



Six Year Integrated Water Cycle Management Strategy Review

Background Paper

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PROJECT 12-020– TSC SIX YEAR IWCM REVIEW

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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 defensible 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 be 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.

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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.

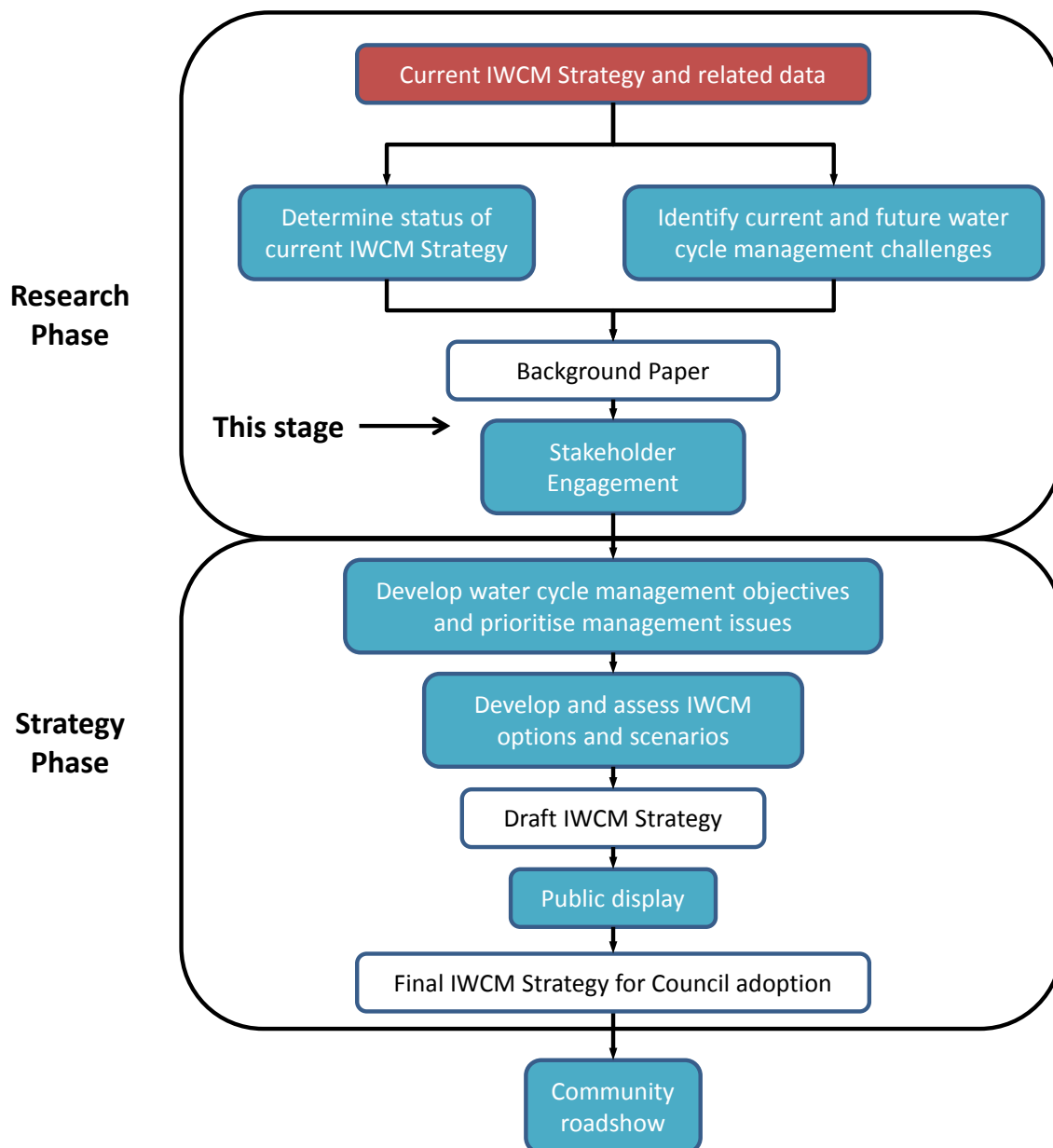


Figure 1: Six Year IWCM Review Process

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

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

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, <i>Local Government Act, 1993</i>
	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.

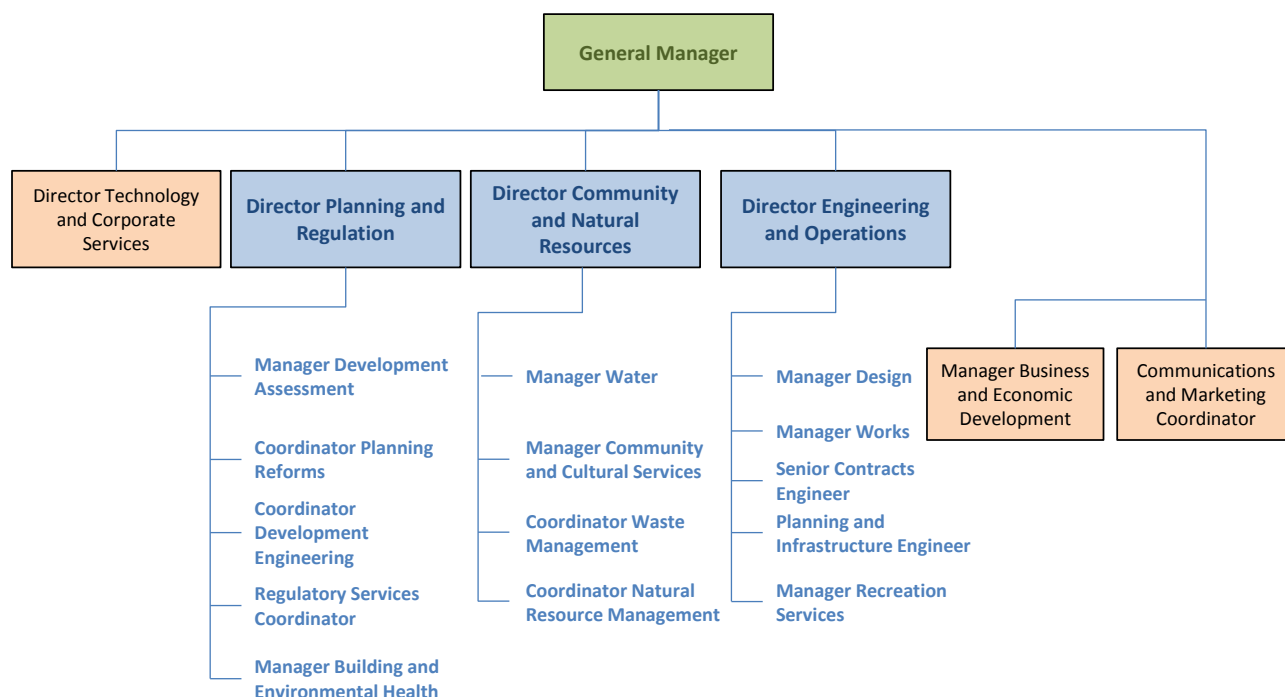


Figure 2: Council organisation structure and functions related to water cycle management

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 defensible 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.

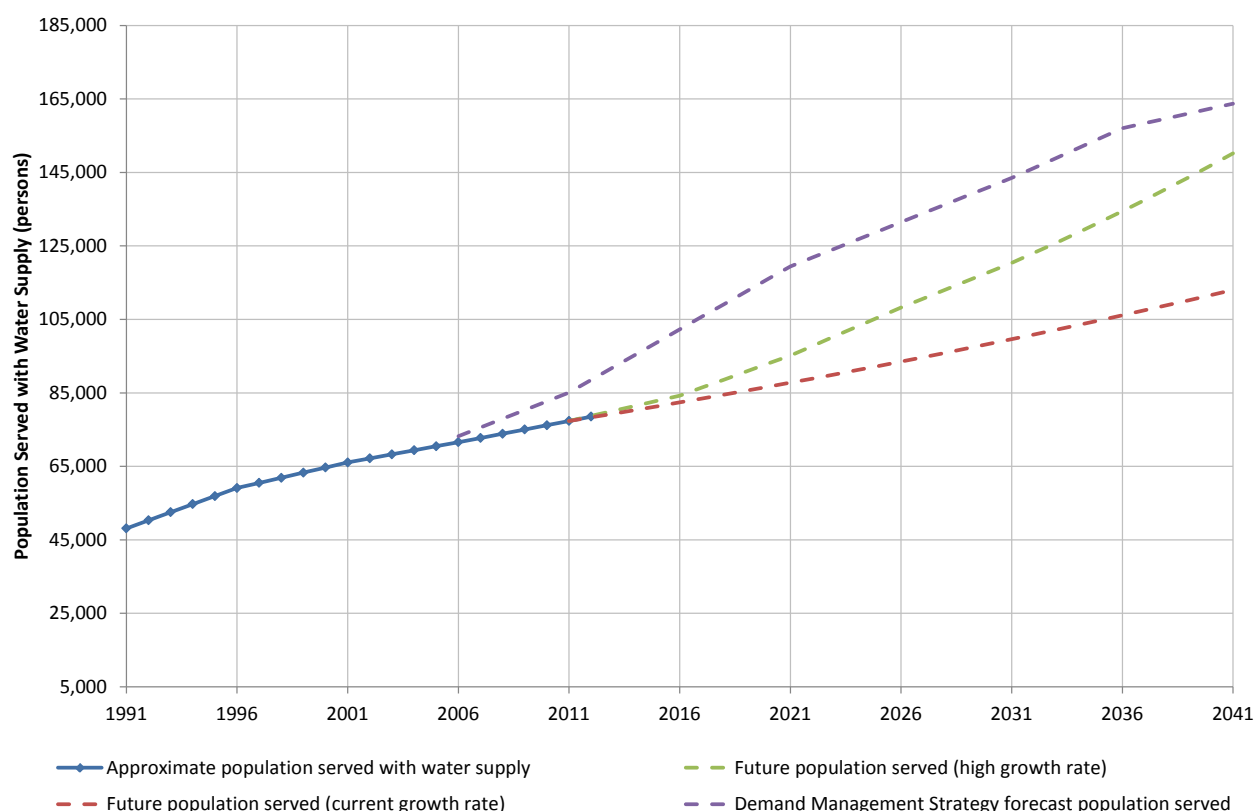


Figure 3: Comparison of population forecasts

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 CO₂ equivalents per 1,000 properties compared to the state-wide median of 360 tonnes CO₂ 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 CO₂ 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.

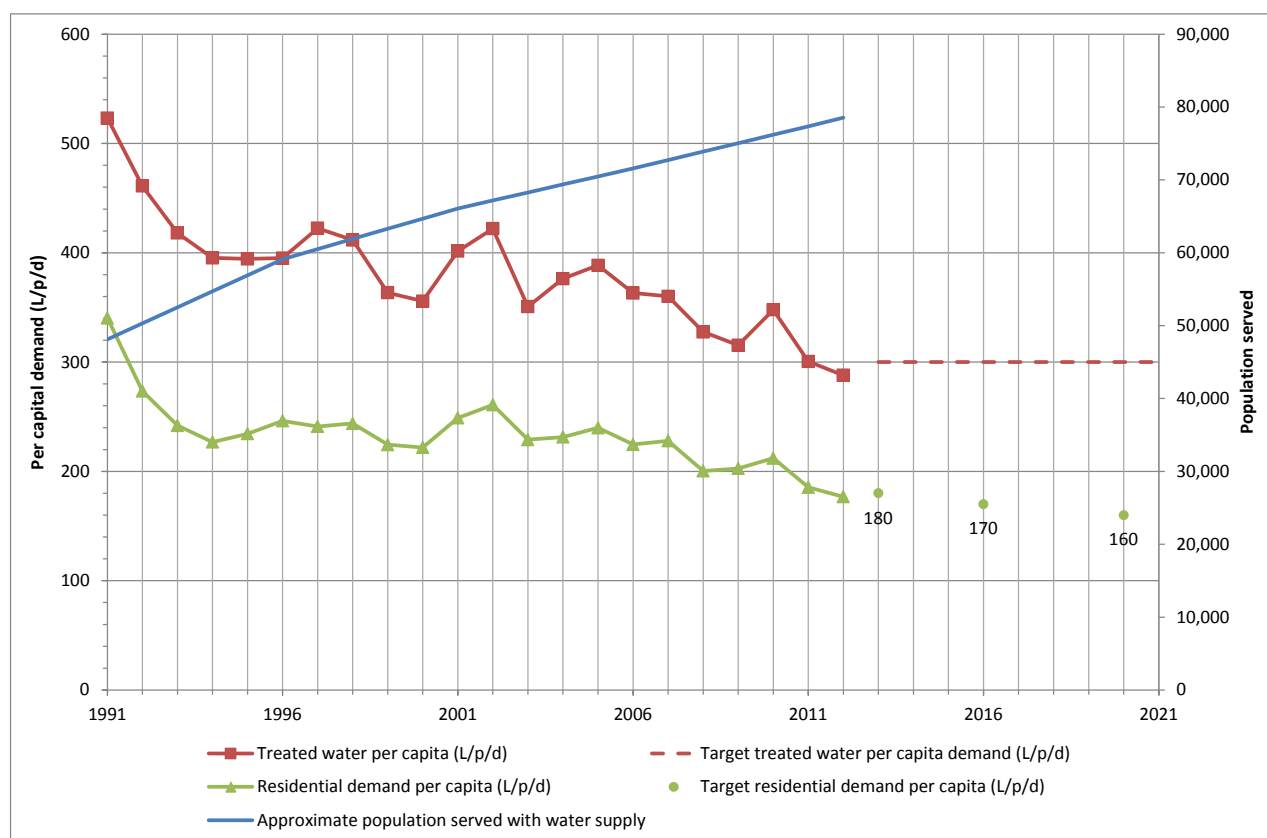


Figure 4: Water Supply Demand KPIs and Targets

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 m². 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.

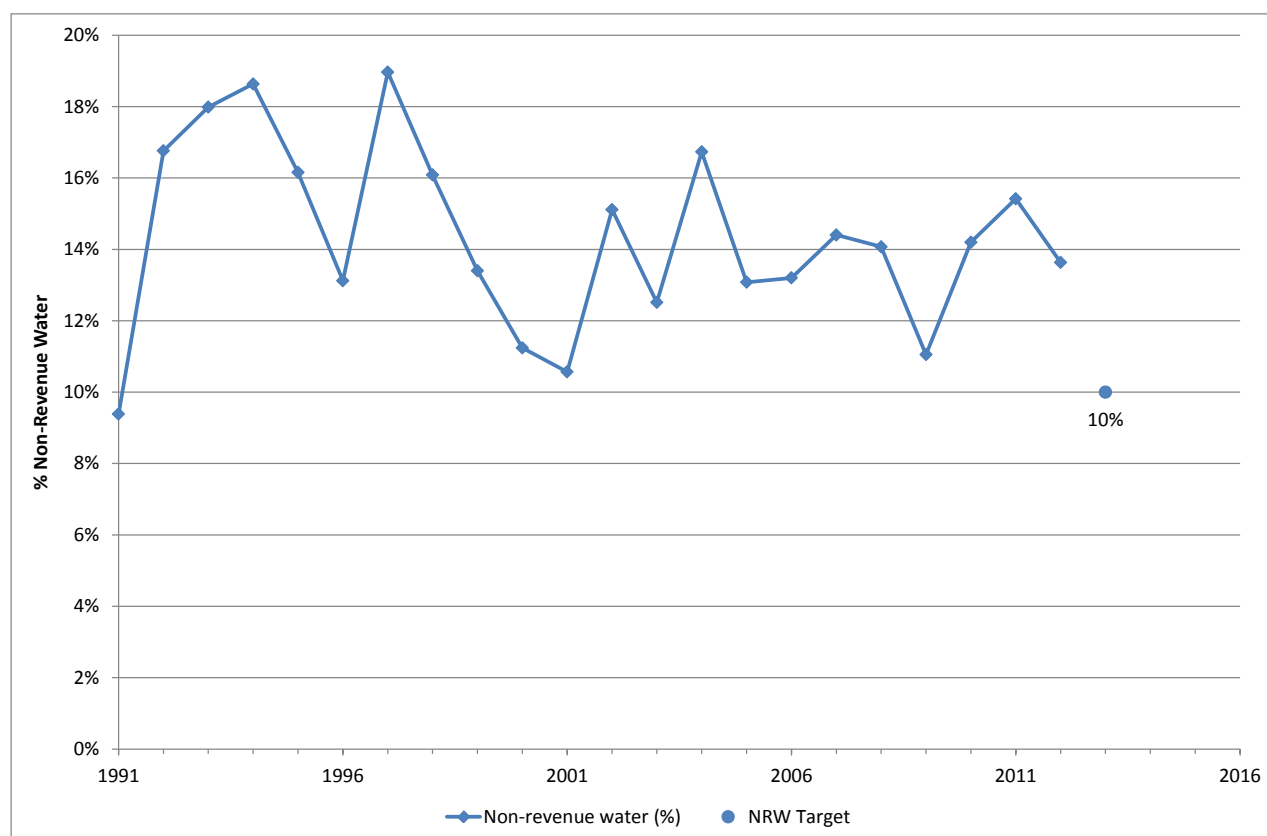


Figure 5: Historic level of Non-Revenue Water

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).

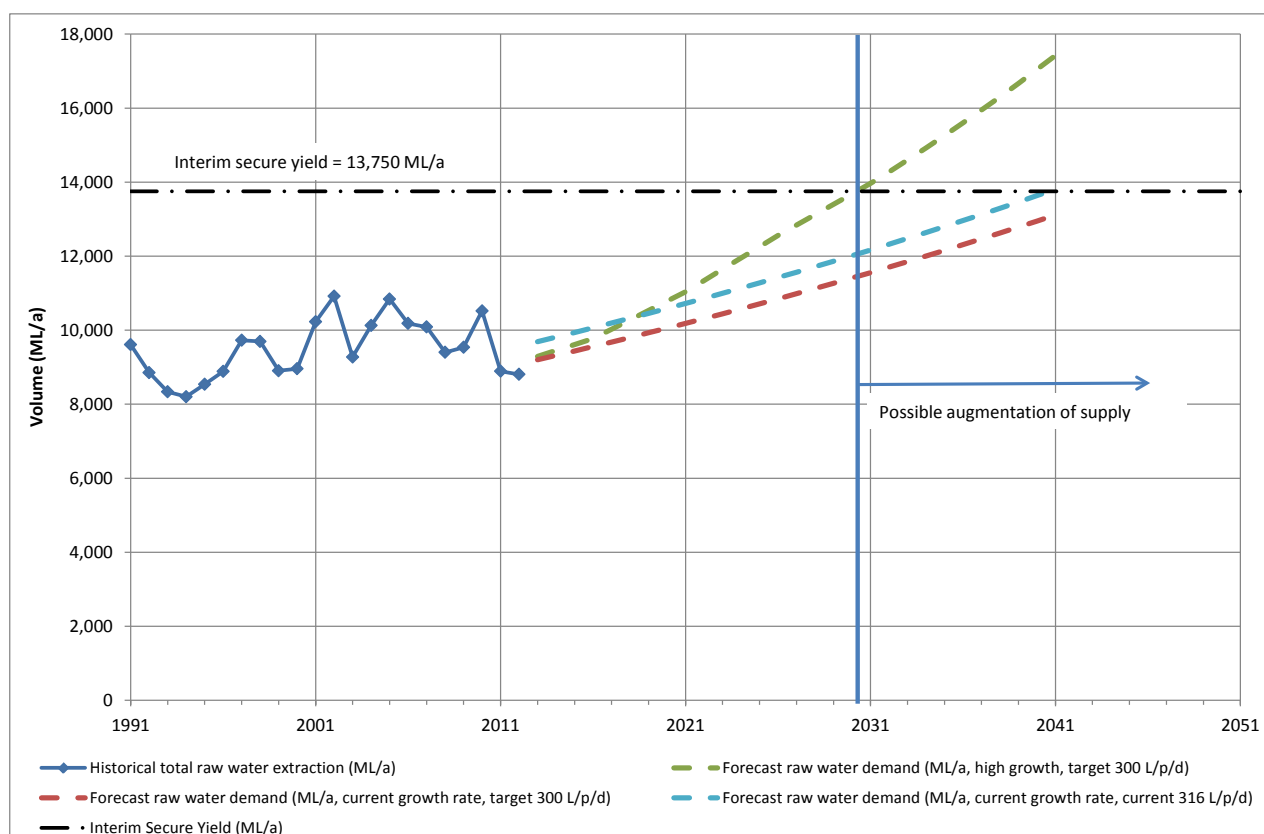


Figure 6: Demand Forecasts

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:
 - o Coastal Zone Management Plan for Cobaki Broadwater and Terranora Broadwater (Australian Wetlands, 2010);
 - o Upper Tweed Estuary Management Plan (TSC, 1996);
 - o 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;

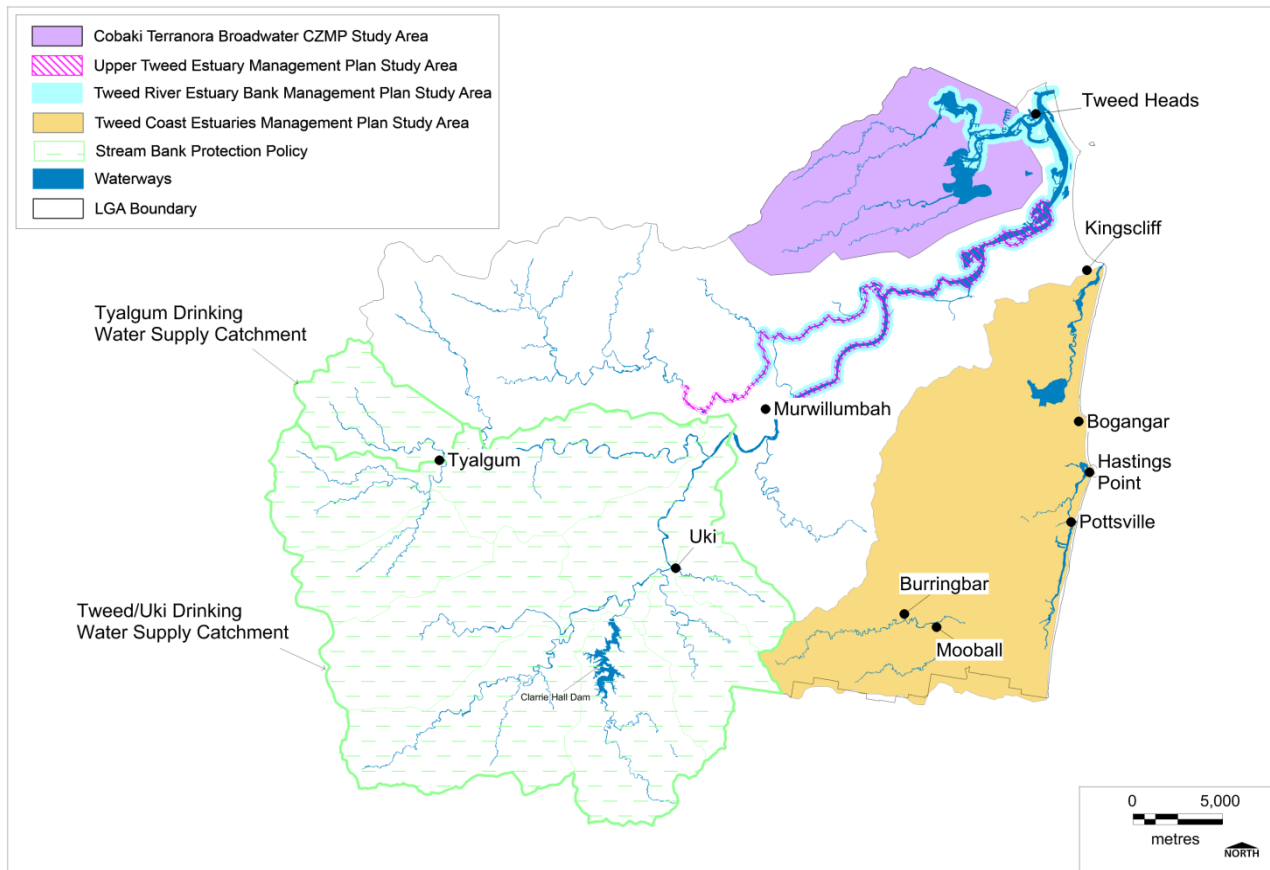


Figure 7: Areas covered by existing management plans or policies related to catchment management

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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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:
 - o The upper Tweed catchment was significantly impacted by agricultural runoff, including soil erosion, and modified rural runoff containing fertilisers and animal waste,

- o 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
 - o Suspended solids generally increased with rainfall, with soil erosion considered the primary source.
- Tweed estuary:
 - o The Tweed Estuary generally had poor water quality, including high levels of nutrients, suspended sediments and faecal coliforms,
 - o Water quality at the mouth of the Tweed estuary was good as it is relatively well flushed with oceanic water,
 - o 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,
 - o Terranora and Cobaki Broadwaters are both shallow water bodies with reasonable water quality but were subject to nutrient and sediment accumulation from the catchment,
 - o The Rous River was identified as a major hotspot, as it experienced eutrophication and was a likely source of pollution to the mid estuary,
 - o There was a strong seasonal variations in water quality, with higher turbidity and nutrients and lower pH during wet seasons,
 - o In flood events the lower estuary experienced high levels of nutrients (transported from upstream),
 - o Water quality processes were dominated by point source loadings during dry months, while diffuse loads from the whole catchment dominated during wet periods,
 - o The upper estuary was impacted by nutrients derived from agricultural fertilisers,
 - o The mid to upper estuary and Rous River were impacted by wastewater discharges and agricultural fertiliser runoff,
 - o The mid estuary was impacted by wastewater discharges, and
 - o The lower to mid estuary was heavily impacted by urban runoff processes.
- Coastal estuaries:
 - o Estuaries at Bogangar, Hastings Point and Pottsville were affected by urban development, and
 - o 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.

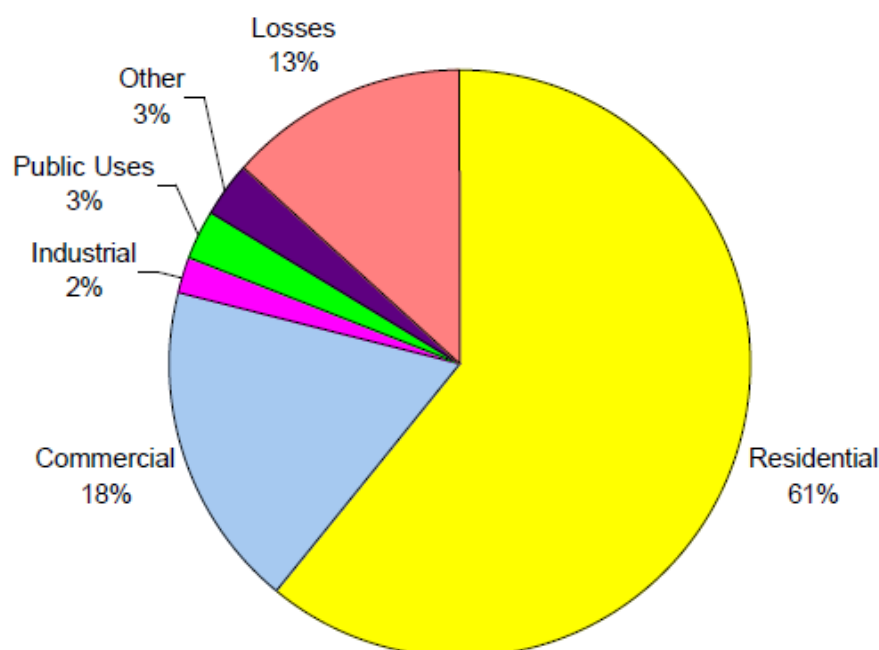


Figure A 1: Typical Breakdown of Town Water Consumption – 2002/03

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 unserved 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, 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] - 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	Loss of riparian vegetation reduces filtering of rural runoff with impacts similar to above	Further loss 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, 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 detention 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 education & 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.

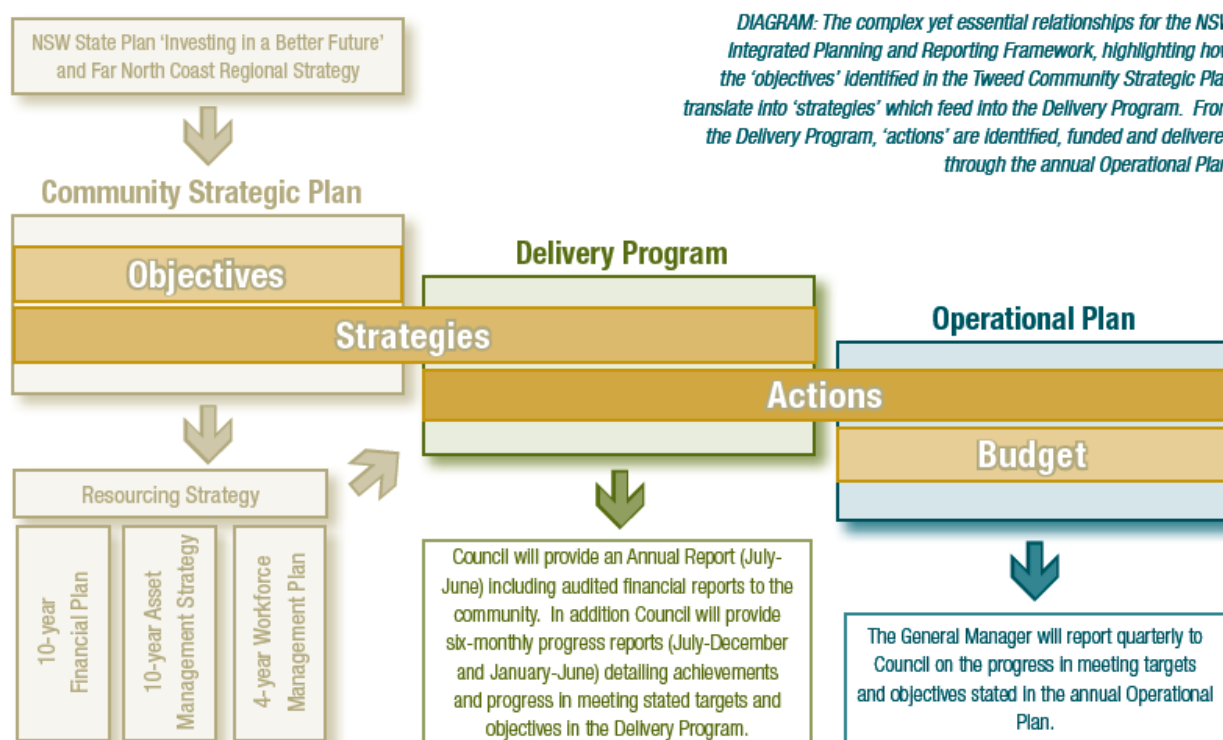


Figure A 2: Integrated Planning and Reporting Framework

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
<i>Civic Leadership</i>		
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.	• Integrated Water Cycle Management Strategy • Interim Water Quality Management Plan
	2.3.3 Provision of high quality and reliable wastewater service which meets health and environmental requirements and projected demand	• Five Year Works Programs • Floodplain Risk Management Plans
	2.3.5 Ensure adequate stormwater drainage, flood management and evacuation systems are in place to protect people and property from flooding.	• 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
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.	• Five year Works Programs • Seven Year Infrastructure and Services Plan
	3.3.2 Facilitate government-funded infrastructure	• Tweed Development Control Plan 2008 • Tweed Futures 2004-2024
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	• Tweed Local Environmental Plan
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.	• Coastal Estuaries Management Plan
	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.	• Coastal Zone Management Plans • Coastline Management Plan • Integrated Water Cycle Management Strategy • Interim Water Quality Management Plan
	4.1.3 Manage and regulate the natural and built environments.	• Far North Coast Regional Strategy
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	• Floodplain Risk Management Plans • Seven Year Infrastructure and Services Plan
	4.2.2 Encourage and promote rehabilitation and management of native vegetation and wildlife habitat in Tweed Shire.	• State of the Environment Report

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
<i>Built Environment (greenfields and brownfields development)</i>	
• 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
<i>Water Supply</i>	
• 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
<i>Wastewater Management</i>	
• 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
<i>Transport Infrastructure</i>	
• Stormwater pollution - Impervious surfaces associated with transport infrastructure create stormwater discharges and associated pollution of local waterways	• Urban road stormwater upgrades
<i>Environmental Education and Capacity Building</i>	
• 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
<i>Catchment Management</i>	
• 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
<i>Bushland and Biodiversity</i>	
• 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
<i>Soils and Sustainable Agriculture</i>	
• 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
<i>Atmosphere</i>	
• 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
<i>Council Operations</i>	
• 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 and 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 a 10 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 Act 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 <i>Environmental Planning and Assessment Act 1979</i> 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 identify 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						
<i>Bilambil Heights</i>	0	0	2,934	5,609	6,881	6,881
<i>Cobaki Lakes</i>	0	0	4,454	8,525	10,464	10,464
<i>Kings Forest</i>	0	0	4,640	8,880	10,900	10,900
<i>Terranora Area A</i>	0	0	1,300	2,498	3,071	3,071
<i>West Kingscliff</i>	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

SECTOR	NUMBER OF ACCOUNTS							ADOPTED GROWTH RATE
	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).

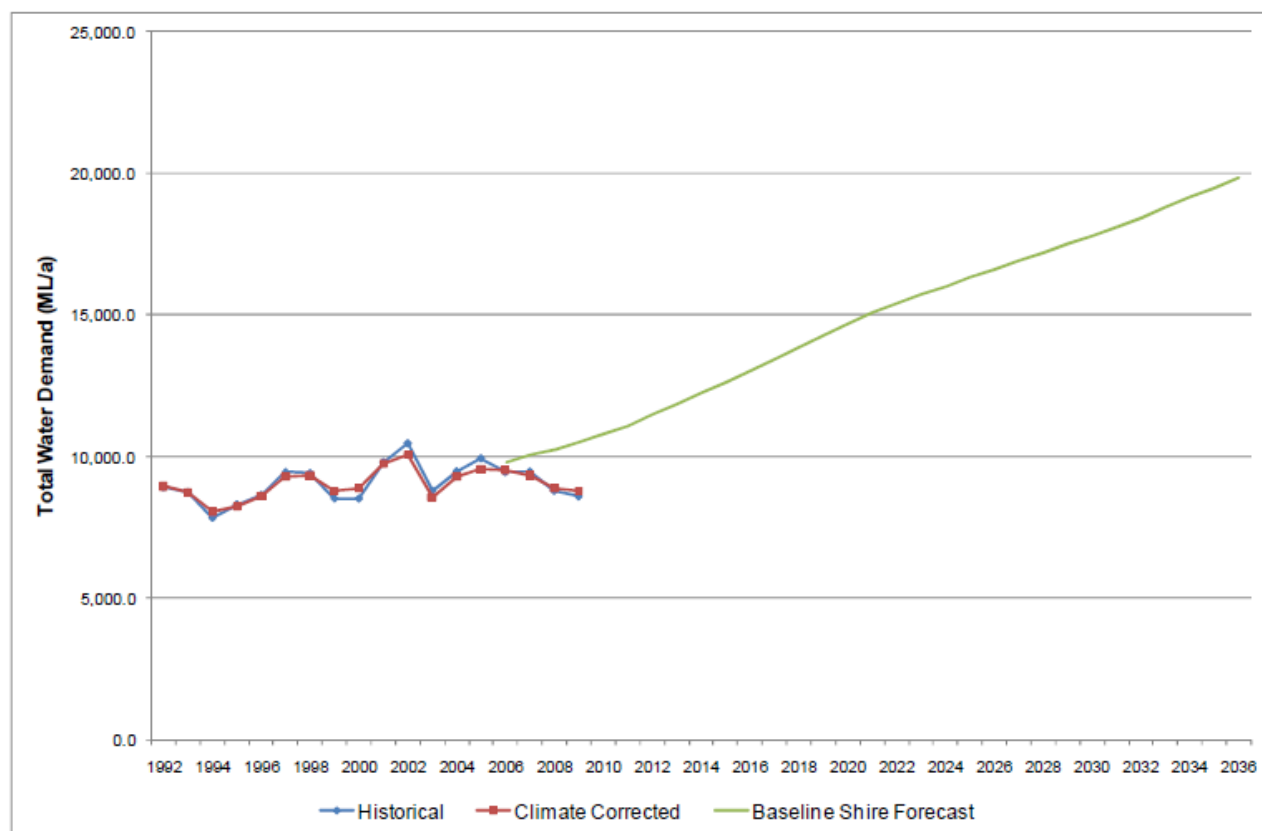


Figure A 3: Total Annual Demand – Baseline Forecast

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)

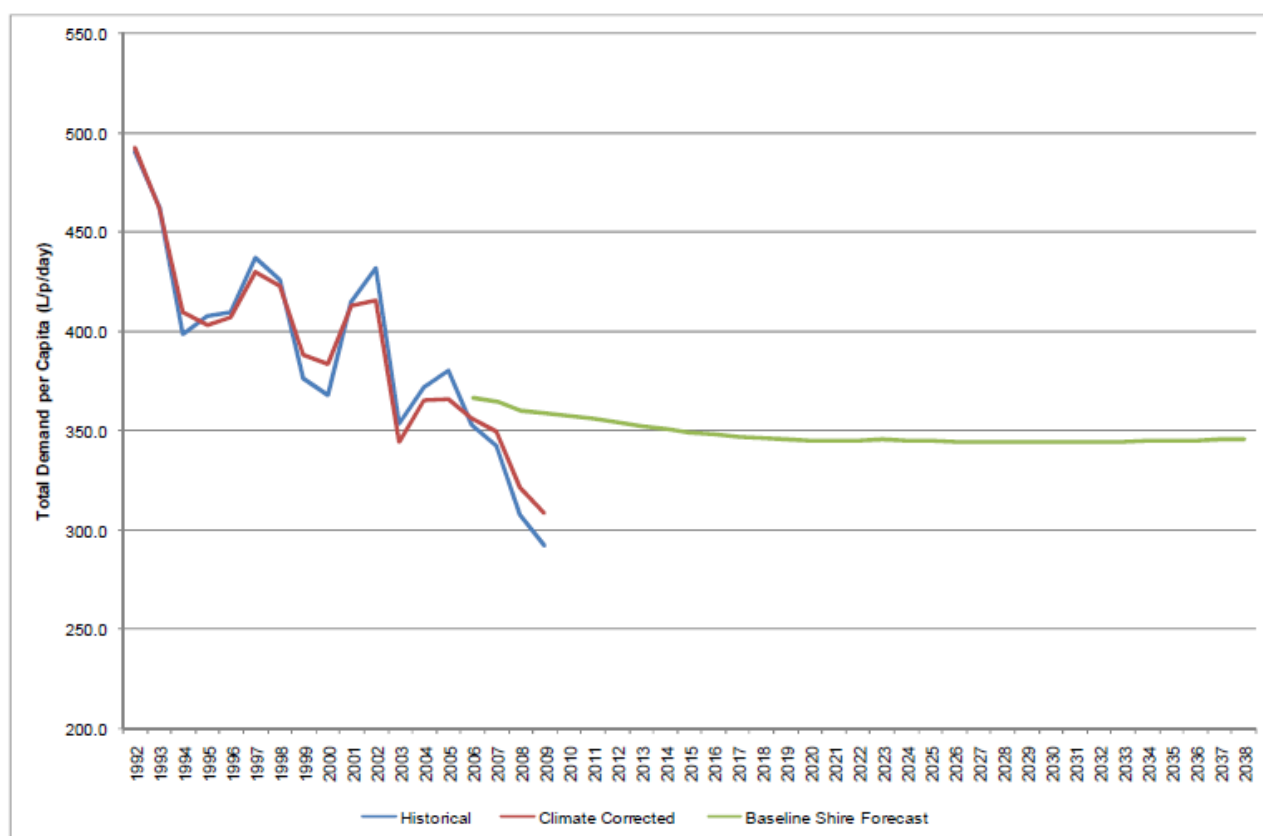


Figure A 4: Total per Capita Demand – Baseline Forecast

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

SECTOR	SCENARIO			
	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)

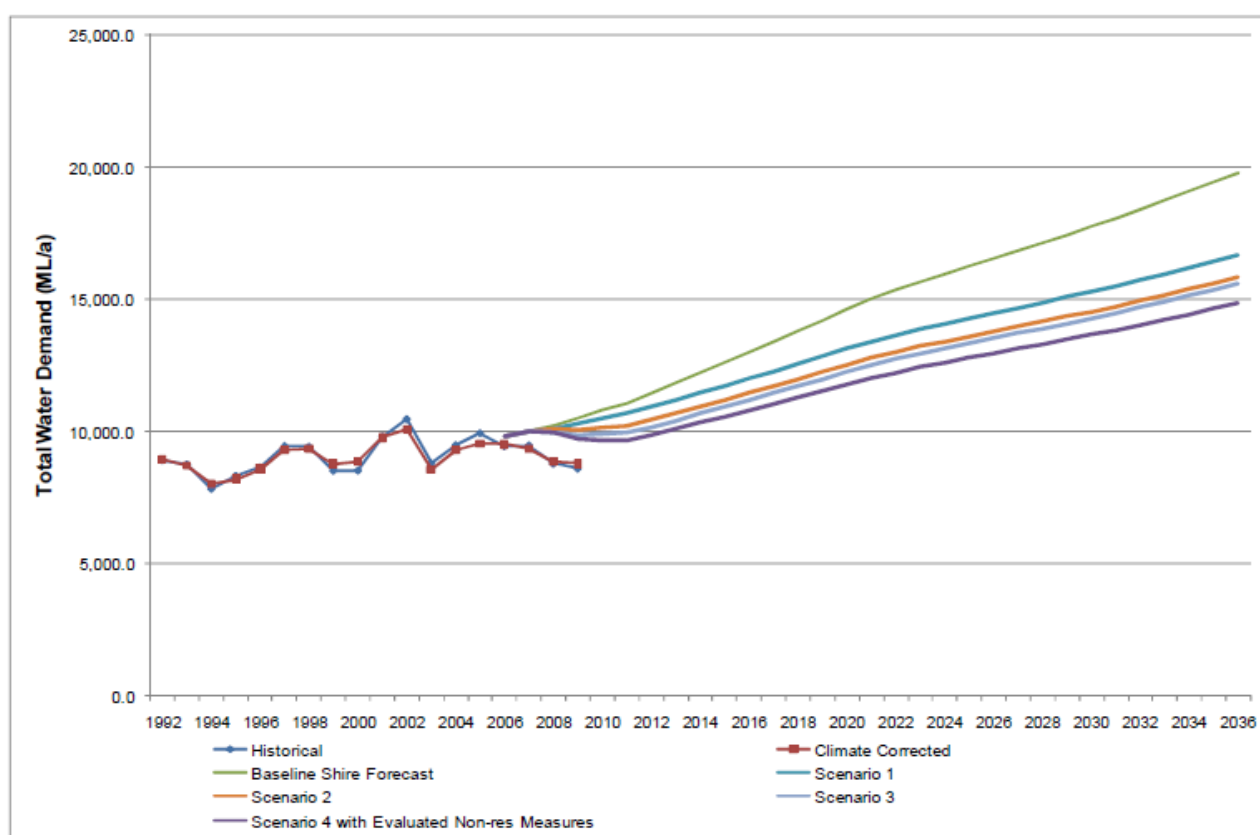


Figure A 5: Total Annual Demand – Managed Forecast

Source: MWH (2009a)

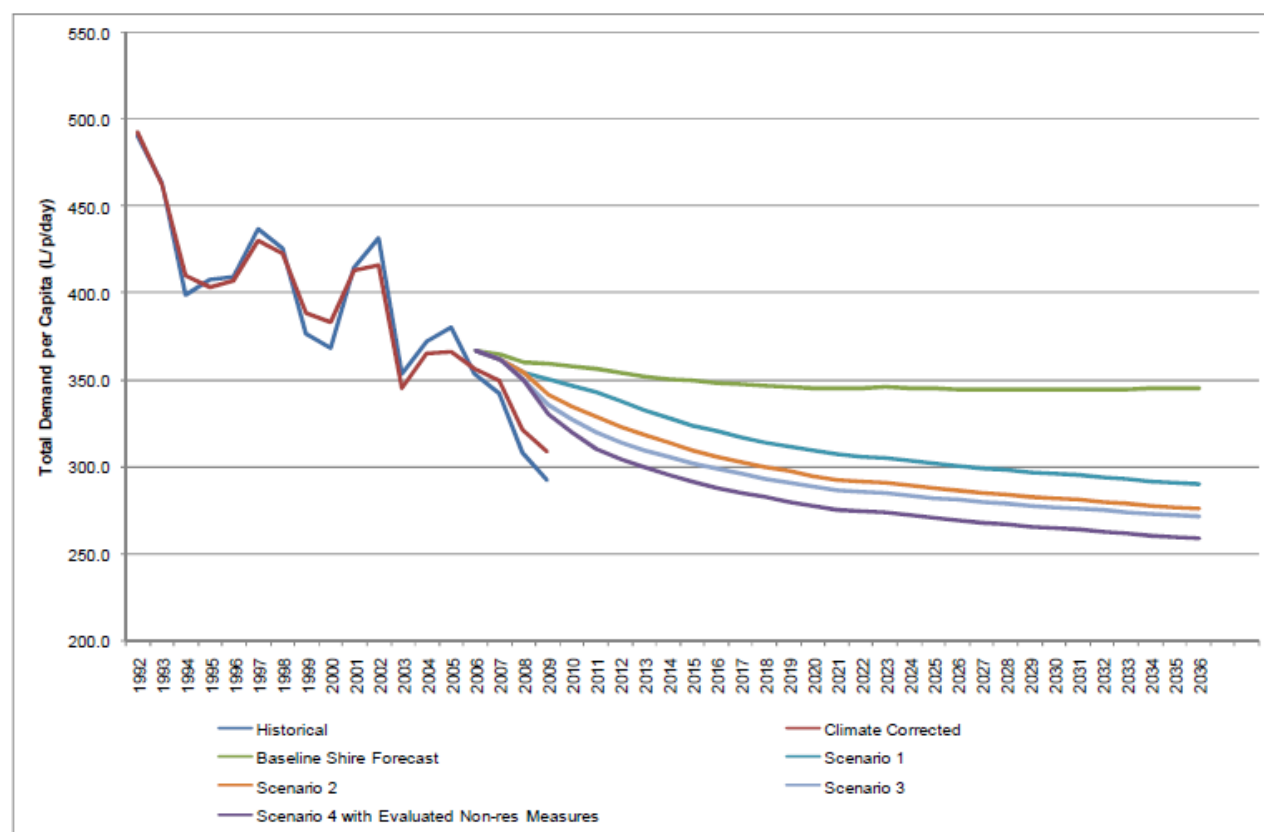


Figure A 6: Total per Capita Demand – Managed Forecast

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 2 Usage 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 2 Usage 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 $\geq$ 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.

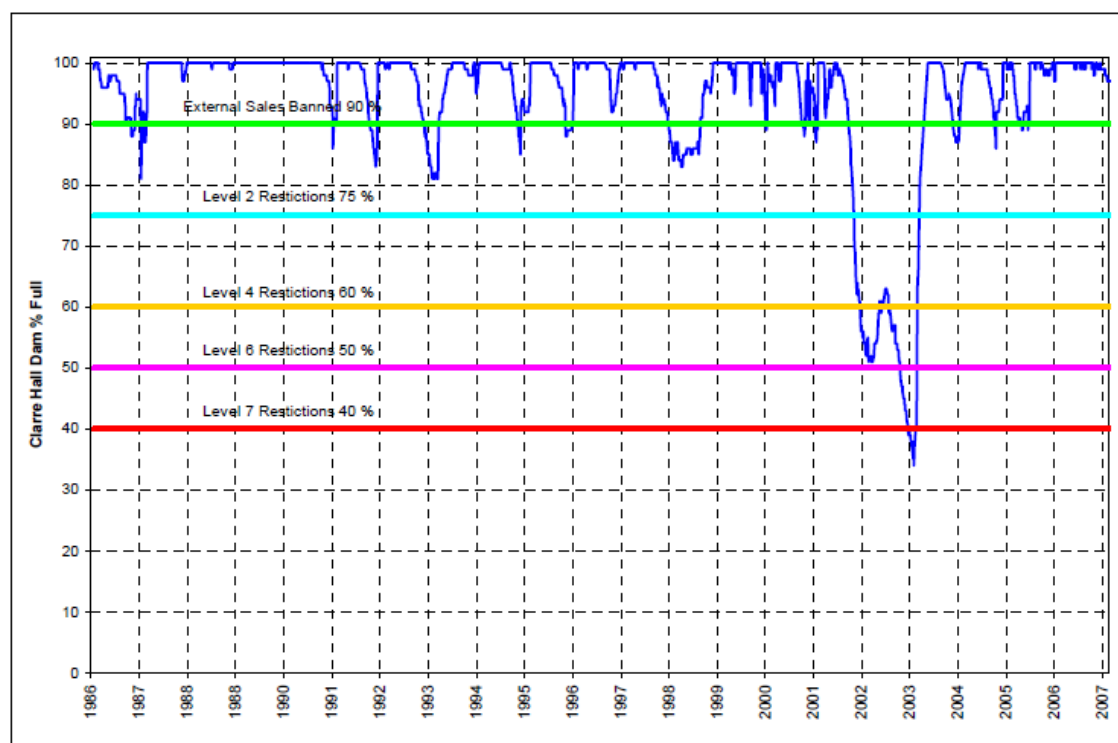


Figure A 7: Restriction Levels and Historic Storage Levels in Clarrie Hall Dam

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):
 - o Storm events in the catchment are known to challenge the water treatment process.
 - o Cyanobacterial blooms occur in the weir.
 - o Upstream rocky cuttings cause flashy runoff from the catchment.

- Uki:
 - o High levels of manganese and iron.
 - o Dirty water and taste and odour complaints.
- Tyalgum (potentially addressed through upgrade of Tyalgum WTP):
 - o Historical losses of disinfection control (>4 mg/L dosed but still loss of residual).
 - o 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 through 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).

Submit DA - SQID Concept Design	•SQID Concept Design
DA Approval	•Council reviews and approves SQID Concept Design
SQID Detailed Design	•SQID Detailed Design •Stormwater Management Plan •Operation and Maintenance Plan
Construction	•Regular inspections at designated 'hold points' during construction and establishment
Practical Completion	•Applicant provides Council with a package of documents and completed checklists •Council assesses design and construction conformance and approves construction
On-Maintenance	•On-Maintenance period specified by Council •Applicant undertakes periodic performance-based monitoring of the SQID/s •Applicant submits reports containing the results of monitoring throughout the maintenance period
Off Maintenance	•At end of On-Maintenance period, applicant provides a package of documents to Council including performance-based monitoring reports demonstrating compliance with the relevant guidelines and detailed design.
Asset Handover	•Council is satisfied SQID is performing in accordance with detailed design and associated checklists received. •Asset is transferred to Council.
On-going Council Maintenance	•Asset is recorded in SQID Asset Database •Maintenance Schedule recorded •On-going maintenance conducted by Council •Asset included into Council SQID Monitoring Program

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 defensible 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 Burringbar/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.