0%	100.0%	100.0%	100.0%

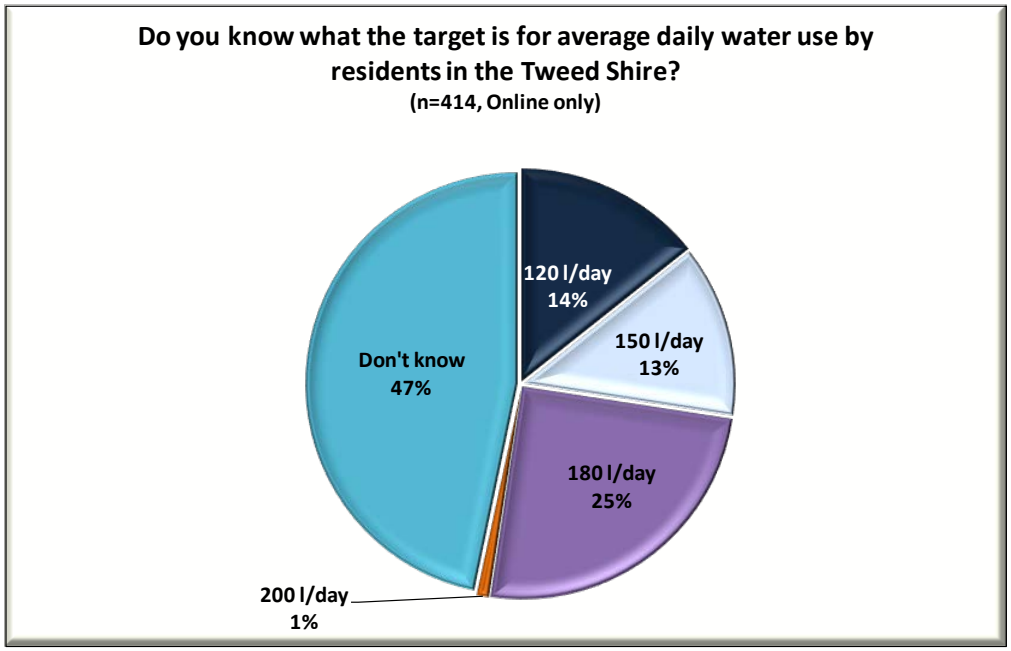
Among online/paper respondents, some 74 per cent of those living in the hinterland believed they used less water than the average household, against less than 50 per cent of those living on the Tweed Coast. (Conversely, 40-plus per cent of coastal residents felt they used the same as the average household, against just 19 per cent of those from the hinterland.)

Table 2.3.4: Perceived usage by household volume (Online/paper only)

		Less than 3/More than 3		Total
		Less than 3 people living in the house	3 or more people living in the house	
Believe your household uses more or less water than average?	More	7	33	40
		3.8%	12.8%	9.1%
	Less	128	88	216
		70.3%	34.2%	49.2%
	Same/average	46	123	169
		25.3%	47.9%	38.5%
	Unsure	1	13	14
		.5%	5.1%	3.2%
Total		182	257	439
		100.0%	100.0%	100.0%

While it is unsurpising that households with three or more residents were significantly more likely to believe they used a greater amount of water than the "average" household, it is interesting that 34 per cent of those in larger households still believed they used less.

Graph 2.4: Do you know what the target is for average daily water use by residents in the Tweed Shire? (Online only - prompted)



The results for this question cannot be compared against the phone sample, due to the different methodologies employed.[5] In the paper/online version, 25 per cent of respondents correctly nominated the correct answer of 180 litres/person/day against four other options. Around half the sample were happy to admit they didn't know, i.e. rather than guessing at one of the prompted options.

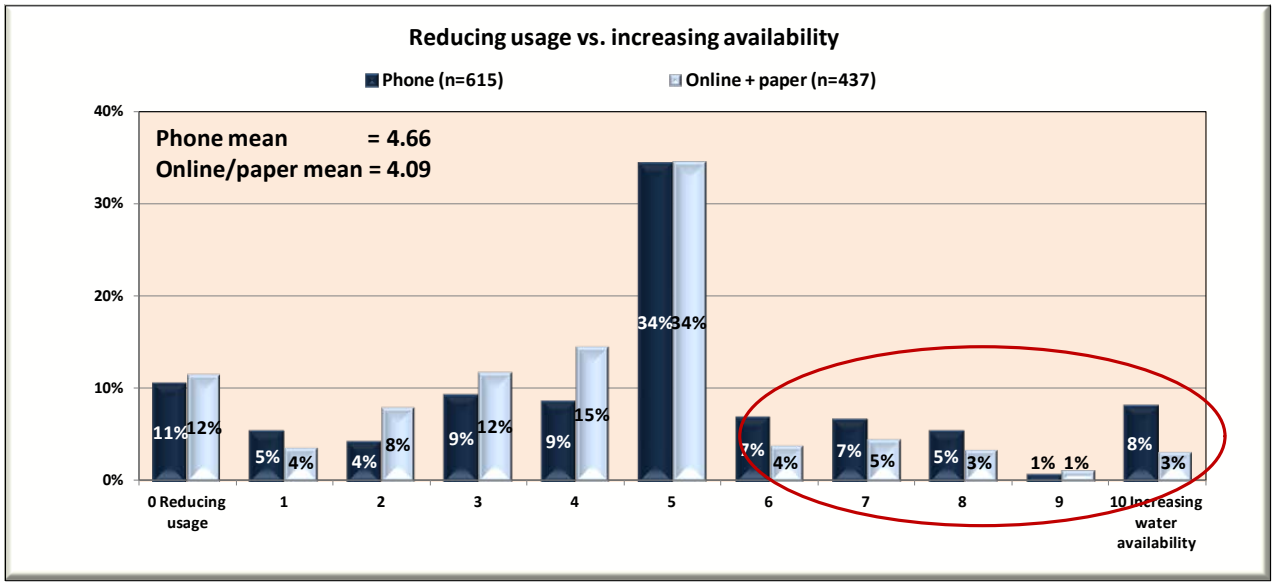
[5] In the case of the telephone survey, this was an unprompted question asking respondents if they knew the current daily target for water consumption. (Just 11 per cent correctly provided the 180 litres/person/day response.) Online and paper respondents were asked if they knew the correct daily target, and given a list of options, including "don't know".

Part 3: Beliefs surrounding water usage and availability issues

Like its telephone survey equivalent, the paper and online surveys included a number of questions designed to test community beliefs surrounding water usage and availability.

The first of these asked "Some people believe that ensuring a long-term water supply is mainly about reducing people's water usage, while others think it's more about increasing water availability. Where would you sit on a sliding scale of 0-10, where 0 means it should all be about reducing usage, and 10 means it should all be about increasing water availability?"

Graph 3.1: Where would you sit on a sliding scale of 0-10, where 0 means (focus) should be all about reducing water usage, and 10 means it should be all about increasing water availability?

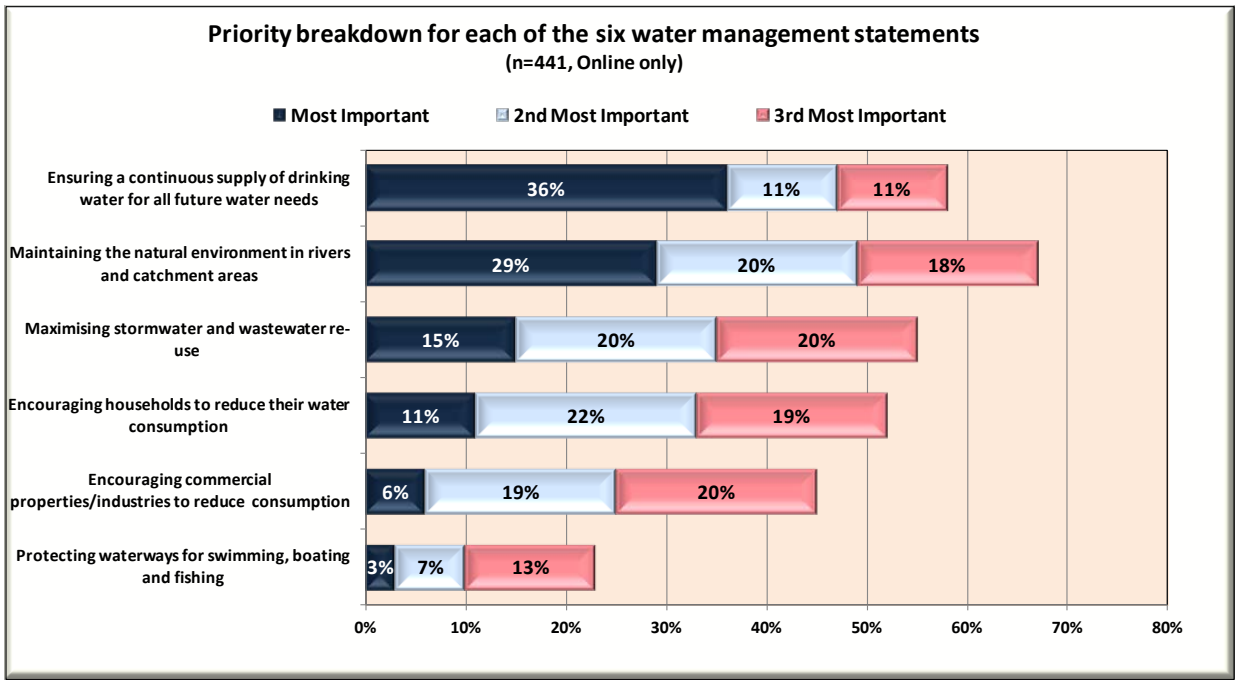


The online/paper respondents were significantly more likely than those interviewed by phone to believe the focus should be more on reducing water usage than increasing availability. This is indicated by the lower number of respondents to the right of the midpoint (see red circle), and hence a lower mean score of 4.09 – against 4.66 for those polled by phone. (However it needs to be acknowledged that both sets of respondents came in on the "reduce usage" side of the continuum.)

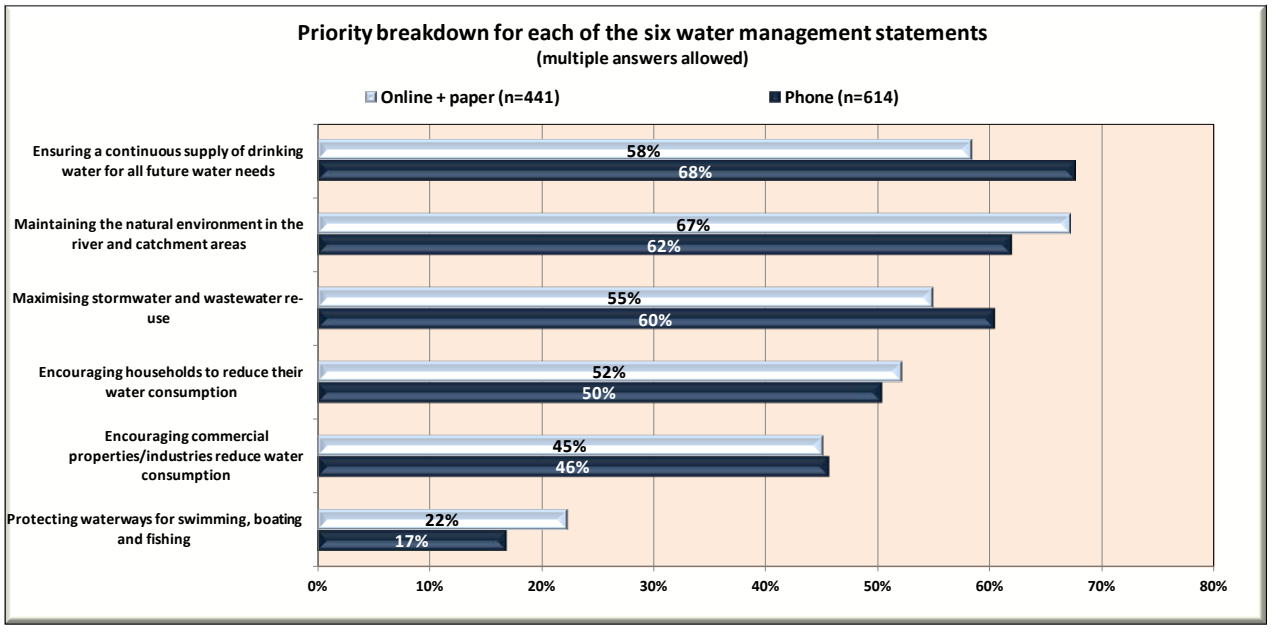
As might be expected, those living in the Tweed hinterland and those classing themselves as rural residents were significantly more likely than coastal residents to focus on reducing usage as opposed to increasing supply.

In a three-part question, respondents were then read a list of six factors involved in securing a long-term water supply, and asked to progressively nominate which of these were the most, second most and third most important to them personally. The online/paper results are shown in Graph 3.2.1, below, while Graph 3.2.2 compares the total nominations for both phone and online/paper polls:

Graph 3.2.1: Priority breakdown for each of the six water management factors (online/paper only)



Graph 3.2.2 Each of the six water management factors named as a priority



Ensuring a continuous supply of drinking water for all future water needs was rated the "most important" factor in both phone and online/paper surveys. However when the three most important factors were totalled (Graph 3.2.2), "maintaining the natural environment in the river and catchment areas" was the most commonly mentioned of the six statements among online and paper respondents.

"Maximising storwater and wastewater re-use" and "encouraging households to reduce their water consumption" ranked third- and fourth-most mentioned statements respectively in both surveys.

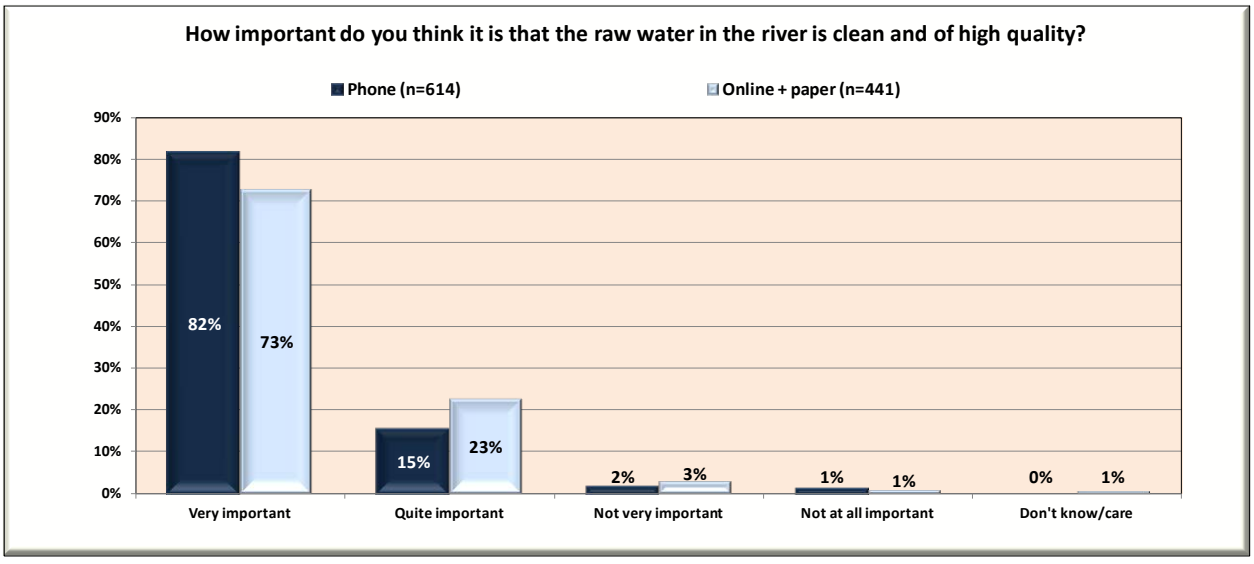
Table 3.2.1: Priorities by location (Online/paper only)

		Which of the following would best describe your location?				Total
		Tweed Coast - north of river	Tweed Coast - south of river	Hinterland	Other	
Priority	Ensuring a continuous supply of drinking water	105	100	33	16	254
		72.4%	57.5%	35.9%	66.7%	
	Maintaining the natural environment	94	116	68	13	291
		64.8%	66.7%	73.9%	54.2%	
	Maximising stormwater and wastewater re-use	69	96	63	11	239
		47.6%	55.2%	68.5%	45.8%	
	Protecting waterways for recreation	33	43	12	9	97
		22.8%	24.7%	13.0%	37.5%	
	Encouraging households to reduce their water consumption	77	89	49	12	227
		53.1%	51.1%	53.3%	50.0%	
	Encouraging commercial properties/ industries reduce water consumption	57	78	51	11	197
		39.3%	44.8%	55.4%	45.8%	
Total		145	174	92	24	435

The collective online/paper results, above, hide some interesting variations by location. In particular (and as shown in Table 3.2.1), hinterland residents were significantly less likely to nominate "ensuring a continuous supply of drinking water" than those living on the Tweed Coast, and significantly more likely to nominate "maintaining the natural environment".

At this point respondents were told that "Water from the Tweed River can be treated to acceptable drinking standard before it reaches your tap", and asked "However how important do you think it is that the raw water in the river is clean and of high quality?" The results are shown in Graph 3.3, below:

Graph 3.3: How important do you think it is that the raw water in the river is clean and of high quality? (prompted)

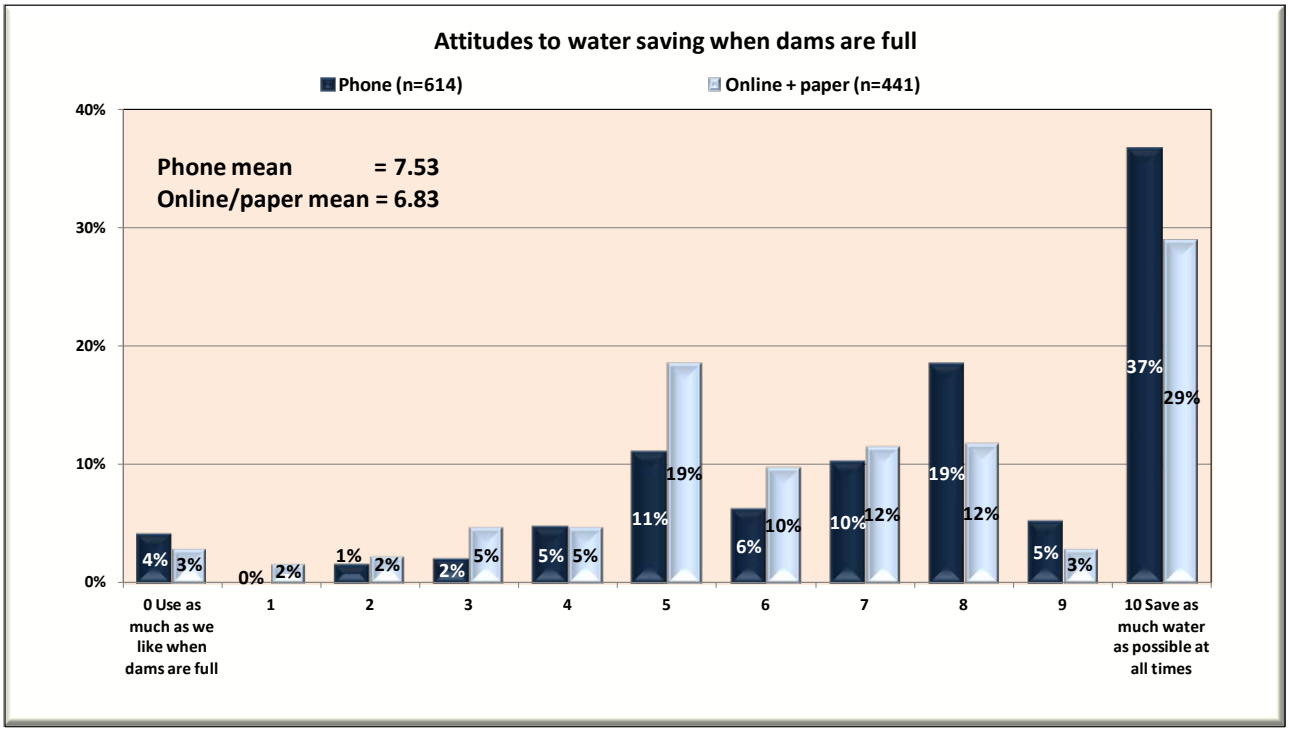


Results were similar between telephone and online/paper surveys, with only the degree of importance changing slightly. But both polls indicated an unequivocal desire for clean, high quality river water.

In a further "forced choice" comparison (i.e. similar to Graph 3,1), online and paper respondents were then told that "Some people believe that when dam levels are full we should be able to use as much water as we like, while others believe the community should save as much water as possible at all times. Where would you sit on a sliding scale of 0-10, where 0 means we should be able to use as much water as we like when dams are full, and 10 means we should save as much water as possible at all times?"

The results are shown in Graph 3.4:

Graph 3.4: Where would you sit on a scale of 0-10, where 0 means we should be able to use as much water as we like when dams are full, and 10 means we should save as much water as possible at all times?



The results of this question are perhaps counter-intuitive given the generally greater focus on water conservation among online/paper respondents in previous survey questions. In this instance those polled by phone were significantly more likely to tend towards the "save as much water as possible at all times" option, with a mean score of 7.53 (on a 0-10 scale) against 6.83 for online/paper respondents. That said, it should be remembered that in both surveys the mean score was firmly on the "conserve at all times" side of the midpoint.

The reason for the stronger "conserve at all times" belief among telephone respondents is almost certainly explained by the age factor, as shown in Table 3.4.1, next page:

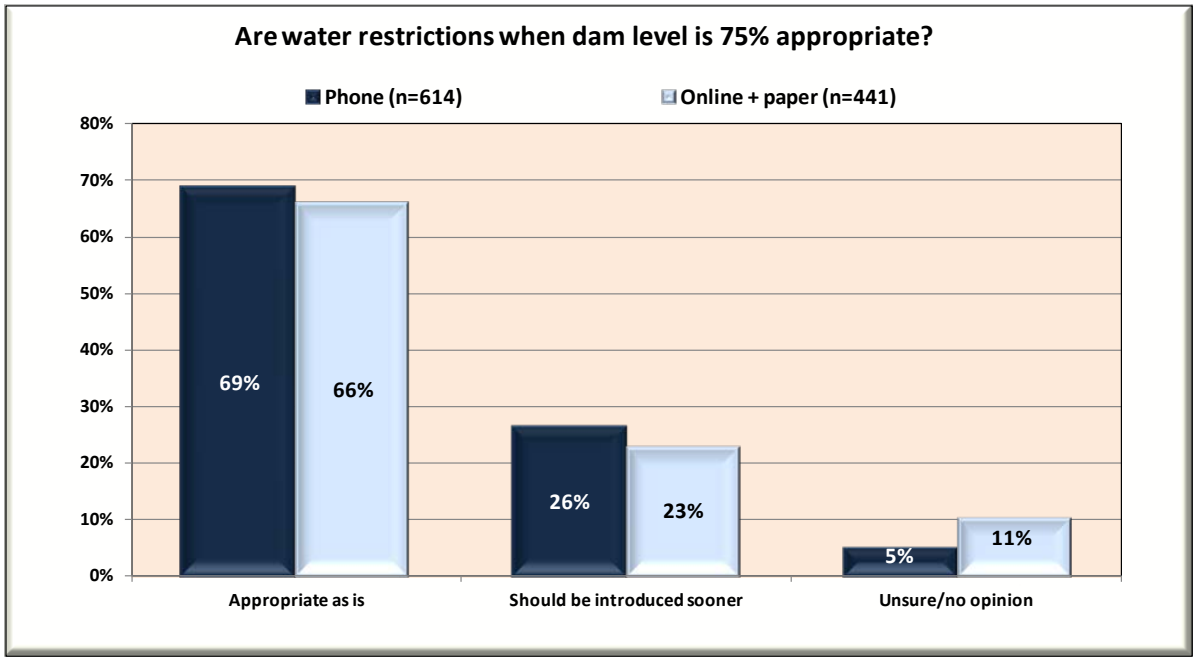
Table 3.4.1: Unlimited use vs. saving at all times by age (Online/paper only)

Age	Mean	N	Std. Deviation
Under 18	6.37	115	2.158
18-39	6.21	81	2.724
40-59	7.05	140	2.944
60-75	7.51	105	2.839
Total	6.83	441	2.730

This suggests a strong correlation between age and a belief that water should be conserved at all times: i.e. respondents aged 60-plus were significantly more likely than those aged less than 39 to feel that water should be saved even in times of plenty. (This may in turn arise from their greater memory of past water shortages.)

Respondents were then told that "Compulsory water restrictions for the Tweed shire currently come into effect when the dam level is 75 per cent, which last occurred in 2003". They were asked if they felt this was appropriate, or whether they believed restrictions should be introduced sooner. The results are shown in Graph 3.5, below:

Graph 3.5: Is it appropriate to introduce water restrictions when dam levels reach 75%, as at present? (prompted)

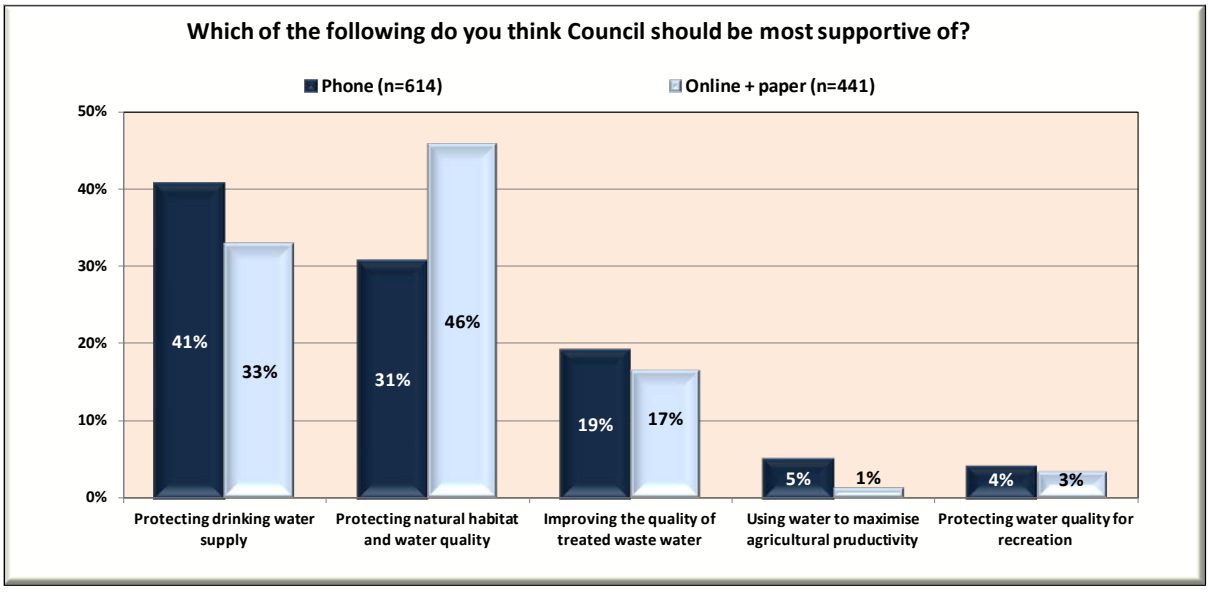


Two-thirds of online/paper respondents agreed that 75 per cent is a logical starting point for water restrictions, a figure that is virtually identical to the phone survey result.

Part 4: Additional water sources

At this point respondents were asked a series of demand and pricing questions about additional water supply sources. This began by asking which of five potential water uses Council should be *most* supportive of:

Graph 4.1: From the following, what do you think Council should be most supportive of? (prompted)



Consistent with other survey findings, online/paper respondents exhibited a greater interest in environmental factors than those interviewed by phone. In this instance, 46 per cent of online/paper respondents nominated "protecting natural habitat and water quality" as the issue most deserving of council resources, against 31 per cent of those polled by phone.

Breaking the online/paper results down by setting:

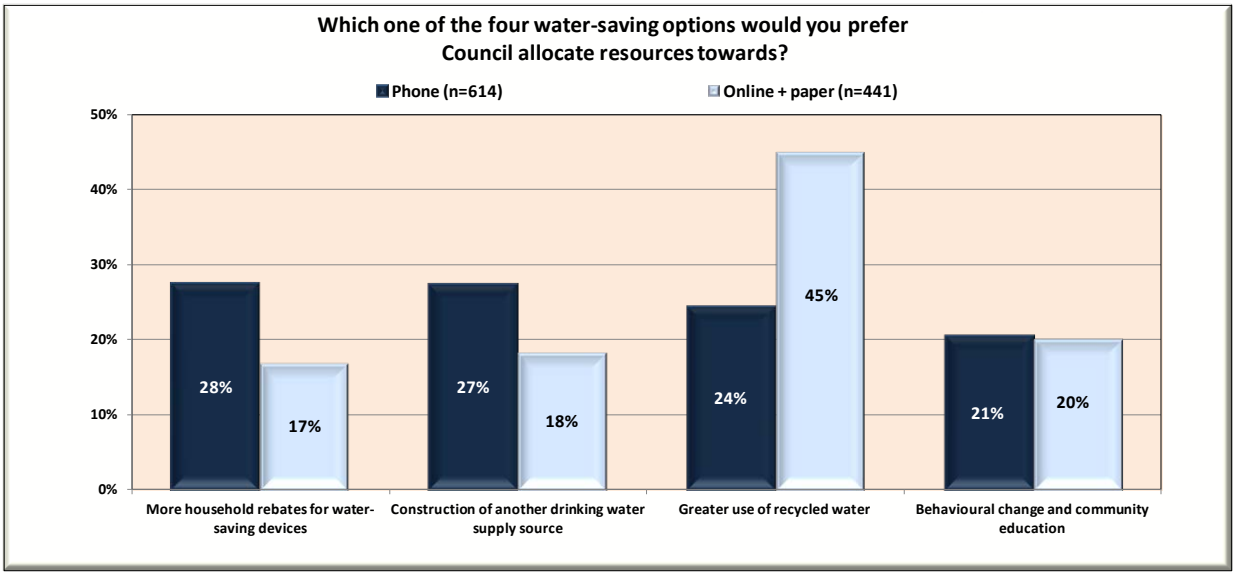
Table 4.1.1: Potential water uses by setting (Online/paper only)

		Urban/rural setting			Total
		Urban	Rural	Unsure/mixed	
In terms of the Shire's waterways, what do you think Council should be most supportive of?	Using water to maximise agricultural pruductivity	4	2	0	6
		1.5%	1.5%	.0%	1.4%
	Improving the quality of treated waste water	49	17	7	73
		18.1%	12.8%	18.9%	16.6%
	Protecting water quality for recreation	7	7	1	15
		2.6%	5.3%	2.7%	3.4%
	Protecting natural habitat and water quality	100	84	17	201
		37.0%	63.2%	45.9%	45.7%
	Protecting drinking water supply	110	23	12	145
		40.7%	17.3%	32.4%	33.0%
Total		270	133	37	440
		100.0%	100.0%	100.0%	100.0%

This suggests that urban respondents were more likely to focus on protecting drinking water supplies, while the bulk (i.e. 63 per cent) of those living rurally nominated the "protecting natural habitat…" option.

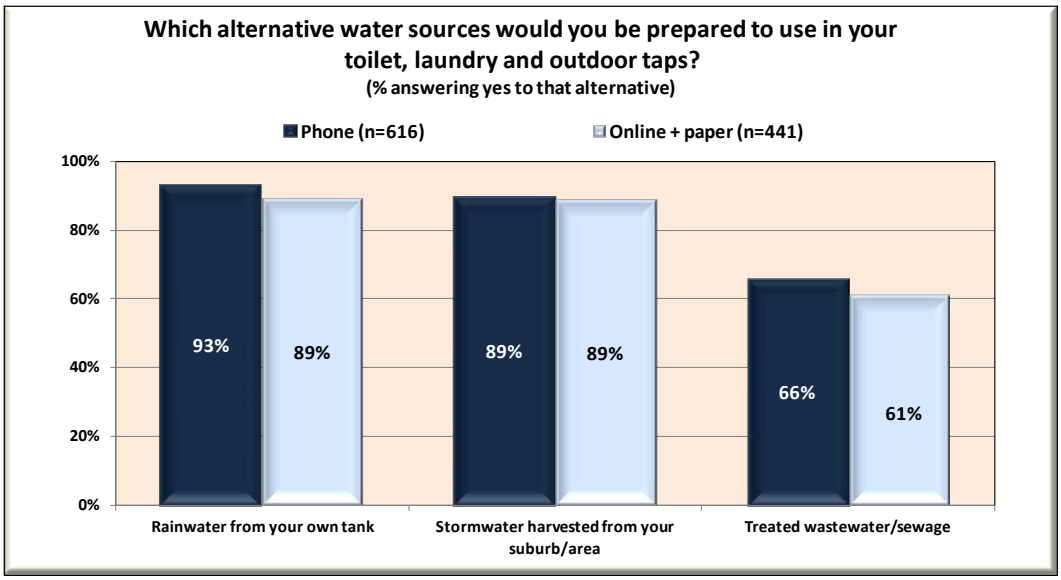
Further to this, respondents were asked to decide which of four potential water-saving options was the most important for Council to be devoting resources towards. Their responses are shown in Graph 4.2, below

Graph 4.2: Which water saving option would you prefer to see Council allocate resources towards?



Whereas telephone respondents were evenly divided between the four prompted options, in the online survey there was a strong bias towards "greater use of recycled water" – being nominated by 45 per cent of participants. Beyond this, however there was roughly equal support for the remaining three options.

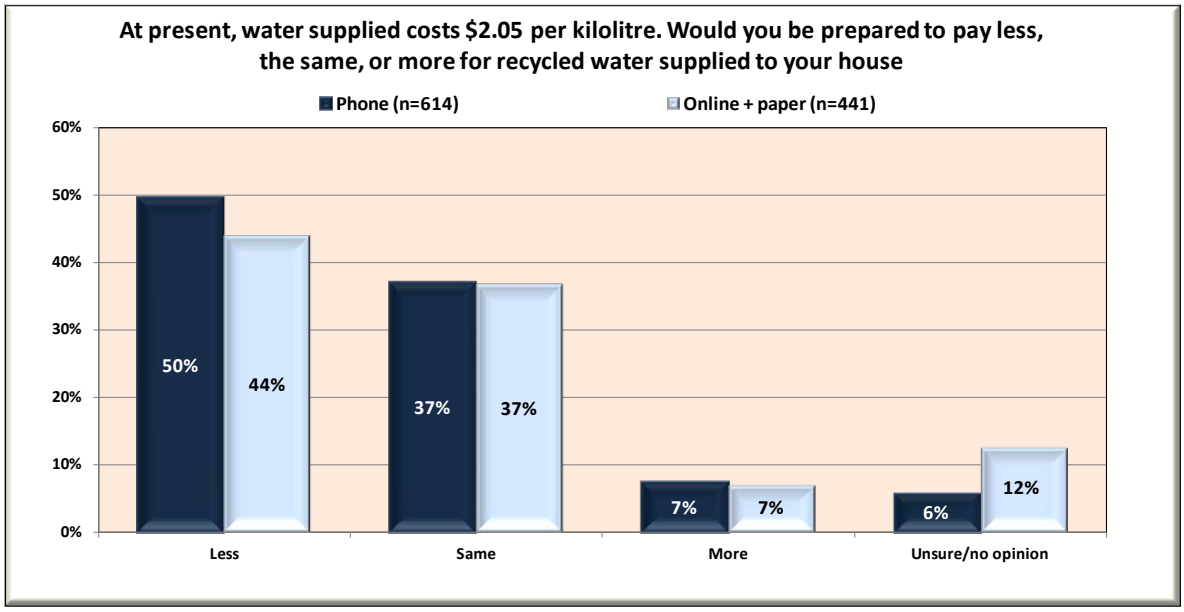
Graph 4.3: Which alternative water sources would you be prepared to use in your toilet, laundry and outdoor taps?



Meanwhile there was strong support for rainwater tanks and harvested stormwater to be used in toilets, laundry and/or outdoor taps (both telephone and online/paper). Six in ten online/paper respondents also said they would be prepared to use treated wastewater and/or sewage.

Regarding preferred water pricing for recycled water options:

Graph 4.4: At present, water supplied costs $2.05 per kilolitre. Would you be prepared to pay less, the same, or more for recycled water supplied to your house?



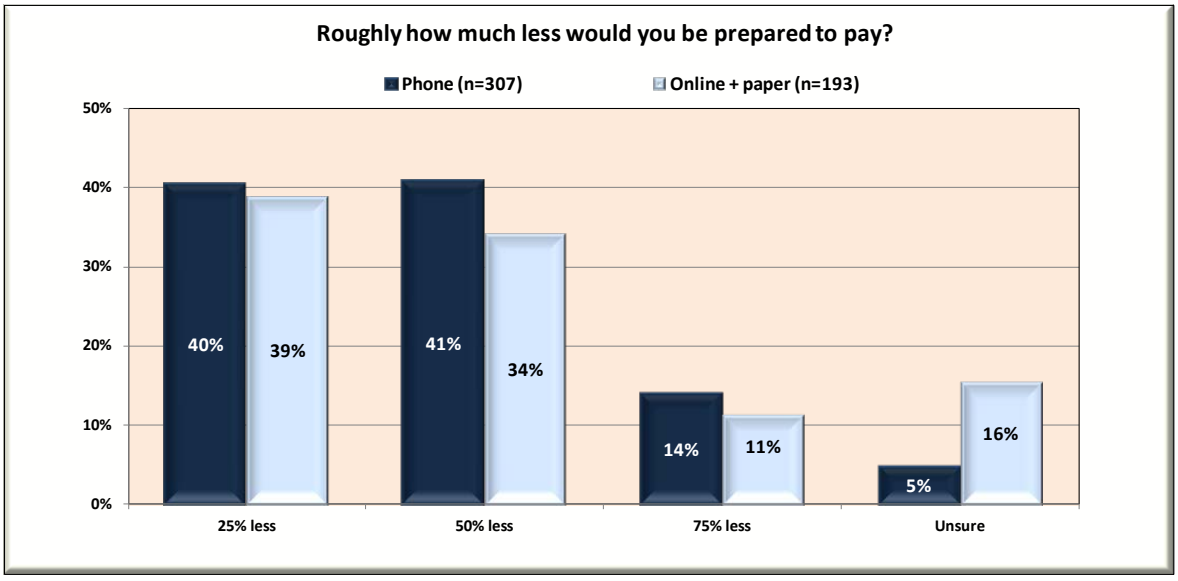
Results were similar between telephone and paper/online surveys, with the largest proportion in each instance (50 and 44 per cent respectively) feeling that recycled water should cost less than existing supply and 37 per cent feeling it should be the same. As shown in Table 4.4.1, below, the jump in "unsure" for online/paper respondents was driven by those respondents aged less than 18.

Table 4.4.1: Current cost options by age. (Online/paper only)

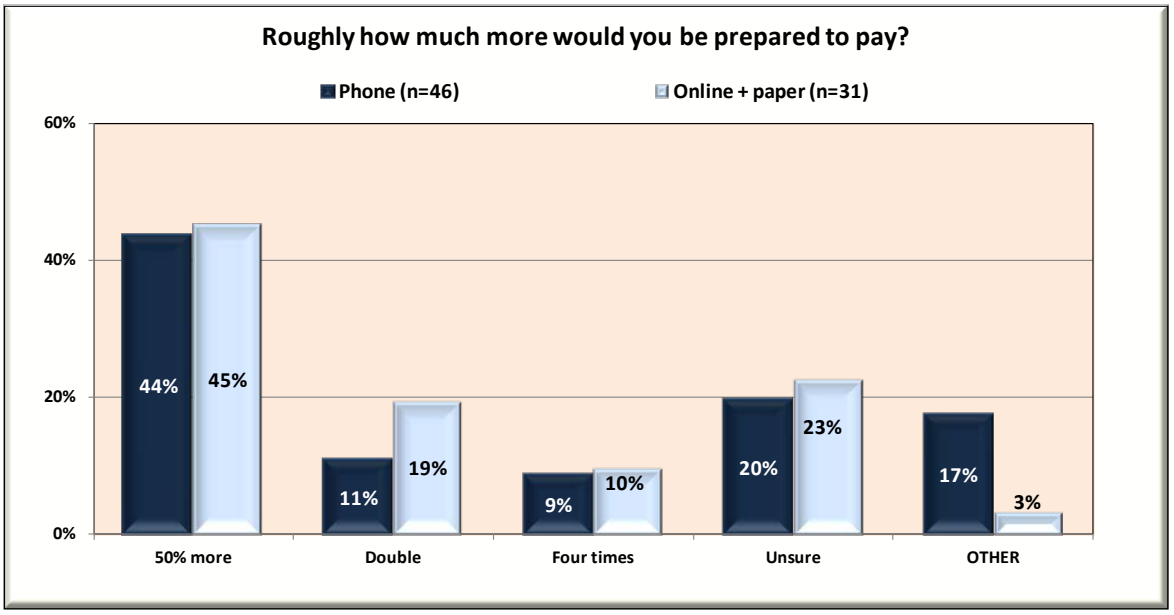
		Age				Total
		Under 18	18-39	40-59	60+	
At present, water supplied costs $2.05 per Kilolitre. Would you be prepared less, the same, or more for recycled water?	Less	44	44	60	45	193
		38.3%	54.3%	42.9%	42.9%	43.8%
	Same	37	23	56	46	162
		32.2%	28.4%	40.0%	43.8%	36.7%
	More	11	4	12	4	31
		9.6%	4.9%	8.6%	3.8%	7.0%
	Unsure/no opinion	23	10	12	10	55
		20.0%	12.3%	8.6%	9.5%	12.5%
Total		115	81	140	105	441
		100.0%	100.0%	100.0%	100.0%	100.0%

Graphs 4.5.1 and 4.5.2, below, show (among those proposing the charge be higher or lower) how much more or less recycled water should cost:

Graph 4.5.1: (For those proposing less) How much less would you be prepared to pay? (prompted)



Graph 4.5.2: (For those proposing more) How much more would you be prepared to pay? (prompted)



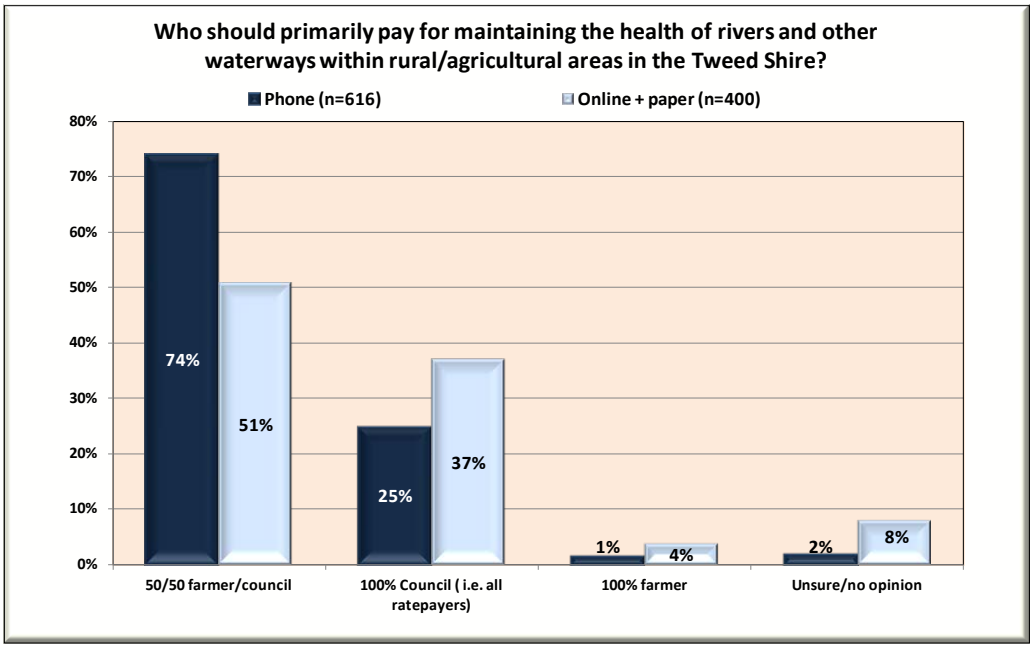
(N.B. Results should be treated with extreme caution due to the small sample sizes)

Of those (193 online/paper respondents) proposing less, opinion was relatively evenly split between those feeling it should be 25 or 50 per cent cheaper. Of those prepared to pay more, just under half felt 50 per cent more was fair.

Part 5: Sharing the burden

The surveys concluded with three questions designed to understand attitudes towards who should pay for maintaining river health in rural and urban areas: adjoining landowners, the community as a whole (i.e. via Council), or a combination of both. Looking first at rural/agricultural areas:

Graph 5.1: Who should primarily pay for maintaining the health of rivers and other waterways within rural/agricultural areas in the Tweed Shire?



Although a slim majority of online/paper respondents believed that farmers should share any cost burden with Council, this was a significantly lower proportion than encountered in the telephone survey.

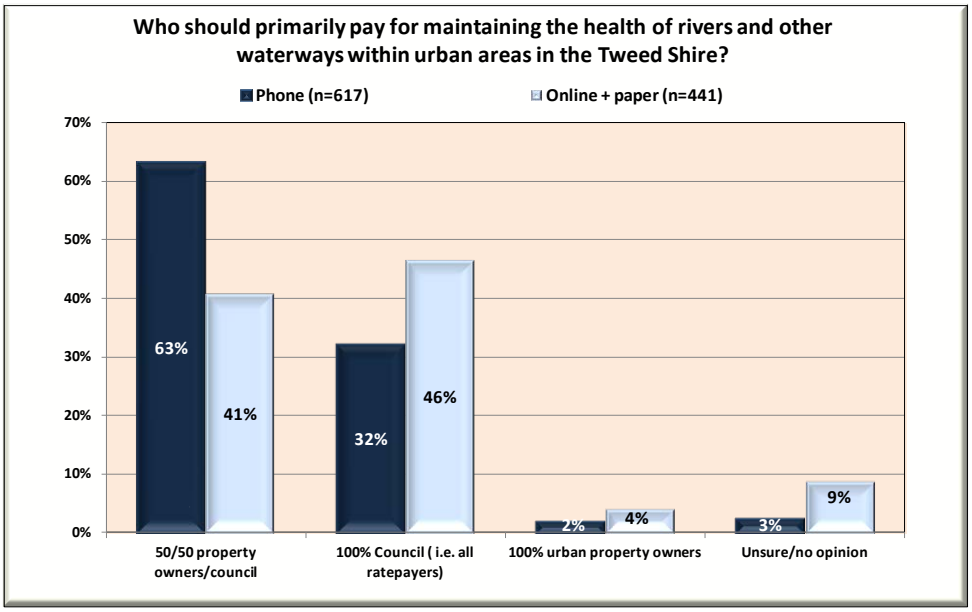
Table 5.1.1: Prime payer (within rural areas) by location (Online/paper only)

		Which of the following would best describe your location?				Total
		Tweed Coast - north of river	Tweed Coast - south of river	Hinterland	Other	
Prime payer for maintaining river health within rural/agricultural areas in Tweed Shire?	100% farmer	6	6	3	0	15
		4.8%	3.7%	3.4%	.0%	3.8%
	100% Council (i.e. all ratepayers)	40	62	40	4	146
		31.7%	38.0%	45.5%	21.1%	36.9%
	50/50 farmer/council	68	81	44	9	202
		54.0%	49.7%	50.0%	47.4%	51.0%
	Unsure/no opinion	12	14	1	6	33
		9.5%	8.6%	1.1%	31.6%	8.3%
Total		126	163	88	19	396
		100.0%	100.0%	100.0%	100.0%	100.0%

Breaking the online/paper sample down by region, we see that hinterland residents were more likely than those living on the coast to believe that council/ratepayers should bear the burden of river health in rural areas. But a bare majority of hinterland residents still believed it should be jointly funded.

Asking the same question about urban areas:

Graph 5.2: Who should primarily pay for maintaining the health of rivers and other waterways within urban areas in the Tweed Shire?



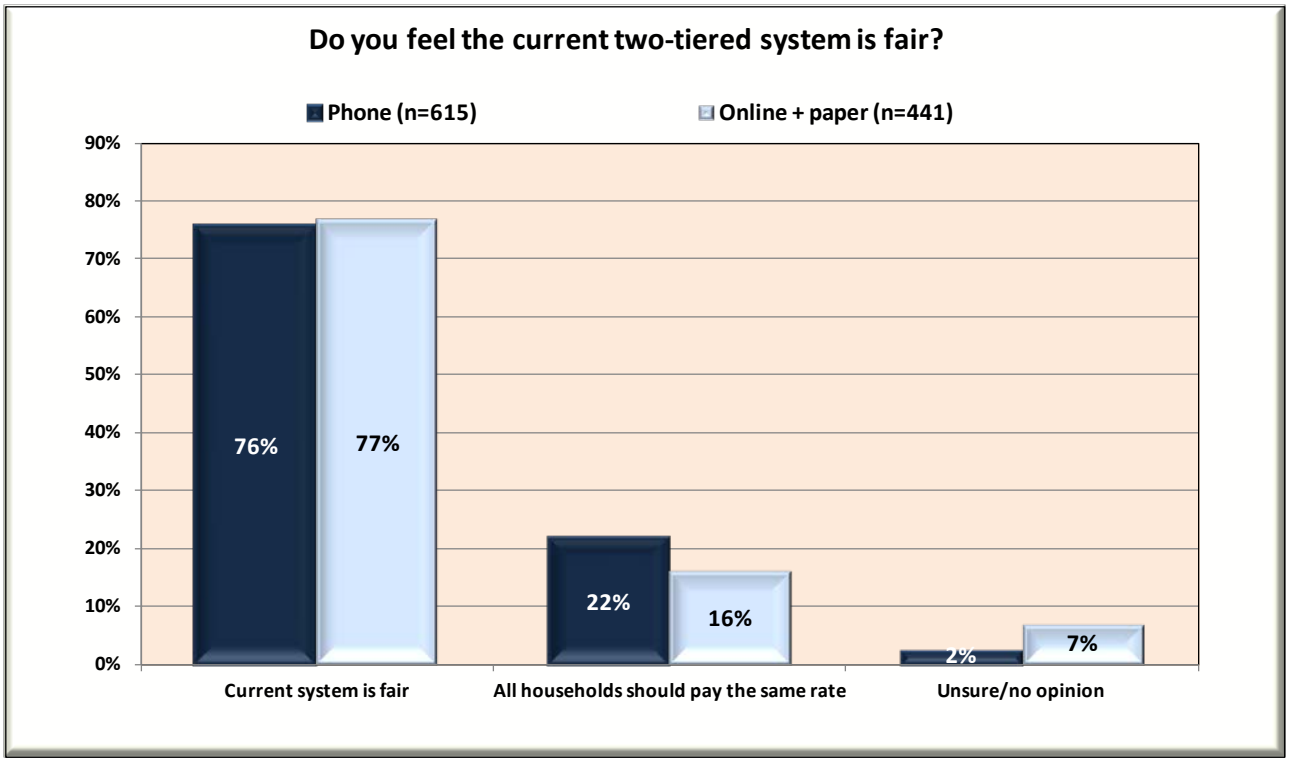
In this instance, the largest proportion of online/paper respondents (46 per cent) felt that Council/ratepayers should pay to maintain river health in urban areas, while only 41 per cent believed this should be borne equally between landowners and council. While such a result may seem somewhat hypocritical, the result was consistent between urban and rural residents (as shown in Table 5.2.1, below):

Table 5.2.1: Prime payer (within rural areas) by location (Online/paper only)

		Urban/rural setting			Total
		Urban	Rural	Unsure/ mixed	
Prime payer for maintaining river health within urban areas in Tweed Shire?	100% urban property owners	9	9	1	19
		3.3%	6.8%	2.7%	4.3%
	100% Council (i.e. all ratepayers)	128	65	12	205
		47.4%	48.9%	32.4%	46.6%
	50/50 property owners/council	110	49	21	180
		40.7%	36.8%	56.8%	40.9%
	Unsure/no opinion	23	10	3	36
		8.5%	7.5%	8.1%	8.2%
Total		270	133	37	440
		100.0%	100.0%	100.0%	100.0%

Finally in this section, respondents were asked whether they believed the current two-tier tariff – in which households using a lot of water pay a higher rate per kilolitre for some of their water – was fair, or whether all households should pay the same price per kilolitre regardless of usage:

Graph 5.3: Do you feel the current two-tiered system is fair?



Results were similar between the two surveys, with three in four respondents believing the current system to be fair. However as shown in Table 5.3.2, below, the proportion of online/paper respondents wanting to maintain the current two-tiered pricing model rose significantly with age.

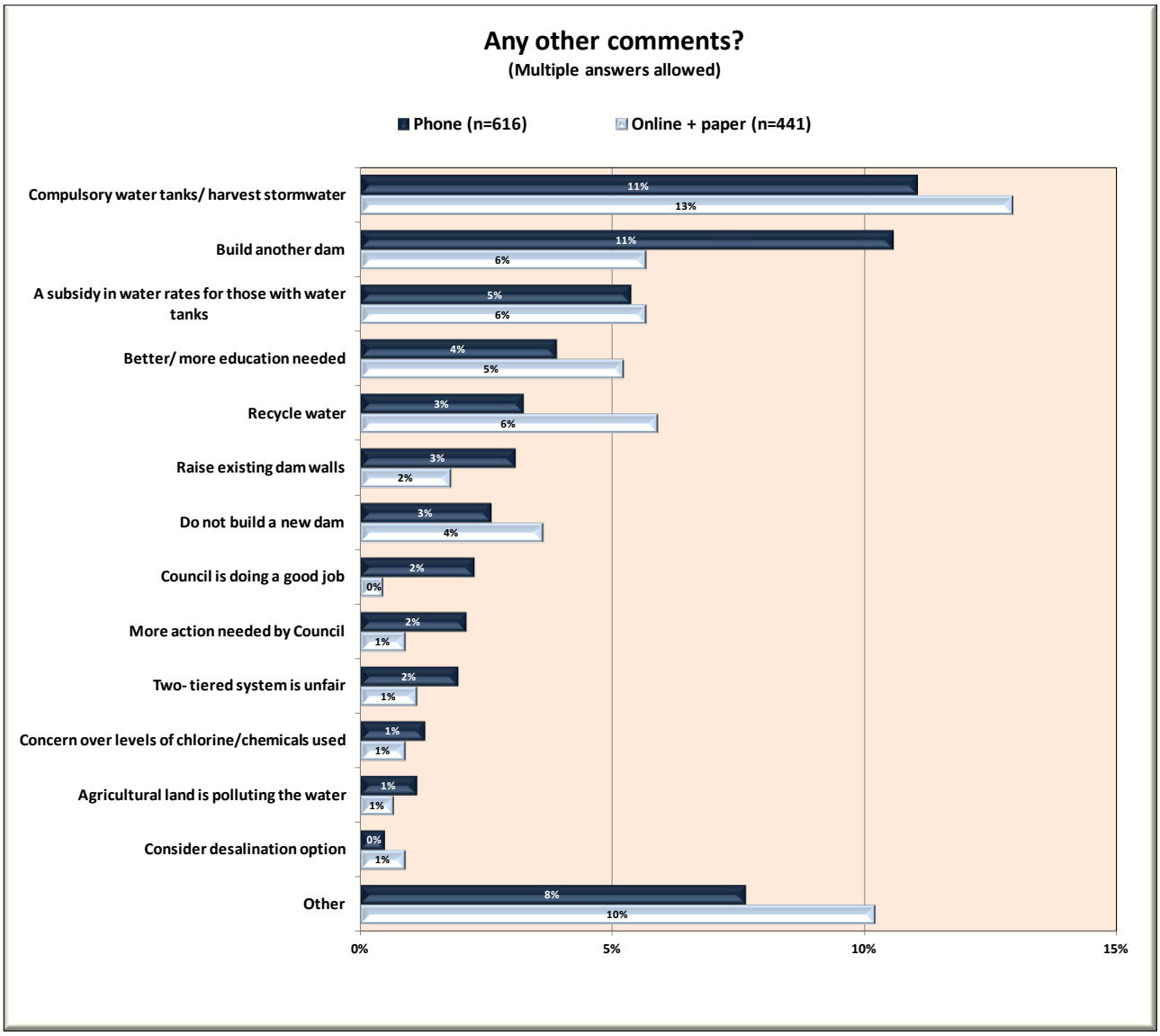
Table 5.3.2: Fairness of current two-tier system, by age (Online/paper only)

		Age				Total
		Under 18	18-39	40-59	60+	
Do you feel the two tiered system is fair for Tweed residents?	Current system is fair	71	61	114	92	338
		61.7%	75.3%	81.4%	87.6%	76.6%
	All households should pay the same rate	23	15	22	12	72
		20.0%	18.5%	15.7%	11.4%	16.3%
	Unsure/no opinion	21	5	4	1	31
		18.3%	6.2%	2.9%	1.0%	7.0%
Total		115	81	140	105	441
		100.0%	100.0%	100.0%	100.0%	100.0%

Part 6: Other comments and suggestions

The survey concluded with respondents being asked, in an open ended question, if they had "any additional thoughts on any aspects of the Tweed's future water cycle management priorities that they would like to share with council." Two hundred and fifteen chose to add additional comment. These have been coded (i.e. themed), and the main themes are shown in Graph 6.1, below. (Note that percentages are as a proportion of all people surveyed, not just those contributing comments.)

Graph 6.1: Other comments or suggestions



The conservation ethos of online and paper respondents was evident in these comments, with a desire to better harvest rainwater and/or see compulsory water tanks noted by some 12 per cent of all online/paper respondents. This was followed by 6 per cent each calling for more water recycling initiatives and subsidies in water rates for those harvesting their own stormwater.

Regarding explicit support and opposition for a new dam, online respondents were almost evenly split in their views. This differs from the telephone survey, where opinion was more skewed towards preference for a new dam.

A full list of "other comments" is included as Appendix 3 to this report.

Appendix 1: Questionnaire

(N.B. This is the paper version of the survey. For all intentions purposes the online version is identical.)

JETTY RESEARCH .com.au

TWEED SHIRE COUNCIL

Have your say in the future of the Tweed Shire's water cycle. Go into the draw to win one of two iPads!*

* or the equivalent value in shopping gift cards

Tweed Shire Council is surveying Tweed residents about the shire's future water cycle management priorities. The survey should take less than 15 minutes to complete and any answers you provide are confidential. Most questions simply require you to tick or place numbers in the appropriate box.

If you complete the survey, you will go into a draw to win one of two iPads (valued at $500 each) or their equivalent in shopping gift cards. (Note that any contact information you provide for this prize draw will be separated from the rest of your answers prior to any data being analysed.)

Surveys must be completed and submitted by midnight on Wednesday, December 12th, 2012.

★ ★ ★

Q1. Are you concerned about the Tweed Shire's ability to meet its water needs in the medium to long term? (Please tick ONE box only)

1. Yes, a lot ☐ 2. Yes, a little ☐ 3. No, not really ☐

Q2. Do you feel the Tweed community as a whole has made serious efforts to reduce daily water use over the past three years?

1. Yes ☐ 2. No ☐ 3. Unsure ☐

Q3. Do you believe your household would use more or less water than the average Tweed Valley household?

1. More ☐
2. Less ☐
3. Same/average ☐
4. Unsure ☐

Q4. Do you know what the target is for average daily water use by residents in the Tweed Shire? (Please tick one of the targets only, or "I don't know what the target is".)

1. 120 Litres per person/day ☐
2. 150 Litres per person/day ☐
3. 180 Litres per person/day ☐
4. 200 Litres per person/day ☐
5. I don't know what the target is ☐

Q5. Some people believe that ensuring a reliable long-term water supply for the Tweed Shire is mainly about reducing people's water usage, while others think it is more about increasing the water availability.

(Question continued next column)

Where would you sit on a scale of 0-10, where 0 means it should all be about reducing usage, and 10 means it should all be about increasing water availability? (Please mark with an "X")

Reducing Water Usage — Both Equally — Increasing Water Availability

0 1 2 3 4 5 6 7 8 9 10

Q6. Ensuring a secure long-term supply of water involves a trade-off between lots of different factors. Please read through the following list, then write the numbers 1, 2 and 3 in three of the boxes (where 1 is the most important to you personally, 2 is the second most important and 3 is the third most important).

- ☐ Ensuring a continuous supply of drinking water for all future water needs
- ☐ Maintaining the natural environment in the river and catchment areas
- ☐ Maximising stormwater and wastewater re-use
- ☐ Protecting waterways for swimming, boating and fishing
- ☐ Encouraging households to reduce their water consumption
- ☐ Encouraging commercial properties and industry to reduce water consumption

Q7. Water from the Tweed River can be treated to acceptable drinking standard before it reaches your tap. How important do you think it is that the raw water in the river is clean and of high quality? (Please tick ONE box only)

1. Very important ☐
2. Quite important ☐
3. Not very important ☐
4. Not at all important ☐
5. Don't know/care ☐

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Jetty Research
Reply Paid 1555
COFFS HARBOUR NSW 2450

Q8. Some people believe that when dam levels are full we should be able to use as much water as we like, while others believe the community should save as much water as possible at all times. Where would you sit on a sliding scale of 0-10, where 0 means we should be able to use as much water as we like when dams are full, and 10 means we should save as much water as possible at all times?

Use as much as we like when dams are full — Both equally — Save as much water as possible at all times

0 1 2 3 4 5 6 7 8 9 10

Q9. Compulsory residential water restrictions for the Tweed Shire currently come into effect when the dam level is 75%, which last occurred in 2003. Do you think this is appropriate, or should they be introduced sooner? (please tick ONE box only)

1. Appropriate as is ☐
2. Should be introduced sooner ☐
3. Unsure/no opinion ☐

Q10. In terms of the Shire's waterways, what do you think Council should be most supportive of? (Please tick ONE answer only)

1. Using water to maximise agricultural productivity ☐
2. Improving the quality of wastewater and stormwater runoff ☐
3. Protecting water quality for swimming, boating and fishing ☐
4. Protecting natural habitat and water quality ☐
5. Protection of drinking water supply ☐

Q11. Providing an additional water supply source is costly. If they could only do one, which of the following four water-saving options would you prefer to see Council allocate resources towards?

1. Greater use of recycled water ☐
2. More household rebates for water-saving devices and systems ☐
3. Construction of another drinking water source ☐
4. Behavioural change and community education ☐

Q12. Assuming it was readily available, which alternative water sources would you be prepared to use in your toilet, laundry taps and outdoor taps? Please tick YES or NO for the following options:

	Yes	No
Rainwater from your own tank	☐	☐
Stormwater harvested from your suburb or area	☐	☐
Treated wastewater/sewage	☐	☐

Q13. Treated and drinkable water supplied to households currently costs $2.05 per kilolitre. Would you be prepared to pay less, the same or more than this amount for recycled water supplied to your house for outdoor use, toilet flushing or clothes washing?

1. Less ☐
2. Same ☐ SKIP TO Q.16
3. More ☐ SKIP TO Q.15
4. Unsure/no opinion ☐ SKIP TO Q.16

Q14. (if "Less" to Q13) Roughly how much less would you be prepared to pay for this recycled water?

1. 25% less ☐
2. 50% less ☐
3. 75% less ☐
4. Unsure ☐

Q15. (If "More" to Q13) Roughly how much more would you be prepared to pay for this recycled water?

1. 50% more ☐
2. Double ☐
3. Four times ☐
4. Unsure ☐
5. Other (please specify) .....

Q16. Who should primarily pay for maintaining the health of rivers and other waterways within rural/agricultural areas in the Tweed Shire?

1. 100% farmers ☐
2. 100% Council (i.e. all ratepayers) ☐
3. 50/50 farmers/Council ☐
4. Unsure/no opinion ☐

Q17. Who should primarily pay for maintaining the health of rivers and other waterways within urban areas in the Tweed Shire?

1. 100% urban property owners ☐
2. 100% Council (i.e. all ratepayers) ☐
3. 50/50 urban property owners/Council ☐
4. Unsure/no opinion ☐

Q18. At the moment there is a two-tier tariff, which means that households which use a lot of water pay a higher rate than others for some of their water. Do you think this system is fair, or should all households pay the same rate per kilolitre regardless of how much they use?

1. Current system is fair ☐
2. All households should pay the same rate regardless of use ☐
3. Unsure/no opinion ☐

Q19. Do you have any other thoughts on any aspect of the Tweeds future water cycle management priorities that you would like to share with Council?

.....

.....

.....

.....

.....

Q20. Into which of the below age ranges do you fall?

1. Under 18 ☐ 2. 18-39 ☐ 3. 40-59 ☐ 4. 60+ ☐

Q21. Gender

1. Male ☐ 2. Female ☐

Q22. Do you live in an urban or rural setting?

1. Urban ☐ 2. Rural ☐ 3. Unsure/mixed ☐

Q23. Are you on town water (i.e. connected to mains water)?

1. Yes ☐ 2. No ☐

Q24. Which of the following housing types would best describe where you live?

1. Detached house ☐
2. Semi-detached house, townhouse or villa ☐
3. Apartment or unit ☐
4. Other ☐

Q25. Which of the following would best describe your location?

1. Tweed Coast-north of river ☐
2. Tweed Coast-south of river ☐
3. Tweed Shire - Hinterland ☐
4. Other/outside Tweed Shire ☐

Q26. What is your residential postcode? .....

Q27. Do you own or rent the house in which you are presently living?

1. Own/Part-own ☐ 2. Rent ☐ 3. Other ☐

Q28. How many people, including yourself, are currently living permanently or part-time in your house? ☐

Q29. And finally, how long have you lived in the Tweed Shire?

1. Less than five years ☐
2. 5-10 years ☐
3. 11-20 years ☐
4. More than 20 years ☐
5. Do not live in the shire ☐

Thank you, that is the end of the survey, and you are now eligible to enter the draw to win one of two iPads, or their equivalent value in shopping gift cards. The competition will be drawn on **Tuesday 18th January 2013** and winners will be notified by phone. The terms and conditions can be found on the Jetty Research website (www.jettyresearch.com.au). Lottery permit LTPM/12/00219.

If you would like to enter the draw, please enter your name and daytime contact phone number below:

Name: .....

Daytime Contact Number: .....

Appendix 2: Promotional A3 posters and business cards

A3 poster (single sided)

Business card – front side

Business card – reverse side

Appendix 3: Other comments

1001	Raising of the Clarrie Hall Dam is most logical and cost effective way to augment the Tweed Shires water supply.
1005	Promotion of rainwater tanks, compost toilets, grey water systems and sustainable technologies for those who can. More community involvement in programs and more ongoing community focussed education programs. Water waste and energy can be viewed holistically and mean more when looked at altogether. Programs that are more flexible and engage more with community members.
1009	The Tweed rainfall is sufficient to keep water tanks useable. This negates the use of contaminated stormwater runoff and waste water reuse. Demand can be lowered with more rainwater tanks. Future population trends need to be better assessed.
1011	I think that the council should give more education to the industries in regards to there usage of water money does not seem to work as I've seen company's dumping water on the street which is drinking water what's with that do you think they care.
1012	I would be happy to use recycled water for toilet flushing and outdoor use, however I've been advised that recycled water stains and deteriorates clothing during clothes washing. It would be beneficial to provide further advice on this, such as recycled water may be used for one or a combination of the following; toilet flushing, outdoor use and clothes washing.
1013	Encourage installation of compost toilets. Recycling of storm water and waste water cities such as London and Singapore use waste water for drinking as well as other use. Step up the effort to get farmers to keep cattle out of waterways and to grow crops organically so there is less nutrients going into the water ways. Make golf courses become organic. Limit population growth and new mini cities.
1019	Is there anyone monitoring and reporting on the levels of dangerous and environmentally persistent chemicals such as Atrazine used by the sugar industry in Tweed waterways. If not why not?
1023	The cost of proper treatment of Sewer is high. The removal of toxins such as medical wastes including thru body fluids is difficult to achieve. I would much prefer the harvest of storm water as a preferred method of recycle in local areas. While the construction of another dam is high, there is need to balance that cost with the benefits of industry development including specialised primary industry, small lot farming and the attraction of additional residents to the region.
1024	I think that the council should recycle more water and protect the natural habitat of the Tweed.
1028	I believe that the Government or Council should help the households out with water tanks for there water system to save water around the Tweed region.
1029	Restrict water.
1031	All I have to say is that every one in the community should pay regardless of how much water is being used and make it fair to everyone else in Tweed.

1040	I live on half a hectare and use water for my flower and vegetable gardens. I should not have to pay any extra than those who live in units or flats. The only logical way forward is to build a new dam. That's what we agreed on years ago and selected land etc. I don't agree with the minority that seem to run there one sided agenda. Council should run a referendum at the next election to find out what the majority wants and not just the ultra green minority wanting to get votes for the election.
1043	Rainwater tanks in urban areas should be encouraged for use in toilets, laundry, gardens and carwash etc.
1044	The council needs to do more about the litter along our roads. It all ends up in the river. Council subs out slashing along our roads, this cuts up the litter and makes it easier to get into the streams and rivers. The council needs to incorporate people with the slashing to pick up the litter in front of the slasher. The slashing occurs about 4 times a year. If people could be employed at the same time as the slashing it wouldn't cost too much but would be a great benefit to rivers, sea life, animal life, and people. This could be a simple solution to two problems, litter and water quality. I can't believe how much litter there is along two roads I travel, Bilambil Rd and Terranora Rd, you would think with the many years of education that people wouldn't do it anymore.
1046	I would not want to use the alternative water options for my laundry, but I would be happy to use them for outdoor taps and toilet.
1047	There should be a greater focus on sustainable use of available water, storage, reuse and recycling rather than greater storage capacity. I am fully supportive of the resources Council commits to natural waterway restoration and management.
1048	I absolutely support much greater incentives for houses to harvest rainwater for all household use .This area (despite recent figures) has such a high rainfall rate yearly that if every house in this area used rainwater first even if connected to town water supplies. I cannot see the need for any large structural changes to the current water supply system. It is madness to have so much run-off from roofs both industrial and urban and frustrating to hear talk of another dam being built. The cost to council in this event is likely being much higher than fully funding the cost of installation of a tank for every house in the shire! In no way do I support the building of a dam further causing needless destruction to rapidly dwindling wildlife habitation. We have so many more sane and cheaper options available to us now. Thanks for your time.
1049	Households that meet the water use target should pay the standard rate. Those that use more should pay more on an increasing scale. The council should promote the use of dry composting toilets. There are failing septic systems all over the shire. In may cases compost toilets would be the answer. This would help improve the health of our waterways and reduce water consumption. If increasing storage capacity was deemed necessary then raising Clarrie Hall Dam is the only sensible option.
1052	High rainfall area. Plans to harvest storm water within the shire and tanks for high water usage commercial users should be an ongoing priority.

1054	Recycled waste water would be fine to use in toilets and outside taps. It would need to be of high quality to consider using it in laundry. It should be used in all parks and Council toilets as well. Raising the Clarrie Hall dam wall seems like the most sensible option. Lastly, we said recycled water should be cheaper than drinking water but maybe this just means that drinking water is actually too cheap! There should probably be more of a sliding scale and target 180Lt seems too large. We have a large home with pool and gardens and we use on average 110Lt per person a day in our household of 4 people. If water was a bit more expensive on a sliding scale, people might think twice about turning on the tap and watering their driveways!
1061	No dams. Housing doesn't bring rain the trees do. More trees along waterways to stop evaporation.
1062	Council should make better reuse of household grey water in future planning and retrospective use in existing households. Reuse of reclaimed water in nearby Greenfield subdivisions. Our bulk water supplies are obtained from the Tweed River and not the Clarrie Hall Dam.
1065	New developments including Council parks and roadside vegetation on sandy soils e.g.. Casuarina and Salt require additional water to maintain vegetation particularly during drought. Basic requirements to be minimise lawns do not seem to be enforced. Developers should be required to provide 100mm of topsoil to ensure there is some capacity for moisture retention in the topsoil.
1067	Please DO NOT DAM at Byrrill Creek.
1068	What if Commonwealth will dictate us to share water with Gold Coast? We are okay so far but will suffer greatly if climate worsen. Desalination would be (in far future) more palatable then recycling. Rise existing dam much better than new collection area with consequences for environment. Dual piping service for laundries is perfect but can we afford it? Rewards in form of water rates discount for rain water tanks would encourage more people to install.
1069	Don't use recycled water from waste water sources. The operators have poor controlling ability and the process engineers aren't really process engineers.
1071	I do think with the ever expanding population we do need another supply e.g. a dam and also encourage more harvesting and use of stormwater.
1072	I'm more in favour of increasing the height of the dam rather than a new dam.
1078	Using recycled stormwater/sewerage for all public parks, sporting venues etc where human consumption is not a risk.
1080	Given climate change predictions and a growing population it is imperative that Tweed Shire should be integrating all water management in the very near future. Therefore, education of the general public is of paramount importance. Further it means that the use of wastewater and stormwater be incorporated into localised areas or used onsite and rain water tanks become mandatory. If these measures are taken, I believe we will be able to secure far more water than that supplied by dams. Responsibility of our own water is the only way to a future of sustainability.
1081	Let every household have their own tanks, use this water as wanted free of charges. Also teaches them to save water like the old days. You get it you look after it.
1082	Raise Carrie Hall dam wall as originally planned for in the early 1980's.
1083	I would like to see much better use of all rooftop runoff water. Schools, commercial, industrial and residential rooftops all shed huge amounts of water that should not run away to sea.

1085	More dams needed in Tweed Shire.
1086	I think it is important to recycle as much waster as possible and focus on keeping the rivers free from pollutants due to agricultural wash-off and petrol powered water sports. I believe that a rebate to install water tanks in residential areas would be great and also making installation a requirement for all new dwellings which are built would help to encourage and educate a water conscious society.
1087	As out water augmentation is being driven by new urban developments, I believe that all new Greenfield Developments should be mandated by Council in the DA Approval process to provide Dual reticulation for toilets and outdoor use as well as a mandatory 10,000lt tank for washing machines and showers. (If council cannot afford this, the developer should pay at least 50% of the cost). Both of these implementations will reduce water use substantially, reduce urban run off and also discharges from sewerage treatment plants which ultimately pollute our waterways. I do not support a new dam at Byrrill Creek, Tweeds highest riparian conservation value area.
1088	Rebates for devices and tanks are usually not suitable for people struggling financially.
1089	Education for property owners and farmers where chemical run-off could go into waterways.
1092	There's been a lot of education about household water usage management but not enough about industrial commercial management. I have seen on many occasions the water sprinklers on at Salt Resort when it is pouring rain. This a complete waste of water and needs to be managed better. I've also seen sprinklers facing out to the road.
1096	It is absolutely important for education which follows through from Council to land owners to home owners e.g. watering, time of water and use of water. We all require education to promote the best for our tomorrow.
1098	Need to have another dam in the shire.
1103	Raising existing Dam as opposed to building new dam.
1104	I very much think that Dual Reticulation or other water management scheme should be required houses in the huge developments of Cobaki and Kings Forest so that the provision of water does not become an issue for the Shire. If property owners knew this was required before purchase, it would be accepted and would be a small percentage of the cost of the land and house. This along with maximum harvesting of stormwater etc. maximum recycling by industry/commercial businesses and continued education of the public to value and use water wisely should ensure that a dam is never again considered and that the Clarrie Hall Dam wall should not be required to be raised. However, if extra water were needed in years to come, Clarrie Hall Dam should be raised, not a dam at Byrrill Creek considered. If Council consider that there will be insufficient water resources in the Shire with stormwater harvesting, recycling etc. and shire residents reducing their usage, the developers of Cobaki and Kings Forest should be required to pay levies to cover the increased water demand similar to Section 96 to fund infrastructure for roads etc. They are making megabucks from the development and existing ratepayers, or the new ones living in these developments, should not be expected to fund extra water needed, especially if prudent water use measures are not put in place for each dwelling. Also I think it should be mandatory for the houses in these developments to have 10,000lt tanks plumbed into the toilet and laundry (there are slim line ones if space is a limiting factor) unless it is just simply not possible. Studies show that Australia has the largest houses in the world which is widely regarded by thinking people to be VERY UNSUSTAINABLE. I think only 5,000lt tanks are required at the moment and I don't know if this is even mandatory.
1107	It would be beneficial for Council to give incentive, such as a subsidy for householders to install rainwater tanks.

1109	Prefer not to have water restrictions unless severe drought as people are already cutting back on their water use and having restrictions which make the area dry and brown is a greater fire risk and deters people from gardening and growing their own fruit and vegetables. The amount of rainfall received in the Tweed is generally fairly high and imposing restrictions which are not necessary just deters people from taking pride in their gardens and the environment and detracts from the beauty of the area which tourists and holidaymakers enjoy.
1110	Build new dam at Byrrill Creek.
1111	I am on a rural property. I have a spring fed dam which never runs dry. I have rainwater tanks for drinking. I would not like to have town water and have to pay for water usage. I think all households should have their own water tanks whether rural or in the suburbs where town water is supplied, a rebate for setting this up would be helpful.
1112	The Tweed Area is expanding all the time so that means the population grows each year. I think of the future years down the track for my kids and grandchildren so maybe it's time to build another dam to cope with the demand of drinking water. I think recycled water should be used for toilets and washing and showering etc . I always worry if the water supply dries up we all dry up. Thanks for an interesting survey.
1113	All new urban developments should be connected with recycled water with storm water captured and recycled too. Runoff water everywhere should be filtered to avoid toxins entering the rivers and estuaries. Stop farm animals and runoff from polluting all rivers and creeks through fencing and swales. Encourage landowners to revegetate river banks and address erosion. Re educate residents that think recycled water is for drinking and that recycled water would be retrofitted to existing homes. Continue supporting landcare groups in their endeavour to address water quality. No new dams. Make river health a shire wide priority.
1115	We have a lot of naturally available water in terms of rainfall in our region. Every dwelling and every building should be required to harvest rainwater i.e. water tanks from it's roof for toilet flushing, laundry and gardens at the very least. Water recycling/re-use storage systems (e.g. shower water used again in the garden, clothes washing, toilet flushing etc.) in domestic households it should be supported (subsidised for existing buildings, required by council in all new buildings). When we have so much water available to us in the form of rainfall, I think the best approach is harvesting and using that available water in the most efficient ways, rather than dams providing all water requirements for everyone and then restricting water when dams get low. Individual households should take some responsibility for their own water provision and use levels with council providing clean drinking water and back-up water where needed to households, probably at a cost after a minimum is provided free. So rainwater tanks, water re-use systems in all buildings also harvesting stormwater run-off for use seem like the best approaches in our region .
1116	I think the Tweed water is some of the best drinking water in Australia considering we travel a fair bit. I have no hesitation in drinking Tweed Water straight from the tap. Some other areas of Australia the water tastes foul and we have to buy drinking water even for making a cup of coffee. Can certainly tell the difference. So thanks Tweed for what you are doing.
1117	All new and eventually all houses should have a water catchment system.
1119	Make water collection mandatory for all new houses. Make composting toilets compulsory as well. Use recycling system for grey water.
1120	I would like to see town water available to rural areas that are still close to town.

1121	Have just moved here from a rural property. Very used to saving and recycling water but feel more education is needed in suburbia. Although have only been here a short time feel that Tweed Council is doing a good job getting the message across and that it all takes time to get through to some people.
1123	Recycling water is a better way of water conservation.
1129	I think we should invest in more payments to households for water saving devices and plans instead of making people pay for them as it would save them money in the long run.
1131	That the increase of the existing dam wall is a far better plan then the production of a new dam
1132	When it rains quite heavily systems need to be in place to capture this water and save it for times of need.
1148	Get body corporate properties on individual meters as soon as humanly possible so each individual property owners/ or the renter in some cases share the responsibility of excess water use. The NSW Sate Government requires this but this Council takes every step to avoid doing this at every turn. Choosing to read metered properties and bill every three months doesn't really reduce consumption it really just increases the workload of staff. Typically in a body corporate situation I have a leaky toilet flushing system, should I have a plumber replace or repair the control mechanism or let the rest of the residents share the low cost of my waste, including long soaking showers and so on. That decision will save me $100 but the wasted water (shared cost) may only cost me $1.20. I would install a water tank on my property but I won't waste my money doing that while someone in the area has an automatic watering system dumping water on there lawns and gardens rain hail or shine. There is no cost benefit in me taking that step. Incidentally I had 3 tanks at my last 3/4 acre home and used 57 litres per person per day and I still have the figures to substantiate that claim! I read my meter every Sunday when I picked the paper delivery up at the front gate! Yet if I choose to run the irrigation system to water my gardens that would use 3000 litres per night - I was happy to pay for the excess water I used and hence when the restrictions came in force in the Caboolture Shire we stopped the full irrigation. This council has a responsibility to install read and implement a full individual metering process wherever possible and as expeditiously as possible! In our complex that could start tomorrow! i.e. Read meters check flow rates of current meters, if the meters are in accurate request owners to install your brand of meter.
1149	Solar wind and powered de-salination plants. Suggest these facilities be small to medium in size. Installed using long term planning and construction.
1150	It seems ridiculous that all water that passes through the system is treated to drinking standard when only a very small percentage is used for consumption. Bourke has dual reticulation, it is an option!
1152	Compulsory rain water tanks, use of recycled water in all new housing estate and in all industrial areas. Farmers allowed to harvest more rain water collected on their on properties either with tanks or dams. Downside with current council's decision is that they have yearly charges on rain water tanks in urban households which deflects the goal of promoting self sustainability. Educating the public and business sectors about water saving is also highly commendable and should be strongly encouraged. Building more dams to cater for predicted growth I AM STRONGLY AGAINST. Methods to harvest stormwater runoff should be investigated.
1153	Modernize. all new developments should have own water collection / recycling rather than more dams.

1154	I would like to be able to access the tap water chemical make up and parameters, e.g. hardness, salinity, ph, phosphate, and what chemicals are added to the water etc as I keep tropical fish and need to know what's in the water.
1157	I am happy to use re-cycled water for gardens, toilets, outdoor wash downs e.g. cars, paths etc. Not too sure about treated effluent for laundry though. Generous rebates for tanks is a terrific idea!
1159	Newly constructed homes should construct rainwater harvesting systems, perhaps slightly subsidized by rate payers. Place substantial fees for swimming pools above and below ground and spa baths. Existing households pay very much higher water rates to appreciate the value of water.
1164	The Clarrie Hall dam catchment area needs to have the cows fenced off. This would slow down the aquatic weeds in the dam.
1165	I would like to see all new housing developments be developed with the capacity to use recycled grey water for toilets, gardens. As our area grows, we must be mindful of why it grows the natural beauty of the Tweed. Our residents always put environment first in every survey. I think the developers should be footing most of the costs for the infrastructure of these developments not ratepayers.
1166	A new dam on Byrrill Creek should be taken off the agenda completely, once and for all. Dams make us lazy in our efforts to find other alternative strategies such as reuse, stormwater capture, rainwater tanks and generally reducing usage.
1167	Please take care of the water ways, beaches and lakes.
1170	Need to consult with the community.
1175	As the population is continuing to grow, so should the supply grow with more storage dams considered.
1179	Continue to educate all residents with new ideas to save water and also focus on industrial usage.
1183	I think Council should be very mindful of the impact of climate change on future water management and plan for this.
1188	The only thing I can think of is the run-off from the road to the water behind Seagulls along the Oyster track , I think it could be managed better as a lot of sludge and rubbish is washed into the water where the Oyster farm is . I think recycled water is a great idea especially for parks and household gardens. I believe each household could also use a small tank for garden usage and a rebate for instillation (I realise there is one but maybe continue it and or increase the rebate to encourage people to install one) or a free one would be would be an advantage.
1189	Keep up the good work as tap water for drinking beats bottled water any day .
1196	I think that water restrictions should be on all the times. Introducing restrictions at the last minute or a trigger point is reactionary e.g. watering of gardens odds and evens, trigger nozzle for hosing and cars washed by using high pressure sprayer.
1198	All new developments must have water tanks and reusable grey water systems.
1200	I believe that education is critical and that the community should be in an informed place when making vital decisions such as issues relating to water management. Therefore, forums and community meetings would be beneficial.

1203	New developments should be made to install rain water/grey water reuse and existing households should be rewarded or subsidised for installing the same if they choose to do so. Grey water or recycled water to be used on all outdoor activities, toilet and laundry facilities.
1204	Recycled water is a viable option for the future.
1206	There should be more education from an early age so it becomes normal behaviour as our children grow up, to save our planet. There should be fines for wasting water and polluting our waterways .
1208	Rebates attract people to change for change sake and costs the Council a lot of money and businesses inflate the prices of these item and services making them more expensive, therefore making extra monies from the Council.
1209	Ongoing education of all residents is a most important part of any planning. We all need to take responsibility for being careful with our water use.
1210	While controversial, I believe a new dam is the best option for future demand of water use. I am strongly against desalination plants.
1213	Having previously lived in a rural area with only rainwater available, I am very mindful of the amount of wasted water coming off our roofs. Council should encourage residential catchment and use of rainwater to augment the reticulated supply.
1214	Personally I would like to install water tanks but require a little assistance with that given the capital cost. Having recently migrated here from Melbourne the concepts of water saving education, measures and targets are well ingrained. The target of 155 Litres per day was achieved in our home through water tanks and vigilance. What I may not understand at present is the mix of rural and urban populations in our shire and the direct impact of the rural landscape upon the water supply.
1218	Encourage more households, especially older homes to install rainwater tanks and also be able to use rainwater for showers as well as toilets and washing.
1220	I think there should be an incentive for households that use less water than the target. We are a family of 7 and we come way under the target. Our neighbours are a couple only and use way more! I think a discount on water or rates or a bonus in some form would be a great way to motivate residents to reduce their usage. Maybe also suggesting some ways to reduce water use in your newsletter would be great, perhaps you could ask residents to send in their suggestions and the best each week wins a prize. Prizes and discounts would be my advice for trying to change people and business attitudes to water use.
1223	Consideration of decentralising water harvesting, recycling and reuse into much smaller and more manageable catchments e.g. new subdivision could have there own system rather than rely on the larger more regionally based systems. The street or block storage unit (collecting run-off etc) could then supplement individual water tanks. More education in terms of water smart house design. This could include more interactive displays of water usage at the point of usage rather than a meter hidden away in the garden with numbers that no one understands.

1226	I am concerned that the present water level at which restrictions are applied by Council of 75% full, points to an inadequate total maximum storage. 75% in other places e.g. Sydney and Melbourne represents more than a years supply; in Tweed it is obviously much less but I don't think the estimated weeks of consumption in storage is public knowledge. We know that seasonal rainfall predictions seem now to be less reliable with the onset of global climate change and it is therefore more responsible for Tweed to begin a program to increase its safety stock of water by expanding and controlling the catchment volume than to adopt short range conservation policies and hope for the best. The cost of this program is likely to be less than the cost of building and maintaining a desalination plant, ($16M PA for standby cost of Tugun's desalination plant, Tweed Sun, 6 Dec 12). The increasing development within the Tweed Shire with growing population will place more demand on reliable water resources which emphasizes the priority for Council to commit to the long view.
1228	Tweed Shire is blessed with one of the most beautiful and diverse environment with a sub tropical climate which fortunately receives adequate annual water supply. This natural beauty and the river systems must be protected for the future of our valley. Encouraging both industry and residential households to be aware and develop water saving processes is essential. Permanent water restrictions are not warranted with our current climate but Council should be looking to developing an alternative dam water source over the next 20 years.
1236	I believe if we all manage our water usage better now, then our own children of today will learn to respect our most important life force and they in turn will teach their children for future generations to come. Water is our livelihood and also provides food on our tables. What more can I say. Keep up the wonderful supply of fresh clean water we so fortunately have now. Teach everyone how to save water more often as this can only be beneficial in the long term. I cannot see any other method of preservation.
1238	This survey did not include questions that people already living just on rainwater collected on their properties could easily answer e.g.. how much more would I pay for recycled water. Not enough focus in the survey on the option of rainwater collection in urban areas.
1243	We have a few neighbours who persistently hose their road and gutters every day which is a blatant waste of water. This practice should be prohibited.
1247	If Council stopped approving large housing developments, they could conserve water and natural waterways.
1248	I'm a big believer of recycling.
1252	As long as people are educated on simple ways to conserve this precious resource the management of this should be sustainable. Severe consequences should be dealt to those who threaten our beautiful area.
1254	Recycled and rain water is an efficient way to save water.
1257	I cannot understand why it's not compulsory for every new house or units built to have rainwater tanks. In the case of units, why isn't all the catchment not stored underground and used for gardens toilets etc. Instead it is just wasted down the stormwater into the rivers and oceans, such a huge waste. It all seems very simple and logical.
1258	Should raise Clarrie Hall Dam then build Byrrill Creek Dam.

1259	All storm water should be used for our toilets and pumped out to the farmers so we keep our fruit and vegies cheap and also support our Australian farmers to keep their farms alive without struggle, maybe costly to help the farmers but beneficial in the long run especially if solar or wind is used to pump the water out. Also sewage water should be used if cheap enough to recycle on things that do not require coming into contact with human needs, not even laundry. It should be used to clean down machinery or factory floors where it's not going out to the ocean. Also using the Tweed river for water will eventually increase the salt content in the water and so I think should not be used. I'm unsure of the facts but in any case think it should be left alone as I'm sure it would affect fish in the ocean or other disturbances. Lastly there should be more rebates for solar water and electricity and good rebates on putting power back into the grid, as again it maybe costly to start with but we are creating a good economy by helping people out finically so they can put more money back into our country to improve it. Not just giving them money to spend but actually giving discounts to improve and that can only be good. Laundry water should have something given out by the Council so it can be used (our grey water) to water our gardens therefore saving once again on water.
1260	I would prefer Council to spend money on many water tank rebates and rebates for plumbing to the whole house or at least toilet, shower and washing machine and never build another dam and all the infrastructure. As well as helping alleviate supply needs, tanks relieve waste water pressures. We can never underestimate the importance of our natural water ecosystems for us locals, visitors, recreation, livelihoods, and for the whole nation and future generations. We must value it in every decision and enhance it's functioning.
1261	I think the priority should be for every home to have a water tank.
1263	Keep looking into the future and make decisions on the number of households there will be in the future.
1265	We need a tank scheme to encourage at source collection of rainwater for household use.
1267	I have a form of TB called 'Bronchiectasis' or 'Lady Windermere Syndrome' which my lung specialist has told me has probably come from our tap water supply, so now I have to buy and drink only bottled water.
1271	Don't build a new dam
1272	Council to ensure that future water cycle management priorities are actually activated and are not just words without substance to make Council members sound as if they are doing something towards the future of the Tweed.
1273	As far as community education is concerned, a weekly water saving tip on the front of the Tweed link would be effective, especially if it is made children friendly.
1275	The one and only thing that should be allowed during water restrictions is washing of vehicles once every 2 weeks. Vehicles are an expensive part of our lives and should be looked after.
1277	Lots of warning to enable ratepayers to modify their usage before restrictions become necessary. Hand held hoses and no sprinklers during restrictions. Commercial car washes to recycle water during restrictions.
1278	Enable homes to utilise semi treated grey water for garden use is a must!
1281	Environmental protection should be the highest priority. If population growth is not going to be addressed all systems should be on a user pays basis. I don't mind as a ratepayer paying for services and programs that protect our waterways but funding needs to be used wisely. I'd rather pay for preventative measures to be put in place rather than funding repair works.

1283	Water tanks for households is an easy option for individual use. Encouragement and rebates for existing houses and compulsory installation in new houses is a good idea.
1284	Any new development should be required to have water tanks or water storage.
1286	The solution to water availability is to alter the way we use and think about water, not to just continue to provide more. Water is the worlds most valuable resource and we need to alter our perception to reflect its value.
1287	Education of school children would seem a sensible path for future water management. If they can understand the prospect of a possible future with insufficient water. This should help to reduce water consumption. Maybe Council could offer a prize for the best projects and ideas, this may involve parents also.
1288	A healthy natural environment is the most fundamental necessity for life to flourish and that includes human life. Despite our technology, in the long run we are not insulated from the damage that is done to the natural world.
1289	All houses should be fitted with a rainwater tank to maximise water supplies. Prevent random wholesale clearing of hills and river banks to reduce erosion and improve water quality.
1294	I think educating people about being water wise is huge, especially for young people. Don't know if there are any water wise programs going around schools but would be a good idea. Need to be taught water is precious. There are still a lot of people in the community who are not very water wise e.g. they leave water running when washing dishes with no plug in sink.
1295	Other alternatives should be made available.
1296	Bear in mind that no matter how comprehensive a strategy is arrived at for future water usage, Council must recognise that any water supply (except for desalination) is entirely dependent on rainfall. Future plans must include strategies for both too much and or not enough available water. Household and business education is important for adaptability into the future.
1298	Building a overwhelmingly unnecessary dam is COMPLETELY DAFT when there are so many modern, affordable, tried and true recycling/reusing water methods available. These methods have been introduced to Council but often fall on deaf ears. Please find the time to consider these and implement them before it is too late.
1299	I really think education will help with saving water. I don't know a great deal about what will happen if we continue to over use so I can't educate my children except to tell them not to waste water.
1303	Continue the focus on sustaining low water usage through demand management measures and reduce the NRW component in the system and regularly reassess the decision window for augmentation options based on latest population projections.
1309	Rainwater tanks of at least 10000 litres should be mandatory in all new homes. A council approved composting toilet system design should be supplied and encouraged for use to home owners as an option when building and renovating their homes.
1311	I'm in favour of building the new dam. Council has prepared for this for many years. It will take years to build with all the future buildings planned to be built so our population will skyrocket. We now have a wonderful water separation plant which is waiting to work at it's full potential.

1313	Levels of protection and management do not reflect environmental significance of the areas. Increased water demand should be dependent on the capacity of the waterways to sustain environmental health which is currently not being achieved. Reduce population increases if necessary. Develop a strategy that would avoid any more damming at all costs please.
1314	There appears to be no information in high rise apartments owned, rented or holiday leased about water restrictions or conservation. Tourists have open slather to waste water which we as rate payers have to cover. This is not fair and needs to be addressed.
1315	I think that water is a fundamental need in our community. Every attempt to use water wisely and better education is very important.
1316	The survey seems to lean towards the construction of a dam on Byrrill Creek. This is an appalling and wrong idea mooted by those with a vested interest in making money. Tweed Shire has the rainfall and the population to be world leaders in water conservation and recycling. I urge you to show your creativity and willingness to preserve our unique environment. Focus on that and the rest will take care of itself.
1318	Encourage residents to purchase tanks for outside water use, maybe through a rebate system. Holiday accommodation and high rise units need to ensure signage is plentiful and obvious in encouraging guests and owners to use water carefully .
1319	Put the proposed dam in at Byrill Creek.
1321	People who want the luxury of their own swimming pool should pay premium rates. Council should monitor both wastewater and rivers and creeks for industrial and agricultural chemical pollution. Destroying natural areas especially forested areas to satisfy massive urban overuse is reprehensible.
1322	Fencing agricultural land to prevent cattle defecating in Oxley and Tweed rivers should be a priority. Water recycling would be much better than building a new dam.
1325	Reduce, reuse and recycle are the basic principals to achieving efficient resource use. Only a few percent of water treated to potable standard is actually used for that purpose. This leaves plenty of scope for using non-potable water. Naturally, Council still has a duty of care that supplies are fit for purpose. Good water management is usually cheaper in the long term than building new dams. More dams is a last resort and represent an outmoded, engineering approach to fixing a problem. Council should adopt all aspects of Water Sensitive Urban Design and IUWM. Our neighbours on the Gold Coast and in Brisbane are doing this. It has been shown to be a win for people and their environment and is especially suited to Greenfield developments such as Cobaki and Kings Forest.
1326	As well as municipal recycling of grey water there should be encouragement of and investigation into onsite reuse of water especially for gardens. This would help to lower consumption of provided water and drive home the message of reuse of water.
1327	Perhaps a generic household usage amount should be capped for all residents and if you go over then you get penalised.
1329	Emphasize water reduction strategies combined with rebates for low water appliance use.
1337	Farmers should not pay for anything.
1342	That it's cheaper for families.

1347	There should be subsidies for urban households to install big tanks such as narrow ones along fences or any size for small yards. New houses should install big tanks not the little one's being installed at present.More effort to recycle waste water and collect storm water from all buildings particularly from commercial buildings. Compost toilets should be encouraged.
1349	Recycling is a very clever idea because it is important to think ahead.
1350	We need to have better recycling and water needs to be recycled. Something needs to be introduced to use grey water on gardens rather than drinking water.
1355	Clearer waterways for recreational use would boost tourism.
1361	No one knows what the future will bring! However educating everyone from an early age about water cycle management so that it becomes a way of life rather than something to do in times of drought is probably the most important tool to preserving our future water resources.
1362	Recycled water would be a great way to help with the water supply but the community has to be educated about the proper usage of water otherwise it is pointless.
1364	If it is possible to harvest and treat stormwater to exclude any harmful bacteria, I would use it for outdoor, toilet and laundry use. I am opposed to installing and using a desalination plant for household water especially with the adverse effects from climate change already affecting our oceans. We do not know enough about what returning salt and water from desalination plants is going to do to the ocean, its marine life, reef and effects on climate. I understand Ballina Shire has a mandatory policy of installing water tanks in new buildings for toilet use. I think this is commendable and Tweed Shire Council should consider it too. However I'm unsure of what happens if the water tank runs out in drought times and whether owners would be charged for normal drinking water usage even though they have already contributed to the cost of installation of this alternative system.
1367	I don't believe it's fair to overcharge those who use more water for the same rate.
1369	Perhaps the Council should look at subsidising water storage tanks for residents home use and with professional advice where to install the tank.
1371	The ecological value of Byrill Creek outweighs the argument for a dam there. Build the dam somewhere else for goodness sake, where the nature is already destroyed. Build a dam on old farmland and replant it into a forested water catchment area and hey presto we can have more water and keep the iconic Byrill Creek. How about getting more serious about the size of household tanks, especially new housing developments that can build in large scale storm-water storage to supply the whole of the development.
1372	I suggest that rainwater tanks be made available. Grey water could be recycled too.
1373	All new developments should have waste water recycling systems, rainwater tanks and water saving devices made compulsory.
1374	Ratepayers should receive more information on the water usage in the area with comparisons to last years usage.
1375	The recycling and dual reticulation of water should become mandatory in new urban areas, as building new dams is neither cost effective nor environmentally sustainable.
1376	Not enough effort has been made to recycle or reuse water. A lot of talk and no action. Old-school attitudes prevail such as our forefathers bought the land at Byrill Creek, hence a dam shall be built there. No one in my family supports the dam option.

1377	New subdivisions, including the mini cities of Cobaki Lakes and Kings Forest must have dual reticulation and wetlands to enable them to harvest and clean stormwater runoff then recycle this back as garden, toilet and laundry water. I find it offensive that Councils all around the country are doing this yet we in the Tweed, who have such a wonderful environment to preserve are doing nothing.
1378	If population growth is to be as predicted, water usage and rainwater storage in individual household tanks and recycling of water within households must be a priority. It would be wrong at both a practical and moral level to make heavy investment in water supply so as to allow wastage and misuse to continue at the present level e.g. drinking water to flush toilets.
1380	More dams may not be the most sustainable long term answer. We need to look after the natural environment and minimise our impact rather than changing it to suit our ever expanding needs.
1381	No dams are needed. We have high rainfall to capture. Less concrete and runoff is a solution.
1384	I do not believe that another dam or extending Clarrie Hall Dam is the answer. Council should support as many households as possible to install tanks for rainwater. The Tweed is one of the most bio-diverse areas in Australia and we should be maintaining the natural environment as much as possible to ensure there is something for the residents of the future. The reason I believe all households should pay the same amount is because the two-tiered system places undue stress on low socio-economic people who have large families.
1385	The wording of this survey is biased towards reinforcing existing levels of knowledge whereby many people think that household consumption of water is the most important issue in water management and that they will have to suffer some reduction in their lifestyle if reduction in water consumption targets are to met. The ecosystem services of the Tweed Shire are to preserve and enhance in accordance with best practice, the natural environment better managed and so on. It is good that words to the effect that it is costly to provide an alternative water source are included in the survey but the concept of COST for ecosystem services and the overall positive benefits to the community of best practice water management as part of ecosystem services management is not at all adequately conveyed in this survey. This is unfortunate as many surveys conducted in the past have found a high and consistent level of concern and awareness by Tweed residents that resources be managed to preserve and enhance what makes the shire attractive to them and to visitors. They expect a 'whole of landscape' approach that responds to the World Heritage status of three national parks within the shire and sets clear guidelines for land development so that it enhances, rather than detracts from the ecosystem services of the shire.
1386	We in the Tweed should be and could be much more creative with regards to water cycle management. There are many options that could be explored and adopted. Increased cost to households is a small price to pay to protect our unique environment.
1387	Council to increase water saving by increasing cost of water, recycling of waste water, capture of roof water, water saving devices in households and industry. Drinking quality water should not be flushed down toilets. Byrrill Creek should not be earmarked for a new dam.
1388	No new dam, but all new developments in the shire should be using recycled water designed in the development for sewerage and water saving devices in the housing designs e.g. tanks are compulsory.
1389	Building more dams is not the solution. That just ruins the environment and the Tweed hasn't got much of it left. More emphasis needs to be put on the current wastage of water and how it can be recycled or re-used. People need to be educated about water conservation and not

	encouraged to think it's an unlimited source.
1390	I would like to see a scheme where water tanks are been offered to residents of Tweed Shire. We live in a rain abundant area and it's a real shame to not capitalise on that resource.
1391	It is vital that the artesian well system of underground aquifers are kept free of contaminants for future generations by ensuring that CSG gas exploration ceases immediately. A greater responsibility is taken by the Council for recycling storm and waste water and more education in water management for the general public. Enforced responsibility of usage of water by commerce and agricultural users.
1392	Water is more precious than anything and should be treated as such.
1393	I would like to see heavily subsidised rainwater tanks and grey water systems for households, especially urban. I live rurally and most people have water tanks already and a focus on industry and agricultural water reduction.
1394	Encouraging the reuse of water with dual reticulation in new urban areas and not retro fitting for existing residents. Recycled water is treated and safe for gardens, washing machines and toilets etc, and that the environment is a prime consideration.
1395	Please encourage the community to become more conscious of their daily usage through ongoing education on the topic.
1396	Strongly opposed to a new dam as I believe the future water needs should be more accurately assessed with regard to potential for recycling/reuse and true cost put onto developers of new housing that would create extra demand. Developments currently under planning consideration like Kings Forest and Cobaki should have dual reticulation. These will be bringing new demand for the next 20 years and is a golden opportunity to implement reuse strategies on a feasible scale.
1397	Council should sell off land acquired for the future dam and fund tanks to all ratepayers in the shire, thereby reducing the need for water supply options and extra expenses from ratepayers. Council should also consider the more effective costs to those who drain the springs of their water from the mountain sources which should be available to eventually end up in the water supply. These people waste water and do not pay sufficient amount for what they are able to take which in turn reduces the water available to others in the catchment areas.
1398	All new developments e.g. Kings Forest and Cobaki Lakes should be fitted with duel reticulation large 10,000Lt tanks. Storm water runoff containment provisions etc, paid for by the developer. I don't think building dams are sustainable options for water supplies in the future but waste water reuse is highly recommended.
1401	Availability of metering system for strata title properties built, prior to introduction of individually metered water supply.
1402	I believe the future supply of water for the Tweed Shire can be supplied without building any more dams. All future developments should have rainwater tanks as compulsory and existing houses could be subsidised to put a rainwater tank on their house. If more water was needed I would prefer raising the existing dam. Byrrill Creek definitely should not be dammed under any circumstances. Ongoing education is important. Our precious water should certainly not be sold to the Gold Coast. Future developments should only go ahead if they can provide their own water supply - thus not increasing the demand on the system.
1403	Protection of underground water. No mining in the Tweed.

1406	We should be looking at alternatives to dams i.e. stormwater harvesting, recycling, large rainwater tanks and dual reticulation especially in new housing estates like Kings Forest, Cobaki Lakes and Terranora etc. If these housing estates are self-sufficient water wise, it drastically reduces the burden on the whole shire. If the developer was responsible for the cost of these it would also mean ratepayers don't have to keep paying higher rates.
1407	I would love to see council being more creative and looking always to current best practice water management. The revelry of the natural environment and the health of the waterways and catchments is vital. Healthy catchments are in everyone's best interest. Onsite water catchments and storage as well as dual reticulation should be mandatory In all new developments in the Tweed. If a rebate system has been proven to be effective, utilise it. If charging more reduces use, use it. I am opposed to building another dam at Byrril Creek and would only like to see Clarrie Hall increased if all other options have been tried. It makes good sense to me that if the Tweed waterways can only sustain a certain population we should look seriously at the viability of all future development applications in light of this. Let's work out what is possible and desirable and forward plan future developments from this rather than approve developments of large towns and then wonder where we shall find the water. Kings Forest and Cobaki should both be models of best practice water management. Thanks for the opportunity to have my say.
1409	User pays system is the fairest.
1410	Generally I would like to see more recycled water and incentives especially with new housing developments. I currently rent and I'm limited to what is available, however as a home owner I would invest in many initiatives if available. I would like to see cleaner harvesting and reuse of storm water before it enters our waterways.
1412	Force new developments to install water saving infrastructure so no new dams need be built.
1414	Planning and development has not been considered as part of this survey. That is if population growth is not controlled and community strategic plans do not address natural environmental degradation then we lose the ability to provide the very resource we seek to protect.
1416	Rebate scheme for installation of rainwater tanks and the use of grey water for toilets and gardens.
1417	User pay system is fair.
1418	Save as much water for future generations.
1420	I think there should be more than two tiers of water charges, such that extremely high water use is penalised more heavily. Of course the size of the dwelling e.g. number of bedrooms needs to be taken into account when determining acceptable usage levels.
1424	In the future we will have to have a sustainable source of water.
1425	I think it's imperative that the environment and waterways are protected and maintained for the near and far future residents and community.
1439	Recycle more water.
1443	Introduce water tanks into drains to catch rain water and use it for washing machines and tap water in the garden.
1444	Industry's should have recycled water which can be used for agriculture and industrial water use.
1447	Construction of an additional dam to ensure water supply for the Tweed.
1448	Try and recycle as much as possible and save money for society.

1450	Protecting the environment and recycling water and also sharing the burden of Council with farmers water to make sure of a sustainable future.
1451	There should be a greater effort on rehabilitating the natural environment.
1458	Where possible people should be encouraged to convert to tank water and disconnect from Council water. If tank water conversion occurs the householder shouldn't be required to pay water rates.
1459	I don't think new dams are appropriate. I think a moratorium on development is more appropriate. People here live for a lifestyle not to help developers who develop for today's profits and not tomorrows concerns.
1462	I'm all for building a new dam. Please do not close the Tweed River of boating activities. Boating is our life.
1469	Use recycle water from tanks.
1473	Desalination plants would create more drinking water but probably at too much cost.
1479	I would like the environment not to be effected.
1481	Council should work hard to improve the quality and taste of drinking water.
1487	Making a spot in the river that is suitable for swimming and has clean water.
1488	Build a new dam in Tweed area.
1489	More emphasis on water conservation and maintenance of recycling systems.

APPENDIX 3: RAINWATER TANK ASSESSMENT

RAINWATER TANK ASSESSMENT

The appropriateness of the current rainwater tank policy was assessed for a range of rainwater tank sizes on mains water consumption for a number of different water uses. The analysis was carried out using the spreadsheet based Rainwater Tank Model (version RTM 2.1) developed by DWE (now NSW Office of Water).

Rainwater tanks provide a potential alternative water source and can reduce the demand on the mains water supply. However, there are a number of constraints which need to be considered, such as rainfall, roof catchment size, purpose of use and cost, to ensure that the most appropriate sized rainwater tank is installed. Although larger rainwater tanks provide a greater capacity for storage and to reduce the demand on mains water, they are more expensive and may be restricted by planning controls and space.

The aim of the rainwater tank modelling was to assess a number of different rainwater tank scenarios and determine a scenario which best suits the 'average' house in Murwillumbah. Model scenarios were run using a variety of tank sizes and a combination of potential home rainwater uses as follows:

- External use only – garden watering and car washing;
- External use as well as internal toilet and washing machine use.

These two scenarios provide a good indication of the effectiveness of rainwater tanks, based on historical rainfall and temperature information. Assumptions for inputs into the rainwater tank model are presented in Table 18.

Table 18: Assumptions and inputs into the Murwillumbah rainwater tank model

Item	Model Assumptions
Roof area draining to tank (m^2)	160
First flush volume per storm (L)	20
Rainfall water lost due to wetting and evaporation/storm (mm)	0.5
Roof runoff factor (overflow, etc.) (%)	90
Residential annual average external usage (L/d)	150
Residential annual average toilet usage (L/d)	105
Residential annual average cold water washing machine usage (L/d)	88
Total average daily household usage (L/d)	165
Rainfall and temperature data from Bureau of Meteorology for Murwillumbah – 20 years between 1981 and 2001	

The following figures illustrate the results of the modelled scenarios. These figures demonstrate the volume of water saved, the time the tank is full each year and the percentage water which will still need to be supplied via the mains supply required for the different sized rainwater tanks.

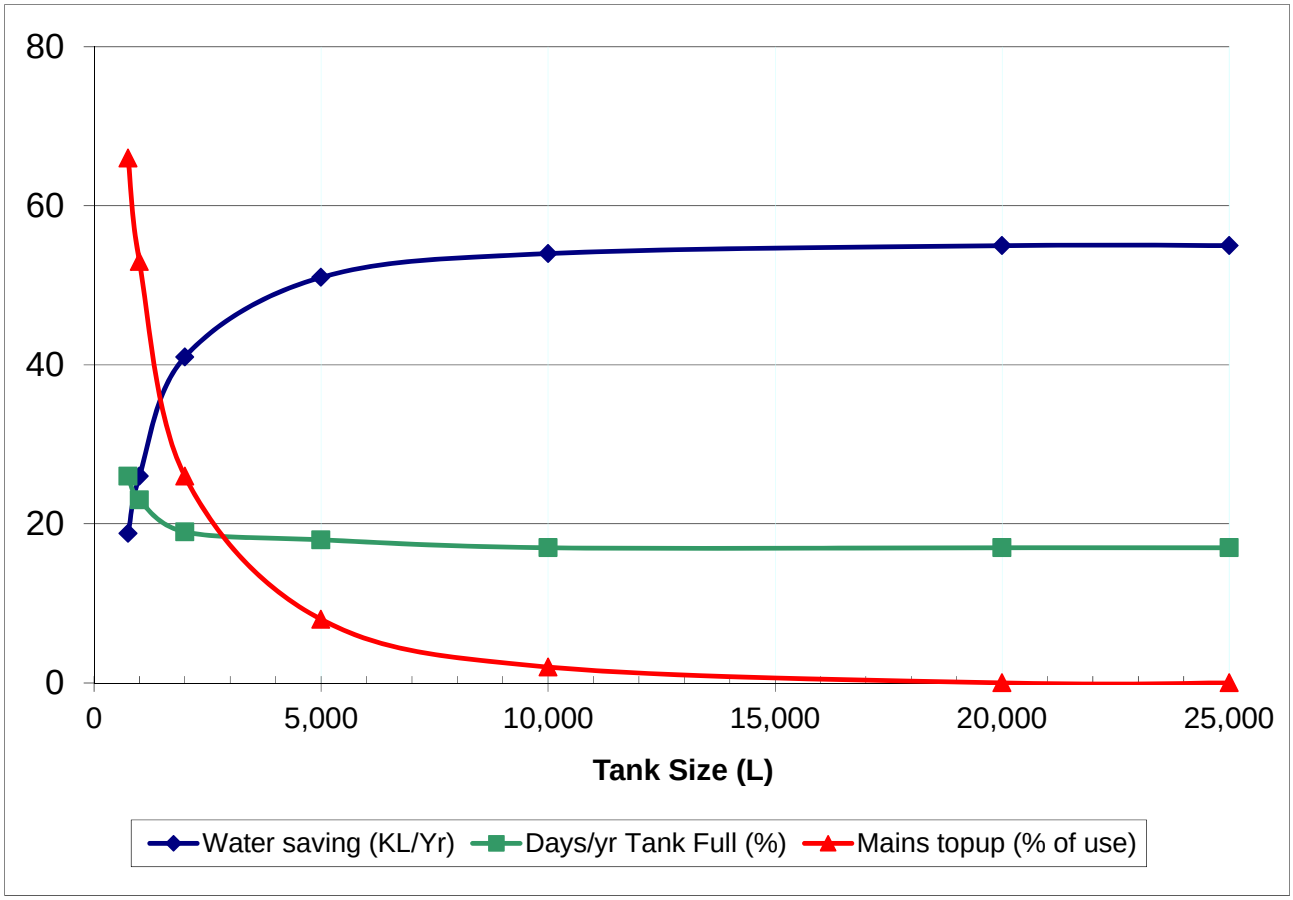

Figure 21: Murwillumbah Scenario 1- Rainwater tank size comparison for external use only

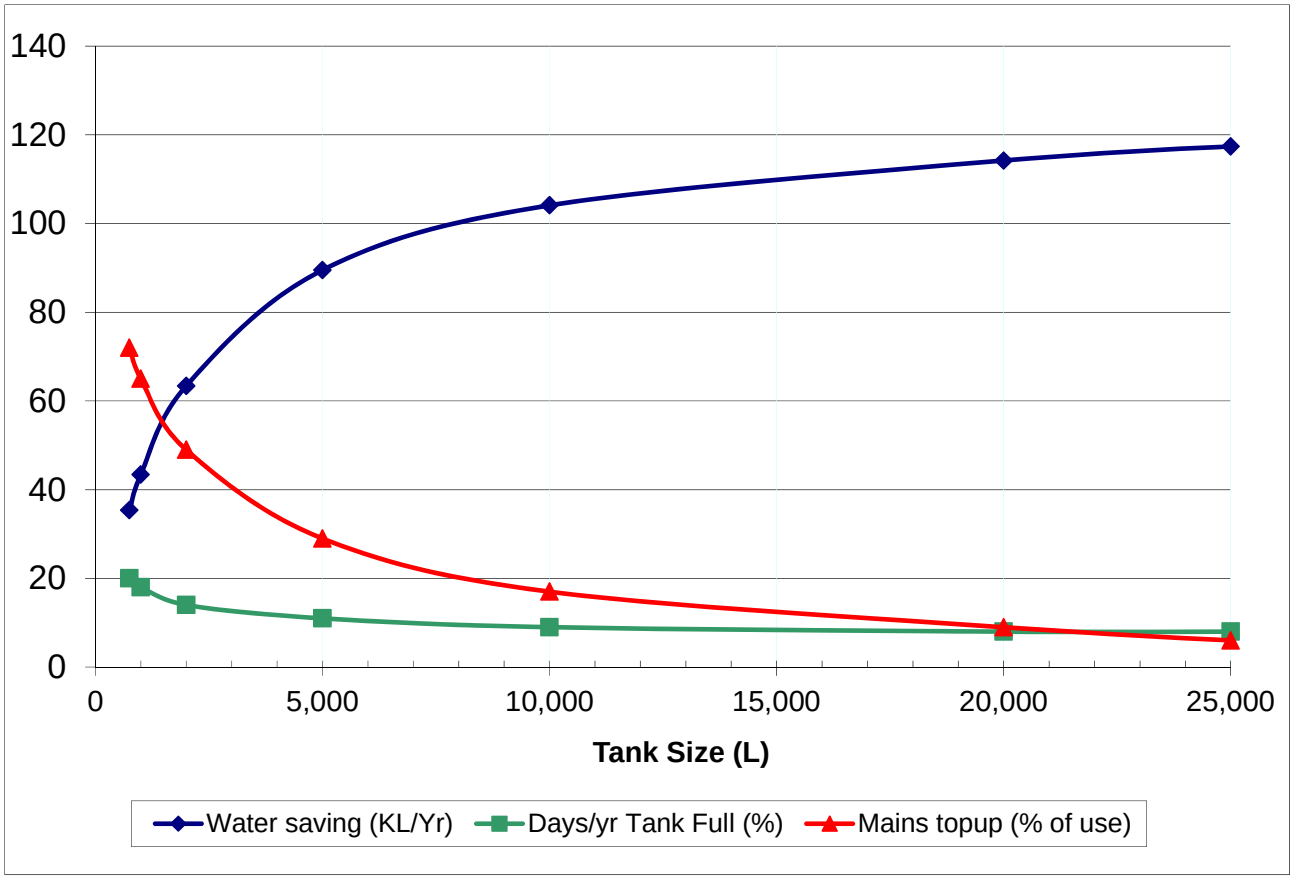

Figure 22: Murwillumbah Scenario 2- Rainwater tank size comparison for external, toilet and cold washing machine use

Based on the results of the model, the optimum tank sizes for an average home in Murwillumbah are shown in Table 19. The effectiveness of the tank size increased significantly up to these sizes and there was a reduction in additional benefit for tanks over these sizes. Due to the high rainfall, the optimum tank size increases with additional rainwater use. Similar results were obtained for coastal areas.

Table 19: Output from the rainwater tank model for Murwillumbah - Optimum tank sizes

Output	Scenario 1 – External Usage Only	Scenario 2– External, Toilet and Washing Machine
Optimum Tank Capacity (L) [1]	5,000	10,000
Roof Runoff to Tank/Year (kL)	216.2	216.2
Rainwater Usage/Year (kL) (%)	50.2 (23)	103.7 (48)
Average Tank Storage (kL) (%)	3.6	5.5 (55)
No. of overflow Days/Year	65	34
Average Overflow Volume/Overflow Day (kL)	2.6	3.3
Maximum Daily Overflow (20yrs) (kL)	39.5	39.3
Days per Year Tank is Full	65	34
Non-Tank Mains Usage per Year (kL)	54.8	125.3
Mains Top-up Usage per Year (kL) (%)	4.2	21.2 (17)
Mains Water Saving and Roof Stormwater Reduction (kL/yr)	50.6	104.1
Total water bill saving ($/yr) (%) – based on TSC 2013 tariff	93.65 (22)	192.56 (45)

1. Based on Figure 21 and Figure 22

APPENDIX 4: IWCM SCENARIO COSTS

Ten Year Costs of IWCM Options and Scenarios (2013 $)

Option		Ten year total additional cost
Level 1- Current Strategy		
All	No increase above current budget	-
Level 2 - Urban Water Cycle Management Improvements		
2b	Strengthened community engagement process	110,000
3b	Improved data management	260,000
5c	Full compliance with best-practice guidelines	20,000
5d	Review and Update Sewer Overflow Abatement Strategy	50,000
5e	Review and update water supply and wastewater Business Continuity Plans	150,000
6c	Climate change adaptation – flooding and tidal inundation	150,000
6d	Climate change adaptation – surface water availability	250,000
6e	Reduction in energy consumption and greenhouse gas emissions	Included in Council's broader sustainability initiatives
7b	Improved community understanding of water consumption targets	55,000
7c	Targets for non-residential consumption	Minimal
7d	Water Loss Management Program	150,000
7e	Review of effectiveness of RWTs	35,000
7f	Rainwater tank rebate	700,000
7g	Permanent water conservation measures	30,000
9d	Drinking water catchment planning	100,000
10b	Review and update Drought Management Strategy	150,000
13b	Biosolids Management Strategy	150,000
18b	Provide increased OSSM resources	1,400,000
Total – Level 2		**3,760,000**

Option		Ten year total additional cost
Level 3 - Total Water Cycle Management		
1b	Integrated Council-Wide IWCM Delivery	1,200,000
2c	TWCM community engagement process	100,000
3c	Increased understanding of total water cycle	100,000
4b	Strengthened IWCM policies	50,000
5f	Management of natural assets	100,000
11b	Integrated servicing strategies	160,000
11c	Identify opportunities for increased water recycling	250,000
14b	Greater integration of WSUD across Council	500,000
15b	Develop guidelines for compensatory measures	60,000
16b	Review and update erosion and sediment controls and provide increased resources	1,520,000
17f	Review of Streambank Protection Policy	20,000
17g	Total water cycle management framework and sub-catchment plans	450,000
17h	Upper catchment floodplain planning	400,000
17i	Monitoring, evaluation and reporting	400,000
18c	Integration of OSSM with water cycle management	Included in TWCM framework (Option 17g)
Total – Level 3 (Including Level 2 costs)		**9,070,000**