INTEGRATED WATER CYCLE MANAGEMENT

EVALUATION STUDY

PART 1

March 2010

Executive Summary

This Evaluation Study forms the first part of an Integrated Water Cycle Management (IWCM) strategy for Walcha Council's water utility services. The IWCM process aims to optimise the urban water cycle involving water supply, sewerage and stormwater by minimising the impacts between the water services and the catchment and by integrating the water services with each other.

Walcha is experiencing water related problems and, in its role as the local water utility (LWU), Walcha Council will benefit from such a study. The problems which Council was previously aware of broadly relate to pollution issues, system capacity limitations, the deteriorating condition of aging infrastructure and the limited capacity of a small customer base to pay.

IWCM assesses information at three different levels; catchment, water resource and the township urban area. Although fundamentally linked, these areas are operated and managed separately.

The first step was to compile the list of LWU targets and community objectives and then following an audit of available data, an initial list of IWCM issues related to the catchment, water resources and urban service delivery was prepared. Stakeholder input was sought in order to validate and refine the initial list of issues. The forum for stakeholder involvement was a Project Reference Group (PRG) workshop held on 9 December 2009, and attended by representatives of Council, the local community and State Government departments.

The validated issues were separated into two groups; those for which Council, as the local water utility has responsibility to address and all other issues which are either the responsibility of another authority or Council's responsibility as a provider of services other than as the local water utility e.g. garbage disposal or stormwater. The issues were then given a high, medium or low priority by the PRG. The IWCM issues that were validated at the PRG workshop held in December 2009 and which Council as the LWU, needs to address are summarised below.

Summary of Identified Issues to be addressed by Council as the LWU.

Audit Component	Identified Issues	Priority	Management Option
Catchment	There have been incidences of algal blooms occurring in the off-creek storage during summer leading to failure to meet the desired level of service (LOS) for water quality i.e. taste and odour.	M	Likely due to "first flush" runoff following heavy rainfall or storms in the catchment. Council to consider upgrading telemetry system to shut down intake pumps during periods of rapid rise in river levels or installing PAC treatment to remove taste and odour compounds and toxins.
Water Resources	Security of supply has not been tested. A single source of supply in the upper reaches of the Macdonald River catchment may be vulnerable to the effects of a severe prolonged drought. The issue is the lack of adequate information	H	The effects of a severe prolonged drought have not yet been fully assessed and a yield study for the catchment is required prior to the next review in 2014. This is an identified data gap.
Urban Area	Test results show water quality does not comply fully with target of 100% compliance with ADWG for chemical and microbiological standards. Samples over last 5 years: 1 of 10 outside pH guideline. 1 of 10 outside turbidity guideline. 9 out of 186 outside total coliforms guideline.	H	Need to review management practices e.g. adopt rigorous standard operating procedures (SOPs).
	Water quality sampling does not meet target of 100% compliance with frequency requirements of NSW Health (52 micro samples, 2 chemical and 10 fluoride samples per year).	H	Need to improve sampling techniques and reliability of transport to laboratory.
	No asset management plans in place for water supply and sewerage infrastructure.	M	Preparation and implementation of robust, up-to-date asset management plans is required.
	Office of Water inspecting officer has reported instances of OH&S issues at sewerage treatment plant.	H	Sewerage treatment plant requires investigation to determine whether upgrading, augmentation or replacement is required to ensure OH&S, reliability and performance standards continue to be met.

	Sewage overflows are higher than the state median per 100km of mains resulting in public health concerns. Information required on condition of gravity mains.	H	High levels may reflect the deteriorating condition of the gravity mains. Audit or investigation of asset condition required for data input into asset management plan.
	High treatment and pumping costs of sewerage placing further upward pressure on the typical residential bill.	M	Council to carry out extensive investigation (including dye testing) to determine source of stormwater infiltration into sewer system. Additional budget provision for corrective work is required.
	Levels of unaccounted water losses in the system appear to be high.	M	More accurate data required to determine if this is an issue. An improved measurement technique to assess quantity of water delivered from water treatment plant is required as a first step.
	No demand management or drought management plan in place.	M	Need to implement all six Best Practice criteria.

The validated issues were then compared with the Business as Usual (BaU) scenario to determine which issues remain unresolved.

Since the BaU scenario does not indicate that all IWCM issues are addressed, the options are either to complete the Simplified Strategy by developing the simplified scenario (no significant capital works within 10 years) or the Detailed Strategy with full scenarios. The IWCM Evaluation should also develop a list of all technically feasible options or potential management actions to address the remaining IWCM issues that are not addressed by the business as usual scenario. These include new and alternative options as well as previously dismissed options as solutions to issues. Independent input was provided through the Project Reference Group.

The IWCM Evaluation Study for Walcha recommends that a Simplified Strategy be undertaken. The Simplified Strategy is attached as Part 2 of this report.

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1 Introduction

Walcha Council has initiated an Integrated Water Cycle Management (IWCM) study to aid the identification and development of management strategies for urban water cycle planning.

Walcha is currently experiencing a number of water cycle issues. These issues broadly relate to pollution problems, system capacity limitations and the deterioration of aging infrastructure.

One of the highest priority issues will be addressed by investigation into whether augmentation, upgrading or replacement of the existing sewerage system is required. This project is currently in the planning stage.

The IWCM process will integrate existing management strategies with options for managing other identified water cycle issues.

The IWCM process is catchment based. The Macdonald River catchment for the Walcha water supply is wholly contained within the local government boundaries of the Walcha LGA. (See location map in Section 2.2)

1.1 What is IWCM?

Integrated Water Cycle Management (IWCM) is a 30 year strategic planning tool for local water utilities (utilities) developed by the former New South Wales Department of Water and Energy (DWE), now NSW Office of Water. IWCM enables utilities to manage their urban water services in a holistic manner within a catchment context in accordance with the *Best-Practice Management of Water Supply and Sewerage Guidelines August 2007*. Utilities have the goal of providing an appropriate, affordable, cost-effective (value for money) and sustainable urban water services that meet community needs, protect public health and the environment, and make best use of regional resources.

IWCM involves looking at the three components of the urban water services (water supply, sewerage and stormwater) in an integrated way when identifying all the IWCM issues and developing scenarios to address these issues. If a detailed strategy is found to be required, the scenarios are evaluated and compared on the basis of their social, environmental and economic impacts referred to as Triple Bottom Line (TBL).

The methodology behind IWCM is based on the following three questions with a stepped approach taken to solving each of these questions. The resulting answers form the basis of IWCM.

“What is the issue?”

Issues are identified by comparing and collating the data on catchments, water resources, urban environment, urban water supply, sewerage and stormwater systems with the urban water service/utility targets to determine non-compliances. Based on these non-compliances, a preliminary list of

IWCM issues is developed. Non-compliances are where the data indicates that the targets are not being met, the data is not suitable for determining compliance or there is no data available.

The result will be a list of all of the current and future (next 30 years) urban water issues that relate to the utility's business, including the urban water service context of catchment and water resource issues. Changes such as population, climate, demographics and legislation that could change the requirements and impacts of the water supply, sewerage and stormwater services are included.

Only IWCM issues (those relevant to the utility and its urban water service) should be addressed during the IWCM process. Issues which are identified but are not related to how the utility undertakes its business are prepared as a second list for presentation to the relevant authority, including Council as a provider of other services not related to water utility and Government agencies. Hence, the list of IWCM issues needs to be specific to the local circumstances.

"How do we fix the issue?" looks at addressing LWU related water management problems and requires an understanding of all stakeholder needs, expectations and requirements at all levels. Section 4 includes potential management actions which could be taken to address the identified issues.

The last question **"How do we know the issue is fixed?"** is the process by which we confirm that all impacts are managed to the desired level i.e. all LWU urban water issues are solved and water use is optimised using social, economic and environmental objectives.

1.2 The Integrated Water Cycle Management Process

The IWCM process essentially consists of two main parts:

Phase 1: An IWCM Evaluation Study (this document); and

Phase 2: A Strategy Plan (to be scoped and to follow on from this study if needed).

Phase 1: The IWCM Evaluation

Utilities start by reviewing existing information and data on their urban water supply and related catchment. The evaluation focuses on the utility's targets - requirements, obligations and objectives.

Issues are identified by comparing targets against actual performance at a catchment, water resources and urban water supply system level. If the review finds that the water utility's action in providing urban water supply across all components - potable water, sewage and stormwater - has met or exceeds previously set targets, the utility has completed its IWCM process until the next six year review.

Phase 2: The IWCM Strategy

If there are outstanding issues that have not been addressed by existing actions or formally adopted plans, the LWU needs to move to the second step in the process. This involves identifying the best options to address all issues, based on suitable technology, resourcing and community acceptance. Possible scenarios are compared and ranked on the basis of their environmental, social and economic impacts (TBL). This step is the development of an IWCM Strategy.

If it is likely that no significant capital works are required within 10 years, IWCM issues are addressed by a "simplified scenario" and no scenario comparison is required.

Walcha Council is undertaking the Phase 1 IWCM Evaluation Study in-house with assistance from the NSW Office of Water and will proceed to Phase 2 if a detailed strategy is found by the study not to be required.

This evaluation study has as its objectives:

To identify and summarise the key water cycle issues impacting on the Walcha Local Government Area (LGA);

To identify those issues which are the responsibility of Council (as the LWU) in the water cycle context; and

To suggest potential actions for managing the water cycle issues.

1.3 Structure of this Document

This Evaluation Study aims to address two of the three questions posed in Section 1.1 above as follows:

What is the issue?

Section 2.0 is presented as a summary of the available data about the catchment including details of the urban component of that catchment. Since the catchment is wholly contained within the Walcha LGA, the LGA has been adopted as the study area. This section defines the key physical, social and water resource characteristics of the study area in order to provide a context for the IWCM investigation.

Section 3.0 is an analysis and interpretation of the available data and comparison with the identified targets of the LWU in order to determine an initial list of IWCM issues.

How do we fix the issue?

Section 4.0 Stakeholder input was sought in order to validate and refine the initial list of issues. This section presents the results of the PRG workshop

including the priority that the community have placed on the issues identified. In addition, management options which could be employed to address the validated issues are proposed. These issues are then compared with the Business as Usual scenario to determine which issues remain unresolved and need to be addressed in the next stage of the IWCM process.

Section 5.0 provides a summary of the conclusions of the study.

2 Walcha – Data and Information

Knowledge of the study area is an important first step in undertaking an IWCM strategy. The following summary is provided in an urban water service context. The data gathered is presented in three parts: Catchment Context, Water Resource Context, and Urban Context and is used to scope the context of the LWU study.

Therefore, for an IWCM strategy to be produced, it is necessary for the links between the catchment, the water resource, and the urban area to be clearly identified and considered as a whole. In this way, the three data sets highlight opportunities and problems for the LWU when considering solutions to the issues.

2.1 Catchment Data

2.1.1 Location

The town of Walcha is 1067 metres above sea level and is situated on the New England Tablelands at the junction of the Oxley Highway and Thunderbolt's Way approximately 420km from Sydney and 530km from Brisbane by road. It is approximately 200km inland by road from the New South Wales mid-north coast.

The Walcha Council local government area (LGA) covers an area of 640,028 hectares and shares boundaries with Tamworth Regional, Uralla, Armidale Dumaresq, Bellingen, Hastings and Gloucester local government areas.

The district is largely made up of a plateau forming part of the Great Dividing Range. The maximum elevation is 1462m at Grundy Trig, 39 km south of Walcha. To the east of Walcha the plateau is steeply dissected by spectacular gorge country which is readily seen at the Apsley Falls, 18 km east of Walcha. The first drop of the falls is 114 m and the second, 1 km further on, is 195 m. At this location, the gorge has a depth of 360m but further downstream the gorge can be up to double this depth.

The LGA encompasses part of the catchments of the Macleay and Namoi Rivers and to a much lesser extent, the Hunter River in the remote south west corner. Consequently Walcha LGA is included in three Catchment Management Authority areas: Northern Rivers, Namoi and Hunter.

Major centres in the catchment include Armidale, Walcha, Guyra and Kempsey and the population of the sub catchment is estimated at 60,000.

2.1.2 Population

Population forecasts are important in assessing future needs for urban infrastructure (treatment plants, mains, reservoirs etc). This information is also important for planning water conservation programs and determining the

community's capacity to pay. The nature and location of population growth (or decline) will determine future water, sewerage and stormwater requirements.

The values in Table 2.1 and Table 2.2 and **Error! Reference source not found.** below were collected from ABS Census data.

Table 2.1 Historical Populations for the Walcha LGA

Year	1981	1986	1991	1996	2001	2006
Total (census) Population	3712	3439	3548	3208	3102	3186
Walcha township	1674	1639	1781	1623	1488	1623

Table 2.2 Population Age and Gender Distribution 2006

Age Group	Population		
	Males	Females	Total
Under 15	344	326	670
15 to 17	69	62	131
18 to 24	98	75	173
25 to 34	146	152	298
35 to 44	224	205	429
45 to 54	243	228	471
55 to 64	243	231	474
65 to 74	152	136	288
75+	105	147	252
Total	1,624	1,562	3,186

Source: Australian Bureau of Statistics 2006

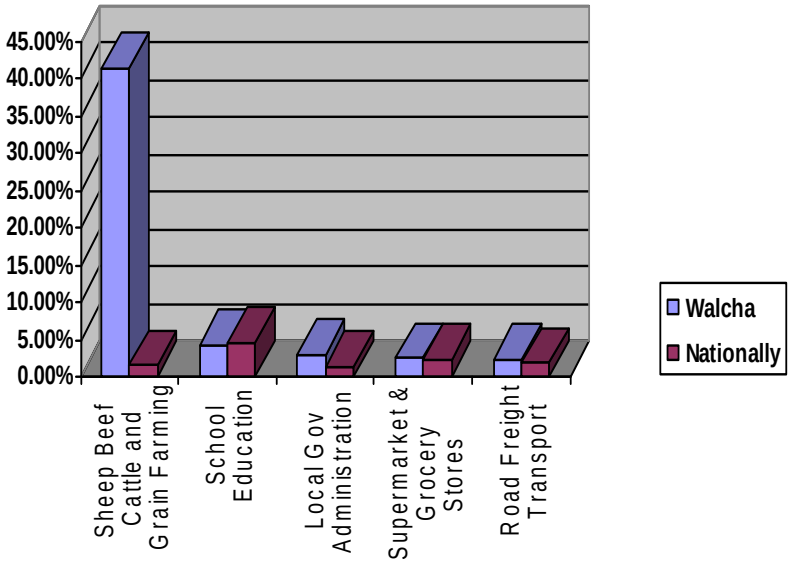


Figure 2-1 Distribution of Employment by History

Figure 2-1 above indicates that 41.3% of the population of Walcha LGA is employed in the sheep, beef cattle and grain farming industries compared to 1.3% employed nationally in these industries.

Population Outlook

Table 2.3 Estimated Population 2006 – 2041

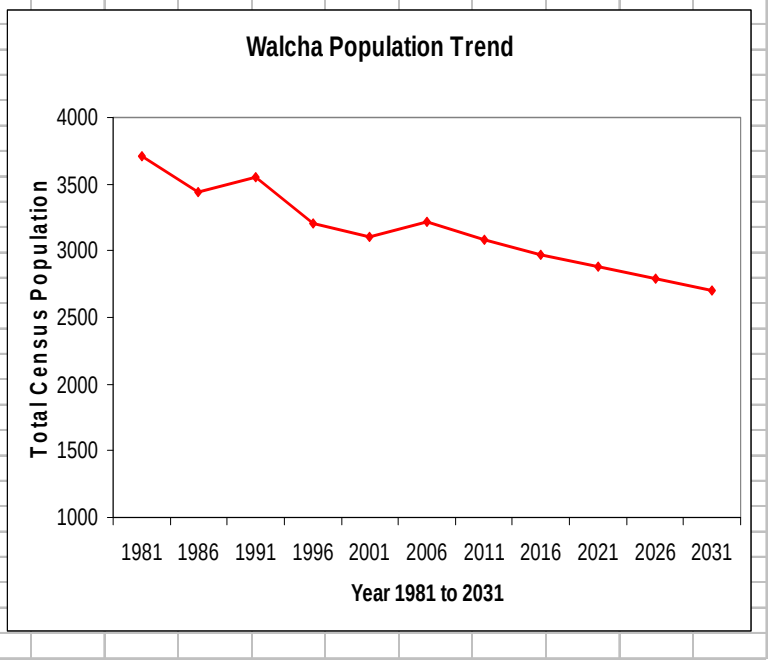
	2006	2011	2016	2021	2026	2031	2036	2041
Population	3214	3084	2973	2878	2792	2697	2603	2512
Annual growth		-26	-22	-19	-17	-19	-19	-18
Annual Growth Rate		-0.8%	-0.7%	-0.6%	-0.6%	-0.7%	-0.7%	-0.7%

Source: OLGR Social Profile Report – March 2009.

Note: Department of Planning forecast data has been used to provide population projections up to 2031. This information was retrieved in May 2009 from www.olgr.nsw.gov.au/pdfs/5_Social_Profile_Walcha . The figures to 2041 were extrapolated from the forecast data.

Table 2.4 Walcha Population Trend 1981 to 2031

1981	3712		
1986	3439	-273	-7.94%
1991	3548	109	3.07%
1996	3208	-340	-10.60%
2001	3102	-106	-3.42%
2006	3214	112	3.48%
2011	3084	-130	-4.22%
2016	2973	-111	-3.73%
2021	2878	-95	-3.30%
2026	2792	-86	-3.08%
2031	2697	-95	-3.52%



The population of the Walcha LGA has declined steadily from a 1981 peak of 3,712 to a total of 3,186 at the 2006 census. This represents a total decrease of 14.2% over the 25 year period or an average decease of 0.55% per year. During the same period, the population of Walcha township declined by only 3.0% from 1,674 in 1981 to 1,623 in 2006.

Despite a small increase in total population between 2001 and 2006, the Department of Planning projections indicate the LGA population is expected to

decline by around 0.7% per annum until 2031. Most of the decrease in population however, is expected to continue the trend and come from the rural sector as people leave the area or relocate into Walcha.

2.1.3 Climate

Importance of Data to IWCM: Rainfall, runoff and evaporation data are important for determining the nature and availability of surface and ground water resources. Climate interacts with topography and geography.

The area is located in the sub-humid temperate zone. Summers are short and mild and winters long and cold. Mean monthly maximum temperatures vary from 25.4 degrees Celsius in February to 11.7 degrees Celsius in July. Mean monthly minimum temperatures vary from 12.5 degrees Celsius in February to minus 2.9 degrees Celsius in July. Frosts occur throughout the year beginning in March and ending in December and it is not uncommon to have temperatures drop to minus 10 or 12 degrees Celsius during winter in the lower areas. Consequently, Walcha occasionally features as having the lowest minimum in the State.

Snow occurs on an average of two days per year. In January to April winds blow most frequently from the north-east while in May to December from the west to north-west.

The average annual rainfall at Walcha is 809mm with December and January the wettest months and April and May the driest. Rainfall in the district generally ranges from 700mm to 1200mm annually with approximately 60 per cent falling in the summer and 40 per cent in the winter. Locations on the eastern fall of the LGA receive up to 1500mm rainfall per annum.

The average annual evaporation rate is 1192mm per year.

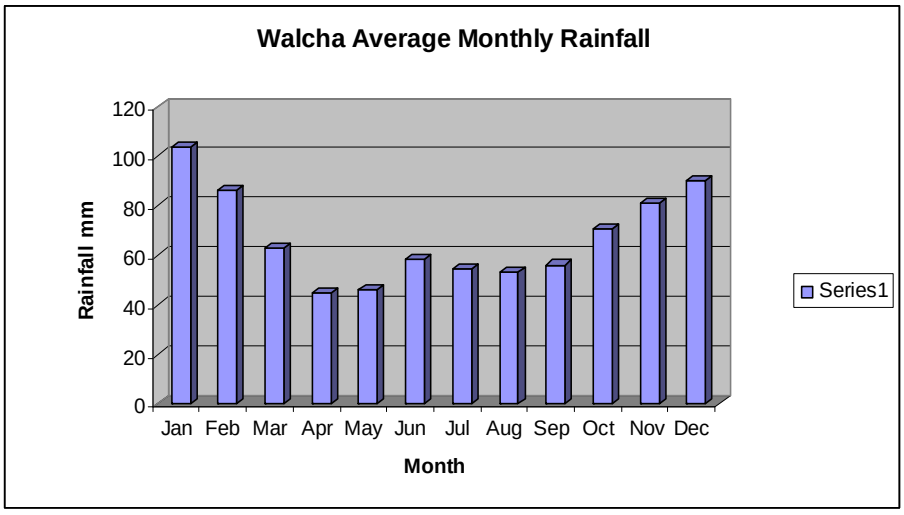


Figure 2-2 Walcha Rainfall

2.1.4 Soils and Geology

Importance of Soils Data to IWCM

Soil characteristics will be partial determinants of the water quality of the study area and will also influence the type of land use within the study area as well as groundwater and land disposal opportunities.

Geologically the Walcha district is part of the New England Region consisting of extensive sedimentary rocks with granite intrusions to the north-east. Basalt rock dominates the centre of the district.

The district forms part of the catchments of four major river systems. These are the westward flowing Namoi River and the eastward flowing Macleay, Hastings and Manning Rivers.

The Macleay catchment of some 11420 square kilometres includes extensive areas of the Northern tablelands, a sparsely populated escarpment area and a coastal area ranging from foothills to coastal plans. From the gently rolling hills of the tablelands, the central catchment is mountainous with deep gorges.

Soils in the upper catchment vary from red and yellow podzolics to krasnozems. In the steep middle catchment shallow lithosols, stony red or yellow earths and stony duplex soils are found.

Much of the tablelands has been cleared of trees and is now covered in native and introduced pastures. Rainforest and wet sclerophyll forests occur in the steep slopes and gorges of the escarpment. The lower ridges support wet and dry sclerophyll forests. These give way to cleared pasture land and wetlands on the floodplain.

Vital Statistics

Within the Apsley River sub-catchment, the geology consists of 17% basalt, 3% granite, 39% sedimentary, 35% metasediments and 6% other. Over one third of the district is covered by shallow soil types.

2.1.5 Flooding

Importance of Data to IWCM

Flood data is important for determining appropriate types of land development and management strategies in flood liable land. Such data assists to identify the nature of existing flood problems, assess the most appropriate flood planning level of protection for existing and future developments and identify appropriate cost effective measures to reduce the impact of flooding and potential losses caused by flooding. Floodplain management should comply with the NSW Floodplain Management Manual, April 2005.

Flooding is not expected to have a significant impact on the urban water system apart from inundation of several sewage manholes and the Lagoon Street pumping station in the event that the existing levee system is overtopped.

The Macdonald River flood of record occurred in January 1962.

2.1.6 Land Use

Importance of Data to IWCM

Surrounding land use is an important factor in the Macdonald and Apsley catchment water quality. Natural bushland areas may protect source waters from potential pollutants, whilst agricultural, urban and industrial land areas are often accompanied by diffuse and point sources of pollutants including nutrients and faecal contaminants.

Land Use Data

Walcha is essentially a service centre to the surrounding area which has traditionally been associated with sheep, wool and cattle, although timber and timber-processing have been of increasing importance to the local economy since World War II. The local timber mill was closed by the owners in 2008 due to the prevailing economic conditions.

The eastern and southern areas of the district are covered with wet sclerophyll forests which yield large quantities of valuable hardwood timber. The central and north-western areas consist of open woodland which has been extensively cleared. Altogether almost half of the district is under native timber.

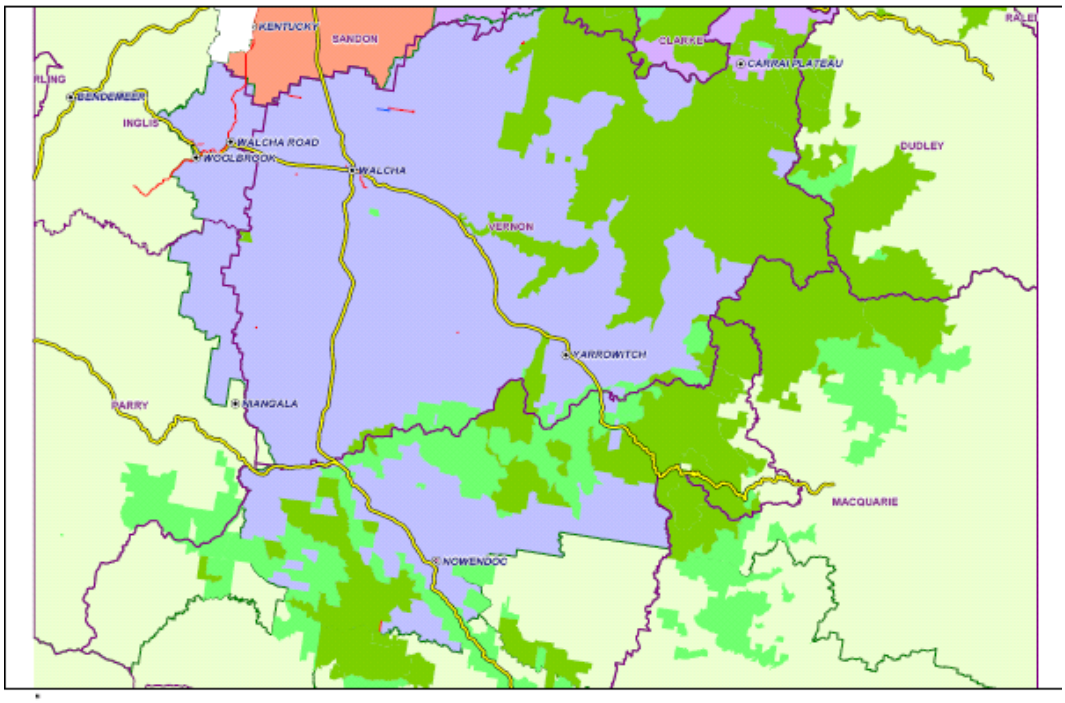


Figure 2-3 Map Showing Areas of Native Timber (Shown by Green Colours)

The large areas of native forest and the long history of pasture improvement on the cleared lands have resulted in the district having experienced little soil erosion. At least half of the district is largely un-eroded and the remainder experiences either slight to moderate sheet erosion or occasional formation of gullies in drainage lines.

Certain land uses in the catchment increase the likelihood of land and waterway contamination. Potential sources of contamination include chemical processing and storage sites, former sheep and cattle dip sites, landfill sites, petroleum storage areas, pesticide application areas and railway depots. Table 2.3 outlines activities licensed under the NSW Protection of the Environment Operations (POEO) Act.

Table 2.5 Activities in Walcha LGA Licensed Under POEO

Licensed Activity	Discharge To	Parameters	Monitoring Regime
Walcha Water Treatment Plant	Water (Apsley River)	Annual discharge volume <20ML.	12 samples per year.
Walcha Sewerage Treatment Plant	Water (Apsley River)	Tests for pH, BOD,TSS and Al Annual Load: BOD, N, P, Oil and grease, TSS and volume <219ML per year. Biological: Faecal coliforms and chlorophyll-a. Chemical: Concentrations of oxidised N, NH3, N, oil and grease, P, TKN, and TSS. Physical: conductivity (EC) and pH, BOD,TSS	12 samples per year.
Walcha Waste Depot	Air, groundwater	NH3, bicarbonate, Mg, nitrite, total organic carbon, TKN, TDS, temperature, sulphate, Na, pH, redox potential, K, Phosphate, BOD, TSS, Fl, nitrate, EC, chloride, Ca.	All 2 times per year.
		As, Cd, Ca, Cu, Hg, Fe, benzene, Zn, Cr, Mg, organophosphates, organochlorines, xylene, toluene, total phenolics, total PAHs, Pb, ethyl benzene.	All once per year.
Allen, Taylor & Co (Boral Timber Mill)	Closed in 2008		

2.2 Water Resources

Importance of Data to IWCM

Knowing the characteristics of the water resource is important in determining the opportunities or restrictions on the LWU. The quantity and quality of water available plays a role in determining the availability and type of treatment the water will require in order to be used in a particular way, and may impact on the cost of providing the water. Understanding these characteristics is important in ensuring the resource is used in the most efficient and sustainable way.

2.2.1 Surface Waters

The Walcha local government area lies at the eastern extremity of the Namoi River catchment and at the western extremity of the Macleay River catchment. The Walcha water supply system is unusual in that it sources water from the Macdonald River, part of the westerly flowing Namoi catchment, and discharges effluent into the Macleay catchment via the Apsley River, an easterly flowing stream. Therefore the two discrete catchments are of interest in this study.

Whilst the district is best known for the production of fine wool, it is also known as the first location in Australia to apply agricultural fertilizers using aircraft. This practice has continued since the 1950s and the build up and subsequent runoff of nutrients from the soil has been flagged as a concern for the water resource. The Department of Primary Industries (DPI) has advised that high nutrient loads can result in high algal levels in surface streams during summer which potentially impact on the use of these sources for town water and recreation. Agriculture and erosion may be potential sources of nutrients into the system.

The DPI also advises that agricultural practices using pesticides have the potential to contaminate surface water from streams, dams and rain water tanks for domestic supplies as a result of spray drift during application. Industry best practice and better regulation of chemicals is expected to have minimised problems with the use of pesticides however, Council's planning system should incorporate the separation of land uses to avoid potential conflicts.

The catchment characteristics of the Macleay and Namoi catchments are shown below in Table 2.6.

Table 2.6 Macleay and Namoi Catchment Characteristics

Catchment Characteristic	Macleay	Namoi
Rainfall (mm/year)	965	610
Runoff (mm/year)	175	23
Annual Flow (ML)	1,950,000	1,000,000
Evaporation (mm/year)	1049	
Catchment Area (sq km)	11,420	43,050
Total Dam Capacity (ML)	16,390	871,334
Licensed Diversions (ML)	5,362	264,686
Groundwater Volume used (ML/year)	2,346	140,326

Macdonald River

The source of Walcha's urban water supply, the upper reaches of the Macdonald River, forms part of the headwaters of the Namoi River which is part of the wider Murray Darling Basin (MDB) system.

The location of the Namoi catchment is shown below in

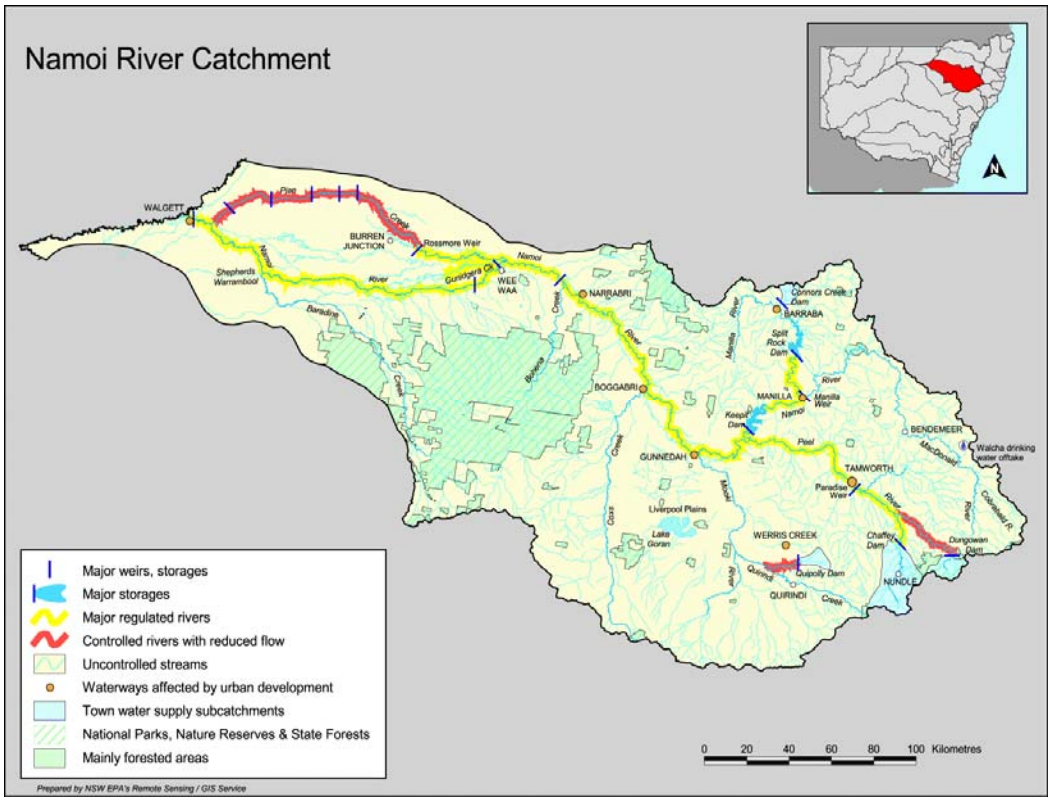


Figure 2-4.

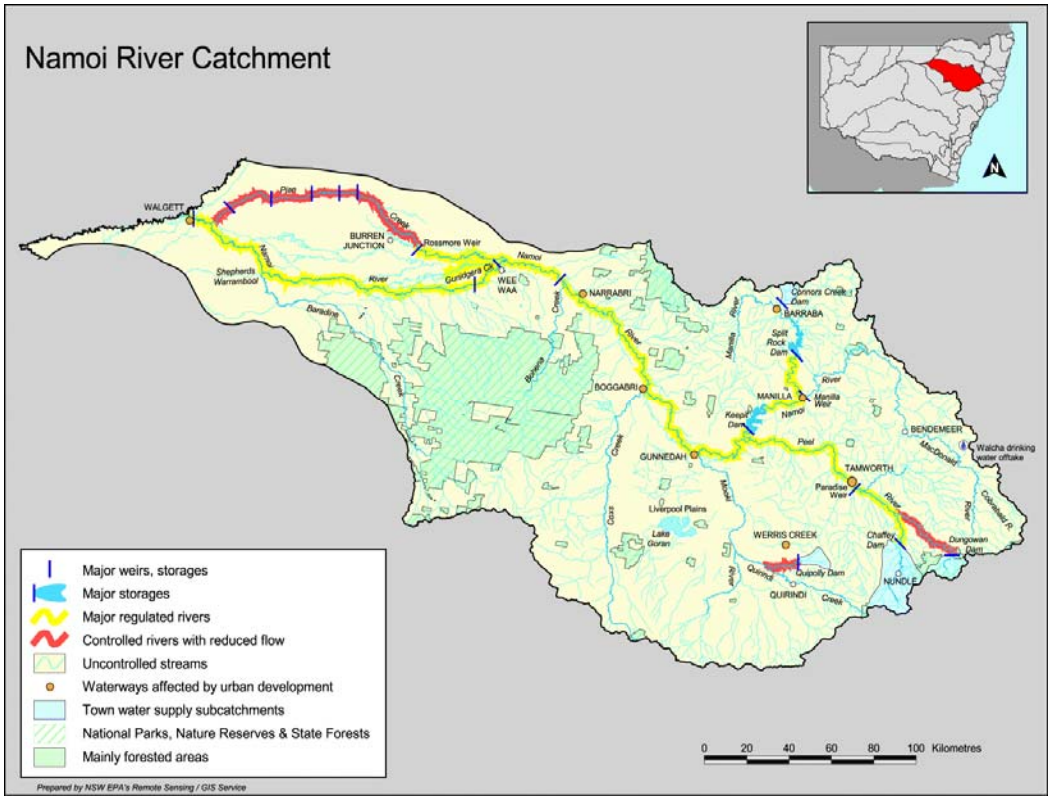


Figure 2-4 Location of Namoi River Catchment

The location of the Upper Macdonald River catchment is shown in Figure 2-5.

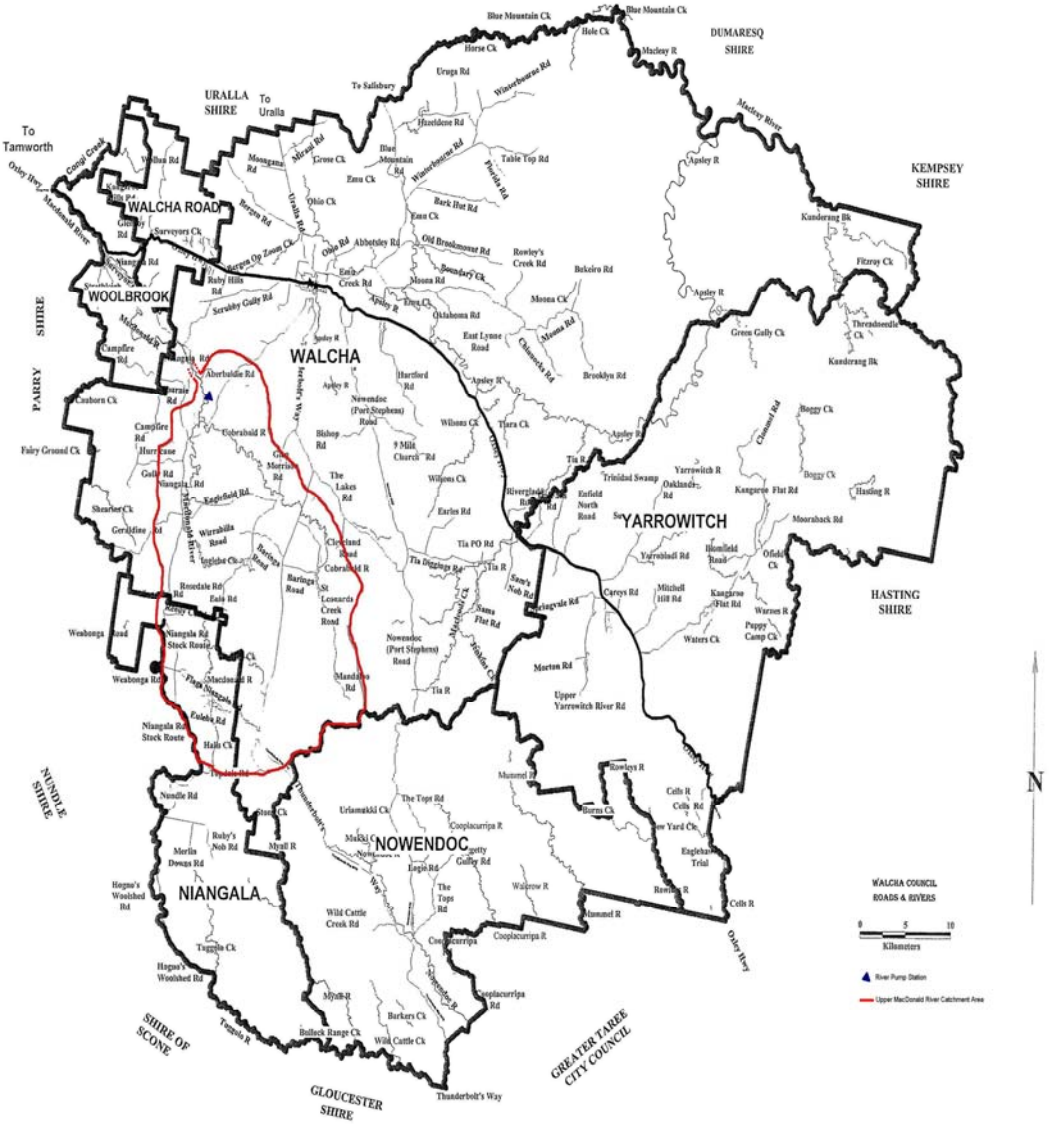


Figure 2-5 Location of Upper Macdonald River Catchment

The catchment characteristics of the Apsley and Upper Macdonald sub-catchments are shown below in Table 2.7.

Table 2.7 Apsley and Upper Macdonald Sub-catchment Characteristics

Characteristic	Sub-catchment	
	Apsley	**Upper Macdonald**
Area (ha)	115,400	85,284
Total Authorised Irrigation Area (ha)	114	123
River Flow (ML/day)		
50th percentile		67
80th percentile	2.24	17
No of water licences	11	27
Management category	S1	U3

Legislation requires that water be allocated for the fundamental health of a river and its dependent ecosystems, such as wetlands and floodplains, as a first priority. The Water Sharing Plan for the Apsley River does this by setting aside a proportion of each flow class for the environmental needs of the water source. In particular, the maintenance of water in the river during the very low flow periods is essential to provide refuge areas for fish and other aquatic species. A cease to pump condition is established for water access licences (those known as unregulated river access licences which cover irrigation, farming, industrial and recreational uses) when the flow is at, or below, 1 ML/day (measured at the flow reference point).

Limited volumes will be available below this cease to pump threshold for basic landholder rights (estimated to be 0.08 ML/day) and for licence holders that require continued access to water for hygiene and health purposes. A standard amendment was made to all unregulated river water sharing plans allowing licence holders who historically required water for dairy wash down, fruit washing, poultry watering and animal hygiene to extract up to 20 kilolitres per day during very low flow periods. At the start of the plan, no such licence holders had been identified in the Apsley River water source, however, a provision exists for licence holders to be added to the Plan if they are identified at a later stage.

Effluent Reuse

Council has recently commissioned an effluent reuse scheme that will divert approximately 100 kL per day of treated effluent from the discharge point into the Apsley River to land disposal. Whilst this amount is not significant during normal flows, in periods of low or no flow, there may be times when even this quantity is sufficient to maintain flows above the cease to pump threshold. Whilst STP discharge is not included when water sharing is considered, there is a need to liaise with downstream water users.

2.2.2 Groundwater

Groundwater supply in the local area is severely limited and, whilst the use of groundwater has been considered, it is not viable as an alternative or supplementary supply.

The aquifers are shallow, low-yielding fractured rock type only with depths between 50 and 100 metres in local shales and granites. Volumes are as yet undetermined.

However, the single source of supply in the upper reaches of the Macdonald River catchment may be vulnerable to the effects of a severe prolonged drought. These effects have not yet been fully assessed and a Yield Study for the Upper Macdonald River catchment is required to determine worst case and to account for expected effects of climate change. Whether investigation of the limited groundwater sources as a potential supplementary source of Walcha's water supply should be further considered will depend on the outcomes of the catchment Yield Study.

2.2.3 Other Sources

Stormwater

The watercourses from the urban area catchment are located immediately upstream of the levees constructed along the Apsley River and there is insufficient space to site a detention/collection basin to allow effective harvesting of this source. Any storage basin would need to be constructed in the higher reaches of the stream catchments. In addition, current high levels of suspended solids and nutrients adversely affect the quality of the resource.

Floodwater

Flood waters are not considered to have harvesting potential due to poor water quality during flood events.

Rainwater

There are currently no incentives in place to encourage the increased use of rainwater tanks in the urban area as an alternative source of water supply.

An assessment of the impact of rainwater tanks on household water cost, mains water supply and roof stormwater runoff was carried out using the DEUS generic model (Version RTM 2.1). The model is attached to this report as Appendix D and outputs from the model are shown below in Table 2.8.

Table 2.8 Summary of Outputs from the Rainwater Tank Model (V2.1)

Output	Tank Size 10,000L	Tank Size 2,000L
Mains Water Saving and Roof Stormwater Reduction kL per year	67.0	50.8
Total Water Bill Saving $/year	$53.58	$40.65
Total Water Bill Saving %	19%	14%

2.3 Urban Services

Walcha is located on the Apsley River floodplain and is subject to flooding both from rises in the river and local storm events. The worst floods occurred in the district in 1935, 1941, 1952 and 1962. The 1962 event affected 46 business premises in the Walcha CBD area or 90% of existing businesses at the time. Levees have since been constructed to a design level of 1m above the 1962 flood. The levees were completed in 1973 and whilst they have contained all flood events since then, The 2009 Study projections indicate that a 100 year ARI flood event would overtop the levee and result in flooding to depths of between 0.5 and 2.5 metres in low lying areas of the town. If this event were to occur, the sewerage system would be affected by flood water inundating manholes and the pumping station in Lagoon Street.

On three occasions (1929, 1938 and 1971) flood prone areas to the west of the Apsley River have been inundated by local flooding from Blairs Gully. Whilst not as severe as flooding from the Apsley River, the area affected was similar and flooding to a depth of one metre occurred at the Walcha News office in 1971. In sever storm events, several manholes near Walcha Central School would be at risk of inundation from localised flooding.

2.3.1 Water Supply

Data on the existing water supply system is important for determining how well the system is performing in terms of delivery of water services.

Records of the water volumes extracted, treated and consumed are used to determine how efficiently the water system is operated, and identify places where water is lost or unaccounted for. Understanding how water is consumed is a condition for adequate water demand management planning, which allows the development of programs to encourage people to use water wisely. Data on the capacity of the existing system is important for identifying places were the system may be unable to deliver services in the future and may require improvement.

Present Scheme Outline

Walcha Council operates one water scheme which serves primarily the urban area of Walcha. The surrounding rural area mainly relies on rainwater tank supplies for domestic water.

Raw water for the town of Walcha is sourced from a large pool in the Macdonald River approximately 17 km south west of the town at the property "Muluerindie". River water is pumped through a 225mm diameter rising main to a balance tank situated at the highest elevation 10km south of Walcha. It then flows under gravity in a pipeline either direct to the Water Treatment Plant at Legg Street or to the off-creek storage reservoir located adjacent to Aberbaldie Road on the outskirts of Walcha. See Figure 2-6 below.

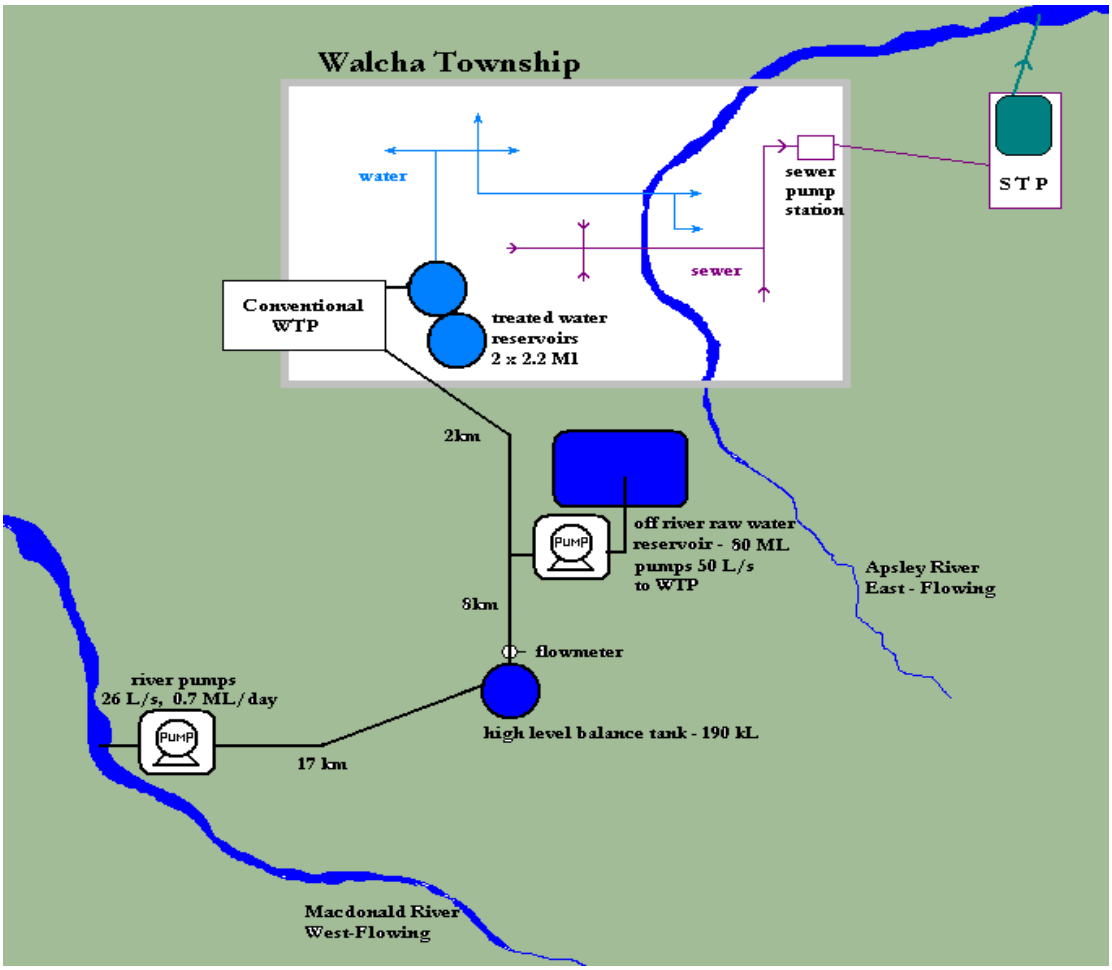


Figure 2-6 Walcha Water Supply and Sewerage Schematic

The water treatment plant was constructed in 1985 and the treatment process includes the following steps:

1. Coagulation
2. Flocculation

3. Sedimentation
4. Filtration
5. Chemical balancing
6. Chlorination
7. Fluoridation

Figure 2-7 Water Treatment Plant

Treated water is stored in two concrete reservoirs and distributed throughout Walcha via gravity mains or pumped to the high-level service reservoir for distribution to the high southwest section of the town.

The imposition of water restrictions is frequent and usually involves Level 1 restrictions which place a temporary ban on the use of fixed sprinklers. n the last 10 years, water restrictions were imposed in November 2002, January 2003, March 2004, May 2005, February 2007 and most recently in December 2009.

Future Arrangements

There are no major changes proposed to the water supply scheme as it currently stands. However, as discussed elsewhere in this report, the existing source of supply is seasonal and vulnerable to long periods of drought hence the need for a Yield Study of the supply catchment has been identified. The yield study represents the starting point to determine whether other sources of supply will need to be investigated. Future investigations will identify options for alternative sources of supply to cope with any potential growth in demand.

Concurrently, other alternatives such as the increased use of rain water tanks and the reuse of backwash water will also be investigated. See Section 2.2.3 for the outputs of rainwater tank modelling.

Likely capital works required in the longer term include:

1. Upgrading of the river intake works (minor works).
2. Construction of a new off-creek storage reservoir to improve the reliability of supply and storage of raw water (major works). This work will depend on the outcomes of the Yield Study.
3. Minor upgrading of the Water Treatment Plant and provision of clear water reservoirs
4. Programmed main replacement and extension.

Scheme Capacity

The system has a capacity of treating and supplying 4 ML per day. In 2006/07 a total of 212ML was supplied to meet demand at an average rate of 533KL per day. In 2008/09, 195ML was supplied at an average of 534KL per day. The average consumption equates to 190KL per property which is significantly lower than weighted median average of 305KL per day for inland local water utilities.

A summary of potable water quality monitoring results reporting and compliance with chemistry and microbiology guidelines for the period 2005 to 2009 are shown in Appendix B.3.

The current total number of rateable assessments connected to the scheme is 915 made up of 730 residential (including 27 vacant lots) and 158 non residential. Change over the past 21 years is shown by the following increase in the number of connections:

- 1988 – 721 total
- 1993 – 758 total
- 1998 – 805 total
- Current (2009) – 915 total

These statistics do not include 13 untreated (non-potable) metered services connected to the raw water supply main.

Averaged over the period, this trend gives an annual increase of 1.1% per annum which translates into approximately 9 new connections to the scheme each year

The Strategic Business Plan contains an assumed rate of growth of 1.0% per annum based on current consumption records. This gives a modest increase of 8 new assessments per year (see Figure 2.8 below). However, this growth needs to be considered in light of house occupancy rates which are likely to be falling thus giving fewer people and more housing. This trend can be taken

into account in the Demand Side Management Decision Support System model which has been developed by the former DEUS to enable water utilities to improve accuracy of their water supply forecasts and obtain a better understanding on how investment in water conservation can result in net savings in capital and operating costs.

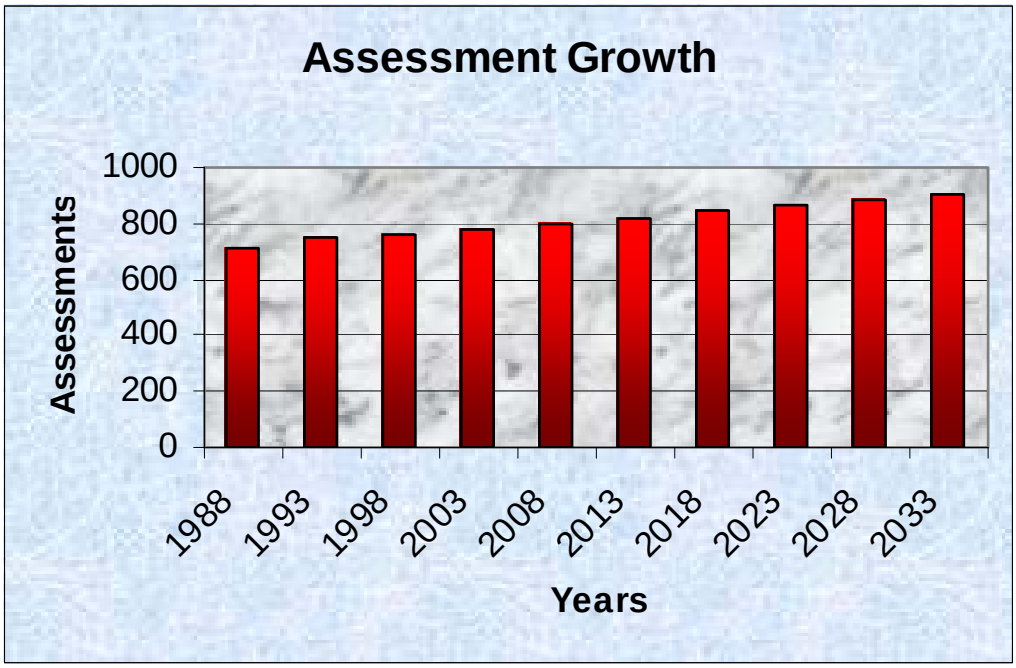


Figure 2-8 Assessment Projections (Water)

Asset Valuation and Condition

The total replacement value of the water supply assets is $14.395M and the written down cost is $13.465M. The assets are generally in good condition with the exception of the oldest parts of the reticulation system which require systematic programmed replacement. There is no asset management plan currently in place.

Tariffs and Charges

Walcha Council does not have a demand management program in place, however public education order to promote sustainable water practices is carried out and pay-for-use tariff structures are in place. Walcha is in the BASIX 30% Water Target Area

Table 2.9 below lists the water supply tariffs charged by Council for the 2009-10 financial year.

Table 2.9 Walcha Water Tariffs

Tariff Category	Tariff Type	Access Charge	Usage Charge
Residential (potable)	Two part	20mm $133 25mm $207 38mm $480	$1.95 per kL for < 300kL $2.87 per kL for > 300kL
Residential (non-potable)	Two part	20mm $130 25mm $200 38mm $465	$0.97 per kL
Non-residential	Two part	20mm $133 25mm $207 38mm $480	$1.95 per kL

2.3.2 Sewerage Scheme

Present Scheme Outline

Walcha Council operates one conventional sewerage scheme serving the town of Walcha. The scheme consists of:-

- Gravity collection mains
- Pump station
- Rising main
- Sewerage treatment plant

The existing sewerage treatment plant (2400 EP) has a capacity of 3ML per day and is located approximately 3 km east of the town centre adjacent to the Oxley Highway on the south bank of the Apsley River. Constructed in 1970, the plant is a conventional trickling filter system consisting of:

- Screens and grit chamber
- Sedimentation tanks
- Anaerobic digester
- Sludge drying beds
- Trickling filter
- Humus Tank and
- Oxidation pond

Figure 2-9 Walcha Sewerage Treatment Plant

Although the infrastructure is aging and parts of the system are currently working at operating limits, the plant currently meets the legislative standards required for discharge of treated effluent to the Apsley River.

A maturation (tertiary) pond is used for disinfection of the effluent. The area serviced by the Walcha Sewerage Scheme is outlined in Figure 2-8 below.

An effluent reuse scheme with a capacity of 100kL per day was commissioned in 2009. Treated effluent is piped from the STP to a storage tank and then used to irrigate Crown Land located adjacent to the STP on the northern side of the Apsley River. The remaining effluent that is not reused is piped by gravity flow from the maturation pond outlet to the discharge point on the Apsley River. Approximately 10 ML (or 6%) of Walcha STP inflows are expected to be reused in the first reporting year, however this amount is expected to increase to up to 50% in the future as further land for disposal of effluent becomes available. Alternative sites for land disposal of the effluent are currently being investigated.

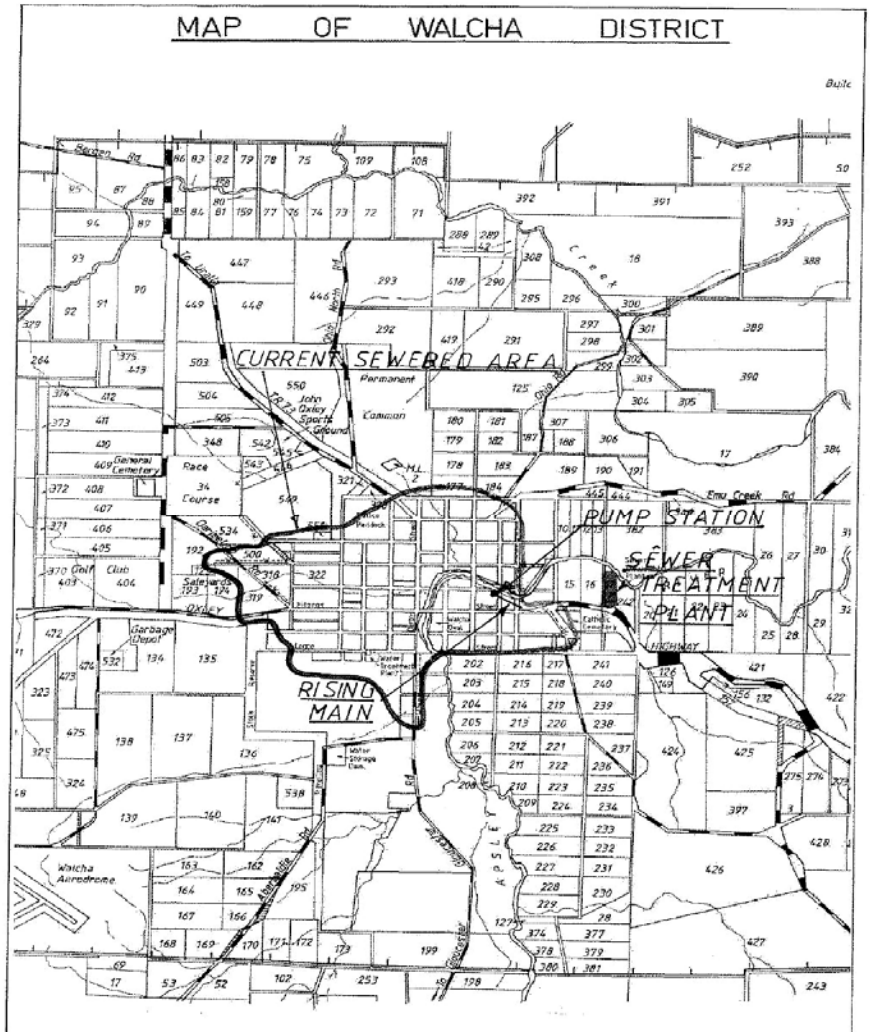


Figure 2-10 Walcha Sewerage Scheme Area

Future Predictions

The following expectations for the sewerage system in the year 2039 have been prepared.

Population growth is expected to decline overall in the LGA by approximately 0.7% per annum but remain relatively constant in the urban area as people relocate from the surrounding rural areas. The population projection for Walcha in 30 years time demonstrates minimal growth, if any, and the volume of sewage to be treated is therefore expected to remain unchanged for the foreseeable future.

The Community will however, maintain the right to access a well managed, affordable and environmentally efficient sewerage service. ESD principles will become integral to a higher quality of life in the future and demands for higher quality standards will need to be met by service providers.

More emphasis on alternative technologies will make other treatment and disposal methods such as land disposal and grey water usage common and

improve the chances of achieving the goal of not needing to use river disposal as much as is the case now.

Reduced wastage will result from improved resource and asset management. More efficient sewage appliances, homes, gardens and industry and in-house re-use will reduce loadings per capita so that total volumes treated may well be less than current levels.

These impacts will need to be quantified and may influence the outcomes of the yield study. Future opportunities for Council may emerge for example, subsidies for the installation of rainwater tanks or replacement of inefficient toilets or increased grey water use.

The Cost of Services will adjust to two major influences; namely supply and demand. Supply is affected by environmental costs (which must be incorporated) and technological gains in efficiency. Demand will always drive costs up if it exceeds supply.

Several other items have been identified as needing to be addressed in the medium to longer term. The items are:

- **Collection System**
    - Programmed replacement of aging gravity sewer mains
    - Potential mains extensions
    - Pump station storage refurbishment work
    - Pump station mechanical / electrical upgrading
- **Treatment System**
    - Investigation of STP including capacity, appropriateness/robustness of process, asset condition and OH&S;
    - Procurement and implementation of any capital works identified from the investigation.
- **Disposal**
    - Optimise capacity of effluent reuse scheme

These works will be considered over the medium and longer term to ensure a more reliable, cost effective and environmentally sustainable system continues to operate.

It is proposed that provision be made for the implementation of identified capital works to the existing STP within the next five to ten years.

It is important that the detailed investigation be carried out before any firm proposals are adopted. The investigation will need to be wide-ranging and include the identification of opportunities and a review of options for collection, treatment and disposal or recycling of wastewater.

Capital works may include:-

1. Extensions and replacement of sewer mains

2. Upgrading of the existing pumping station
3. Replacement or substantial upgrading of the treatment plant

Number of assessments

The number of rateable assessments currently (2009) connected to the scheme is 831, made up of 674 residential, 36 vacant lots and 121 non residential. Change over the past 21 years is shown by the following increase in the number of connections:

- 1988 – 710 total
- 1993 – 748 total
- 1998 – 763 total
- Current (2009) – 831 total

Averaged over the period, this trend gives an annual increase of 0.75% per annum which translates into approximately 6 new connections to the scheme each year.

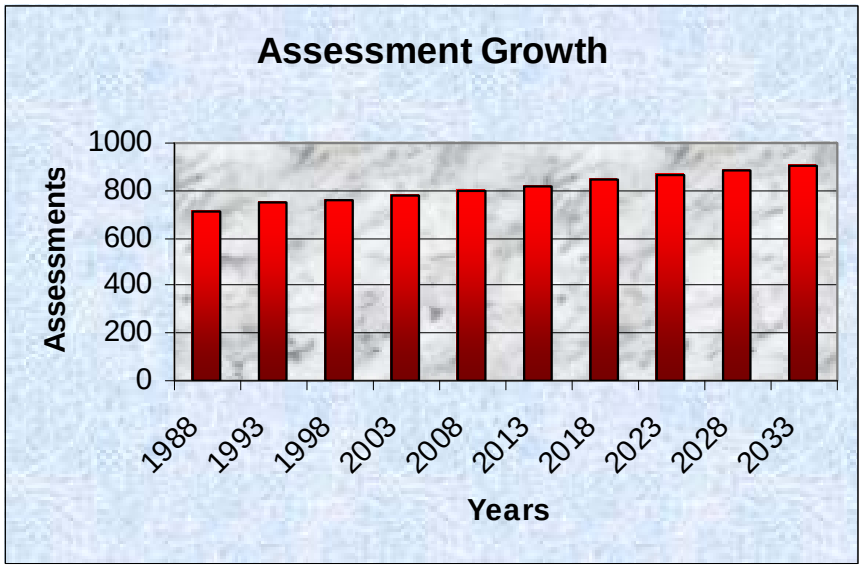


Figure 2-11 Assessment Projections (Sewerage)

Asset Valuation and Condition

The total replacement value of the assets is $7.59M and the written down cost is $6.77M. The assets are generally in fair condition with the exception of the oldest parts of the reticulation system and the treatment plant which will likely require augmentation works in the future, as discussed above. There is no asset management plan currently in place.

Sewerage Tariffs and Charges

For residential customers, the best practice guidelines have been adopted with a uniform sewerage bill for all properties based on the estimated volume of sewerage discharged from all residential customers. The annual residential sewerage bill is calculated as the Sewer Discharge Factor (SDF) times the annual non-residential sewerage access charge for a 20mm water service connection plus SDF times the product of the sewer usage charge (UC) and the average residential consumption. That is

$$B_R = (SDF \times AC_{20}) + (SDF \times C_R \times UC)$$

where

BR	=	Annual residential sewerage bill ($)
SDF	=	Sewer Discharge Factor – the proportion of total residential water consumption that is discharged to the sewerage system. A typical value for NSW is SDF = 0.7
AC_{20}	=	Annual Access Charge for a 20mm diameter water supply service connection ($). Calculated to be $361.20 for Walcha.
C_R	=	Average annual residential water consumption (kL). For Walcha last year this figure was 205kL.
UC	=	Sewer usage charge ($/kL). This has been set at $0.90 /kL which is within the recommended range.

Based on the above formula the sewerage charge for residential customers is set at $405.00 per year.

The unoccupied sewerage charge for residential customers is $202.00 per year.

Trade Waste Charges

Council has adopted the best practice guidelines which recommend that councils responsible for sewerage must levy appropriate trade waste fees and charges on all liquid trade waste dischargers in addition to the non-residential sewerage bills.

The fees and charges in 2009/10 are:

- Classification A $74.00
- Classification B $148.00
- The annual charge for classification C discharges will be set on a case by case basis depending on the complexity of monitoring required (for charging purposes and other administrative requirements)
- Re-inspection Fee $75.00

- Trade Waste Usage Charges for Dischargers with Prescribed Pre-Treatment
    - With appropriate pre-treatment: $1.40 / kL
    - Without appropriate pre-treatment: $12.85 / kL

2.3.3 Stormwater

Importance of Urban Stormwater Data to IWCM:

Urban stormwater quality and quantity data are important for determining how this potential resource source can be better managed. Dependent on the reliability of rainfall, it may be possible to reduce the volume of stormwater generated by harvesting rain from roofs, and thereby supplement potable tap water. The quality of stormwater will also impact on the potential use of this resource and dictate appropriate treatment, reuse and disposal methods. Surface runoff and stormwater quality can be improved through the use of Gross Pollutant Traps, wetlands and grass swales.

Council manages the system in accordance with the adopted Stormwater Management Plan prepared in 2003.

Catchment Description

The Walcha stormwater catchment consists of the urban area of Walcha plus some immediately adjacent vacant land. The town catchment covers an area 743ha and includes 45ha of commercial and 152ha of residential land. A further 36ha is taken up by sealed and some unsealed roads and the remaining 510ha is devoted to open space or agricultural pursuits.

Annual runoff from the Walcha catchment is estimated at 665ML or 39% of rainfall.

The estimated contaminant load in the runoff from the urban areas is 53 tonnes of suspended solids, 1.3 tonnes of nitrogen and 0.3 tonnes of phosphorus. The estimated annual flow and contaminant load in the Apsley River from the 2877 ha catchment upstream of Walcha is 3896ML of water, 195 tonnes of suspended solids , 1.9 tonnes of nitrogen and 0.6 tonnes of phosphorus. (Source: Walcha Stormwater Management Plan 2003)

These results indicate that Walcha stormwater is adding a significant proportion to the contaminant load in the Apsley River. Sampling results taken from the Apsley River downstream of Walcha indicate ecologically significant concentrations of phosphorus occur during dry periods when flows in the river are low.

2.4 Adequacy of Data

Following the review and compilation of available information, a gap analysis was carried out to determine the areas where critical information for

developing an IWCM strategy is either missing, unavailable or deficient. The critical information is that which is required to confirm whether targets are being met.

The results of the gap analysis are presented in Table 2.10 below.

Table 2.10 Data Gap Analysis

Input Item		Data used for:			Data Gap
No.	**Description**	**Catchment Audit**	**Water Resource Audit**	**Urban Area Audit**	
1	Yield Study for Macdonald River catchment				None existing
2	Environmental data including water quality for Macdonald River				Insufficient data available
3	Environmental data including water quality for Apsley River				No data available
4	Information on rainwater tanks including number, size, location and water use				No data available
5	Asset Management Plans for both water and sewerage				Incomplete data available
6	System Performance Reports				Insufficient data available
7	Trade Waste sources and volumes				Insufficient data available
8	Septic Tank Audit reports				None existing
9	Report on water system losses				None existing
10	Results from inflow and infiltration tests				None existing
11	Water Supply Demand Management Program				None existing
12	Water Supply Drought Management Program				None Existing

2.5 LWU Targets and Community Objectives

Introduction

The Integrated Water Cycle Management (IWCM) process is about addressing urban water service related problems. These issues are defined by non-compliance with urban water service targets, both legal obligations and agreed levels of service. Urban water service targets are the responsibility of the local water utility. Designing targets, measuring achievements against these targets and developing actions to solve problems in not reaching targets is central to the IWCM process.

What are water service targets?

All urban water services will have targets which relate to legislation, contracts, standards and agreed levels of service. There are also community objectives which may also link to the urban water service in a way that reflects what the community would like the urban water service to have or do.

These community objectives are often about the things the community values and wishes to support and pay for (e.g. higher levels of environmental protection). These two types of targets, utility and community, are used differently in the IWCM process.

How targets and community objectives are used in the IWCM process

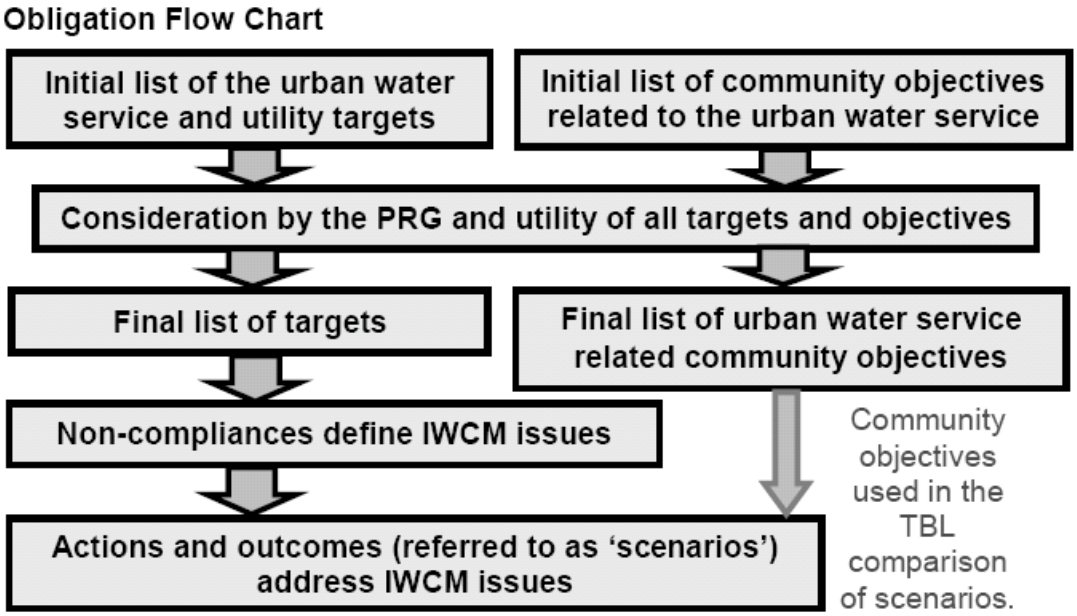
Utility targets are essentially those that must be met - either for health, level of service or environmental reasons and non-compliances are therefore described as IWCM issues. Community objectives relate to what the community considers important. Community objectives are considered when using the Triple Bottom Line (TBL) process to compare the ways the IWCM Strategy can address any problem areas. Only the community objectives which relate to the provision of the urban water service should be used in the IWCM process.

Key points to consider:

- If the requirement is a “must do” for the utility - it is an IWCM target.
- If the requirement is a “would like” - it is an IWCM community objective.

How are the urban water service requirements defined?

The Project Reference Group (PRG) and the utility should first clearly understand and define the ‘must do’ targets (e.g. extraction licence conditions). They should then list the preferred ‘would like’ objectives (e.g. use of renewable energy). By looking at all these requirements, the PRG and utility should be able to clearly define the services that must be provided, together with how the urban water service could support important community objectives.



Preliminary IWCM Targets

Lists of preliminary targets and community objectives were prepared for consideration by the Project Reference Group (PRG) at a workshop held on 9 December 2009. The final lists of targets and community objectives were subsequently adopted and are shown below in Tables 2.11 and 2.12.

Table 2.11 "Must Do" Utility Targets

Utility Service	Element	Obligation	Target	Comments	IWCM Issue?
Water Supply	Water Quality - Chemical and Microbiological	Agreed Level of Service (LOS)	100% compliance with ADWG.	1 of 10 samples over last 5 years outside pH guideline. 1 of 10 samples over last 5 years outside turbidity guideline. 9 out of 186 samples over last 5 years outside guideline for total coliforms. Nil of 186 samples over last 5 years outside guideline for e. coli.	Yes
	Water Quality sampling	Legislative requirement	Meet NSW Health sampling frequency requirements (52 per year)	83 and 89% compliance 2008 and YTD 2009.	Yes
	Water extraction from Macdonald River	Legislative requirement	Compliance with licence conditions	No Water Sharing Plan for the Macdonald River so currently no daily extraction rules. Note: a Water Sharing Plan is likely to be enacted within the next few years which will introduce a volumetric licence condition. Likely to then become	No

Utility Service	Element	Obligation	Target	Comments	IWCM Issue?
				an IWCM issue.	
	Security of water supply	Agreed LOS	Comply with the 5:10:20 design standard for imposing water restrictions.	No Demand Management in place. Only infrequent restrictions imposed but need for Yield Study to be undertaken to determine worst case and to account for expected effects of climate change.	Yes
	OH&S	Legislative	100% compliance with statutory requirements.	No breaches identified.	No
	Asset Management	Best Practice	Implement a robust, up-to-date AM Plan.	No Asset Management Plan in place.	Yes
	Management of scheme	Best Practice	Comply with all 6 Best Practice criteria.	Strategic Business Plan in place, Demand Management and Drought Management Plans required. IWCM in progress.	Yes
Sewerage	Effluent quality BOD, TSS, pH and oil & grease.	Legislative requirement	100% compliance with DECC&W licence conditions.	92% overall level of compliance over last 3 years.	Yes
	Sewage overflows	Environmental	< state median per 100km of main	21 in 2005-06 (median 8) 27 in 2006-07 (median 18) 17 in 2007-08 (median 12)	Yes
	Infiltration of stormwater	Best Practice	Reduce infiltration by 50%	Large spike in inflow volumes at STP during storm events. Possible effect on effluent discharge quality. Program needed to identify sources of infiltration.	Yes
	OH&S	Legislative	100% compliance with statutory requirements.	Some issues identified by OOW inspector. Safety audit required.	Yes
	Asset Management	Best Practice	Implement a robust, up-to-date AM Plan.	No Asset Management Plan in place.	Yes

Table 2.12 "Would Like" Community Objectives

Utility Service	Element	Obligation	Target	Comments
Water Supply	Typical residential bill (TRB)	Best Practice	Future level needs to reflect sustainable asset needs at minimum cost. Required levels will be an outcome of the Yield Study and Asset Management Plan when completed.	TRB currently less than statewide median for similar sized LWUs. TRB $451 in 2006-07 (median $496) TRB $493 in 2007-08 (median $531) TRB $509 in 2008-09 (median $556) Best Practice pricing adopted by Council.

Utility Service	Element	Obligation	Target	Comments
	Demand	Desired LOS	Maintain demand < weighted average median for similar inland LWUs.	Demand Management Study required as currently no demand management in place. In 2007-08, 190kL per property was supplied compared to the weighted average median for inland LWUs of 305kL and coastal LWUs of 170kL. Note that Walcha's climate is not typical of a hot, dry inland centre.
	Pressure and flow	Desired LOS	Compliance with WASA Water Supply Code of Australia	Areas of high elevation are affected: eastern end of Croudace Street, western end of Legge Street and western end of Hill Street.
	Water quality complaints e.g. taste and odour	Desired LOS	Number of complaints <4 per 1000 properties.	Occasional complaints of poor taste when algal blooms present in off creek storage. Occasional complaints of strong chlorine smell. Total complaints 2 in 2006-07 and nil in 2007-08
	Continuity of supply - Service interruptions	Customer Service Obligation	< state median for main breaks per 100km of mains.	2 in 2006-07 (median 11) 4 in 2007-08 (median 9)
	Water unaccounted for.	Best Practice	< 15% of total water treated.	Preliminary investigations show levels of unaccounted water losses in the system appear to be high. Need to assess losses more accurately.
	Environmental sustainability	Environmental	20% of energy from renewable sources.	Significant component of operating costs. Combined OMA costs per property: $697 in 2006-07 (median $700) $762 in 2007-08 (median $$730)
Sewerage	Odour	Desired LOS	< state median for complaints per 1000 properties.	Nil in 2005-06 (median 0.8) Nil in 2006-07 (median 0.9) Nil in 2007-08 (median nil) Some concerns regarding odour from STP.
	Recycled water	Environmental	Recycle as much effluent as is economically and environmentally sustainable.	Currently 6% but has capacity to increase. Note requirement for Section 60 approval. The Apsley River catchment has been classified as High Hydrologic Stress and High Environmental Stress under high extraction conditions and redirection of STP effluent will reduce low flows downstream. Liaison with downstream landholders is required
	Typical residential bill (TRB)	Best Practice	Future level needs to reflect sustainable asset needs at minimum cost. Required levels will be an outcome of the Asset Management Plan when completed.	TRB currently less than statewide median for similar sized LWUs. TRB $360 in 2006-07 (median $360) TRB $378 in 2007-08 (median $380) TRB $390 in 2008-09 (median $393)

Utility Service	Element	Obligation	Target	Comments
Storm water	Local flooding	Environmental	No impact on sewerage infrastructure for events <5% AEP.	Two manholes at risk behind Central School.
	Contaminant load	Environmental	Reduce load on Apsley River.	Identified as an issue in Stormwater Management Plan. Recent improvements in the Blairs Gully watercourse will decrease contaminant levels reaching the Apsley River.

3 Walcha – Audit and Interpretation

Whilst the data presented in Section 2.0 forms the first step in understanding the study area, the audit process presented in the following section is important for understanding how well a system is performing. The audit involves an assessment of the current data against the targets for water resource management and urban water service delivery of the local water utility, government policy and regulation. Auditing is based on the level of achievement against these objectives for the purpose of formulating ways to improve resource management and service delivery. The audit process allows the water utility to have a greater understanding of how well the Walcha system is meeting the various objectives for the urban water service resource management and will also help in setting priorities for future actions.

The Walcha audit has been undertaken in three parts: Catchment Audit; Water Resource Audit and Urban Area Audit. Each part generally contains some initial analysis and an assessment against the relative objectives. A summary of identified issues that results from the outcomes of each independent audit is also presented at the end of the section.

3.1 Catchment Audit

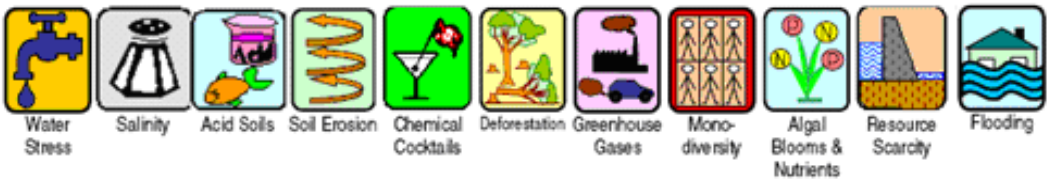
Details of Approach: The Walcha catchments were audited for a range of catchment objectives represented by the icons below. These objectives have been developed by the former DEUS to generally reflect existing land and water management policies of NSW. The objectives include issues such as salinity, deforestation, acid soils, erosion and water stress. For each objective, key drivers and criteria (a mix of quantitative and qualitative) were identified in order to assess the relevance of each objective to a particular catchment.

Although the catchment objectives do not designate compliance with a single numeric value, they do serve to show where a particular issue e.g. salinity or acid soils, is of specific importance in a catchment and will need to be considered in relation to water resource management and the provision of urban water services.

A summary of the ranking of the catchment objectives is presented in Table 3.1 below.

Table 3.1 Ranking of Catchment Objectives

Icon Colour	Ranking
Coloured icon	Objective **is identified** as an issue
White icon	Not enough information available on which to make an assessment
Grey icon	Objective **is not identified** as an issue



3.1.1 Water Stress

The NSW Water Reforms report Namoi Catchment Stressed Rivers Assessment August 1999 gives the classification and ratings for the river catchments as follows in Table 3.2:

Table 3.2 Stressed Rivers Assessment Classification and Rating

Sub- catchment	Overall Stress Classification	Full Development Stress Classification	Hydrology Stress Rating	Environmental Stress Rating	Identified Conservation	
					NPWS	Fisheries
Apsley River	S1	S1	High	High	Yes	No
Upper Macdonald River	S4	U3	Medium	Medium	No	No

Discussion: The S1 classifications for the Apsley River indicate that water extraction is likely to be contributing to environmental stress. However, since the source of Walcha's water supply is from the Macdonald River, any stress in the Apsley would result from other sources of extraction.

By contrast, for a low proportion of water extracted, the U3 Full Development Stress Classification in the report indicates that for the source of Walcha's water, the upper reaches of the Macdonald River, environmental stress is likely to be due to factors other than water extraction. Further, as the stress is not high, the river would be a lower priority for management action.

For medium proportion of water extracted, water extraction may be contributing to environmental stress however, insufficient data is available to quantify this impact, if any.

Urban and lifestyle water use competes with agriculture and other industry for this valuable resource. This can effectively see water consumed for lifestyle e.g. swimming pools, parks and gardens watering, at the expense of the environment and primary industries. Increased extraction has a severe cumulative negative impact on the protection of downstream aquatic habitats and places extra pressure on productive agriculture which relies on water for stock. Ribbon development along rivers can also block industry's access to

water for stock and potential supplementary irrigation. Council needs to plan for all residential developments to be connected to town water supplies and prevent ribbon development along water ways and reliance on ground water supplies to enable appropriate control of water resources.

Audit Outcome:

- Surface water. extraction of water for the Walcha supply has no impact on the Apsley River. Environmental stress in the Macdonald River is likely to be due to factors other than water extraction for periods of low extraction but may be contributing to environmental stress during periods of medium extraction.
- Groundwater. The number of licensed bores is low and is considered to not be applying pressure on groundwater supplies.

Although unlikely, not enough information is available to determine if Water Stress is an issue in the Walcha LGA.

3.1.2 Salinity

The Northern Rivers CMA advised by email dated 27 May 2009 that salinity mapping in the eastern fall of Walcha LGA has been carried out by consultants on behalf of the CMA. This mapping showed that there are some patches of existing saline affected land and land that is susceptible to salinity in the Walcha LGA. Rather than sodium chloride, the salts being expressed are carbonates and potassium sulphate.

The CMA further advised that:

- The main issue with salinity is the rise in surface water EC which threatens stream health. Generally the affected areas are not large enough and are manageable so as not to be considered a significant issue for agriculture.
- The areas of concern are north and west of the Walcha township and are most severe in the Wollun area outside the Walcha LGA boundary within Uralla LGA.

- Strategies which are currently being implemented by landholders include fencing areas to reduce erosion by stock and to allow for vegetation establishment and strategic tree planting.
- Previous Landcare initiatives in the Walcha LGA include property planning to raise landholder awareness of the issue and implementation of the strategies mentioned above to manage it. In addition, peizometers were installed in the Wollun area to monitor affects.

Figure 3-1 Dryland Salinity

This photograph shows the most publicised example of dryland salinity in NSW. It occurs at Dicks Creek, just outside the ACT. The site has long been used to illustrate the rising groundwater salinity model and consequent land management problems. Isolated areas in the Walcha district, outside the water supply catchment, exhibit similar characteristics but not to the same extent.

Soil salinity is generally low and highly variable both vertically and horizontally and temporally, with the majority of salt occurring at the soil surface, particularly during the hotter months following rainfall (i.e. increased evaporation rates). Salinised scalds contain both acidic (soil pH ~4) and highly alkaline soils (soil pH ~11), as indicated by Kreeb et al. who investigated scalds near Walcha in 1995 (see abstract reproduced below).

Abstract from research by Kreeb et al. (1995).

The characteristics of the soil, vegetation and groundwater at a dryland salinity site on Miramoona, a grazing property north of Walcha, were investigated. Soil parameters were highly correlated with the pattern of vegetation. Of overriding significance was soil pH, which varied from a high of over 10 on bare areas to a low of less than 5 on grazing land supporting the growth of a wide range of pasture species. The bare areas were characterized by alkalinity. While they were sodic at all depths measured, they were only marginally saline and then only at the soil surface. The chemical composition of the groundwater collected from three piezometer tubes varied quite markedly over the site.

It is hypothesized that the presence of alkaline bare areas on the Northern Tablelands is not a new problem, but rather the natural result of alternating wet and dry periods which have induced accumulation of carbonates and bicarbonates of the alkali cations, notably sodium. Drainage of the original perched swamps by the early landholders, tree clearing and the grazing of domestic livestock would have accelerated the process since European settlement. However, tree planting would appear unlikely to have any impact on the reclamation process in the short term. A more viable option would be the recreation of the original swamps in suitable situations, although this solution would create problems for grazing management.

Audit Outcome:

Although some areas to the north and west of Walcha have been identified and researched in the past, the area of most concern lies outside the Walcha LGA boundary and not within the water supply catchment boundaries. The combined affected areas are estimated to be a very small proportion of the Walcha LGA and the Northern Rivers CMA advises that these areas are currently being managed.

Salinity is not identified as an issue in the Walcha LGA.

3.1.3 Acid Soils

The Department of Environment and Climate Change website at www.environment.nsw.gov.au/acidsulfatesoil/riskmaps.htm contains advice that areas that contain acid sulfate soils have been mapped for the entire NSW coastline. The maps show:

- Probability of occurrence of acid sulphate soils
- Depth to acid sulphate soils
- Environmental risks associated with disturbing the soil
- The landform element on which the soil occurs.

A check of the website confirms a risk map has not been prepared for any area contained within the Walcha LGA. The nearest maps relate to the

Clybucca and Telegraph Point areas. Local enquiries reveal that there is no known incidence of acid sulphate soils in the Walcha area.

Audit Outcome:

No acid sulphate soils risk map has been prepared for the Walcha LGA and local enquiries reveal that there is no known incidence of acid sulphate soils occurring in the area. The soils of the area are naturally acidic but do not impact significantly on water quality.

The occurrence of acid sulphate soils is not identified as an issue for the Walcha catchment.

3.1.4 Soil Erosion

Soil types in the Walcha LGA are considered to have potential to be moderately erodible. The eastern side of the LGA catchment has very high rainfall (average >1500mm per year) suggesting that it is highly probable that the catchment has lost topsoil by accelerated erosion from land-clearing on steep slopes and past unsound land-use practises.

Development of farming properties resulted in the construction of a network of unsealed roads, often with inadequate regard to the erosion potential. After heavy rainfall, the turbidity of the waterways attests to the high level or erosion occurring. For example, samples taken after storm events in August and September 2006 and again in January and June 2007, give medium to high levels of turbidity ranging from 13 to 32 NTU.

Causes of degradation also include forestry operations, uncontrolled access by stock to stream banks, poorly formed tracks, clear felling and over-development of land.

Turbidity in streams impacts upon urban and rural water provisions. The major source of turbidity is stream bank erosion caused by pests (aquatic and terrestrial animals and plants), river regulation and management of agricultural and forestry land with in the catchment.

Audit Outcome:

Soils within the Walcha LGA are considered moderately to highly erodible. Little information is available on soils specifically within the Macdonald and Apsley River catchment areas.

Erosion affects water turbidity in the waterways and can be a problem particularly in the Macdonald River catchment. Erosion is considered to be an IWCM issue within the catchment.

3.1.5 Chemical Cocktails

Agricultural practices using pesticides have the potential to contaminate surface water from streams, dams and rain water tanks for domestic water supplies as a result of spray drift during application. Industry best practice and better regulation of chemicals is expected to have minimised problems surrounding the use of pesticide. However, Council's planning scheme should incorporate the separation of land uses to avoid potential conflicts.

Historic and current sites of waste storage have the potential for being point sources of contamination. These may include old dip sites and waste disposal sites. There is a need for mapping of historic and current potential point sources of pollution throughout the study area in order to quantify potential impact on water quality.

A number of poor practises have been identified in the LGA introducing the possibility of chemical cocktails. These practises include:

- Dumping of rubbish around skip bins
- Some old skip bins not having lids
- Poor environmental practices in auto mechanical and service station businesses, including hosing down of outside areas, inappropriate storage of liquids, waste, batteries and motors.

Audit Outcome:

Chemical cocktails have the potential to leach contaminated water to ground or surface waters. However, there are no known sites within the LGA where the concentration of chemicals is considered to be an issue and the DECC has no record of contaminated sites within the LGA.

Currently there is no testing regime in place which would detect the presence of chemical cocktails in the raw water supply.

There is insufficient data to conclusively determine if Chemical Cocktails are an issue in the Walcha LGA.

3.1.6 Clearing

Whilst forestry operations in the local area are significant, they do not occur within the boundaries of the water supply catchment. Forested areas occupy approximately 30% of the Walcha local government area and are being cleared (and replanted) at a rate of about 2% per year.

The resultant disturbed soil, albeit temporary, may lead to a loss of topsoil in steep terrain during storm events contributing to erosion and subsequent turbidity in streams. Land clearing may also be contributing to an increase in greenhouse gases.

Audit Outcome:

Forestry operations and other land clearing have the potential to impact on the turbidity levels of local streams and increase in greenhouse gases.

There are no forestry operations undertaken by NSW Forests within the boundaries of the Macdonald River catchment. Further clearing by private landholders is controlled under the Native Vegetation (Conservation) Act.

Clearing is not identified as an issue in the Walcha LGA.

3.1.7 Greenhouse Gases

Warming of the climate system over the past century is very clear and since the mid 20th century most of this warming is due to increases in greenhouse gas concentrations. Global warming will lead to changes in rainfall and runoff and will significantly impact on the regional hydrology. In particular, reduction in rainfall will result in reduced runoff.

Australian natural resources management agencies are aware of the risks of climate change, and many have carried out studies for their systems, ranging from simple climate change impact assessment to detailed system-scale modelling.

The Department of Environment, Climate Change and Water (DECCW) – NSW Office of Water is responsible for management of water resources throughout NSW. To effectively manage water resources the Department requires future projections for rainfall and temperature, and an understanding of the impacts of this future climate on runoff and water availability.

A study into future climate and runoff projections for NSW and the ACT commissioned by DWE in 2008 concluded that:

- The predicted global warming by 2030 relative to 1990 in the IPCC greenhouse gas emission scenario is 0.9 degrees Celsius, whilst the mean average APET in 2030 relative to 1990 would increase by 2 to 4 percent.
- The majority of models (9 out of 15) show a decrease in the mean annual rainfall. Most indicate that future winter rainfall is likely to be lower across the entire region whereas only 5 of the 15 models indicate a reduction in future summer rainfall.
- The median or best estimate indicates that future mean annual runoff in NSW in 2030 relative to 1990 will be lower by 20% in the southern parts, no change to a slight reduction in the eastern parts and higher by 0 to 20% in the northwest corner. Averaged across the entire region, the median or best estimate is a 5% decrease in mean annual runoff.

Accordingly, the impact of potential climate change on the local catchment is expected to have minor consequences. Notwithstanding, Council should consider reviewing their policies to identify where reductions in greenhouse emissions and subsequent impact on climate variability can be made.

Audit Outcome:

A review of Council policies and procedures may result in a local reduction in greenhouse emissions.

Greenhouse gas emissions are not identified as an issue in the Walcha LGA.

3.1.8 Reduced Biodiversity

Audit Outcome:

Approximately 30% of the catchment area is improved pasture and management practices are in place to preserve remaining biodiversity.

Reduced biodiversity is not identified as an issue in the Walcha LGA.

3.1.9 Algal Blooms and Nutrients

High nutrient loads result in high algal levels in surface streams during summer which potentially impact on the use of these sources for town water and recreation. Agriculture and erosion may be sources of nutrients to the system.

Nutrients encourage the growth of blue-green algae . Eutrophication is the process of nutrient enrichment in waterways and the main nutrients which contribute to this process are phosphorus and nitrogen.

The NSW Office of Water advises that one of the major sources of phosphorus and nitrogen entering waterways is from runoff and erosion from fertilised agricultural areas.

The application of fertiliser by aircraft has continued to the present day after the practice was pioneered in the Walcha district in 1950 by the use of a Tiger Moth aeroplane to spread superphosphate for the first time in Australia.

The Stressed Rivers Assessment for the Upper Macdonald River identifies the two primary stress factors are land use pressures (which include the agricultural pursuits of grazing and cropping/cultivation) and chemicals. The report advises that these activities "contribute to sediment inputs into the river systems and promote eutrophication". This nutrient enrichment can lead to blue-green algae blooms in the summer months."

There have been two isolated instances of blue-green algal blooms in the off-creek water storage during peak summer periods pre 2002. Improved management practices were implemented post 2002, including constant drawing from the storage to ensure regular replenishment of supply and the provision of aeration equipment. Whilst there have been no significant algal blooms since that time, a minor algal bloom occurred in the off-creek storage in November 2008 following heavy storms at night in the catchment. At the time, the river intake pumps were in service and delivered some of the "first flush" runoff from the catchment into the off-creek storage which resulted in a minor bloom several days later.

Council should consider the provision of additional telemetry equipment to ensure river intake pumps are shut down during periods of sudden rises in river levels. These rises indicate storms in the catchment and the telemetry will prevent nutrients being delivered into the system because of the "first flush" effect.

Audit Outcome:

There have been isolated incidences of algal blooms occurring in the off-creek storage in the past however details of these occurrences have not been recorded. Since management practices were changed and aeration equipment installed in 2002, there has been one further minor outbreak.

Algal blooms are identified as an issue in the Walcha LGA.

3.1.10 Resource Scarcity

The source of Walcha's water supply, the upper reaches of the Macdonald River, raises questions of reliability of supply from a single stream source.

Approximately 60% of the annual rainfall occurs in the summer making the supply seasonal and vulnerable to long periods of drought. The off-creek storage on the outskirts of Walcha has sufficient capacity for about 90 days at normal rates of demand. In times of supply shortage, consumption can be managed with restrictions. Notwithstanding, the effects of a severe prolonged drought have not yet been fully assessed.

Walcha Council has recently installed (September 2009) a system to initially recycle approximately 20% of effluent which will be used to irrigate a travelling stock reserve.

Planning for the disposal of waste water also needs to be well considered since agricultural land which may be suitable to aid disposal (proximity, soil type, topography, free from the potential of land use conflict) is a limited resource and should be protected and promoted. Downstream agriculture may be currently utilising a proportion of Council's waste water hence consultation regarding proposed diversion of this resource may be necessary as the industry may have become reliant on this resource.

Audit Outcome:

A single source of supply in the upper reaches of the catchment may be vulnerable to the effects of a severe prolonged drought.

Resource scarcity is identified as an issue in the catchment.

3.1.11 Flooding

The altering of floodplain landscape impacts upon urban areas by diversion of floodwater and can lead to localised flooding. Council must not allow development other than routine agriculture on the floodplain.

Audit Outcome:

Levees at Walcha were completed in 1973 and whilst they have contained all flood events since then, projections indicate that a 100 year ARI flood event would overtop the levee and result in flooding to depths of between 0.5 and 2.5 metres in low lying areas of the town.

On three occasions flood prone areas to the west of the Apsley River have been inundated by local flooding from Blairs Gully. Notwithstanding, the impact on infrastructure from flooding is estimated to be minor.

Flood waters are not considered to have harvesting potential due to poor water quality during flood events.

Flooding is not identified as an issue for Walcha.

3.2 Water Resource Audit

The Walcha Water Resource Audit was undertaken in two parts. Firstly, an assessment of the Macdonald River water quality was undertaken by conducting an audit of the water quality data for the catchment against reasonable water quality standards. Whilst the water quality standards are the same for the Apsley River catchment, there are no test results available for that stream. Secondly, an assessment of the water volume (allocation) within the catchment was undertaken against typical river flow requirements. This audit is limited in that no specific water quality or flow objectives have been set for the Macdonald River.

3.2.1 Water Quality

Water quality assessment data was taken from the NSW Office of Water gauging station at Bendemeer and from test results of five samples taken by the NSW Health Commission at sites near Walcha.

Details of Approach: Water quality was assessed against reasonable water use quality objectives. Each of these objectives is represented by a series of icons that is defined by a group of water quality indicators and associated criteria derived from the ANZECC Water Quality Guidelines 2000.

As each environmental objective is represented by a group of indicators, all indicator criteria must be met for that environmental value to be considered protected. Each environmental objective is also ranked on its level of compliance to all of the criteria associated with its indicator group. A four-colour coded ranking for the environmental objective icons is provided in Table 3.3. The ranking highlights the level of compliance with each environmental objective in the Walcha scheme. Where insufficient information is available to assess criteria, the corresponding cell is shown in grey colour.

Table 3.3 Ranking of Environmental Objectives for Water Quality

Ranking	Lower Limit of Compliance	Upper Limit of Compliance	Colour
Good	75%	100%	Green
Fair	50%	75%	Yellow
Poor	25%	50%	Orange
Very Poor	0	25%	Red

Water Quality Objectives

The identified water quality objectives and criteria are shown in Appendix B.1.

Water Quality Outcomes

Details of the water quality audit are shown in Appendix B.2 however, some key outcomes of the audit are:

- Although only low levels of faecal coliforms were recorded, this is nevertheless adversely impacting on both homestead and town raw water supplies.
- High levels of total phosphorus and total nitrogen result in very poor quality compliance for aquatic ecosystems.
- There was insufficient data to determine the impact of the water quality on irrigation and livestock water supplies and aquatic foods (cooked).

3.2.2 Water Volume (Allocation) Assessment

Data Sources: Flow data for the surface streams was obtained from DWE gauging stations and the NSW Office of Water web site.

Macdonald River

The average daily stream flow in the Macdonald River measured at gauging station 419010 at Woolbrook is 348.5 ML whilst the historical record daily flow from this catchment is 47.9 GL in February 1955. There is currently no surface Water Sharing Plan (WSP) for this catchment relevant to the study area.

Historical flows recorded at the gauging station at Woolbrook are shown in Figure 3.4 below.

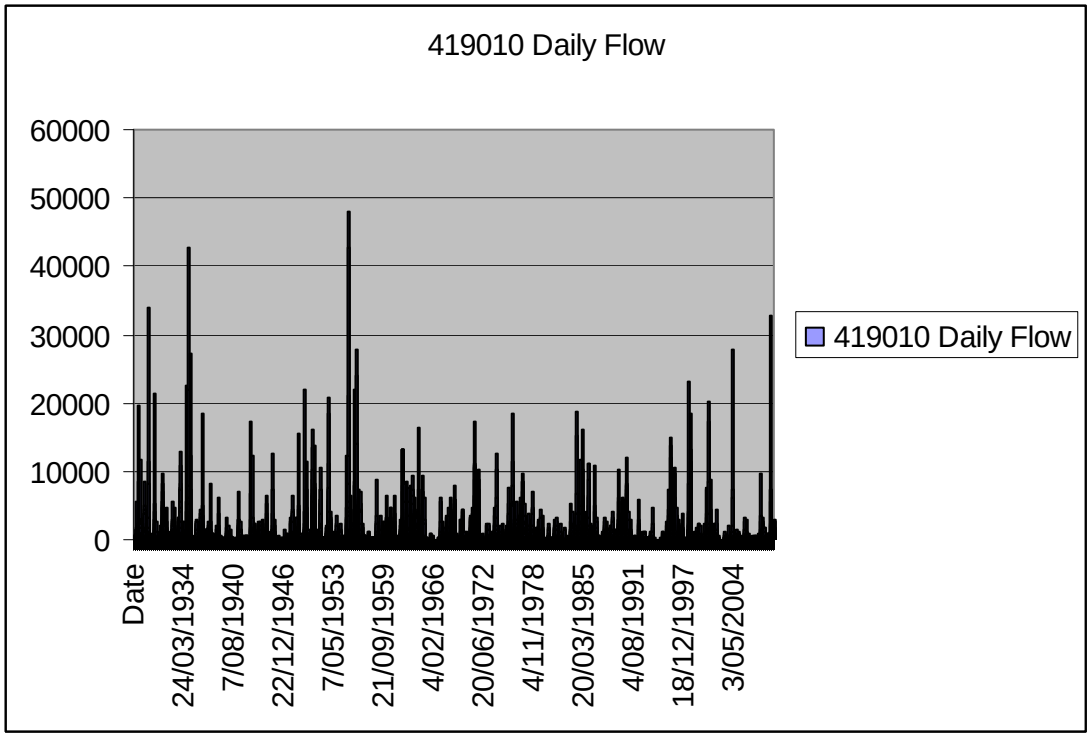


Figure 3-2 Historical Flows in the Macdonald River at Woolbrook

Apsley River

The Apsley River is located on the eastern fall of the Great Dividing Range and is a tributary of the Macleay River. The Apsley River Gorge is part of the Oxley Wild Rivers National Park and is immediately downstream of the Apsley Falls. Walcha is also within its catchment. The water source has an area of about 1,154 square kilometres, which is generally undulating, cleared agricultural land.

A river flow gauging station has operated at Apsley Falls since 1952. Apsley River is a relatively low flowing river compared to many other eastern flowing water sources in northern NSW. January tends to be the month of the lowest flows. This is also the time when water demands for irrigation are high.

A Water Sharing Plan for the Apsley River Water Source was implemented in 2003.

Currently there are 11 water access licences in the water source totalling 336 ML. Of these, 2 were for domestic and stock purposes. Domestic and stock access licences are required for intensive stock raising purposes and for those landholders whose property does not front a river or creek.

3.2.3 Climate Change

Climate change impacts on town water supplies throughout NSW need to be considered within the IWCM Evaluation. The long term climate forecast is predicting longer, hotter and drier bouts of weather and greater storms.

The following list of possible climate change impacts relating to water service planning has been determined as relevant to the water services Walcha Council is providing and have the potential to affect Council's ability to maintain desired levels of service to customers.

External impacts

- Reduced annual rainfall and runoff (catchment, urban and roof)
- Increased variability in rainfall
- Increased evaporation
- Greater competition for existing water sources
- Lowered or raised water table
- Changed soil moisture contents

Utility impacts

- Changed water access licence conditions (e.g. less access to low flows)
- Greater uncertainty about sustainable yield from existing water sources
- Increased interest in rainwater tanks and use of recycled water
- Greater interest in or need to use low carbon dioxide (green) energy

Customer Impacts

- Increased customer total or seasonal water usage demand
- Greater grey water reuse

The greatest risk is to the sustainability of the Macdonald River water source and further reinforces the need for a yield study to be undertaken on the catchment.

DEUS Water Demand Trend Tracking and Climate Correction v10 model.

This model was supplied to Council by the former DEUS and was developed for LWUs who wish to track trends in water demand and production on a climate-corrected basis.

Although use of this model was considered and the required historical data necessary to run the model can be sourced, the value of the model outputs for

Walcha at this stage of the IWCM process is considered marginal. In consultation with the Office of Water, it was decided that the use of this model would be of greater value when the secure yield study is undertaken and the results incorporated into a future review of IWCM.

3.3 Urban Area Audit

The Walcha Urban Area Audit was undertaken in two parts. Firstly, an assessment of existing urban area impacts on the water resource was undertaken. Secondly, the performance of the local water utility's water and sewerage infrastructure was assessed against Council's Strategic Business Plan and the performance of other utilities across the state, in particular towns of similar size and climatic location.

3.3.1 Assessment of Urban Area Impacts

Available data on the quality and quantity of sewage effluent was utilized to determine estimates of the annual load of nutrients (TN and TP) and suspended solids (SS) discharged to the environment from these point sources. Table 3.4 outlines the estimated nutrient loads from both urban sources and that recorded naturally in the Apsley River in an average year.

Table 3.4 Estimated Nutrient Loads from the Walcha Urban Area

Parameter	Stormwater (tonnes)	Sewage (tonnes)	Total Urban (tonnes)	River (tonnes)
Total Nitrogen	1.3	2.2	3.5	1.9
Total Phosphorus	0.3	1.8	2.1	0.6
Suspended Solids	53	5	58	195

The issue of stormwater runoff adding significantly to the contaminant load of the Apsley River downstream of Walcha is one for Council to address but not in its role as the LWU.

3.3.2 Urban Services Performance Assessment

The (former) DEUS reported performance comparison for Walcha is attached as Appendix C. Points to note from the performance comparison are:

- Operating costs for water supply have been increasing for the past 3 reporting years and are now well above the State median;

- Average residential water consumption is comparable with the state median but well below the weighted median average for inland LWUs,
- Typical residential bill for water is considerably higher than the state median;
- Water supply service complaints consist of taste and odour problems, particularly when there have been occurrences of blue-green algae, and low pressure. The number of complaints are comparable to the state median;
- Microbiological contamination in potable water systems is low compared to the state
- average;
- There have been no odour complaints from sewerage and
- Walcha STP DECC&W licence compliance is comparable to the state median.

3.4 Summary of Issues Arising from the Audit

Having undertaken individual assessments of the catchment, the water resource and the urban area, it is important to summarise the audit outcomes and, if possible, determine relationships between identified issues. The objective of such an audit is to highlight an integrated set of water resource and urban water service management issues.

The preliminary issues identified by this process are summarised in Table 3.6.

Table 3.6 Summary of Issues arising from the audit

Audit Component	Identified Issues	Comments
Catchment	Water extraction for the Walcha supply may be contributing to environmental stress in the Macdonald River during periods of medium extraction. If so licence conditions in the future may be more restrictive if a water sharing plan is implemented. This may result in more frequent and/or tighter restrictions being imposed.	The residential water supplied by the scheme is 190 kL per property which is low compared to the weighted median average of 305 kL for inland LWUs.
	Erosion is affecting turbidity levels in waterways, particularly in the Macdonald River catchment. Homestead water supplies and primary contact recreation are adversely affected.	Soils within the Walcha LGA are considered moderately to highly erodible. A major source of turbidity is stream bank erosion.
	There have been incidences of algal blooms occurring in the off-creek storage during summer. These may be due to high nutrient loads resulting from agricultural practices involving the use of fertilisers.	Need to address at catchment level.

	No collection and monitoring of data to identify potential for chemical cocktails with potential to affect water quality.	
	Agricultural practices involving the use of pesticides have the potential to increase the accumulation of undesirable chemicals in soils.	Application of industry best practice and improved regulation of chemicals is expected to reduce pesticide concentrations.
	High levels of P and N in surface waters are adversely affecting aquatic ecosystems.	
	Levels of faecal coliforms are impacting on both homestead and town raw water supplies.	
	The Apsley River catchment has been classified as High Hydrologic Stress and High Environmental Stress under high extraction conditions.	This stream is not the source of Walcha's water supply. The proposed reuse of STP effluent will reduce low flows downstream of Walcha.
Water Resources	A single source of supply in the upper reaches of the catchment may be vulnerable to the effects of a severe prolonged drought.	A Yield Study of the catchment is required.
	Groundwater supply is severely limited. Little opportunity to access as an alternative or supplementary supply.	Aquifers are shallow, low-yielding fractured rock aquifers only. Depths between 50 and 100 metres in local shales and granites. Volumes are undetermined.
Urban Area	Sewerage system is aging and deteriorating. STP requires upgrading or replacement in order to meet future discharge standards.	
	No existing on-site sewage system database to allow for monitoring and compliance of systems.	
	Insufficient gross pollutant traps or stormwater control devices resulting in lack of control of water quality discharging into Apsley River.	Stormwater runoff is adding significantly to the contaminant load of the Apsley River.
	The typical residential bill for water and sewer are high.	A static urban population may place financial pressure on future generations to fund infrastructure replacement.
	Lack of incentives for consumers to develop alternative water sources e.g. rainwater tanks.	
	Infiltration of stormwater into sewerage reticulation system.	May be impacting on the quality of effluent discharged from the STP.
	Any other issues identified by the PRG.	

4 Verification and Prioritisation of Issues and Potential Management Actions

4.1 Role of the PRG

Stakeholder input is required for the IWCM process to achieve its objective.

A Project Reference Group (PRG) is a group of people representing key stakeholders that assists the IWCM process to develop a long term and sustainable urban water service strategy. It facilitates community involvement and choosing solutions which best fit local requirements.

The PRG provides input by encouraging discussion, debate and consideration of a wide variety of views and opinions. The PRG meets during the IWCM study to guide the process towards a solution that meets community expectations and needs.

At a workshop held on 9 December 2009, the PRG considered the list of issues identified by the audit process and other technical findings developed by Council as the local water utility. The PRG provided input on all existing and potential issues likely to affect the local community relating to the provision of the urban water service over the next 30 years, validated the issues and helped to identify locally suitable options for managing these issues.

4.2 Business as Usual Scenario

Some or all issues may be addressed in the IWCM Evaluation by the Business as Usual (BaU) scenario. This scenario identifies the utility and council actions that have been put in place to address IWCM issues over the next 30 years.

Actions need to be firm commitments (that is, formally adopted) by the utility or council. They can not only be in a business plan. The business as usual scenario filters issues to find any that need new actions or works. If the business as usual scenario finds that all issues can be addressed through existing actions or formally adopted actions or works, there is no need to develop a separate IWCM Strategy.

For an action or capital work to be included in the BaU scenario, it must either already exist or be formally adopted by the utility or council. Formal adoption means that the pre-project phase of works has been completed. This includes determining the need for the project, obtaining regulatory requirements, arranging preparation of a draft options report, providing a copy of the draft report to the Office of Water for review and concurrence, determining the adequacy and suitability of the option, arranging preliminary community

consultation and formally passing a resolution by the utility to adopt the action as the preferred action.

Current planning makes provision only for the ongoing maintenance and operational costs of the existing water supply, sewerage and stormwater infrastructure and has not formally committed substantial actions or capital works to any of the water services. In addition, there are no Asset Management Plans currently in place.

Consequently, the identified issues are considered not to be adequately addressed by existing and formally adopted actions, the BaU scenario, and require management action.

4.3 Demand Side Management Decision Support System model vS1.1

This model was developed by the former DEUS to enable LWUs to improve the accuracy of water supply forecasts and obtain a better understanding of how investment in water conservation can bring about significant net savings in capital and operating costs.

The model was run for the Walcha case and is attached to this report as Appendix E. The outcomes of the model show the predicted changes to Per Capita Water Demand (L/day), Total water Demand (ML/year) and Peak Day Water Demand for four different scenarios of water conservation measures.

These outcomes will have a bearing on the security of supply bottom line and represent vital data for the catchment yield study modelling.

Further, these results, and those from the Rainwater Tank model in Appendix D, will be incorporated into Council's future Demand Management Plan and the next IWCM review, once the Yield Study on the catchment has been completed.

4.4 PRG Verified Issues, Priorities and Potential Management Actions

The IWCM issues that were validated and identified as either high, medium or low priority at the PRG workshop held in December 2009 are summarised in Table 4.1 and Table 4.2 below.

Table 4.1 Summary of Identified Issues to be Addressed by the LWU

Audit Component	Identified Issues	Priority	Management Option
Catchment	There have been incidences of algal blooms occurring in the off-creek storage during summer leading to failure to meet the desired LOS for water quality i.e. taste and odour.	M	Likely due to "first flush" runoff following heavy rainfall or storms in the catchment. Council to consider upgrading telemetry system to shut down intake pumps during periods of rapid rise in river levels or installing PAC treatment to remove taste and odour compounds and toxins.
Water Resources	Security of supply has not been tested. A single source of supply in the upper reaches of the Macdonald River catchment may be vulnerable to the effects of a severe prolonged drought. The issue is the lack of adequate information	H	The effects of a severe prolonged drought have not yet been fully assessed and a Yield Study for the catchment is required prior to the next review in 2014. This is an identified data gap.
Urban Area	Test results show water quality does not comply fully with target of 100% compliance with ADWG for chemical and microbiological standards. Samples over last 5 years: 1 of 10 outside pH guideline. 1 of 10 outside turbidity guideline. 9 out of 186 outside total coliforms guideline.	H	Need to review management practices e.g. adopt rigorous SOP.
	Water quality sampling does not meet target of 100% compliance with frequency requirements of NSW Health (52 micro samples, 2 chemical and 10 fluoride samples per year).	H	Need to improve sampling techniques and reliability of transport to laboratory.
	No Asset Management Plans in place for Water Supply and Sewerage infrastructure.	M	Preparation and implementation of robust, up-to-date Asset Management Plans is required.
	OOW Inspecting Officer has reported instances of OH&S issues at STP.	H	STP requires investigation to determine whether upgrading, augmentation or replacement is required to ensure OH&S, reliability and performance standards continue to be met.
	Sewage overflows are higher than the state median per 100km of mains resulting in public health concerns. Information required on condition of gravity mains.	H	High levels may reflect the deteriorating condition of the gravity mains. Audit or investigation of asset condition required for data input into Asset Management Plan.
	High treatment and pumping costs of sewerage placing further upward pressure on typical residential bill.	M	Council to carry out extensive investigation (including dye testing) to determine source of stormwater infiltration into sewer system. Additional budget provision for corrective work is required.
	Levels of unaccounted water losses in the system appear to be high.	M	More accurate data required to determine if this is an issue. An improved measurement technique to assess quantity of water delivered from WTP is required as a first step.
	No Demand Management or Drought Management Plan in place.	M	Need to implement all six Best Practice criteria.

Table 4.2 Summary of Identified Issues Outside the Authority of the LWU

Audit Component	Identified Issues	Comments
Catchment	Erosion is affecting turbidity levels in waterways, particularly in the Macdonald River catchment. Homestead water supplies and primary contact recreation are adversely affected.	Soils within the Walcha LGA are considered moderately to highly erodible. A major source of turbidity is stream bank erosion. Refer to Namoi CMA.
	There may be high nutrient loads resulting from agricultural practices involving the use of fertilisers.	Need to address at catchment level. Refer to Namoi CMA.
	Agricultural practices involving the use of pesticides have the potential to increase the accumulation of undesirable chemicals in soils.	Application of industry best practice and improved regulation of chemicals is expected to reduce pesticide concentrations.
	Catchment audit results show high levels of P and N in surface waters are adversely affecting aquatic ecosystems.	Need to address at catchment level. Refer to Namoi CMA and NSW Fisheries.
Water Resources	No issues identified.	
Urban Area	No existing on-site sewage system database to allow for monitoring and compliance of systems. No data available as to whether on-site systems are polluting a potential water source.	Insufficient data available. Need to capture data prior to next review in 2014 to determine if provision needs to be made to connect properties to the reticulation system or upgrade systems.
	Insufficient gross pollutant traps or stormwater control devices resulting in lack of control of water quality discharging into Apsley River.	No stormwater monitoring plan currently in place. Establishment of a plan is identified as an option in Walcha SMP.
	Stormwater runoff is adding significantly to the contaminant load of the Apsley River downstream of Walcha.	Management option included in Walcha SMP and assigned ranking of 5 out of 86. Goal is to reduce contaminant loads to below national average for urban centres with similar landuse mix within 5 years.

4.5 Potential TBL Assessment Criteria

A preliminary list of triple bottom-line (TBL) criteria have been developed for the assessment of future IWCM opportunities. These criteria appear in Table 4.3 below

Table 4.3 Triple Bottom Line Criteria

Economic	Social	Environmental
1. What is the impact on the TBL?	2. Are the costs affordable? 3. Does it encourage user-pay principles? 4. Will it not increase demand? 5. Will it improve pressure and flow? 6. Will it reduce the number of water quality complaints? 7. Will it increase effluent reuse? 8. Will it increase public awareness of urban water issues? 9. Will it improve service reliability to customers? 10. Will it enhance community lifestyle? 11. Will it reduce the frequency of water restrictions?	12. Will it ensure the efficient use of the fresh water resource? 13. Will it minimise water extractions and protect low flows? 14. Will it reduce the contaminant load in the Apsley River? 15. Will it minimise green house gas emissions? 16. Will it minimise urban stormwater volumes? 17. Will it increase the use of energy from renewable sources? 18. Does it ensure sustainable practices?

5 Summary

The Walcha IWCM Evaluation Study is the first phase of the IWCM process and has defined the catchment, water resource and urban water issues faced by Walcha Council. Those issues which will not be addressed by existing activities and formally adopted plans (the Business as Usual scenario) have been identified.

The process has identified the issues which are either directly or indirectly related to the planning and service delivery for urban water supply, sewerage and stormwater in Walcha over the next 30 years and whether these issues are the responsibility of Council as the local water utility, or some other authority.

With the involvement of the PRG, the process has also identified feasible management options in operational areas which will assist Walcha Council to achieve compliance with appropriate standards.

The Evaluation Study has identified that an investigation to determine whether upgrading, augmentation or replacement of the existing STP is required to ensure OH&S, reliability and performance standards continue to be met is required. Notwithstanding the outcome of that investigation which will determine if significant capital works will be required in the future, it is likely that a Simplified IWCM Strategy will address all outstanding issues in the next phase of the IWCM process.

Consequently, it is recommended that the Simplified Strategy be developed and form Part 2 of this report.

Appendix A – Audit Questions

Ref	Factor	Information Required	Available Information
1.0 Landscape characteristics			
1.1	What is the forested area of your catchment?	Give number and percentage cover of catchment.	**There are no State Forests located within the catchment boundaries however it is estimated that 30% of privately owned land in the catchment area is forested.**
1.2	Is catchment area currently subject to clearing?	Yes/No, if yes provide % annual removal of existing cover.	**No.**
1.3	What is the upstream extent of your estuary (tidal and saline).	Describe location and where and how this may vary.	**None.**
1.4	Are there wetlands in your catchment?	Yes/No, if yes describe location and % cover.	**Map 6.1 retrieved from www.environment.nsw.gov.au/soe/soe2006/chapter6 shows no wetlands in the catchment.**
1.5	What are the predominant types of vegetation in your catchment?	Describe location and cover.	**The eastern and southern areas of the district are covered with wet sclerophyll forests which yield large quantities of hardwood timber. The central and north-western areas consist of open woodland which has been extensively cleared and sown to pasture.**
1.6	Does your catchment have potential acid sulphate soils?	Yes/No, if yes describe location of soils and % of LGA affected.	**No.**
1.7	Are there acid impacts in your catchment waters?	Yes/No, if yes describe.	**No**
1.8	Are urban areas located in areas of potential acid soil?	Yes/No, if yes what proportion.	**No**
1.9	Are there acid impacts in your urban areas?	Yes/No, if yes describe impacts.	**No**
1.10	Does either dryland or irrigation salinity occur in your catchment?	Yes/No, if yes what type and where?	**No. Minor dryland salinity occurs mainly north and west of Walcha but not in the catchment.**
1.11	What area of the catchment is salt	Give % or area number.	**None.**

Ref	Factor	Information Required	Available Information
	affected?		
1.12	Are urban areas salt affected?	Yes/No, if yes what proportion.	**No**
1.13	Are there salinity targets for waterways?	Yes/No, if yes describe.	**Yes, from 30 – 350 uS/ for aquatic ecosystems, up to <1500 as a source for Drinking Water (clarification and disinfection).**
1.14	What are the predominant types of soil in your catchment?	Describe.	**Krasnozems, chocolate and solod soils. Within the sub-catchment, the geology consists of 17% basalt, 3% granite, 39% sedimentary, 35% metasediments and 6% other. Over one third of the district is covered by shallow soil types.**
1.15	Are there national parks in your catchment?	Yes/No, if yes name, size, type and location.	**Yes. The Aberbaldie Nature Reserve of 285 ha located at the junction of the Cobrabald and Macdonald Rivers.**
1.16	Are there protected areas (including water supply catchments and aquifers) in your catchment?	Yes/No, if yes describe.	**Tamworth NSW Office of Water advises it is unable to identify specific protected areas within the Walcha LGA.** **No new bores west of divide (stock and some domestic bores exempt). There is no Water Sharing Plan in place for unregulated Macdonald River. A Water Sharing Plan for the Apsley River was implemented in 2004.**
1.17	Are there any threatened species or critical habitats in your catchment?	Describe.	**No.**
1.18	What is the topography of your catchment?	Describe, provide GIS image if available.	**The catchment forms part of the plateau on the western fall adjacent to the Great Dividing Range. The off-take for the water supply is at an elevation of 980m whilst the highest point of the catchment is 1462m at Grundy Trig.**
1.19	What is the average catchment runoff?	Give number as % of rainfall	**18.1%**
2.0 Urban and Agriculture			
2.1	Are there STPs in your catchment?	Yes/No, if yes give number, type, age and location.	**No. The Walcha trickling filter plant built in 1970 is located adjacent to the Apsley River.**
2.2	Is effluent quality monitored?	Yes/No, if yes describe effluent quality (mean values)	**Yes. See attached effluent quality data.**
2.3	Is the STP discharge volume	Yes/No, if yes give total annual discharge and	**Yes. ~180 ML p.a.** **Average dry flow 4.5 L/s** **Average wet flow 12 L/s**

Ref	Factor	Information Required	Available Information
	monitored?	daily average dry weather volumes.	
2.4	Where are the STP discharge locations?	Describe location.	**Apsley River south of Walcha.**
2.5	What is the load of nutrients and any other monitored contaminants from the STP discharge?	Give number.	**Total Nitrogen – 2.2 tonnes per year** **Total Phosphorus – 1.8 tonnes per year** **Suspended solids (SS) – 5.0 tonnes per year**
2.6	What is the expected effluent flow (total and dry weather only) in 25 years time?	Give number based on pro-rata population increase/decrease estimates for this period.	**Expected to remain at current level or increase marginally.**
2.7	What is the expected load of nutrients and any other monitored contaminants in 25 years time?	Give number based on pro-rata population increase/decrease estimates for this period.	**Expected to remain at current level or decrease marginally.**
2.8	Are there any WTPs in your catchment?	Yes/No, if yes give name, treatment type, capacity and location.	**One flocculation, sedimentation, filtration plant at Walcha built in 1985.**
2.9	Is WTP final water quality monitored?	Yes/No, if yes provide data.	**Yes. See attached treated water quality data.**
2.10	What is the WTP capacity range?	Give annual capacity and peak daily capacity.	**Peak capacity is 55 L/s or 4 ML per day.** **Annual average is 232 ML.**
2.12	What is the urban area in your LGA?	Area in square km.	**5.2 sq. km**
2.13	What types of agriculture are there in your catchment?	Describe	**Sheep, wool and beef cattle production.**
2.14	What is the location and area of this agriculture?	Describe location and size.	**It is estimated that agricultural pursuits occupy 70% of the catchment land area.**
2.15	Is there modified or contaminated	Yes/No, if yes estimate the load of contaminants in	**Yes, but no information is available on which to base an estimate of contaminant load.**

Ref	Factor	Information Required	Available Information
	runoff or wastewater generated from this agriculture?	runoff.	
2.16	What is the population of the LGA?	Give number and year.	**3,186 (2006)**
2.17	What is the urban population?	Give number.	**1,623 (2006)**
2.18	What is the expected urban population growth?	Give number.	**0.7%**
2.19	What is the expected rural (non-urban) population growth?	Give number.	**negative 1.8%**
2.20	How many on-site sewage (septic) systems operate in the catchment?	Give number.	**Incomplete records of number and location but estimated to be 20.**
2.21	What types of industry operate in within the catchment?	Describe.	**Transport, agriculture and forestry.** Under current POEO legislation, the following sites are licensed by DECC in the Walcha LGA: Water Treatment Plant Sewerage Treatment Plant Waste Depot Allen, Taylor & Co (Boral Timber Mill). Closed in 2008.
2.22	Where is this industry located?	Describe.	**Industry is primarily based in the rural areas.**
2.23	Is the volume of industry waste discharge monitored?	Yes/No, if yes give discharge volume.	**No**
2.24	Where is industry wastewater discharged?	Describe	**WTP and STP discharge into Apsley River. No discharge from Waste Depot.**
2.25	Is there wastewater or reclaimed	Yes/No, if yes describe and give volume and	**Yes.**

Ref	Factor	Information Required	Available Information
	water use in the catchment?	location of reuse.	
2.26	Is reuse water monitored?	Yes/No, if yes give discharge volume, quality and contaminant load.	**Yes.**
2.27	What is the volume of urban stormwater generated?	Give number based on estimated urban runoff, area and local precipitation.	**2,524 Ml per year**
2.28	Is stormwater quality monitored?	Yes/No, if yes give estimate of quality and contaminant load. If no, use MEU water quality estimate for rural towns and previous volume estimate.	**Yes.** **Total Nitrogen – 1.3 tonnes per year** **Total Phosphorus – 0.3 tonnes per year** **Suspended solids (SS) – 53 tonnes per year**
2.29	What is the expected stormwater flow volume in 25 years time?	Give number based on pro-rata population increase/decrease estimates for this period.	**Based on a projected urban population increase of 0.7% per annum (resulting in an increase of 19% over 25 years) and taking into account the impact of infill development and domestic harvesting of rainwater it is estimated that stormwater flow will increase by 10% to 2,770 Ml per annum.**
2.30	What is the expected increase in urban area in 25 years time?	Give area as well as location of the proposed expansion of urban areas.	**Allowing for infill development, it is estimated the urban area will increase by approximately 0.5 sq km.**
2.31	Are there any contaminated sites in your LGA?	Give location, type and area.	**DECC&W Armidale office advises there is no record of contaminated sites identified under the Contaminated Land Management Act with the Walcha LGA.**
2.32	Does flooding occur in urban areas?	Identify locations and what infrastructure is susceptible to flooding.	**Apsley River has not over topped levees since they were constructed in 1970.** **Localised flooding from Blairs Gully does not significantly affect infrastructure.**
2.33	Have algal blooms been recorded in your LGA?	Yes/No, if yes give dates and type of bloom if known.	**Yes. Blue green algae between 20 January 04 and 8 March 04, in December 2006 and November 2008. Previous blooms (if any) are not recorded.**
2.34	What are your water demands?	Provide records of all urban water demands.	**190 Kl per property**
2.35	What is your water consumption?	Quarterly or annual volumes of water consumed.	**Average 232 Ml per annum.**

Ref	Factor	Information Required	Available Information
2.36	What is your energy consumption (kWh/ML) for your water and wastewater facilities and what is the bill for each?	Total energy consumed plus tariff type for each of water and sewerage.	**Water: 2570 kWh/Ml** **Sewerage: 210 kWh/Ml** **Electricity Costs** **$ / pa** River pumps $60,833 Sewage pump station $6,105 Trickling filter plant $1,900 IDEA plant $25,000 100% effluent re-use pump station $19,100
2.37	What is your sewerage and water supply operating cost per 100km of mains?	Give separate costs for sewer and water supply.	**Sewerage $580k** **Water $465k**
2.38	What is your sewerage and water supply operating cost per property?	Give separate costs for sewer and water supply.	**Sewerage $255** **Water $420**
2.39	Sewerage and water supply service complaints (per 1000 properties).	Give separate totals for sewer and water supply.	**Sewerage nil** **Water 2.4**
2.40	Water supply quality complaints	Per 1000 properties.	**2.4**
2.41	Number of supply main breaks	Per 100km of main	**Average 2 per year for 36.5 km of main.**
2.42	Sewer chokes and collapses	Per 100km of main	**Average 6 per year for the reticulation system.**
2.43	Sewer overflows to the environment	Per 100km of main	**27**
2.44	Are sewer overflows monitored?	Yes/No, if yes frequency, volume, quality, impact	**No**
2.45	Typical developer charges for sewerage and water	$/e.t. for each	**Not levied**
2.46	Average residential bill for sewerage services	$/connected property	**$375**
2.47	Volume of sewage	kL/annum	**209 kL**

Ref	Factor	Information Required	Available Information
	treated per property		
2.48	Urban properties without reticulated public sewerage and water supply.	% value for each of sewerage and water	**Sewerage – 5%** **Water - nil**
2.49	Water usage charge	cents/kL	**0 to 300kl $1.95 per kl** **Above 300kl $2.87 per kl**
2.50	Annual water allowance	kL/assessment	**Tiered system – see above.**
2.51	Access charge – water	$/assessment	**$133**
2.52	Drinking water quality tests	For last 3 years	**See Report.**
2.53	Raw water quality data at extraction point	For last 3 years	**No data available.**
2.54	STP effluent quality licence monitoring results	Preferably spreadsheet	
2.55	Water quality licence monitoring results for local waterways	Preferably spreadsheet	**No data available.**
2.56	Water supply, sewerage and stormwater system maps	Preferably on a GIS	**See report.**
2.57	Number of residential dwellings	Total as well as % occupied	**Details not available.**
2.58	Range of typical residential lot sizes	% for each size range	**Details not available.**
2.59	Number and size of rainwater tanks	Include location, age, and nature of usage where available.	**No data available**
2.60	Number of tanks connected to the potable supply for top up.	Number, location and sizes of tanks. Water usage and potable system protection measures.	**No data available**

Ref	Factor	Information Required	Available Information
2.61	Rainwater tank rebate.	Amount of rebate and conditions.	**No**
2.62	Is there polluted atmospheric fallout over the urban area	Type, source, frequency and contaminants	**No**
2.63	Is there an on-site detention policy (OSD)	Copy of policy and areas covered.	**No**
3.0 Climatic			
3.1	What is the mean annual rainfall for the LGA?	Give number.	**809mm**
3.2	What is the mean average evaporation for the LGA?	Give number.	**1190mm**
3.3	What is the seasonality of the rainfall?	Typical rainfall by month.	**December and January are the wettest months averaging 90 to 100mm and April and May are the driest months averaging 40mm per year.**
3.4	What is the maximum temperature and annual temperature range?	Typical max and min temperature by month.	**Mean monthly maximum temps vary from 25.4 degrees Celsius in February to 11.7 degrees in July. Mean monthly minimum temps vary from 12.5 degrees Celsius in February to minus 2.9 degrees Celsius in July.** **Snow occurs on an average of two days per year.**
4.0 River and Groundwater			
4.1	What is the water quality of dry weather river flows?	Data spreadsheets from monitoring programmes.	**No data available.**
4.2	What is the total annual dry weather discharge volume?	Give mean value.	**Characteristic** / **Sub-catchment** **Apsley** / **Upper Macdonald** Area (ha) 115,400 85,284 Total Authorised Irrigation Area (ha) 114 123 River Flow (ML/day) • 50th percentile 67 2.24 17 • 80th percentile No of water licences 11 27

Ref	Factor	Information Required	Available Information
			Management category S1 U3
4.3	What is the annual dry weather contaminant load?	Give numbers calculated from quality and volume above.	**For Apsley River 53 tonnes of SS, 1.3 tonnes of Total Nitrogen and 0.6 tonnes of phosphorus.**
4.4	What is the water quality of wet weather river flows?	Data spreadsheets from monitoring programmes.	**No data available**
4.5	What is the wet weather mean annual discharge?	Give volume.	**No data available**
4.6	What is the annual wet weather contaminant load?	Give numbers calculated from quality and volume above.	**No data available**
4.7	Have environmental flow requirements been identified for catchment streams?	Yes/No. If yes, have they been implemented or are they planned for future?	**Yes. A cease to pump condition is established for water access licences (those known as unregulated river access licences which cover irrigation, farming, industrial and recreational uses) when the flow is at, or below, 1 ML/day (measured at the flow reference point).**
4.8	What is the location of all catchment dams?	Give number, location and storage type (on-stream or off-stream)	**One off-creek storage located on Walcha southern outskirts.**
4.9	What is the capacity of each catchment dam?	Give volume for each dam.	**The off-creek storage has capacity of 80ML.**
4.10	What is the secure yield of each catchment dam?	Give volume for each dam.	**NA**
4.11	What is the water quality in each dam?	Give mean values.	**NA**
4.12	What is the location of all catchment weirs?	Give number, location and type.	**Nil**
4.13	What is the capacity of all catchment weirs?	Give volume for each weir.	**NA**
4.14	What is the	Give volume for	**NA**

Ref	Factor	Information Required	Available Information
	secure yield of all catchment weirs?	each weir.	
4.15	What is the water quality in each weir?	Give mean values.	**NA**
4.16	Are return flows provided from, or intended to be provided from storages or weirs?	Yes/No. If yes, give volumes for each storage or weir.	**NA**
4.17	Is the water quality from the return flows expected to be the same as the water quality in the dam or weir?	Yes/No. If no, give mean values.	**NA**
4.18	What is the extent and nature of groundwater resources within the catchment?	Give estimated volumes (for specific aquifers if available) and annual recharge (as a % of average annual rainfall).	**Tamworth DWE office advises shallow, low-yielding fractured rock aquifers only. Depths between 50 and 100 metres in local shales and granites. Volumes are undetermined.**
4.19	Does catchment include one or more estuary habitats	Yes/No.	**No**
4.20	Are there licensed extractions in the catchment?	Yes/No. If yes, give source, location, purpose and volume.	**11 access licences totalling 336ML.**
4.21	Are there licensed town water extractions in the catchment?	Yes/No. If yes, give source, location and volume.	**Yes, two extraction licences on Macdonald River.**
4.22	What is the projected town water demand in the next 25 years?	Give number based on current population usage x population increase.	**Projected demand in 2036 is 149 ML per year.**

Appendix B.1 - Catchment Water Quality - Objectives and Criteria

Type	Parameter	Macdonald River and Apsley River	Unit	Comments
Aquatic Ecosystems	TP	20	ug/L	
	TN	250	ug/L	
	DO	90 – 110%		
	pH	6.5 – 8.0		
	Salinity	30 – 350	uS/cm	
	Chemicals	ANZECC 2000 Guidelines Table 3.4.1		
	Turbidity	2 - 25	NTU	Values in the lower part of the range will be found in rivers during low flows.
Visual Amenity	Visual clarity and colour	Natural visual clarity not be reduced by >20% Natural hue of the water should not be changed by more than 10 points on the Munsell Scale.		
	Surface film and debris	Oils and petrochemicals should not be noticeable as a visible film on the water, nor should they be detectable by odour. Waters should be free of floating debris and litter.		
	Nuisance organisms	Macrophytes, phytoplankton scums, filamentous algal mats, blue-green algae, sewage fungus and leeches should not be present in unsightly amounts.		
Secondary contact recreation	FC	Median <1000/100mL, with 4 out of 5 samples <4000/100mL (min 5 samples taken at intervals <1 month)	cfu/100mL	
	Enterococci	Median < 230 with maximum 450-700/100mL	eu/100mL	
	Algae and blue-green algae	<15,000	cells/mL	
	Nuisance organisms	Use visual amenity guidelines. Large numbers of midges and aquatic worms are undesirable.		
	Chemical contaminants	ANZECC 2000 Guidelines Tables 5.2.3 and 5.2.4		
Primary contact recreation	Turbidity	6	NTU	
	FC	Median <150/100mL, with 4 out of 5 samples <600/100mL (min 5 samples taken at intervals <1 month)	cfu/100mL	During bathing season
	Enterococci	Median of <35/100mL with maximum in any one sample 60-100/100mL	eu/100mL	During bathing season
	Protozoans	Pathogenic free-living protozoans should be absent from bodies of fresh water.		It is not necessary to analyse water for these pathogens unless temperature is >24 degrees Celsius.
	Algae and blue-green algae	<15,000	cells/mL	

	Nuisance organisms	Use visual amenity guidelines. Large numbers of midges and aquatic worms are undesirable.		
	pH	5.0 – 9.0		pH varies naturally. Goal is to retain the natural range of pH.
	Temperature	15 – 35 degrees Celsius for prolonged exposure.		
	Chemical contaminants	ANZECC 2000 Guidelines Tables 5.2.3 and 5.2.4		Waters containing chemicals that are either toxic or irritating to the skin are unsuitable for recreation.
Livestock water supply	Algae and blue-green algae	Microcystins <11,500 cells/mL and/or concentrations exceed 2.3 ug/L expressed as microcystin-LR toxicity equivalent		
	Salinity	ANZECC 2000 Guidelines Table 4.3.1		
	FC	Median <100	thermotolerent coliforms per 100mL	
	Chemical contaminants	ANZECC 2000 Guidelines Table 4.3.2		Refer to Australian Drinking Water Guidelines (NHMRC and NRMMC 2004) for advice regarding pesticides and other organic contaminants.
Irrigation water supply	Algae and blue-green algae	Should not be visible.		No more than low algal levels are desired to protect irrigation equipment.
	FC	ANZECC 2000 Guidelines Table 4.2.2		
	Salinity	Refer ANZECC 2000 Guidelines Chapter 4.2.4		Consider irrigation water quality, soil properties, plant salt tolerance, climate, landscape and water and soil management.
	Heavy metals and metalloids	ANZECC 2000 Guidelines Table 4.2.10		
Homestead water supply	Blue-green algae – no concern	<1000 cells/mL		
	Blue-green algae – immediate action required	>2000 cells/mL >6500 cells/mL		Seek expert advice. Seek advice from health authority.
	Turbidity	5	NTU	
	TDS - acceptable	500 - 1000	mg/L	
	TDS - unsatisfactory	>1000	mg/L	
	FC	0	cfu/100mL	
	pH	6.5 – 8.5		
	Chemical contaminants	ADWG Guidelines for Inorganic chemicals		
Drinking Water – Clarification and disinfection	Blue-green algae - potable	<2000	Algal cells/mL	
	Blue-green algae – potable + weekly testing	>2000 >6500	Algal cells/mL	Seek expert advice. Seek advice from health authority.
	Blue-green algae – potable + full	>15000	Algal cells/mL	Full treatment incorporates filtration and

	treatment			activated carbon.
	Turbidity	Site specific determinant.		
	Salinity	<1500	uS/cm	>800 causes deterioration in taste.
	FC	0	cfu/100mL	
	TC – 95% samples	0	cfu/100mL	
	TC - occasional	<10	cfu/100mL	Coliform organisms should not be detected in 100mL in any two consecutive samples.
	DO	>6.5	mg/L	
	pH	6.5 – 8.5		
	Chemical contaminants	ANZECC 2000 Guidelines Section 6.2.2		
Aquatic Foods (cooked)	Algae and blue-green algae	No guideline is directly applicable, but toxins present in blue-green algae may accumulate in other aquatic organisms.		
	FC	Median 14 with no more than 10% >43.	MPN/100 mL	Fish destined for human consumption should not exceed a limit of 2.3 MPN E coli/g of flesh with a standard plate count of 100,000 organisms/g.
	Toxicants	Metals: Copper <5 Mercury <1 Zinc <5 Organochlorines: Chlordane <0.004 PCBs <2	ugm/L	
	Physico-chemical indicators	SS <40 Temperature: <2 degrees Celsius change over 1 hour	ugm/L	

Appendix B.2 - Catchment Water Quality Analysis Results

Monitoring Point: Macdonald River at Bendemeer														
Stream Type: Unregulated							**Objectives**		**Aquatic Ecosystems**			**Secondary Contact Recreation**		
Station No	Parameter	First Date	Last Date	Count	Min	Mean	Max	Units	Limit	Result	% compliance	Limit	Result	% compliance
419071	TP	4-Jul-02	2-Jun-09	85	13.2	70	209	ug/L	20	82	4			
419071	TN	4-Jul-02	2-Jun-09	85	210	600	1500	ug/L	250	83	2			
419071	DO	4-Jul-02	2-Jun-09	85	No data available				90 – 110%	n/a				
419071	pH	4-Jul-02	2-Jun-09	85	7.1	7.7	8.3		6.5 – 8.0	7	92			
419071	Salinity (EC)	4-Jul-02	2-Jun-09	85	84	133	264	uS/cm	350	0	100			
419071	Chemicals	4-Jul-02	2-Jun-09	85					ANZECC Table 3.4.1					
419071	Turbidity	4-Jul-02	2-Jun-09	85	0.5	8.8	120	NTU	25	2	98			
	FC	19-Sep-77	19-Sep-77	5	0	14	60	cfu/100ml				1000	0	100
419071	SS	4-Jul-02	2-Jun-09	85	<5	n/a	140	mg/L						
419071	Temperature	4-Jul-02	2-Jun-09	85	4.8	15	25.3	degrees Celsius						
	Algae and Blue Green Algae				No data available			cells/100mL				15,000	n/a	
	TDS							mg/L						
	Toxicants:													
	Metals - copper				No data available									
	- mercury				No data available									
	- zinc				No data available									
	Organochlorines													
	- Chlordane				No data available			ugm/L						
	- PCBs				No data available			ugm/L						
								RESULT	Very Poor			Insufficient Data		

Monitoring Point: Macdonald River at Bendemeer														
Stream Type: Unregulated							**Objectives**		**Primary Contact Recreation**			**Irrigation Water Supply**		
Station No	Parameter	First Date	Last Date	Count	Min	Mean	Max	Units	Limit	Result	% compliance	Limit	Result	% compliance
419071	TP	4-Jul-02	2-Jun-09	85	13.2	70	209	ug/L						
419071	TN	4-Jul-02	2-Jun-09	85	210	600	1500	ug/L						
419071	DO	4-Jul-02	2-Jun-09	85	No data available									
419071	pH	4-Jul-02	2-Jun-09	85	7.1	7.7	8.3		5.0 to 9.0	0	100			
419071	Salinity (EC)	4-Jul-02	2-Jun-09	85	84	133	264	uS/cm						
419071	Chemicals	4-Jul-02	2-Jun-09	85										
419071	Turbidity	4-Jul-02	2-Jun-09	85	0.5	8.8	120	NTU	6	31	64			
	FC	19-Sep-77	19-Sep-77	5	0	14	60	cfu/100ml	150	0	100			
419071	SS	4-Jul-02	2-Jun-09	85	<5	n/a	140	mg/L				4.2.4		
419071	Temperature	4-Jul-02	2-Jun-09	85	4.8	15	25.3	degrees Celsius	15 to 35	42	51			
	Algae and Blue Green Algae				No data available			cells/100mL	15,000	n/a		Not visible	n/a	
	TDS							mg/L						
	Toxicants:													
	Metals - copper				No data available							ANZECC Table 4.2.10		
	- mercury				No data available									
	- zinc				No data available									
	Organochlorines													
	- Chlordane				No data available			ugm/L						
	- PCBs				No data available			ugm/L						
								RESULT	Fair			Insufficient Data		

Monitoring Point: Macdonald River at Bendemeer														
Stream Type: Unregulated							**Objectives**		**Livestock Water Supply**			**Homestead Water Supply**		
Station No	Parameter	First Date	Last Date	Count	Min	Mean	Max	Units	Limit	Result	% compliance	Limit	Result	% compliance
419071	TP	4-Jul-02	2-Jun-09	85	13.2	70	209	ug/L						
419071	TN	4-Jul-02	2-Jun-09	85	210	600	1500	ug/L						
419071	DO	4-Jul-02	2-Jun-09	85	No data available									
419071	pH	4-Jul-02	2-Jun-09	85	7.1	7.7	8.3					6.5 - 8.5	0	100
419071	Salinity (EC)	4-Jul-02	2-Jun-09	85	84	133	264	uS/cm						
419071	Chemicals	4-Jul-02	2-Jun-09	85					ANZECC Table 4.3.2	n/a				
419071	Turbidity	4-Jul-02	2-Jun-09	85	0.5	8.8	120	NTU				5	40	53
	FC	19-Sep-77	19-Sep-77	5	0	14	60	cfu/100ml	100	0	100	0	3	40
419071	SS	4-Jul-02	2-Jun-09	85	<5	n/a	140	mg/L						
419071	Temperature	4-Jul-02	2-Jun-09	85	4.8	15	25.3	degrees Celsius						
	Algae and Blue Green Algae				No data available			cells/100mL	11,500	n/a		1,000	n/a	
	TDS							mg/L				1,000	n/a	
	Toxicants:													
	Metals - copper				No data available									
	- mercury				No data available									
	- zinc				No data available									
	Organochlorines													
	- Chlordane				No data available			ugm/L						
	- PCBs				No data available			ugm/L						
								RESULT	Insufficient Data			Poor		

Monitoring Point: Macdonald River at Bendemeer														
Stream Type: Unregulated							**Objectives**		**Drinking Water - Raw**			**Aquatic Foods (Cooked)**		
Station No	Parameter	First Date	Last Date	Count	Min	Mean	Max	Units	Limit	Result	% compliance	Limit	Result	% compliance
419071	TP	4-Jul-02	2-Jun-09	85	13.2	70	209	ug/L						
419071	TN	4-Jul-02	2-Jun-09	85	210	600	1500	ug/L						
419071	DO	4-Jul-02	2-Jun-09	85	No data available				6.5	n/a				
419071	pH	4-Jul-02	2-Jun-09	85	7.1	7.7	8.3		6.5 - 8.5	0	100			
419071	Salinity (EC)	4-Jul-02	2-Jun-09	85	84	133	264	uS/cm	1500	0	100			
419071	Chemicals	4-Jul-02	2-Jun-09	85					ANZECC Sec 6.2.2	n/a				
419071	Turbidity	4-Jul-02	2-Jun-09	85	0.5	8.8	120	NTU	Site specific					
	FC	19-Sep-77	19-Sep-77	5	0	14	60	cfu/100ml	0	3	40	14	0	100
419071	SS	4-Jul-02	2-Jun-09	85	<5	n/a	140	mg/L						
419071	Temperature	4-Jul-02	2-Jun-09	85	4.8	15	25.3	degrees Celsius						
	Algae and Blue Green Algae				No data available			cells/100mL						
	TDS							mg/L						
	Toxicants:													
	Metals - copper				No data available							5	n/a	
	- mercury				No data available							1	n/a	
	- zinc				No data available							2	n/a	
	Organochlorines													
	- Chlordane				No data available			ugm/L				0.004	n/a	
	- PCBs				No data available			ugm/L				2	n/a	
								RESULT	Poor			Insufficient Data		

Appendix B.3 - Walcha Water Supply – Potable Water Quality

Summary of Results Reporting – Compliance with Chemistry and Microbiology Guidelines 2005 - 2009

Parameter	Guideline Value	No of Samples	% Meet Guideline	No of Samples	% Meet Guideline	No of Samples	% Meet Guideline	No of Samples	% Meet Guideline	No of Samples	% Meet Guideline
Chemistry											
pH	6.5 - 8.5	2	100	2	50	2	100	2	100	2	100
Turbidity	5.0000 NTU	2	100	2	100	2	100	2	100	2	50
Total Dissolved Solids (TDS)	500.0000 mg/L	2	100	2	100	2	100	2	100	2	100
Aluminium	0.2000 mg/L	2	100	2	100	2	100	2	100	2	100
Antimony	0.0030 mg/L	2	100	2	100	2	100	2	100	2	100
Arsenic	0.0070 mg/L	2	100	2	100	2	100	2	100	2	100
Barium	0.7000 mg/L	2	100	2	100	2	100	2	100	2	100
Boron	4.0000 mg/L	2	100	2	100	2	100	2	100	2	100
Cadmium	0.0020 mg/L	2	100	2	100	2	100	2	100	2	100
Calcium	9999 mg/L	2	100	2	100	2	100	2	100	2	100
Chloride	250.0000mg/L	2	100	2	100	2	100	2	100	2	100
Chromium	0.0500 mg/L	2	100	2	100	2	100	2	100	2	100
Copper	2.0000 mg/L	2	100	2	100	2	100	2	100	2	100
Fluoride	1.5000 mg/L	12	100	12	100	11	100	12	100	9	100
Iodine	0.1000 mg/L	2	100	2	100	2	100	2	100	2	100
Iron	0.3000 mg/L	2	100	2	100	2	100	2	100	2	100
Lead	0.0100 mg/L	2	100	2	100	2	100	2	100	2	100
Magnesium	9999 mg/L	2	100	2	100	2	100	2	100	2	100
Manganese	0.5000 mg/L	2	100								
Mercury	0.0010 mg/L	2	100	2	100	2	100	2	100	2	100
Molybdenum	0.0500 mg/L	2	100	2	100	2	100	2	100	2	100
Nickel	0.0200 mg/L	2	100	2	100	2	100	2	100	2	100
Nitrate	50.0000 mg/L	2	100	2	100	2	100	2	100	2	100
Nitrite	3.0000 mg/L	2	100	2	100	2	100	2	100	2	100
Selenium	0.0100 mg/L	2	100	2	100	2	100	2	100	2	100
Silver	0.1000 mg/L	2	100	2	100	2	100	2	100	2	100
Sodium	180.0000 mg/L	2	100	2	100	2	100	2	100	2	100
Sulfate	500.0000 mg/L	2	100	2	100	2	100	2	100	2	100
Total Hardness as CaCO3	200.0000 mg/L	2	100	2	100	2	100	2	100	2	100
True Colour	15.0000 Hazen units (HU)	2	100	2	100	2	100	2	100	2	100
Zinc	3.0000 mg/L	2	100	2	100	2	100	2	100	2	100

Parameter	Guideline Value	No of Samples	% Meet Guideline	No of Samples	% Meet Guideline	No of Samples	% Meet Guideline	No of Samples	% Meet Guideline	No of Samples	% Meet Guideline
Microbiological											
Total Coliforms	0.0000 cfu/100 mL	36	94	36	92	36	97	43	98	35	94
E. coli	0.0000 cfu/100 mL	36	100	36	100	36	100	43	100	35	100
pH	6.5 – 8.5							12	100		
Free Chlorine	5.0000 mg/L							8	100		
Total Chlorine	5.0000 mg/L							5	100		

Appendix C - Summary of LWU performance 2007/08

Performance Indicator	Unit	Walcha	Statewide Median	Notes	Comment
Typical Residential Bill - Water	$/ assessment	$470	$370	40% of LWUs are under $425	High
Typical Residential Bill - Sewer	$/ assessment	$375	$405	40% of LWUs are under $370	
Typical Residential Bill - Total	$/ assessment	$845	$765	40% of LWUs are under $840	
Chemical water quality compliance	per cent	100%	na	71% of LWUs complied with the Australian Drinking Water Guidelines	
Microbiological Water Quality compliance	per cent	100%	na	83% of LWUs complied with the Australian Drinking Water Guidelines	
Water Quality Complaints - Water	no. per 1000 properties	2.4	3.0	40% of LWUs had under 2 complaints. Group 4 Councils had a low incidence under 2	
Odour complaints - Sewerage	no. per 1000 properties	0	0.4	50% of LWUs had nil sewer odour complaints	Very low
Residential water supplied	kL/property	190	185	Weighted median average for inland LWUs is 305kL	Low for an inland LWU
BOD compliance - sewerage	per cent	100	na	71% of LWUs complied with the DECC licence	
SS compliance - sewerage	per cent	100	na	57% of LWUs complied with the DECC licence	
Sewer overflows to environment	no. per 100km mains	27	18	40% of LWUs have under 4	
Recycled water	per cent	0	18	70% of LWUs carry out some recycling	Low but being addressed
Return on assets - water	per cent	1.0	1.9	40% of LWUs have a ROA over 2.3%	Low
Return on assets - sewerage	per cent	0.9	1.4	40% of LWUs have a ROA over 2.2%	Low
Operating costs - water	$/property	$420	$290	40% of LWUs have an operating cost under $350	High

Performance Indicator	Unit	Walcha	Statewide Median	Notes	Comment
Operating costs - sewerage	$/property	$255	$320	40% of LWUs have an operating cost under $270	A little low?
Operating costs per kL - water	c/kL	170	90	80% of LWUs have operating costs below 127 c/kL	Very high
Management costs - water	$/property	$106	$115	40% of LWUs have management costs under $100	
Management costs - sewerage	$/property	$50	$110	40% of LWUs have management costs under $80	Very low
Revenue from Usage - water	per cent	82	67	Second highest of all LWUs.	Very high

Appendix D - DEUS-Rainwater Tank Model (20yrs)(Version RTM 2.1)

ASSESSMENT OF HISTORIC RAINWATER TANK PERFORMANCE ACROSS NSW for a 20 YEAR PERIOD (Version - RTM 2.1)
IMPACT ON HOUSEHOLD WATER COST, MAINS WATER SUPPLY AND ROOF STORMWATER RUNOFF
Generic Model (With supporting data from 4 IWCM Study Towns)

DEPARTMENT OF ENERGY, UTILITIES AND SUSTAINABILITY
NEW SOUTH WALES GOVERNMENT

(Note, only enter data into Bright Yellow Cells. All other cells are locked.)

"Design" Parameter	Value ##	Typ. Vals #
Roof Area Draining To Tank (m2)	150	200
First Flush Vol/ day (Represents FF per Storm) (L)	25	20
Rainfall water lost due to Wetting & Evap/Storm (mm)	1.0	0.5
Roof Runoff Factor (allows for gutter overflow, etc) (%)	90	90
Tank Starting Volume when first installed (L)	1	1
Annual Av Outside Usage (L/day) ***	200	190
Av. Daily Toilet Usage (L/day)	100	105
Av. Daily Washing Machine Cold Water Usage (L/day)	90	97
Av. Daily Hotwater Usage (supplying H/W unit) (L/day)	120	140
Av. Annual Household Usage (KL/yr) (Equation = Locked)	181	250
Av. Daily Household Usage (L/day)	496	684
Maximum Mains Tank Topup per day (L)	600	600
Use values for a typical family. If ERROR appears check Daily Usage.		ERROR
Typical Water Usage Charge ($/KL)	1.95	0.80
Typical Water Access Charge ($/year)	133.00	200.00
(Typical Water Bill ($/year)) (Equation = locked)	486.27	400.00

Statistics with no tank installed

Roof Runoff Days/Yr	69
Roof runoff volume per year (L)	81,677

(# Typ. Vals = Typical values are listed here for guidance only.)

(## Users can vary any RED NUMBERS on this page & run the Model by pressing "F9" for new results. This may take a few seconds.)

TO CHECK GENERAL TANK PERFORMANCE THE USER CAN USE RAINFALL & TEMP DATA FROM OUR 4 SAMPLE TOWNS BY SELECTING THE TOWN CODE AS SEEN BELOW or SELECT "L" IF LOCAL DATA HAS BEEN IMPUTED ON SHEET "VARIATION 1".

Enter town code (A,B,C,DorL) in this cell, hit Return Key & "F9" → c

Kempsey	(Av. Annual rainfall is 1230 mm)	A
Eurobodalla	(Av. Annual rainfall is 970 mm)	B
Parkes	(Av. Annual rainfall is 590 mm)	C
Cobar	(Av. Annual rainfall is 380 mm)	D
Local	(Using local rainfall and max temp data.)	L

Variable sets 1&2 allow comparison of two options with different tank size and/or water usage.

1. Variable Set One

Say "Yes" by placing "Y" or "y"↴.		Values.
Outside usage	y	200
Toilet		-
W/machine cold		-
Hotwater unit		-
Total internal (L/day) =		-
Tank Connected TOTAL(L/day) =		200
Tank Connected TOTAL(L/year) =		73,050

OUTPUT AREA →

Tank Size (L)	10,000	
Roof Runoff to Tank/Year (L)	71,773	
Tank Overflow/Year (L) (%)	16,081	22%
Rainwater Usage/Year (L) (%)	55,692	78%
Average Tank Volume (L)(%)	4,988	50%
No. of overflow Days/Year	13	
Average Overflow Vol/Day (L)	1,232	
Max Day Overflow (20years) (L)	9,333	
Days/Year Tank is Full (days & % of year)	13	4%
NonTank Mains Usage per Year (L)	73,050	
Mains Topup per Year (L) (% of uses)	17,937	25%
Mains Water Saving & Roof Stormwater Redn (KL/Yr)	**55.1**	
Total water bill saving ($/year)(%)	107.47	22%

ENTER DATA AND PRESS "F9" TO UPDATE MODEL.

2. Variable Set Two

Say "Yes" by placing "Y" or "y"↴.		Values.
Outside usage	Y	200
Toilet	y	100
W/machine cold		-
Hotwater unit		-
Total internal (L/day)=		100
Tank Connected TOTAL(L/day) =		300
Tank Connected TOTAL(L/year) =		109,575

OUTPUT AREA →

Tank Size (L)	2,000	
Roof Runoff to Tank/Year (L)	71,773	
Tank Overflow/Year (L) (%)	33,146	46%
Rainwater Usage/Year (L) (%)	38,626	54%
Average Tank Volume (L)(%)	874	44%
No. of overflow Days/Year	23	
Average Overflow Vol/Day (L)	1,411	
Max Day Overflow (20 years) (L)	9,033	
Days/Year Tank is Full (days & % of year)	23	6%
NonTank Mains Usage per Year (L)	109,575	
Mains Topup per Year (L) (% of uses)	71,213	65%
Mains Water Saving & Roof Stormwater Redn (KL/Yr)	**38.4**	
Total water bill saving ($/year)(%)	74.81	15%

(*** The outside usage is varied across the year based on max temp & 2 days of rain. This gives a seasonal looking usage. The % similarity of Variable Set 1 target and calculater is given here just for information. (100% is ideal) → 100%

This model should only be used for the undertaking of an IWCM Study in NSW. Usage validation No.= DEUS 37644

Appendix E1 – Demand Side Decision Support System (Simplified version 1.1)

Summary of Scenarios and Average Annual Water Savings

Description	Scenario 1	Scenario 2	Scenario 3	Scenario 4
National Mandatory Water Efficiency Labelling Scheme (WELS)	X	X	X	X
Community Education	X	X	X	X
Residential Shower Retrofit	X	X	X	X
Residential Washing Machine Rebate		X	X	X
Permanent Low Level Restrictions on Water Use		X	X	X
Conservation Pricing for Residential Users			X	X
Fixture Code - Taps and Showers - New Development				X
Non-Residential Water Audits		X		
System Water Loss Management				X
Rainwater Tanks for all New Residential Development			X	
Dual Reticulation for all New Residential Development				
BASIX - Fixture Efficiency with Rainwater Use				
BASIX - Fixture Efficiency with Dual Reticulation				
System Water Loss Management			X	
Evaporative Cooling Unit and Cooling Tower Audit				
Utility B/C Ratio	2.1	3.8	2.0	5.5
Community B/C Ratio:	1.2	0.9	0.7	1.4
Average Water Savings (ML/a):	4.7	13.7	23.7	20.8

Note: X denotes measure is included in the Scenario.

The following 3 graphs give the model results for Walcha if the default measures are included for each scenario. There is an immediate decrease in demand for all scenarios and a gradual increase in Total Water Demand and Peak Day Water

Demand to accommodate the projected additional connections forecast over the next 30 years. The per capita water demand shows no increase for Scenario 1 and a marginally decreasing trend for the other three scenarios over the same period.

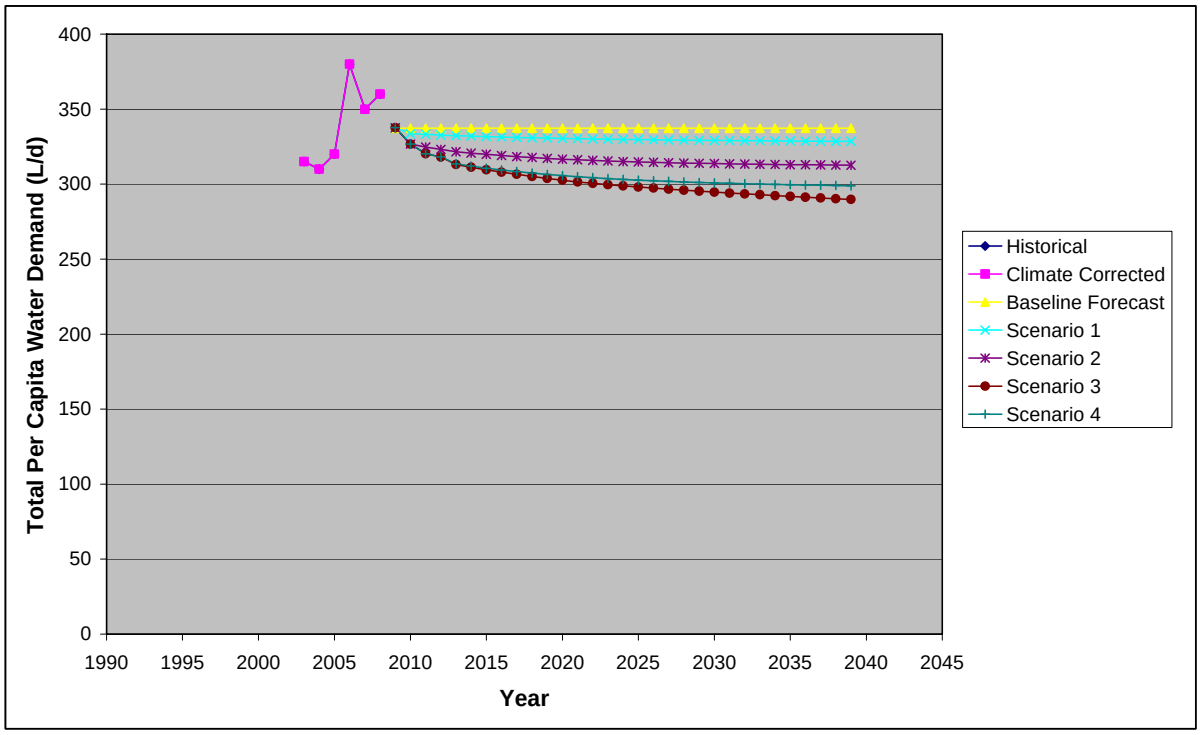
The graphs give results for:

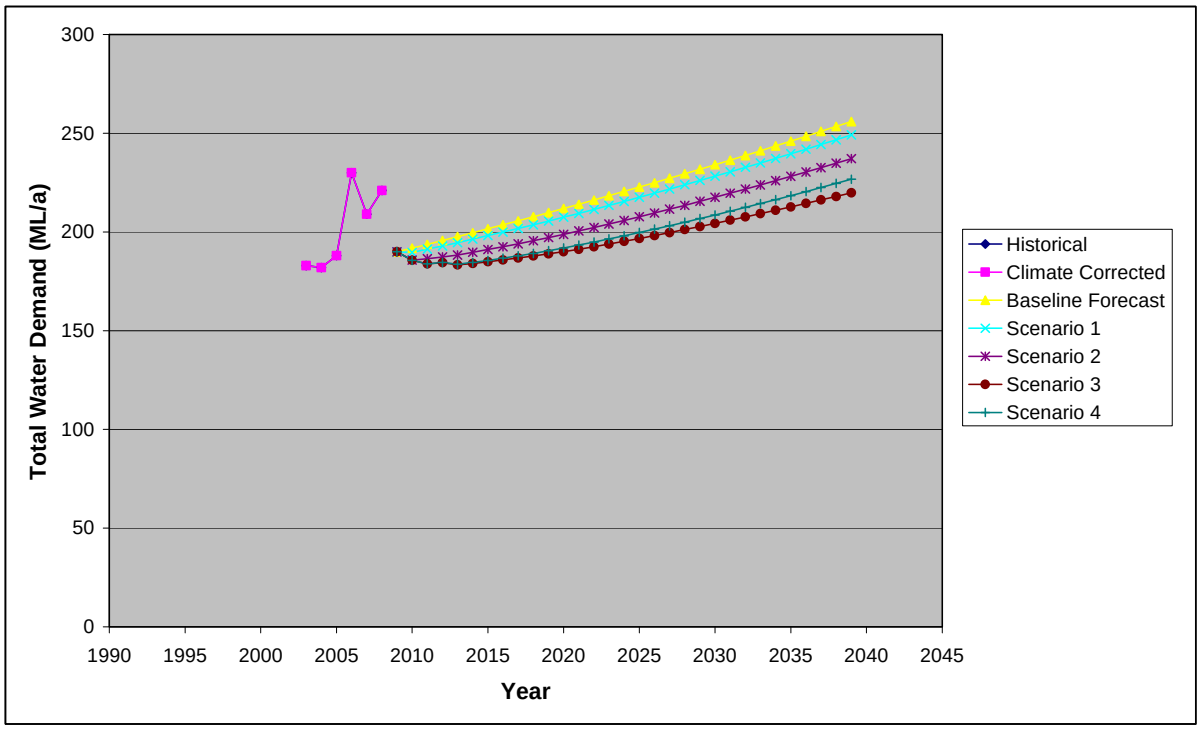
E.1 Total per capita water demand (L/day)

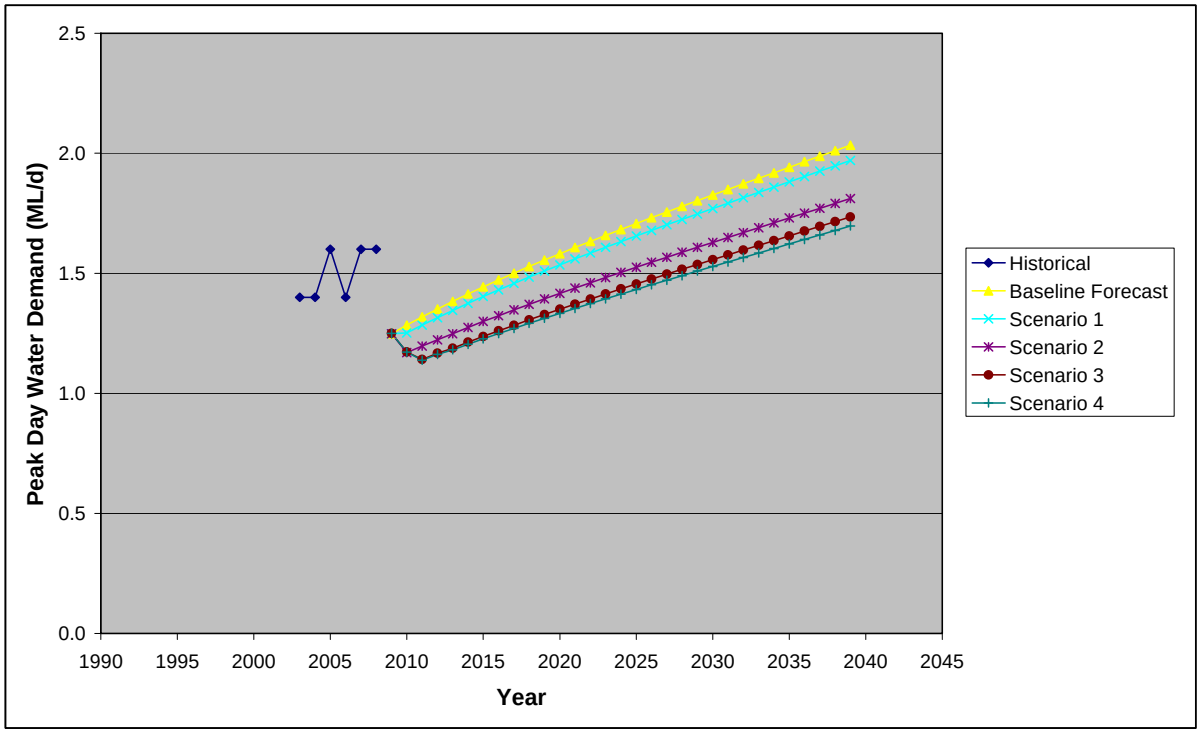
E.2 Total water demand (ML/year)

E.3 Peak day water demand (ML)

Appendix E2 – Walcha - DEUS-DSM DSS - Simplified - Version 1.1 - Model Demand Side Decision






Peak Day Water Demand (ML/d)
2.5
2.0
1.5
1.0
0.5
0.0
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
Year
Historical
Baseline Forecast
Scenario 1
Scenario 2
Scenario 3
Scenario 4

Appendix F - Environment Protection Licence 2613 Sewerage Plant

Department of
Environment and Conservation (NSW)
incorporating the Environment Protection Authority

Mr Jack O'Hara
General Manager
Walcha Council
PO BOX 2
WALCHA NSW 2354

Our Reference : 250829A1/02
: TRIM DOC 3649
Contact : Angela Shallvey, 6773 7000
Date : 4 January 2004

Dear Mr O'Hara,

ISSUE OF VARIED LICENCE

The recent variations made to the Walcha STS Licence (Number 2613) are now in effect and a copy of the varied licence is enclosed for your information. Please read the reviewed licence carefully and place it into your licence information folder for reference.

Please note that, although the EPA is now a part of the Department of Environment and Conservation, certain statutory functions and powers continue to be exercised in the name of the Environment Protection Authority (EPA).

Please contact Angela Shallvey at the EPA's Armidale office on 6773 7000 to discuss any of the issues addressed in this letter.

Yours faithfully,

A. Shallvey

ANGELA SHALLVEY
Regional Operations Officer
Northern Tablelands

Attachments:
1. Environment Protection Licence 2613